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Dergimizin değerli okuyucuları,

2023 yılının ilk sayısını ilginize sunuyoruz. Okurlarımız ve yazarlarımızın da geri bildirimlerini değerlendirerek dergimizi uluslararası indekslere girebilecek seviyeye çıkartmak için çalışmalarımız sürüyor. Her geçen sayıda okuyucularımızı daha özgün ve daha ilgi çekici konularda hazırlanmış bilimsel araştırmalarla buluşturmaya çalışıyoruz. Biz sayıyı hazırlarken çok şey öğrendik. Umarız sizin için de eğitici ve keyifli bir sayı olur.
Bu vesile ile tüm meslektaşlarımızın 14 Mart Tıp Bayramını da kutluyorum. Sağlıcakla kalınız…

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Baş editör

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GENEL BİLGİLER

Sakarya Tıp Dergisi, Acil Tıp, Adli Tıp, Aile Hekimliği, Algoloji, Anatomi, Aneztezi ve Reanimasyon, Beyin ve Sinir Cerrahisi, Çocuk Sağlığı ve Hastalıkları, Deri ve Zührevi Hastalıklar, Enfeksiyon Hastalıkları ve Klinik Mikrobiyoloji, Fiziksel Tıp ve Rehabilitasyon, Fizyoloji, Genel Cerrahi, Göğüs Cerrahisi, Göğüs Hastalıkları, Göz Hastalıkları, Halk Sağlığı, Hava ve Uzay Hekimliği, Hematoloji, Histoloji ve Tıbbi Embriyoloji, İç Hastalıkları, Kadın Hastalıkları ve Doğum, Kalp ve Damar Cerrahisi, Kardiyoloji, Kulak Burun Boğaz Hastalıkları, Nöroloji, Nükleer Tıp, Ortopedi ve Travmatoloji, Plastik ve Rekonstriktif Cerrahi, Radyasyon Onkolojisi, Radyoloji, Ruh Sağlığı ve Hastalıkları, Spor Hekimliği, Sualti Hekimliği ve Hiperbarik Tıp, Tıbbi Biyokimya, Tıbbi Ekoloji ve Hidroklimatoloji, Tıbbi Farmakoloji, Tıbbi Genetik, Tıbbi Mikrobiyoloji, Patoloji, Üroloji Anabilim Dalları ve yukarıda adı geçen tüm bilim dallarının yan dallarıyla ile ilgili olabilecek retrospektif, prospektif veya deneysel araştırma, derleme, olgu sunumu, editöryal yorum/tartışma, editöre mektup, cerrahi teknik, ayırıcı tanı, tıbbi kitap değerlendirmeleri, soru- cevaplar ve tıp gündemini belirleyen güncel konuları yayınlayan, Ulusal ve Uluslararası tüm tıbbi kurum ve personele ulaşmayı hedefleyen bilimsel bir dergidir. 06/07/2019 tarihinden itibaren Diş Hekimliği, Beslenme ve Diyetetik, Sağlık Yönetimi Bilim Dallarından gönderilen çalışmalar koruyucu hekimlik konularını işlemek kaydıyla kabul edilecektir.

Dergi yılda dört sayı olarak Mart, Haziran, Eylül ve Aralık aylarında yayınlanmaktadır. Derginin resmi yayın dili Türkçe ve İngilizcedir. İngilizce yazım tercih sebebidir. Dergi ile ilgili her türlü işlem ve başvuru http://dergipark.gov.tr/smj adresinden yapılabilir. Geçmiş sayılarda yayınlanan çalışmalara bu adresten ulaşılabilir.

Bilimsel Politikalar ve Etik Sorumluluğu: Yazıların bilimsel sorumluluğu yazarlara aittir. Tüm yazarların çalışmaya aktif olarak katılmış olması gereklidir. Gönderilen yazıların dergide yayınlanabilmesi için daha önce başka bir bilimsel yayın organında yayınlanmamış olması gerekir. Gönderilen yazı daha önce herhangi bir toplantıda sunulmuş ise; toplantı adı, tarihi ve düzenlendiği şehir belirtilmelidir. Klinik araştırmaların protokolü ilgili kurumun etik komitesi tarafından onaylanmış olmalıdır. İnsanlar üzerinde yapılan tüm çalışmalarda, "Yöntem ve Gereçler" bölümünde çalışmanın ilgili komite tarafından onaylandığı veya çalışmanın Helsinki İlkeler Deklerasyonuna (www.wma.net/e/policy/b3.htm) uyularak gerçekleştirildiğine dair bir cümle yer almalıdır. (Etik kurul tarih ve protokol numarası) Çalışmaya dahil edilen tüm insanların bilgilendirilmiş onam formunu imzaladığı metin içinde belirtilmelidir.

Çalışmada "Hayvan" öğesi kullanılmış ise yazarlar, makalenin Gereç ve Yöntemler bölümünde Guide for the Care and Use of Laboratory Animals (www.nap.edu/catalog/5140.html) prensipleri doğrultusunda çalışmalarında hayvanhaklarını koruduklarını ve kurumlarının etik kurullarından onay aldıklarını belirtmek zorundadır.

Değerlendirme Süreci:

Dergiye gönderilen yazıların değerlendirilmesi üç aşamada yapılmaktadır. Birinci aşamada makaleler dergi standartları açısından incelenir, yazım kurallarına uymayan makaleler reddedilir. Makale yazım kurallarına göre düzenlendikten sonra aynı isimle yeniden dergiye yüklenebilir. İkinci aşamada makaleyi editör kurulu tarafından içerik ve yöntem açısından değerlendirmeye alınır. İlk iki aşamayı tamamlayan makaleler üçüncü aşamaya geçerek incelenmesi için hakemlere gönderilir.

Tüm yazılarda editöryel değerlendirme ve düzeltmeye başvurulur; gerektiğinde, yazarlardan bazı soruları yanıtlaması ve eksikleri tamamlaması istenebilir. Değerlendirme sonucu kabul, minör revizyon, major revizyon, yeniden yazılması gerekli ya da ret kararı çıkabilir. Dergide yayınlanmasına karar verilen makale basım sürecine alınır; bu aşamada tüm bilgilerin doğruluğu için ayrıntılı kontrol ve denetimden geçirilir; yayın öncesi şekline getirilerek yazarların kontrolüne ve onayına sunulur.

Yayın Hakkı:

1976 Copyright Act'e göre, yayımlanmak üzere kabul edilen yazıların her türlü yayın hakkı dergiyi yayımlayan kuruma aittir. Yazarlar, http://dergipark.gov.tr/smj internet adresinden ulaşacakları "Yayın Hakları Devir Formu"nu doldurup (mavi kalemle ve ıslak imzalı olacak şekilde tüm yazarlarca imzalanmış), DergiPark sitemi üzerinden göndermelidirler.

- Olgu sunumu/serisi ve derleme dışındaki bilimsel çalışmalarda etik kurul onay belgesi sisteme yüklenmelidir.
- Veri toplama süreci Aralık 2010 tarihinden önce tamamlanmış çalışmalar kabul edilmeyecektir.
- Bilimsel çalışmalar, çalışmadaki yazarların isim ve soy isimleri (çalışmaya dahil olan tüm yazar isimleri yazılmalı) ile çalışma başlığındaki tüm kelimelerin (bağlaçlar hariç) sadece ilk harfleri büyük harf olacak şekilde DergiPark sistemine yüklenmelidir.
- Yazarların aynı sayıda ilkisim oldukları yalnızca bir çalışmaları yayınlanacaktır.
- SCI, SSCI, SCIE, ESCI veya A&HCI'de
- indekslenen dergilerde yayınlanmış çalışmalarında Sakarya Tıp Dergisi'nde yayınlanmış herhangi bir çalışmaya atıfta bulunan yazarların çalışmalarına öncelik verilecektir. (Çalışma bilgilerinin ve varsa linkinin Editöre Sunum Sayfası'nda belirtilmesi gerekmektedir ve hckerbicer@gmail.com adresine mail atılarak hatırlatma yapılmalıdır).
- Yazım dili İngilizce olan bilimsel çalışmaların veya yazım dili Türkçe olan çalışmaların İngilizce özetlerinin yazımında akademik düzenleme hizmeti veren profesyonel kurum veya kuruluşlardan yardım alındığının belgelenmesi durumunda bu çalışmalara öncelik verilecektir.

Yazının Hazırlanması

- Derleme türündeki bilimsel çalışmalar için yazar sayısı üçü geçmemelidir.
- Olgusunumları için yazar sayısı altıyı geçmemelidir.
- Yazılar çift satır aralıklı ve 10 punto olarak, her sayfanın iki yanında ve alt ve üst kısmında 2.5 cm boşluk bırakılarak yazılmalıdır. Yazı stili Arial olmalıdır.
- Yazılar Microsoft Word formatında olmalıdır. (Tablolar dahilolacak şekilde)
- Kısaltmalar, özette ve ana metinde kelimenin ilk geçtiği yerde parantez içinde verilmeli ve tüm metin boyunca o kısaltma kullanılmalıdır. Küçük harflerle yapılan kısaltmalara getirilen eklerde ise kısaltmanın son harfinin okunuşu esas alınır: cm'yi, kg'dan, mm'den, kr.un. Büyük harflerle yapılan kısaltmalara getirilen eklerde ise kısaltmanın son harfinin okunuşu esas alınır: BDT'ye, TDK'den, THY'de, TRT'den, TL'nin vb. Ancak kısaltması büyük harflerle yapıldığı hâlde bir kelime gibi okunan kısaltmalara getirilen eklerde kısaltmanın okunuşu esas alınır: ASELSAN'da, BOTAŞ'ın, NATO'dan, UNESCO'ya vb.
- Editöre sunum sayfası ayrı bir Word dosyası olarak gönderilmelidir. Editöre sunum sayfasında gönderilen çalışmanın kategorisi, eş zamanlı olarak başka bir dergiye gönderilmemiş olduğu, daha önce başka bir dergide yayınlanmamış olduğu, varsa çalışmayı maddi olarak destekleyen kişi ve kuruluşlar ile varsa bu kuruluşların yazarlarla olan ilişkileri belirtilmelidir.
- Kapak sayfası ayrı bir Word dosyası olarak gönderilmelidir. Kapak sayfasında başlık basit ve anlaşılır şekilde olmalıdır (Türkçe ve İngilizce). Başlık 60karakterden daha uzun
- olduğu takdirde İngilizce ve Türkçe kısa başlık da kapak sayfasına eklenmelidir. Tüm yazarların adı, soyadı ve unvanları, ORCID numaraları, çalıştıkları kurumun adı ve şehri bu sayfada yer almalıdır. Bu sayfaya ayrıca "yazışmadan sorumlu" yazarın isim, açık adres, telefon ve e-posta bilgileri eklenmelidir.

İstatistik Bilgi Notu

- Kullanılan istatistiksel yöntem, orijinal veriye erişebilecek bilgili bir okuyucunun rapor edilen sonuçları onaylayabileceği bir ayrıntıda belirtilmelidir. İstatistiksel terimler, kısaltmalar ve semboller tanımlanmalıdır. Kullanılan bilgisayar programı, istatistiksel yönteme dair açıklama verilmelidir. Çalışma deseni ve istatistiksel yönteme dair kaynaklar mümkünse belirtilmelidir.
- Sonuçların sunumunda, özellikle ortalama ve yüzdelik verirken, ondalıklı hanelerin gösteriminde virgülden sonra sonra 2 hane kullanılmalıdır (112,2 yerine; 112,20 veya 112,21 gibi). P, t, Z değerleri istisnadır ve virgülden sonra 3 hane verilmelidir (p<0,05 yerine tam değer p=0,001). Tam sayı dışındaki gösterimlerde virgülden sonra iki hane, istatistiksel değerlerin (p,t,z,F,Ki-Kare gibi) virgülden sonra üç hane değerlerin sunulması, p değerlerinin sunumunda p<0,05 veya p>0,05 yerine test istatistiği ile birlikte tam p değerinin (bu değerin binde birden küçük olması durumunda p<0,001 biçiminde) gösterilmesi gerekmektedir.

Yazının Bölümleri

- Çalışmanın gönderildiği metin dosyasının içinde sırasıyla, Türkçe başlık, Türkçe özet, Türkçe anahtar kelimeler, İngilizce başlık, İngilizce özet, İngilizce anahtar kelimeler, çalışmanın ana metini, kaynaklar, her sayfaya bir tablo olmak üzere tablolar ve son sayfada şekillerin (varsa) alt yazıları şeklinde olmalıdır. Tablolar kaynaklardan sonra, her sayfaya bir tablo olmak üzere çalışmanın gönderildiği dosya içinde olmalı ancak çalışmaya ait şekil, grafik ve fotoğrafların her biri ayrı bir imaj dosyası (jpeg ya da gif) olarak gönderilmelidir.

Araştırma Makalesi:

Öz (Abstract): Türkçe ve İngilizce özetler çalışmanın başlığı ile birlikte verilmelidir. Özetler Amaç (Objective), Gereç ve Yöntemler (Materials and Methods), Bulgular (Results) ve Sonuç (Conclusion) bölümlerine ayrılmalı ve 250 sözcüğü geçmemelidir.

Anahtar Kelimeler (Keywords): Türkçe özetten sonra Türkçe anahtar kelimeler, İngilizce özetten sonra İngilizce anahtar kelimeler belirtilmelidir.

Giriş (Introduction): Giriş bölümünün son paragrafında çalışmanın amacını bildiren bir cümle yer almalıdır.

Gereç ve Yöntemler (Materials and Methods): Araştırmanın tipi, etik hususlar (etik onamının alındığı kurum, tarih ve no), kullanılan istatistiksel analiz yöntemleri belirtilmelidir.

Bulgular (Results) Tartışma (Discussion) Kaynaklar (References)

Makalenin son sayfasında etik onamının alındığı kurum, tarih ve no ayrıca belirtilmelidir.

Olgu Sunumu/Serisi:

Öz (Abstract): Türkçe ve İngilizce özetler makelenin başlığı ile birlikte verilmelidir. Özetler tek paragraflık olmalıdır. (100-150 kelime olmalıdır.)

Anahtar Kelimeler (Keywords): Türkçe özetten sonra Türkçe anahtar kelimeler, İngilizce özetten sonra İngilizce anahtar kelimeler belirtilmelidir.

Giriş (Introduction)

Olgu Sunumu (Case Report) Tartışma (Discussion) Kaynaklar (References)

*Olgu sunumlarında, bilgilendirimiş gönüllü olur/onam formunun imzalatıldığına dair bilgiye makalede yer verilmesi gereklidir.

Derleme:

Öz (Abstract): Derleme özetleri kısa ve tek paragraflık olmalıdır (ortalama 100-150 kelime; bölümsüz, Türkçe ve İngilizce)

Anahtar Kelimeler (Keywords): Türkçe özetten sonra Türkçe anahtar kelimeler, İngilizce özetten sonra İngilizce anahtar kelimeler belirtilmelidir.

Giriş (Introduction) Konu İle İlgili Başlıklar Sonuç (Conclusion) Kaynaklar (References)

Editöre Mektup:

Mektuplar, kaynaklar hariç 500 kelimeyi geçmemelidir. Türkçe ve İngilizce özete gerek yoktur. Kaynak sayısı 5 ile sınırlandırılmalıdır. Bir mektup en fazla 4 yazar tarafından yazılabilir. Editöre mektuplar hakem değerlendirme sürecine alınmaz, ancak editör tarafından gerekli durumlarda yazarlardan mektuba cevap vermeleri istenebilir.

Anahtar Kelimeler

- En az 3 en fazla 6 adet, Türkçe ve İngilizce yazılmalıdır.
- Kelimeler birbirlerinden noktalı virgül (;) ile ayrılmalıdır.
- İngilizce anahtar kelimeler "Medical Subject Headings (MESH)"e uygun olarak verilmelidir (www.nlm.nih.gov/mesh/MBrowser.html).
- Türkçe anahtar kelimeler Türkiye Bilim Terimleri'ne uygun olarak verilmelidir (www.bilimterimleri.com).

Kaynaklar

- Yazarlar yalnızca doğrudan yararlandıkları kaynakları yazılarında gösterebilirler.
- Kaynaklar yazıda geliş sırasına göre yazılmalı ve metinde cümle sonunda noktalama işaretlerinden hemen sonra "Üst Simge" olarak belirtilmelidir.
- Çalışmada bulunan yazar sayısı 6 veya daha az ise tüm yazarlar belirtilmeli, 7 veya daha fazla ise ilk 6 isim yazılıp "et al" eklenmelidir.
- Kaynak yazımı için kullanılan format Index Medicus'ta belirtilen şekilde olmalıdır (www.icmje.org).
- Kaynak listesinde yalnızca yayınlanmış ya da yayınlanması kabul edilmiş veya DOI numarası almış çalışmalar yer almalıdır.
- Kaynak sayısının araştırmalarda 50 ve derlemelerde 100, olgu sunumlarında da
- 10 ile sınırlandırılmasına özen gösterilmelidir.
- Kaynakların dizilme şekli ve noktalamalar aşağıdaki örneklere uygun olmalıdır (Noktalamaişaretlerine lütfen dikkat ediniz):

Makale için; Yazar(lar)ın soyad(lar)ı ve isim(ler)inin başharf(ler)i, makale ismi, dergi ismi, yıl, cilt, sayı, sayfa no'su belirtilmelidir.

Örnek: Dilek ON, Yilmaz S, Degirmenci B, Ali Sahin D, Akbulut G, Dilek FH. The use of a vessel sealing system in thyroid surgery. Acta Chir Belg 2005;105:369-372.

Kitap için; Yazar(lar)ın soyad(lar)ı ve isim(ler)inin başharf(ler)i, bölüm başlığı, editörün(lerin) ismi, kitap ismi, kaçıncı baskı olduğu, şehir, yayınevi, yıl ve sayfalar belirtilmelidir.

Örnek:

- Yabancı dilde yayımlanan kitaplar için;
- Vissers RJ, Abu-Laban RB. Acute and Chronic Pancreatitis. In: Tintinalli JE, Kelen GD, Stapczynski JS (eds.), Emergency Medicine: A comprehensive Study Guide. 6 st ed. New York: McGraw-Hill Co; 2005. p.573-577.
- Türkçe kitaplar için; Gökçe Ö. Peptik ülser. Dilek ON, editör. Mide ve Duedonum.
- 1. Baskı. Ankara: Anıt Matbaası; 2001. s:265- 276.
- On-line yayınlar için format; DOI tek kabul edilebilir on-line referanstır.

Şekil, Resim, Tablo ve Grafikler

- Şekil, resim, tablo ve grafiklerin metin içinde geçtiği yerler ilgili cümlenin sonunda belirtilmelidir.
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RESEARCH ARTICLE / *Araştırma Makalesi*

Percentages and Gender Distribution of Anatomic Variations of Inferior Vena Cava, Renal Veins, and Posterior Lumbar Tributaries of the Left Renal Vein

İnferior Vena Kava, Renal Venler ve Sol Renal Venin Posterior Lomber Dallarının Anatomik Varyasyonlarının Yüzdeleri ve Cinsiyet Dağılımı

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Öz

Introduction	The aim of this study was to investigate percentages and gender distribution of the variations of the inferior vena cava (IVC), renal veins, and posterior lumbar tributaries of the left renal vein (LRV).
Materials and Methods	For this cross sectional observational study, the computed tomography (CT) images of 1949 patients were evaluated retrospectively.
Results	In the present study, percentages of double IVC, left IVC, and IVC interruption with azygos continuation were 0.5%, 0.2%, and 0.1%, respectively; circumaortic left renal vein (CLRV) was 6% and retroaortic left renal vein (RLRV) was 4.2%. Multiple renal vein variations were 24.1% on the right, but none on the left. Posterior lumbar tributaries of the renal veins were 0.15% on the right and 48% on the left. There was no difference between genders in terms of LRV and IVC variations. While the incidence of multiple right renal veins was statistically significantly higher in male patients compared to female patients (p = 0.045), the opposite was true for the posterior lumbar tributaries of the LRV (p = 0.035).
Conclusion	The venous system has a wide variety of variations, and the renal venous circulation is supported by number variations on the right in men and collaterals on the left in women.
Keywords	Renal veins; inferior vena cava; anatomic variation

Abstract

Amaç	*Bu çalışmanın amacı, inferior vena kava (İVK), renal venler ve sol renal venin posterior lomber dallarının varyasyonlarının yüzdelerini ve cinsiyet dağılımını araştırmaktı.*
Yöntem ve Gereçler	*Bu kesitsel gözlemsel çalışma için 1949 hastanın bilgisayarlı tomografi (BT) görüntüleri retrospektif olarak değerlendirildi.*
Bulgular	*Bu çalışmada çift İVK, sol İVK ve azigos veni ile devam eden İVK kesintisi yüzdeleri sırasıyla %0,50, %0,20 ve %0,10; sirkumaortik sol renal ven %6 ve retroaortik sol renal ven %4,20 idi. Multipl renal ven varyasyonları sağda %24,10 iken solda yoktu. Renal venlerin arka lomber dalları sağda %0,15 ve solda %48 idi. Sol renal ven ve İVK varyasyonları açısından cinsiyetler arasında fark yoktu. Multipl sağ renal ven insidansı erkek hastalarda kadın hastalara kıyasla istatistiksel olarak anlamlı derecede yüksek iken (p = 0,045), sol renal venin arka lomber dalları için bunun tersi doğruydu (p = 0,035).*
Sonuç	*Venöz sistem çok çeşitli varyasyonlara sahiptir ve renal venöz dolaşım erkeklerde sağda sayı varyasyonları ve kadınlarda solda kollaterallerle desteklenmektedir.*
Anahtar Kelimeler	*Renal venler; inferior vena kava; anatomik varyasyon*

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INTRODUCTION

The systemic venous system exhibits embryologically complex developmental stages. During the 4th to 8th weeks of gestation, the infrahepatic IVC forms from the development, anastomosis, and regression phases of the posterior cardinal, subcardinal, and supracardinal veins, respectively. Pauses or deviations in these developmental stages cause IVC variations.[1,2] Therefore, venous system has diverse and much more variations than the arterial system.[1-3] Variations can be an advantage or a disadvantage.

The inferior vena cava (IVC), left renal vein (LRV), right renal vein (RRV) and posterior lumbar tributaries of LRV variations are important in surgical and interventional procedures, such as donor nephrectomy.4 It is evident that alternative pathways of venous drainage from the kidney can be life-saving or offer options to the surgeon. Variability can help ensure the survival of the organ with alternative venous circulation if veins are cut or damaged during surgery or traumas.[3] It has been reported that the LRV can be resected or ligated without reconstruction during surgery.[5] This is due to its extensive venous collateralisation.[6-8] Because the LRV is longer than the RRV, the left kidney is preferred to the right in transplantation, facilitating implantation in these recipients.[4,9] The LRV as opposed to the RRV has several tributaries. Before reaching the IVC, it receives the left adrenal, left inferior phrenic, left capsural, and left gonadal veins, and the posterior lumbar veins.[3] For renal transplantation and other urological procedures, it is necessary to know the anatomic variations of the renal veins and their tributaries.[4,10] The posterior lumbar tributaries of the LRV are especially important in donor nephrectomy operations and their variations have been investigated.[3,11] Since lumbar veins can be hidden in laparoscopic surgery and their sizes are variable, informing the surgeon by the radiologist before the procedure is of great importance in order to prevent complications.[3]

In this study, the posterior lumbar arms of the LRV and the variations in the renal veins and IVC were examined and it was evaluated whether they differed according to gender. Although renal vein and IVC variations have been evaluated in this respect, the posterior tributaries of the LRV have not been evaluated yet.

MATERIALS and METHODS

This study was approved by the Clinical Research Ethics Committee of the hospital where it was conducted, with the decision number 593 taken at the meeting number 43 held on 06.11.2019. As this study was retrospective, the patients' consent was waived.

The IVC, renal veins, and posterior lumbar tributaries of the renal veins were evaluated in the images of 2095 patients who were requested upper abdominal computed tomography (CT) with different indications from different clinics in our hospital those examined in the Radiology Department between 1-25 October 2019. Suboptimal examinations, nephrectomy, kidney agenesis, anomalies of kidney shape and position, and tumoral involvement of kidney and renal vessels were excluded. The ages, genders, and venous variations of the remaining 1949 patients were evaluated.

The study included 477 non-contrast examinations in which retroperitoneal adipose tissue was adequate to evaluate vascular structures and 1472 contrast-enhanced examinations. Images obtained using a multislice single detector row helical CT (Philips Ingenuity Core 128, 2017, Cleveland, Ohio, USA). Slice thickness was 3 mm with interval reconstruction 1.5 mm. Scans were obtained 55 seconds after bolus tracking in contrast enhanced examinations.

A SPSS 23.0 Statistics Program package was used for statistical analysis of the data. Categorical measurements were summarised as numbers and percentages, and continuous measurements as mean and standard deviation (median and minimum-maximum where appropriate). A chi-square test and Fisher's Exact Test were used to compare

categorical variables. The Shapiro-Wilk test was used to determine whether the parameters in the study showed a normal distribution. The Mann-Whitney U test was used for parameters that did not show normal distribution in continuous measurements between groups. A statistical significance level of 0.05 was used in all tests.

RESULTS

1100 (56.4%) of patients were male and 849 (43.6%) were female. The age range of patients was 0-108 (median=51, mean ± SD= 49.31 ± 20.37). In a patient who underwent left renal vein resection, left renal venous drainage was through the lumbar venous system (Figure 1).

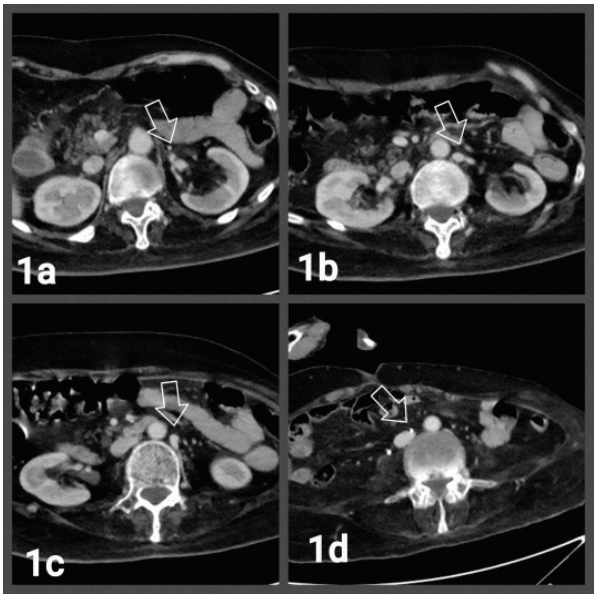

Figure 1: Contrast-enhanced axial CT scans show that intrarenal veins drain into the lumbar venous system after left renal vein resection in a patient undergoing hysterectomy for endometrial cancer. Intrarenal veins are seen to be collected in the renal hilus (arrow), but there is no left renal vein that passes in front or behind the aorta and drains into the inferior vena cava (Figure 1a). It is observed that the venous drainage of the left kidney is in the vein (arrow) located just to the left of the aorta (Figure 1b). In the section passing through the lower level, it is seen that the vein (arrow) is the lumbar vein (Figure 1c). In the operated patient with endometrial cancer, a surgical clip (arrow) is observed for the ligation of the lower-located left renal vein at the point where it drains into the inferior vena cava (Figure 1d).

Frequency and percentage of variations are presented in Table 1.

Table 1. Frequency and percentage of variations

Variations	n	(%)
One RRV	1480	75.9
Two RRVs	402	20.6
Three RRVs	62	3.2
Four RRVs	5	0.3
One RRV	1480	75.9
Multiple RRVs	469	24.1
RLRV	80	4.1
CLRV	116	6.0
D IVC	8	0.4
L IVC	3	0.2
IVC Interruption with azygos/hemiazygos continuation	2	0.1
One posterior lumbar tributary of LRV	842	90.1
Two posterior lumbar tributaries of LRV	85	9.1
Three posterior lumbar tributaries of LRV	7	0.7
One posterior lumbar tributary of LRV	842	90.1
Multiple posterior lumbar tributaries of LRV	92	9.9
Posterior lumbar tributary of LRV available	934	47.9
Posterior lumbar tributary of LRV absent	1015	52.1

Abbreviations: RRV, right renal vein; RLRV, retroaortic left renal vein; CLRV, circumaortic left renal vein; D IVC, double inferior vena cava; L IVC, left inferior vena cava; IVC, inferior vena cava; LRV, left renal vein.

Posterior lumbar tributaries of the RRV were detected in 3 patients, all at the L2 level (0.15%). In 934 patients (47.9%), 1033 posterior lumbar tributaries of the LRV were detected. The number and frequency of posterior lumbar tributaries for levels L1, L2, L3, and L4 were 314 (30.4%), 648 (62.7%), 68 (6.6%), and 3 (0.3%), respectively.

Table 2. shows comparisons of anatomical RRV, LRV, IVC and posterior lumbar tributaries of LRV variations by gender. There was no difference between genders in terms of LRV and IVC variations. Multiple RRV variations were

found to be significantly higher in male patients included in the study compared to female patients (p = 0.045) (Figure 2). In the female population, the number of posterior lumbar tributaries of the LRV was significantly higher than in the male population (p = 0.002) (Figure 3). While there was no difference between genders in terms of a single posterior lumbar tributary of the LRV; percentages of two, three, and multiple posterior lumbar tributaries were statistically significantly higher in females than males (p = 0.035).

Table 2. Comparison of anatomical RRV, LRV, IVC and posterior lumbar tributaries of LRV variations by gender

Anatomical variation	**Male**		**Female**		**p**
	n	**(%)**	**n**	**(%)**	
One RRV	819	(74.5)	661	(77.9)	**0.244**
Two RRVs	238	(21.6)	164	(19.3)	
Three RRVs	39	(3.5)	23	(2.7)	
Four RRVs	4	(0.4)	1	(0.1)	
One RRV	819	(74.5)	661	(77.9)	**0.045***
Multiple RRVs	281	(25.5)	188	(22.1)	
IVC and LRV variation	108	(9.8)	101	(11.9)	**0.141**
RLRV	38	(3.5)	42	(4.9)	
CLRV	63	(5.7)	53	(6.2)	
Double IVC	4	(0.4)	4	(0,5)	
Left IVC	2	(0.2)	1	(0.1)	
IVC Interruption with azygos/hemiazygos continuation	1	(0.1)	1	(0.1)	
One posterior lumbar tributary of LRV	454	(92.1)	388	(88.0)	**0.033***
Two posterior lumbar tributaries of LRV	38	(7.7)	47	(10.7)	
Three posterior lumbar tributaries of LRV	1	(0.2)	6	(1.4)	
One posterior lumbar tributary of LRV	454	(92.1)	388	(88.0)	**0.035***
Multiple posterior lumbar tributaries of LRV	39	(7.9)	53	(12.0)	

Statistical significance was considered at $p < 0.05$.
Abbreviations: RRV, right renal vein; LRV, left renal vein; IVC, inferior vena cava; RLRV, retroaortic left renal vein; CLRV, circumaortic left renal vein.

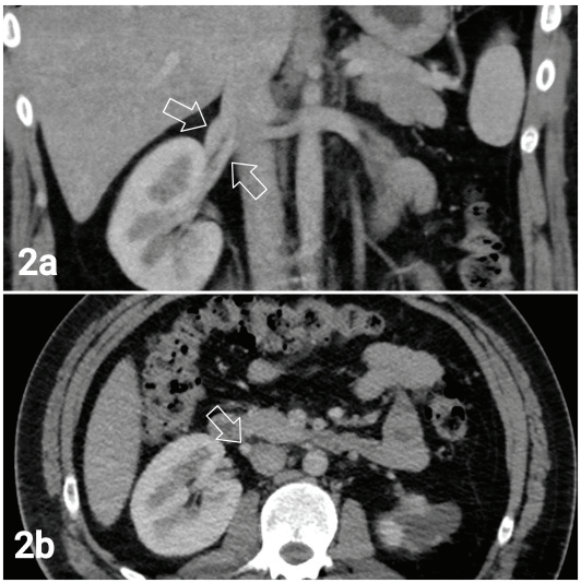

Figure 2: CT images of the patient with 3 right renal veins. Coronal contrast-enhanced CT scan shows the right renal veins (arrows) draining into the inferior vena cava (Figure 2a). In the axial contrast-enhanced CT scan, the third right renal vein (arrow) draining more caudally into the inferior vena cava is seen (Figure 2b).

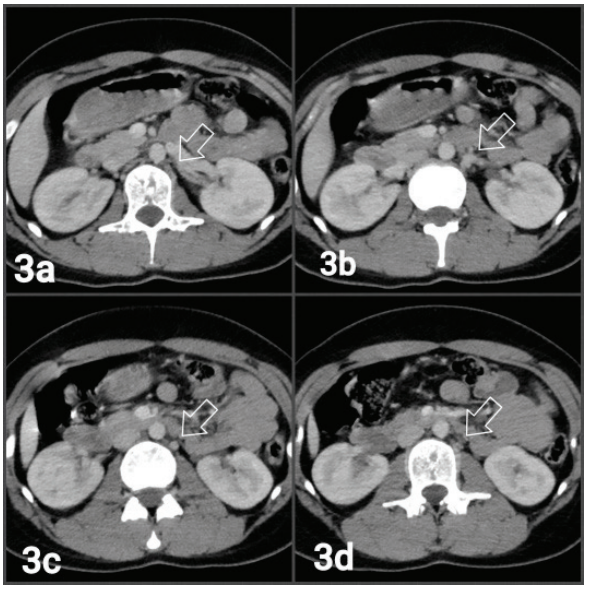

Figure 3: Axial contrast-enhanced CT images show that the lumbar veins at the L1 and L2 levels are draining into the left renal vein. The left renal vein and the left lumbar vein (arrow) at the L1 level are visible (Figure 3a). It is seen that the left lumbar vein originating from the L1 level drains into the left renal vein (arrow) (Figure 3b). It is observed that the vein (arrow) continues inferior to the left of the aorta (Figure 3c). More caudally, it is observed that it drains the left lumbar vein at L2 level.

DISCUSSION

It was observed that the renal venous system was supported by multiplicity on the right and lumbal venous collaterals on the left. The frequency of these variations was also found to differ in terms of sexes. Statistically significant, right multiple renal veins were more common in men and left renal vein with multiple posterior lumbar arms more frequently in women.

In a meta-analysis study of renal vein variations, multiple renal veins were detected at 16.7%, and it was reportedly much more common on the right (16.6%) than the left (2.1%).[12] There are also studies where multiple renal vein variations were detected none on the left.[9,13] Similarly, more than one LRV was not detected in this study.

Multiple renal vein variations on the right have been reported ranging from 20.4%- 38.79%.[3,9,13,14] In a study where multiple RRVs were reported as the most common renal vein variation, the percentages were reported at 21.6%, 19.2%, 2.2%, and 0.2% for multiple RRVs, two right renal veins, three right renal veins and four right renal veins, respectively.[15] In another study, they were reported at 29% for two right renal veins and 9.7% for three or more renal veins.[9] In present study, the percentages of multiple RRVs, two RRVs and three or more RRVs were found to be

24.1%, 20.6% and 3.5%, respectively, and consistent with the literature.

In different studies, percentages of posterior lumbar tributaries of the LRV have been reported with a range of 43%-90.9%.11 In this study posterior lumbar tributaries of the LRV were detected in 934 (47.9%) of patients. The number of patients for single, two, and three posterior lumbar tributaries were, respectively, 842, 85, and 3. Regarding the levels, the number of patients for L1, L2, L3, and L4 were, respectively, 314, 648, 68, and 3.

In the study by Li et al., the percentages of one, two, and three posterior lumbar tributaries were 47.5%, 32.8%, and 3.3%, respectively.[11] In this study, these rates were, respectively, 43%, 4.5%, and 0.4%.

There are no gender assessment studies in terms of posterior lumbar tributaries in the literature. Although our study is the first on this subject, additional studies are needed to create a general consensus. The variations differ widely, and there may be discrepancies between studies in terms of sexes.

In this study, 8 patients had duplication of the IVC (0.4%), 3 patients had left IVC (0.2%), and 2 patients had IVC interruption with azygos continuation (0.1%) variations.

In the duplication of the IVC variation, the IVC is observed on both sides of the aorta below the renal level, then at the level of the renal veins, the left IVC passes anterior or posterior to the aorta and ends by joining with the right IVC. In the literature, it has been reported with a range of 0.2-3%.16 The results found in this study were within this range.

In the left IVC variation, the IVC is observed to the left of the aorta below the renal level. This variation has been reported with a range of 0.2-0.5% in the literature.[1,2] In this study, it was found at the lower end of the range (0.2%).

In the IVC interruption with azygos continuation variation, there is no hepatic segment of the IVC, and after receiving the renal veins, the IVC passes the diaphragm crus posteriorly and continues to the azygos system. In the literature this variation has been reported with a frequency of 0.6%.2 The results found in this study were lower than this value.

During embryological development of the LRV, the subcardinal veins anastomose anterior to the aorta and the supracardinal veins posterior to the aorta. Normally, the posterior anastomosis regresses and the LRV passing in front of the aorta is observed. If it does not regress, the CLRV variation occurs. It has been reported with a range of 1.07%-17%. The RLRV variation develops if the anterior anastomosis regresses and the posterior anastomosis persists. The range has been reported as 0.8%-4.2%.[2,3,9,13,14] In a meta-analysis study of renal vein variations, CLRV and RLRV variations were reported at 3.5% and 3%, respectively.12 In this study, percentages of CLRV and RLRV variations were consistent with the literature.

Dilli et al. reported that IVC and LRV variations are independent of gender.[17] Renal vein variations have reportedly been more common in women.[13,18] But they have also been reported as independent of gender.[15] In a study where no statistically significant correlation was found between gender and variations of the LRV and CLRV, RLRV was found to be statistically significantly higher in men than in women ($p = 0.039$).[19] In the present study, no difference was found between genders in terms of IVC and LRV variations.

Evaluation of venous structures with abdominal CT rather than CT angiography is a limitation. Evaluation of images by a single radiologist is also a limitation.

Renal veins exhibit high variability. The RRV is supported by number variations, especially in men, and the LRV has considerable collateral circulation, especially in women.

The knowledge of these anatomical variations, as obtained by imaging before the operation will undoubtedly benefit surgeons.

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ARAŞTIRMA MAKALESİ / *Research Article*

Sezaryan Doğum Sırasında Post-Spinal Hipotansiyon Yönetiminde Profilaktik Üç Farklı Tek Doz Norepinefrinin Etkinlik ve Güvenliğinin Değerlendirilmesi

Evaluation of the Efficacy and Safety of Prophylactic Three Different Single Dose Norepinephrine in the Management of Post-Spinal Hypotension During Cesarean Delivery

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Öz

Amaç	Sezaryen doğum sırasında uygulanan spinal anestezi, post-spinal hipotansiyona neden olabilmekte ve tedavi amaçlı ilk olarak vazopressörler tercih edilmektedir. Bu çalışmada sezaryen doğum sırasında post-spinal hipotansiyon yönetiminde üç farklı bolus doz norepinefrinin etkinlik ve güvenliğinin karşılaştırılması amaçlandı.
Yöntem ve Gereçler	Çalışmaya elektif şartlarda sezaryen uygulanacak 100 hasta dahil edildi. Hastalar 4 gruba ayrılarak spinal anestezi yapıldıktan sonra Grup I'e % 0,9 NaCl (Salin), Grup II'ye 0,05 µg.kg-1, Grup III'e 0,075 µg.kg-1 ve Grup IV'e ise 0,10 µg.kg-1 tek doz norepinefrin toplam 2 ml olacak şekilde bolus uygulandı. Sistolik kan basıncı değeri <100 mmHg veya bazal sistolik kan basıncı değerinde % 20'den daha fazla bir düşme durumunda 5 mg efedrin iv bolus olarak uygulandı. Kalp atım hızı 60 atım/dk'nın altına düştüğünde 0,50 mg iv atropin ile tedavi edildi.
Bulgular	Demografik veriler tüm gruplarda benzerdi. Cerrahi operasyon süresince uygulanan toplam efedrin ve atropin dozları grup I ve grup II'de grup III ve IV'e göre anlamlı bir şekilde daha yüksek bulunmuştur (Total Efedrin Dozu (mg) 26.00 ± 22.78, 26.00 ± 20,05, 9.80 ± 12.03, 10.60 ± 13.64 (p=0,014), Total Atropin Dozu (mg) 0.32 ± 1.00, 0.10 ± 0.35, 0.04 ± 0.20, 0.06 ± 0.16 (p=0,032) sırasıyla). Apgar skorları yönünden gruplar arasında bir fark tespit edilmezken umblikal arter kan gazında I. grupta, II, III ve IV. gruba göre parsiyel oksijen basıncı (PO2) değerinin anlamlı bir şekilde daha düşük, parsiyel karbondioksit basıncı (PCO2) değerinin ise anlamlı derecede daha yüksek olduğu bulunmuştur (p=0,032 p=0,020 sırasıyla). Bulantı ve kusma sayılarında gruplar arasında istatistiksel bir fark bulunmamıştır (p=0,096).
Sonuç	Elektif sezaryen doğumlarda spinal anesteziye bağlı hipotansiyonu önlemek için profilaktik tek doz bolus norepinefrin uygulamalarında 0,075 ve 0,10 µg.kg-1 dozları etkili olduğu, efedrin ve atropin ihtiyacını önemli derecede azalttığı kanısına varıldı.
Anahtar Kelimeler	Sezaryen doğum; spinal anestezi; hipotansiyon; norepinefrin

Abstract

Introduction	*Spinal anesthesia applied during cesarean section can cause postspinal hypotension and vasopressors are preferred in the first place in the treatment. In this study, it was aimed to compare the efficacy and safety of three different bolus doses of norepinephrine in the management of post-spinal hypotension during cesarean section.*
Materials and Methods	*100 patients who will undergo cesarean section under elective conditions were included in the study. After spinal anesthesia was performed, patients were divided into 4 groups; % 0,9 NaCl (Saline) was given to Group I, 0,05 µg.kg-1 to Group II, 0,075 µg.kg-1 to Group III and 0,10 µg.kg-1 to Group IV single dose of norepinephrine was administered as a total of 2 ml bolus. 5 mg ephedrine was administered as an IV bolus when the systolic blood pressure value was <100 mmHg or in case of a decrease of more than 20% in the baseline systolic blood pressure. When the heart rate fell below 60, 0,50 mg iv atropine was administered.*
Results	*Demographic data were similar in all groups. Total ephedrine and atropine doses administered during the surgical operation were found to be significantly higher in group I and group II compared to group III and group IV (Total ephedrine dose (mg) 26.00 ± 22.78, 26.00 ± 20,05, 9.80 ± 12.03, 10.60 ± 13.64 (p=0,014), Total atropine dose (mg) 0.32 ± 1.00, 0.10 ± 0.35, 0.04 ± 0.20, 0.06 ± 0.16 (p=0,032) respectively). While there was no difference between the groups in terms of Apgar scores; in umbilical arterial blood gas, PO2 value was found to be significantly lower and PCO2 value was found to be significantly higher in group I compared to groups II, III and IV (p=0,032; p=0,020 respectively). There was no statistical difference between the groups in terms of nausea and vomiting (p=0,096).*
Conclusion	*It was concluded that the administration of prophylactic single dose bolus norepinephrine at doses of 0,075 and 0,10 µg.kg-1 was effective in preventing hypotension due to spinal anesthesia and significantly reduced the need for ephedrine and atropine in elective cesarean deliveries.*
Keywords	*cesarean section; spinal anesthesia; hypotension; norepinephrine*

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GİRİŞ

Spinal anestezi hızlı etki başlangıcı, hasta konforu ve azalmış komplikasyon nedeniyle sezaryen ameliyatlarında yaygın olarak tercih edilmekle birlikte önemli hemodinamik değişikliklerin görülebildiği nöraksiyel bir tekniktir. Spinal anestezi sonrası sempatik sinir sistemi blokajı ve Bezold-Jarisch refleksi (BJR) ile kalp debisi (CO) ve sistemik vasküler rezistans (SVR) azalmakta dolayısıyla kan basıncı düşmektedir. Bu durum fetüsü ve anneyi tehlikeye atarak hipotansiyona neden olabilir. Post-spinal hipotansiyon (PSH) ve bradikardi, spinal anestezi sonrası en sık görülen intraoperatif komplikasyonlardır. PSH annede bulantı, kusma, bilinç kaybı ve pulmoner aspirasyon gibi olumsuz etkilere ilaveten plasental hipoperfüzyon ile bebekte hipoksi, asidoz ve nörolojik hasara neden olabilir.[1,2]

Klöhr ve arkadaşlarının (ark.) 63 yayını (7120 hasta) değerlendiren literatür taramasında 15 farklı hipotansiyon tanımının yapıldığını, içlerinde sistolik kan basıncı (SKB) başlangıç değerinin % 80'inin altına düşme veya 100 mmHg'nın altındaki kan basıncının en sık kullanılan iki tanım olduğunu belirtmiştir.[3] Çalışmamızda da bu iki tanımı örnek alarak hipotansiyon tedavisi yapılmıştır.

Post-spinal hipotansiyon tedavisinde preoperatif ve intraoperatif birçok farklı yaklaşım uygulanmaktadır. İlk basamak tedavi olarak, hızlı etki başlangıcı nedeniyle sıklıkla vazopressörler seçilir.[4]

Fenilefrin sezaryen doğum sırasında PSH'nin yönetimi için ilk tercih edilen saf α-agonist vazopressördür. Fenilefrin α-mimetik etkisiyle arteriyel vazokonstriksiyon yaparak sistemik vasküler rezistansı (SVR) ve ortalama arter basıncını (OAB) artırır.

Bununla birlikte son zamanlarda fenilefrin afterloadu artırma eğilimi nedeniyle annede bradikardi ve kalp debisinde azalma yaptığı için PSH tedavisinde sorgulanmaktadır. Fenilefrine bağlı kalp debisinde azalma, plasental perfüzyonun bozulması ve fetüse sunulan oksijenin azalması ile ilişkili olduğu için endişeye yol açmıştır.[5,6]

Fetüs bu hemodinamik değişiklikleri iyi tolere ediyor gibi görünse de, etkileri tam olarak açıklanmış değildir. Ayrıca annede kalp hastalığı varlığı, plasental yetmezlik veya fetal asidoz gibi yüksek riskli durumlarda kalp hızı ve kalp debisinin korunması önemli olabilir.[7,8]

Son zamanlarda, norepinefrin, belirgin maternal veya neonatal olumsuzluklar olmaksızın PSH'nin tedavisi için umut verici bir vazopressör olarak önerilmiştir.6 Sezaryen olgularında hipotansiyonu önlem ve tedavisinde norepinefrin güçlü α-adrenerjik ile zayıf β-adrenerjik etkiye sahip olması ve bu nedenle kalp atım hızını ve kalp debisinde azalma yapmaması nedeniyle fenilefrin ile karşılaştırıldığında ek β–adrenerjik etkilerinin teorik avantajlarına sahip olabileceği düşünülmüştür.[6,7]

Ngan Kee ve ark.'ları sezaryen sırasında PSH'yi önlemek amacıyla norepinefrin 5 μg.ml-1 ile fenilefrin 100 μg.ml-1 infüzyon dozları çalışılmış ve norepinefrinin, fenilefrine göre daha yüksek kalp debisi ve kalp atım hızının yanı sıra kan basıncını korumada da etkili olduğu görülmüştür. Bu bulguların esas olarak norepinefrinin ek β-adrenerjik etkilerine atfedilebileceğini öne sürmüştür.[6] Bununla birlikte PSH'nin tedavisinde norepinefrin infüzyon dozları sık olarak kullanılmış olmasına rağmen ideal norepinefrin bolus dozuna ilişkin veriler sınırlıdır. Bu nedenle çalışmamızda sezaryen doğum sırasında PSH yönetiminde profilaktik 3 farklı bolus doz norepinefrin karşılaştırılarak etkin ve güvenli doz değerlendirilmesi amaçlandı. Böylece çalışmanın birinci amacı sezaryen doğum sırasında PSH yönetiminde ideal bolus norepinefrin dozunun ve ilave efedrin tüketiminin belirlenmesidir. Sekonder amacı ise maternal bulantı, kusma, bradikardi ve fetal asidoz gibi yan etkilerin değerlendirilmesidir.

GEREÇ ve YÖNTEMLER

Prospektif, randomize, çift kör, kontrollü bu çalışma Çukurova Üniversitesi Tıp Fakültesi Etik Kurulu (25.04.2017

tarihli karar no: 66/5) onayı sonrasında çalışmaya katılacak hastalardan aydınlatılmış onam alınarak ve Helsinki Bildirgesi ilkelerine uygun olarak yürütülmüştür.

Çalışmaya 18-40 yaş arası, ASA(American Society of Anesthesiologists) II fiziksel statüsüne sahip, 37-42 haftalık gebelerde elektif şartlarda sezaryen yapılacak 100 hasta dahil edildi. Kardiyovasküler, serebrovasküler, pulmoner, renal ya da hepatik hastalığı olan hastalar, çalışmaya katılmak istemeyen, spinal anestezi için kontrendikasyonu bulunan (koagülasyon bozukluğu, işlem yerinde enfeksiyon vb.), çalışmada kullanılacak ilaçlara alerjisi bulunan ve vücut kitle indeksi (VKİ)>30 olan hastalar çalışmaya alınmadı.

Tüm hastalar operasyon odasına alınmadan önce 18G intraket ile damar yolu açıldı ve hidrasyon amacıyla 15 ml kg-1 sa-1 hızında Ringer Laktat (RL) infüzyonu başlandı. 8 saatlik açlık süresi dolan hastalar premedikasyon yapılmadan operasyona alındı. 150 sol lateral pozisyonda oksijen satürasyonu (Sp02) ve elektrokardiyografi monitörizasyonu yapıldı. Non-invaziv sistolik kan basıncı (SKB) ve kalp atım hızı (KAH) 3 kez ölçüldü ve ortalama sistolik kan basıncı ve kalp atım hızı bazal değerler olarak kabul edildi. Spinal anestezi oturur pozisyonda L3-L4 veya L4-L5 intervertebral aralığından 25G pencil-point iğne ile subaraknoid aralığa girilip berrak BOS akışını takiben 10 mg % 0,5 hiperbarik bupivakain ve 20 µg fentanil spinal aralığa uygulandı. Spinal anestezi uygulandıktan sonra hastalar 15-200 baş yukarı, supin, sol lateral tilt pozisyonda yatırıldı.

Hastalar spinal anestezi indüksiyonundan 10 dakika önce bilgisayar tarafından oluşturulan rastgele tablolar kullanılarak 25 kişilik dört gruba randomize edildi. Her grubun enjektörleri eşit volümde (2 ml) belirlenen norepinefrin dozlarını veya salin içerecek şekilde grupları bilmeyen bir anestezist tarafından kör olarak hazırlandı. Çalışmanın çift kör olması açısından yalnızca kodlanmış bir etiketle işaretlendi.

Grup I'e spinal anestezi yapıldıktan sonra 2 ml serum fizyolojik iv yolla uygulandı ve bu grup kontrol grubu olarak belirlendi. Spinal anestezi yapıldıktan sonra bazal SKB'yi korumak amacıyla Grup II'ye 0,05 µg kg-1, Grup III'e 0,075 µg kg-1 ve Grup IV'e 0,10 µg kg-1 norepinefrin dozları verilen ilacın içeriğini bilmeyen anestezi doktoru tarafından bolus doz uygulanarak çalışmanın takibi sağlandı. Non-invaziv kan basıncı, KAH, SpO2 operasyonun ilk 10 dk'sında 1 dk aralıklarla, daha sonra operasyon bitimine kadar 2 dk aralıklarla kaydedildi. SKB değeri <100 mmHg veya bazal SKB değerinde % 20 den daha fazla tekrarlayan bir azalma durumunda 5 mg efedrin iv bolus olarak müdahale edildi. KAH'nın 60 atım/dk'nın altına düşmesi ise bradikardi olarak kabul edildi ve 0,50 mg iv atropin ile tedavi edildi.

Hastaların demografik verileri, intratekal enjeksiyon ile cilt insizyonu arasında geçen süre, cilt insizyonundan bebek çıkışına kadar geçen süre ve toplam cerrahi süre kaydedildi. Tüm olgularda SKB, KAH, SpO2, vazopressör (efedrin) ihtiyacı, atropin ihtiyacı ve bulantı ve kusma sıklıkları kaydedildi. Bebek çıktıktan sonra umblikal arter kan gazı analizi yapıldı ve neonatal Apgar skorları 1. ve 5. dk'da kaydedildi.

İstatistik

Verilerin istatistiksel analizinde SPSS 25.0 paket programı kullanıldı. Kategorik ölçümler sayı ve yüzde olarak, sürekli ölçümlerde ortalama ve standart sapma (gerekli yerlerde ortanca ve minimum - maksimum) olarak özetlendi. Kategorik değişkenlerin karşılaştırılmasında Ki Kare test ya da Fisher test istatistiği kullanıldı. Gruplar arasında sürekli ölçümlerin karşılaştırılmasında dağılımlar kontrol edilecek, parametrik dağılım gösteren değişkenler için tek yönlü varyans analizi Anova, parametrik dağılım göstermeyen değişkenler için de Kruskal Wallis testi kullanıldı. Gruplar arasındaki ikili karşılaştırmalarda normal dağılım gösteren parametreler için Post-Hoc analizler kullanıldı, normal dağılım göstermeyen parametrelerde Mann Whitney U testi kullanıldı. Tekrarlı ölçümlerin karşılaştırılmasında

tekrarlı ölçüm karşılaştırılmalarında Repeated Measures Analizi ya da Friedman Testi kullanıldı. Tüm testlerde istatistiksel önem düzeyi 0.05 olarak alındı.

BULGULAR

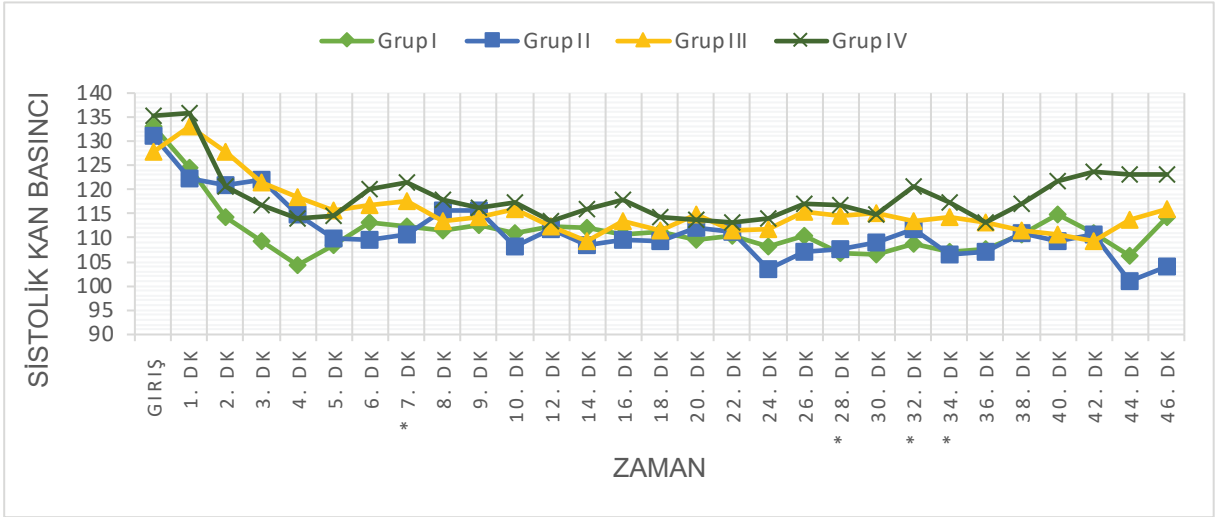
Demografik verilerde gruplar arasında uygulanan tek yönlü varyans analizi sonuçlarında istatiksel bir farklılık görülmemiştir. Hasta gruplarının, yaş, kilo, boy, gebelik sayısı, geçirilmiş sezaryen sayısı, cilt insizyonundan bebek çıkışına kadar geçen süre ve toplam cerrahi süre benzer bulunmuştur (p>0,05) (Tablo 1).

Dört grup arasında karşılaştırmada 7, 28, 32, 34 ve 44. dakikalarda SKB Grup I ve II'de, Grup III ve IV'e göre istatistiksel olarak daha düşük tespit edilmiştir (p=0,032; p=0,037; p=0,044; p=0,034; p=0,046 sırasıyla) (Şekil 1) (Tablo 2). Diğer zaman dilimlerinde gruplar arasında SKB'de istatiksel bir farklılık görülmemiştir (Şekil 1) (Tablo 2).

Bulunan sonuçlara göre cerrahi operasyon süresince OAB değerlerinde gruplar arasında anlamlı bir farklılık görülmemiştir. Norepinefrin uygulanan hastaların hiçbirinde hipertansiyon gerçekleşmemiştir.

Tablo 1. Farklı Norepinefrin Dozları Uygulanan Deney Gruplarında Bazı Özelliklerin Karşılaştırılması

	Grup I (n=25)	Grup II (n=25)	Grup III (n=25)	Grup IV (n=25)	p
Yaş	31,72 ± 4,58	28,80 ± 5,66	30,68 ± 5,85	29,80 ± 5,51	0,273
Kilo (kg)	81,76 ± 13,71	73,76 ± 10,17	81,80 ± 14,87	78,60 ± 10,38	0,081
Boy (cm)	162,80 ± 9,00	162,36 ± 6,20	165,64 ± 7,56	163,36 ± 4,28	0,357
Gebelik sayısı	2,48 ± 1,42	2,24 ± 1,27	2,64 ± 1,41	2,84 ± 1,65	0,512
Sezaryen sayısı	1,08 ± 1,04	0,88 ± ,97	1,16 ± 1,03	0,96 ± 1,02	0,771
İT enjeksiyon-Cilt insizyonu (dk)	5,16 ± 1,57	5,56 ± 2,00	5,00 ± 1,44	5,52 ± 1,98	0,140
Cilt insizyonu-Bebek doğumu (dk)	6,20 ± 3,18	5,88 ± 2,37	6,64 ± 3,84	6,40 ± 2,36	0,834
Cerrahi süre (dk)	32,72 ± 7,41	32,80 ± 8,43	33,44 ± 9,39	33,56 ± 6,61	0,162
Veriler Ort. ± SS şeklinde gösterildi İT: İntratekal kg: kilogram cm: santimetre dk: dakika Ort:ortalama SS: Standart Sapma					



Şekil 1. *Sistolik Kan Basıncı*

7, 28, 32, 34 ve 44.dakikalarda SKB Grup I ve II'de, Grup III ve IV'e göre istatistiksel olarak daha düşük tespit edilmiştir (p=0,032; p=0,037; p=0,044; p=0,034; p=0,046 sırasıyla).

Tablo 1. Farklı Norepinefrin Dozları Uygulanan Deney Gruplarında Bazı Özelliklerin Karşılaştırılması

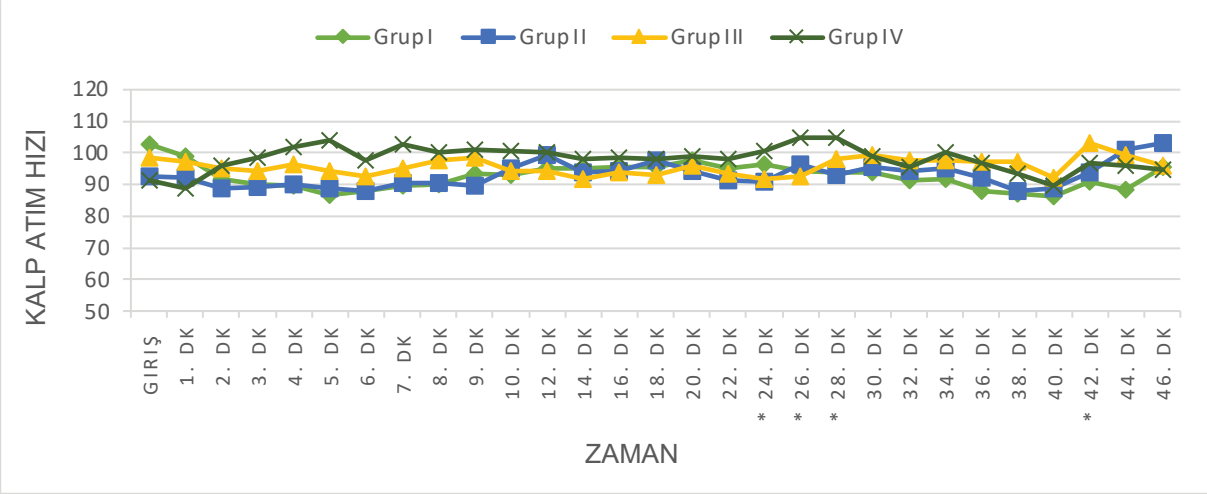
	Grup I (n=25)	Grup II (n=25)	Grup III (n=25)	Grup IV (n=25)	p
Giriş	133,16 ± 8,43	131,2 ± 14,96	127,72 ± 12,07	135,32 ± 12,41	0,154
1. dk	124,44 ± 18,07	122,24 ± 25,7	133,04 ± 18,73	135,88 ± 21,92	0,093
2. dk	114,36 ± 24,57	120,96 ± 22,69	127,76 ± 22,25	120,52 ± 19,39	0,559
3. dk	109,36 ± 24,28	122,04 ± 26,13	121,4 ± 16,9	116,8 ± 17,64	0,302
4. dk	104,24 ± 15,93	114,92 ± 25,77	118,32 ± 14,54	113,96 ± 20,66	0,051
5. dk	108,56 ± 16,59	109,84 ± 21,99	115,64 ± 16,79	114,6 ± 27,34	0,375
6. dk	113,08 ± 13,63	109,68 ± 19,42	116,6 ± 16,39	120 ± 19,61	0,121
7. dk	112,44 ± 12,38	110,64 ± 16,46	117,48 ± 11,63	121,48 ± 18,88	0,032
8. dk	111,6 ± 13,73	115,68 ± 21,57	113,4 ± 12,28	117,88 ± 13,63	0,305
9. dk	112,56 ± 15,41	115,72 ± 23,68	114,24 ± 14,48	116,12 ± 13,78	0,758
10. dk	110,84 ± 15,7	108,2 ± 18,93	115,88 ± 14,77	117,24 ± 18,43	0,209
12. dk	112,24 ± 16,49	111,64 ± 18,69	112,44 ± 13,81	113,56 ± 13,66	0,971
14. dk	112,04 ± 15,48	108,44 ± 16,36	109,16 ± 14,06	115,96 ± 16,47	0,414
16. dk	110,6 ± 12,58	109,64 ± 14,28	113,52 ± 11,92	117,96 ± 21,39	0,499
18. dk	111,2 ± 19	109,36 ± 12,68	111,56 ± 11,18	114,38 ± 14,48	0,506
20. dk	109,44 ± 11,88	111,92 ± 13,83	114,71 ± 12,51	113,65 ± 16,84	0,464
22. dk	110,28 ± 12,69	111,17 ± 11,72	111,38 ± 11,86	113,05 ± 14,29	0,944
24. dk	108,2 ± 13,71	103,48 ± 13,11	111,7 ± 15,29	113,95 ± 11,44	0,084
26. dk	110,52 ± 14,65	106,95 ± 13,55	115,35 ± 13,58	117,05 ± 14,71	0,199
28. dk	106,76 ± 15,49	107,58 ± 11,67	114,44 ± 12,92	116,6 ± 13,22	0,037
30. dk	106,58 ± 15,86	108,89 ± 12,56	115 ± 13,56	114,76 ± 12,74	0,055
32. dk	108,62 ± 14,79	111,64 ± 12,49	113,47 ± 12,74	120,73 ± 12,99	0,044
34. dk	107,11 ± 15,37	106,58 ± 9,33	114,36 ± 9,61	117,42 ± 11,8	0,034
36. dk	107,5 ± 16,17	107 ± 8,86	113,08 ± 15,02	113,25 ± 9,6	0,303
38. dk	110,57 ± 11,43	111 ± 10,37	111,38 ± 11,96	116,89 ± 13,71	0,633
40. dk	114,91 ± 18,11	109,33 ± 9,05	110,67 ± 6,65	121,63 ± 7,27	0,114
42. dk	-	110,67 ± 18,15	109,25 ± 7,37	123,6 ± 8,44	0,212
44. dk	-	101	113,67 ± 5,51	123,2 ± 10,83	0,046

Veriler Ort. ± SS şeklinde gösterildi dk: dakika Ort:ortalama SS: Standart Sapma * p: 0,05

Gruplar arası karşılaştırmada 24, 26, 28 ve 42.dakikalarda KAH Grup I ve II'de, Grup III ve IV'e göre istatistiksel olarak daha düşük tespit edilmiştir (p=0,039; p=0,014; p=0,008; p=0,021 sırasıyla) (Şekil 2). Diğer zaman dilimlerinde gruplar arasında KAH'ta istatiksel bir farklılık görülmemiştir (Şekil 2).

Hastaların Grup I'de % 92'sine, Grup II'de % 84'üne, Grup III'de % 68'ine ve Grup IV'de ise % 56'sına efedrin uygulanmıştır (Tablo 2). Cerrahi operasyon süresince uygulanan toplam efedrin dozu Grup I ve Grup II'de, Grup III ve Grup IV'e göre anlamlı bir şekilde yüksek bulunmuştur (p=0,014) (Tablo 3).

Gruplar arasında Grup I ve Grup II'de 7 hastada (% 28'ine), Grup III'de 1 hastada (% 4'üne) ve Grup IV'de ise 3 hastada (% 12'sine) bradikardi nedeniyle atropin uygulanmıştır (Tablo 3). Cerrahi operasyon süresince uygulanan toplam



Şekil 2. *Kalp Atım Hızı*

24, 26, 28 ve 42.dakikalarda KAH Grup I ve II'de, Grup III ve IV'e göre istatistiksel olarak daha düşük tespit edilmiştir (p=0,039; p=0,014; p=0,008; p=0,021 sırasıyla).

Tablo 3. Total Efedrin-Atropin Dozu, Umblikal Arter Kan Gazı Degeri ve APGAR Skoru

	Grup I (n=25)	**Grup II (n=25)**	**Grup III (n=25)**	**Grup IV (n=25)**	**p**
Total Efedrin - Atropin dozu					
Total Efedrin Dozu (mg)	26.00 ± 22.78	26.00 ± 20.56	9.80 ± 12.03	10.60 ± 13.64	0.014*
Efedrin Frekansı (%)	92	84	68	56	
Total Atropin Dozu (mg)	0.32 ± 1.00	0.10 ± 0.35	0.04 ± 0.20	0.06 ± 0.16	0.032*
Atropin Frekansı (%)	28	28	4	12	
Bulantı-Kusma Frekansı (%)	20	12	12	8	0.396
Apgar skoru					
1. dk	8 ± 0.78	8.16 ± 0.57	8.20 ± 0.76	8.24 ± 0.60	0.901
5. dk	9.16 ± 0.64	9.20 ± 0.50	9.40 ± 0.58	9.40 ± 0.50	0.659
Umblikal arter kan gazı degeri					
pH	7.30 ± 0.05	7.30 ± 0.06	7.33 ± 0.05	7.31 ± 0.05	0.193
PO2(mmHg)	21.49 ± 5.58	27.66 ± 15.48	26.51 ± 5.62	25.89 ± 6.88	0.032*
PCO2(mmHg)	45.59 ± 6.00	38.27 ± 9.28	37.97 ± 4.43	37.64 ± 5.26	0.020*
BE(mmol/l)	-2.76 ± 1.87	-4.40 ± 4.77	-3.52 ± 2.84	-3.83 ± 2.67	0.446

Veriler Ort. ± SS şeklinde gösterildi. * p: <0,05 mg: milligram dk: dakika mmHg:milimetre civa PO2: Oksijen Parsiyel Basıncı, PCO2: Karbondioksit Parsiyel Basıncı, BE: Baz Fazlalığı

atropin dozu Grup I ve Grup II'de, Grup III ve Grup IV'e göre anlamlı bir şekilde yüksek bulunmuştur (p=0,032) (Tablo 3).

Bulantı ve kusma sıklığı değerlerinde gruplar arasında istatistiksel bir fark bulunmamıştır (Grup I % 20, Grup II % 12, Grup III % 12, Grup IV % 8) (p=0,396) (Tablo 3).

Apgar skoru yönünden 1.dakika (p=0,901) ve 5.dakikasında (p=0,659) gruplar arasında bir fark tespit edilmemiştir. Umblikal arter kan gazı değerlerinde Grup I'de, Grup II, III ve IV'e göre PO2 değeri anlamlı bir şekilde daha düşük, PCO2 değerinin ise anlamlı derecede daha yüksek olduğu bulunmuştur (p=0,032; p=0,020 sırasıyla) (Tablo 3).

TARTIŞMA

Çalışmamızda, elektif sezaryen operasyonlarında spinal anestezi sonrası profilaktik bolus norepinefrin uygulamalarında 0,075 μg kg-1 ve 0,10 μg kg-1 doz grupları PSH'yi önlemede 0,050 μg kg-1 ve salin gruplarına göre daha etkili olduğu ve efedrin ve atropin ihtiyacını önemli derecede azalttığı görülmüştür.

Apgar skorları yönünden gruplar arasında bir fark tespit edilmezken umblikal arter kan gazında PO2 değerinin I. grupta, diğer gruplara göre anlamlı bir şekilde daha düşük, PCO2 değerinin ise anlamlı derecede daha yüksek olduğu bulunmuştur. Bulantı ve kusma sayılarında gruplar arasında bir fark bulunmamıştır.

Literatür verilerinde sezaryenle doğum sırasında PSH'nin yönetimi için en son fikir birliği, hipertansif olmayan tüm annelerde profilaktik vazopressörlerin kullanılması önerilmektedir;[9] ancak profilaktik vazopressör alan annelerde bile PSH mevcuttur. Bu nedenle, bolus vazopressör kullanarak PSH'nin yönetimi gereklidir.[10] Bu amaçla obstetrik vakalarında efedrin, fenilefrin, norepinefrin gibi vazopressörler kullanılmaktadır.

Efedrin ilk ajan olarak kullanıldığı dönemlerde etki süresinin daha yavaş, maternal taşikardi ve neonatal asidoz gibi yan etki profilinin daha geniş olması nedeniyle bu popülerliğini fenilefrine bırakmıştır.[10]

Fenilefrin, PSH'nin önlenmesi ve yönetimi için hala ilk seçenek ilaçtır; bununla birlikte, kullanımı bradikardi ve maternal kalp debisinin azalmasıyla sonuçlanabilir.[10,11]

Norepinefrin, zayıf beta adrenerjik agonistik aktiviteye sahip bir alfa adrenerjik agonisttir; bu nedenle, kan basıncını fenilefrin kadar etkili bir şekilde korumakla birlikte, bradikardi ve maternal kalp debisinde azalma gibi yan etki olasılığı daha düşüktür.[6] Bu etkilerinden dolayı norepinefrin infüzyonu, sezaryenle doğum sırasında fenilefrin infüzyonuna iyi bir alternatif olarak kabul edilmektedir; ancak PSH'nin tedavisinde ideal norepinefrin bolus dozuna ilişkin veriler sınırlıdır ve optimum doz belirsizdir. Yetersiz norepinefrin bolus dozu tedavinin başarısız olmasına ve uzun süreli hipotansif epizodlara yol açarken, daha yüksek bir doz reaktif hipertansiyona ve/veya bazen bradikardiye yol açabilir. Bu nedenle, optimum norepinefrin bolus dozunun belirlenmesi, maternal hemodinamik profilin uygun şekilde kontrol edilmesini sağlayacaktır.

Çalışmamızda sezaryen doğum sırasında PSH yönetiminde profilaktik 3 farklı bolus doz norepinefrinin (0,050, 0,075 ve 0,10 μg kg-1) etkinliğini ve ek vazopressör (efedrin) tüketimini karşılaştırdık. Çalışmamızın sonuçları Grup I (salin) ve II'de (0,050), Grup III (0,075) ve IV'e (0,10) göre SKB daha düşük tespit edildi. Cerrahi operasyon süresince uygulanan toplam efedrin ve atropin dozlarının ise Grup I ve II, Grup III ve IV'e göre anlamlı bir şekilde daha fazla olduğu belirlendi (p=0,032) (p=0,014), sırasıyla.

Çeşitli çalışmalar farklı dozlar veya göreceli konsantrasyonlar kullanarak spinal anestezi uygulanan hastalarda norepinefrinin gücünü karşılaştırmıştır. Onwochei ve ark. spinal anestezi altındaki hipotansiyonu önlemek amacıyla SKB bazal seviyenin altına düştüğünde intermittan 6 μg 'lık bolus norepinefrin ED90 dozu önermiştir.[13]

Ngan Kee ve ark. elektif sezaryen doğum için spinal anestezi uygulanan 180 sağlıklı hastada ilk hipotansiyon atağının önlenmesinde norepinefrin ve fenilefrinin bolus dozlarını karşılaştırmış ve hipotansiyonu tedavi etmek için gereken norepinefrin dozunu 8 µg olarak belirlemiştir.[14]

Wang T ve ark. da spinal anestezi altında sezaryen uygulanan 42 hastada norepinefrin bolus dozu ED50 ve ED95 sırasıyla 0,072 µg kg-1 ve 0,121 µg kg-1 olarak bulmuştur.[15] Çalışmamızda mevcut verilere dayanarak hipotansiyonu önlemek için kullandığımız doz aralığının (0,050, 0,075 ve 0,10 µg kg-1) yeterli olduğuna inanıyoruz ve bu durumda daha yüksek dozların kullanılması aslında hastanın kan basıncını yükselterek hipertansiyona neden olabileceğini düşünmekteyiz.

Çeşitli çalışmalar spinal anestezi sonrası norepinefrin kullanımında hipotansiyon insidansı ve efedrin tüketimi açısından doz ve güç karşılaştırması yapmıştır.

Hasanin ve ark. spinal anestezi altında sezaryen uygulanan 290 hastada norepinefrin infüzyonu başlamış ve başlangıç infüzyon hızları 0,025, 0,050 ve 0,075 µg kg-1 olan üç gruba randomize edilmişti. 0,050 ve 0,075 µg kg-1 norepinefrin infüzyon hızları, 0,025 µg kg-1 infüzyona kıyasla sezaryen doğum sırasında PSH'yi etkili bir şekilde azalttığı sonucuna varmışlardır. Üç grup intraoperatif hipertansiyon sıklığı, bradikardi insidansı ve neonatal sonuçlar açısından benzerdi.[16]

Sharkey ve ark. sezaryen doğumlarında spinal kaynaklı hipotansiyonu önlemek ve tedavi etmek için aralıklı iv fenilefrin ve norepinefrin boluslarını karşılaştırdı. SKB taban değerinin altında olduğunda 100 µg fenilefrin veya 6 µg norepinefrin uyguladı. Bradikardi insidansı, fenilefrin grubuna kıyasla norepinefrin grubunda daha düşüktü (% 10,7'ye karşı % 37,5). Efedrin kurtarma boluslarına ihtiyaç duyan hastaların oranı, fenilefrin grubuna kıyasla norepinefrin grubunda daha düşüktü (norepinefrin için % 7,2'ye karşı fenilefrin için % 21,4).[17]

Yasmin ve ark. sezaryen doğum sırasında PSH'nin önlenmesinde iki norepinefrin bolus dozunun etkililiğini ve güvenliğini karşılaştırdı ve hipotansif epizotların yönetimi için 6 µg veya 10 µg bolus norepinefrin uyguladı. 0,05 µg kg-1 dk -1 profilaktik norepinefrin infüzyonu altında elektif sezaryen doğum yapan annelerde, hipotansif atağın kurtarma yönetimi için 6 µg norepinefrin bolus yerine 10 µg norepinefrin bolus kullanılmasının bir avantajı yoktu. Bradikardi ve reaktif hipertansiyon insidansı, her iki norepinefrin dozu arasında benzerdi.[18]

Çalışmamızda da benzer olarak Grup I (salin) ve II'de (0,050), Grup III (0,075) ve IV'e (0,10) göre hipotansiyon insidansı ve efedrin tüketimi anlamlı bir şekilde daha fazla tespit edilmesine rağmen 0,075 µg kg-1 ile 0,10 µg kg-1 bolus norepinefrin kullanılan iki grup arasında hipotansiyon insidansı ve efedrin tüketimi anlamlı bir fark yoktu. Bununla birlikte vazopressör profilaksisinin kullanılmasının, vazopressör içermeyen protokollere kıyasla PSH insidansını azaltacağını varsayıyoruz. Bu gerçek, hipotansif atakların tedavisinde farklı bolus dozlarını değerlendiren çalışmalara olan ihtiyacı desteklemektedir.

Norepinefrin kullanımının önemli avantajlarından birisi de bradikardi oluşturmamasıdır. Norepinefrin α-etkilerine ek olarak doğal β-agonist aktivitesi içermesi sebebiyle kalp hızı üzerindeki negatif etkisi daha azdır. Çalışmamızda uygulanan toplam atropin dozu açısından Grup I (salin) ve II'de (0,050), Grup III (0,075) ve IV'e (0,10) göre anlamlı bir şekilde yüksek bulunmuştur. 0,075 µg kg-1 ile 0,10 µg kg-1 norepinefrin grupları arasında ise bradikardi insidansı istatistiksel olarak benzerdi. Bu anlamda çalışmamız Hasanin ve Yasmin'nin yapmış olduğu çalışmayla uyumlu, Sharkey'in çalışmasını destekler niteliktedir.

Norepinefrinin utero-plasental geçişinin sınırlı olması sebebiyle daha az fetal etkilerinden söz edilmektedir. Minzter ve ark. norepinefrinin fetal arteriyel perfüzyon basıncı

üzerine etkisi olmadığını ve fetoplasental mikrosirkülasyonunun bozulmadığını bildirmişlerdir.[19]

Ngan Kee ve ark. sezaryenle doğum sırasında spinal anestezi sonrası arteriyel kan basıncını korumak için fenilefrin ve efedrin kombinasyonlarını karşılaştırdığı çalışmada, fenilefrin oranı azaldıkça ve efedrin oranı arttıkça, fetal pH ve baz fazlalığı olumsuz etkilendiğini, efedrin için plasental transferin daha yüksek olduğunu ve umblikal arteriyel PO2 içeriğinin azaldığını ve PCO2'nin arttığını bildirmiştir.[20] David W. Cooper ve ark. sezaryen doğumda fenilefrin ve efedrinin fetal ve maternal etkilerini karşılaştırdığı çalışmada efedrin grubunda artmış fetal asidoz insidansı ve umblikal arter PCO2 değeri ile azalmış umblikal arter PO2 değerini bildirmiştir.[21] Çalışmamızda doğumdan hemen sonra fetal durumu değerlendirmek için umblikal arter kan gazı ve Apgar skorları neonatal iyilik halinin bir göstergesi olarak ölçülmüştür. Umblikal arter kan gazında Ph ve baz fazlalığı değerlerinde farklılık görünmezken, salin grubunda norepinefrin gruplarına göre PO2 değerinin anlamlı bir şekilde daha düşük, PCO2 değerinin ise anlamlı derecede daha yüksek olduğu bulunmuştur. PO2 düzeyinin salin grubunda düşük kalması profilaktik norepinefrin dozlarının utero-plasental dolaşımın devamlılığını sağlanması için önemli olabilir. Ayrıca salin grubunda efedrin tüketimi fazla olması nedeniyle umblikal arter azalmış PO2 ve artmış PCO2 değerleri Ngan Kee ve David'in çalışmalarıyla uyumludur. Apgar skorunda dört grup arasında hiçbir farklılık gözlenmedi ve yeni doğan bebeklerin tamamı 8 ve üzeri puan alarak servise gönderilmiştir. Bulantı ve kusma sıklığında gruplar arasında farklılık gözlenmemiştir.

Özetle, bu çalışma, elektif sezaryen operasyonlarında spinal anestezi sonrası profilaktik bolus norepinefrin uygulamalarında 0,075 µg kg-1 ve 0,10 µg kg-1 dozları PSH'yi önlemede daha etkili olduğu ve efedrin ve atropin ihtiyacını önemli derecede azalttığı görülmüştür. İki doz arasında istatistiksel fark olmamasına rağmen klinik takiplerde 0,10 µg kg-1 bolus norepinefrin uygulamasının en etkin doz olduğunu düşünmekte ve profilaktik bolus norepinefrin kullanımını desteklemekteyiz.

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Fikir; YE, MG; Veri toplama; YE;Çalışma tasarımı; YE, MG; Verilerin analizi; YE, EM

Makale hazırlama

YE, EM; Makalenin gözden geçirilmesi; YE, EM;

Çıkar Çatışması Beyanı

Herhangi bir çıkar çatışması yoktur.

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RESEARCH ARTICLE / *Araştırma Makalesi*

At Least Four-Year Follow-Up Results of Total Hip Replacement Surgery Usıng A Direct Anterior Approach

Direk Anteriror Yaklaşım Kullanılarak Uygulanan Total Kalça Protez Cerrahisinin En Az Dört Yıllık Takip Sonuçları

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Abstract

Introduction	This study aims to evaluate the clinical and radiological results of patients who were followed for at least four years after total hip arthroplasty, which was performed using a direct anterior approach and to compare the results with different surgical approaches in the literature.
Materials and Methods	The study included 37 patients who underwent total hip replacement surgery using the direct anterior approach. Harris hip scores and lower extremity functional scores were recorded. The correlations between the scores and gender, body mass index, length of hospital stay, and inclination angle were examined.
Results	Of the cases, 26 (70.3%) were female and 11 (29.7%) were male. The mean age was 51.2 (26-76) years. The patients were followed up for an average of 58 (48-72) months. No significant difference was determined between the improvement in Harris hip score and gender, age, body mass index, and length of hospital stay. Postoperative acetabular inclination was 40.8° (35 - 55). One of the patients had early dislocation and three patients had serous wound draiage. Three patients developed n.cutaneus femoris lateralis injury. Five patients had periprosthetic fracture during surgery.
Conclusion	In our study, it was seen that patients had successful and fast functional results when total hip replacement was performed using a direct anterior approach. Compared to the literature, faster recovery was observed in the early period compared to other approaches; however, no difference was seen between the approaches in the mid- and long term.
Keywords	Direct anterior approach, Total hip arthroplasty, mid-term results

Öz

Amaç	*Bu çalışmanın amacı, direkt anterior yaklaşım kullanılarak uygulanan ve en az 4 yıl takip edilen total kalça artroplastisi ile tedavi edilmiş hastaların klinik ve radyolojik sonuçlarının değerlendirilmesi, elde edilen sonuçların literatürdeki farklı cerrahi yaklaşımlar ile karşılaştırılmasıdır.*
Yöntem ve Gereçler	*Direkt anterior yaklaşım kullanılarak total kalça protezi uygulanan 37 hasta çalışmaya alındı. Harris kalça skorları ve alt ekstremite fonksiyonel skorları kaydedildi. Elde edilen skorlar ile cinsiyet, vücut kitle indeksi, yatış süreleri ve inklinasyon açısı arasındaki ilişki araştırıldı.*
Bulgular	*Olguların 26'sı kadın (%70,3), 11'i erkek (%29,7) olup ortalama yaş 51.2(26-76) idi. Hastalar ortalama 58 (48-72) ay takip edildi. Harris kalça skorundaki düzelme ile cinsiyet, yaş, vücut kitle indeksi ve yatış süreleri arasında anlamlı bir fark görülmedi. Ameliyat sonrası grafilerde asetabular inklinasyon ortalama olarak 40,8° (35-55) ölçüldü. Hastalarımızın birinde erken dönem dislokasyon görüldü. Üç hastada seröz akıntı gelişti. Üç hastada n.cutaneus femoris lateralis hasarı gelişti. Beş hastada ameliyat sırasında periprostetik kırık görüldü.*
Sonuç	*Yaptığımız çalışmada, direkt anterior yaklaşım kullanarak uygulanan total kalça protezi, uygun endikasyon ve cerrahi teknikle yapıldığında hastalarda başarılı ve hızlı fonksiyonel sonuçlar elde edildiği görülmektedir. Literatür ile karşılaştırıldığında erken dönemde diğer yaklaşımlara göre daha hızlı iyileşme görülmekte fakat orta ve uzun dönemde yaklaşımlar arasında fark görülmemektedir.*
Anahtar Kelimeler	*Direk anterior yaklaşım, kalça artroplasitisi, orta dönem sonuçlar*

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INTRODUCTION

Total hip arthroplasty ranks first among all orthopedic surgeries with best outcomes. Among approaches applied in surgery, which one is superior is still controversial.[1–3] The most commonly used approaches are the anterolateral, direct lateral, posterolateral, and anterior approaches. There are structures that require attention and muscle and tendon structures that need to be dissected in each approach. The direct anterior approach (DAA) was defined many years ago and its popularity has been rapidly increasing in recent years.[4] The surgery is completed by entering the area between the tensor fascia lata and sartorius muscles, without cutting any muscles. Studies have shown that DAA has many advantages compared to other approaches, such as faster rehabilitation, less pain, and decrease in blood loss and hospital stays.[5–8] However, the long learning curve of DAA is one of its disadvantages.

This study aimed to evaluate the clinical and radiological results of patients who had been treated with total hip arthroplasty using DAA and followed up for at least four years.

MATERIALS and METHODS

In this retrospective study, we included 37 patients with primary and secondary hip osteoarthritis, who underwent total hip arthroplasty with DAA and were regularly followed up. Total hip replacement was performed on 42 hips of 37 patients. Patients who came for regular checkups were included in the study. Preoperatively, all patients were evaluated clinically, radiologically, and functionally and their laboratory findings were examined. The 'template' procedure was performed using hip radiographs taken in accordance with the standards. The preoperative and postoperative second-year functional results of the patients were evaluated and scored according to the Harris hip function evaluation scale.

Surgical procedure

The patient was anesthetized before the surgery, taken on a standard operating table, and placed in the supine position (Figure 1). The pelvis was raised approximately 5 cm with supports.

Figure 1: A support of approximately 5 cm is placed under the pelvis

General anesthesia was administered to all patients and a skin incision of approximately 8-9 cm was made on the cleavage area between the sartorius and tensor fascia. Acetabulum was rimerized at 40-45 degrees of abduction and 10-15 degrees of anteversion under fluoroscopy control and the appropriate acetabular cup was placed in the anteversion and abduction determined under fluoroscopy control (Figure 2),

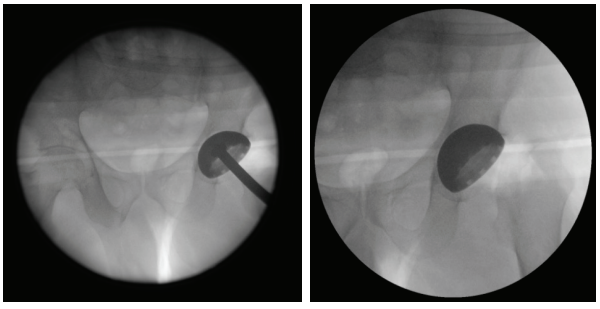

Figure 2: Evaluation of the appropriate position of the acetabular component

Soft tissue releases were performed to reach the femoral canal; the table was flexed approximately 30 degrees; the opposite leg was abducted and the hip was placed in the position of '4' figure (Figure 3).

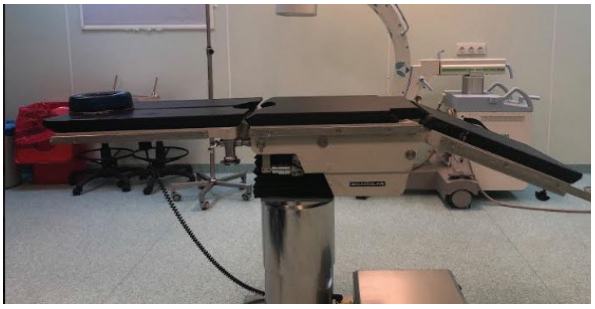

Figure 3: The table is tilted approximately 30° down to reach the femur.

The hip was examined with appropriate trials. The stability of the hip and the equality of length of the legs were checked. Equality of the legs was assessed through medial malleolar examination and with a metal stick passing through the lower border of both ischium (Figure 4). Cementless femoral stem and cementless alumina-ceramic head were used in all patients. The patients were not drained. Postoperatively, patients started physical therapy and walked within 24 hours.

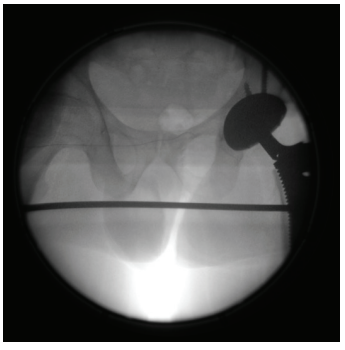

Figure 4: Evaluation of hip height difference

The patients were invited to the outpatient clinic at the second week, sixth week, third month, sixt month, and first year after discharge and for annual follow-ups. Hemogram values on the first and third days were recorded. VAS scores were recorded at the sixth-month follow-up. Functional outcomes were assessed at postoperative sixth month according to the Harris hip function evaluation scale.

Statistical analysis

The data obtained in the research were transferred to the computer environment and analyzed in the SPSS 18.0 program. Number, percentage, min, max, and mean±standard deviation were used in descriptive statistics. The student t-test was used for comparison of independent groups and paired t-test was used for comparison of dependent groups. Pearson correlation analysis was performed for the correlation analysis of continuous data. A p-value of <0.05 was considered statistically significant.

Ethical Aspects

Ethics Committee approval was obtained from the Ethics Committee of Sakarya University Faculty of Medicine Dean's Office.

Ethics Committee no: 71522473/050.01.04/75
Date: 02.07.2018

RESULTS

The demographic characteristics and diagnoses of the patients included in the study are presented in Table1. Preoperatively, all hips were in the weak group according to the Harris hip score whereas all patients were in the good and excellent groups at the end of an average of 32-month follow-up. Six of them had good results and 31 had excellent results.

Tablo 1: Age, gender, BMI, and etiology of the patients		
Mean Age (min. Max. Range)		**54.68 (26- 76)**
Gender	**Male**	26 70.2%
	Female	11 29.8%
Side of operation site	**Right**	19
	Left	13
	Bilateral	5
Body mass index (BMI)	**Obese**	15
	Non-obese	22
Etiology	**Primary coxarthrosis**	20 47.5%
	Developmental hip dysplasia	14 33.3%
	Avascular necrosis	5 11.9%
	Femoral neck fracture	3 7.1%

Acetabular inclination in postoperative radiographs was measured. Mean acetabular inclination was 40.8° (35 - 55). When the data were compared according to gender, there was no significant difference in terms of BMI, and postoperative Harris hip score, The data are presented in Table 2 in detail.

Table 2: Comparison of Data According to Gender			
Gender	**Female (mean±sd) n:26**	**Male (mean±sd) n:11**	**P-value**
Harris hip score postoperative	95.84±3.91	94.45±2.72	0.27
BMI	28.13±3.90	29.55±3.30	0.28

When the data of those aged 60 and over and those younger than 60 were compared, there was no significant difference in terms of postoperative Harris hip score, length of hospital stay, postoperative inclination, duration of follow-up, and BMI (Table 3).

Table 3: Comparison According to Age Group			
Age	**<60 (mean±sd) n:18**	**60 and over (mean±sd) n:19**	**P-value**
Harris Hip Score postoperative	95.72±2.86	95.10±4.36	0.59
BMI	28.59±4.74	28.52±2.34	0.95
Length of Hospital Stay (day)	3.24±1.78	2.84±1.83	0.49
Postoperative Inclination	41.81±5.81	39.95±4.73	0.27

When the data of the group with a BMI of 30 and above and those with a BMI of less than 30 were compared, no significant difference was found in terms of Harris hip score, length of hospital stay, postoperative inclination, and duration of follow-up. (Table 4)

Table 4: Comparison According to BMI			
BMI	**<30 (mean±sd) n:22**	**30 and over (mean±sd) n:15**	**P-value**
Harris Hip Score postoperative	95.87±3.30	94.82±4.03	0.36
Length of Hospital Stay (day)	3.30±1.96	2.71±1.53	0.30
Postoperative Inclination	40.74±5.06	41.18±5.85	0.80

Our patients were admitted to the hospital on the day before the surgery. The mean postoperative length of hospital stay was three days (minimum 1, maximum 8) and 12 patients were discharged within the first 24 hours. The mean duration of postoperative follow-up of the patients was 32 (minimum 8, maximum 52) months. When the data of those with one day of hospitalization and those with more than one day were compared, no significant difference was found in terms of postoperative Harris hip score and time of walking. (Table 5)

Table 5: Comparison According to Length of Hospital Stay			
Length of hospital stay	**1 day (mean±sd) n:12**	**More than 1 day (mean±sd) n:30**	**P-value**
Harris Hip Score postoperative	94.40±3.45	95.86±3.66	0.24

The mean preoperative Harris hip score of the patients was 48±7.94 (minimum 38-maximum 65) and the mean postoperative score was 95.43±3.62 (83-100) during outpatient clinic control examinations. Significant improvement was seen between preoperative and postoperative Harris hip scores (p=0.001).

Complications

A serous wound drainage occurred at the early postoperative wound site in three of 42 hips who underwent total hip arthroplasty in our clinic. In all three patients, BMI was above 30. The discharge was terminated in two of these patients without the need for a radical intervention other than antibiotic therapy and dressing. Debridement was performed on one patient. Since the infection was not eliminated, the prosthesis was removed in the third postoperative week and an antibiotic spacer was implemented. This patient was scheduled for revision surgery but died due to internal reasons.

Nervus femoris cutaneus lateralis is at risk in total hip arthroplasty. In three patients, it was damaged with the direct anterior approach. The complaints of the patients were numbness and burning sensation on the tigh anterolateral. In two of these patients' complaints disappeared in the sixth week. In five cases, a femoral fracture occurred during the surgery. Of these fractures, three were calcareous fissures and two were trochanter major type. Fractures were fixed with cerclage. It was observed that all cases resulted in the complete union at the outpatient clinic examinations in the sixth month. The prosthesis was dislocated in one patient on the first postoperative day. It was reduced at the bedside before discharge and no dislocation was observed in the fifth-year follow-up. All complication data are presented in Table 6.

Table 6: Complications	
Wound problems	
Superficial SSI	2
Deep PJI	1
Dislocation	1
Periprosthetic fracture	
Vancouver A	5
Vancouver B	0
Vancouver C	0
Aseptic Loosening	0
Revision	
Acetabular Component	0
Femoral Component	0
Total Revision	1
N.Cutaneus femoris lateralis injury	3

DISCUSSION

Many studies claimed that total hip arthroplasty surgeries performed using the direct anterior approach (DAA) provide less muscle damage, faster recovery, and a more comfortable walk in the postoperative period compared to other approaches.[9–12] In a study, 150 cases of total hip replacement were examined: a posterior approach was used in 50 patients and a direct anterior approach was used in 100 patients. It was observed that the length of hospital stay was shorter in the anterior group. In the first six weeks after surgery, pain and the use of narcotic analgesics were less in the anterior group. Compared to the control group, patients who used the direct anterior approach showed faster recovery.[8] Bergin PF et al. compared the direct anterior and posterior approaches in terms of muscle damage and inflammation markers. In all patients, serum creatinine kinase (CK) and inflammation markers were checked preoperatively and on the postoperative first and second days. Inflammation markers were found to be low in the direct anterior group. CK elevation was 5.5 times higher in the posterior group. As a result, it was shown that the direct anterior approach caused less muscle damage.[10]

Seven studies comparing anterior and posterior approaches and a total of 2302 patients were reviewed. The direct anterior group was found to be significantly superior in four studies comparing patients' pain and function in the early postoperative period.[13] In another study, direct anterior (DAA) and posterior (PA) approaches were compared at the postoperative sixth week. The hospital stay was recorded as 1.4 days in the DAA group and 2.0 days in the PA group. Pain score was significantly better in the DAA group. Patients in the DAA group quit walking aids earlier. Despite all these findings, there was no significant functional difference between the two groups at the end of the sixth week.[14] Many other studies reported good results in the early period.[15–18] When the preoperative and postoperative Harris scores of our cases were compared, statistically significant clinical results were obtained in the early period, supporting the literature.

Day-case surgery defined as patient discharge on the same day after surgery. In a study conducted in 2018, studies comparing day-case knee and hip arthroplasty and hospitalized arthroplasty were assessed. There was no difference in comorbidity and mortality. However, it was observed that outpatient arthroplasty costs 30% less on average. Similar results were obtained with the conventional method with patient training, pain control, blood loss control, and thromboprophylaxis.[19] In another retrospective study comparing the posterior approach with DAA, it was shown that patients in the DAA group were discharged earlier.[20] Twelve of our patients were discharged in the first 24 hours. No significant difference was found in terms of pain, postoperative Harris hip score, morbidity and time of walking when compared with those with more than one-day hospitalization.

Hip arthroplasty was performed using the direct anterior approach and 99 patients with lateral cutaneus femoris neuropraxia were included in the study. At the end of the mid-term follow-up, it was seen that 75% of the patients continued to have neuropraxia. No pain, limitation of movement, or loss of function was observed in the patients.[21] The incidence of neuropraxia was reported between 1% and 67% in the literature.[15,22] Most paresthesias regress spontaneously; very few patients have true marelgia paresthetica.[15,22–24] In our study, neuropraxia was observed in three of 42 patients. At the end of the 6th week, the complaints of one patient continued in the postoperative second year. Similar to the literature, the cases had no loss of strength, pain, or loss of function.

Periprosthetic fractures occurring during surgery in DAA are defined in the literature. These fractures are mostly trochanter major and calcar fractures.[17,23,25] Many articles showed that the incidence of fracture decreases as the experience of the surgeon increases.[17,25,26] During surgery, periprosthetic fracture developed in five of 42 hips included in the study. In their study, Masonis et al included 300 patients who underwent total hip arthroplasty and reported 3 calcar fracture in the first 62 cases %4.8.27 Similarly, in the study of Jewett and Collision, the first 200 cases were included and 10% intraoperative fractures were seen in 20 cases. In our study, 11% intraoperative fractures were seen in 5 patients. In this study three of the fractures were in the calcar fissure and two were in the trochanter major. All fractures were cable-fixed.

According to the literature, the risk of infection in patients with DAA is similar to those in other approaches. Periprosthetic joint infection rates in literature vary between 0.57% and 2.23%.[28] The risk was significantly higher especially in patients with high BMI.[29] Since the skin incision was on the inguinal area, wound healing problems were observed especially in obese patients due to the fact that the wound remained moist. In the present study, three obese patients had skin healing problems and two of them healed with dressing. In our study, periprosthetic infection developed in one %2.38 patient. This rate is seen to be high when compared to the literature. We think that more case series are needed to get more accurate results.

Dislocation rates after total hip arthroplasty with DAA are

various in the literature. In a study of 494 patients, the rate of dislocation was 0.61%.[23] All cases were closed-reduced and none of patients developed recurrent dislocation. In the study of Siguer et al., dislocation rates were reported as 0.96%.[30] In our study, dislocation was observed in one patient during post-operative patient transfer. The dislocation was reduced as closed, and the dislocation of this patient did not recur in the 5th year follow-up. We think that postoperative patient transfer is important and that maximum care should be taken.

CONCLUSION

Total hip arthroplasty using a direct anterior approach gives good results with appropriate indications and appropriate surgical techniques. As for disadvantages, the cutaneus femoris lateralis nerve is at risk and femoral access is limited. As a result of fewer muscle incisions during the surgery, patients can be rehabilitated and discharged early. Controlled trials including larger numbers of patients and other approaches are needed to better evaluate the results.

In this study, national and international ethical rules were complied with.

Ethics Committee approval was obtained from the Ethics Committee of Sakarya University Faculty of Medicine Dean's Office.

Ethics Committee no: 71522473/050.01.04/75
Date: 02.07.2018

Conflict of Interest

The authors declare that they have no conflicts of interest. The authors declare that they do not use any financial support.

Author Contributions

Concept: A.A., L.B Design: A.A Supervision: M.E. Materials: A.A, A.C.E Data: A.A., A.C.U. Literature search: A.A, A.C.E Analysis: N.T, L.B. Writing: A.A Critical revision: A.A, M.E

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RESEARCH ARTICLE / *Araştırma Makalesi*

Regional Anesthesia vs General Anesthesia In Patients with Covid-19: The Effect on Critical Care Admission, Mortality Rates and Pulmonary Complications

COVID-19 Hastalarında Rejyonal Anestezi ve Genel Anestezinin Yoğun Bakım Başvurusu, Mortalite Oranları ve Pulmoner Komplikasyonlar Üzerine Etkisi

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Abstract

Introduction	The appropriate anesthesia method in patients requiring surgical treatment with confirmed or suspected new coronavirus disease (COVID-19) is unclear. This study aimed to compare regional anesthesia (RA) with general anesthesia (GA) in patients with COVID-19 infection in terms of admission to intensive care unit (ICU), rate of pulmonary complications and mortality.
Materials and Methods	Reviewed medical records between March 2020 and December 2021 added patients with COVID-19 that operated under RA or GA in the study. Patient data were obtained from the patient database program of our hospital. The patients were assigned into two groups: 1. patients operated under RA and 2. patients operated under GA. Demographic data, surgery types, anesthesia types, intensive care unit (ICU) admission rates, pulmonary, renal and hepatic labratory data, perioperative mortality rates, hemogram values were recorded. Primary outcomes were admission rates to the ICU, acute pulmonary, renal and hepatic complications and perioperative mortality rates.
Results	Included 123 patients in the study. While 97 (78.9 %) patients under RA and 26 (21.1 %) patients under GA were operated, the number of patients who underwent RA was statistically significantly higher (p<0.001). Although pulmonary complications were observed in 6 (6.2 %) patients in the RA group and in 2 (7.7 %) patients in the GA group no statistically significant difference was found (p=0.535). While the rate of admission to the ICU was 8.2 % in the RA group and 11.5 % in the GA group, no statistically significant difference was observed (p=0.422). Although perioperative mortality rates were lower in the RA group, no statistically significant difference was found (p=0.535).
Conclusion	Pulmonary complications, ICU admission, and perioperative mortality rates were lower in COVID-19 patients operated under RA however the differences were not statistically significant.
Keywords	Regional anesthesia, General anesthesia, COVID-19, ICU admission, Pulmonary complications

Öz

Amaç	*Yeni tip koronavirüs hastalığı (COVID-19) olan ve cerrahi tedavi gerektiren hastalarda hangi anestezi yönteminin uygulanacağı belirsizliğini korumaktadır. Bu çalışmada COVID-19 enfeksiyonu olan hastalarda rejyonal anestezi (RA) ve genel anestezi (GA)'nın pulmoner komplikasyon oranı, yoğun bakım ünitesine (YBÜ) kabul oranı ve mortalite açısından karşılaştırması amaçlandı.*
Yöntem ve Gereçler	*Çalışmaya Mart 2020 ile Aralık 2021 arasında RA ve GA altında ameliyat edilen COVID-19 hastaları dahil edildi. Veriler hastane bilgi sisteminden elde edilmiştir. Hastalar iki gruba ayrıldı: 1. Grup RA ile ameliyat edilen hastalar ve 2. grup GA ile ameliyat edilen hastalar. Demografik veriler, cerrahi tipleri, anestezi tipi, yoğun bakım ünitesine (YBÜ) kabul oranları, pulmoner, renal ve hepatik labratuar verileri, perioperatif mortalite oranları, hemogram değerleri kaydedildi. Birincil sonuçlarımız YBÜ kabul oranları, akut pulmoner, renal ve hepatik komplikasyonlar ve perioperatif mortalite oranlarıydı.*
Bulgular	*Çalışmaya 123 hasta dahil edildi. RA altında 97 (% 78.9) hasta, GA altında ise 26 (% 21.1) hasta opere edilirken RA uygulanan hasta sayısı istatistiksel olarak anlamlı derecede yüksekti (p<0.001). RA grubunda 6 (%6.2) hastada ve GA grubunda 2 (% 7.7) hastada pulmoner komplikasyonlar görülmesine rağmen istatistiksel anlamlı bir fark bulunamadı (p=0.535). YBÜ'ye kabul oranı RA grubunda % 8.2, GA grubunda % 11,5 iken istatiksel olarak anlamlı fark görülmedi (p=0.422). Perioperatif mortalite oranları RA grubunda daha düşük olmasına rağmen istatistiksel anlamlı fark bulunamadı (p=0.535).*
Sonuç	*Rejyonel anestezi ile ameliyat edilen COVID-19 hastalarında pulmoner komplikasyonlar, yoğun bakım yatışı ve perioperatif mortalite oranları daha düşük olmasına rağmen istatistiksel olarak anlamlı bir fark tespit edilememiştir.*

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INTRODUCTION

Anesthesia management in patients requiring surgical treatment with confirmed or suspected new coronavirus disease (COVID-19) is challenging for all anesthetists. The safety of both patients and healthcare professionals should be considered a major issue when surgical procedures are performed for those patients. Patients undergoing surgery are a vulnerable group being at risk of exposure to the COVID-19 virus in the hospital. Besides, patients with confirmed or suspected COVID-19 disease may be particularly susceptible to pulmonary, renal and hepatic complications due to surgery, mechanical ventilation, and immunosuppressive responses.[1]

Elective surgery of patients with respiratory tract infections, including COVID-19 disease, should be postponed and rescheduled after the proper treatment of the infection.[2] During the SARS-CoV-2 pandemic, guidelines on surgery and anesthesia management have been published suggesting modalities of anesthesia management; however, these mainly consist of expert opinions.[3,4] In a single-center retrospective observational study, they reported that 49 patients with COVID-19 disease who underwent cesarean section (C/S) operation or orthopedic surgery under spinal anesthesia did not develop severe pneumonia and no mortality was reported.[5] A meta-analysis in 2020 investigated the factors affecting the death of operated patients with confirmed COVID-19 infection and reported that no death was seen in patients operated under regional anesthesia (RA).[6] However, the appropriate anesthesia method in patients requiring surgical treatment with confirmed or suspected COVID-19 is unclear, and data is needed from studies comparing RA with general anesthesia (GA).

Based on these studies, we hypothesized that the mortality rate, admission to intensive care unit (ICU), and pulmonary complications would be lower in patients operated under RA than patients operated under GA. The primary aim of this study was to assess RA and GA methods in surgically operated patients with COVID-19 infection in terms of pulmonary, renal and hepatic complications, admission to ICU, and mortality rates.

MATERIAL and METHODS

This study was planned as a retrospective comparative cohort study and was carried out in Sakarya Research and Training Hospital, Department of Anesthesiology and Reanimation. Study approval was obtained from Sakarya Universty Faculty of Medicine Local Ethics Committee (Approval number: 050.01.04.113329-67). Patient data were obtained from the patient database program of our hospital (Karmed, Kardelen Software).

We reviewed the records of the patients who operated under RA or GA between March 2020 and December 2021. Patients diagnosed with COVID-19 (confirmed by nasopharyngeal-oropharyngeal swab RT-PCR test) within seven days before the operation; were included in the study. Patients hospitalized in the intensive care unit in the preoperative period and patients who met the criteria for hospitalization in the intensive care unit were excluded from the study. The patients with respiratory, renal or hepatic symptoms before surgery were also excluded from the study.

The patients were assigned into two groups: patients operated under RA group and patients operated under GA group. The indications for surgery were classified as C/S operation, general surgery operations (colostomy, appendectomy, cholecystectomy) and other surgery operations (cardiovascular, urology, neurosurgery, orthopedics). The decision on the anesthesia method was based on the recommendations of the Regional Anesthesia and Pain Medicine (ASRA) and the European Society of Regional Anesthesia and Pain Therapy (ESRA) in patients with COVID-19.4 These recommendations are consistent with our institutional proposal of adopting RA as the primary anesthesia method in patients with COVID-19. In our clinic, spinal anesthesia in lower extremity surgeries and

(C/S), brachial plexus block in upper extremity surgeries are the anesthesia methods used routinely during the COVID-19 process.

The primary outcomes were acute pulmonary complications, admission rates to the ICU, and perioperative mortality. Secondary outcomes were perioperative hepatic and renal disorders. New onset of postoperative dyspnea, tachypnea, decrease in oxyhemoglobin saturation, need for additional oxygen supplementation and signs of pneumonia were considered pulmonary complications. Hepatic disorder was defined as an increase in liver enzymes. Renal disorder was defined as deterioration in renal laboratory parameters and the need for hemodialysis.

The criteria for admitting patients to the intensive care unit after surgery were as follows: Patients with respiratory distress (>30 breaths/min), oxygen saturation < 90 at rest under nasal oxygenation with 5–6 liters/min, arterial partial pressure of oxygen (PaO2) / fraction of inspired oxygen (FiO2) < 300 mmHg In addition to these, symptoms of shortness of breath, fever and/or cough, and significant comorbidities (chronic kidney disease, congestive heart failure, chronic obstructive pulmonary disease, and diabetes) which may significantly worsen with concomitant COVID-19 infection. Mechanical ventilation indications are the presence of hypercapnic acidosis and hypoxemia despite administration of high flow nasal oxygen.

Statistical analysis

Statistical analyzes were performed using the IBM SPSS Statistics 22 program. Categorical variables were expressed as numbers and percentages, while continuous variables were expressed as mean ± standard deviation or median (interquartile range). Chi-square and Fisher's exact tests were used for categorical variables. The distribution of numerical variables was evaluated by Kolmogorov Smirnov. Data of independent groups with normal distribution were compared with Student's t-test, and data without normal distribution were compared with the Mann-Whitney-U test. $p < 0.05$ was considered significant.

RESULTS

Included 128 patients in the study who were found eligible. Five patients were excluded from the study; three were indicated for intensive care hospitalization preoperatively; meanwhile, two patients were in ICU before the operation.

Data of 123 patients were analyzed. The mean age of the patients operated under RA (30.53 ± 10.60) was found statistical significantly lower than the patients operated under GA (44.72 ± 26.51) ($p<0.001$). Female patients number were statistical significantly high in the RA group ($p<0.001$). The demographic characteristic has been shown in Table 1.

Table 1. Demographic characteristics of patients. Data expressed as Mean ± Standard deviation, n (%), Median[IQR].

	Regional anesthesia (n=97)	**General anesthesia (n=26)**	**p**
Age, year	30.53 ± 10.60	44.72 ± 26.51	<0.001*
Gender, n (%)			
Male	9 (9,3)	9 (34,6)	<0.001*
Female	88 (90,7)	17 (65,4)	
Type of operation			
C/S	83 (91.2)	8(8.8)	<0.001*
General surgery	6 (6.2)	14 (53.8)	
Other a	8 (8.2)	4 (15.4)	
Urgent	46 (47.4)	15 (57.7)	0.352
Elective	51 (52.6)	11 (42.3)	
Operation time (min)	90 [80-105]	90 [90-120]	0.036*

a Other (cardiovascular, urology, neurosurgery, orthopedics), C/S: cesarean operation.
*statistically significant

We determined that 61 (49.6 %) of the 123 surgeries were emergency surgeries, and 62 (50.4 %) were elective surgeries. Ninety-seven patients were operated under RA (78.9 %); meanwhile, 26 patients (21.1 %) were operated under GA. In the RA group, infraclavicular block was applied to 2 (2.1 %) patients, while spinal anesthesia was adminis-

tered to 95 (97.9 %) patients. The rate of RA was statistically significant higher than GA rate (p=0.001) (Table 1). C/S operations (91.2 %) constituted the significance of patients who underwent RA (p<0.001). Twenty operations (16.3 %) were general surgery and 12 operations (9.8%) were other surgeries in the cohort. In the general surgeries, 6 (30 %) were operated RA and 14 (70 %) patients under GA. In the other surgeries, 8 (66.7 %) patients were operated under RA and 4 (33.3 %) patients under GA (Table 1). Mean operation time in the RA group was statistically significant shorter than GA group (p=0.036).

Pulmonary disorders developed totally in 8 patients in the cohort. Of these, 6 (6.2 %) patients were in the RA group and two (7.7 %) were in the GA group. No statistically significant difference was found (p=0.535) (Table 2).

Eleven patients were admitted to the ICU (8.9 %). In the RA group, 8 patients (8.2 %) were admitted to intensive care and in the GA group, three patients (11.5 %) were admitted to the ICU (Table 2). Although there was a higher rate of intensive care hospitalization in the GA group, the difference was not statistically significant (p=0.422) (Table 2).

The perioperative mortality rate was 5.7 % (7 patients) in our cohort. The mortality rate was 5.2 % (5 patients) in the RA group and 7.7 % (2 patients) in the GA group. Despite the proportionally higher mortality rate in the GA group, no statistically significant difference was found (p=0.457). We have made a subgroup of C/S operations that consisted of most of the operations performed in patients with COVID-19. C/S was performed in 91 patients (74 % of the cohort). Of these patients, 83 patients received RA group and eight received GA group. The rate of pulmonary disorders, admission to ICU and perioperative mortality were similar in RA and GA groups in the obstetric population (Table 3).

During the postoperative follow-up period of the patients, we observed that three (3.1 %) patients needed renal replacement therapy in the RA group; meanwhile, one (3.8 %) patient required renal replacement therapy in the GA group. No statistically significant difference was found in the necessity of renal replacement therapy (p=0.618). An increase in liver function tests was observed in 9 patients (9.3 %) in the RA group and four in the GA group (15.4 %). The difference was not statistically significant (p=0.282). The rates of pneumonia, ICU admission rates and mortality rates were also stated in Figure 1.

Table 2. Outcome of pulmonary disorders, ICU Hospitalization, perioperative mortality, liver and renal disorders, and laboratory data. Data expressed as Mean ± Standard deviation, n (%), Median[IQR].

	Regional anesthesia (n=97)	General anesthesia (n=26)	p
Pulmonary disorder	6 (6.2%)	2 (7.7%)	0.535
ICU Hospitalization	8 (8.2%)	3 (11.5%)	0.422
Perioperative mortality	5 (5.2%)	2 (7.7%)	0.457
Increase in liver enzymes	9 (9.3%)	4 (15.4%)	0.282
Renal Replacement Therapy	3 (3.1%)	1 (3.8%)	0.618
Blood urea nitrogen	14 [11-22]	22 [14-31]	0.090
Creatinine	0.5 [0.4-0.7]	0.6 [0.5-1]	0.129
WBC	8.3 [6.6-11.3]	11 [7.8-15]	0.040*
PLT	210 [165-268]	259 [186-307]	0.266
HGB	11.2 [10-12]	11 [9.7-13.5]	0.226

*statistically significant ICU: Intensive Care Unit, WBC: white blood cell, PLT: Platelet count, HGB: Hemoglobin

Table 3. Outcome of C/S operations. Data expressed as Mean ± Standard deviation, n (%), Median[IQR].			
	Regional anesthesia (n=83)	General anesthesia (n=8)	p
Urgent	6 (6.2%)	2 (7.7%)	0.535
Elective	38 (45.8 %)	3 (11.5%)	0.422
45 (54.2 %)	6 (75 %)	2 (7.7%)	0.457
2 (25 %)	0.113	4 (15.4%)	0.282
Operation time (min)	90 [80-90]	85 [75-90]	0.196
Renal Replacement Therapy	1 (1.2 %)	0	0.912
Increase in liver enzymes	3 (3.6 %)	0	0.756
Blood urea nitrogen	13.9 [11.2-17.9]	15.8 [14-23]	0.261
Creatinin	0.5 [0.4-0.6]	0.5 [0.5-0.8]	0.202
WBC	8.4 [6.7-11.5]	9.5 [7.6-11.9]	0.771
PLT	204 [161-272]	270 [221-301]	0.387
HGB	10.8 [9.9-11.5]	11 [10.9-12.6]	0.073
Pulmonary disorder	1 (1.2 %)	0	0.912
ICU hospitalization	2(2.4 %)	0	0.831
Perioperative mortality	1 (1.2 %)	0	0.912
*statistically significant ICU: Intensive Care Unit, WBC: white blood cell, PLT: Platelet count, HGB: Hemoglobin			

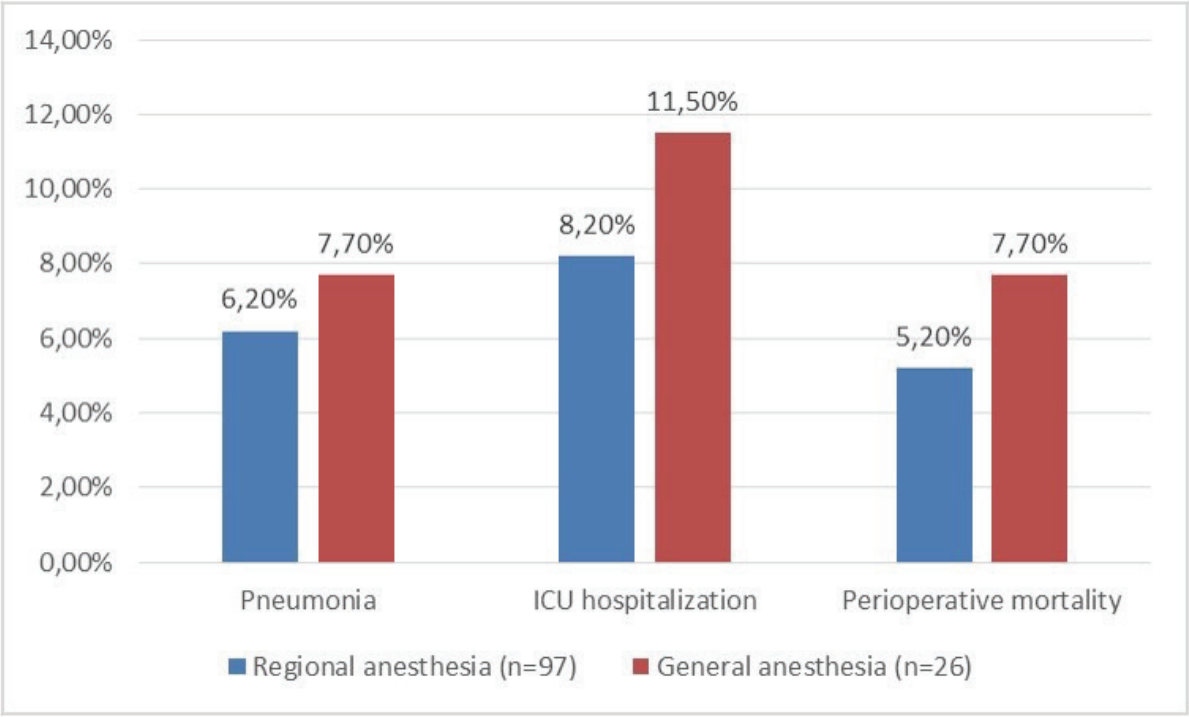

Figure 1. Data of pulmonary disorders, ICU Hospitalization, perioperative mortality, liver and renal disorders, and laboratory data. Data expressed as percentage.

DISCUSSION

The study results showed that acute pulmonary complications, admission to the ICU and perioperative mortality rates were similar when RA or GA was performed in patients with perioperative COVID-19 disease.

A joint statement by the American Society of Regional Anesthesia and Pain Medicine (ASRA) and European Society of Regional Anesthesia and Pain Therapy (ESRA) was reported in 2020 with recommendations on anesthesia methods in patients with COVID-19. These recommendations are usually consisted of expert opinions and do not include a previous comparative study. Avoiding GA was suggested, and RA was promoted whenever possible.[4] Neuraxial techniques are also recommended for surgical anesthesia and pain relief, especially in cesarean/section (C/S) operations.[7]

Many surgery clinics have postponed elective surgeries with the rapid spread of new coronavirus infection worldwide.[8] Although elective surgeries have been postponed, cancer surgeries, trauma surgeries, emergency operations, and especially obstetric surgery continued even in the presence of acute COVID-19. In our study, we observed that 74 % of our patient cohort consisted of C/S operations. Most of the C/S operations (91.2 %) were operated under RA. We also determined that 49.6 % of our cohort consisted of emergency operations. Since all elective surgeries have been stopped in our institution at that time period, this could be understandable. These results are consistent with the published literature. Nepogodiev et al. stated that 74.0% of the operated patients underwent an emergency operation. They also noted that 30-day mortality was 23.8% in operated patients with confirmed COVID-19. They could not find a statistically significant difference between GA and RA in mortality rates.[9] In the study of Chen et al., they implemented epidural anesthesia to 14 patients and GA to 3 patients in an obstetric cohort and reported no mortality.[10] In another study in which 28 patients were included spinal and local anesthesia was applied to 24 patients and GA was applied to four patients. All patients were operated under GA and transferred to intensive care and one death was reported postoperatively.[11] In our cohort, the mortality rate was 5.7 %, lower than the previous studies.

General anesthesia requiring airway intervention has a higher risk of perioperative pulmonary complications than regional anesthesia.[2] Postoperative pulmonary complications are the most common mid-term complications after surgery and significantly impact a patient's well-being and recovery.[12] The most important of these are pneumonia, atelectasis, acute respiratory distress and the need for mechanical ventilation.[13] A review also reported a lower incidence of postoperative pneumonia in patients undergoing neuraxial anesthesia than in patients undergoing GA.[14] Pulmonary dysfunctions resulting from subsequent restrictive lung injury have also been described in patients with severe COVID-19. Chen et al. reported that both RA and GA can be used safely in their study on COVID-19 positive pregnant patients.[10] In their study, Korkmaz et al. evaluated all patients with suspected COVID-19 who underwent surgery during the pandemic process and stated that mortality was associated with increasing age and GA application. At the same time, they reported that hospitalization in intensive care units, respiratory problems, acute renal failure and acute thrombotic events were the cause of death in patients.[15] In our study, pneumonia and respiratory distress were observed in 6 (6.2%) patients in the RA group and 2 (7.7%) patients in the GA group. At the same time In the RA group 8 patients (8.2%) were admitted to intensive care, and in the GA group three patients (11.5 %) were admitted to the ICU. Although pneumonia, respiratory complications and ICU admission rate were lower in the RA group compared to the GA group, this difference was not statistically significant. We guess that this is because the majority of our patient group consists of young and obstetric patients.

Liver enzymes in COVID-19 patients may be increased;

however, there is inconsistency about the effect of GA or RA on liver damage, even in patients with liver disease.[16] While an increase in liver enzymes occurred in 10.6 % of our patients, no statisticaly significant difference was found between the RA and GA groups.

One of the main concerns during the anesthesia management of patients with COVID-19 is the transmission of the infection to the healthcare staff via aerosol release, especially during GA.[17] This was not a subject of our study as there is no clear recommendation in the literature regarding the anesthesia method that should be used.

The study's main limitation seems to be the heterogeneous patient distribution due to the excess of C/S operations that consisted of the majority of our patients. We have analyzed the results of a subgroup consisting of C/S operations and found no statistically significant difference between RA and GA. The retrospective and observational characteristics of the study may also pose a limitation, and our findings need to be confirmed by prospective controlled studies.

In conclusion, pulmonary complications, ICU admission, and mortality rates were similar in patients operated under RA compared to GA. RA did not reduce the requirement of renal replacement therapy.

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RESEARCH ARTICLE / *Araştırma Makalesi*

Radiological Features and Outcomes of COVID-19 Associated ARDS Patients with Barotrauma

Barotravma Saptanan COVID-19 İlişkili ARDS Hastalarının Radyolojik Özellikleri ve Sonlanımları

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Abstract

Introduction	Barotrauma developing spontaneously or associated with positive pressure ventilation is reported more frequently in patients with novel coronavirus 2019 (COVID-19). In this study, we aimed to determine the frequency of barotrauma in critically-ill patients with COVID-19 associated acute respiratory distress syndrome (ARDS) who received invasive mechanical ventilation (IMV), (non-invasive mechanical ventilation NIMV) or high flow nasal oxygen therapy (HFNO) and reveal clinical features, radiological findings and outcomes of these patients.
Materials and Methods	In this two-center study, the patients who followed up in the ICU due to COVID-19 were retrospectively investigated. Barotrauma findings were determined as pneumothorax, pneumomomediastinum, pneumopericardium and subcutaneous emphysema.
Results	Barotrauma was detected in 29 (4.4%) of 660 patients. Nineteen (65.5%) patients had pneumothorax, 5 (17.2%) patients had pneumomediastinum, 5 (17.2%) patients had subcutaneous emphysema; 18 (62.1%) patients underwent tube thoracostomy, 11 (37.9%) patients were followed conservatively. When barotrauma developed, 17 (58.6%) patients were receiving IMV, 11 (37.9%) patients were receiving NIMV, and 1 (3.4%) patient was receiving HFNO. The mean length of stay in the ICU was 15.3±10.8 days, 19 (65.5%) of the patients died.
Conclusion	Barotrauma is not uncommon in COVID-19 ARDS patients; It is a complication that can increase mortality and length of stay in ICU.
Keywords	COVID-19, ARDS, barotrauma, intensive care unit

Öz

Amaç	*Spontan veya pozitif basınçlı ventilasyona bağlı gelişen barotravmanın Coronavirus 2019 (COVID-19) hastalarında diğer hastalara göre daha sık olduğu bildirilmiştir. Bu çalışmada yoğun bakım ünitesinde; invaziv mekanik ventilasyon (İMV), non-invaziv mekanik ventilasyon (NİMV) ya da yüksek akışlı nazal oksijen tedavisi (YANO) alan COVİD-19 ilişkili akut solunum distres sendromu (ARDS) hastalarında barotravma insidansının tespit edilmesi ve bu hastaların klinik, radyolojik özellikleri ve sonlanımlarının ortaya koyulması amaçlanmıştır.*
Yöntem ve Gereçler	*Bu iki merkezli çalışmada, yoğun bakım ünitesinde COVİD-19 ilişkili ARDS nedeniyle izlenen ve İMV, NİMV ve YANO tedavisi alan hastalar retrospektif olarak incelendi. Barotravma bulguları pnömotoraks, pnömomediastinum, pnömoperikardiyum ve subkütan amfizem olarak belirlendi.*
Bulgular	*Toplam 660 hastanın 29'unda (%4,4) barotravma tespit edildi. Barotavma izlenen hastaların 19'unda(%65,5) pnömotoraks, 5'inde (%17,2) pnömomediastinum ve 5'inde (%17,2) subkutan amfizem tespit edildi. Onsekiz (%62,1) hastaya tedavi amaçlı tüp torakostomi uygulanırken, 11 (%37,9) hasta konservatif olarak izlendi. Barotravma saptandığı anda 17 (%58,6) hasta İMV, 11 (%37,9) hasta NİMV ve 1 (%3,4) hasta YANO tedavisi almaktaydı. Barotravma izlenen 29 hastanın ortalama yoğun bakım yatış süresi 15,3±10,8 gün idi ve 19 (%65,5) hasta kaybedildi.*
Sonuç	*Barotravma, COVİD-19 ilişkili ARDS hastalarında nadir olmayan ve yoğun bakım yatış süresi ve mortaliteyi artırabilecek bir durum olarak tespit edildi.*
Anahtar Kelimeler	*COVİD-19, ARDS, barotravma, yoğun bakım*

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INTRODUCTION

Physiologically, spontaneous breathing is negative pressure breathing whereas the patients on mechanical ventilation (MV) invasively or non-invasively are ventilated with positive pressure. Barotrauma is a common complication of positive pressure ventilation which is not physiological.[1] High transpulmonary pressure caused by invasive and noninvasive mechanical ventilation (IMV an NIMV) can lead extraalveolar air leakage where it is not normally found in patients receiving MV. Barotrauma which can also be a manifestation of ventilator induced lung injury (VILI) may result in severe conditions such as pneumothorax, pneumomediastinum, pneumopericardium and subcutaneous emphysema.[2] Barotrauma has not been observed commonly in patients with acute respiratory failure due to viral pneumonia. However; it has been reported to be frequent in patients with Coronavirus Disease 2019 (COVID-19) related acute respiratory distress syndrome (ARDS).[3-5] In COVID-19 associated ARDS patients who receive IMV; the incidence of barotrauma have found 17-33%.[6-7] Although the pathopysiological basis of susceptibility to barotrauma in COVID-19 patients still remains unclear; rupture of alveoli secondary to severe diffuse alveolar damage in those patients seems major underlying proposing pathophysiological mechanism. Because it has been shown that barotrauma develops in spontaneously breathing COVID 19 patients.[8]

In our study, we aimed to determine the frequency of barotrauma in critically-ill patients with COVID-19 associated ARDS who received IMV, NIMV or high flow nasal oxygen therapy (HFNO). We also aimed to reveal clinical features, radiological findings and results of these patients.

MATERIALS and METHODS

Patients selection and data collection

Patients who admitted to University of Health Sciences Kütahya Training and Research Hospital and Diskapi Yildirim Beyazit Training and Research Hospital COVID-19 intensive care units (ICUs) between 1st July 2020 – 15th January 2021 were retrospectively analysed. Patients who was tested positive for SARS-CoV-2 based on real-time reverse transcriptase polymerase chain reaction (RT-PCR) from a nasopharyngeal swab and had the diagnosis of ARDS were included in study. Clinical features, radiological findings and outcomes of patients who received IMV, NIMV or HFNO during ICU stay were recorded. To determine barotrauma; the signs of subcutaneous emphysema, pneumomediastinum, pneumothorax and pneumopericardium at chest computed tomography (CT) scans and X-ray graphies were observed. Patients' airway pressures ((plateau pressure (Pplat), peak inspiratory pressure (PIP), positive end expiratory pressure (PEEP)) at the day of barotrauma, barotrauma signs and treatments were noted.

Patients' demographic data (age, gender), comorbidities, Acute Physiology and Chronic Health Evaluation (APACHE) II and Sequential Organ Failure Assessment (SOFA) score and partial pressure of arterial oxygen/fraction of inspired oxygen ratios (PaO2/FiO2) on ICU admission, presence and severity of ARDS defined by Berlin criteria[9] were recorded. Type L and type H phenotypes of COVID-19 associated ARDS for each patients were determined based on previous definition.[10] Lung protective MV and open lung strategy were performed in patients who received IMV. ARDSnet PEEP – FiO2 table[11] was applied for PEEP titration and transpulmonary pressure could not be measured due to lack of esophageal manometry. The follow up strategy to detect barotrauma in both centers was same. Daily chest X-ray scan was performed in patients who had severe ARDS and chest imaging was performed for all patients whose clinical condition detoriorated and airway pressures increased. Chest imagings were analysed by two experienced intensive care specialists in both of the centers.

Official permission was obtained from the Turkish Ministry of Health for this retrospective study (Number:2020_11_19T14_17_48) and Instutional Review

Board of our tertiary hospital was approved the study.

Statistical analysis was performed using SPSS Statistics (Version 17.0, SPSS Inc). The normal distribution of the data was tested using the Shapiro-Wilk test. Continuous variables were shown as mean±standard deviation or median (25th and 75th percentiles) depending on data distribution. Categorical variables are expressed as numbers (%). Level of statistical significance was considered as $p<0.05$.

RESULTS

A total of 660 COVID-19 associated ARDS patients admitted to two ICUs during the study period. Among 660 patients; 175 (26.5%), 450 (68.1%), 35 (5.3%) were received IMV, both NIMV and HFNO, only HFNO respectively. Twenty nine (4.4%) patients had barotrauma (subcutaneous emphysema, pneumomediastinum, pneumothorax) signs at chest X-ray graphies (n=10) and chest computed tomography (CT) scans (n=19). Barotrauma frequency in our two centers were similar [4.8% (21/436) vs 3.6% (8/224); p=0.04]. The mean age of patients with barotrauma was 68.8±12.6 and 23 of 29 patients (79.3%) were male. Thirteen patients (44.8%) were ex-smoker, 10 (34.5) patients had a history of chronic obstructive pulmonary disease (COPD) and 5 (17.2%) patients had bullo or emphysema at chest CT scan on ICU admission. Mean APACHE II score and median SOFA score on admission were 19.1±6.6 and 4 [IQR= 3-10], respectively. On ICU admission, twenty three (79.3%) patients had severe ARDS, while 5 (17.2%) and 1 (3.4%) patients had moderate and mild ARDS, respectively. In terms of COVID-19 associated ARDS phenotypes, 8 (27.6%) patients had the signs of L type, whereas 21 (72.4%) patients had H type (Table). Subcutanous emphysema, pneumothorax, pneumomediastinum were observed in 5 (17.2%), 19 (65.5%), 5 (17.2%) patients, respectively. Four (13.8%) patients had both subcutanous emphysema and pneumothorax. Tube thoracostomy was performed in 18 (62.1%) patients, while 11 (37.9%) patients are treated conservatively. At the day of barotrauma; 17 (58.6%), 11 (37.9%) and 1 (3.4%) patients were receiving IMV, NIMV and HFNO respectively. In the patients who received IMV, mean PIP and Pplat at the day of barotrauma were 47.6±9.3 and 33.8±6.7 cmH2O and Pplat of 12 (70.6%) patients were higher than 30 cmH2O. Mean length of ICU stay in patients with barotrauma was 15.3±10.8 days and 19 (65.5%) patients deceased (Table).

Table: General Characteristics and Outcomes of Patients with Barotrauma

Characteristics	**n=29 (%)**
Age (mean±SD)	68.9±12.9
Gender	
Male	23 (79.3)
Female	6 (20.7)
APACHE II (mean±SD)	19.1±6.6
SOFA (median [25-75])	4 [3-10]
Smoking status	
Ex-smoker	13 (44.8)
None	16 (55.2)
Comorbidities	
Coronary artery diseases	13 (44.8)
Hypertension	16 (55.2)
Diabetes mellitus	12 (41.4)
Arrhythmia	10 (34.5)
COPD/Asthma	10 (34,5)
Chronic kidney disease	2 (6.9)
ARDS Type	
L Type	8 (27.6)
H Type	21 (72.4)
ARDS Severity	
Mild	1 (3.4)
Moderate	5 (17.2)
Severe	23 (79.2)
Thoracic Computed Tomography Findings on ICU Admission	
Bilateral involvement	27 (93.1)
Bulla/emphysema	5 (17.2)
Barotrauma diagnosis with:	
Chest X-ray	19 (65.5)
Barotrauma types	
Pneumothorax	19 (65.5)
Subcutaneous emphysema	5 (17.2)

Pneumomediastinum	5 (17.2)

Characteristics	**n=29 (%)**
Barotrauma treatment modalities	
Chest tube	15 (51.7)
Conservative medical follow-up	9 (31.0)
Subcutaneous intraket placement	5 (17.2)
Respiratory support at the day of barotrauma	
Non-invasive mechanical ventilation	11 (37.9)
Invasive mechanical ventilation	17 (58.6)
High-flow nasal oxygen therapy	1 (3.4)
Mechanical ventilation mode at the day of barotrauma (n=17)	
Assiste/Control Ventilation (ACV)	14 (48.3)
Synchronized Intermitant Mandatory Ventilation (SIMV)	3 (10.3)
Airway pressures at the day of barotrauma (n=17)	
Plateau pressure (mean±SD)(cmH20)	33.8±6.7
Peak airway pressure (mean±SD)(cmH20)	47.6±9.3
PEEP (mean±SD)(cmH20)	10±2
ICU Outcomes	
Exitus	14 (48.3)
Discharged to the ward	15 (51.7)
Lenght of ICU Stay (mean±SD) (days)	15.3±10.8
SD:standard derivation, APACHE II:Acute Physiology and Chronic Health Evaluation, SOFA:Sequential Organ Failure Assessment, COPD: chronic obstructive pulmonary disease, ARDS:Acute Respiratory Distress Syndrome, ICU:intesive care unit, PEEP:positive end expiratory pressure	

In figure 1a and 1b, pneumomediastinum and subcutanous emphysema at chest X ray graphies were shown in two patients who received NIMV and in figure 1c, pneumothorax was shown in a patient who were performed IMV. Subcutanous emphysema and pneumomediastinum were depicted in two patients' chest CT scans in figure 2a-2b.

DISCUSSION

In our two-center study barotrauma frequency was 4.4%. Our study showed that NIMV and HFNO may create a predisposition to barotrauma in COVID-19 associated ARDS patients, as well as IMV. We also observed elevated Pplat in patients with barotrauma.

The determined barotrauma frequency in our large cohort of patients with COVID-19 associated ARDS was lower than reported previous studies.[3,4,12]

Barotrauma prevelance in critically-ill patients during SARS ve Middle East Respiratory Syndrome (MERS-CoV) epidemics were reported 12% and 34%, respectively.[13,14] The reported incidence of barotrauma in patients with COVID-19 varies between 1% to 40%, and there is uncertainty regarding its influence on mortality.[15-17] In our study barotrauma frequency was 4.4% and it may be associated with lower number of patients in the previous studies.

Pathophysiology of spontaneus barotrauma in ARDS have been attributed Macklin phenomenon.[5] Macklin MT and Macklin CC defined the pressure gradiant between alveoli and interstitium of lungs.[18] Released alveolar air from alveolar rupture centripetally dissects through the pulmonary interstitium along the bronchovascular sheaths toward the pulmonary hila and into the mediastinum and subcutanous space which has the lowest resistance.[19] When mediastinal pleura ruptures, pleural space fills with free air and results in pneumothorax. The clinical affects of these cases are ranged from asymptomatic illness to severe life-threatining conditions.[20] In a previous study by McGuinees et al.[12], researchers investigated barotrauma frequency in patients who underwent IMV and determined that barotrauma prevelance in COVID-19 patients was higher than those without COVID-19 (24% vs 1%, p<0.001). They observed barotrauma in 89 (15%) of 601 patients and reported barotrauma as an independent risk factor for mortality (Odds Ratio:2.2; p=0.03). Similar to our findings pneumothorax was the most common barotrauma sign. Relationship and underlying mechanism between COVID-19 and barotrauma are still remaining unclear. Radiological changes including airspace opacities, consolidations and reticulary pattern are common in COVID-19 cases.[21] However; cavitation, cyste formation and bullae during COVID-19 course have been oberved

by previous case reports.[22-24]

In our study, we observed barotrauma frequency %9.7 in the patients with COVID-19 associated ARDS who received IMV. In the previous McGuinees et al's study[12] which reported higher barotrauma frequency than our study, there was no data on patients' disease severity or airway pressures. Therefore, it is not applicable to compare results of these two studies. In another recent study investigators evaluated occurence of pneumomediastinum, pneumothorax and subcutanous emphysema during COVID-19 course. They reported that 11 of 1648 (0.7%) hospitalized patients had pneumomediastinum in the absence of MV and all patients were non-smokers without any risk factor for these complications and 8 of their 11 patients deceased.[25] These findings suggests there may be a link between these complications and COVID-19 associated lung infection.

Although the incidence of barotrauma in patients receiving NIMV is lower than patients receiving IMV, predisposing lung pathologies such as ARDS, COPD, asthma increased the risk of barotaruma during NIMV. In a previous study by Martinelli et al. analysed 62 hospitalized COVID-19 patients with pneumothorax and only 3 of patients (4.8%) were receiving NIMV at the day of pneumothorax.[15] In our study, 11 of 29 patients (37.9%) with barotrauma was receiving NIMV at the day of barotrauma. There may be some factors leading these different results. In our study we analysed our ICU patients while in Martinelli et al' study they investigated hospitalized patients not critically ill patients. Diagnosing barotrauma in ICU setting is more likely due to advanced monitorization and more common use of chest imaging. Moreover, ICU patients may be more prone to barotrauma because of their more severe respiratory failure and ARDS.

Our study is important, because there is limited data on COVID-19 and barotrauma in COVID-19 associated ARDS patients in ICU settings and our study has data of two different centers. On the other hand, our study has some limitations. Firstly, our study includes small number of patients with barotrauma. Secondly, we were not able to perform chest CT scan for all our patients who are suspected with barotrauma. Therefore frequency of barotrauma might be detected lower than it is. Finally, due to its retrospective nature temporal bias and data veracity are major concerns.

CONCLUSION

Barotrauma is not an uncommon condition in patients with COVID-19 associated ARDS and it is a serious complication that can increase mortality and prolong length of stay in ICU.

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RESEARCH ARTICLE / *Araştırma Makalesi*

Association Between Triglyceride Glucose Index and Neutrophil Lymphocyte Ratio in Patients with Gonarthrosis

Gonartrozlu Hastalarda Trigliserit Glikoz İndeksi ile Nötrofil Lenfosit Oranı Arasındaki İlişki

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Abstract

Introduction	This study investigated the relationship between Triglyceride Glucose (TyG) index, Neutrophil Lymphocyte Ratio (NLR) and gonarthrosis disease and investigated the role of these indicators in the development of gonarthrosis.
Materials and Methods	This study was carried out at Ayancık State Hospital between August 15 and September 15, 2022. The information of the patients who met the inclusion criteria of the retrospectively planned study was obtained from the hospital information system. Patients diagnosed with gonatrosis were divided into the study group and healthy patients were divided into the control group. NLR and TyG index were calculated for each patient, and the demographic characteristics and biochemical data of the patients were examined comparatively.
Results	The mean age of the patients included in the study was 54.10±12.5 (18-75) years. In the gonatrosis group, plasma glucose was 129.6 ± 65.6 mg/dL and triglyceride was 150.1 ± 111.9 mg/dL, and blood plasma glucose level was significantly higher than the control group (p=0.000). The TyG index level was 4.30±0.22 in the gonatrosis group and 4.21±0.08 in the control group, and there was a significant difference between the two groups in the TyG index level (p=0.008). The mean NLR level in the gonarthrosis group was 3.02±5.55, while it was 1.37±0.53 in the control group, and there was a significant difference between the two groups in terms of NLR levels (p=0.025).
Conclusion	In our study, TyG index and NLR levels were found to be significantly higher in patients with gonatrosis compared to patients in the control group. Metabolic syndrome indices such as TyG and NLR should be carefully monitored in the clinical follow-up of patients with gonatrosis.
Keywords	Triglyceride Glucose Index; Neutrophil Lymphocyte Ratio; Gonarthrosis

Öz

Amaç	*Bu çalışma, Trigliserit Glikoz (TyG) indeksi, Nötrofil Lenfosit Oranı (NLR) ve gonartroz hastalığı arasındaki ilişkiyi inceleyerek bu göstergelerin gonartroz gelişimindeki rolünü araştırmıştır.*
Yöntem ve Gereçler	*Bu çalışma 15 Ağustos-15 Eylül 2022 tarihleri arasında Ayancık devlet Hastanesi'nde yapıldı. Retrospektif olarak planlanan çalışmanın dahil edilme kriterlerine uyan hastaların bilgileri hastane bilgi sisteminden elde edildi. Gonatroz tanısı alan hastalar çalışma grubu ve sağlıklı hastalar ise kontrol grubu olarak ayrıldı. NLR ve TyG indeksi her hasta için hesaplandı ve hastaların demografik özellikleri ve biyokimyasal verileri karşılaştırmalı olarak incelendi.*
Bulgular	*Çalışmaya alınan hastaların yaş ortalaması 54,10±12,5 (18-75) yıldı. Gonatroz grubunda plazma glukozu 129,6 ± 65,6 mg/dL ve trigliserit 150,1 ± 111,9 mg/dL idi ve kan plazma glukoz düzeyi kontrol grubuna göre anlamlı düzeyde yüksekti (p=0.000). TyG indeksi düzeyi Gonatroz grubunda 4.30±0.22, kontrol grubunda ise 4.21±0.08 idi ve iki grup arasında TyG indeksi düzeyi arasında anlamlı fark vardı (p=0.008). Gonartoz grubunda NLR düzeyi ortalama 3.02±5.55 iken kontrol grubunda ortalama 1.37±0.53 idi ve iki grup arasında NLR düzeyi açısından anlamlı fark vardı (p=0.025).*
Sonuç	*Çalışmamızda, Gonatroz hastalarında kontrol grubu hastalara göre TyG indeksi ve NLR düzeyleri anlamlı düzeyde yüksek olduğu saptanmıştır. Gonatroz hastalarının klinik takibinde TyG ve NLR gibi metabolik sendrom indeksleri düzeyleri dikkatle izlenmelidir.*
Anahtar Kelimeler	*Trigliserit Glikoz İndeksi; Nötrofil Lenfosit Oranı; Gonartroz*

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INTRODUCTION

The American Society of Rheumatology defined osteoarthritis as a group of heterogeneous conditions leading to joint symptoms and complications with articular cartilage defects and causing the underlying bone changes at the border of the joint.[1] Gonarthrosis is the leading cause of disability and pain in the elderly and the most common form of arthritis.[2] Recent studies on the pathophysiology of the disease have recognized the disease as a condition related to genetics, age, trauma, and metabolic conditions.[3] Metabolic conditions play a significant role in the development and progression of this disease, such as adipokines, high blood sugar, hormonal changes, and free radicals, which lead to the development of this complication in middle age (45-65 years old) and brings pain and disability.[4]

While the prevalence rate of metabolic syndrome for people without osteoarthritis is about 23%, studies show that this prevalence rate for osteoarthritis patients is 59%.[5] The findings of studies also show a relationship between having metabolic syndrome and developing arthritis at a younger age, and these patients usually have more pain and general symptoms than patients without metabolic syndrome.[2,4,5] Today, gonarthrosis is a systemic and inhomogeneous disease, and its structural and clinical aspects have been greatly improved over the past years, improving our understanding of its pathology. Age-related, metabolic, genetic, and pain-related phenotypes are hypothesized for this disease.[6,7] Aging is still recognized as the leading risk factor for gonarthrosis, but the metabolic phenotype of the disease is becoming the second sub-unit of the disease in clinical studies.[7]

On the other hand, oxidative stress can be defined as an imbalance between the production and destruction of free radicals.[8] The results of studies indicate that increased oxidative stress plays a significant role in developing diseases related to metabolic syndromes such as atherosclerosis, high blood pressure, and type 2 diabetes.[6,8] Oxidative stress has also been associated with obesity and insulin resistance in men[9] and metabolic syndrome in American adults.[10] Several studies indicate that metabolic syndrome can be considered a pre-oxidative condition.[8-10] Over time and with the increase of our knowledge about the relationship between the four main aspects of metabolic syndrome and the disease, today, efforts are underway to study the relationship between metabolic syndrome as a whole and osteoarthritis disease.[6-10] In this study, we investigate the relationship between the indicators of metabolic syndrome (Triglyceride Glucose-TyG), inflammation (Neutrophil Lymphocyte Ratio-NLR), and gonarthrosis disease to investigate the relationship between these factors and study the role of these indicators in the development of gonarthrosis.

MATERIALS and METHODS

The study was carried out in the Orthopedics and traumatology clinic of Ayancık State Hospital between August 15 and September 15, 2022. Ethics committee approval was obtained before starting the study (dated 08.08.2022 and numbered E-715222473-050.01.04-155161-230). Retrospectively planned study data were obtained from the hospital information system. The study population consisted of patients hospitalized in the orthopedics clinic between 01.20.2021 and 01.06.2022. Patients diagnosed with pregnancy status, acute inflammation, alcohol use, malignancy history, kidney or infectious disease, viral hepatitis (HBs Ag or anti-hepatitis C positive) and liver cirrhosis were excluded from this study. Persons with a history of diabetes mellitus or newly diagnosed diabetes and taking triglyceride-lowering drugs (statins, fibrates, omega-3, thiazolidinediones or insulin) were also excluded. Participants were divided into two groups as control and study groups. Participants diagnosed with gonarthrosis were included in the study group and healthy controls were included in the control group.

Laboratory examination results of the patients were obtained from the hospital information system. Fasting

blood glucose and triglyceride levels were obtained from the hospital information system from the examinations of the patients studied in the biochemistry laboratory. Plasma glucose (cut-off level 70-100 mg/dL) was determined by the glucose oxidase method. Triglyceride (cut-off level 0-150 mg/dL) was determined by enzymatic method. TyG index was calculated using fasting triglyceride and glucose with the following formula: [fasting TGs (mg/dL) x fasting glucose (mg)/dL)/2]. Demographic characteristics and biochemical data of the patients were obtained from patient file records and electronic records.

Analysis Method

The Kolmogorov-Smirnov test was performed to check the normality, and the nonparametric tests were performed given the groups' non-normality before the statistical analyses. Mean and standard

deviations (SD) were measured to check each continuous variable. Data analysis was done with SPSS 21.0 and studied at a 95% confidence level. The analysis of the variables according to the group was examined with the parametric t-test. The Chi-square test analyzed the relationship between the group and gender and the TyG Index group. The cut-off value was calculated by ROC analysis.

RESULTS

Of the 141 patients included in the study, 83 were female and 58 were male. Gender distribution according to the Gonarthrosis and control groups is shown in Table 1. There was a significant difference between the gender distribution of the patients in the gonatrosis group and the patients in the control group (p=0.000).

Table 1: Distribution of Gonarthrosis and control group patients by gender

		Gonarthrosis (n=67)		Control (n=74)		p
		N	%	N	%	
GENDER	Male	15	25.9	43	74.1	0.000
	Woman	52	62.7	31	37.3	

*p<0.05 Chi-square test

While the mean age of the patients in the gonatrosis group was 68.43±8.13 years, the mean age of the patients in the control group was 32.3±10.3 years, and there is a significant difference between the mean age of both groups (p=0.000).

Granulocyte, Glucose, CRP, TyG index and NLR levels of biochemical parameters were significantly higher in patients in the gonatrosis group compared to the control group (respectively; p= 0.004, p=0.000, p=0.016, p=0.025, Table 2). Albumin and Protein levels were significantly lower in the gonatros group than in the control group (Respectively, p=0.000, p=0.001, Table 2). The distribution of laboratory parameters of patients with gonarthrosis and control group is shown in Table 2.

Table 2: Comparison of laboratory parameters of gonarthrosis and control group

Laboratory parameters	Gonarthrosis (n=67)	Control (n=74)	P value
Age, year	68.43±8.13	32.3±10.3	0.000*
Lym	1.96±0.99	2.23±0.58	0.060
Granulocyte	9.06±14.3	3.71±1.23	0.004*
Glucose	129.6±65.63	95±10.58	0.000*
Albumin	28.26±19.14	45.66±5.82	0.000*
Protein	58.19±26.43	72.15±3.75	0.001*
HDL	46.99±12.62	49.54±10.00	0.202
LDL	103.02±36.17	109.63±56.38	0.456
Triglyceride	150.14±111.9	125.41±90.04	0.165
CRP	19.28±50.15	3.21±3.06	0.016*
TyG index	4.30±0.22	4.21±0.08	0.008*
NLR	3.02±5.55	1.37±0.53	0.025*

*p<0.05 t-test; Lym: Lymphocytes; HDL: High-density lipoprotein; LDL: Low-density lipoprotein; CRP: C- reactive protein; NLR: Neutrophil-to-lymphocyte ratio

The cut-off value calculation of TyG Index and NLR levels according to gonarthrosis and control groups is shown in Table 3.

Table 3: TyG Index and NLR Cut-off Value Calculation by Groups

Laboratory parameters	Sensitivity	Specificity	area	Std. error	P value	Asymptotic 95% Confidence Interval	
						lower limit	upper limit
TyG index	0.750	0.531	0.658	0.057	0.003	0.546	0.769
NLR	0.688	0.563	0.581	0.059	0.127	0.465	0.697

***p<0.05 ROC Analysis**

The area under the curve for the TyG Index was 0.658, relative to the gonatros and control groups. This area is significantly higher (p<0.05). When the results are examined, the best discrimination value for the TyG Index is 4.33. The value of the area under the curve for the NLR is 0.581. This area is not significantly high (p>0.05). The relationship between the TyG Index group in the gonatrosis and control group is shown in Table 4. There is a significant relationship between groups regarding TyG Index (p<0.05). 69.5% of those with a TyG Index value of less than 4.33 were in the control group, and all those above 4.33 were in the gonarthrosis group (Table 4).

Table 4: Examining the Relationship Between the Groups and the TyG Index

		Gonarthrosis		Control		p
		n	%	n	%	
TyG Index	under 4.33	32	30.5	73	69.5	0.000
	over 4.33	22	100.0	0	0.0	

*p<0.05 Chi-square test

The specificity of the variables and the sensitivity of the ROC curves are presented in Figure 1.

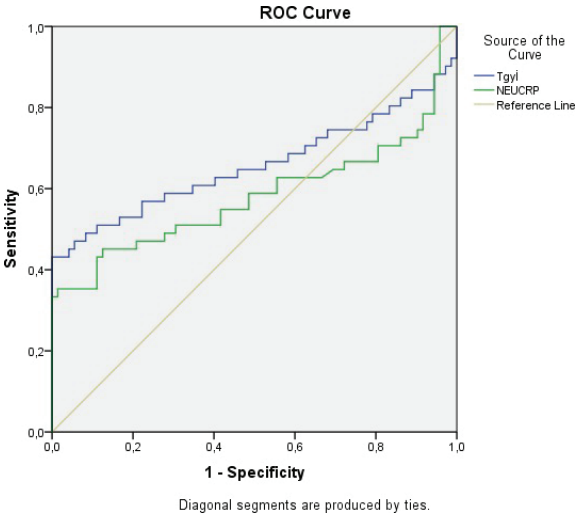

Figure 1. The variables' specificity and sensitivity of the ROC curves

DISCUSSION

Arthritis is the leading cause of pain and disability in the elderly, and gonarthrosis is the most common form of arthritis.[5] Therefore, more knowledge about the risk factors and their predisposing factors can help to prevent it and minimize the amount of disability caused by it in the elderly. New studies suggest that metabolic syndrome, due to its range of complications and different dimensions involving many organs, is probably the cause and facilitator of osteoarthritis.[5,6,8,9]

The present study investigated the relationship between

Triglyceride Glucose Index and Neutrophil Lymphocyte Ratio in patients with gonarthrosis. The results showed that these two variables are significantly higher in the gonarthrosis group. Therefore, these two variables can be considered significant indicators of metabolic syndrome and systemic inflammation in gonarthrosis populations. The findings of this study are consistent with the previous studies.[7-11] In the third round of the National Health and Nutrition Examination Survey (NHANES) study (1994-1988), metabolic syndrome was more prevalent in people with gonarthrosis.[11] In the Michigan Bone Metabolism and Health Study, obese women with two or more cardiovascular disease risk factors reported more knee pain in the past three years.[12] In the Japanese ROAD study, the risk of osteoarthritis increased with the presence of each component of the metabolic syndrome.[13] In addition, in a study in Russia with the presence of 1,350 people with osteoarthritis, 56.62% had metabolic syndrome.[14] Also, other studies have discussed the relationship between the components of metabolic syndrome and osteoarthritis.[12,13,15] Arthritis and obesity have been known to be related to each other in many studies.[14-16] Although the exact association mechanism between obesity and arthritis is unknown, studies report metabolic and mechanical factors in this relationship.[13-17]

Regarding mechanical factors, joints, especially cartilage and subchondral bone, are exposed to mechanical pressures.[9] Studies have shown that increased pressure hinders the cartilage matrix synthesis and increases the expression of pro-inflammatory factors and degrading enzymes by activating ERK, NF-KB, and Ca2+ pathways.[11,17] Also, studies showed that the reduction of body fat could have a better impact than reducing body weight in the treatment of gonarthrosis patients.[14] It has been determined that adipose tissue secretes adipokines such as leptin, adiponectin, visfatin, and resistin.[15] Dumond et al.[18] provided the first findings related to the crucial role of leptin in osteoarthritis and opened the way for further investigation of adipokines as a metabolic link between osteoarthritis and obesity.

In the present study, no significant difference was observed between the cholesterol indices of the two groups. Findings related to the relationship between cholesterol and osteoarthritis are mixed. Epidemiological studies in this field showed the relationship between increased serum cholesterol and osteoarthritis.[19] A positive correlation between serum cholesterol levels and knee and hand osteoarthritis, independent of obesity, has been shown in 1003 women aged 45-64.[20] In addition, in a study where femoral head samples were examined in 23 osteoarthritis patients, it was shown that the number of fatty acids and arachidonic acids in these samples had increased significantly concerning the severity of the disease. Apolipoprotein A1, which is part of HDL and is traditionally considered a protector against heart diseases, was shown to significantly increase in patients with osteoarthritis compared to healthy people.[21] Therefore, it seems likely that the disorder in fat metabolism plays an essential role in the development of osteoarthritis.

Another index that this study examined was the Neutrophil Lymphocyte Ratio, which was significantly higher in the patients of the study group. The relationship between the Neutrophil Lymphocyte Ratio as an index of systemic inflammation and various diseases has been of great interest in recent years. Over the past years, osteoarthritis and metabolic syndrome have been increasingly considered mild inflammatory condition that leads to increased inflammatory factors in the systemic blood flow.[22] However, it is still unclear whether the increase in inflammation leads to metabolic syndrome/osteoarthritis or whether these inflammatory mediators begin to increase following the development of the disease. One of the significant justifications is that the imbalance in the pro-inflammatory cytokines secreted from the fat tissue leads to mild insulin resistance, and in the continuation of metabolic disorders, metabolic syndrome appears.[23] As discussed in the section on the relationship between obesity and osteoarthritis, the

pro-inflammatory hormone leptin, secreted by adipose tissue macrophages and the primary mediator of obesity-related metabolic disorders, is an essential link between obesity and osteoarthritis.[22,23]

Moreover, the results of the studies indicate that the increase in oxidative stress plays a significant role in causing diseases related to metabolic syndromes, such as atherosclerosis, high blood pressure, and type 2 diabetes.[24] Oxidative stress has also been associated with obesity and insulin resistance in men[12] and metabolic syndrome in American adults.[14] Several studies indicate that

metabolic syndrome can be considered a pre-oxidative condition.[17,18,24] Studies have shown that the amount of free radicals is related to the damage of osteoarthritis due to local joint reactions to them. Increasing the level of free radicals in the systemic circulation due to their production in other places causes cell aging in the joints, cartilage apoptosis, and eventually decreases the cartilage's thickness in the joint.[16, 22-24]

Considering the relationship between gonarthrosis and metabolic syndrome, it seems that future treatment goals should consider these two conditions together. Studies on the effects of this therapeutic combination are being carried out, which have not yet led to a change in treatment recommendations. New drugs that focus on intermediate metabolites in the pathology of gonarthrosis are under study. It is hoped that the convergence of studies between clinical researchers and basic science will inspire new efforts toward better treatment and more effective prevention of this disease. The limitations of this study included the small number of samples and the collection of all samples from one treatment center. In future studies, more samples and several different treatment centers can be used to improve the results.

CONCLUSION

This study observed a significant association between metabolic syndrome indexes, such as Triglyceride Glucose Index and Neutrophil Lymphocyte Ratio, and gonarthrosis. Of course, more studies are still needed to prove the possible cause-and-effect relationship. However, the existing results sufficiently implicate at least metabolic syndrome or its components, such as obesity, blood lipid disorders, or oxidative stress, in developing gonarthrosis.

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RESEARCH ARTICLE / *Araştırma Makalesi*

Evaluation of Insulin and Glucagon-Like Peptide-1 Analog Sales in Turkey Before the Pandemic Period; Projection for Upcoming Years: A Market Analysis Study

Pandemi Dönemi Öncesinde Türkiye'de İnsülin ve Glukagon Benzeri Peptid-1 Analog Satışlarının Değerlendirilmesi; Önümüzdeki Yıllar İçin Projeksiyon: Bir Pazar Analiz Çalışması

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Abstract

Introduction	This study was designed to evaluate the box sale trends of insulin preparations and glucagon-like peptide-1 (Glp-1) analogs by their therapeutic categories in Turkey. Also, we aimed to project sale trends of these pharmaceuticals in next years.
Materials and Methods	We analyzed the data before the covid-19 pandemic and made predictions based on these data. This study analyzed retail and hospital box sales of insulin preparations from 4 therapeutic categories (fast/short-acting, intermediate-acting, premix, long-acting) and Glp-1 analogs.
Results	Total box sales of the insulin preparations were increased by %13,30 in the period examined. While fast/short-acting and long-acting insulin box sales increased with a decreasing upward trend, intermediate-acting and premix insulin box sales decreased.
Conclusion	Glp-1 analog sales increased rapidly in this period. Currently, newer pharmaceuticals have been entering Turkish market for diabetes treatment. Less insulin might be required if newer pharmaceuticals are more widely available in diabetes treatment. Also it will be useful to evaluate the effect of the pandemic on access to pharmaceuticals used in the treatment of chronic diseases in future studies.
Keywords	Diabetes mellitus; Insulin sales; Glucagon-like peptide-1 analog sales

Öz

Amaç	*Bu çalışmada, Türkiye'deki insülin preparatları ve glukagon benzeri peptid-1 (Glp-1) analoglarının terapötik kategorilerine göre kutu satış trendlerini değerlendirmek amaçlanmıştır. Ayrıca bu ilaçların önümüzdeki yıllardaki satış trendlerini de yansıtılması hedeflenmiştir.*
Yöntem ve Gereçler	*Covid-19 pandemisi öncesi verileri analiz edilmiş ve bu verilere dayanarak tahminlerde bulunulmuştur. Bu çalışmada, 4 terapötik gruptaki insülin preparatlarının (hızlı/kısa etkili, orta etkili, premiks, uzun etkili) ve Glp-1 analoglarının perakende ve hastane kutu satışlarını analiz edilmiştir.*
Bulgular	*İncelenen dönemde insülin preparatlarının toplam kutu satışlarının %13,30 oranında arttığı saptanmıştır. Hızlı/kısa etkili ve uzun etkili insülin kutusu satışları azalan artış trendi ile artarken, orta etkili ve premiks insülin kutu satışları azalmıştır. Glp-1 analog satışları bu dönemde hızla artmıştır. Diyabet tedavisi için Türkiye pazarına yeni ilaç grupları ve etken maddeler girmektedir.*
Sonuç	*Bu yeni ilaçların diyabet tedavisinde daha yaygın olarak kullanılması daha az insülin kullanımına neden olabilir. Ayrıca gelecekte yapılacak çalışmalarda pandeminin kronik hastalıkların tedavisinde kullanılan ilaçlara erişim üzerindeki etkisinin değerlendirilmesi faydalı olacaktır.*
Anahtar Kelimeler	*Diyabetes Mellitüs; İnsülin satışları; Glukagon benzeri peptid-1 analog satışları*

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INTRODUCTION

Despite all the precautions taken, diabetes mellitus (DM) is a severe epidemic that continues to grow and threatens public health in the world and in Turkey[1-2]. The International Diabetes Federation (IDF) estimates that 463 million adults worldwide have diabetes, and 1.1 million children and adolescents have type 1 diabetes mellitus (T1DM). The prevalence of diabetes has reached epidemic rates and is expected to reach 760 million by 2030. With the aging population, urbanization and changing lifestyles, the incidence of diabetes, along with other chronic diseases, rapidly increase. It is known that approximately three-quarters (79%) of diabetic patients live in low- and middle-income countries[2]. According to the field research conducted in 2010, 'Turkey Diabetes, Hypertension, Obesity and Endocrinology Diseases Prevalence Study-II (TURDEP-II Study)', diabetes rate in Turkey was 13.7%. Also, in that study, it was determined that in 12 years, diabetes prevalence in Turkey increased by 90%1. IDF also reported that Turkey has the highest age-adjusted comparative prevalence (11.1%) in all over Europe, with over 6,6 million diabetes patients[2]. According to the TURDEP-II data, diabetes has already reached the prevalence of the World Health Organization and the IDF rates, which are expected to be reached in the 2030s.

DM is a progressive disease, and reducing the risk of microvascular and macrovascular complications is the primary goal in the treatment of the disease. Therefore, strict glycemic control is required along with oral anti-diabetic drugs (OAD). Insulin therapy is also essential to achieve this glycemic control which is applied in the treatment of Type 2 diabetes mellitus (T2DM) when the dietary and OAD combinations cannot achieve targeted glycemic control[3]. Various stresses, such as acute and chronic complications, pregnancy, surgery and severe hyperglycemia and all patients with T1DM are also indications for insulin use[4].

Insulin preparations are categorized into three groups according to their effect profiles: short/fast/very fast-acting, intermediate-acting, and long/very long-acting. Various combinations of short/fast acting and intermediate-acting insulin have been developed to facilitate insulin treatment, particularly in T2DM. These are called ready-to-use insulin preparations (premix insulin)[5]. Usually, it is recommended to add basal insulin (long-acting insulin analogs) to OAD once a day at the beginning of insulin therapy in T2DM[6-9]. Various combinations of premix insulin are used to facilitate insulin therapy when basal insulin and OAD combination therapy cannot achieve glycemic control, likewise in the case of basal-bolus, insulin therapy is difficult to administer. Intermediate-acting insulins, which are often used in combination therapies, are closely related to hypoglycemia. Therefore, among the insulin treatment regimens, intermediate-acting insulin treatment is not much preferred[9]. Treatment of T2DM includes daily single dose long-acting insulin or premix insulin with or without the combination of OADs10. T1DM treatment usually includes basal-bolus insulin therapy11, which is made up of a combination of basal (long-acting) and bolus (short-acting) insulins[12].

All over the world and in Turkey; Glucagon-like peptide-1 (Glp-1) analogs were added to T2DM treatment in the last decade. Glp-1 analogs should be added to treatment in patients with T2DM who do not have adequate glycemic control with insulin and OADs and combinations thereof. They are preferred in the second-and third-line treatment, especially in obese patients with T2DM (BMI≥30 kg/m2)[2]. The addition of a Glp-1 analog to the therapy in patients not achieving glycemic targets despite optimized basal insulin therapy is one of the recommended options[13]. The results of studies in obese T2DM patients showed that this combination therapy lowered required insulin doses, provided adequate glycemic control and minimalized insulin-dependent weight gain in those patients[14].

Increased T2DM rates support the growth of the insulin market. It was estimated that global insulin use will increase by 20% between 2018 and 2030 in T2DM15. On

the other hand, since the beginning of the 2000s shift between insulin categories was shown in T2DM treatment. Long-acting insulin analogs market share was increased in different countries' insulin markets[16-17]. In this retrospective study of the sales trends, we aimed to evaluate the box sale trends of the insulin preparations and Glp-1 analogs, a new therapy, by their therapeutic categories in Turkey. Also, we aimed to project the sales trends of these drugs in the coming years in the absence of pandemic conditions.

MATERIALS and METHODS

This study analyses retail and hospital box sales of insulin preparations from 4 therapeutic categories as fast/short-acting, intermediate-acting, premix (fast+intermediate) and long-acting insulins and Glp-1 analogs as well.

1. Data collection

Data used in this study were obtained from IQVIA Health, an international pharmaceutical consulting company that collects sales and price data from various countries. The company collects the data at the level within the pharmaceutical market supply and distribution chain that provides reliable information. The IQVIA data used here were on all pharmaceutical sales for the selected sample through retail pharmacies for 5 years between 2014 and 2019. The central unit of analysis here was the product, aggregated overpacks for each product. The data were used in quarterly periods starting from the last quarter of 2014 and ending in the third quarter of 2019. By using these 20-time points, market trends were estimated up to the last quarter of 2022.

2. The proposed model

The most used linear econometric methods in the estimation of time series are the Box-Jenkins methodology known as Autoregressive Integrated Moving Average (ARIMA) models. The method was developed by Box and Jenkins in 1976, and the foundations of this method were laid by Yule in 1927. Varieties of autoregressive moving average techniques (MA, AR, ARIMA, etc.) have become essential procedures in the analysis of time series. The method is widely used because it considers the stability and seasonality of the evaluated series at the same time and can be easily applied by using package programs.

According to the Box-Jenkins method, any variable is modeled using its own and stochastic error terms' historical values. The ARIMA model is preferred for estimating non-stationary time series whose mean and variance are not constant over time. The general representation of these models is an ARIMA (p, d, q). Here, "p" is the degree of autoregressive (AR) model, "q" is the degree of moving average (MA) model and "d" is the degree of differentiation18. The basic steps in the Box-Jenkins approach in the process of setting up the time series model can be considered in four stages such as determination of the time series model, model fitting, test, and estimation[18]. These steps were provided to estimate future trends by performing the best model for our case.

Mean Absolute Percentage Error (MAPE), Alternate Square Error (MSE), Mean Absolute Error (MAE), Root Mean Square Error (RMSE), Akaike Information Criteria (AIC), Bayesian Information Criteria (BIC) criteria have been used to select the best model for the time series. Applying such generally accepted objective model selection criteria in the model determination stage allows avoiding a certain degree of subjectivity. The model with more minor selection criterion statistics could be preferable[19].

3. The results of the proposed model

In this study, all methods were performed using SPSS (version 22) software. In order to model the time series of insulin data, first, since the series was not stationary, the difference series were formed, and then many models were performed by giving various values to p and q parameters. The stability of the first difference sequence was analyzed, and then from this, it was deduced that the model was suitable. After testing the candidate models in which the primary criteria was to reach the best estimation, results were given by using selection criteria such as (MSE, RMSE, MAE, MAPE, AIC, BIC) (Table 1).

Table 1: Autoregressive Integrated Moving Average (ARIMA) models	
Glp-1 analogs	ARIMA(0,1,0)(1,0,0)
Fast-acting	ARIMA(1,1,0)(1,0,0)
Premix (fast+intermediate)	ARIMA(0,0,0)(0,1,0)
Intermediate-acting	ARIMA(0,1,0)(1,1,1)
Long-acting	ARIMA(0,1,0)(0,0,1)
Total	ARIMA(0,1,1)(1,0,0)

RESULTS

Total box sales of insulin preparations were 2.964.760 boxes (total of fast-acting, intermediate-acting, premix and long-acting insulin) in the first quarter which was investigated in this study. Box sales increased to 3.359.114 boxes in the last quarter, which was analyzed in this study, with 13,30% increase. While fast/short-acting and long-acting insulin box sales increased in that period (17,57% and 67,52%, respectively), intermediate-acting and premix insulin box sales decreased (35,86% and 27,08%, respectively). Glp-1 analogs sales increased rapidly in this period. Quarter box sales average by years are shared in the Table-2.

If an extraordinary situation does not occur, the upward trend in long-acting insulin and Glp-1 analogs box sales will continue with the applied models. While the total box sales of insulin preparations will be about 13,5 million boxes with a 10,4% increase in 2022 (Figure-1a), Glp-1 analogs box sales will be about 0,3 million with a 200% increase (Figure-2). Fast/short-acting and long-acting insulin box sales will be about 5,3 million and 5,1 million boxes, respectively, between 2020-2022. The box sales decrease of intermediate-acting and premix insulin will continue in the following years (Figure-1b)

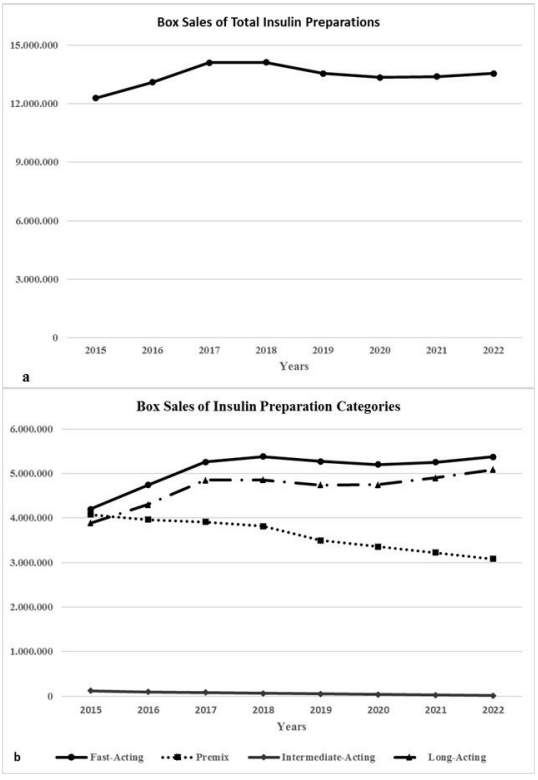

Figure 1: Annual, between 2015-2019, and projected, between 2020-2022, box sales of total (a) and categories of (b) insulin preparations in the Turkish market. Insulin preparations are categorized according to their duration of action as fast / short-acting, medium-acting, premix (fast-medium) and long-acting insulins.

Table 2: Annual, between 2015-2019, and projected, between 2020-2022, average sales of quarter box sales of total and categories of insulin and Glucagon-like peptide-1 (Glp-1) analog preparations in the Turkish market. Insulin preparations are categorized according to their duration of action as fast/short-acting, medium-acting, premix (fast-medium) and long-acting insulins.

Year	Quarter	Glp-1 Analogs	Fast-acting	Premix	Intermediate-acting	Long-acting	Total
2014	4th quarter	16.201	964.766	1.035.458	32.541	931.995	2.964.760
2015	Average of all quarters	23.416	1.049.749	1.019.446	29.030	971.510	3.069.736
2016	Average of all quarters	34.748	1.185.226	990.190	23.794	1.074.851	3.274.061
2017	Average of all quarters	46.033	1.315.020	977.718	20.746	1.212.309	3.525.793
2018	Average of all quarters	56.069	1.344.473	954.134	15.719	1.213.669	3.527.994
2019	Average of 3 quarters	60.779	1.331.551	885.787	11.419	1.196.838	3.425.595

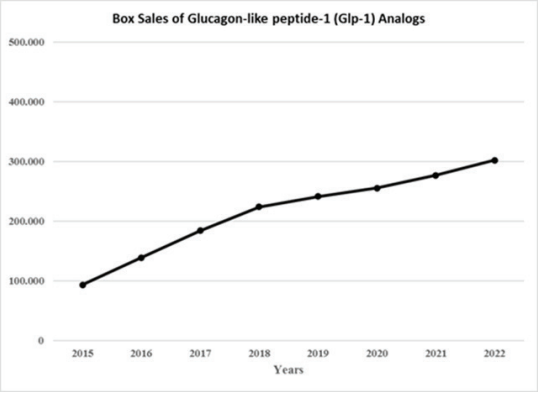

Figure 2: Annual, between 2015-2019, and projected, between 2020-2022, box sales of total Glucagon-like peptide-1 (Glp-1) analog preparations in the Turkish market.

DISCUSSION

Anti-diabetic pharmaceuticals are one of the leading therapeutic groups in pharmaceutical market share. According to the analysis, this situation will continue in the forthcoming years[28]. In this study, we demonstrated that total box sales of the insulin preparations were increased by %13,30 between the last quarter of 2014 and the third quarter of 2019. While fast/short-acting and long-acting insulin box sales increased with a decreasing upward trend, intermediate-acting and premix insulin box sales decreased. Also, Glp-1 analog sales increased rapidly in this period. Previously, it was demonstrated that a total of 4,2 million OAD preparation boxes were sold in 1998, while this number reached 38,1 million boxes in 2014 in Turkey[29]. Likewise, in Canada it was demonstrated that total insulin utilization increased 21% between 2010 and 2015[17]. Most of the insulins and insulin analogues currently authorized in the European Union (EU) were already available before 200530. Similarly, insulin have been on the Turkish market for a long time. Also, four biosimilar insulin analogues have been on the EU market since 2014[30]; furthermore, they have been available in Mexico, India, China and other parts of Asia for more than a decade[31]. First biosimilar insulin entered Turkish market in 2016. These biosimilars are improving insulin access worldwide. It was estimated that global insulin use will increase by 20% between 2018 and 2030 in T2DM[15]. According to the data of Turkish Social Security Institution, between 2008 and 2012, while spending on OAD decreased over the years, spending on insulin and analogues increased by an average of 15% each year compared to the previous year[32]. In our study, we showed that the rate of increase in total insulin box sales has been decreasing since 2017. We estimate that the increase trend in the insulin sales will continue slightly. Currently newer pharmaceuticals have been entering Turkish market for T2DM treatment. Less insulin might be required if newer drugs such as Glp-1 analogs and sodium-glucose co-transporter-2 (SGLT2) inhibitors will be more widely available in T2DM treatment. Future studies would analyze whether the plateau condition or slight increase in insulin box sales will continue.

In the treatment of T2DM, basal insulin or premix insulin or a combination of oral anti-diabetic agents and insulin analogs is recommended[10,26]. On the other hand, T1DM patients need daily insulin injections to maintain a glucose level in the appropriate range[2]. Basal-bolus insulin therapy should be preferred in those patients[11]. As 2000s, a shift in insulin utilization from the human insulin to human insulin analogs was observed. Long-acting insulin analogs' market share reached 50% in the beginning of the 2010s in US market[16]. The first biosimilar long-acting insulin analog, which might affect insulin preparations' market share, was approved for marketing in 2015 and then other biosimilars entered in US market, respectively[31]. It was demonstrated that the rate of utilization of long-acting insulin had increased between the years 2010-2015 also in Canada. In that period dispensing rate of intermediate-acting and premix insulin declined[17]. In our study, while the rate of increase in fast-acting insulin and long-acting insulin box sales have been decreasing since 2017, the increasing trend in these insulins will continue slightly. Also, intermediate-acting insulin and premix insulin box sales decreased year by year. These data are similar to both US and Canada data, which are mentioned above.

Glp-1 analogs entered Turkish pharmaceutical market in the beginning of the 2010s. According to the Turkish Social Security Institution rules, these pharmaceuticals are reimbursed in the second-and third-line treatment, especially in obese patients with T2DM. Despite these restricted rules, in our study, we demonstrated that Glp-1 analogs box sales increased rapidly in the second half of 2010s, although total insulin box sales reached the plateau in last years. The first Glp-1 analog product was approved in the EU in 2006. Thereafter, five more products of that class have been authorized, most recently in 2018[30]. The safety and effectiveness of Glp-1 analogs are confirmed by systematic reviews[33]. In a study, clinical characteristics of patients in which Glp-1 analogs were initiated from 2010 to 2018 in Northeast Italy were investigated. It was shown that 50% of patients who have initiated treatment between the years 2016 to 2018 were prescribed Glp-1 analog[34]. In different forecasts, it was estimated that the world Glp-1 analog market would grow in the following years. North America is the largest consumer of these pharmaceuticals[35-36]. In our study, we also predicted that if an extraordinary situation does not occur, the upward trend in Glp-1 analogs box sales will continue in upcoming years with a similar ratio. At the beginning of 2020, the first oral Glp-1 analog was licensed by European Medicines Agency (EMA). Therefore, it can easily be predicted that the market share of insulin and other antidiabetic pharmaceuticals would change. Also, in the last reports, it was stated that Glp-1 analogs might be considered a second-line treatment for T2DM after metformin, especially in obese patients who need to be avoided from hypoglycemia[37]. Considering these advancements, the impact of Glp-1 analogs on the sales and clinical use of insulin should be investigated in the coming years.

In conclusion, we showed that fast-acting insulin and long-acting insulin box sales upward trend is decreasing since 2017. This trend is expected to continue likewise over the next few years. On the other hand, premix and intermediate-acting insulin box sales are decreasing in last years and this decrease tends to continue in upcoming years. With this trend, we may say that intermediate-acting insulin will have a limited market share or will exit from Turkish market. It is considered that the increase in the sales of Glp-1 analogs will continue further due to the widespread use of these pharmaceuticals in recent years. Moreover, with the introduction of new pharmaceuticals such as dipeptidyl peptidase-4 (DPP-4) inhibitors and SGLT2 inhibitors, the market share balance of insulin and other antidiabetic pharmaceuticals would change, as well as treatment strategies. In this study, we analyzed the data before the covid-19 pandemic and made predictions based on these data. It will be helpful to evaluate the effect of the pandemic on access pharmaceuticals used in the treatment of chronic diseases in future studies.

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ARAŞTIRMA MAKALESİ / *Rerseasrch Article*

Evre 1-3 Kolon Kanserinde Tümör Lokalizasyonunun Demografik Veriler ve Laboratuvar Bulguları ile Karşılaştırılması ve Hastalıksız Sağkalıma Etkisinin Gösterilmesi

Comparison of Tumor Localization with Demographic Datas and Laboratory Findings and Disease Free Survival in Stage 1-3 Colon Cancer

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Öz

Amaç	Kolon kanserinin tek bir hastalık olmadığı, sağ ve sol kolon kanserinin epidemiyolojik, klinikopatolojik ve prognostik açıdan farklılıklar gösterdiği çok sayıda çalışma ile desteklenmiştir. Biz de çalışmamızda iki grup arasındaki demografik, klinik, biyokimyasal ve inflamatuvar belirteçleri ve hastalıksız sağkalım verilerini karşılaştırarak tek merkez verilerimizi sunmayı amaçladık.
Yöntem ve Gereçler	Çalışmaya evre 1-3 kolon kanserli rezektabl 77 hasta dâhil edildi (% 58,40 erkek, % 41,60 kadın). Hastalar sağ ve sol kolon kanseri olarak iki gruba ayrıldı. Gruplar arasında yaş, cinsiyet, evre, lenf nodu sayısı, patolojik ve biyokimyasal parametreler ile inflamatuvar belirteçler karşılaştırıldı.
Bulgular	Sağ kolon kanserinde total çıkarılan lenf nodu sayısı (p: 0,010) ve mikrosatellit instabilite (MSI) yüksek hasta sayısı (p:0,001) sol kolon kanserine göre anlamlı olarak daha yüksek bulundu. Sol kolon kanserinde ise nötrofil sayısı sağ kolon kanserine göre daha fazlaydı (p: 0,008).
Sonuç	Sağ kolon kanserinde MSI yüksek hasta sayısı sola göre daha fazlaydı. Total çıkarılan lenf nodu sayısı da sağ kolon kanserinde daha yüksekti. Bunun aksine nötrofil sayısı sol kolon kanserinde daha yüksek bulundu. Hastalıksız sağkalım analizleri için daha uzun takip süresine ihtiyaç vardı.
Anahtar Kelimeler	Evre, Hastalıksız sağkalım, Kolon kanseri, mGPS, MSI,

Abstract

Introduction	*It has been supported by many studies that colon cancer is not a single disease, and that right and left colon cancer differ in epidemiological, clinicopathological and prognostic terms. In our study, we aimed to present single center experience by comparing demographic, clinical, biochemical and inflammatory markers and disease free survival data between two groups.*
Materials and Methods	*77 resectable patients with stage 1-3 colon cancer were included in the study (58.40% males, 41.60% females). The patients were divided into two groups according to side of the colon cancer. Age, gender, stage, number of lymph nodes, pathological and biochemical parameters and inflammatory markers were compared between the groups.*
Results	*The total number of lymph nodes removed in right colon cancer (p: 0.010) and the number of patients with high microsatellite instability (MSI) (p: 0.001) were found to be significantly higher than in left colon cancer. The number of neutrophils was higher in left colon cancer than in right colon cancer (p: 0.008).*
Conclusion	*The number of patients of right side colon cancer was higher than the left side colon cancer according to high MSI parameter. The total number of lymph nodes removed was also higher in right colon cancer. In contrast, the neutrophil count was higher in left colon cancer. Longer follow-up required for disease free survival analyzes.*
Keywords	*colon cancer, disease free survival, mGPS, MSI stage*

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GİRİŞ

Kolorektal kanserler Dünya genelinde en sık görülen 3. kanser türü olup, insidansı özellikle gelişmiş ülkelerde daha fazladır. Ülkemizde de en sık görülen 4. kanser türü olup kansere bağlı ölüm sıralamasında 2. sırada yer almaktadır[1]. Evre 1-3 kolorektal kanserlerde standart tedavi radikal cerrahi rezeksiyon olup, postoperatif dönemde yüksek riskli evre 2 ve evre 3 hastalarda adjuvan kemoterapidir[2].

1990'dan bu yana sağ kolon kanseri ile sol kolon kanserinin farklı kanser türleri olduğu bilinmektedir[3]. Distal duodenumdan transverse kolonun proksimal 2/3 'üne kadar olan sağ kolon embriyolojik olarak midguttan gelişmiş olup, transverse kolonun distal 1/3'ünden anorektal kanalın üst 2/3 'lük kısmına kadar olan sol kolon hindguttan köken almıştır[4].

Epidemiyolojik ve histolojik olarak ta sağ ve sol kolon arasında farklılıklar bulunmaktadır. Sağ kolon kanserleri sola göre genellikle kadınlarda ve daha ileri yaşlarda görülmekte olup, histolojik olarak müsinöz, andifferansiye ve taşlı yüzük hücreli olma eğilimindedir[5]. Sol kolon kanserleri tanı anında daha erken evrede saptanmakta olup, tümör boyutu sağ kolon kanserlerine göre daha küçüktür[6]. 1990-2003 yılları arasında tamamlanan İnsan Genom Atlası ile birlikte genomik subtiplerin sağ ve sol kolon kanserlerinde farklı dağılım gösterdiği kanıtlanmıştır. Buna bağlı olarak sağ ve sol kolon kanserlerinin karsinogenezde farklı yolaklar kullandığı, moleküler özelliklerinin ve gen ekspresyon profillerinin farklı olduğu görülmüştür[7]. Son yıllarda kolon karsinogenezinde önemli bir odak noktası da gut mikrobiyatadır. Sağ kolon kanserinde Prevotella, Pyramido-bacterium, Selenomonas ve Peptostreptococcus daha yoğun olarak bulunurken, sol kolon kanserinde Fusobacterium, Escherichia, Shigella ve Leptotrichia daha baskındır[8]. Kolon kanserinde prokarsinojenik epitelyal yanıtla ilişkili olan invaziv bakteriyal biyofilm ise sağ kolon kanserinde yaklaşık % 90 oranında iken, sol kolon kanserinde sadece %10 sıklıkta görülmektedir[9]. Bu farklı karakteristik özelliklere bağlı olarak kolon kanserinde primer tümör lokalizasyonu kemoterapiye olan klinik yanıt, prognoz ve onkolojik sonlanım noktalarındaki heterojeniteyi de beraberinde getirmektedir.

Literatürdeki çok sayıda yapılmış çalışma sağ kolon kanserlerinin sol kolon kanserlerine göre daha yüksek rekürrens ve daha düşük sağkalım ile ilişkili olduğunu göstermiştir[10,11]. Bununla birlikte bazı çalışmalar evre 2 kolon kanserinde sağ yerleşimli tümörlerin sola göre daha iyi prognoza sahip olduğunu vurgulamıştır. Özellikle iyi prognoz göstergesi olan mikrosatellit instabilite (MSI) -yüksek tümörlerin sağ kolon kanserinde daha sık görülmesinin bu sonuçla ilişkili olabileceğini belirtmişlerdir[11,12]. Biz de çalışmamızda evre 1-3 kolon kanseri hastalarında primer tümör lokalizasyonun hastalıksız sağkalıma olan etkisini ve immunohistokimyasal ve biyokimyasal parametrelerle olan ilişkisini göstermeyi amaçladık.

GEREÇ ve YÖNTEMLER

Hastalar

Çalışmaya Kasım 2016 ile Şubat 2021 tarihleri arasında Sakarya Üniversitesi Eğitim ve Araştırma Hastanesi'nde evre 1-3 kolon adenokanseri için ameliyat edilmiş 77 hasta dâhil edildi. Evreleme için tümör / nod / metastaz evreleme sistemi kullanıldı (American Joint Committee on Cancer TNM evreleme sistemi 8. Baskı, 2017). Karsinoma in situ, adenokarsinoma dışı histoloji, rektal kanser, evre 4 kolon kanseri, R2 rezeksiyon, senkron kanser, palyatif rezeksiyon ve 18 yaş altı hastalar çalışma dışı bırakıldı. Çalışma Sakarya Üniversitesi Eğitim ve Araştırma Hastanesi Etik Kurulu tarafından onaylandı (Onay numarası 71522473/050.01.04/198).

Hasta verileri

Tümör lokalizasyonu çekum, çıkan kolon ve transvers kolonun proksimal 2/3'lük kısmına kadar sağ kolon, transvers kolonun distal 1/3'lük kısmı, inen kolon, sigmoid kolon ve anorektal kanalın üst 2/3'lük kısmına kadar sol kolon olarak tanımlandı. Hastaların medikal kayıtlarından tanı anındaki yaşı, cinsiyeti ve Eastern Cooperative On-

cology Group (ECOG) performans skoru, patoloji raporlarından tümörün grade, T evresi, metastatik lenf nodu sayısı ve total çıkarılan lenf nodu sayısı, lenfovaskuler invazyon (LVI) ve MSI durumu, aldıysa adjuvan kemoterapi tedavisi ve süresi, laboratuvar parametrelerinden karsinoembriyonik antijen (CEA), kanser antijeni 19-9 (Ca 19-9), C-reaktif protein (CRP), albümin, nötrofil, lenfosit ve Glasgow prognostik skoru (GPS) ve hastaların son kontrol tarihi kayıt edildi. Hastalıksız sağkalım primer tümör rezeksiyonu ile nüks, metastaz veya son kontrol tarihine kadar geçen süre olarak tanımlandı.

İstatistik analiz

Tüm istatistik incelemeler için SPSS (Mac için sürüm 25) programı kullanıldı. Sürekli değişkenleri tanımlamak için deskriptif istatistikler kullanılmıştır. Değişkenlerin normal dağılıma uygunluğu Kolmogorov-Smirnov testi ile değerlendirildi. Normal dağılım gösteren sayısal değişkenler için bağımsız t testi ve normal dağılım göstermeyen değişkenler için Mann-Whitney U testi kullanıldı. Kategorik değişkenler arasındaki karşılaştırma Ki-kare testi ile yapıldı. Gerekli durumlarda Fisher's Exact testi p değeri dikkate alındı. Sağ ve sol kolon tutulumu olan hastaların hastalıksız sağkalım değerlendirmesi için Kaplan-Meier eğrileri oluşturuldu ve eğrilerin karşılaştırılması için Log-rank Mantel-Cox analizi kullanıldı. İstatistiksel anlamlılık değeri ≤0,05 kabul edildi.

BULGULAR

Hasta karakteristikleri

Çalışmaya 77 hasta dâhil edildi. Hastaların 45 'i (% 58,40) erkek, 32'si (% 41,60) kadındı. Hastaların 33'ü (% 42,90) sağ, 44'ü (% 57,10) sol kolon kanseriydi. Sağ kolon kanseri kadın hasta sayısı 15, erkek hasta sayısı 18, sol kolon kanseri kadın hasta sayısı 17, erkek hasta sayısı 27 idi. Hastaların ortalama yaşı 64,5 ± 10,8 idi.

Klinikopatolojik karakteristikler

Tablo 1 'de sağ kolon kanseri ve sol kolon kanseri tanılı hastaların klinikopatolojik karakteristik özellikleri görülmektedir. İki grup arasında hastaların cinsiyet, yaş, T evresi, metastatik lenf nodu sayısı (N), adjuvan kemoterapi durumu ve LVI açısından farklılık yoktu. Total çıkarılan lenf nodu sayısı sağ kolon kanserinde sola göre anlamlı olarak daha fazlaydı (p=0,010). MSI yüksek olan hasta sayısı sağ göre istatistiksel anlamlı olarak daha yüksekti (p=0,001). Hastalar ECOG performans skoruna göre 0 ve 1 olanlar ile 2 ve 3 olanlar olarak gruplandırıldığında, iki taraf arasında anlamlı farklılık görülmedi. T1/2N0 hastalar MSI durumundan bağımsız olarak adjuvan tedavisiz takibe alındı. MSI stabil T3/4N0 tümörü olan hastalarda adjuvan kemoterapi kararı vermede sistemik rekürrens için yüksek risk faktörleri olup olmaması değerlendirildi. Bu risk faktörleri arasında az diferansiye histoloji, LVI, perinöral invazyon, barsak obstrüksiyonu, perforasyon, 12'den az lenf nodu diseksiyonu yapılmış olması ve cerrahi sınır pozitifliği yer almaktaydı. Bu grupta olan hastalardan 3'ü ECOG performans skoru 3 olması, 1 hasta kendi isteği ile kemoterapi almak istememesi, 1 hastada postoperatif 15. haftada kliniğimize başvurması nedeniyle adjuvan kemoterapi alamadı. Evre 3 hastalar MSI durumundan bağımsız olarak adjuvan kemoterapi almış olup , bu grupta sadece 1 hasta ECOG performans skoru 3 olması nedeniyle tedavi alamadı.

Laboratuvar parametreleri ve inflamatuvar belirteçler

İki grubun laboratuvar parametreleri ve inflamatuvar belirteçleri açısından karakteristik özellikleri Tablo 2' de görülmektedir. Hastaların CEA, Ca 19-9, CRP, albumin ve lenfosit sayıları iki grup arasında benzerdi. Nötrofil sayısı sol kolon kanserinde sağa göre istatistiki anlamlı olarak daha yüksekti (p=0,008). GPS 0 ve 1 olanlar modifiye GPS (mGPS) düşük grup, 2 olanlar mGPS yüksek grup olarak kabul edildi. Sağ ve sol kolon kanserinde mGPS açısından farklılık yoktu.

Hastalıksız Sağkalım analizi

Hastaların medyan takip süresi 26 ay olarak bulundu (çeyrekler arası değer: 12-40 ay). Sağ kolon yerleşimli hastalarda medyan hastalıksız sağkalım 26 ay, sol kolon yerleşimli hastalarda medyan hastalıksız sağkalım 24 ay idi. Hastalık-

sız sağkalım açısından 2 grup arasında istatistiksel anlamlı farklılık yoktu (p:0,752) (şekil 1).

Tablo 1. Demografik Veriler ve Hastalık Özellikleri

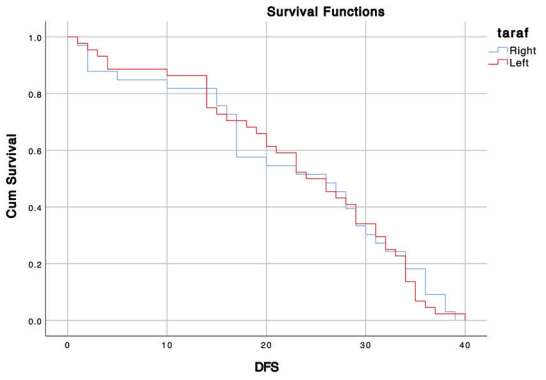
		Sağ Kolon n=33	Sol Kolon n=44	Tüm Hastalar	P
Yaş (yıl)	**Ort+ SS**	65,2+11,8	64,1+10,1	64,6+10,8	0,657[1]
Cinsiyet	**Erkek**	18(54,5)	27(61,4)	45(58,4)	0,548[2]
	Kadın	15(45,5)	17(38,6)	32(41,6)	
Evre	**1**	6(18,2)	5(11,4)	11(14,3)	0,700[3]
	2	15(45,5)	22(50)	37(48,1)	
	3	12(36,4)	17(38,6)	29(37,6)	
Grade	**1**	1(3)	2(4,5)	3(3,9)	0,138[3]
	2	27(81,8)	40(90,9)	67(87)	
	3	5(15,2)	2(4,5)	7(9,1)	
T	**1**	2(6,1)	1(2,3)	3(3,8)	0,238[3]
	2	5(15,2)	4(9,1)	9(11,7)	
	3	15(45,5)	20(45,5)	35(45,5)	
	4	11(33,3)	19(43,2)	30(39)	
Metastatik lenf nodu sayısı	**Ort+ SS**	2,1+8,2	1,2+3	1,6+5,8	0,493[1]
Total lenf nodu sayısı	**Ort+ SS**	34,9+17,7	25,3+14,2	29,4+16,4	**0,0101**
Adjuvan kemoterapi	**Var**	21(63,6)	36(72,8)	57(74,1)	0,072[2]
	Yok	12(36,4)	8(18,2)	20(25,9)	
LVI	**Yok**	14(42,4)	22(50)	36(46,8)	0,510[2]
	Var	19(57,6)	22(50)	41(53,2)	
MSI	**High**	12(36,4)	3(6,8)	15 (19,5)	**0,001[2]**
	Stabil	21(63,6)	41(93,2)	62 (80,5)	
ECOG	**0-1**	16(48,6)	24(54,6)	40(51,9)	0,598[2]
	2-3	17(51,4)	20(45,4)	37(48,1)	
GPS	**Düşük**	28(84,8)	41(93,2)	69(89,6)	0,239[2]
	Yüksek	5(15,2)	3(6,8)	8(10,4)	

T, Tümör; LVI, Lenfovasküler invazyon; MSI, Mikrosatellit instabilite; ECOG, Eastern Cooperative Oncology Group; GPS, Glaskow prognostik skor; yüzdeler parantez içerisinde verilmiştir.
[1] Independent t testi, [2] Mann Whitney u test, [3] Ki-Kare testi, [4] p değeri verilemedi

Tablo 2. Laboratuvar Parametrelerinin Değerlendirilmesi

		Sağ Kolon n=33	Sol Kolon n=44	Tüm Hastalar	P
CEA	**Ort+ SEM**	4,2+1,1	6,2+1,8	5,3+1,1	0,378[1]
CA19-9	**Ort+ SEM**	12,1+2,4	33,9+16,8	24,6+9,7	0,266[1]
CRP	**Ort+ SEM**	24,9+5,1	21,9+4,8	23,2+3,5	0,672[1]
Albumin	**Ort+ SEM**	3,8+0,4	4+0,6	3,9+0,5	0,087[1]
Nötrofil	**Ort+ SEM**	5,4+0,4	7,2+0,6	6,4+0,4	0,008[1]
Lenfosit	**Ort+ SEM**	2+0,6	1,9+0,7	2+0,8	0,555[1]
NLR	**Ort+ SEM**	4,2+0,7	3,7+0,4	3,9+0,4	0,525[1]

CEA, Karsinoembriyonik antijen; CA, Kanser antijeni; CRP, C-reaktif protein; NLR, Nötrofil-lenfosit oranı
1Bağımsız t testi



Şekil 1. *Kolon kanserinin sağ ve sol kolon tutulumuna göre hastalıksız sağkalım eğrisi*

TARTIŞMA

Kolon kanserinin tek bir hastalık olmadığı, sağ kolon kanseri ve sol kolon kanserinin klinik, patolojik ve prognostik farklılıklar gösterdiği literatürdeki çok sayıda yapılan çalışma ile gösterilmiştir[12-14]. Genel sağkalım süreleri de tümör lokalizasyonuna bağlı olarak değişiklik göstermektedir[15-17]. Biz de çalışmamızda sağ kolon kanseri ve sol kolon kanseri tanılı hastalardaki klinikopatolojik karakteristiklerdeki farklılıkları ve tümör lokalizasyonunun hastalıksız sağkalım ile olan ilişkisini göstermeyi amaçladık.

Literatürdeki popülasyon temelli çalışmalarda sağ kolon kanserinde kadın cinsiyetin daha yüksek oranda olduğu ve hastaların yaş ortalamasının sol kolon kanserli hastalara göre daha fazla olduğu gösterilmiştir[5,18]. Kötü prognostik özellikler ile ilişkili olan ileri T ve N evresi, az diferansiasyon, LVI ve daha büyük tümör boyutunun sağ kolon kanserinde daha sık görüldüğü çok sayıda çalışma ile kanıtlanmıştır[11,19-21]. Yang ve arkadaşlarının yaptığı bir çalışmada evre 1, 2 ve 3 kolon kanserli 1017 hasta küratif cerrahi sonrası tümör yerleşimine göre iki gruba ayrılarak hastaların klinik ve patolojik karakteristikleri değerlendirilmiştir[22]. Bu çalışmada minimal invaziv cerrahinin sol kolon kanserinde daha sık yapıldığı, buna karşılık sağ kolon kanserinde açık cerrahinin sıklığı ve çıkarılan lenf nodu sayısının da sola göre anlamlı olarak daha yüksek olduğu gösterilmiştir. Qiu ve arkadaşlarının yaptığı bir diğer çalışmada da sağ kolon kanserinde total çıkarılan lenf nodu sayısının daha fazla olduğu ancak metastatik lenf nodu sayısının sol kolon kanserinde anlamlı olarak daha yüksek olduğu gösterilmiştir[23]. Benedix ve arkadaşları ile Wray ve arkadaşlarının yaptığı çalışmalarda da hem çıkarılan lenf nodu sayısı hem de metastatik lenf nodu sayısının sağ kolon kanserinde daha fazla olduğu ve buna bağlı olarak sağ kolon kanseri tanılı hastaların tanıda sol kolon kanserine göre daha ileri evrede olduğu gösterilmiştir[5,17]. Bizim çalışmamızda da literatürle uyumlu olarak çıkarılan total lenf nodu sayısının sağ kolon kanserinde anlamlı olarak daha fazla olduğu gösterilmiştir[5,12,17,22,23]. Metastatik lenf nodu sayısı açısından istatistiki farklılık olmasa da sağ kolon kanserinde sayısal olarak üstünlük olduğu görülmektedir. Sonuç olarak erken ve lokal ileri evre kolon kanserinde cerrahi sırasında çıkarılan ve etkilenen lenf nodu sayısı hem evreyi doğrudan değiştirmekte hem de prognostik önemi ve tedavi seçimini etkilemesi açısından kalite parametresi olarak kullanılmaktadır[24,25]. Bununla birlikte çalışmamızda iki grup arasında cinsiyet, yaş, T evresi, grade ve LVI açısından farklılık görülmemesi çalışmadaki hasta sayısının az olması ile ilişkili olabilir. 2011'de yapılmış bir moleküler biyolojik çalışmada hasarlı DNA'yı tamir eden onarım genlerinin eksikliğinin (dMMR) özellikle erken ve lokal ileri evre sağ kolon kanserli hastalarda daha fazla görüldüğü, bu durumun da iki tarafın embriyolojik olarak farklı kökenlerden gelişmesi ile ilişkili olduğu gösterilmiştir[26]. Gervaz ve arkadaşlarının yaptığı çalışmada sağ kolon kanserinde MSI yüksek hastaların görülme sıklığı yaklaşık % 25 olarak bulunmuştur[27]. Özellikle MSI yüksek evre 2 sağ kolon kanserli hastaların prognozunun sol kolon kanserine göre daha iyi olduğu ve 5- florourasil temelli adjuvan kemoterapiden fayda görmediği bilinmektedir[28]. Evre 3 sağ kolon kanserli hastalarda prognozun evre 2 sağ kolon kanserli hastalara göre biraz daha kötü olduğu bildirilmiş olup, bu durumun MSI yüksek olan hasta grubunun evre 2 sağ kolon kanserinde daha dominant olması ile ilişkili olabileceği belirtilmiştir[5]. Sinicrope ve arkadaşlarının yaptığı bir çalışmada opere edilmiş evre 3 kolon kanserli hastalarda MMR statüsünün prognostik

önemi araştırılmıştır[29]. Bu çalışmada MMR eksik olan evre 3 sağ kolon kanserli hastalarda hastalıksız sağkalımın aynı statüdeki sol kolon kanserli hastalara göre anlamlı olarak daha iyi olduğu gösterilmiştir. Özellikle adjuvan tedavide oksaliplatin kullanılmasının bu grup hastalarda sağkalım avantajı gösterdiği ve bu sonucun MMR statüsünden bağımsız olarak görüldüğü belirtilmiştir. Fakat literatürdeki çalışmalarda genellikle evre 2 ve 3 hastalar kombine edilerek MMR durumuna göre değerlendirilmiş olup özellikle erken evrede dMMR olanlarda sağkalımın daha iyi olduğu sonucuna varılmıştır[30,31]. Bizim çalışmamızda da literatürle uyumlu olarak sağ kolon kanserli hastalarda MSI yüksek olan hasta oranı % 36,40 iken, sol kolon kanserinde bu oran sadece % 6,80 olarak bulundu. Her ne kadar hasta sayısı az olsa da, çalışmamız sağ kolon kanserinde MSI yüksek olduğunu bir kez daha vurgulamış oldu.

Patolojik ve biyolojik karakteristikler dışında klinisyenler kolon kanserinde daha basit prognostik araçlara da ihtiyaç duymaktadır. Bu nedenle de inflamatuvar belirteçler ve bazı laboratuvar parametrelerinden oluşan bazı indeksler geliştirilmiştir. Hayama ve arkadaşlarının yaptığı bir çalışmada ameliyat edilmiş sağ ve sol kolon kanserli hastalarda albümin, total kolesterol, CRP, mGPS, nötrofil, lenfosit, trombosit, CEA ve Ca 19-9 değerleri karşılaştırılmıştır[32]. Albumin, total kolesterol ve total lenfositten oluşturulan kontrollü beslenme indeksi ve trombosit/lenfosit oranı (PLR) sağ kolon kanserinde sola göre daha yüksek bulunmuş ve daha kısa hastalıksız sağkalım ile ilişkili olduğu vurgulanmıştır. Guo ve arkadaşlarının yaptığı bir çalışmada da evre 1-3 opere sağ ve sol kolon kanserinde inflamatuvar belirteçlerin sağkalımla olan ilişkisi araştırılmıştır[33]. Sağ kolon kanserinde sol kolon kanserine göre nötrofil/lenfosit oranı (NLR) ve PLR anlamlı şekilde yüksek iken, lenfosit/monosit oranı (LMR) sol kolon kanserinde anlamlı olarak yüksek bulunmuştur. Bu üç inflamatuvar belirteç özellikle sağ kolon kanserinde daha düşük genel sağkalım ve hastalıksız sağkalımla anlamlı ilişki göstermiştir. Literatürdeki bir diğer çalışmada rezektabl kolon ve rektum kanserli hastalarda operasyon öncesi bakılan mGPS skorunun genel sağkalımı predikte etmedeki rolü araştırılmıştır[34]. Bu çalışmada yaş ve mGPS hem univariate hem de multivariate analizlerde kanser spesifik sağkalımı göstermede bağımsız prediktör olarak bulunmuştur. Biz de çalışmamızda sağ ve sol kolon kanserli hastaların laboratuar parametreleri ve inflamatuvar belirteçlerini karşılaştırdık. Çalışmamızda sadece nötrofil değerleri açısından iki grup arasında istatistiki anlamlı farklılık mevcuttu. NLR oranı sayısal olarak sağ kolon kanserinde daha yüksek olmakla birlikte p değeri iki grup arasında benzerdi. Yine hastalar mGPS açısından değerlendirildiğinde sol kolon kanserinde mGPS düşük olan hasta sayısı sağa göre daha fazla olmakla birlikte aradaki fark istatistiksel olarak anlamlı değildi. Sağ ve sol kolon kanserli hastalarda hastalıksız sağkalım açısından istatistiksel anlamlı farklılık gösterilemedi. Özellikle medyan takip süresinin kısa olması ve adjuvan kemoterapi alması gereken hastaların yaklaşık %9'unun tedavi alamaması, iki grup arasında hastalıksız sağkalımın benzer bulunmasına katkıda bulunmuş olabilir.

Çalışmamızda bazı kısıtlamalar mevcuttu. İlk olarak çalışmamız retrospektif bir çalışmaydı. İkinci olarak, tek merkezli yapılan bu çalışmada hasta sayısı azdı ve takip süreleri kısaydı.

Sonuç olarak çalışmamız evre 1-3 kolon kanserli hastalarda MSI yüksek olan hastaların sağ kolon kanserinde sola göre daha fazla olduğunu ve total çıkarılan lenf nodu sayısı açısından da sağ kolon kanserinde anlamlı bir üstünlük olduğunu göstermiş oldu. Uzun takip süresine sahip, prospektif ve çok merkezli çalışmalarla bu verilerin desteklenmesi literatüre önemli katkılar sağlayacaktır.

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RESEARCH ARTICLE / *Araştırma Makalesi*

Biomechanical Investigation Of The Effects Of Various Treatment Options On The Talus In Supination External Rotation Type 4 Ankle Injuries With Ruptured Deltoid Ligament: Finite Element Analysis

Deltoid Bağ Rüptürü Olan Tip 4 Supinasyon Dış Rotasyon Ayak Bileği Yaralanmalarında Çeşitli Tedavi Seçeneklerinin Talus Üzerine Etkisinin Biyomekanik Olarak İncelenmesi: Sonlu Elemanlar Analizi

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Abstract

Introduction	The purpose of this study is the biomechanical investigation of the rotation, stress, and deformation caused in the talus, under a specific load, by various fixation methods in the ankle, which has supination external rotation type 4 injury with deltoid rupture (SER type 4 DR).
Materials and Methods	The ankle of a healthy individual was analyzed with the help of a package program based on the finite element method (FEM). Then, the SER type 4 DR injury model was created. Next, the lateral malleolar plate was fixed with a screw, and different repair models for ankle fit were created. In the analysis section, forces obtained from the literature were applied to the healthy and repaired models. As a result of the analyses, mechanical values that occurred in the talus were obtained.
Results	As a result of this study, mechanical changes in the talus, which were caused by, deltoid ligament repair, suture button syndesmosis fixation, syndesmosis fixation with transfixation screw, suture button fixation + deltoid ligament repair and transfixation screw + deltoid ligament repair in the SER type 4 DR injury model with deltoid ligament rupture, were evaluated.
Conclusion	This study showed that the application of syndesmosis screw together with deltoid ligament repair in the treatment of SER type 4 DR ankle injuries with rupture of the deltoid ligament made regression, displacement, and talus rotations on the talus almost normal. In addition, syndesmosis fixation screw applications give better results than syndesmosis fixation suture button applications.
Keywords	Biomechanics, finite element method, talus, syndesmosis fixation

Öz

Amaç	*Bu çalışmanın amacı deltoid yırtığı olan supinasyon dış rotasyon tip 4 yaralanmalı ayak bileğinde belirli bir yük altında talusta meydana gelen rotasyon, gerilme ve deformasyonun çeşitli fiksasyon yöntemleri ile biyomekanik olarak incelenmesidir.*
Yöntem ve Gereçler	*Sağlıklı bir bireyin ayak bileği sonlu elemanlar yöntemine dayalı bir paket program yardımıyla incelendi. Ardından deltoid ligament yırtığı olan supinasyon dış rotasyon tip 4 yaralanma modeli oluşturuldu. Lateral malleol plak vida ile sabitlendi ve ayak bileği uyumu için farklı onarım modelleri oluşturuldu. Analiz bölümünde literatürden elde edilen kuvvetler sağlıklı ve tamir edilmiş modellere uygulandı. Yapılan analizler sonucunda talusda oluşan mekanik değerler elde edildi.*
Bulgular	*Bu çalışma sonucunda, deltoid yırtığı olan supinasyon dış rotasyon tip 4 yaralanma modelinde deltoid bağ tamiri, sütür button syndesmosis fiksasyonu, transfiksasyon vidası ile syndesmosis fiksasyonu, sütür buton fiksasyonu+deltoid bağ tamiri ve transfiksasyon vidası+deltoid bağ tamiri ile talusta meydana gelen mekanik değişiklikler değerlendirildi*
Sonuç	*Bu çalışma, deltoid yırtığı olan supinasyon dış rotasyon tip 4 yaralanma tedavisinde deltoid bağ onarımı ile birlikte syndesmosis vidası uygulamasının talus üzerindeki gerilme, yer değiştirme ve rotasyonların normale yaklaştığını gösterdi. Ayrıca syndesmosis tespit vidası uygulamaları, syndesmosis sütür button uygulamalarına göre daha iyi sonuç vermektedir.*
Anahtar Kelimeler	*biyomekanik, sonlu elemanlar yöntemi, talus, syndesmosis fiksasyon*

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INTRODUCTION

Ankle fractures constitute 10 % of the fractures, and 40% of these require surgery.[1] Three different classifying systems are used for malleolar fractures; Lauge-Hansen, Dannis Weber, and American Orthopedic Association classifying systems. While Danis- Weber classification is made concerning the height of relation of fibula fracture with syndesmosis, the Lauge-Hansen classification is made concerning the fracture occurrence mechanism. In this classification, malleolar fractures are divided into 4/four subgroups; pronation- external rotation, supination-external rotation (SER), supination-adduction, and pronation-abduction.[2] Among these subgroups, SER injury is commonly encountered. In recent years, SER injuries have been divided into 4/four subgroups, and the most commonly encountered was reported as SER type 4 injuries.[3-4] The components of SER type 4 ankle injury are: anterior inferior tibiofibular ligament (AITFL) rupture, posterior inferior tibiofibular ligament (PITFL) rupture, oblique lateral malleolar fracture in the syndesmosis level, medial malleolar fracture and deltoid ligament rupture. Deltoid ligament rupture can be overlooked if no medial malleolar fracture is present, and this can lead to chronic ankle instability. This can result in a talus osteochondral defect (OCD) and may cause ankle osteoarthritis. Some authors report that, after ankle trauma, the possibility of developing OCD in the talus is 50%.[5] It is not clear where OCD will develop in the talar dome. While some authors report that OCD may develop in the talar dome lateral, some report that it can develop in the medial.[5-6] Deltoid ligament is the main stabilizer in the medial ankle. The deltoid ligament has shallow and deep layers. While the shallow layer resists the plantar flexion and external rotation of the talus relative to the tibia, the deep layer is more important for stabilization. The main function of the deep layer is to prevent the valgus positioning and posterior and lateral movement of the talus.[7-9] While subjective findings such as swelling in the medial ankle, sensitivity, and ecchymosis point to a deltoid ligament injury, a definitive diagnosis is made with stress radiographies. The most solid finding for diagnosis is medial clear space being 5 mm or more.[10] Treatment protocol for ankle fractures with deltoid ligament injury is still a controversial. The main reason for this uncertainty is that it is not decided whether the deltoid ligament should be repaired or not. While in some old papers, it is asserted that deltoid ligament repair is not necessary,[11-12], in current literature, the tendency is towards deltoid ligament repair.[8,13] Some authors claim that, compared to deltoid ligament repair, the use of a transfixation screw will result in a higher syndesmotic malreduction ratio, thus, abnormal talus motion.[14] No biomechanical study has been found in the literature that analyzes the effect of the deltoid ligament repair in a SER type 4 ankle fracture with a deltoid ligament injury and syndesmotic fixation treatment methods on talus.

Lately, in the biomechanical evaluation of musculoskeletal disorders in orthopedics, and in the development of implants, finite element method (FEM) is used. The advantage of this method is that it is cheaper and more practical than experimental studies. Another important advantage is that it analyzes the mechanical values in detail.[15-17]

In this study, the stress, deformation and rotation values caused in the talus by supination external rotation type 4 injury with deltoid rupture (SER type 4 DR) were investigated. In addition, respectively, deltoid ligament repair, suture button syndesmosis fixation, syndesmosis fixation with transfixation screw, suture button fixation+deltoid ligament repair, and transfixation screw+deltoid ligament repair models were created in the SER type 4 DR injury model. To our knowledge, no detailed study analyzes this phenomenon in this detail. The results of the study give information about the appropriate values that can be used in the application.

MATERIALS and METHODS

The images of the examined model were provided from computer tomography (CT) scans of the right foot ankle of a normal male in the unloaded state. The male was 30

years old, 178 cm in height, and 80 kg in weight. The solid model was obtained from the previously licensed work.[15] The data, consisting of images in DICOM form, were then imported into the Mimics Innovation Suite 24.0 program to create the geometry of the bones (tibia, fibula, talus, calcaneus, cuboid, navicular, cuneiform, metatarsal, and phalange) in the ankle.[18]

Model parts imported from Mimics were composed using Materialise 3-Matic 16.0 to form solid geometries for each bone. The talocrural joint is balanced by modeled ligaments, taking into account their geometric properties. Ligaments; anterior inferior tibiofibular ligament (AITFL), posterior inferior tibiofibular ligament (PITFL), anterior talofibular ligament (ATAFL), posterior talofibular ligament (PTAFL), deltoid ligament (DL), calcaneofibular ligament (CFL) were created (Fig. 1).[19]

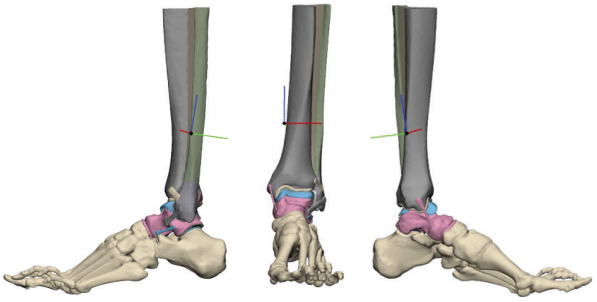

Figure 1: *Solid model.*

The composed bones, ligaments, and cartilage were transferred to the ANSYS package program based on the finite element method.20 The geometry mesh size was chosen to be the same size. After performing a mesh sensitivity analysis, the mesh size was set to 3 mm (Fig. 2). 1 mm thickness on the surfaces of the tibia, fibula, and talus was set to the cortex of bone, and the inner part was trabecular bone. The thickness of the cartilage was about 1.0 mm.21 The finite element mesh of the model is created of 3D tetrahedron elements.

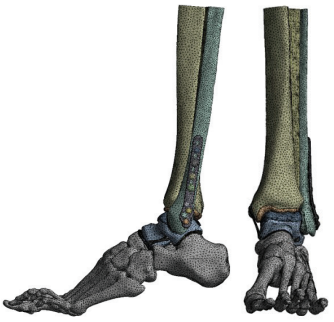

Figure 2: *Mesh structure of the model.*

Human bone is contained two different types of bone cortical and trabecular. Cortical bone is more rigid than trabecular bone due to cellular density. All elements are modeled as linear elastic, homogeneous and isotropic structures.[22] Ligaments are contained parallel collagen fibers, and articular cartilage is a biphasic material. The material properties used for the model were obtained from the literature (Table 1).[23-31] There are 731928 elements and 1154127 nodes in the finite element model of the created ankle.

Table 1: The material properties of the models.

Material Type		Elasticity Modulus (MPa)	Poisson's Ratio
Calcaneobular		17000	0.49
Talobular		17000	0.49
Cartiladge		10	0.30
Trabecular		530,9	0,30
Cortical		12100	0.30
Interosseous		260	0.40
Titanium (Ti6Al4V)		113800	0.34
UHPWE-Suture button		928.5	0.35
	ATFL	16.55	0.49
	PTFL	18.44	0.49
Ligaments	ATAFL	15	0.49
	PTAFL	15	0.49
	DL	7	0.49
	CFL	11	0.49

2352 N vertical, 235 N horizontal forces, and 2.7 Nm clockwise moment were applied to the upper part of the tibia (Fig. 3).[32-33]

In order to realize the purpose of this study, analysis was carried out in seven different models. These models; screw for syndesmosis fixation (deltoid ligament repaired), suture button for syndesmosis fixation (deltoid ligament repaired), deltoid ligament repaired, screw for syndesmosis fixation (deltoid ligament unrepaired), suture button for syndesmosis fixation (deltoid ligament unrepaired), no syndesmosis fixation (deltoid ligament unrepaired) (Figs. 4-5)

anteroposterior view lateral view

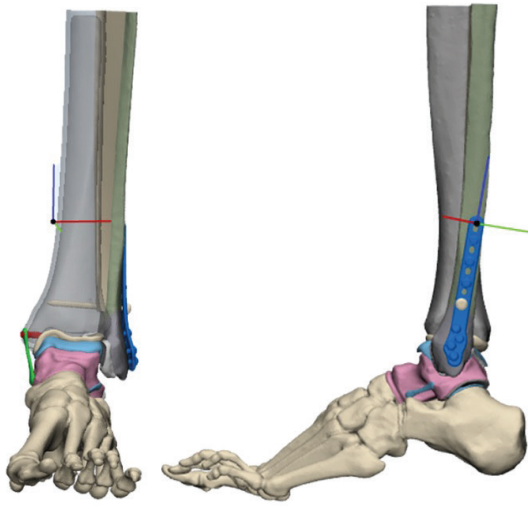

Figure 4: *Screw for syndesmosis fixation+deltoid repaired.*

anteroposterior view lateral view

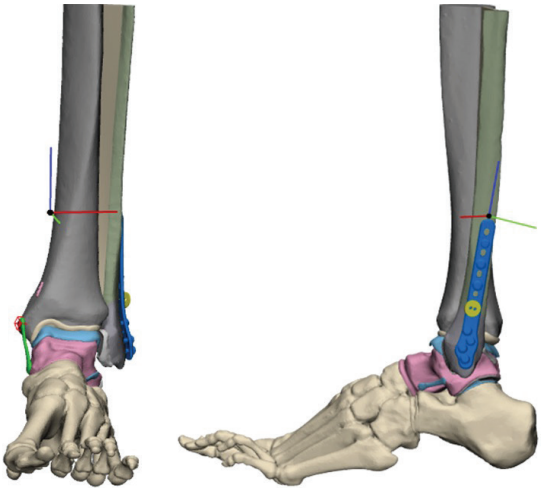

Figure 5: *Suture button for syndesmosis fixation+deltoid repaired.*

After defining all the data required for the element types, material properties, boundary conditions, and loadings, static structural analyzes were performed, and the results are given below.

RESULTS

In this study, different simulations were performed to analyze the seven models. As a result, the rotation, stresses, and deformation obtained for the talus under various geometrical conditions were obtained. The obtained values are presented in the figures.

The stress distribution for different models is given as an example (Fig. 6). These models are defined as; intact, screw for syndesmosis fixation (deltoid ligament repaired) (SSF+DLR), suture button for syndesmosis fixation (deltoid ligament repaired) (SBSF+DLR), deltoid ligament repaired (DLR), screw for syndesmosis fixation (deltoid ligament unrepaired) (SSF), suture button for syndesmosis fixation (deltoid ligament unrepaired) (SBSF), no syndesmosis fixation (deltoid ligament unrepaired) (No SF+No DLR).

The numerical values of the analysis results obtained from

different applications are shown graphically in Figure 7-9. The rotation, maximum stress, and deformation values obtained in the talus of seven models (intact, SSF+DLR, SBSF+DLR, DLR, SSF, SBSF, No SF+No DLR are given in the figures. The rotation, changes in the talus are given in Figure 7. From the figure, it can be seen that the difference in rotation obtained from the intact and No SF+No DLR model are great. As seen in the figure, lower rotation values were obtained when the syndesmosis fixation screw application was compared with the suture button. Another result is that deltoid ligament repair reduces rotation values. The deformation values obtained in the talus of seven models are given in Figure 8. The results revealed that model No SF+No DLR has the highest stress values, and model SSF+DLR has the lowest deformation values. Different results were obtained for the different models. Another considerable result seen in the figure is that the values for the syndesmosis fixation suture button are higher than the values for the syndesmosis fixation screw. The maximum stresses in the talus for different models obtained from the analysis are shown in Figure 9. The figure disclosed that model SF has the highest maximum stress, and model SSF+DLR has the maximum stress. Different results were obtained for the geometrical conditions in seven models. As can be clearly seen from the figures, the results closest to the intact model were obtained as follows, SSF+DLR, SBSF+DLR, DLR, SSF, SBSF, and No SF+No DLR, respectively.

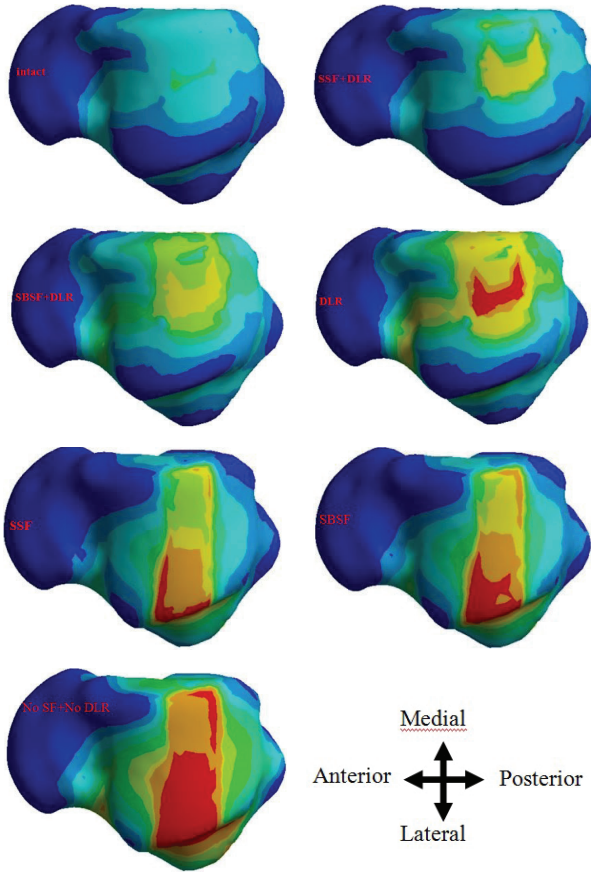

Figure 6: *Stress distribution in the talus for models.*

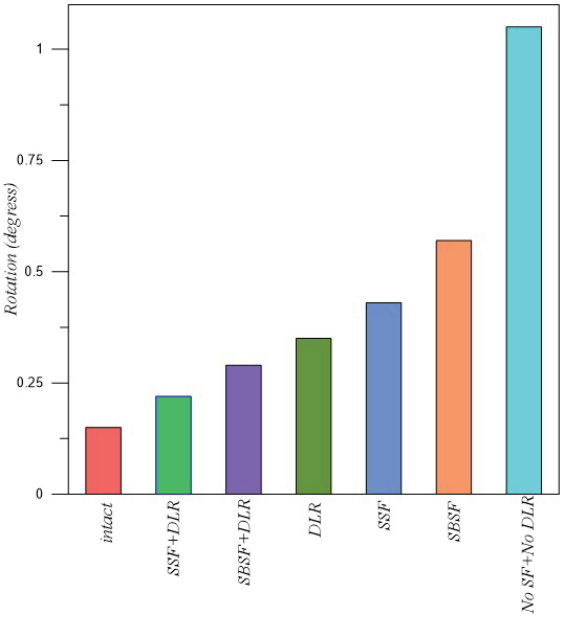

Figure 7: *Rotation in the talus for models.*

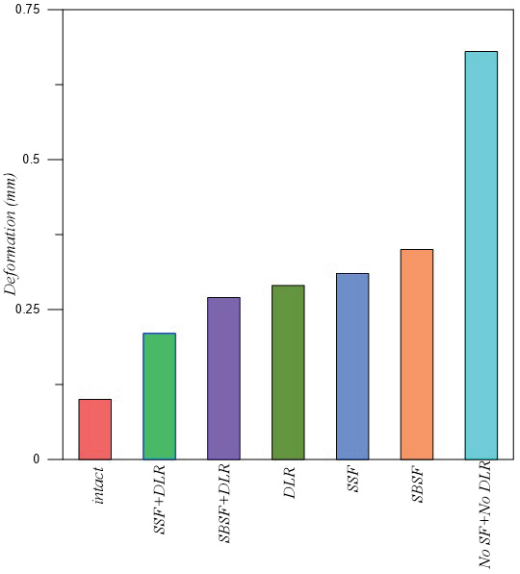

Figure 8: *Deformation in the talus for models.*

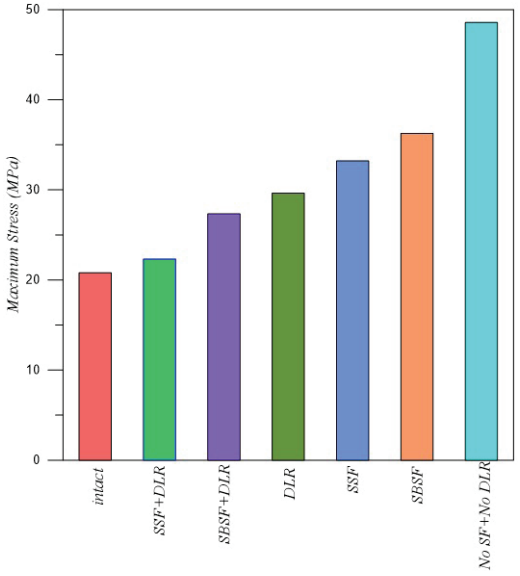

Figure 9: *Maximum stress in the talus for models.*

DISCUSSION

The aim of this study is to investigate the rotation, stress, and displacement that take place in the talus in a model with SER type 4 DR injury of the ankle with a deltoid ligament rupture. The secondary aim of the study is to obtain the values of the stress and displacement in the talus and investigate the relationship with traumatic osteochondral defects. When the data was analyzed, it was seen that the model closest to the healthy ankle was the one in which deltoid ligament repair was used with a transfixation screw. After ankle injuries where medial clear space has been opened, usually, a syndesmosis screw is used. In a study that compares deltoid ligament repair and transfixation screw, authors reported that functional results were similar. They reported that deltoid ligament repair could be an appropriate treatment strategy, and the transfixation screw should be removed.[34] Another biomechanical study reports that the combined usage of a transfixation screw with deltoid repair brought talus rotation and translation levels nearly to normal levels.[35] Butler et al., in their biomechanical study, published the results of deltoid ligament repair in the SER type 4 DR fracture model. They saw an increase in internal and external rotation in the talus under load when the deltoid ligament was not repaired (when open reduction+internal fixation was applied to the lateral malleolar), and they reported that there was no biomechanical difference between deltoid ligament repair and the healthy model.[36] In this study, while only deltoid ligament repair gave satisfactory results in SER type 4 DR injury, the use of deltoid ligament repair together with transfixation screw was found to reduce strain and displacement on the talus almost to the values of the intact model. Also, in this study, the suture button and transfixation screw, which is commonly used in fixing the syndesmosis in SER type 4 DR injury repair where clinical deltoid ligament rupture is present. While the transfixation screw limits the external rotation of the talus, the stress and displacement in the talus are significantly higher in both treatment methods. As a result, when the rotation, stress, and displacement values are analyzed, the transfixation screw is more appropriate than the suture button application.

In recent years, the suture button fixation method has become popular in syndesmosis instabilities. However, in a biomechanical study investigating the effect on talus movements, the authors reported that the suture button method provides less stability in spite of deltoid ligament

repair and transfixation screw.[35] As the result of this study, suture button fixation in syndesmosis fixation, without deltoid ligament repair, has significantly increased the stress and displacement on the talus. This situation will probably be considered as the factor leading to osteochondral defect or osteoarthritis in the future.

Publications which report that talus osteochondral defect can occur secondarily to the ankle injury have been popular in recent years. However, no papers have been found in the literature that analyses the relation with deltoid ligament rupture. Martijn et al., in their compilation study, found that post-trauma osteochondral defect occurrence is 45%, and they reported that the most defect occurred in talus anteromedial. They reported that the rate of OCD occurrence was higher in SER injuries compared to other types of injuries.[5] In another study, the authors report that even though OCD incidences were much higher in SER injuries, the majority of the injuries took place in the lateral talar dome.[6] A study that supports this study was published in 2020. In this study, it has been reported that the majority of post-traumatic OCD took place in the lateral dome.[37] When the treatment options in this study were analyzed, it was seen that, both in syndesmosis fixation with transfixation screw and syndesmosis fixation with suture button, stress and displacement increased more in the talar dome middle section and less in the medial section. There was no significant difference in other treatment methods.

CONCLUSION

This study evaluated the talus biomechanically following treatment options for SER type 4 DR ankle injuries with rupture of the deltoid ligament. The results obtained from the study are briefly summarized below:

- The best results were obtained with the application of the syndesmosis screw with deltoid ligament repair.
- Models with deltoid ligament repair gave better results.
- By examining the mechanical values created by various treatment methods on the talus gives us an idea about the possible location of osteochondral defects that may occur after treatment.
- Syndesmosis fixation screws give better results than fixation suture button applications.

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ARAŞTIRMA MAKALESİ / *Rerseasrch Article*

Perkütan Kolesistostominin Akut Kolesistit Tedavisindeki Yeri

The Role of Percutaneous Cholecystostomy in the Treatment of Acute Cholecystitis

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Öz

Amaç	Çalışmamızda perkütan kolesistostomi (PK) işleminin hastaların klinik ve laboratuvar bulgularına etkisini araştırdık.
Yöntem ve Gereçler	Çalışmamıza Şubat 2017 ile Kasım 2018 tarihleri arasında PK yapılan 36 hasta dahil edildi. Hastaların işlem öncesi ve sonrası klinik ve laboratuvar bulguları retrospektif olarak tarandı.
Bulgular	Hastaların yaş ortalaması 72 (±12.7)'dir. Hastalarımızda akut kolesistit rekürrensi görülmemiştir. PK işlemi ile ilişkili mortalite ya da komplikasyon izlenmemiştir. Kateterin takılı kalma süresi 50.2 ± 26.1 gün, hastane yatış süresi 7.5 ± 5.2 gün olarak belirlenmiştir. Total bilirubin değeri ve beyaz küre sayısı yüksek olan hasta sayısında işlem öncesi ve sonrası arasında istatistiksel olarak anlamlı fark saptanmıştır. Alanin aminotransferaz (ALT), alkalen fosfataz (ALP), C-reaktif protein (CRP) değerleri, beyaz küre sayısı, total ve direkt bilirubin parametrelerinin işlem öncesi ve sonrası değerleri arasında da istatistiksel olarak anlamlı fark saptanmıştır. Akut kolesistit Tokyo kılavuzu evresi ile yoğun bakım ihtiyacı arasında istatistiksel olarak anlamlı fark saptanmış olup yoğun bakımda tedavi gösteren tüm hastalar evre 3'tür. PK sonrasında cerrahiye giden hastaların yaş ortalaması diğer gruba göre daha yüksektir.
Sonuç	İşlem sonrasında beyaz küre sayısı ve CRP değerinde anlamlı düşüş ve hastaların çoğunluğunda klinik düzelme görülmesi, PK'nin akut kolesistit kaynaklı enflamatuar sürecin gerilemesine katkı sağladığını göstermektedir.
Anahtar Kelimeler	akut kolesistit, kolesistektomi, perkütan kolesistostomi, safra kesesi

Abstract

Introduction	*In our study, we investigated the effect of the percutaneous cholecystostomy (PC) on patients' clinical and laboratory findings.*
Materials and Methods	*In our study, 36 patients were included, who underwent PC between February 2017 and November 2018. The clinical and laboratory findings of the patients before and after the procedure were reviewed retrospectively.*
Results	*The mean age of the patients was 72 (±12.7). No recurrence of acute cholecystitis was observed in our patients. There was no mortality or complication associated with the PC. The duration of catheterization was 50.2 ± 26.1 days, and the hospital stay was 7.5 ± 5.2 days. A statistically significant difference was found between pre- and post-procedure in the number of patients with high total bilirubin and white blood cell (WBC) values. Another statistically significant difference was also found between the values of alanine aminotransferase (ALT), alkaline phosphatase (ALP), C-reactive protein (CRP), WBC, total and direct bilirubin parameters before and after the procedure. A statistically significant difference was found between the Tokyo guideline stage of acute cholecystitis and the need for intensive care unit, and all patients treated in the intensive care unit were stage 3. The mean age of patients who underwent surgery after PC was higher than the other group.*
Conclusion	*Significant decrease in WBC and CRP value after the procedure and clinical improvement in the majority of patients indicate that PC contributes to the regression of the inflammatory process caused by acute cholecystitis.*
Keywords	*acute cholecystitis, cholecystectomy, gallbladder, percutaneous cholecystostomy*

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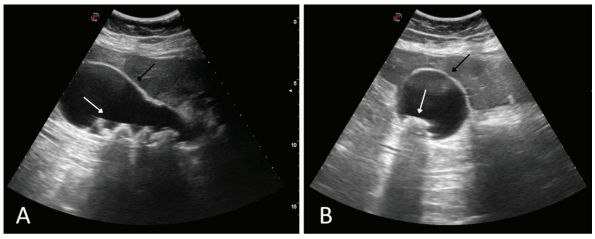
GİRİŞ

Akut kolesistit (AK) genel olarak sistik kanal obstrüksiyonundan kaynaklanan safra kesesi (SK) enflamasyonudur. Sistik kanal obstrüksiyonunun en sık sebepleri safra taşları ve safra çamurudur. Diğer sebepler ise kitle (primer safra kesesi tümörü ya da polip) veya parazitlerdir. Safra taşı kaynaklı olmayan akut kolesistitlere ise akut akalkülöz kolesistit (AAK) denir.[1]

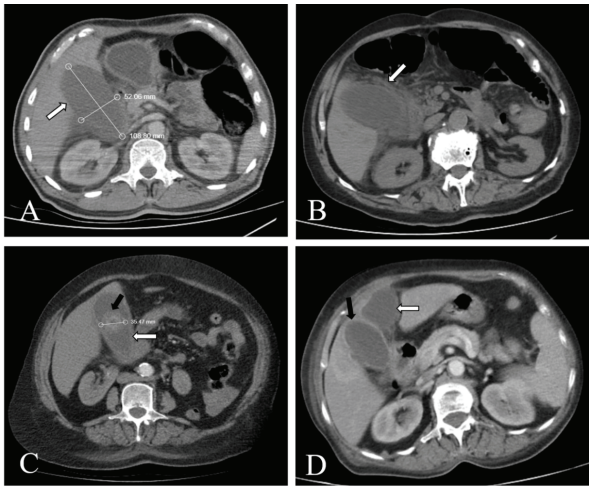
AK için en tipik klinik prezentasyon sağ üst kadran ve/veya epigastrik bölgede; şiddetli, sabit ve uzun süren ağrıdır. Ağrıya ateş, bulantı, kusma ve iştahsızlık eşlik edebilir. Fizik muayenede karın bölgesinde istemsiz defans, pozitif Murphy bulgusu ve bunlara eşlik eden ateş ve taşikardi izlenir.[2] Laboratuvar incelemede band formlarının sayıca arttığı lökositoz en sık karşılaşılan anormalliktir. Ayrıca hastalarda kan kültüründe pozitiflik de görülebilir. Total bilirubin ve alkalen fosfataz (ALP) yüksekliği komplikasyon gelişmeyen AK vakalarında sık görülmemekle birlikte biliyer tıkanıklık açısından şüphe uyandırmalıdır.[2]

AK tanısı ve hastalık şiddetinin evrelemesinde Tokyo Kılavuzu (TK) son yıllarda yaygın şekilde kullanılmaktadır.[3] Kılavuz ilk olarak 2007'de yayınlanmış, daha sonra 2013 ve 2018'de revize edilmiştir.[3] Bu kılavuza göre AK tanı kriterleri lokal enflamasyon bulguları (pozitif Murphy bulgusu, sağ üst kadranda ağrı/hassasiyet), sistemik enflamasyon bulguları (ateş, lökositoz, CRP yüksekliği) ve görüntüleme bulgularının pozitifliği olarak 3 grupta toplanmıştır. Lokal ve sistemik enflamasyon bulgularından en az birer kriterin pozitifliği AK açısından şüpheli olarak kabul edilirken buna pozitif görüntüleme bulgusu eklendiğinde tanı kesinleşir.[3]

Ultrason görüntüleme (USG) klinik olarak AK şüphesi olan durumlarda ilk tercih edilen en pratik görüntüleme yöntemidir. AK durumunda USG bulguları; safra taşı (kolelitiazis) veya safra çamuru, SK'da distansiyon (transvers çap>4 cm), SK duvarında ödemli görünüm ve kalınlaşma (>3-5 mm), perikolesistik sıvı varlığı, sonografik Murphy bulgusunun pozitifliği ve Doppler incelemede kese duvarında kanlanma artışıdır (Figür 1).[4] AK tanısında ilk basamak görüntüleme yöntemi USG olsa da karın ağrısı ile gelen hastalarda bilgisayarlı tomografi (BT) incelemesi gerekli olgularda sıklıkla ilk tercih olabilmektedir. AK'da BT bulguları kolelitiazis, SK distansiyonu, SK duvar kalınlaşması, mukozal kontrastlanma artışı, perikolesistik yağlı dokuda çizgilenme ya da sıvı varlığı, SK fossasındaki karaciğer parankiminde reaktif hiperemiye sekonder kontrastlanma artışı (BT rim bulgusu) şeklindedir (Figür 2).[5]



Figür 1: Akut sağ üst kadran ağrısı ile başvuran 46 yaşındaki erkek hastada akut kolesistitin USG bulguları. A: Sagital düzlemde hidropik görünümde safra kesesi izlenmekte olup kese lümeninde posterior akustik gölgelenmesi olan çok sayıda taş ekojenitesi (beyaz ok) ve safra kesesinde duvar kalınlaşması (siyah ok) mevcuttur. B: Safra kesesi lümenindeki taş ekojenitesi (beyaz ok) ve kese duvar kalınlaşması (siyah ok) aksiyel düzlemde de görülmektedir.



Figür 2: Akut kolesistit tanılı dört farklı hastanın aksiyel BT görüntüleri. A: Safra kesesinde distansiyon (108x52 mm). B: Perikolesistik yağlı dokuda çizgilenme (beyaz ok). C: Safra kesesinde duvar kalınlaşması (beyaz ok) ve lümende 36 mm çaplı hiperdens kalkül (siyah ok). D: Kontrastlı incelemede safra kesesinde mukozal kontrastlanma artışı (siyah ok) ve komşuluğunda duvar kontrastlanması gösteren perikolesistik apse (beyaz ok).

AK tanısı konulan hastalarda, 2018 TK'ya göre hastaların evrelemesi hastalığın yönetiminde temel alınabilmektedir.[6] Kılavuza göre AK, hastalığın şiddetine göre evre 1 (hafif düzey), evre 2 (orta düzey) ve evre 3 (şiddetli) olarak 3'e ayrılmaktadır. Hastalık evresine göre değişmekle birlikte uygulanan tedavi yöntemleri medikal tedavi (non-steroidal anti-enflamatuar ilaçlar, opiatlar ve antibiyotikler), erken veya geç dönem (elektif) cerrahi ve perkütan SK drenajıdır (kolesistostomi).[6]

PK tanım olarak SK lümenine görüntüleme eşliğinde kateter yerleştirilmesidir.[7] Kritik durumda ve cerrahi için uygun olmayan akut kalkülöz ya da akalkülöz kolesistit tanılı hastalarda uygulanır. Akut enflamasyon durumunun gerilemesine yardımcı olur ve sonrasında uygulanacak olan cerrahi tedaviye kadar olan süreçte zaman kazandırır. Akalkülöz kolesistit durumunda ise kesin tedavi yöntemi olup enfektif süreç gerilediğinde cerrahiye gereksinim duyulmayabilir.[8]

Çalışmamızın amacı AK tanısı ile PK uygulanan hastalarda, klinik başvuru anındaki semptomlar ve laboratuvar bulguları ile işlem sonrası elde edilen verileri karşılaştırmalı olarak analiz ederek PK tedavisinin etkinliğini ve klinik sonuçlarını göstermektir.

GEREÇ ve YÖNTEM

Bu çalışmaya Şubat 2017 ile Kasım 2018 tarihleri arasında hastanemiz acil servisine başvurarak AK ön tanısı ile interne edilen ve bu nedenle PK yapılmış olan 36 hasta dahil edildi. Hastalara ait işlem öncesi ve sonrasındaki klinik ve laboratuvar bulgulara, uygulanan PK işlemine ait detaylı raporlara, hastalara ait mevcut komorbiditelere, işlem öncesi ve sonrasını kapsayan klinik seyir kayıtlarına retrospektif olarak ulaşıldı. Çalışmanın retrospektif natürü ve dosya taraması şeklinde olması nedeniyle hasta rızasından feragat edildi. Ayrıca işlemin hangi modalite eşliğinde yapıldığı (yalnızca USG veya USG ile birlikte skopi görüntülemesi) ve işlemin hangi yaklaşımla uygulandığı (transhepatik ya da transperitoneal) belirlendi.

Hastaların başvuru esnasındaki radyolojik tetkiklerinden (USG, BT, Manyetik Rezonans Kolanjiopankreatograf) faydalanılarak AK ya da AAK olarak iki gruba ayrıldı. PK yapıldığı bilinen hastaların ilk başvurusunda ve işlem sonrasındaki laboratuvar ve klinik parametreleri incelendi. İncelenen laboratuvar parametreleri normal kabul edilen değer aralıkları ile birlikte Tablo 1'de verilmiştir.

Laboratuvar değerlerinde; işlem öncesi olarak PK işleminden hemen önceki, işlem sonrası olarak ise işlemden en az 72 saat sonraki değerler esas alındı. Beyaz küre sayısı ve CRP ile birlikte 2018 TK'da da sistemik enflamasyon bulgusu olarak kabul edilen ateş ölçümleri de (sınır değer: 38.5°C) işlem öncesi ve sonrası olarak kaydedildi.[3]

Çalışmamızda; konjestif kalp yetmezliği (KKY), koroner arter hastalığı (KAH), kronik böbrek yetmezliği (KBY),

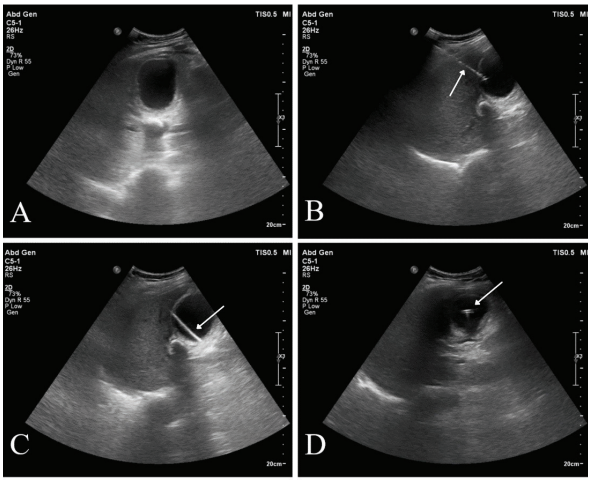
hipertansiyon (HT), kronik obstrüktif akciğer hastalığı (KOAH), serebrovasküler hastalık (SVH), diabetes mellitus (DM), geçirilmiş veya mevcut malignite, hipertiroidi/hipotirodi ve demans gibi kronik sistemik hastalıklar komorbidite olarak kabul edildi.

Tablo 1: Hastalarda incelenen laboratuvar parametreleri ve normal aralıkları

Laboratuvar Parametresi	**Normal Aralık**
Karaciğer Fonksiyon Testleri	
AST	0-50 (U/L)
ALT	0-50 (U/L)
Kolestaz Enzimleri	
ALP	30-120 (U/L)
GGT	0-55 (U/L)
Bilirubin Değerleri	
Total Bilirubin	0-0.2 (mg/dL)
Direk Bilirubin	0.3-1.2 (mg/dL)
Sistemik Enflamasyon Bulguları	
CRP	0-5 (mg/dL)
Beyaz Küre Sayısı	4600-10200 (/μL)

Hastaların klinik seyirleri AK ile ilişkili komplikasyonlar ve PK işlemi sonrasında gelişen komplikasyonlar açısından incelendi. Başvuru ya da yatış esnasında yapılan radyolojik incelemeler taranarak AK ile birlikte koledok taşı (koledokolitiazis) bulunup bulunmadığı tespit edildi. Ayrıca klinik seyirler incelenerek hastaların hastanede yatış süresi, aynı yatış süreci içerisinde yoğun bakım desteğinin gerekliliği değerlendirildi. PK işleminden sonraki süreçte hastaların klinik düzelme gösterip göstermediğini belirlemek için 2018 TK'daki lokal ve sistemik enflamasyon bulgularının gerilemesi esas alındı. Sistemik enflamasyon bulgularının seyri için kılavuzda belirtilen ateş, lökositoz ve CRP değerlerine bakıldı. Lokal enflamasyon bulguları ise kılavuzda Murphy pozitifliği ve sağ üst kadranda ağrı/hassasiyet olarak belirtilmiştir.[3] Ancak hastaların tamamında muayene bulgularına çalışmanın natürü gereği (retrospektif olması) ve hasta dosyalarındaki klinik seyirler üzerinden ulaşılamadığından, hastalardaki semptomatik gerileme kriteri olarak yalnızca hastaların ağrısında düzelme olup olmadığına bakıldı. Hastalarda AK'nın şiddetini belirlemede yine 2018 TK kullanıldı. Bu kılavuza göre hastalığın evresi evre 1 (hafif), evre 2 (orta) ve evre 3 (şiddetli) olarak belirlendi.[6]

İşlem cilt dezenfeksiyonu ve lokal anestezi uygulanmasını takiben USG ya da USG ve skopi eşliğinde gerçekleştirilmiştir. Tüm işlemlerde seldinger yöntemi ve hastaların çoğunluğunda (36 hastanın 34'ünde) transhepatik yaklaşım kullanılmıştır (Figür 3).



Figür 3: Sağ üst kadran ağrısı ile başvuran 52 yaşındaki kadın hastaya USG eşliğinde, seldinger tekniği uygulanan PK işleminin basamakları. A: Akut kolesistitli hastada kese boyun kesimindeki kalkül ve kese duvarında kalınlaşma. B: Transhepatik yaklaşımla uygulanan perkütan kolesistostomi işleminde 18 G Chiba iğnesi (beyaz ok) ile yeterli karaciğer parankimi geçilerek yapılan safra kesesi ponksiyonu. C: Chiba içerisinden gönderilen kılavuz tel (beyaz ok). D: Kılavuz tel üzerinden gönderilen kateterin pigtail yapıldıktan sonraki görünümü (beyaz ok).

Çalışmamızda PK kateteri takılıp taburcu edildikten sonra hastalarda kateterin ne kadar süre kaldığı, kateter çıkarıldıktan sonra hastaya kolesistektomi yapılıp yapılmadığı ve kolesistektomi yapılmayan hastalarda AK'nın rekürrens oranı kaydedildi. Hastaların takip süresi ay olarak ortalama 20.2±15.5, ortancası 18 (minimum:1, maksimum:52)

olarak bulunmuştur.

İstatistiksel analizler SPSS 15.0 (Statistical Package For Social Sciences for Windows v.25.0, SPSS Inc. Chicago, IL, Amerika Birleşik Devletleri) istatistik paket programında yapılmıştır. Tanımlayıcı istatistikler ortalama, ortanca, yüzde dağılımı olarak sunulmuştur. İstatistiksel analiz olarak Pearson Ki-Kare, Fisher'in Kesin Testi, McNemar testi, Student T testi, Eşleştirilmiş T testi kullanılmıştır. Ortalamalar 'ortalama±standart sapma' şeklinde sunulmuştur. Tüm analizlerde istatistiksel anlamlılık düzeyi p= 0.05 olarak kabul edilmiştir.

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BULGULAR

Araştırma 36 hastanın katılımıyla yürütülmüştür. Katılımcıların yaş ortalaması 72±12.7 ve yaş ortancası 74.5 (min:43; maks:93)'tür. Katılımcıların 20'si erkek, 16'sı kadındır.

Hastaların tamamı AK tanısı ile PK işlemi yapılan hastalardır. Hastaların hastane yatış süreleri ve kateterlerinin takılı kalma sürelerinin dağılımı Tablo 2'de sunulmuştur. 36 hastanın 34'ü taşlı (kalküloz) kolesistit olup bu hastaların 21'ine PK işlemi sonrasında cerrahi yapılmıştır. Cerrahi yapılan 21 hastanın 20'si laparoskopik yöntemle, 1 kişi ise açık cerrahi ile opere edilmiştir. PK işlemi sonrası cerrahi yapılmayan hastaların hiçbirinde takip süresinde AK rekürrensi görülmemiştir.

Tablo 2: Hastaların kateter takılı kalma ve hastane yatış süreleri

Değişkenler	Süre (Ortalama ± Standart Sapma)
Kateter Kalma Süresi (gün)	50.2 ± 26.1
Hastane Yatış Süresi (gün)	7.5 ± 5.2

Çalışmamızda AST, ALT, ALP, GGT ve direkt bilirubin değerlerinin yüksek olduğu hasta sayısında işlem öncesi ve sonrasında istatistiksel olarak anlamlı fark saptanmamıştır. Total bilirubin değeri ve beyaz küre sayısı için ise işlem öncesi yüksek olup işlem sonrasında değerleri normale dönen hasta sayısında istatistiksel olarak anlamlı fark saptanmıştır (p<0.05) (Tablo 3a).

Tablo 3a: Perkütan kolesistostomi işlemi öncesi ve sonrası bazı biyokimya parametreleri normal ve yüksek olan hastaların karşılaştırmalı dağılımı

İşlem Öncesi Laboratuar Değerlerinin Normal ve Yüksek Olarak Hastalara Dağılımı **		**İşlem Sonrası Laboratuvar Değerleri**	
		Normal	Yüksek
		Sayı (Yüzde)	Sayı (Yüzde)
Total Bilirubin			
	Normal (21)	21 (100.0)	0
	Yüksek (15)	8 (53.3)	7 (46.7)
***p=0.008**			
Beyaz Küre Sayısı			
	Normal (9)	8 (88.9)	1 (11.1)
	Yüksek (27)	22 (81.5)	5 (18.5)
***p=0.001**			

Satır yüzdesi verilmiştir. *McNemar testi uygulanmıştır. ** Nümerik değerler hasta sayısı olarak verilmiştir

Biyokimya parametrelerinden AST ve GGT değerlerinin işlem öncesi ve sonrası değerleri arasında istatistiksel olarak anlamlı fark saptanmamıştır. İşlem öncesi ve sonrasında ortalama ALT değeri normal sınırlar içerisinde bulunmuş olup işlem sonrasında ALT değerlerinde istatistiksel olarak anlamlı düşüş saptanmıştır (p:0.041) (Tablo 3b). İşlem öncesi ve sonrasında ortalama ALP ve CRP değerleri normal sınırların üzerinde saptanmış olup işlem sonrasında bu değerlerde anlamlı düşüş gözlenmiştir (p<0.05) (Tablo 3b). Beyaz küre sayısı, total bilirubin ve direkt bilirubin ortalama değerleri işlem öncesi normal sınırın üzerindeyken işlem sonrasında anlamlı düşüş göstererek normal sınırlara gelmiştir (p<0.05) (Tablo 3b).

Tablo 3b: Perkütan kolesistostomi işlemi öncesi ve sonrası bazı biyokimya parametrelerinin karşılaştırılması	
Değişkenler	**Değer (Ortalama ± Standart Sapma)**
ALT	
İşlem Öncesi ALT	38.7 ± 58.8
İşlem Sonrası ALT	21.2 ± 20.6
ALP	
İşlem Öncesi ALP	201.5 ± 251.4
İşlem Sonrası ALP	139.8 ± 133.5
***p=0.014**	
CRP	
İşlem Öncesi CRP	159.3 ± 107.2
İşlem Sonrası CRP	53.7 ± 42.6
***p=0.001**	
Beyaz Küre Sayısı	
İşlem Öncesi Beyaz Küre Sayısı	14126 ± 5501
İşlem Sonrası Beyaz Küre Sayısı	8691 ± 2781
***p= 0.001**	
Total Bilirubin	
İşlem Öncesi Total Bilirubin	1.4 ± 1.6
İşlem Sonrası Total Bilirubin	0.7 ± 0.5
***p=0.004**	
Direkt Bilirubin	
İşlem Öncesi Direkt Bilirubin	0.6 ± 1.0
İşlem Sonrası Direkt Bilirubin	0.2 ± 0.2
***p= 0.010**	
* Eşleştirilmiş T Testi uygulanmıştır.	

Katater kalma süresine etki edebilecek faktörlerin analizinde, işlem sonrası semptomatik düzelme gösteren grubun kateter kalma süresinin semptomatik düzelme görülmeyen gruba göre istatistiksel olarak anlamlı ölçüde daha uzun olduğu bulunmuştur (p:0.027) (Tablo 4). Diğer değişkenler (cinsiyet, başvuruda komplike kolesistit varlığı, laboratuvar değerleri, yoğun bakıma alınma ya da kolesistektomi geçirme durumu) ile kateter kalma süresi arasında istatistiksel olarak anlamlı ilişki saptanmamıştır.

Tablo 4: Hastalarda semptomatik düzelme görülme durumu ile kateter kalma süresi arasındaki ilişki	
Değişken	**Kateter Kalma Süresi (Ortalama ± Standart Sapma)**
Semptomatik Düzelme Görülme Durumu	
Düzelme Görülenler (31)	54.0 ± 24.0
Düzelme Görülmeyenler (5)	26.6 ± 28.7
***p=0.027**	
*Student T testi uygulanmıştır.	

Çalışmada hastaların semptomatik düzelmesine etki edebilecek faktörler analiz edilmiştir. Buna göre cinsiyet, akut kolesistitin komplike ya da non-komplike olması, hastalık evresi ve komorbid hastalık sayısı ile semptomatik düzelme arasında istatistiksel olarak anlamlı ilişki saptanmamıştır.

Hastane yatış süresine etki eden faktörlere bakıldığında, yalnızca cinsiyet ile hastane yatış süreleri arasında istatistiksel olarak anlamlı ilişki olduğu dikkati çekmiştir (p:0.031). Erkeklerin hastane yatış sürelerinin daha uzun olduğu görülmektedir (Tablo 5).

Tablo 5: Hastane yatış süresine etki edebilecek bazı değişkenlerin analizi	
Değişkenler	Hastane Yatış Süresi (Ortalama ± Standart Sapma)
Cinsiyet	
Erkek (20)	9.1 ± 6.5
Kadın (16)	5.5 ± 1.8
***p=0.031**	
Başvuruda Komplike Kolesistit Varlığı	
Komplike Kolesistit (8)	11.7 ± 8.3
Komplike Olmayan Kolesistit (28)	6.3 ± 3.4
*p=0.110	
İşlem Öncesi AST	
Normal (30)	7.5 ± 5.4
Yüksek (6)	7.5 ± 4.7
*p=0.989	
İşlem Öncesi ALT	
Normal (31)	7.8 ± 5.5
Yüksek (5)	5.4 ± 2.3
*p=0.340	
İşlem Öncesi GGT	
Normal (17)	6.1 ± 2.8
Yüksek (19)	8.7 ± 6.6
*p=0.138	
İşlem Öncesi ALP	
Normal (19)	6.0 ± 2.7
Yüksek (17)	9.1 ± 6.8
*p= 0.095	
İşlem Öncesi Beyaz Küre Sayısı	
Normal (9)	9.7 ± 8.3
Yüksek (27)	6.7 ± 3.7
*p= 0.325	
*Student T testi uygulanmıştır	

Hastalarda yoğun bakım ihtiyacı oluşmasına etki edebilecek değişkenler incelendiğinde; hastaların TK evresi ile yoğun bakım ihtiyacı arasında istatistiksel olarak anlamlı ilişki olduğu görülmüştür (p:0.001). Yoğun bakımda tedavi gösteren tüm hastalar evre 3'tür (Tablo 6).

Tablo 6: Hastaların yoğun bakım ihtiyacı oluşmasına etki edebilecek değişkenlerin karşılaştırılması		
Değişkenler	**Yoğun Bakım İhtiyacı**	
	Yoğun Bakıma Girmeyenler	**Yoğun Bakıma Girenler**
	Sayı (Yüzde)	**Sayı (Yüzde)**
Cinsiyet		
Erkek	17 (85.0)	3 (15.0)
Kadın	14 (87.59	2 (12.5)
*p=0.610		
Başvuruda Komplike Kolesistit Varlığı		
Komplike olmayan kolesistit	25 (89.3)	3 (10.7)
Komplike kolesistit	6 (75.0)	2 (25.0)
*p=0.305		
Tokyo Kılavuzu Evresi		
Evre 1	9 (100.0)	0 (-)
Evre 2	22 (100.0)	0 (-)
Evre 3	0 (-)	5 (100.0)
µ p=0.001		
Cerrahi Olma Durumu		
Cerrahiye Gidenler	18 (85.7)	3 (14.3)
Cerrahi Yapılmayanlar	13 (86.7)	2 (13.3)
*p=0.990		
İşlem Öncesi ALP		
Normal	17 (89.5)	2 (10.5)
Yüksek	14 (82.4)	3 (17.6)
*p=0.650		
İşlem Öncesi Beyaz Küre Sayısı		
Normal	7 (77.8)	2 (22.2)
Yüksek	24 (88.9)	3 (11.1)
*p=0.581		
İşlem Öncesi Total Bilirubin		
Normal	20 (95.2)	1 (4.8)
Yüksek	11 (73.3)	4 (26.7)
*p=0.138		
Komorbid Hastalık Sayısı		
En fazla 1 hastalık	16 (88.9)	2 (11.1)
İki komorbid hastalık	8 (88.9)	1 (11.1)
3 ve üzeri komorbid hastalık	7 (77.8)	2 (22.2)
µ p=0.706		
Satır yüzdesi verilmiştir. *Fisherin kesin testi uygulanmıştır. µ: Pearson Ki-kare testi uygulanmıştır.		

Ayrıca yoğun bakıma alınan hastaların yaş ortalaması alınmayanlara göre anlamlı derecede yüksektir (p:0.033) (Tablo 7).

Tablo 7: Yoğun bakıma alınma durumuna hastaların yaşının etkisi	
Değişken	**Yaş (Ortalama ± Standart Sapma)**
Yoğun Bakıma Alınma Durumu	
Alınmamış (31)	70.1 ± 12.6
Alınmış (5)	83.2 ± 6.7
*p=0.033	
*Student-T testi uygulanmıştır.	

Çalışmada PK işlemi sonrasında hastaların cerrahiye gitme durumunu etkileyen faktörler incelenmiştir. Bu faktörler arasında yalnızca yaş ile cerrahiye gitme durumu arasında istatistiksel olarak anlamlı ilişki saptanmıştır (p:0.005). Cerrahi yapılmayan hastaların yaş ortalaması daha yüksektir (Tablo 8).

Tablo 8: Cerrahi olma durumuna hastaların yaşının etkisi	
Değişken	**Yaş (Ortalama ± Standart Sapma)**
Cerrahi Olma Durumu	
Cerrahiye Gidenler (21)	67.1 ± 12.4
Cerrahi Yapılmayanlar (15)	78.8 ± 10.1
*p=0.005	
*Student-T testi uygulanmıştır.	

TARTIŞMA

AK tanılı hastalarda PK işlemi; cerrahi için yüksek risk bulunuyorsa kesin tedavi yöntemi iken daha sonra cerrahi planlanan hastalarda ise cerrahiye kadar köprü tedavidir.9 PK işlemi genel olarak cerrahi açıdan yüksek risk taşıyan hastalarda endikedir.[10] Çalışmamızda AK tanısı ile PK uygulanan hastaların işlem sonrası cerrahiye gitme oranı %58.3 (21/36) dür. Bu oran J. Bundy ve arkadaşlarının 324 hastayla yaptığı çalışmada %29.6, Joseph ve arkadaşlarının çalışmasında %25.5, Diamond ve arkadaşlarının yaptığı çalışmada ise %16.4 şeklindedir.11 Dolayısıyla çalışmamızda hastalarda cerrahiye gitme oranının literatürle kıyaslandığında daha yüksek olduğu görülmektedir. Öte yandan literatürdeki çalışmalar hastaların cerrahiye gitmesi açısından genç yaşın prediktif bir faktör olduğunu işaret etmektedir.12–14 Bu durum çalışmamızdaki hastaların yaş ortalamasının (72) bahsedilen 3 çalışmaya oranla düşük olabileceğini düşündürse de diğer çalışmalardaki yaş ortalamasının (sırasıyla 67; 66; 65.9) daha düşük olduğu görüldü. Cooper ve arkadaşlarının yaptığı çalışmada, PK işlemi sonrasında hastaların cerrahiye gitmesi açısından literatürde bilinen tek anlamlı prediktif faktör genç yaş olarak bildirilmiştir.12 Pang ve arkadaşlarının yaptığı çalışmada ise hastaların cerrahiye gitmesi açısından prediktif faktörler incelenmiş; genç yaş, kısa süreli hastane yatışı ve yatışı sırasında yoğun bakım ihtiyacının olması gibi durumlarda cerrahiye gitme ihtimalinin arttığı; ileri yaş ve respiratuvar komorbidite varlığında ise azaldığı gösterilmiştir .13 PK uygulanıp cerrahiye giden ve gitmeyen hastaları karşılaştıran güncel bir çalışmada ise cerrahi yapılmayan gruptaki hastalarda daha ileri yaş, daha fazla komorbidite, daha yüksek Tokyo evresi ve karaciğer fonksiyon testleri saptanmıştır.14 Çalışmamızda PK sonrasında hastaların cerrahiye gitmesi açısından prediktif faktörler incelenmiş olup diğer 3 çalışma ile benzer şekilde PK sonrasında cerrahiye gitmeyen hastaların yaş ortalamasının daha yüksek olduğu görülmüştür.

PK sonrasında evre 2 hastalarda elektif, evre 3 hastalarda erken dönem ya da elektif cerrahi yapılmakta ve laparoskopik cerrahi açık tekniğe oranla daha yaygın olarak kullanılmaktadır.[2,6] Pang ve arkadaşlarının yaptığı çalışmada PK uygulanan 71 hastada cerrahiye giden hasta sayısının 32 (%45.1) olup bunların 21'i (21/32) laparoskopik 11'i (11/32) açık cerrahi geçirmiştir. Bu çalışmada, ayrıca cerrahiye giden tüm hastaların 6'sına (6/32) ilk başvuruda erken dönem cerrahi yapılırken kalan 26 hastaya (26/32) elektif cerrahi yapılmıştır.[13] Bizim çalışmamızda ise cerrahiye giden hastaların 19'unda (19/21) elektif cerrahi planlanırken yalnızca başvuru anında SK perforasyonu nedeniyle perikolesistik apse (8 cm ve 7 cm çaplarında) bulunan 2 (2/21) hastaya yatışı sırasında cerrahi (yine laparoskopik

teknikle) uygulanmıştır. Dolayısıyla hastalarımızda hem laparoskopik hem de elektif cerrahi oranının Pang ve arkadaşlarının yaptığı çalışmaya oranla daha yüksek olduğu görülmektedir. Bizim çalışmamızdaki hastaların cerrahi öyküleri incelendiğinde yalnızca 1 hastamıza açık cerrahi uygulandığı görülmüştür. Bu hasta ilk başvuru anında SK tümörü ön tanısı ile operasyona alınmış, frozen biyopsi sonucu malignite ile uyumlu gelmeyince operasyon sonlandırılarak hasta PK işlemi için tarafımıza yönlendirilmiştir. Hastaya PK kateteri takıldıktan 45 gün sonra açık cerrahi uygulanmıştır. Cerrahi sonrasında hastanın patoloji sonucu yine malignite ile uyumlu gelmemiştir.

PK, 2018 TK'ya göre evre 2 ve 3 hastalar için endikedir. Evre 1 hastalarda cerrahi açısından yüksek riskli değilse PK endikasyonu bulunmamaktadır.[6] Çalışmamızda evre 1 olup PK uygulanan hasta sayımız 9 (%25)'dur. Bu hastaların büyük kısmı (6/9) ASA-3 sınıfında (American Society of Anaesthesiologists Classification) sebebiyle cerrahi yapılamadığı için PK uygulanan hastalardan oluşmaktadır. Evre 1 olan diğer 3 hastadan; 1 hastaya herpes enfeksiyonu nedeniyle cerrahi yapılamamış, diğer 2 hastaya ise cerrahi kliniğinin kararı ile PK uygulanmıştır. Hastalarımızın 22 tanesinde (%61.1) evre 2 AK bulunmaktadır. Evre 2 hastaların 7'si (7/22) 18.000/mm3 üstü lökosit, kalanlar ise diğer kriterler sebebiyle bu evrede değerlendirilmiştir. Çalışmamızda hastaların TK'ya göre evresi ile yoğun bakım ihtiyacı arasında istatistiksel olarak anlamlı fark saptanmış olup yoğun bakımda tedavi gören tüm hastalar evre 3'tür. Aynı zamanda yoğun bakım ihtiyacı olan hastaların yaş ortalaması olmayanlara göre yüksek bulunmuştur.

PK işlemi için hastalarımızın çoğunluğunda (34/36; %94.4) transhepatik yaklaşım seçilmiş olup yalnızca 2 hastada kateter transperitoneal yaklaşım ile takılmıştır. Bu hastalarda ise birinde uygun giriş yolu bulunamaması, diğer hastada ise giriş yolu üzerinde 8 cm çapında apse olması nedeniyle transhepatik yol seçilememiştir. Transperitoneal yol seçilen her 2 hastada da PK işlemiyle ilişkili komplikasyon görülmemiştir. Literatürde de transhepatik yaklaşımın daha sık olarak kullanıldığı görülmektedir.[15] Sanjay ve arkadaşları ise safra kesesinin belirgin distandü olduğu, batın duvarı ile ilişkili hale geldiği ya da transhepatik yaklaşımın zor olduğu durumlarda transperitoneal yaklaşımın kullanılması gerektiğini önermişlerdir.[16] Horn ve arkadaşlarının yaptığı çalışmada transhepatik yaklaşımda AK rekürrensinin diğer yaklaşıma oranla daha düşük olduğu saptanmış olup, bu iki teknik arasında komplikasyon açısından fark olduğu ilk defa bu çalışmada bildirilmiştir.[15] Çalışmamızda uyguladığımız PK işleminde çoğunlukla (36 hastanın 34'ü) transhepatik yaklaşım ile yeterli karaciğer parankimi geçilerek safra kesesine ulaşılmış ve safra kesesinin karaciğere yapışık yüzünden safra kesesi lümenine ponksiyon yapılmıştır. PK işlemi için çoğunlukla transhepatik yaklaşımı seçmemizin hastalarda rekürrens görülmemesine, kateterin çıkartılması sonrası safra fistülü izlenmemesine ve hastaların klinik düzelmesine katkısı olduğunu düşünmekteyiz.

PK işlemi sonrasında kateterin görüntüleme ile kese lümeninde olduğunun gösterilmesi işlemin teknik olarak başarılı olduğunu gösterir. Literatürde bu oranın %90'ın üzerinde olduğu belirtilmiştir[17] SK lümeninin küçük olması, kalınlaşmış SK duvarı ve porselen SK durumunda işlemin teknik başarısı düşmektedir.[17] Çalışmamızda PK işlemi sırasında Chiba iğne ile safra kesesinden örnek alınmış; işlem sonrasında USG ile kontrol görüntüleme yapılmış ve kateter yerleştirildikten sonra drenaj kontrol edilmiştir. Bunların sonucunda kateterin kese lümeninde olup olmadığı işlem raporunda belirtilmiştir. Buna göre tüm hastalarımızda işlem sonrasında kateterin SK lümeninde olduğu belirtilmiş olup teknik başarımız %100 olarak saptanmıştır.

Hastalara uygulanan PK işlemi sonrası hasta yönetiminde; yapılması planlanan cerrahinin zamanlaması ya da kateterin kalma süresi ile ilgili yüksek kalitede bilimsel kanıt sunan randomize klinik çalışma bulunmamaktadır.[10] PK kateteri takıldıktan sonra cerrahiye erken dönem ve geç dönem giden hastaları karşılaştıran birkaç literatür bu-

lunmaktadır. Bu literatürlerden birkaçında erken dönem cerrahi uygulanan hastalarda kanama oranı ve hastanede kalma süresinin uzun olduğu gösterilmiştir.[18,19] Diğer bir literatürde ise erken ve geç dönem cerrahiye giden hastalar arasında komplikasyon, cerrahi türü (açık ya da laparoskopik), hastanede kalma süresi ve laparoskopik cerrahiden açık cerrahiye dönme oranları arasında anlamlı fark bulunmamıştır.[20] Ancak tüm bu literatürlerde hastaları erken ve geç dönem olarak ayıran süre farklılık göstermektedir. Inoue ve arkadaşlarının yaptığı retrospektif çalışmada PK işlemi ile cerrahi arasında geçen süre için cut-off değer 216 saat olarak bulunmuş, bu süreden daha önce cerrahiye giden hastalarda komplikasyon oranının ve cerrahinin teknik zorluğunun daha yüksek olduğu saptanmıştır.[21] Çalışmamızdaki hasta grubumuzda kateter kalma süresi ortalama 50 gün olarak bulunmuştur. Bu süre J. Bundy ve arkadaşlarının çalışmasında 89 gün, Tullius ve arkadaşlarının çalışmasında ise 64 gün şeklindedir. J. Bundy ve arkadaşları, diğer literatüre kıyasla daha uzun kateter kalma sürelerini kliniklerinde kolesistoskopi eşliğinde taş ekstraksiyonu (kolesistolitotomi) uygulama sıklığının daha fazla olmasına bağlamışlardır. Çalışmada kolesistolitotomi işleminin ilk başta büyük boyutlu kateter uygulamasını gerektirdiği ve işlem sonrası safra kaçağını önlemek için aynı trakta daha küçük çaplı ardışık kateterler yerleştirilmesinin kateter kalma süresini uzattığını belirtmişlerdir.[11] Bizim çalışmamızda literatürdeki diğer 2 çalışmaya göre kateter kalma süresinin kısa olması; merkezimizde kolesistolitotomi uygulanmaması ve hastalarımızda cerrahiye gitme oranlarının literatüre göre yüksek olması ile bağdaştırılabilir. Ayrıca çalışmamızda, kateter kalma süresi semptomatik düzelme gösteren hastalarda daha uzun bulunmuştur. Bunun sebebinin semptomatik düzelme olmayan hastaların, hastane yatışı sırasında cerrahiye gitmesi ve kateterin cerrahi sırasında çekilmesi olduğu düşünülmüştür. Cerrahiye gitmeyen hastalarda PK kateterinin çıkarılması komplikasyonlara neden olabilmektedir. Safra kaçağı olması durumunda safra peritoniti ve sepsis gelişebilir. Dolayısıyla safra kaçağını önlemek için PK kateterinin trakt maturasyonu gerçekleştikten sonra çıkarılması kritik öneme sahiptir. Trakt maturasyonu için gereken minimum süre transhepatik yaklaşım için 2 hafta, transperitoneal yaklaşım için 3 hafta olarak belirtilmektedir.[22] Ayrıca kontrolsüz diyabet, uzun dönem steroid tedavisi, malnütrisyon, asit varlığı veya trakt enfeksiyonu gibi durumlarda trakt matürasyonu gecikeceği için PK kateterinin daha uzun süre kalması tavsiye edilmektedir.[23] Çalışmamızda PK kateteri 2 haftadan önce çekilen 2 hasta bulunmakta olup bu iki hastanın da kateteri cerrahi sırasında çekilmiştir. Bu hastalar komplike AK (perfore SK) ile başvurmuş olup PK işlemi sonrasında semptomatik düzelme göstermedikleri için cerrahiye alınmışlardır.

PK kateterinin işlem sonrasında erken dönem (ilk 7 gün) veya geç dönemde (7 günden sonra) çekilmesinin etkilerini karşılaştıran bir çalışmada erken dönem çekilen hasta grubunda komplikasyon oranının yüksek olmadığı ancak rekürrensin yüksek olduğu gösterilmiştir.[10]

PK işlemi sonrasında gelişen komplikasyonlar minör (kateterin yerinden çıkması, minör kanama, pnömotoraks, apse gelişimi, barsak perforasyonu ve safra kaçakları) ve majör (işlemle ilişkili mortalite, sepsis ve transfüzyon gerektiren kanama) olarak 2 sınıfa ayrılırken, minör komplikasyonlar daha sık görülmektedir.[24] Literatürlerde bildirilen minör komplikasyon yüzdeleri sırası ile 2.5; 4.7; 1.7 ve 0.9 şeklindedir.[25–27,11] Cooper ve arkadaşlarının yaptığı çalışmada ise 30 hastanın 16'sında (%53) komplikasyon bildirilmiş olup komplikasyonlarının çoğu kateterin safra kesesinden çıkması şeklindedir.[12] Winbladh ve arkadaşlarının yaptığı sistematik derlemede toplam 35 çalışmada kateterin yerinden çıkma oranı %8.57 olarak belirlenmiştir. Yine bu derlemede toplam 44 çalışmanın verilerine göre %6.[24] hastada en az bir komplikasyon bildirilmiş, ancak bildirilen komplikasyon türleri ve oranlarında çalışmalar arasında büyük farklılıklar olduğu da vurgulanmıştır.[28] PK işlemiyle ilişkili morbidite oranının literatürde %8 ile %44 arasında değişiklik gösterdiği ve bunların çoğunlukla kateter malpozisyonu, kateter çıkması, intrakolesistik hemoraji ve daha nadiren safra kaçağı ile sonuçlanan safra yolu hasarından

kaynaklandığı belirtilmiştir.[16,29] Pang ve arkadaşlarının 71 hasta ile yaptığı retrospektif çalışmada PK uygulanan 29 hastada mortalite belirtilmiştir.[13] Bizim çalışmamızda P.K ile ilişkili mortalite ve majör komplikasyon görülmemiştir. Yalnızca bir hastamızda (%2.8) minör komplikasyon olarak kontrol USG incelemesinde subkapsüler yerleşimli 8 cm çaplı bilioma saptanmıştır. Hastanın biliomaları kliniğimizde drenaj kateteri ile tedavi edilmiş olup bu hastanın takip süresi 40 aydır.

AK'nın kesin tedavisi etiyolojisine bağlı olarak değişir. AAK için çoğu görüş PK işlemi sonrasında rekürrensin nadir olduğu ve PK sonrasında cerrahinin gerekli olmadığı şeklindedir. Akut taşlı kolesistit için ise Tokyo kılavuzları medikal tedavi ve PK işlemi sonrasında rekürrens oranlarını azalttığı için cerrahiyi önermektedir.[13,6]

Çalışmamızda PK kateteri takılan hastalarda rekürrense rastlanmadı. Cooper ve arkadaşları PK kateteri ile taburcu edilen 24 hastanın 5'inde (%21) rekürrens olduğunu belirtmişlerdir. Ayrıca bu çalışmada literatürdeki rekürrens %4-41 aralığında bildirilmiştir.[12] Pang ve arkadaşlarının 71 hasta ile yaptığı retrospektif çalışmada median 62 günlük takipte 7 hastada (%11.9) rekürrens izlendiği belirtilmiştir. Bu çalışmada rekürrens için prediktif faktör olarak tanı anındaki serum ALP yüksekliği gösterilmiştir.[13] Horn ve arkadaşları ise PK kateteri üzerinden antegrad kolanjiografi yapılan hastalarda duodenuma kontrast geçişi olan hastalarda geçiş olmayan gruba göre rekürrens oranının daha düşük olduğunu göstermişlerdir.[15] Ayrıca bazı yayınlarda PK kateteri çekilen hastalarda, kolelitiazisin takipte rekürrense yol açtığı gösterilmiş olup tek başına PK işleminin bu hastalarda tedavi edici olmayabileceği vurgulanmıştır.[9]

PK potansiyel olarak cerrahi adayı olan hastalarda cerrahiye kadar AK atağının iyileşmesi sürecinde köprü tedavi veya cerrahi uygulanamayacak hastalarda kesin tedavidir.[10] Hasbahçeçi ve arkadaşları cerrahiye gidebilecek olan hastalarda PK kateterini cerrahi zamanına kadar yerinde bırakıp cerrahi sırasında çıkarmanın rekürrensi önlemede etkili olabileceğini belirtmişlerdir. Yaptıkları çalışmada PK sonrasında elektif kolesistektomi geçiren ve kateterleri cerrahi sırasında çekilen hastalarda rekürrens olmadığını göstermişlerdir.[30] Bizim çalışmamızda kolesistektomiye giden hastaların tamamında kateter cerrahi sırasında çekilmiş ve bu çalışma ile benzer şekilde rekürrens görülmemiştir.

SIR (Society of Interventional Radiology) kalite geliştirme kılavuzunda PK işleminin klinik başarısı ağrının gerilemesi; ateş, beyaz küre ve CRP'nin normal değerlere dönmesi şeklinde belirtilmiştir.[17] Winbladh ve arkadaşlarının yaptığı sistematik literatür taramasında PK işleminin klinik başarısı %85.6 olarak gösterilmiştir.[28] Ayrıca PK işleminin yapılması ile klinik düzelme arasındaki ortalama zaman 3 gün olarak belirtilmiştir.[17] Çalışmamızda PK işlemi sonrasında 31 hastamızda (%86.1) semptomatik düzelme olduğu görülmüş olup bizim çalışmamız da Winbladh ve arkadaşlarının çalışması ile benzerlik göstermektedir. Takipte semptomatik düzelme göstermeyen 5 hastadan 4'ü cerrahiye giderken, 1 hasta mükerrer başvurularında ağrı ve lökositozun devam etmesi üzerine destek tedavisiyle takip edilmiş ve sonrasında klinik düzelme kriterlerini karşılayınca kateteri çekilmiştir. Hastalarımızda kateter kalma süresi semptomatik düzelme gözlenmeyen grupta düzelme gösteren gruba göre daha kısa olarak bulunmuştur.

Literatürde PK uygulanan hastalarda başvuru anındaki karaciğer fonksiyon testleri ve total bilirubin seviyesi yüksekliğinin klinik sonuçlara etkisini araştıran birkaç yayın bulunmaktadır. Joseph ve arkadaşları bu değerlerdeki yüksekliğin kötü klinik sonucu işaret ettiğini belirtirken, Sosna ve arkadaşları bu değerler ile klinik sonuç arasında anlamlı ilişki bulamamışlardır.[31,26] Kaya ve arkadaşları başvuru anında ortalama beyaz küre sayısını 15686/mm3, CRP değerini 97 mg/dl olarak bulmuşlar, ancak AK rekürrensi ile başvuru anındaki değerler arasında anlamlı ilişki gözlemlememişlerdir.[32] Çalışmamızda hastaların başvuru anındaki laboratuvar değerlerinin; kateter kalma süresi, hastane yatış süresi, yatış süresince yoğun bakım ihtiyacı

ve hastanın cerrahiye gitme durumu gibi değişkenler üzerine etkisini araştırıldı. Ancak laboratuvar değerleri ile bu değişkenler arasında anlamlı ilişki gösterilemedi.

PK işleminin laboratuvar parametrelerine etkisini araştıran kısıtlı miktarda literatür bulunmaktadır. Viste ve arkadaşlarının çalışmasında CRP değerlerine PK işlemi öncesi, 2. gün ve 4. gün bakılmış; değerler sırası ile ortalama 263, 124 ve 48 bulunmuş olup CRP değerinde belirgin azalma olduğu belirtilmiştir.[33] Yıldırım ve arkadaşları PK işlemi öncesi ve işlemden 72 saat sonrasındaki beyaz küre sayısını karşılaştırmış; beyaz küre sayısının hastaların %73'ünde başvuru anında yüksek, 72. Saatte ise %86'sında normal olduğunu göstermişlerdir. Çalışmada beyaz küre sayısı işlem sonrasında yüksek kalan hastaların çoğunluğunda perikolesistik apse (komplike kolesistit) olduğu saptanmıştır.[34] Noh ve arkadaşlarının AAK tanılı 271 hasta ile yaptığı çalışmada işlemden sonraki 4. günde beyaz küre sayısının ortalama 13.200'den 9900'e, CRP değerinin ise ortalama 13.8'den 10.2'ye gerilediği belirtilmiştir.[35] Çalışmamızda, hastaların ortalama beyaz küre sayıları ve CRP değerleri işlem öncesinde sırasıyla 14126 (± 5501) ve 159.3 (± 107.2) iken; işlem sonrasında beyaz küre sayıları normale dönmüş (8691 ± 2781), CRP değerleri ise 53.7'ye (± 42.6) düşmüştür (Tablo 3b). PK işlemi sonrası beyaz küre sayıları ve CRP değerlerinde istatistiksel olarak anlamlı düşüş olduğu saptanmış olup çalışmamızdaki bulgular literatür bulguları ile paralellik göstermektedir. Ayrıca beyaz küre sayısı yüksek olan hasta sayısında işlem öncesine göre (22 hasta, %81.5) işlem sonrasında (5 hasta, %18.5) anlamlı düşüş saptanmıştır (Tablo 3a). PK işlemi öncesinde hastalarımızın 6 tanesinde (%16.7) ateş izlenirken işlem sonrasında hiçbir hastada ateş gözlenmemiştir. Çalışmamızda PK'nın karaciğer fonksiyon testleri ve kolestaz enzimleri üzerine etkisi de araştırılmıştır. ALT, ALP, total ve direkt bilirubin değerlerinde işlem sonrasında anlamlı düşüş olduğu gösterilmiştir. Ortalama değerlerinde işlem sonrasında düşüş olduğu saptanan bu parametrelerden ALT işlem öncesinde ve sonrasında normal sınırlarda; ALP işlem öncesi ve sonrasında normalden yüksek; total ve direkt bilirubin ise işlem öncesi normalden yüksek iken işlem sonrasında normal sınırlarda izlenmiştir (Tablo 3b).

Çalışmanın sınırlılıkları aşağıda sıralanmıştır:

- PK işlemi sonrasında bazı hastaların fizik muayene bulgularına hasta dosyalarından ulaşılamamıştır. Bu nedenle semptomatik düzelme hastaların klinik seyirlerinde "hastanın ağrısında düzelme/gerileme" şeklinde not edildiğinden klinik düzelme kriteri olarak yalnızca karın ağrısındaki gerileme kabul edilmiştir.
- Sadece 22 hastada işlem öncesi ve sonrasında CRP değerlerine ulaşılabilmiştir.

SONUÇ

PK işleminin AK tedavisindeki yeri ve klinik sonuçlarını araştıran çalışmamızda; işlemin teknik başarısı %100 olarak saptandı ve ayrıca hastalarda takip süresinde rekürrens gözlenmedi. Hastalarımızda PK kateterinin kalma süresinin, literatürdeki birkaç yayın ile karşılaştırıldığında daha kısa olduğu görüldü. Bu durumun çalışmamızda PK işlemi sonrası cerrahiye giden hasta oranının literatüre göre yüksek olması ile ilişkili olabileceği göz önünde bulunduruldu. Ayrıca daha genç hastaların cerrahiye gitme oranının literatürle paralellik gösterecek şekilde daha yüksek olduğu görüldü. Çalışmamızda ayrıca PK kateterinin kalma süresinin semptomatik düzelme göstermeyen grupta daha kısa olduğu görüldü. Semptomatik düzelme göstermeyen hasta grubunun çoğunluğunda cerrahiye gidilmesi ve kateterin cerrahi sırasında çekilmesinin buna sebep olabileceği düşünüldü. Ancak hem kateter kalma süresi hem de bu iki değişken arasındaki ilişkiyi araştıran az sayıda literatüre rastlandığından bu konuda daha fazla çalışmaya ihtiyaç vardır. Hastaların laboratuvar değerleri; bu değerlerin yüksek/normal oluşu ve yüksek/normal olduğu hasta sayıları açısından, işlem öncesi ve sonrası olarak karşılaştırılarak sonuçlar ortaya konuldu. PK işleminin laboratuvar değerleri üzerine etkisini araştıran kısıtlı miktarda literatür bulunduğundan ortaya konulan sonuçların desteklenmesi açısından daha fazla çalışmaya ihtiyaç vardır.

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ARAŞTIRMA MAKALESİ / *Research Article*

Radyoloji Penceresinden Erişkin Kraniofarengiomalar

Craniopharyngioma in Adults: Radiologic Overview

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Öz

Amaç Erişkin kraniofarengiomaların bilgisayarlı tomografi (BT) ve manyetik rezonans görüntüleme (MRG) bulguları üzerinden, radyolojik özelliklerini ortaya koymak ve sellar – parasellar lezyonlardan ayırıcı tanısına katkıda bulunmak amaçlanmıştır.

Yöntem ve Gereçler 2005 – 2022 yılları arasında, histopatolojik açıdan "kraniofarengioma" tanısı doğrulanmış, erişkin hastalar merkezimiz veri tabanı üzerinden retrospektif olarak taranmıştır. Görüntüleme analizinde tümör boyutu, şekli, kalsifikasyon varlığı ve tipi, topografik ve morfolojik (kistik-solid) özellikleri, kistik ve solid komponentlerin radyolojik karakteristikleri ve olası hidrosefali varlığı değerlendirilmiştir.

Bulgular 2005 ve 2022 yılları arasında, çalışma kriterlerine uyan 12 olgu tespit edilmiş olup, çalışma grubunda erkek dominansisi (2/1) izlenmiştir. Görüntüleme analizinde, kraniofarengioma lezyonlarının sıklıkla lobüle kontürlü olduğu (%75) ve yüksek oranda kalsifikasyon gösterdiği (%63.6) tespit edilmiştir. Lezyonların topografik değerlendirilmesinde en sık yerleşimin sellar-suprasellar psödo 3V tip (%41.7) olduğu saptanmıştır. Çalışma grubundaki olguların tamamında kistik komponent tespit edilmiş olup; lezyonların kistik komponenti MRG incelemelerinde T1AG'de sıklıkla izointens (%41.7), T2AG'de ise olguların önemli bir kısmında (%91.7) hiperintens sinyal özelliği gösterirken, lezyonların solid komponenti T1AG'de ağırlıklı olarak izo-hafif hipointens (%91.7), T2AG'de ise sıklıkla izo-hafif hiperintens (%66.6) olarak izlenmiştir. Post-kontrast serilerin değerlendirilmesinde tüm olgularda (%100) kontrast tutulumu saptanmıştır. Lezyonların solid komponentlerinde en sık retiküler paternde kontrastlanma izlenirken (%55.6), kistik komponentlerde kapsüler kontrastlanmanın sıklıkla (%72.7) ince düzgün, lineer rim tarzında olduğu dikkati çekmiştir. Ayrıca kraniofarengioma lezyonlarına, olguların %16.7'sinde nonkomminikan hidrosefalinin eşlik ettiği tespit edilmiştir.

Sonuç Erişkin kraniofarengiomaların radyolojik özellikleri lezyonun natürüne göre değişkenlik gösterebilmektedir. Kalsifikasyon varlığı, sellar – parasellar lezyonlar arasında kraniofarengiomayı öne çıkaran değerli bir radyolojik bulgudur.

Anahtar Kelimeler Kraniofarengioma; Rathke poşu tümörü; Bilgisayarlı tomografi; Manyetik rezonans görüntüleme; Nöroradyoloji.

Abstract

Introduction *To reveal the radiological features of craniopharyngioma in adults by computed tomography (CT) and magnetic resonance imaging (MRI) findings and to contribute to the differential diagnosis of sellar – parasellar lesions.*

Materials and Methods *From 2005 to 2022, adult patients who had histopathologically confirmed "craniopharyngioma" diagnoses were enrolled from the institutional database retrospectively. In the imaging analysis, tumor size, shape, presence, and type of calcification, topographic and morphological (cystic-solid) features, radiological characteristics of cystic and solid components, and possible hydrocephalus were evaluated.*

Results *Between 2005 and 2022, twelve patients who had male dominance (2/1), met the study criteria. In the imaging analysis, craniopharyngiomas had frequently lobulated contours (75%) and showed a high rate of calcification (63.6%). The most common localization was the sellar-suprasellar pseudo 3V type (41.7%) in the topographic evaluation. In the MRI examinations, the cystic component of the lesions, which was detected in all the cases in the study group, was frequently isointense (41.6%) on T1W-images and hyperintense (91.7%) on T2W-images; while the solid component of the lesions was predominantly iso-slightly hypointense (83.3%) on T1W-images and iso-slightly hyperintense (66.6%) on T2W-images. Contrast enhancement was detected in all cases (100%). Reticular enhancement was the most common (55.6%) enhancement pattern in the solid components; while capsular enhancement in cystic components was frequently (72.7%) in the form of a thin, smooth, linear rim enhancement. Besides, non-communicating hydrocephalus accompanied craniopharyngioma in 16.7% of the cases.*

Conclusion *The radiological features of craniopharyngioma in adults may vary according to the nature of the lesion. The presence of calcification is a valuable radiological finding that highlights craniopharyngioma among sellar – parasellar lesions.*

Keywords *Craniopharyngioma, Adult; Rathke Pouch Tumor; Computed tomography; Magnetic resonance imaging, Neuroradiology.*

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GİRİŞ

Kraniofarengiomalar, nadir görülen, yavaş büyüyen, Rathke kleft epitelinden köken alan, benign natürlü, WHO grade 1 tümörlerdir.[1] Sellar, ya da suprasellar yerleşim gösterirler. Bu tümörler, hipotalamus-hipofiz aksının herhangi bir yerinden kaynaklanabilse de en sık infindibulum ve/veya tuber sinereumu içerisine alan 3. ventrikül tabanından köken almaktadır.[2]

Kraniofarengiomalar ile ilişkili semptomlar arasında baş ağrısı gibi nonspesifik bulgular yanı sıra, görme defektleri, endokrinopatiler ve kognitif bozukluklar yer almaktadır.[1-3] Sellar ve parasellar bölge, bir dizi neoplastik, enfeksiyöz, inflamatuar, gelişimsel ve vasküler patolojilerin ortaya çıkabileceği anatomik olarak karmaşık bir alandır. Bu lezyonların çoğu hipofiz adenomlarının klinik, endokrinolojik ve radyolojik görünümlerini taklit edebildiğinden, farklı etiyolojiler arasında ayrım yapmak her zaman kolay olmayabilir.[4,5]

Yüksek yumuşak doku çözünürlüğü nedeniyle manyetik rezonans görüntüleme (MRG) lezyonun lokalizasyonu ve yaygınlığı hakkında ayrıntılı bilgi sağlar. Bu nedenle, yapısal lezyonları dökümente etmek veya dışlamak için mevcut en önemli görüntüleme tekniğidir. Bilgisayarlı tomografinin (BT) önemi, MRG'nin görece zayıf kaldığı olası kalsifikasyonların tanımlanması ve kafa tabanındaki kemik yapıların değerlendirilmesinde ortaya çıkmaktadır.[6]

Bu çalışmada, BT ve MRG bulguları ışığında, erişkin dönemde farklı radyolojik karakteristikler gösterebilen ve aynı bölgeden kaynaklanabilen diğer yer kaplayıcı lezyonlar ile karışabilen kraniofarengiomaların ayırıcı tanısına katkıda bulunabilecek radyolojik özelliklerin ortaya konulması amaçlanmıştır.

GEREÇ ve YÖNTEMLER

2005 – 2022 yılları arasında, görüntüleme bulguları yanı sıra histopatolojik olarak 'kraniofarengioma' tanısı verifiye edilmiş, 18 yaşından büyük olgular hastanemiz veri tabanı üzerinden retrospektif olarak taranmıştır. Çalışmamız, kurumsal etik kurul tarafından onaylanmıştır.

Bu olguların preoperatif hipofiz/kranial BT ve preoperatif kontrastlı hipofiz/kranial MRG görüntüleri hastanemiz PACS sistemi (Sectra Workstation IDS7, Linköping, İsveç) üzerinden olguların klinik bilgilerine kör iki radyolog tarafından değerlendirilmiştir. Olguların cinsiyet ve yaş bilgileri, başvuru şikayetleri ve lezyonların histopatolojik alt tip verileri kaydedilmiştir.

Çalışma grubunda lezyonların; boyutu, şekli, morfolojisi, topografisi, kistik-solid ve septal komponentlerin prekontrast T1-ağırlıklı görüntüleri (T1AG), T2-ağrlıklı görüntüleri (T2AG), postkontrast T1AG'de sinyal özellikleri ve eşlik eden olası hidrosefali varlığı 1.5 Tesla (SIGNA Explorer, GE Medical Systems; MAGNETOM Aera, Siemens) veya 3.0 Tesla (Ingenia, Philips) MRG cihazlarında elde olunmuş hipofiz/kranial MRG incelemeleri üzerinden değerlendirilmiştir. Olguların BT analizinde, lezyonların olası kalsifik komponenti, septa varlığı ve solid-kistik komponentlerin dansite özellikleri değerlendirilmiştir. Kalsifik komponent; periferal rim şeklinde kalsifikasyon, periferal punktat kalsifikasyon ve distrofik kalsifikasyon olmak üzere olarak üç grupta incelenmiş olup, değerlendirme preoperatif kranial BT tetkikleri üzerinden yapılmıştır. Kontrast ajan ve lezyonun olası kalsifik komponenti dansite ölçümünü etkileyeceğinden, dansite analizi kontrastsız BT incelemeleri üzerinden, kalsifik komponent hariç tutularak yapılmıştır.

Kraniofarengioma tümör volümü MRG kesitleri üzerinden klasik formülle üç planda (anterior-posterior, medial-lateral, superior-inferior) en uzun eksende milimetre (mm) cinsinden ölçüm yapılarak 0.5 ile çarpılıp (APxMLxSIx0.5) mililitre (ml) cinsinden hesaplanmıştır. Lezyon şekli ise yuvarlak, oval ve multilobüle olarak üçe ayrılmıştır. Lezyonların morfolojik özellikleri kistik, predominant kistik, mikst (kistik/solid), predominant solid ve solid tip olarak sınıflandırılmıştır. Ağırlıkla kistik olup mural nodül

içeren lezyonlar da predominant kistik lezyon kategorisinde değerlendirilmiştir. Septa varlığı sayısına (monosepta: 1, oligosepta: 1-3, multisepta: >3) ve lineer ya da nodüler kontrastlanma özelliğine göre sınıflandırılmıştır. Lezyon kontrastlanma paterni kapsül ve solid komponent olarak ikiye ayrılmış olup; kapsül kontrastlanması lineer ve düzensiz olmak üzere iki grupta, solid komponent kontrastlanma paterni ise minimal heterojen kontrastlanma, retiküler kontrastlanma ve homojen kontrastlanma olarak üç grupta incelenmiştir. Lezyonların topografik özellikleri ise Prieto ve ark. tarafından tanımlanan 5 ana gruba göre7 (sellar-suprasellar, psödointraventriküler, sekonder intraventriküler, infindibulo-tuberal ve tamamıyla intraventriküler) değerlendirilmiştir.

Görüntüleme analizi esnasında, kantitatif verilerin ölçümünde araştırmacılar arasında uyumun incelenmesi için IBM SPSS Statistics 23 programından yararlanılmış olup, bu amaçla 'Intraclass correlation coefficient (ICC)' değeri hesaplanmıştır. Kalitatif parametrelerin değerlendirilmesinde araştırmacılar arasında fikir ayrılığı yaşanan durumlar uzlaşma ile sonuca bağlanmıştır.

BULGULAR

2005 – 2022 yılları arasında kliniğimizde 'kraniofarengioma' tanısı ile takip ve tedavi edilen 14 erişkin hasta bulunmakla birlikte, iki olgu histopatolojik olarak doğrulanamadığından çalışma grubundan çıkarılmıştır. Ayrıca, bir olgunun preoperatif BT incelemesi bulunmadığından BT tetkiki ile kalsifikasyon değerlendirilmesi 11 hasta üzerinden ve yine bir olgunun da preoperatif BT incelemesi kontrast madde enjeksiyonu sonrası elde olunduğundan, dansite analizi 10 olgu üzerinden yapılmıştır. Bunların dışında, bir hastanın da başvuru anındaki anamnez bilgilerine hastanemiz veri tabanı üzerinden ulaşılamaması nedeniyle başvuru şikayetleri 11 hasta üzerinden değerlendirilmiştir.

Çalışma grubundaki 12 olgunun 8'i (%66.6) erkek, 4'ü (%33.3) kadın olup, olguların yaş ortalaması 42.2 (20 – 69 yaş) olarak hesaplanmıştır.

Bu çalışmada olguların en sık başvuru şikâyeti görme bozuklukları (%72.7) olup, altı olguda görme kaybı, iki olguda pitozis izlenmiştir. Amenore, aşırı yeme ve davranış bozuklukları diğer tanımlanan şikayetlerden olup, olguların başvuru şikayetleri Tablo 1'de özetlendi.

Tablo 1. Tablo 1. Çalışma grubundaki olguların demografik özellikleri ve klinik bulguları gösterilmektedir. *Olguların bir kısmı birden fazla şikayetle başvuruda bulunmuştur.

Özellikler	Olgu Sayısı (n)	Olgu Yüzdesi (%)
Cinsiyet		
Erkek	8	66.6
Kadın	4	33.4
Klinik Bulgular		
Görme bozukluğu	8	72.7
Baş ağrısı	3	27.3
Endokrinopati	1	9.1
Bilişsel bozukluk	1	9.1
Hipotalamik bozukluk	1	9.1
Asemptomatik	1	9.1

Çalışma grubundaki olguların tamamında 'kraniofarengioma' tanısı histopatolojik olarak doğrulanmış olup, ilaveten beş olguda histopatolojik subtiplendirme de yapılmıştır. Histopatolojik subtiplendirme yapılan olguların tamamını 'adamantinömatöz tipte' idi.

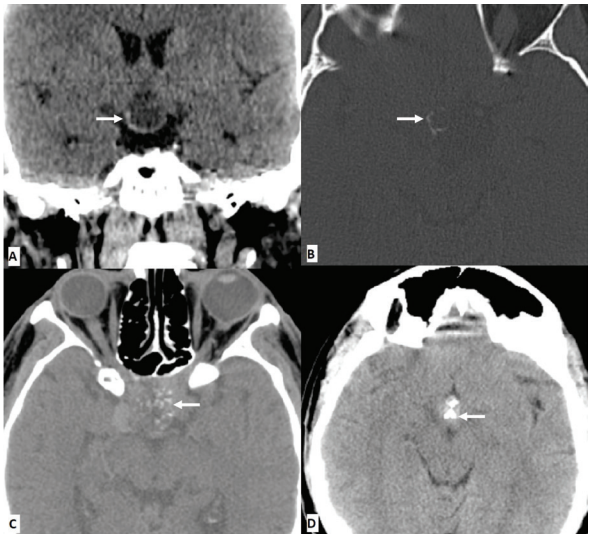
Olguların kraniofarengioma lezyon volümü 2.1 ml ile 86.1 ml arasında değişkenlik göstermekle birlikte, çalışma grubunda ortalama tümör volümü 14.9 ml olarak hesaplanmıştır. Lezyon volümü hesaplanmasında, araştırmacılar arası uyumun oldukça iyi olduğu saptandı (Intraclass correlation coefficient (ICC) değeri: 0.987).

Kraniofarengioma lezyonları şekil özelliği bakımından değerlendirildiğinde en sık lobüle kontürlü (%75) lezyonlara rastlandı. Çalışma grubunda saptanan diğer şekil özellikleri Tablo 2'de özetlendi.

Tablo 2. Çalışma grubundaki kraniofarengiomaların şekil, kalsifikasyon, morfoloji ve topografik bulguları özetlenmiştir.

Özellikler	Olgu Sayısı (n)	Olgu Yüzdesi (%)
Tümör şekli		
Yuvarlak	1	8.3
Oval	2	16.7
Lobüle	9	75
Kalsifikasyon		
Var	7	63.6
Yok	4	36.3
Kalsifikasyon tipi		
Periferal rim	3	27.3
Punktat	3	27.3
Distrofik	1	9
Morfoloji		
Kistik	3	25
Predominant kistik	4	33.3
Mikst (kistik/solid)	4	33.3
Predominant solid	1	8.3
Solid	0	0
Tümör Topografisi		
Sellar-suprasellar	1	8.3
Sellar-suprasellar psödo 3v	5	41.7
Sellar-suprasellar sekonder 3v	2	16.7
İnfindibulo-tuberal (Not strictly 3v)	4	33.3
Tamamıyla intraventriküler (Strictly 3v)	0	0

Kraniofarengiomaların preoperatif BT kesitleri üzerinden yapılan kalsifikasyon analizinde; yedi olguda (%63.6) lezyonda kalsifik komponent saptandı. Bu olguların üçünde periferal rim tarzı kalsifikasyon, üç olguda punktat kalsifikasyon ve bir olguda kaba-distrofik kalsifikasyon tespit edildi. (Resim 1). Kontrastsız Kranial BT kesitleri üzerinden yapılan dansite değerlendirilmesinde, dokuz olgu (%90) gri cevher ile izodens, bir olgu (%10) hipodens görünümde izlenirken, hiperdens lezyona rastlanmadı.

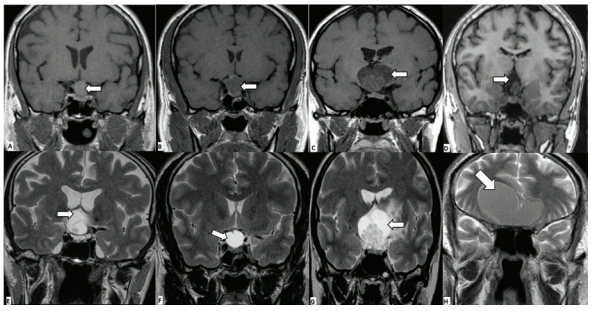


Resim 1. *Çalışma grubundaki farklı olgularda saptanan kalsifikasyon çeşitlerine örnekler. Koronal kontrastsız BT kesitinde (A) periferal rim şeklinde kalsifikasyon (ok), kemik pencerede aksiyel kontrastsız BT kesitinde (B) periferal rim tarzında kalsifikasyon (ok), aksiyel kontrastsız BT kesitinde (C) multiple punktat kalsifikasyon (ok) ve yine aksiyel kontrastsız BT kesitinde (D) distrofik kalsifikasyon (ok) gösterilmektedir.*

Morfolojik değerlendirme sonucunda çalışma grubundaki olguların tamamında kistik komponent tespit edildi. Üç olguda (%25) lezyonun tamamen kistik, dört olguda (%33.3) predominant kistik, dört olguda (%33.3) mikst tip (kistik/solid), bir olguda ise (%8.3) solid ağırlıklı mikst tipte olduğu dikkati çekmiştir. Pür solid lezyon şeklinde bir olguya ise çalışma grubumuzda rastlanmadı (Tablo 2). Lezyonların topografik değerlendirmesi sonucunda saptanan en sık yerleşim sellar-suprasellar psödo 3V tip (%41.7) ve infindibulo-tuberal (%33.4) tiptir. Diğer topografik bulgular Tablo 2'de özetlendi.

Hidrosefali açısından yapılan değerlendirmede ise, çalışma grubundaki iki olguda (%16.7) kraniofarengiomaya nonkomminikan hidrosefalinin eşlik ettiği tespit edilmiştir.

Lezyonlarda tanımlanan kistik komponent MRG incelemelerinde T1AG'de sıklıkla izointens (%41.6), T2AG'de ise olguların önemli bir kısmında (%91.7) hiperintens sinyal özelliği göstermiştir (Resim 2). BT incelemelerinde ise aynı komponent sekiz olguda (%80) hipodens, bir olguda (%10) hafif hipodens ve yine bir olguda (%10) hiperdens görünümde izlendi. Kistik komponentlerin BT ve MRG analiz verileri Tablo 3'te gösterildi.



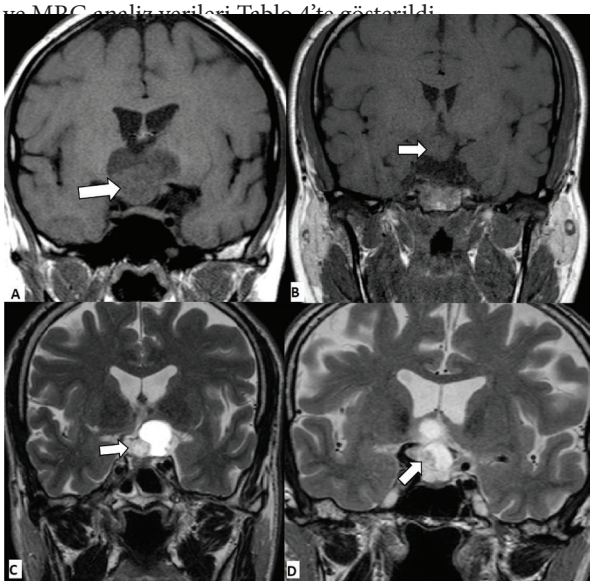
Resim 2. *Kraniofarengioma lezyonlarının kistik komponentinde saptanan MRG sinyal özellikleri gösterilmektedir. Koronal T1AG'de (üst sıra) sırasıyla; hiperintens (A), izointens (B), hafif hipointens (C) ve hipointens (D) kistik komponentler dikkati çekmektedir (oklar). Koronal T2A kesitlerde ise (alt sıra) kistik komponentler hiperintens (E, F ve G) ve izointens (H) görünümde izlenmektedir (oklar).*

Tablo 3. Çalışma grubundaki kraniofarengioma lezyonlarının kistik komponentlerinin MRG ve BT bulguları gösterilmektedir.

Özellikler (Kistik komponent	Olgu Sayısı (n)	Olgu Yüzdesi (%)
MRG Bulguları		
T1A		
Hiperintens	1	8.3
İzointens-hiperintens	1	8.3
İzointens	5	41.6
İzointens-hipointens	3	25
Hipointens	2	16.6
T2A		
Hiperintens	11	91.7
Hafif hiperintens	0	0
İzointens	1	8.3
Hafif hipointens	0	0
Hipointens	0	0
Kontrastlanma (Kapsül/Septa) - (kistik, predominant kistik, mikst (kistik-solid) lezyonlarda)		
Lineer rim tarzı	8	72.7
Kalın düzensiz	3	27.3
Septa Özellikleri (MRG)		
Septasyon göstermeyen (0)	9	75
Monosepta (1)	1	8.3
Oligosepta (1-3)	1	8.3
Multisepta (>3)	1	8.3
Septal Kontrastlanma	3	25
Yok	0	0
Lineer	3	100
Nodüler	0	0
BT Bulguları		
Hiperdens	1	10
Hafif hiperdens	0	0
İzodens	0	0
Hafif hipodens	1	10
Hipodens	8	80

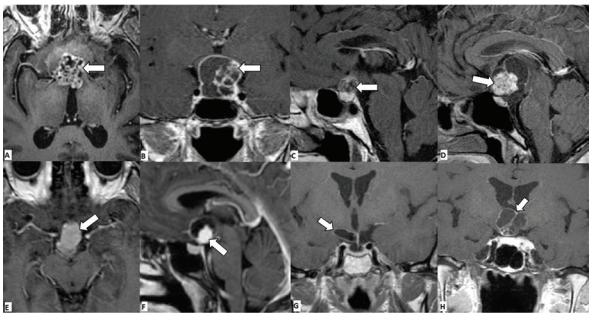
Kraniofarengioma olgularının MRG analizinde üç hastada (%25) septa formasyonuna rastlanmış olup, bu olgulardan birinde monosepta, birinde oligosepta ve birinde de multiseptasyon izlendi. Septaların tamamında ince lineer kontrastlanma saptandı (Tablo 3). Bu olguların BT incelemelerinde ise septa varlığı tespit edilemedi.

Olgularda tanımlanan solid komponent MRG'de T1AG'de ağırlıklı olarak izo-hafif hipointens (%91.7), T2A'da ise sıklıkla izo-hafif hiperintens (%75) olarak izlenmiştir (Resim 3). BT incelemelerinde ise solid komponent dokuz olguda (%90) gri cevher ile izodens, bir olguda ise (%10) hipodens görünümde izlenmiş olup, lezyonların solid komponentinde hiperdansiteye rastlanmadı. Solid komponentin BT ve MRG analiz verileri Tablo 4'te gösterildi.



Resim 3. *Solid komponentlerin MRG analizde, suprasellar yerleşimli örnek olguların koronal T1A kesitlerde (A ve B) gri cevher ile izointens solid komponentler izlenmektedir (oklar). Koronal T2A görüntülerde ise C'de hiperintens, D'de ise hafif hiperintens solid komponentler izlenmektedir (oklar).*

Post-kontrast serilerin değerlendirilmesinde tüm lezyonlarda (%100) kontrast tutulumu saptandı (Resim 4). Kraniofarengiomaların büyük çoğunluğunda (%91.7) kapsüler kontrastlanma izlenmiş olup, bu olguların önemli bir kısmı (%72.7) düzgün rim tarzında kontrastlanma paterni gösterdi. Solid komponent bulunduran olgularda ise, solid komponentte en sık görülen kontrastlanma paterni retiküler kontrastlanma oldu (%55.6). Solid komponentlerin kontrastlanma paternine ait veriler Tablo 4'te belirtildi.



Resim 4. *Kraniofarengioma lezyonlarının kontrastlanma paternleri sunulmaktadır: Aksiyel (A), koronal (B) ve sagittal (C) postkonrast T1A görüntülerde lezyonların solid komponentinde retiküler kontrastlanma izlenmektedir (oklar). D'de sagittal postkontrast T1A imajda lezyonun solid komponentinde diffüz heterojen kontrastlanma izlenmektedir (ok). Yine kontrast madde enjeksiyonu sonrası elde olunan aksiyel (E) ve sagittal (F) T1A görüntülerde solid komponentte homojen kontrastlanma izlenirken, koronal postkontrast T1A kesitte (G) kapsüler kontrastlanma dikkati çekmektedir (oklar). H'de ise hem kapsül hem de septada lineer kontrastlanma izlenmektedir (oklar).*

Tablo 4. Çalışma grubundaki kraniofarengioma lezyonlarının solid komponentlerinin MRG ve BT bulguları gösterilmektedir.

Özellikler (Solid komponent)	Olgu Sayısı (n)	Olgu Yüzdesi (%)
MR Bulguları		
T1A		
Hiperintens	0	0
İzointens-hafif hipointens	11	91.7
Hipointens	1	8.3
T2A		
Hiperintens	3	25
İzointens-hafif hiperintens	9	75
Hipointens	0	0
Kontrastlanma paterni		
Minimal heterojen kontrastlanma	2	22.2
Retiküler kontrastlanma	5	55.6
Homojen kontrastlanma	2	22.2
BT Bulguları		
Hiperdens	0	0
İzodens	9	90
Hipodens	1	10

TARTIŞMA

Kraniofarengiomalar, involüsyone olamamış kraniofarengeal kanal ya da bu trasede yerleşim gösteren Rathke kesesi kalıntılarından köken alan benign tümörler olup, insidansı milyonda 0.5-2'dir.[1,2,8,9] Kraniofarengiomalar, köken aldığı yapı itibariyle pitüiter bezi itip basılar, ki bu özelliği ayırıcı tanı açısından değerlidir.[10]

Demografik açıdan ele alındığında, kraniofarengiomalar erkeklerde daha sık görülmektedir.[1,3] Nitekim, güncel çalışmada da erkek cinsiyet predominansisi izlenmiştir. Diğer yandan, literatürdeki farklı araştırmalarda erişkin kraniofarengiomalarda tespit edilen yaş ortalamalarının 29-63 arasında değiştiği belirtilmekle birlikte[3], Manet ve ark. meta-analizinde erişkin kraniofarengiomalar için ortalama yaş 42.7 bulunmuştur.[3] Çalışma grubumuzda ortalama yaş 42.2 olup, bu veriler ile paralellik göstermektedir.

Sellar kaviteden 3. ventrikül düzeyine kadar yerleşim gösterebilen kraniofarengiomalar; hipofiz bezi, optik sinir, vasküler yapılar, hipotalamus ve 3. ventrikül gibi kritik anatomik yapılarla ilişkisi nedeniyle ciddi klinik semptomlara neden olabilmektedir.[1,3,8] Pediatrik ve erişkin kraniofarengioma olgularının klinik bulgular açısından anlamlı farklılık göstermediği ifade edilmekle birlikte[8], pediatrik yaş grubunda baş ağrısı, bulantı-kusma ve kranial sinir paralizisi sıklığının erişkin olgulara göre daha yüksek olduğu üzerinde durulmaktadır. Erişkin kraniofarengioma olgularını ele alan bir meta-analizde en sık rastlanan klinik bulgu %95.6 oranıyla görme defektleri olup, baş ağrısı, hidrosefali, endokrin ve bilişsel bozukluklar diğer sık semptomlar olarak tanımlanmıştır.[1] Başka bir çalışmada, kraniofarengioma olgularında görme defektlerinin yine en sık semptom (%65) olduğu belirtilmiştir.[3] Bu çalışmada da literatür ile uyumlu olarak en sık (%72.7) rastlanılan bulgu görme bozukluklarıdır.

Histopatolojik açıdan adamantinomatöz (ACP) ve papiller kraniofarengioma (PCP) olmak üzere iki alt tipi bulunan kraniofarengiomaların subtipleri, kökenleri ve görüldükleri yaş aralıkları bakımından farklılıklar arz etmektedir.[1,2,9] ACP, daha sık görülen subtip olup, tüm yaş gruplarında rastlanılabilir. Pediatrik olguların neredeyse tamamını oluşturan ACP, epidemiyolojik olarak 5-15 yaş ile 45-60 yaş arası olmak üzere bimodal dağılım gösterir.[2,9] Erişkin grupta ise PCP görülebilmekle birlikte, yine baskın olan subtipin ACP olduğu ifade edilmektedir.[2] 18 yaş üzeri olguların dahil edildiği güncel çalışmada subtip analizi yapılan beş olgunun tamamının ACP subtipinde olduğu saptanmıştır.

Hipofiz adenomları, kraniofarengiomalar ve Rathke kleft kistleri gibi benzer bölgeye lokalize yer kaplayıcı lezyonların MRG bulgularını ele alan bir çalışmada Rathke kleft kistlerinin daha küçük volümde (<2ml) olma eğilimi tespit edilmiş ve kraniofarengioma olgularının büyük çoğunluğunun volümünün 2ml'nin üzerinde olduğu ifade edilmiştir.[11] Erişkin kraniofarengioma olgularını ele alan mevcut çalışmada da benzer şekilde, lezyonların tamamının 2

ml'den büyük olduğu saptanmış ve ortalama tümör volümü yaklaşık 15 ml olarak hesaplanmıştır.

Sartoretti-Schefer S ve ark. kraniofarengiomaları şekil özelliklerine göre yuvarlak, oval ve multilobüle olarak değerlendirilmiştir.[12] Diğer bir çalışmada ise, sellar-supraseller yerleşimli lezyonlar oval, kardan adam, lobüle kontürlü şeklinde sınıflandırılmış olup, kraniofarengiomaların %69.2 ile en sık lobüle kontürlü (süperior kesimden) olduğu tespit edilmiştir.[11] Bizim çalışmamızda da literatür ile uyumlu olarak, lezyonların ağırlıklı olarak lobüle kontürlü (%75) olduğu ve bu lezyonların da sıklıkla (%66.7) ile süperior kesimden lobülasyon gösterdiği dikkati çekmiştir. Kraniofarengioma tanısında altın standart görüntüleme yöntemi MRG olsa da kalsifikasyon tespiti ve lezyonların kemik yapıyla ilişkisinin değerlendirilmesinde BT önemlidir.[2,3,6] Erişkin ve pediatrik kraniofarengioma olgularının uzun dönem takip sonuçlarının ele alındığı bir çalışmada, lezyonlarda kalsifikasyon oranının %42.7 olduğu üzerinde durulmuştur.[8] Erişkin kraniofarengioma olgularının değerlendirildiği çalışmamızda, lezyonların önemli bir kısmında (%63.6) kalsifikasyon saptanmıştır. Kraniofarengiomalar histopatolojik alt tiplerine göre incelendiğinde, ACP subtipinin sıklıkla kalsifikasyon gösterdiği belirtilmektedir.[2,10] Çalışmamızdaki ACP alt tipi tanısı doğrulanan ve preoperatif BT tetkiki bulunan olgularda yüksek oranda (%75) kalsifikasyon tespit edilmiştir. Kraniofarengiomaların parasellar diğer yer kaplayıcı lezyonlara kıyasla yüksek oranda kalsifikasyon göstermesi, ayırıcı tanıda önemli bir ipucudur.[10]

Kraniofarengioma morfolojisinin değerlendirildiği bir çalışmada[8], erişkin kraniofarengioma olgularının sıklıkla kistik natürde (%73.1) izlendiği belirtilmiş olup; buna paralel olarak bizim çalışmamızda da olguların büyük oranda kistik natürlü (%33.3'ü kistik, %33.3'ü predominant kistik) olduğu saptanmıştır. Kraniofarengiomalar histopatolojik alt tiplerine göre incelendiğinde PCP subtipinin genellikle solid natürde olduğu, nadiren kistik komponent içerdiğini belirtilmektedir.[2] Daha sık görülen adamantinamatöz tipin ise sıklıkla (%90) kistik komponent içerdiği ifade edilmektedir.[2,10] Çalışmamızdaki kraniofarengioma olguları arasından ACP alt tipi verifiye edilen olguların tamamında kistik komponent saptanmıştır.

Preoperatif MRG temelli, hipotalamik distorsiyona göre yapılan topografi sınıflamasına göre çalışmamızda en sık psödointraventriküler ve infindibulo-tuberal tipler görülürken, Prieto ve ark. kraniofarengioma çalışma gruplarında infindibulo-tuberal tip ve tamamıyla intraventriküler tiplere daha sık rastlamışlardır.[7] Bu topografik sınıflamayla, lezyonların büyük oranda (%86) doğru lokalize edildiği, doğru topografi ile de uygun cerrahi yaklaşımın belirlenerek hipotalamik yaralanmaların önüne geçilebildiği ve güvenli radikal rezeksiyon ihtimalinin arttığı ifade edilmektedir.[7]

Kraniofarengioma olgularında, foramen Monro obstrüksiyonu sonucu ventriküler akışın kısıtlanması nedeniyle hidrosefali görülebilmekte olup[12,13] opere kraniofarengioma olgularının ele alındığı bir çalışmada erişkin kraniofarengioma vakalarında tespit edilen hidrosefali oranı %14.1 bulunmuştur.[8] Erişkin kraniofarengioma olgularının ele alındığı bir meta-analizde ise olgularda hidrosefali oranı %0 ile %19.2 arasında değişmekle birlikte ortalama %13.4 olarak belirlenmiştir.[3] Güncel çalışmada ise iki olguda (%16.7) kitle etkisine sekonder bilateral foramen Monro basılanmasına bağlı olarak hafif derecede obstrüktif hidrosefali saptanmıştır.

Kraniofarengiomaların kistik komponent ağırlıklı olması; sellar-parasellar lezyonlardan pitüiter adenomların solid ağırlıklı, Rathke kleft kistlerinin ise tamamen kistik natürde olması nedeniyle ayırıcı tanıda önemli bir yer teşkil etmektedir.[11]

Kraniofarengioma olgularının kistik ve solid komponentlerinin değerlendirilmesinde BT incelemelerde, PCP subtipinin genellikle solid ve izodens olduğu; ACP subtipinin ise solid komponentlerinin izodens, kistik komponentle-

rinin ise hipodens izlendiği belirtilmektedir.[10] Bizim çalışmamızda da, ACP subtip tanılı olguların preoperatif BT incelemelerinde, solid komponentin literatür ile uyumlu olarak, olguların tamamında gri cevher ile izodens görünümde olduğu; kistik komponentin ise ağırlıkla hipodens görünümde izlenmekle birlikte dansitesinin değişkenlik gösterdiği saptanmıştır. Kistik komponent dansitesinin olgular arasında farklılık arz etmesinde, kist içeriğinin rolü olduğu, yoğun içerikli veya kist içi hemoraji varlığında kistik komponentin dansitesinin artacağı ve bu nedenle olguların bir kısmında kistik komponentin görece hiperdens izlenebileceği düşüncesindeyiz. Nitekim, literatürde kraniofarengiomaların kistik komponentinde protein içeriğine bağlı olarak kist sinyalinin değişebileceği ve PCP subtipinde kist içeriğinin vizköz sarı renkli olduğu, ACP subtipinin kistik komponentinde makroskopik olarak "motor yağı" şeklinde tarif edilen lipitten zengin sıvı, eski hemorajiler ve kalsifik ürünlerin bulunduğu belirtilmektedir.[2,4,9]

Kistik ve solid komponentlerin MRG sekanslarındaki sinyal özellikleri, lezyonun histopatolojik alt tipine, kistik/solid natürüne ve kistik lezyonlarda kist içeriğine göre farklılıklar göstermektedir.[2,4] Müller ve ark.[2] kraniofarengiomaların solid komponentleri ile kistik lezyonların duvarında T1AG'de hipointensten hiperintense farklı sinyal özellikleri izlenebildiğini vurgulamış olup; sellar ve parasellar lezyonların görüntüleme bulgularının ele alındığı başka bir çalışmada ise, kraniofarengiomaların kistik komponentinin protein içeriğinden ötürü çeşitli sinyal özellikleri gösterebildiği, solid komponentin ise T1A imajlarda nonspesifik ara sinyalde, T2A imajlarda izointensten hiperintense kadar değişiklik sinyaller gösterebildiği ifade edilmiştir.[2,4] Bizim çalışmamızda ise tümörün kalsifikasyon haricindeki solid komponenti T1A görüntülerde ağırlıkla izo-hafif hipointens görünümde izlenmiş olup, T2A serilerde ise bu komponentin sıklıkla izo-hafif hiperintens görünümde izlendiği saptanmıştır. Çalışma grubumuzdaki kraniofarengioma olgularının kistik komponentleri ise literatürde belirtildiği gibi[2,4] farklı sinyal özellikleri göstermiştir.

Histopatolojik alt tipe göre kraniofarengioma olgularının MRG sinyalleri değerlendirildiğinde, ACP subtipinin T1AG'de hiperintens kist ve heterojen sinyalli solid nodül, PCP subtipinin izointens solid nodül şeklinde görüldüğü belirtilmektedir.[10,11] Bununla birlikte, intrasellar ve suprasellar yer kaplayıcı lezyonların MRG bulgularının ele alındığı bir çalışmada, T1AG'de kist hiperintensitesinin Rathke kleft kistlerinde, kraniofarengioma ve kistik pitüiter adenomlara göre daha yüksek bulunduğu vurgulanmıştır.[11] Bizim çalışmamızda ACP alt tipindeki olguların kistik komponentinin T1AG'de sinyal özellikleri kist içeriğine göre değişkenlik göstermekle birlikte, T2AG'de ağırlıklı olarak hiperintens görünümde izlenmiş olup; bu subtipte olguların tamamında lezyonun solid komponenti T1AG'de gri cevher ile izointens, T2AG'de hiperintens sinyal özellikleri göstermiştir.

Post-kontrast serilerde, kraniofarengiomaların solid komponentlerinde yoğun kontrast tutulumu izlenirken, kistik lezyonların duvarında ise ince veya kalın lineer kapsüler kontrastlanma görülebilmektedir.[10,11] Kraniofarengioma olgularının PCP subtipinde solid komponentin homojen kontrast tutulumu gösterebileceği ifade edilmektedir.[12] Bununla birlikte, başka bir çalışmada, kraniofarengiomaların solid komponentinde hakim olan kontrastlanma paterninin retiküler kontrastlanma olduğu ve bu kontrastlanma paterninin, solid komponenti homojen kontrastlanan aynı bölgeye lokalize pituiter adenom ayırıcı tanısında önemli bir kriter olduğu vurgulanmaktadır.[11] Aynı çalışmada retiküler paterndeki kontrastlanmayan boşlukların nekroz, debris ve kalsifikasyon olabileceği üzerinde durulmaktadır.[11] Bizim çalışmamızda da solid komponent barındıran olguların ağırlıkla retiküler kontrastlanma gösterdiği saptanmıştır. Hipofiz adenomları ve kraniofarengiomalarda bahsedilen kontrastlanma paterni farklılığına ilaveten, Rathke kleft kistlerinde kist duvarının kontrastlanmaması ya da ince kontrastlanma paterni göstermesi bu alana lokalize diğer kistik lezyonlardan ayrımında önemli bir radyolojik bulgudur.[10,11]

Sellar ve suprasellar bölgeye lokalize yer kaplayıcı lezyonların ayırıcı tanısında pituiter adenom, Rathe kleft kist ve kraniofarengioma öncelikli olarak yer almaktadır.[11] Yukarda bahsedilen radyolojik ipuçları özellikle bu lezyonların ayırıcı tanısında önemli katkılar sunmaktadır. Bu anatomik bölgeye lokalize, ayırıcı tanı listesinde daha nadir görülen patolojiler arasında araknoid kistler, menengiomlar, epidermoid-dermoid tümörler ve germ hücreli tümörler yer almaktadır.[10]

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Çalışmamızın kısıtlılıkları bulunmaktadır. Retrospektif dizaynı yanı sıra, histopatolojik olarak verifiye edilmiş erişkin kraniofarengioma olgu sayısının az olması (PCP subtipte olduğu doğrulanmış olgunun bulunmaması) çalışmanın temel kısıtlılığıdır. Bununla birlikte, bazı kraniofarengioma olgularının tama yakın kistik komponent ihtiva etmesi nedeniyle MRG analizinde solid komponent olarak kist duvarının sinyal özelliklerinin değerlendirilmesindeki güçlük diğer bir kısıtlılıktır. Histopatolojik olarak doğrulanmış PCP alt tipte olguların da bulunduğu, geniş serilerle yapılacak çalışmaların, erişkin kraniofarengiomaların görüntüleme bulguları konusunda literatüre ilave katkılar sağlayabileceği kanaatindeyiz.

Sonuç olarak; kraniofarengiomalar, sellar ve suprasellar yerleşim gösterebilen nadir görülen benign tümörler olup, radyolojik görüntüleme bulguları histopatolojik alt tipe ve lezyonun natürüne göre değişkenlik göstermektedir. Bu alana lokalize bir yer kaplayıcı lezyonda kalsifikasyon saptanması, kraniofarengioma tanısını öne çıkaran önemli bir radyolojik bulgudur.

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RESEARCH ARTICLE / *Araştırma Makalesi*

The Effect of Bruxism on the Severity of OSAS in Patients with OSAS and Headache

Baş Ağrısı Olan OUAS'lı Hastalarda Bruksizmin OUAS Şiddetine Etkisi

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Abstract

Introduction	Morning headaches have been associated with sleep-related breathing disorders and Sleep Bruxism (SB). The present study aims to investigate the relationship between SB, primary headaches and the severity of Obstructive Sleep Apnea Syndrome (OSAS) in patients presenting with morning headaches and a prediagnosis of OSAS.
Materials and Methods	The study included 480 patients who prediagnosis of OSAS and morning headache complaints, and were diagnosed with primary headache according to the International Classification of Headache Disorders (ICHD). Age, gender, Body Mass Index (BMI), headache type, presence of SB, OSAS stage according to Apnea-Hypopnea Index (AHI), and presence of hypoxia were recorded. Patients were then divided into 2 groups of SB (-) and SB (+), and both groups were compared in terms of headache.
Results	In the classification according to headache types, 31.5% of the patients were classified as migraine, 41.9% as tension-type headache (TTH), 2.1% as cluster, and 24.6% as other types of headache. While 76% of the patients had no SB, 24% had SB. The rate TTH was significantly ($p<0.05$) higher in the group with SB than in the group without SB. Severe OSAS and high BMI were significantly higher in the SB group compared to the non-SB group ($p <0.05$).
Conclusion	PSG should be performed to make a differential diagnosis of sleep-related disorders in patients presenting with a morning headache. Obesity, severe OSAS, TTH, hypoxemia are common in patients with sleep bruxism. SB, headache, and sleep-disordered breathing share common risk factors or common pathophysiology without specific cause-and-effect relationship.
Keywords	: sleep bruxism; obstructive sleep apnea syndrome; headache

Öz

Amaç	*Sabah baş ağrıları, uyku ile ilişkili solunum bozuklukları ve Uyku Bruksizmi (UB) ile ilişkilendirilmiştir. Bu çalışmanın amacı, sabah baş ağrıları ile başvuran ve Obstrüktif Uyku Apne Sendromu (OUAS) ön tanısı olan hastalarda UB, primer baş ağrıları ve OUAS şiddeti arasındaki ilişkinin araştırılmasıdır.*
Yöntem ve Gereçler	*Çalışmaya OUAS ön tanılı olan sabah baş ağrısı yaşayan ve Uluslararası Baş Ağrısı Bozuklukları Sınıflandırmasına (ICHD) göre primer baş ağrısı tanısı alan 480 hasta dahil edildi. Yaş, cinsiyet, Beden Kitle İndeksi (VKİ), baş ağrısı tipi, SB varlığı, Apne-Hipopne İndeksi'ne (AHİ) göre OUAS evresi ve hipoksi varlığı kaydedildi. Hastalar daha sonra SB (-) ve SB (+) olarak 2 gruba ayrıldı ve her iki grup baş ağrısı açısından karşılaştırıldı.*
Bulgular	*Baş ağrısı tiplerine göre yapılan sınıflamada hastaların %31,5'i migren, %41,9'u gerilim tipi baş ağrısı (GTBA), %2,1'i küme, %24,6'sı diğer baş ağrısı tipleri olarak sınıflandırıldı. Hastaların %76'sında SB yokken, %24'ünde SB vardı. SB olan grupta GTBA oranı SB olmayan gruba göre anlamlı olarak ($p<0,05$) daha yüksekti. Şiddetli OUAS ve yüksek VKİ, SB grubunda, SB olmayan gruba göre anlamlı olarak daha yüksekti ($p <0,05$).*
Sonuç	*Sabah baş ağrısı ile başvuran hastalarda uyku ile ilişkili bozuklukların ayırıcı tanısını yapmak için PSG yapılmalıdır. Uyku bruksizmi olan hastalarda obezite, şiddetli OUAS, GTBA, hipoksemi sık görülür. SB, baş ağrısı ve uykuda solunum bozukluğu, spesifik neden-sonuç ilişkisi olmaksızın ortak risk faktörlerini veya ortak patofizyolojiyi paylaşır.*
Anahtar Kelimeler	*uyku bruksizmi; obstrüktif uyku apne sendromu; başağrısı*

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INTRODUCTION

Sleep disorders are common in patients presenting to neurology clinics with refractory headaches. Many sleep disorders, especially insomnia and OSAS, can be seen with accompanying headaches. OSAS is a recurrent, partial or complete airway obstruction during sleep. Headache is present in 30% to 70% of patients with OSAS and often has features of tension-type headache (TTH), migraine, or chronic migraine, especially in the morning. Sleep-related headaches can also be treated by treating sleep disorders.[1,2] The most common headaches are tension-type headaches and migraine.[3] The pathophysiology of TTH and migraine is complex and multifactorial. In TTH, sensitization of the pain pathways is facilitated, resulting in sensitization of the trigeminocervical nucleus, whereas, in migraine, pain is associated with abnormal neuronal excitability, cortical spreading depression, and central sensitization of trigeminovascular pain.[4,5] However, previous studies have shown that dysfunction of the masticatory and cervical muscles is associated with an increased prevalence of headaches in both types of pain.[6,7]

SB can be defined as the activity of masticatory muscles during sleep. It is not considered a movement disorder or sleep disorder in healthy individuals. Previous studies have shown that SB can cause both TTH and migraine headaches during the day.[6,8,9] SB has also been frequently associated with sleep-disordered breathing, snoring, and OSAS, in particular.[10,11] The coexistence of SB and morning headache suggests the presence of sleep-disordered breathing. Moreover, SB, headache, and sleep-disordered breathing may also coexist due to common risk factors or common pathophysiology.[12,13] The presence of sleep-disordered breathing and SB should be investigated especially in patients presenting with a morning headache. This study aims to investigate the relationship between SB and primary headaches in patients presenting with morning headaches and a prediagnosis of OSAS.

MATERIALS and METHODS

The study included patients who were admitted to the sleep outpatient clinic of the Neurology Clinic of Medicana International Istanbul Hospital with a prediagnosis of OSAS and complaints of morning headache and were diagnosed with primary headache according to the International Classification of Headache Disorders (ICHD). For the study, the files of 512 patients who presented with morning headaches and underwent PSG between October 15, and December 15, 2022, were retrospectively reviewed. Thirty-two patients were excluded from the study because of headaches due to secondary causes, and the study was completed with the remaining 480 patients. All patients included in the study were the first time application to the neurology outpatient clinic with headache complaints and did not receive any specific treatment for headaches. Approval was obtained from the Sakarya University Faculty of Medicine Non-Interventional Ethics Committee with approval no: E-71522473-050.01.04-17132-252 and the date 05.10.2022.

The age, gender, and Body Mass Index (BMI) of the patients were recorded. Patients were grouped as underweight for BMI <19 kg/m², normal for BMI <25 kg/m², preobese (overweight) for 25 kg/m2≤ BMI<30 kg/m², Class I obese for 30 kg/m2≤ BMI<35 kg/m², Class II obese for 35 kg/m2≤ BMI<40 kg/m², and Class III obese for 40 kg/m² ≤ BMI, according to the classification made by the World Health Organization. The patients were divided into 4 groups: migraine, TTH, cluster, and other primary headaches according to ICHD criteria. PSG data were then examined. Two Alice® Sleepware, Philips Respironics, PA, USA (Philips Respironics) software diagnostic devices were used for PSG data collection. PSG examination included brain activity measurement by electroencephalography (EEG) (recorded from F3-A2, C3-A2, F4-A1, C4-A1, O1-A2, O2-A1 channels placed according to the international 10-20 system), bilateral eye movements by electrooculography, submental muscle and bilateral tibialis anterior muscle activity by electromyography, airflow

with a thermistor and nasal cannula, chest and abdominal respiratory movements with plethysmography, lying position with position sensors, snoring with laryngeal microphone, oxygen saturation (SpO2) with finger oximetry, heart rhythm with one-lead electrocardiography, and video recordings were made with an infrared camera.

PSG recordings were scored according to the 2018 American Academy of Sleep Medicine version 2.5 PSG scoring criteria.[14] PSG recordings were scored in 30-second epochs with Somnologica 3.3.2 software (Flaga Inc). Sleep recordings were examined in 30-second epochs and staged according to the guideline criteria published by the American Academy of Sleep Medicine (AASM). According to AASM criteria, hypopnea was defined as a ≥ 30% decrease in flow from baseline for at least 10 s with associated oxygen desaturation or associated stimulation. Apnea was defined as a ≥90% decrease in airflow for at least 10 seconds. AHI was obtained by dividing the sum of the number of apneas and hypopneas by the sleep duration in hours. Patients with AHI ≥5 were considered to have OSAS and patients with AHI 5-15 were grouped as mild, 16-30 as moderate, and >30 as severe OSAS.[15] Sleep stages were scored as N1, N2, N3, and REM sleep.

In the scoring, those with SB were also identified according to AASM international diagnostic criteria.[16] For bruxism, EMG activity lasting more than 2 seconds recorded with electrodes placed on the masseter muscles at 2 cm intervals during routine PSG was considered bruxism. According to the scoring, the patients were divided into two groups SB (+) and SB (-), and the two groups were compared with each other.

Statistical Analysis

Mean, standard deviation, median, minimum, maximum, frequency, and ratio values were used in the descriptive statistics of the data. The distribution of the variables was measured by the Kolmogorov-Smirnov test. Mann-Whitney u test was used in the analysis of quantitative independent data. The Chi-square test was used in the analysis of qualitative independent data, and the Fischer test was used when chi-square test conditions were not met. SPSS 28.0 program was used in the analyses.

RESULTS

The study included 480 patients. The mean age of the patients was 42.2±10.6 years. Of the patients, 58% were male, and 41.9% were female. According to BMI, 0.6% of the patients were classified as underweight, 20.6% as normal, 40% as overweight, 26.7% as Class I obesity, 9.4% as Class II obesity, and 2.7% as Class III obesity. The mean BMI was 29.0±5.0. According to AHI scores, 3.1% of the patients were classified as normal, 26.5% as mild, 32.9% as moderate, and 37.5% as severe OSAS. In the classification according to headache types, 31.5% of the patients were classified as migraine, 41.9% as tension-type, 2.1% as cluster, and 24.6% as other types of headache. In terms of the presence of hypoxia, 63.3% of the patients were classified as normal, 23.1% as hypoxia-prone, and 13.5% as hypoxia. While 76% of the patients were SB (-), 24% were SB (+) (Table 1).

Table 1: Demographic Data, BMI, AHI, Headache Type, Presence of Hypoxia and Bruxism

		Min-Max	Median	Avg.±SD/n-%	
Age		18.0-59.0	43.0	42.2±10.6	
Gender	Male			279	58.1%
	Female			201	41.9%
BMI		17.1-44.5	28.7	29.0±5.0	
Classification According to BMI	Underweight			3	0.6%
	Normal			99	20.6%
	Overweight			192	40.0%
	Class I Obesity			128	26.7%
	Class II Obesity			45	9.4%
	Class III Obesity			13	2.7%
Minimum Oxygen Saturation					
AHI Index		54.0-99.0	91.0	90.3±6.0	
Classification According to AHI	Normal	1.1-101.1	22.6	15	3.1%
	Mild OSAS			127	26.5%
	Moderate OSAS			158	32.9%
	Severe OSAS			180	37.5%
Headache Type	Migraine			151	31.5%
	Tension Type			201	41.9%
	Cluster			10	2.1%
	Other			118	24.6%
Presence of Hypoxia	Normal			304	63.3%
	Hypoxemia Tendency			111	23.1%
	Hypoxemia			65	13.5%
Bruxism (SB)	No			365	76.0%
	Yes			115	24.0%

Min: Minimum, Max: Maximum, Avg: Average, SD: Standard Deviation, BMI: Body Mass Index, AHI: Apnea Hypopnea Index, OSAS: Obstructive Sleep Apnea Syndrome, SB: Sleep Bruxism

The ages of the patients did not differ significantly between the SB (-) and (+) groups ($p > 0.05$). The proportion of male patients was significantly ($p < 0.05$) higher in the SB (+) group than in the SB (-) group. The mean BMI value was 30.9±5.1 in the SB (+) group, and 28.4±4.9 in the SB (-) group, which was significantly ($p < 0.05$) higher in the SB (+) group. In OSAS staging according to AHI, normal and mild OSAS were significantly higher in the SB (-) group, while severe OSAS was significantly ($p < 0.05$) higher in the SB (+) group compared to the SB (-) group. The rate of tension-type headache was 58.3% in the SB (+) group, and 36.7% in the SB (-) group, and it was significantly ($p<0.05$) higher in the SB (+) group. The migraine rate was 35.3% in the SB (-) group and 19.1% in the SB (+) group and was significantly ($p<0.05$) higher in the SB (-) group. The rate of the tendency to hypoxemia was 31.3%, and the rate of hypoxia was 30.4% in the SB (+) group, while the same rates were 20.5% and 8.2% in the SB (-) group, respectively,

and were significantly ($p < 0.05$) higher in the SB (+) group (Table 2).

Table 2: Comparison of Sleep Bruxism (+) and (-) groups in terms of BMI, AHI, Headache Type, and Hypoxia Presence

		SB (-)			SB (+)			p
		Avg.±SD/n-%		Median	Avg.±SD/n-%		Median	
		41.7 ± 10.7		42.0	43.8 ± 10.3		45.0	0.063
Gender	Male	200	54.8%		79	68.7%		**0.000** m
	Female	165	45.2%		36	31.3%		
		28.4 ± 4.9		28.3	30.9 ± 5.1		30.9	**0.000** m
Classification According to BMI								
Underweight		3	0.8%		0	0.0%		**0.000** m
Normal		83	22.7%		16	13.9%		
Overweight		159	43.6%		33	28.7%		
Class I Obesity		82	22.5%		46	40.0%		
Class II Obesity		31	8.5%		14	12.2%		
Class III Obesity		7	1.9%		6	5.2%		
Minimum SO_2		91.6 ± 4.6		92.0	86.2 ± 7.9		87.0	**0.000** m
AHI Index		24.3 ± 16.8		18.7	43.2 ± 21.7		42.2	**0.000** m
Classification According to AHI								
Normal		15	4.1%		0	0.0%		**0.000** m
Mild OSAS		120	32.9%		7	6.1%		
Moderate OSAS		121	33.2%		37	32.2%		
Severe OSAS		109	29.9%		71	61.7%		
Headache Type								
Migraine		129	35.3%		22	19.1%		**0.000** m
Tension Type		134	36.7%		67	58.3%		
Cluster		9	2.5%		1	0.9%		
Other		93	25.5%		25	21.7%		
Presence of Hypoxia								
Normal		260	71.2%		44	38.3%		**0.000** m
Hypoxemia Tendency		75	20.5%		36	31.3%		
Hypoxemia		30	8.2%		35	30.4%		

m Mann-Whitney u test / X^2 Chi-square test
SB: Sleep Bruxism, Avg: Average, SD: Standard Deviation, BMI: Body Mass Index, AHI: Apnea Hypopnea Index, OSAS: Obstructive Sleep Apnea Syndrome

DISCUSSION

Sleep disorders are common but overlooked health problems in the community. OSAS occurs in 3% of the middle-aged population. The prevalence of sleep apnea headache in this population is 12-18%, while morning headache with symptoms similar to sleep apnea headache occurs in 5-8% of the general population. Headache disorders and sleep disorders have a well-established comorbid relationship.[17,18] Although headaches in obstructive sleep apnea patients may appear to be a non-specific symptom, the types of headaches in obstructive sleep apnea have characteristics of tension-type headache, migraine, or chronic migraine, often reported in the morning. In this study, 41.9% of the patients whose PSG results were compatible with OSAS had TTH, 31.5% had migraine, 2.1% had cluster headaches, and 24.6% had other primary headaches. The physiopathology of morning headaches in obstructive sleep apnea patients is not fully understood. The headache may be the result of recurrent obstructive respiratory events associated with oxygen desaturation and sleep fragmentation. The role of nocturnal hypoxemia is controversial, and a slight association with sleep architecture parameters has been found.[2,19] However, our patients, especially the group of patients with sleep bruxism was more prone to hypoxemia. In the same group, higher AHI increased nocturnal hypoxemia, and SB also contributed to this increase.

According to the International Classification of Sleep Disorders (ICSD-3), SB causes sleep quality deterioration and sleep disturbance.[16] SB is defined as rhythmic or non-rhythmic masticatory muscle activity that occurs in the masticatory muscles during sleep. In addition to sleep disturbances, symptoms such as hypertrophy of the masseter and temporal muscles, tooth wear, tenderness of the jaw muscles, pain on palpation, and morning headache are frequently seen in these patients.[8] Although many studies have demonstrated the relationship between SB and headaches, most of these studies have not classified headaches. De Luca Canto et al. reported that TTH and migraine are also associated with SB.6 However, unlike the literature, while the frequency of TTH was higher in the SB (+) group, migraine was more common in the SB (-) group in our study. Although the pathophysiology of TTH and migraine is complex and multifactorial, previous studies suggest that dysfunctions of masticatory and cervical muscles are associated with an increased prevalence of these disorders.[7]

SB has been frequently associated with sleep-disordered breathing, especially snoring, and obstructive sleep apnea.[10,11,20,21] In our study, the frequency of severe OSAS was significantly higher in the SB (+) group compared to the SB (-) group. In parallel with this, BMI values were statistically higher in the SB (+) group compared to the SB (-) group. We believe that the high incidence of severe OSAS in the SB (+) group may be related to its high incidence in males, and the high number of male patients in this group. In conclusion, sleep-disordered breathing was found to be significantly higher in subjects with morning headaches, and the presence of TTH, obesity, and severe OSAS was found to be higher in those with SB (+) in our study, consistent with the literature. We believe that the relationship between SB, headache, and sleep-disordered breathing may arise due to common risk factors or common pathophysiology without a specific cause-and-effect relationship. However, further studies with a larger number of patients are needed to demonstrate the relationship between these disorders.

Study Limitations

The biggest limitation of our study is that although the number of patients included in the study was high, the number of patients with sleep bruxism was low; and these data stays limited in reflecting the general population. Again, due to the retrospective nature of the study, patients were evaluated only based on medical records and polysomnography data, and it was not sufficient to evaluate the long-term treatment and outcome of all patients. Since the polysomnography examination, for which we obtained

the main data of our study, is expensive and difficult to apply, the study was planned retrospectively. Therefore, more accurate results can be obtained with a prospective study.

There are no conflicts of interest.

Written informed consent was obtained from patients who participated in this study.

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Authors' Contributions :F.Y.: Conceptualization, Data curation, Methodology, Project administration, Resources, Supervision, Writing – original draft, Writing – review & editing. Y.G.A.: Formal analysis, Methodology, Supervision, Visualization, Writing – original draft. S.B.U: Resources Investigation, Visualization, Writing – original draft. Each author gave the final approval of the version to be published and agreed to be accountable for all aspects of the work, ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved

The study was approved by the Clinical Studies Ethical Committe of Sakarya University Training and Research Hospital by the decision no E-71522473-050.01.04-17132-252 and date 05.10.2022

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RESEARCH ARTICLE / *Araştırma Makalesi*

The Validity and Reliability of the Turkish Version of the Modified Yale Food Addiction Scale Version 2.0

Modifiye Edilmiş Yale Yeme Bağımlılığı Ölçeği Sürüm 2.0'ın Türkçe Uyarlamasının Geçerlilik ve Güvenilirlik Çalışması

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Abstract

Introduction	In this study, we aimed to test the validity and reliability of the Turkish version of the modified Yale food addiction scale version 2.0, which has been developed to evaluate the substance use disorder criteria in DSM V in 2017 in terms of food addiction.
Materials and Methods	The methodological and descriptive study was performed in seven family medicine units between June 2017 and March 2018. A total of 271 people was included in the study, and the questionnaire was asked to answer a total of 32 questions, including 13 questions about phrasing, socio-demographic characteristics, habits, current diseases, and 19 questions about weight. In statistical analyses, the validity of the scale was tested for language validity, content validity, factor validity, and construct validity. In the reliability analysis, internal consistency and time invariance of the scale against time were evaluated. A p-value of <0.05 was considered significant
Results	The mean age of the 271 participants (75.6% female) was 39.23±12.66 SD, and the mean body mass index (BMI) was 29.249±6.113 SD. After the language validity of the scale, the content validity of the scale (Davis value≥0.80), compatibility with factor analysis (KMO value 0.709 and Barlett sphericity test result p<0.001), and internal consistency (Cronbach alpha coefficient 0.802) were found sufficient.
Conclusion	mYFAS 2.0 can be used as a data collection tool in 'food addiction' screening.
Keywords	Food Addiction; Validity; Reliability

Öz

Amaç	*Bu çalışmada 2017 yılında DSM 5'teki madde kullanım bozukluğu kriterlerini yeme bağımlılığı açısından değerlendirmek için geliştirilen modifiye edilmiş Yale yeme bağımlılığı ölçeği sürüm 2.0'ın Türkçe'ye uyarlanarak geçerlik ve güvenilirliğinin sınanması amaçlanmıştır.*
Yöntem ve Gereçler	*Metadolojik ve tanımlayıcı tipteki araştırma 7 aile hekimliği birimine Haziran 2017-Mart 2018 tarihleri arasında başvuran hastada yapıldı. Toplam 271 kişinin dahil edildiği araştırmada ölçeğe ait 13 ifade, sosyo-demografik özellikler, alışkanlıklar, mevcut hastalıklar, ve kiloyla ilgili 19 soru olmak üzere toplam 32 sorunun cevaplanması istendi. İstatistiksel analizlerde ölçeğin geçerliği değerlendirilirken dil geçerliği, kapsam geçerliği (content validity), faktör analizine uygunluğu ve yapı geçerliği test edildi. Güvenirlik analizinde iç tutarlılık ve ölçeğin zamana karşı değişmezliği değerlendirildi. p<0,05 anlamlı kabul edildi.*
Bulgular	*Toplam 271 katılımcının (%75,6'sı kadın) yaş ortalamaları 39,23±12,66 SS ve beden kitle indeksi (BKİ) ortalamaları 29,249±6,138 SS idi. Ölçeğin dil geçerliği sağlandıktan sonra kapsam geçerliğinin (Davis sayısı ≥ 0,80), faktör analizine uygunluğunun (KMO değeri 0,709 ve Barlett küresellik testi sonucu p<0,001), iç tutarlılığının (Cronbach alfa katsayısı 0,802) yeterli olduğu görülmüştür.*
Sonuç	*mYYBÖ 2.0 'yeme bağımlılığı' taramalarında veri toplama aracı olarak kullanılabilir.*
Anahtar Kelimeler	*Yeme Bağımlılığı; Geçerlilik; Güvenilirlik*

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INTRODUCTION

We need nutrients to meet our physiological needs. Nutrients are known as natural rewards and affect the reward system in the limbic system. Vital natural rewards are defined as eating, drinking, sexuality, and social relationships.

In the preclinical studies, the homeostatic and non-homeostatic aspects of nutrition and their relationships with each other were evaluated. In a study, it was concluded that everyone would be at their ideal weight under conditions where nutrition is controlled only by homeostatic systems and that nutrition would be perceived as a vital need such as breathing. The hedonic system plays a role besides the reward system and its association with the sense of taste and pleasure. As a result, some nutrients are consumed excessively.[1,2]

When mentioned about addiction, at first, tobacco, alcohol, and substance addictions come to mind. However, behavior-based food addiction that is not based on a physical substance, gaming addiction, sex addiction, computer addiction, television addiction, shopping addiction, internet addiction can also be mentioned.[3,4] The inability to control behavior or action and the continuity of behavior or action despite its negative consequences can be shown as standard features for the concept of addiction both in substance addiction, such as alcohol and tobacco, and in behavioral addictions such as eating, sex, and internet.[5] Moreover, the dependence that occurs with these behaviors can cause activity changes in the anterior and limbic regions of the brain similar to that of substance dependence.[6-10]

Randolph first proposed the concept of food addiction (FA) in 1956, but it has become more emphasized with the spread of obesity in recent years.[11] In the 1990s, pioneers of FA, such as chocolate addiction, emerged in the literature. Although it was previously mentioned in popular media, in the early 2000s, they systematically began to be seen in the scientific literature. FA is considered as a valid further research topic for some individuals because of neurophysiological symptoms such as biobehavioral symptoms, the development of tolerance to certain foods, the presence of withdrawal symptoms, and the presence of endogenous opioids and dopamine activity in the midbrain FA is defined as a type of dependence in which some people over-consume certain foods, clinically leading to weight gain and obesity. However, is there a disorder that can be defined as food addiction? If there is such a disorder, the question of in which obesity or addiction-related disorders should the eating disorders be included has been raised.[12-16]

The debate continues in the literature, whether FA is a distinct phenomenon, a subtype of obesity, a qualifier for eating disorders, or a behavioral addiction.[17]

Although it is still debated that food is needed to survive unlike abused substances, and at what point it can be called addiction; the consumption of processed fat and carbohydrate-containing foods more than needed evokes the need for reward rather than the sense of saturation, and reinforces the concept of FA.[18] In some studies, it is believed that food addiction is the cause of many obesity cases. For example, a US survey found that food addiction is one of the most commonly used explanations for the cause of increasing obesity rates in Western society.

In the first half of the 20th century, chronic degenerative diseases came to the forefront after the infectious diseases that killed masses were kept under control. WHO reported that, in 2012, increased BMI was a risk factor for cardiovascular diseases, diabetes, and some cancers, one of the leading causes of death. The prevalence of obesity continues to rise in Turkey as a serious problem threatening the public health as around the world. According to TUIK (2016) data, the prevalence of obesity increased by 31.1% in 2014, from 15.2% in 2008 to 19.9%. In 2016, it was 19.6%. Although it is predicted that food addiction can cause obesity, it is not possible to say that the reason

for obesity is only food addiction. Understanding the extent of the relationship will only be possible through an appropriate assessment of food addiction.

Although there is no clarity in its definition, if FA is an addiction such as alcohol addiction, and if it confronts us with serious public health consequences related to obesity, we need to have information about the prevalence of this addiction and develop primary, secondary and tertiary protection strategies. To this end, Gearhardt and colleagues developed the Yale food addiction scale version 2.0 (YFAS version 2.0) in 2016.

There is no measurement tool developed for the diagnosis of FA in Turkish compatible with the recent changes in DSM-V. This study was conducted to adapt and test the validity and reliability of the modified Yale Food Addiction Scale Version 2.0 (mYFAS version 2.0), which is the short version of the test developed by Schulte and Gearhardt in 2017 to evaluate substance use disorder (SUD) criteria in FA.

MATERIAL and METHODS

This study is a methodological study conducted with 271 patients who admitted to 7 family medicine units affiliated to 3 Family Health Centers (ASM) in Sakarya province between June 2017 and March 2018 to test the validity reliability of the scale. Before starting the study, ethics approval was obtained from the Non-Interventional Research Ethics Committee of Sakarya University Faculty of Medicine (date: 02.10.2017; number: 71522473/050.01.04/200). Participants were selected from individuals between 18-65 years of age, who were mentally capable of understanding what they read or read to them, were not pregnant, not breastfeeding, had not undergone any gastrointestinal system surgery, and had no cancer.

Participation in the study was voluntary, and the scale was given to the participants and asked to mark the most appropriate option for them. For the retest, the participants were called one day in advance, invited to the ASM, and asked to complete the scale again. Height and weight measurements were carried out by the researcher with the measurement instruments included in the ASMs.

Modified Yale Food Addiction Scale Version 2.0 (mYFAS version 2.0)

Following the publication of DSM-V in 2013, the YFAS, which was formed based on the criteria in DSM IV, and its short version, the Modified YFAS, were out of date. Thereupon, in 2016 Gearhardt et al. developed the YFAS 2.0, which met the 11 SUD criteria in DSM V.[19] It was followed by modified YFAS 2.0 developed by Erica M. Schulte and Asley N. Gearhardt in 2017, to be used in extensive epidemiological studies, and in studies which addiction-like eating behavior must be determined with a short measurement.[20] mYFAS 2.0 is an 8-point Likert-type scale that consists of 13 items representing the behavioral findings experienced by the participant during the last year while eating certain foods (mainly processed foods). For scoring, with the suggestion of the author, each item was given a score of 0 or 1 based on the met criteria. (Table 1).

Table 1. Score Equivalent of Answers to 8-point Likert Scale Questions Asked to Participants

Questions	Answers	Score
Question 3, 7, 12, and 13		
	Answers 0-1 and 2	0
	Answers 3-4-5-6 and 7	1
Question 1,4,8, and 10		
	Answers 0-1-2-3 and 4	0
	Answers 5-6 and 7	1
Questions 2, 5, 6, 9 and 11		
	Answers 0-1-2-3-4 and 5	0
	Answers 6 and 7	1

A method was used in the evaluation of the scale, as in the original article.

SYMPTOM COUNT SCORING METHOD

It is calculated according to how many of the 13 items the

participant meets. The total score ranges from 0 to 13.

"Back-translation" method was used to translate the scale in the original language into Turkish, by translation from English to Turkish by three different people who are fluent in English and Turkish, and then the translation to English by two different people.[21,22] Finally, the language equivalence of the scale was obtained by consulting a different person to evaluate the meaning difference and make the necessary changes. The scale was presented to the expert group of six academics to ensure content validity, and the results were evaluated according to Davis technique.[23]

There are two basic psychometric properties (validity and reliability) in scale adaptation.[24] Validity is a concept evaluating if a test measures the property that it wants to measure. In this context, if a test measures the property, it wants to measure accurately, and without mixing it with other features, it is said to be valid. Reliability is the consistency of repetitions in a measurement process where similar results are obtained if the measurement is repeated.[25] The original mYFAS 2.0 scale was unidimensional (Table 2).[20]

Table 2. Methods Used in Validity Analysis

Method	Technique
Language validity	Group translation
	Back-translation
Content/Scope validity	Expert opinion (Davis Technique)
Suitability of sample size	Bartlett test
Suitability of data set for factor analysis	Kaiser-Meyer-Olkin test
Construct validity	Confirmatory factor analysis

Statistical Analysis

In the factor analysis, the sample size and its suitability for the factor analysis were performed with the Keiser-Meyer-Olkin Measure of Sampling Adequacy (KMO) and Bartlett's Sphericity test. KMO ranges from 0 to 1 and is required to approach 1, but above 0.60 is considered sufficient. Bartlett's Sphericity test is said to be appropriate for factor analysis when the p-value is less than 0.05, and attention should be paid to the principle of correlations being in between 0.30 and 0.90.17

The factor structure in the data was tried to be determined with the help of the variables observed in explanatory factor analysis. In the confirmatory factor analysis (CFA) tests, whether the theoretical structure determined by the researcher exists in the data is tested (Alpar 2016). Indices such as $\chi 2$, root mean square error of approximation (RMSA), comparative fit index (CFI), and goodness of fit index (GFI) were used in CFA. Cronbach Alpha Coefficient and KR-21 were used for internal consistency and homogeneity. Spearman correlation analysis and Wilcoxon signed-rank test were used for invariance of the scale against time.[17]

RESULTS

After the language validity of the scale was obtained, expert opinion was sought to evaluate the scope validity. The Davis value was ≥ 0.80, which was sufficient.

The validity of the scale

KMO value, showing the suitability of the scale for factor analysis, was found as 0.709. The Bartlett sphericity test result was p<0.001 (highly significant), and it was concluded that the sample size was sufficient. The single factor model in the original scale was evaluated by confirmatory factor analysis.

Confirmatory factor analysis

In the model, X^2 value was found 220,435, degree of freedom 63, p<0.001, x^2/Sd value 3,499, RMSEA 0.096, and CFI 0.850, showing that the scale was well fit. The factor loads are shown in Table 3.

Reliability analysis

The Cronbach's alpha coefficient calculated for the internal consistency analysis of the scale was 0.802. As a result of the item analysis of mYFAS 2.0, the total correlation values

Table 3. Reflection of substance use disorder criteria on items and factor loads		
DSM-V SUD criteria	mYFAS 2.0 questions	Factor loads
Taking the substance in larger amounts or for longer than meant to.	I ate to the point where I felt physically ill (item 1)	0,48
Wanting to cut down or stop using the substance but not managing to	I tried and failed to cut down on or stop eating certain foods (item 11)	0,33
Spending a lot of time getting, using, or recovering from use of the substance	I spent much time feeling sluggish or tired from overeating (item 2)	0,58
Giving up important social, occupational, or recreational activities because of substance use	I avoided work, school, or social activities because I was afraid I would overeat there. (item 3)	0,14
Continue to use despite known negative consequences	I kept eating in the same way even though my eating caused emotional problems (item 8)	0,54
Tolerance	Eating the same amount of food did not give me as much enjoyment as it used to (item 9)	0,41
Development of withdrawal symptoms, which can be relieved by taking more of the substance	If I had emotional problems because I hadn't eaten certain foods, I would eat those foods to feel better (item 4)	0,27
Continued substance use despite having persistent or recurrent social or interpersonal problems	My friends or family were worried about how much I overate (item 13)	0,36
Substance use resulting in a failure to fulfill major role obligations	My overeating got in the way of me taking care of my family or doing household chores (item 7)	0,44
Substance use in situations in which it is physically hazardous.	I was so distracted by eating that I could have been hurt (e.g., when driving a car, crossing the street, operating machinery). (item 12)	0,32
Substance use causes clinically significant damage	I had significant problems in my life because of food and eating. These may have been problems with my daily routine, work, school, friends, family, or health (item 6)	0,93
Substance use causes clinically significant distress	My eating behavior caused me a lot of distress (item 5)	0,91

of the 3rd and 10th items were below 0.30. Therefore, it was decided not to remove these substances.

The invariance of the scale against time was evaluated over their total scores using test-retest with 32 participants in 15 days intervals. The Kolmogorov-Smirnov test evaluated the compatibility of the variables to the normal distribution, and nonparametric tests were applied. The Mann Whitney U test evaluated total scores, and no significant difference was found (p = 0.919). When the scores obtained were evaluated with Spearman correlation coefficient, a positive, very strong, and very significant correlation (r = 0.899; p <0.001) was found. These results showed that the scale did not change over time. As a result of these analyzes, the scale was adapted to Turkish successfully and named as 'modifiye edilmiş Yale yeme bağımlılığı ölçeği sürüm 2.0'.

Of the 271 participants, 205 were female (75.6%), and 66 were male (24.4%). The mean age was 39.2 ±12.66 SD, and the mean body mass index (BMI) was 29.249±6.183 SD.

Symptom count scoring methods was used to evaluate the participants and 0-13 points were obtained.

DISCUSSION

A negative, weak, significant correlation was found between addiction scores and age (r=0.15, p<0.05) in the study which YFAS developed, but in the original article of mYFAS 2.0 (r=0.13, p=0.06) (Schulte 2017) and in our study, no significant correlation was found between the scores obtained by the symptom counting scoring method

and age (r=0.15; p=0.802).

In our study, no significant difference was found between the genders in terms of symptom counting method, similar to the original article of mYFAS 2.0. This result shows us that if there is a problem, we need to address it as a whole without reducing it to the genders. Although there was no difference between the education levels in the original article in terms of the scores obtained from the scale, total symptom scores of university graduates were lower in our study. It is expected that more educated people will show this will on eating behavior and get a lower score, considering the desire of individuals to increase their education as a result of their will.

In this study, a specific sample selection method to represent the general population was not used since the patients included in the study were patients who applied to AHB. This situation could be considered as a limitation because the results could not be generalized, but the sample size was adequate and suitable for factor analysis. Besides, a scale that evaluates FA in a fast and practical way, which is an important and current problem in the world and Turkey, was adapted to Turkish with validity and reliability analysis. It increases the importance of the study.

There was a time when the risk of smoking was not understood, or it was assumed that smoking was beneficial. However, in the end, its damages were revealed through scientific studies. It is not a proven fact that a person may be addicted to food, but with a cautious approach, we believe that using these and similar scales will return to us as a gain rather than a loss due to the 'prudential principle.'

However, assuming that FA is a disease, the mYFAS 2.0 scale can be considered as an objective and practical tool that can lead us to diagnosis. Current data shows that Turkey will be struggling with obesity and related health problems in the future as today. Therefore, we think that it will be useful to adapt these and similar scales into Turkish for the prevention of obesity.

CONCLUSION

mYFAS 2.0 can be used as a data collection tool in 'food addiction' screenings. Considering that the concept of FA is still debatable, we think that the results obtained with the scale do not make the diagnosis of FA, but it can be a warning and a guide in research on obesity prevention.
In this study, It started with the approval of T.C. Sakarya University Faculty of Medicine Non-Invasive Research Ethics Committee dated 02/10/2017 and decision numbered 71522473/050.01.04/200.

Our article is published with any institution, organization and person. There is no conflict of interest and there is no conflict of interest between the authors.

Author contributions

Concept: ŞT; Supervision: HÇE; Materials: ŞT; Data Collection and/or Processing: ŞT; Analysis and/or Interpretation: ŞT, HÇE, EY; Writing: ŞT

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RESEARCH ARTICLE / *Araştırma Makalesi*

The Effect of HbA1c Levels of Children with Type 1 Diabetes and Their Parents' Anxiety on Family Functioning During the COVID-19 Pandemic

Tip 1 Diyabetli Çocukların HbA1c Düzeylerinin ve Ebeveynlerinin Kaygısının COVID-19 Pandemi Sürecinde Aile İşlevleri Üzerine Etkisi

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Abstract

Introduction	This study was conducted to examine the effects of trait and state anxiety of parents who had children with type 1 diabetes on family functioning during the COVID-19 pandemic.
Materials and Methods	This descriptive, cross-sectional, and correlational study was conducted during the quarantine period by using the random sampling method. The study was completed with the parents of 134 children with type 1 diabetes registered in the pediatric endocrinology outpatient clinic of a hospital in western Turkey.
Results	It was determined that the family functions of parents with children with type 1 diabetes were mostly affected by state anxiety level and trait anxiety level and HbA1c level, respectively. It was found that 45% (F= 36.764, p<.001) of the factors affecting family functioning in the model were explained by state and trait anxiety levels and HbA1c level.
Conclusion	The anxiety levels of parents during the quarantine period negatively affected family functioning. In public health emergencies such as pandemics, parents of children with chronic diseases should be followed carefully, mental assessments should be made, and necessary measures should be taken in the early period.
Keywords	Type 1 Diabetes; Parent; Anxiety; Family Function.

Öz

Amaç	*Bu çalışmada, COVID-19 pandemi sürecinde tip 1 diyabetli çocuğu olan ebeveynlerin sürekli ve durumluk kaygısının aile işlevleri üzerine etkisinin incelenmesi amaçlanmıştır.*
Yöntem ve Gereçler	*Tanımlayıcı, kesitsel ve ilişkisel tipteki bu çalışma rastgele örnekleme yöntemi ile karantina döneminde yapılmıştır. Çalışma, Türkiye'nin batısındaki bir hastanenin pediatrik endokrinoloji polikliniğine kayıtlı 134 tip 1 diyabetli çocuğun ebeveynleri ile tamamlanmıştır.*
Bulgular	*Tip 1 diyabetli çocuğu olan ebeveynlerin aile işlevlerini sırasıyla en çok durumluk kaygı düzeyi ve sürekli kaygı düzeyi etkilediği saptanmıştır. Modelin genelinde aile işlevselliğini etkileyen faktörlerin %43'ünün ((F= 51.356, p<.001) durumluk ve sürekli kaygı düzeyi ile açıklandığı bulunmuştur.*
Sonuç	*Karantina döneminde ebeveynlerin artan kaygı düzeyleri aile işlevlerini olumsuz yönde etkilemiştir. Pandemi gibi halk sağlığı acil durumlarında kronik hastalığı olan çocukların ebeveynler dikkatle takip edilmeli, mental yönden değerlendirmeleri yapılarak erken dönemde gerekli önlemler alınmalıdır.*
Anahtar Kelimeler	*Type 1 Diyabet; Ebeveyn; Kaygı; Aile İşlevi.*

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INTRODUCTION

The World Health Organization (WHO) reported the COVID-19 outbreak caused by SARS-CoV-2 on 30 January, 2020 and declared it as a "public health emergency of international concern".[1] The WHO declared the COVID-19 outbreak as a pandemic due to its alarming spread across the world.[2] Due to the highly infectious nature of COVID-19 and its spread through droplets, countries have taken many restrictive measures such as lockdowns, working from home, restriction of unnecessary movements in the public space, and closure of schools.[3]

It has been stated that COVID-19 is a risk factor for adults with diabetes.3 Although Type 1 Diabetes Mellitus (T1DM) is not considered high risk for children, serious symptoms, including mortality, have been reported in children, and the spread of infection has been found to pose a major health threat to all age groups.[4,5,6] The International Society for Pediatric and Adolescent Diabetes (ISPAD) emphasizes that attention should be paid to diabetes management at home, too, to reduce the need for emergency care and the frequency of hospitalization during the pandemic period.[5]

Parental support is very important in the management of T1DM. In addition, family processes are also affected by the disease[6]. Some family members experience strong feelings of despair and stress. Some studies show that chronic diseases cause psychological and emotional distress, physical illness, and family breakdown, disrupt social and sexual relationships, reduce social activities, and cause economic difficulties (Erdem et al., 2013).

Glycemic control in patients with T1DM can prevent complications. Glycated hemoglobin (HbA1c) is the standard parameter to assess glycemic control in patients with DM. Some studies have found a high level of correlation between poor glycemic control and family conflict.[7,8] The time spent in hospitals, the complexity of medication management, and intensive medical treatments greatly affect family members emotionally, physically, and financially. The impact of the disease on family functioning also affects the child's adaptation to the disease.[9] Parents of children with T1DM take on most of the responsibility for medical care (such as nutrition management, blood glucose monitoring, management of days when the child is sick, and insulin production).[10,11] Although the psychosocial impact of living with diabetes is complex, it affects both the person with T1DM and their family.[12] For example, experiencing hypoglycemia can be challenging for both individuals with diabetes and their family members.[13] The care of children with T1DM (such as blood glucose monitoring, insulin production, and compliance with the nutrition regime) includes daily challenges, and this responsibility can strain parents psychologically. The emotional burden experienced by parents of children with T1DM may be exacerbated by the current COVID-19 pandemic. The change in family dynamics since the onset of COVID-19 is reflected in different aspects of the care of children with T1DM. First, the anxiety about and fear of potentially serious infection of the child creates a stressful situation for parents.[14] Second, the suspension of school and extracurricular activities causes children and adolescents to spend more time at home and requires more attention from parents. Third, the closure of parks and recreational areas may cause a decrease in physical activity.[15] All these changes can significantly affect the child's glycemic control and increase their anxiety by placing more responsibility on parents.[16]

Anxiety is an adaptive mechanism for coping with perceived danger. It is defined as a very basic human emotion and a multifaceted affect. Because of the acute and chronic expression of anxiety, Spielberger et al. (1970) used the concepts of trait anxiety and state anxiety while developing their scale.[17] Accordingly, they defined state anxiety as the emotional response that occurs as a result of individuals' interpretation of negative situations as threatening in a specific moment and trait anxiety as the response of individuals to being generally anxious and stressed about the

situations they are in.[17] When we consider these anxiety types for the parents of children with T1DM, trait anxiety is the anxiety parents feel because their child has a diagnosis of T1DM. State anxiety, on the other hand, is the anxiety they feel because they interpret the pandemic as potentially threatening to their child. The anxiety and stress experienced by parents of children with T1DM can affect family dynamics and functions. Many studies have been conducted in the literature on the anxiety levels of children with T1DM and the effects of the pandemic.[3,18] However, no study has been found on the anxiety levels of parents in this period and its effect on family functioning.

Research Hypothesis

We hypothesized that during the COVID-19 pandemic, the trait and state anxiety levels of parents with a child with Type 1 Diabetes would increase and this would affect family functions. This study was conducted to investigate the effect of HbA1c levels of children with type 1 diabetes and their parents' state and trait anxiety on family functioning during the covid-19 pandemic.

MATERIALS and METHODS

Participants and study design

A descriptive, cross-sectional, and correlational research design was used in this study. The sample size was calculated as 110 individuals on the G-Power software package, based on medium effect size, Type 1 error of 0.05, and Type 2 error of 0.05 (95% power).[19] Parents who met the inclusion criteria, agreed to participate in the study, and submitted a written consent form were included in the study to clearly understand the relationship between the variables. The sample of the study consisted of the parents of 134 children with T1DM who were aged between 9 and 18 and registered with the Pediatric Endocrinology Clinic of a hospital in western XXX between April 2021 and July 2021.

Since face-to-face communication was not possible due to the COVID-19 quarantine, data were collected from the participants through an online self-report questionnaire using Google Forms®. Inclusion criteria for parents: a) having a child with T1DM between the ages of 9-18; b) diagnosis of the child with T1DM at least a year ago; c) volunteering to participate in the study. Criteria for participation in the present study were the absence of disabilities hampering comprehension, and voluntary participation. The exclusion criteria for parents with a diagnosis of psychiatric illness and/or using psychiatric medication were not included in the study. Independent variables: The State-Trait Anxiety Inventory, socio-demographic characteristics and HbA1c level. Dependent variables: The PedsQL Family Impact Module scale scores are dependent variables.

Survey instruments

In this study, a Descriptive Information Form, the State-Trait Anxiety Inventory, and the PedsQL Family Impact Module were applied to parents.

The Descriptive Information Form

This form, which was created by the researchers, consists of questions about the socio-demographic characteristics of parents with a child with T1DM, including age, gender, educational status, HbA1c level of the child with diabetes, and duration of diabetes.

The State-Trait Anxiety Inventory (STAI)

The State-Trait Anxiety Inventory (STAI) developed by Spielberger et al. (1970) was used in the study.[17] It's Turkish translation, reliability and validity studies were carried out by Öner and Le Compte in 1983. It is a self-evaluation scale with a 4-point Likert-type rating structure and includes a total of 40 items consisting of short statements.[20] It involves two parts, including a 20-item "state anxiety form" and a 20-item "trait anxiety form". Cronbach's alpha coefficient of the scale ranges between .83 and .87, test-retest reliability between .71 and .86, and item reliability between .34 and .72. In this study, the reliability coefficient was found to vary between 0.85 and 0.92.

The PedsQL Family Impact Module: This scale was developed by James Varni in 2004 to measure the effects of having a child with a disease on family functioning. It consists of a total of 6 sub-factors and 36 statements.[21] The entire scale consists of positive items and it is graded on a five-point Likert-type scale (Never (0), Rarely (1), Sometimes (2), Often (3), and Always (4)). The items are reverse scored during the calculation of the score (0 = 100, 1 = 75, 2 = 50, 3 = 25, and 4 = 0). Higher scores indicate good family functioning and a low negative impact on the family. Cronbach's alpha coefficient is 0.97 for the overall scale and ranges between 0.82 and 0.97 for the subscales (physical functioning, 0.91; emotional functioning, 0.90; social functioning, 0.88; cognitive functioning, 0.93; communication, 0.88; anxiety, 0.82; daily activities, 0.91; family relations, 0.97). It was adapted in 2020.22 Cronbach's Alpha for the Turkish version of the PedsQL Family Impact Module was found as 0.917, and the alpha coefficients of the subscales ranged between 0.653 and 0.944. In this study, Cronbach's alpha for the total scale was found to be 0.94.

Statistical analysis

The study data were analyzed on the IBM SPSS 22 statistical software package. Frequencies, percentages, and mean scores were used to evaluate the descriptive data of the participants, and the Shapiro-Wilk test was used to evaluate the normality of the data. The relationship between PedsQL Family Impact Module and Trait Anxiety Inventory and between the State Anxiety Inventory and PedsQL Family Impact Module was evaluated by using Pearson correlation analysis. Regression analysis was conducted to determine to what extent parents' trait and state anxiety and children's' HbA1c levels predicted family functions. The independent variables (trait and state anxiety scale scores) that we think may have an effect on family functions, which is our dependent variable in the study, were included in the regression model. In addition, HbA1c level, which is the most important parameter of metabolic control in diabetes, was chosen as an independent variable.

Ethics committee approval

This study was approved by the Institutional Review Board of the University (IRB approval no: 2021/10–33, dated 29.03.2021). In addition, parents were informed about the research, and their written consent was obtained.

RESULTS

The mean age of the parents of the adolescents with T1DM included in the study was 41.8 ± 5.89 years, 76.90% of them were female, 91.80% were married, and 54.50% had an undergraduate degree. Also, 94.80% of the parents stated that they were afraid that their children might contract COVID-19. It was found that the children of the parents participating in the study had diabetes for 6±3.25 years on average and that the HbA1c level of 61.90% of them was above 7.50% (Table 1).

Table 1. Demographic characteristics of participants

Descriptive Features			
		n	%
Gender	Kadın	103	76.9
	Erkek	31	23.1
Marital status	Married	123	91.8
	Not married	11	8.2
Education level	Primary School	20	14.9
	High School	41	30.6
	University	73	54.5
Fear of having Covid-19	Yes	127	94.8
	No	7	5.2
HbA1c (%)	<7.5	51	38.1
	>7.5	83	61.9
Age (year)		41.18±5.89 (min:27- max:54)	
Duration of diabetes (year)		6±3.25 (min:2- max:14)	

When the correlation between the trait and state anxiety levels and family functions of the parents with children with T1DM was examined, there was a moderate negative correlation between parents' state anxiety levels and their family functioning (r= -0.550, p<.001) and a low-level, negative, and significant correlation between family functioning and trait anxiety levels (r= - 0.308, p<.001) (Table 2).

Table 2. The relationship between family functioning and HbA1c Levels of Children with Type 1 Diabetes and Their Parents' Anxiety

	1	**2**	**3**
	r	r	r
1. PedsQl Family Impact Module	1.0		
2. State Anxiety	.550*	1.0	
3. Trait Anxiety	-.308*		1.0

***: p<.001**

Three models were created to determine the level of trait and state anxiety levels of the parents with children with T1DM to predict family functioning. According to the multiple regression analysis, the relationship between the parents' family functioning and other variables was examined, and it was found that there was a moderate, significant negative correlation with the state anxiety levels (β= -0.598, p<.001), a weak, significant negative correlation with the trait anxiety levels (β=-0.356, p<.001), and a significant positive correlation with HbA1c levels (β=-0.141, p<..001). It was determined that the family functioning of parents with children with T1DM was mostly affected by the level of state anxiety, the level of trait anxiety, and HbA1c levels, respectively. It was found that 45% (F= 36.764, p<.001) of the factors affecting family functioning in the model were explained by state-trait anxiety levels and HbA1c levels (Table 3).

Table 3. The level by which state and trait anxiety of parents and HbA1c levels of a child with T1DM predicted family functioning

Variables	B	β	Standard Error	t	p	95% CI for B Lower - Upper
Constant	119.547		4.90	24.370	p < .001	109.843 129.252
Trait Anxiety	-.897	-.356	.17	5.252	p < .001	-1.234 -.559
State Anxiety	-.280	-.598	.16	7.951	p < .001	-1.598 -.961
HbA1c	.700	-.141	1.81		p < .001	2.894 4.295
R2		0.447				
F		36.764				
DW		2.062				
β: Beta , R2: Adjusted R2						

DISCUSSION

The mental health effects of COVID-19, which is a public health emergency, have been identified as a high-priority topic for research.[23] Understanding the psychological effects in different populations can provide a theoretical basis for identifying people at risk and developing solutions.[24] Strengthening families is of great significance in diseases such as T1DM, where family-centered care is important. The results of this study show the relationship between the state and trait anxiety levels of parents with children with T1DM and their family functioning.

It was determined that there was a low-level, negative, and significant relationship between the parents' trait anxiety level and family functioning. Trait anxiety shows how people feel about themselves in general. In studies conducted with parents of children with chronic diseases, parents' anxiety levels were found to be high. Whittemore et al.[25] stated in their study conducted before the pandemic that parents of children with T1DM were more stressed and anxious, given that diabetes management requires a lot of responsibility and time. Some studies have shown that depressive symptoms in parents with children with T1DM are associated with lower parent involvement, lower family adjustment, and higher family conflict.[26,27] The family functioning of children with T1DM is negatively affected by their parents' anxiety levels, and this finding is consistent with the literature.

It was determined that there was a low-level, negative, and significant relationship between parents' state anxiety levels and their family functioning. State anxiety level is defined as the type of anxiety that occurs when an individual experiences a stressful situation/event. The COVID-19 pandemic has caused panic and fear all over the world. Uncertainties, people's lack of knowledge of the disease, and the rapid increase in the number of deaths have increased anxiety. The severe course of infection in those with chronic diseases has also worried the parents. Due to fear of COVID-19 infection and uncertainty about its severity in patients with diabetes, parents have become even more concerned during the pandemic.[28] It has been determined that parents of children with T1DM are twice as likely to be concerned about developing the disease, social distance, and emotional burden than parents of children with no diabetes.[29,30,18] BD found that during the COVID-19 period, families experienced intense anxiety because they were afraid that their children might contract the disease and because they had difficulties in managing diabetes. However, it was stated that family resilience was at a good level in this period.[31] Similar to our findings, the study showed that families with children with T1DM were negatively affected during the COVID-19 period.[32] Although the infection had a mild course in the pediatric age group, the existing anxiety of the parents increased with the pandemic due to the chronic disease in their children. It is thought that parents' anxiety also affected family functioning negatively.

It was determined that the family functioning of parents with children with T1DM was mostly affected by the level of state anxiety, trait anxiety and HbA1c levels, respectively. A low-level correlation was found between HbA1c, which is the most important indicator of metabolic control in diabetes, and family functioning. There were no studies in the literature on the effect of family functioning on metabolic control during the pandemic. Previous research found that families with a child with type 1 diabetes reported lower family functioning than families with no children with type 1 diabetes, which indicates the negative impact that type 1 diabetes can have on a family.[33] Differences in family functioning experience among family members were associated with poor metabolic control.[34,35] Pandemic process affects parent's ability to manage diabetes and to support children's autonomy[18]. In this context, it was observed that the anxiety of parents with children with T1DM affected their family functioning in their daily routine, but that the pandemic led to anxiety that affected family functioning at a higher level. In the literature,

there are studies on how children and adolescents with T1DM are affected in terms of glycemic control, diabetes management, and psychosocial aspects during the COVID-19 period. However, there are no studies on the effects of this pandemic period on families. During this period, it is thought that families have been neglected as studies have focused only on children with T1DM. Therefore, it is thought that this finding will contribute to the literature.

Limitations

This study has several limitations, the most important of which is that the responses of parents consist of data based on self-reports. Another limitation is the collection of data from only one hospital. Therefore, the results of this study cannot be generalized to all regions in Turkey.

CONCLUSION

In conclusion, it was found that the anxiety levels of parents who had children with T1DM negatively affected their family functioning. However, it was determined that the increased anxiety levels of parents during the COVID-19 pandemic process negatively affected family functioning more. Since there are no studies addressing parents regarding this topic, our study will contribute to the field. In future studies, it is recommended to conduct in-depth interviews to better examine the factors that increase parents' anxiety.

It is extremely important to provide and appropriately manage medical consultancy services to facilitate the access of children and their families to health services, make timely controls, and enable them to access accurate information promptly. It is necessary to create social platforms where parents can easily share and reach similar experiences about similar problems and manage them appropriately. Sharing the economic, psychological, and medical knowledge and experiences on such platforms timely and carefully, which have recently become widespread as "know-how", is important not only in the management of the disease but also in terms of its contribution to raising the thresholds of psychological resistance.

It is suggested that mental health specialists should take an active part in the general intervention process of the disease to activate the mental health and psychosocial response promptly during the pandemic. Pediatric/Family nurses should define the psychological and behavioral responses and problems of parents with children with T1DM, and provide psychosocial care that facilitates their adaptation to new situations. Frequent meetings of public health nurses with parents who have children with T1DM in their region through telemedicine will facilitate early detection of possible problems.

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RESEARCH ARTICLE / *Araştırma Makalesi*

Leukoglycemic Index may be a Unique Parameter to Predict Mortality in Patients with Acute Myocardial Infarction: Single Operator Experience

Lökoglisemik İndeks Akut Miyokard Enfarktüsünde Mortaliteyi Öngördürücü Benzersiz Bir Parametre Olabilir

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Abstract

Introduction	Predicting high-risk patients is crucial in acute myocardial infarction (AMI). We aimed to investigate whether the leukoglycemic index (LGI) has a unique ability and to compare it with other inflammatory parameters in predicting in-hospital mortality in AMI.
Materials and Methods	In this single-center study, we retrospectively analyzed all AMI patients hospitalized and followed by a single operator. Patients were divided into two according to in-hospital outcomes. Other inflammatory parameters (systemic immune-inflammatory index, platelet-lymphocyte ratio, neutrophil-lymphocyte ratio, triglyceride-HDL ratio, and LDL-HDL ratio), C-reactive protein (CRP), and LGI were calculated according to previously described criteria. Univariable and multivariable logistic regression analyses were used to find independent predictors. The receiver operating characteristic (ROC) curve was used to find the cut-off point of LGI and other parameters in predicting mortality.
Results	A total of 304 patients with AMI were included in the study. The mean age was 62.18±11.89 and 74 (24.3%) of patients were female. The total death rate was 19 (6.3%). In univariate variable analysis, LGI was found as a significant predictor of mortality (p<0.001). After adjusting risk factors (age, coronary artery disease history, ejection fraction, CHA2DS2VASc score, creatinine, and CRP) in multivariable analysis, LGI was still found as a significant predictor of short-term mortality. ROC curve analysis showed that the area under the curve was 0.837 (0.704-0.971) with a sensitivity of 76.5% and with a specificity of 91.5% with a 3.39 cut-off value.
Conclusion	Our study showed that LGI might be a unique parameter in predicting short-term mortality in AMI.
Keywords	leukoglycemic index, acute myocardial infarction, mortality

Öz

Amaç	*Akut miyokard enfarktüsünde (AME) yüksek riskli hastaları öngörmek çok önemlidir. Bu çalışmada lökoglisemik indeksin (LGI) AME'de hastane içi mortaliteyi öngörmede benzersiz bir yeteneği olup olmadığını araştırmayı ve diğer inflamatuar parametrelerle karşılaştırmayı amaçlanmıştır.*
Yöntem ve Gereçler	*Bu tek merkezli çalışmada, hastaneye yatırılan ve tek operatör tarafından takip edilen tüm AME hastalarını retrospektif olarak inceledik. Hastalar hastane içi ölüm sonuçlarına göre ikiye ayrıldı. Diğer inflamatuar parametreler (sistemik immun-inflamatuar indeks, platelet-lenfosit oranı, nötrofil-lenfosit oranı, trigliserit-HDL oranı ve LDL-HDL oranı), C-reaktif protein (CRP) ve LGI daha önce açıklanan kriterlere göre hesaplandı. Bağımsız yordayıcıları bulmak için tek değişkenli ve çok değişkenli lojistik regresyon analizi kullanıldı. Mortaliteyi öngörmede LGI ve diğer parametrelerin kestirim noktasını bulmak için receiver operator characteristic (ROC) eğrisi kullanıldı.*
Bulgular	*Çalışmaya toplam 304 AMI hastası dahil edildi. Ortalama yaş 62,18±11,89 olup hastaların 74'ü (%24,3) kadındı. Toplam ölüm oranı 19 (%6,3) idi. Tek değişkenli değişken analizinde LGI, mortalitenin anlamlı bir yordayıcısı olarak bulundu (p<0.001). Çok değişkenli analizde risk faktörleri (yaş, koroner arter hastalığı öyküsü, ejeksiyon fraksiyonu, CHA2DS2VASc skoru, kreatinin ve CRP) modele eklendikten sonra LGI, kısa vadeli mortalitenin önemli bir göstergesi olarak bulundu. ROC eğrisi analizi, eğri altında kalan alanın 0,837 (0,704-0,971) olduğunu, duyarlılığın %76,5 ve özgüllüğün %91,5 olduğunu ve 3,39 cut-off değerini gösterdi.*
Sonuç	*Çalışmamız, LGI'nin AMI'de kısa vadeli mortaliteyi tahmin etmede diğer parametrelere göre benzersiz bir parametre olabileceğini gösterdi.*
Anahtar Kelimeler	*lökoglisemik indeks, akut miyokard enfaktüsü, mortalite*

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INTRODUCTION

Acute myocardial infarction (AMI) has high morbidity and mortality worldwide despite advances in medical treatment and interventional techniques. Predicting acute and serious effects of AMI and taking action against it is highly important to prevent harmful outcomes. Therefore, risk factors associated with coronary artery disease (CAD) and AMI were investigated in detailed. Moreover, risk scoring systems have been developed to categorize the high risk and low risk patients.[1,2] Quick and easy markers as well as risk scores and clinical status of the patients have been studied in predicting short and long term outcomes of AMI patients.[3–5]

It is known that inflammation plays a crucial role in the course and prognosis of different acute and chronic diseases.[6–8] Acute MI is strongly associated with inflammatory process and inflammatory markers measured in blood stream can easily reflect this pathophysiological state.[9] Based on this data, different inflammatory markers have been studied in the prognosis of AMI. Neutrophil-lymphocyte ratio (NLR), platelet-lypmhocyte ratio (PLR), systemic immune-inflammatory index (SII), triglyceride-HDL ratio and LDL-HDL ratio and C-reactive protein (CRP) are some of the inflammatory markers of which predictive values have been shown.[3,5,10–12] Leukoglycemic index (LGI) which constitutes blood glucose level and white blood cell (WBC) count has been previously studied in different populations including ST elevation myocardial infarction (STEMI) and thought to be a prognostic marker in prognosis.[13]

Although it was shown that inflammatory markers have prognostic data in predicting short and long term outcomes of AMI in separate studies, LGI has not been compared with other inflammatory markers previously. In this study, we wanted to investigate the ability of LGI and to compare it with other inflammatory markers in predicting in-hospital mortality of AMI patients.

MATERIALS and METHODS

In this retrospective study, patients with AMI followed by a single operator in a tertiary hospital between October 2019 and October 2021 were included in the analysis. NonSTEMI and STEMI diagnoses were based on the European Society of Cardiology guidelines.[14,15] All patients were followed in coronary care unit (CCU) under the supervision of interventional cardiologist and medical and interventional treatments were administered according to the discretion of the physician. Demographic characteristics, laboratory data and discharge status were recorded. Blood tests were taken from patients upon arrival to the CCU and complete blood count samples were collected in dipotassium EDTA tubes. Other biochemical measurements including lipid parameters were also checked.

Inflammatory Parameters

Basic inflammatory parameters (e.g. CRP) were measured in previously taken blood samples and other parameters were calculated according to previously described methods. Triglyceride-HDL ratio, LDL-HDL ratio, SII, PLR and NLR were separately calculated and LGI was calculated by multiplying blood glucose level and WBC count and dividing by a thousand. All parameters were separately tested in univariable logistic regression analysis to test the ability of predicting in-hospital mortality.

Statistical Analysis

SPSS software package (Version 23.0, SPSS, Inc., Chicago, IL) was used for analyzing the data. Shapiro-Wilk test was used to test the distribution of numerical values and mean ± standart deviation was used for normally distributed valus and the median (interquartile range) was used for the non-normal ones. Chi-square test was used to test the categorical variables which were expressed as frequencies (%). Independent samples t-test and Mann-Whitney U test were used to test normally and non-normally distributed variables, respectively. Univariable and multivariable logistic regression analysis was used to test the significance of the variables in predicting the outcomes. First, variables

were tested in univariable logistic regression. Next, LGI was tested in multivariable logistic regression with adjusted model by adding clinically and statistically significant variables to the model. Area under the receiver operating characteristic (ROC) curve was used to test the sensitivity and specificity and find the cut-off value of the LGI.

RESULTS

A total of 304 patients were included in the study. Mean age was 62.18±11.89 and 74 (24.3%) of patients were female. While non-STEMI constituted 169 (55.6%) of patients, STEMI was 135 (44.4%). A total of 19 (6.3%) of patients died in hospital follow-up and there was not statistically significant difference between STEMI and nonSTEMI and between STEMI subgroups in mortality (p=0.176). Table 1 illustrates some of the basal demographic characteristics and laboratory findings of both groups (survivors and nonsurvivors). There was not statistically significant difference between survivors and nonsurvivors in terms of age, gender, cardiovascular risk factors and several laboratory parameters including lipid parameters (all p values >0.005). Ejection fraction was significantly lower in nonsurvivors (Table 1, p<0.001). Previously calculated inflammatory parameters were also compared between groups and SII, PLR, NLR, TG-HDL ratio and LDL-HDL ratio were all similar between groups (Table 1). Only LGI was significantly higher in nonsurvivors (5.3 (2.25-6.85) vs 1.57 (1.19-2.15), p<0.001).

Binary logistic regression analysis was used to find the significant predictors of in-hospital mortality. First, variables were tested in univariable logistic regression analysis. Table 2 showed the univariable analysis results of CRP, LGI and other inflammatory parameters. In unadjusted model, LGI and CRP were significantly related to in-hospital mortality (2.345 (1.759-3.126), p<0.001 and 1.012 (1.003-1.022), p=0.006, respectively). But other inflammatory parameters were failed to predict short-term outcomes. In adjusted model of logistic regression, we added CRP, LGI and clinically important parameters (age, CAD history, ejection fraction, CHA2DS2VASc score (congestive HF or left ventricular dysfunction, HT, age 75 years and older or between 65-74 years, DM, thromboembolism or stroke history, vascular disease, and female gender), creatinine and CRP) to the multivariable model. Adjusted model showed that EF and LGI are the only significant predictors of in-hospital mortality in AMI patients (Table 3). Area under the ROC curve (AUC) showed that LGI has a 76.5% sensitivity and 91.5% specificity with the cut-off value of 3.39 (AUC: 0.837, p<0.001, Figure). Moreover, there was no difference in the prognostic value of LGI in mortality in subgroup analyzes with and without DM.

Table 1. Demographic characteristics and laboratory findings of survivors and nonsurvivors

	Survivors (n=385)	Nonsurvivors (n=19)	p value
Age (years)	62±11.9	64.9±11.7	0.295
Female, n (%)	66 (23.2)	8 (42.1)	0.093
STEMI, n (%)	123 (43.2)	12 (63.2)	0.176
Hypertension, n (%)	97 (34)	5 (26.3)	0.619
Diabetes Mellitus, n (%)	80 (28.1)	5 (26.3)	0.895
CAD, n (%)	70 (24.6)	4 (21.1)	0.900
Hyperlipidemia, n (%)	17 (6)	1 (5.3)	0.955
Smoking, n (%)	116 (40.7)	7 (36.8)	0.720
Body Mass Index	26.4 (24.7-28.3)	25.3 (23.9-27)	0.990
EF (%)	55 (45-55)	30 (25-45)	<0.001
CHA2DS2VASc	2 (1-3)	3 (1-4)	0.198
WBC	10 (8.4-12.6)	15.3 (10.3-19)	<0.001
Hemoglobin	14.5±0.9	13.4±1.1	0.145
Platelet count	287±30	219±46	0.595
Neutrophil count	7±3.7	9.4±7.3	0.046
Lymphocyte count	2.1 (1.5-2.9)	2.5 (1.9-3.8)	0.189
Glucose	147 (117-200)	375 (175-484)	0.001
Creatinine	1.1±0.2	1.7±1.1	0.142
Sodium	140±3.5	138±3.8	0.067
Potassium	4±1	4.3±0.4	0.294
Albumin	4.0±0.4	3.2±0.8	0.298
AST	28 (21-45)	37 (32-90)	0.158
ALT	21 (16-31)	33 (22-76)	0.155
CRP	5 (2-12)	12 (6-76)	0.036
LDL	125±49	132±32	0.328
HDL	40±15	41±14	0.377
Total cholesterol	191±45	189±48	0.178
Triglyceride	125±89	79±17	0.327
LGI	1.57 (1.19-2.15)	5.3 (2.25-6.85)	<0.001
SII	787 (473-1225)	1045 (491-2662)	0.283
PLR	111.8 (81.3-153.8)	105.4 (78-149)	0.365
NLR	3.1 (2.04-5.25)	4.1 (2.5-9.5)	0.286
TG-HDL ratio	3 (2-4.6)	2.2 (1.5-3.8)	0.318
LDL-HDL ratio	3.1 (2.5-3.8)	2.9 (1.8-3.1)	0.175

Continuous variables are presented as mean ± SD or median (IQR), categorical variables are presented as frequency (%)
ALT: alanine transaminase; AST: aspartate transaminase; CAD: Coronary Artery Disease; CRP: C-reactive protein; EF: ejection fraction; HDL: high density lipoprotein; IQR: interquartile range; LDL: low density lipoprotein; LGI: leukoglycemic index; SD: standard deviation; NLR: Neutrophil lymphocyte ratio; PLR: platelet lymphocyte ratio; SII: systemic immune-inflammatory index; STEMI: ST Elevation Myocardial Infarction; TG: triglyceride; WBC: white blood cell

Table 2. Univariable logistic regression analysis of several inflammatory markers

Variable	Odds ratio (Confidence Interval)	p value
CRP	1.012 (1.003 – 1.022)	0.006
SII	1.153 (0.637 – 2.088)	0.639
NLR	1.080 (0.981 – 1.190)	0.118
PLR	0.996 (0.989 – 1.004)	0.363
TG-HDL ratio	0.875 (0.678 – 1.129)	0.304
LDL-HDL ratio	0.678 (0.386 – 1.191)	0.176
LGI	2.345 (1.759 – 3.126)	<0.001

Abbreviations: CRP: C-reactive protein, HDL: high density lipoprotein, LDL: low density lipoprotein, LGI: leukoglycemic index, NLR: neutrophil lymphocyte ratio, PLR: platelet lymphocyte ratio, SII: systemic immune inflammatory index, TG: triglyceride

Table 3. Adjusted and unadjusted logistic regression analysis of LGI in predicting mortality

Variables	Odds ratio (95% CI)	P value
Leukoglycemic index		
Unadjusted	2.345 (1.759 – 3.126)	<0.001
Adjusted	2.159 (1.522 – 3.061)	<0.001

Risk factors adjusted by age ,CAD history, EF, CHA2DS2VASc score, creatinine and CRP
Abbreviations: CAD: coronary artery disease, CRP: C-reactive protein, EF: ejection fraction, LGI: leukoglycemic index

DISCUSSION

Our single operator study showed that LGI may be a unique parameter and has better prediction ability than previuosly studied inflammatory parameters to show in-hospital mortality in AMI.

High mortality risk in AMI led clinicans to investigate the clinical and laboratory predictors of both short-term and long-term mortality. Inflammatory parameters have been tested for several years. White blood cell count, CRP and lymphocyte to monocyte ratio were separately tested and found as significantly correlated with the extent of atherosclerosis and long-term outcomes in AMI.[16–18] Besides, Oylumlu et al. showed that PLR is strongly associated with in-hospital mortality with acute coronary syndrome.[19] Furthermore, the newly described inflammatory parameter SII was tested in several studies and proven that it may

predict short and long term outcomes in stable CAD and AMI patients. Yang et al. investigated the ability of SII in predicting clinical outcomes in patients with CAD. They found that SII has a better predictive ability in major cardiovascular outcomes than traditional risk factors in CAD patients after coronary intervention.[20] Huang et al. revealed the same findings in elderly patients.[21] Moreover, two independent studies proved that increased LDL/HDL ratio and decreased TG/HDL ratio are associated with worse clinical outcomes in patients with STEMI.[11,12] These studies clearly indicate that different inflammatory parameters can be used as a prognostic tool both in chronic coronary syndromes and in AMI. Neverthless, the research to find better parameters to predict the prognosis is still going.

Leukocyte count which is directly related to inflammatory state of the body is a very good prognostic factor in AMI to predict heart failure, cardiogenic shock and death.[22] Besides, hyperglycemia is promoted by activated inflammatory mediators regardless of diabetes and it may also trigger the inflammatory response.[23,24] These pathophysiological effects of leukocyte and vlood glucose levels necessitated investigation of the combination of these parameters. The LGI parameter was obtained as a result of this research and its effects in different clinical scenarios were examined. Padella-Cueto et al. documented the prognostic effects of LGI in Cuban patients with STEMI in a retrospective study.[13] Qi et al. investigated the LGI in an observational and multicenter study including AMI patients and they showed that LGI is a significant predictor of all-cause mortality in non-diabetics, but not in diabetics.[22] Investigators also categorized LGI in their study rather than taking it as a numerical value. Kilic et al. showed that LGI is a predictor of CAD severity and it is highly correlated with the Gensini score.[25] Although these three studies have demonstrated the prognostic value of LGI in different patient groups, LGI was not compared with other inflammatory markers which have proven prognostic value in AMI. Therefore, comparing the prognostic value of LGI with other inflammatory markers will provide a more objective evaluation of the results. Therefore, in our study, besides testing the prognostic value of LGI in AMI patients, we demonstrated its superiority over other inflammatory markers. Based on these findings, it may be rational to use LGI instead of other inflammatory markers in AMI process.

Limitations Of The Study

Despite considerable findings, our study has several limitations. First, our study was designed in a retrospective manner which may lead the investigators to the bias. Second, our population included only single operator patients. Third, data acquired from study includes only single center patients. Therefore, prospectively designed studies involving several centers may provide more comprehensive and valuable information. Fourth, we did not compare the clinical significance of LGI with GRACE risk score which has proven prognostic value in ACS. However, despite these limitations, our study is important in that it demonstrates the superiority of LGI over other inflammatory parameters.

CONCLUSION

This study showed that LGI may be a unique parameter to predict in-hospital mortality in AMI patients including STEMI and nonSTEMI regardless of DM and superior to other inflammatory parameters that have previously proven clinical importance.

Confict of Interest

No conflict of interest was declared by the authors.

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RESEARCH ARTICLE / *Araştırma Makalesi*

Investigation of the Relationship of Sociodemographic and Clinical Characteristics with Cardiovascular Risk Scores in Patients with Schizophrenia Living in Nursing Homes

Bakımevinde yaşayan Şizofreni Hastalarında Sosyodemografik ve Klinik Özelliklerin Kardiyovasküler Risk Skorları ile İlişkisinin İncelenmesi

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Abstract

Introduction	Cardiovascular risk increases in patients with schizophrenia. In our study, it was aimed to predict the 10-year risk of developing cardiovascular disease using the Framingham risk score in schizophrenia patients living in nursing homes
Materials and Methods	In our study, the sociodemographic and clinical characteristics of schizophrenia patients living in nursing homes, such as age, gender, educational status, duration of disease, and treatments used, and Framingham risk scoring which included age, gender total cholesterol, HDL, smoking status, systolic blood pressure, and presence of diabetes mellitus. were used in the calculation of cardiovascular risk. Also, the results of the General Assessment of Functioning and Clinical Global Impression disease severity scale were recorded in order to determine the functionality and severity of the disease.
Results	51 patients with schizophrenia were included, and the Framingham risk score of the patients was calculated as 4.65±4.63. While Framingham risk scores were significantly correlated with disease duration (r=0.284, p=0.044), age (r=0363, p=0.01) and length of stay in nursing home (r=0.538, p<0.001)), No relationship was found between risk scores and the number of psychotropic drugs. disease severity or functionality.
Conclusion	Our results showed that factors such as advanced age, male gender and length of nursing home stay were associated with an increased cardiovascular disease risk. Further studies including schizophrenia patients who do not stay in nursing homes are essential to determine the effects of nursing home conditions on cardiovascular disease risk
Keywords	Schizophrenia, Nursing home, Cardiovascular risk, Framingham risk score

Öz

Amaç	*Şizofreni hastalarında kardiyovasküler riskin arttığı bilinmektedir. Çalışmamızda bakımevinde yaşayan şizofreni tanılı hastalarda Framingham risk skorlaması kullanılarak 10 yıllık kardiyovasküler hastalık gelişme riskini yordamak amaçlanmıştır.*
Yöntem ve Gereçler	*Çalışmamızda bakımevinde yaşayan şizofreni hastalarının yaş, cinsiyet, eğitim durumu, hastalık süresi, kullanılan tedaviler gibi sosyodemografik ve klinik özellikleri yanında işlevsellikleri ve hastalık şiddetini saptamak üzere İşlevsellik Genel Değerlendirmesi ve Klinik Global İzlenim hastalık şiddeti ölçeği sonuçları kaydedilmiş, kardiyovasküler riskin hesaplanmasında yaş, cinsiyet, toplam kolesterol, HDL, sigara içme durumu, sistolik kan basıncı ve diabetes mellitus varlığını içeren Framingham risk skorlaması kullanılmıştır.*
Bulgular	*51 şizofreni hastası dahil edilmiş, hastaların Framingham risk skoru 4.65±4.63 olarak hesaplanmıştır. Framingham risk skorlarının hastalığın süresi (r=0.284, p=0.044), yaş (r=0363, p=0.01) ve bakımevinde kalış süresi (r=0. 538, p<0.001)) ile anlamlı ilişki bulunurken hastalık şiddeti, işlevsellik ve psikotropik ilaç sayıları arasında ilişki bulunamamıştır*
Sonuç	*Sonuçlarımız ileri yaş, erkek cinsiyet ve bakımevinde kalış süresi gibi faktörlerin artmış kardiyovasküler hastalık riski ile ilişkili olduğunu göstermiştir. Bakımevi koşullarının kardiyovasküler hastalık riski üzerindeki etkilerini saptamak için bakımevinde kalmayan şizofreni hastalarını da içeren yeni çalışmalara ihtiyaç vardır.*
Anahtar Kelimeler	*Şizofreni, Bakımevi, Kardiyovasküler risk, Framingham risk skoru*

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INTRODUCTION

Schizophrenia is a chronic mental illness that affects more than 21 million people in the world, usually beginning in adolescence or young adulthood, leading to deterioration in perception, thoughts and behaviors, leading to significant long-term loss of functionality.[1] It is known that individuals with chronic mental illness have higher mortality rates compared to the healthy population schizophrenia[2], those with mortality are higher than other mental illnesses and life expectancy is 15-20 years shorter than in the general population[3]. Although the first cause of death comes to mind is unnatural deaths, such as suicide, cardiovascular diseases (CVD) are the most common cause of death in patients with schizophrenia[4]. Studies have shown that the risk of CVD in schizophrenia increases by 53% and the risk of death from CVD is 2.9 times higher than in the general population[5]. Reasons of increased risk of cardiovascular disease include less use of general health services, unhealthy lifestyle such as increased smoking, poor diet, lack of physical activity, and concomitant physical diseases such as obesity, dyslipidemia, hypertension, diabetes. In addition, pharmacological agents used in the treatment increase the risk[6]. Today, the use of antipsychotic drugs has become widespread in many psychiatric diseases, especially schizophrenia and bipolar disorder, and the choice of drugs has gradually changed. Second generation antipsychotics have generally been preferred to reduce the occurrence of extrapyramidal side effects. This has led to new cardiovascular side effects such as weight gain, lipid and glucose metabolism disorders, metabolic syndrome, orthostatic hypotension, cardiomyopathy, myocarditis, tachycardia, arrhythmia and sudden death[5].

Recent studies showed that some of the people with chronic mental illnesses do not improve functionality despite treatment, and 10-15% of them requires lifelong care[7]. In the last century, policies aimed at treating mental patients in the community have produced supportive services such as Community Mental Health Centers for patients who live with their families, and residential care services such as nursing homes for people with poor social support or alone[7]. In the nursing homes that have been serving since 2007 in our country, the basic requirements such as shelter, nutrition, as well as the mental and social needs of people who can not take care of themselves due to chronic mental illness, who are forced to care for by their families or who do not have a family, are met by trained and competent personnel. In the literature, studies with schizophrenia patients staying in nursing homes are very limited, In these studies, besides some of the advantages of nursing homes, some difficulties have also reported. In the study conducted in 2015, Ersan and Yıldız stated that the recommendations of current treatment guidelines were not followed in psychotic disorder patients staying in nursing homes, the use of multiple antipsychotic drugs was high, and the use of clozapine was quite low[8]. In the study in which Aydın and his colleagues compared schizophrenia patients living in nursing homes and in their homes with families in 2020, it was reported that the male sex ratio, average age, duration of illness and smoking status of those staying in nursing homes were high, and no difference was found between drug side effects and multiple antipsychotic use in both groups[9]. Although nursing homes appear to be sheltered living spaces for people with schizophrenia, there have been no studies on people's medical conditions and cardiovascular risks.

The Framingham Risk Score is an analysis calculated using variables such as age, gender, systolic blood pressure, diabetes mellitus (DM) history, antihypertensive treatment, smoking, and body mass index to predict a 10-year risk of cardiovascular disease[10]. Past studies have shown that the calculated score in schizophrenia patients (5.16%) is significantly higher than the general population (3.02%), and cardiovascular risk is reported to rise as severity and duration of the disease increase[11]. Additionally, comprehensive program of exercise, dietary changes, and behavioral intervention strategies can reduce the risk in people with schizophrenia by changing their lifestyle have been shown in literature[12] In this context, interventions such as the

arrangement of psychiatric treatment of patients staying in nursing homes by stable team working in Community Mental Health Centers, consultating them to medical examinations if necessary, standard meals served under the control of a dietician, and restricting smoking consumption may contribute to reducing the cardiovascular risk increase of patients. Based on this, we aimed to predict the 10-year risk of developing coronary heart disease by using Framingham risk scoring in patients with schizophrenia living in nursing homes

MATERIALS and METHODS

Our study was designed retrospectively, descriptively and cross-sectionally. The study sample consists of patients who are followed up with the diagnosis of schizophrenia according to DSM-5 criteria at Sultanbeyli Community Mental Health Center, who have been regularly brought to their follow-up for the last 6 months, who have complete treatment records, and who are staying in the nursing home. In the collection of the data, the form including the socio-demographic information and clinical characteristics of the patients, the General Assessment of Functionality (IGD) scale, the Clinical Global Impression Disease Severity Scale (CGI-SS) and the Framingham risk scoring. Ethics committee approval from Erenkoy Mental and Nervous Diseases Training and Research Hospital was received for our study (date/number 07.03.2022/13). Our study complies with the Declaration of Helsinki.

Data Collection Tools

The sociodemographic and clinical data form prepared and applied by the researchers includes the age, gender, marital status, education status, duration of the disease, duration of treatment, smoking-alcohol-drug use, additional psychiatric and physical disease history, family history of psychiatric diseases, drugs used and side effects.

The Global Assessment of Functionality Scale (GAF) is a 100-point scale that measures the general psychological, social and occupational functioning level of the patient, with higher scores indicating higher levels of functionality[13].

Clinical Global Impression Disease Severity Scale (CGI-SS) is a 7-point Likert-type scale used to score the severity and degree of recovery of psychiatric illnesses (1: normal; 2: borderline patient; 3: mild patient; 4: moderately ill; 5: markedly ill, 6: severely ill; 7: extremely ill)[14].

Framingham risk score was calculated according to the 10-year cardiovascular risk calculation system determined by the Turkish Society of Cardiology with the data of age, gender, cholesterol and high-density lipoprotein (HDL) levels, systolic blood pressure, presence of DM, smoking of the patients[15].

Statistical evaluation

Windows SPSS [Statistical Package for Social Sciences version 20.0 software for Windows program were used for statistical analysis. The Kolmogorov-Smirnov and Shapiro-Wilk tests were used to determine whether or not the variables were normally distributed. Numerical variables were presented as mean and standard deviation for those with normal distribution and as median (min-max) for those without normal distribution. Categorical variables were presented with n (%) values. Mann-Whitney U test was used in the analysis of quantitative data and Spearman correlation analysis was used to determine the relationship between numerical variables. P values less than 0.05 ($p<0.05$) were considered significant.

RESULTS

51 patients with schizophrenia were included in the study. The mean age of the participants was 49.74±9.32. There were 14(%27.50) females and 37(%72.50) males among the patients. The median disease duration was 20(3-50) years. The total number of psychotropics and antipsychotics used were 3(1-5), 2(1-4) respectively. Framingham risk score of the participants was calculated as 4.65±4.63. The sociodemographic and clinical data of the patients are shown in

detail in Table-1.

Table 1: Sociodemographic and clinical characteristics of patients	
	N (%)
Gender	
Female	14 (27,50)
Male	37 (72,50)
Comorbid medical disease	
No	37 (72,50)
Yes	14 (27,50)
Smoking status	
No	25 (49)
Yes	26 (51)
	Median (min-max)
Age at the onset of disease	25 (15-58)
Duration of illness	20 (3-50)
Number of psychotropic drugs	3 (1-5)
Number of antipsychotic drugs	2 (1-4)
CGI score	5 (4-6)
GAF score	45 (15-65)
Duration of stay in nursing home (months)	50 (6-144)
	Mean ± SD
Age	49,74 ± 9,32
High-density lipoprotein (HDL)	45,47 ± 13,08
Cholesterol	167.17 ± 36.74
Systolic blood pressure	118.25 ± 13.55
Framingham risk score	4.65 ± 4.63

In the correlation analysis that were performed, revealed that Framingham risk scores were positively correlated with duration of the disease (r=0.284, p=0.044), age (r=0.363, p=0.01), and duration of staying at nursing home (r=0.538, p<0.001) There was no correlation between FRS and the scores of GAF and CGI, numbers of psychotropic drugs. Correlations between FRS and other variables are summarized in Table-2.

In the analysis where clinical variables were compared according to Framingham risk score, the FRS of men (5,88±0.8) was significantly higher than that of women (1,39±0,3) (p<0.001). Risk scores of patients who were divided into groups in terms of presence of co-morbidity, smoking status, number of antipsychotics and olanzapine-clozapine use did not differ statistically. Comparison of categorical variables in terms of FRS was shown in Table-3.

Table-3: Comparison of Framingham risk scores and categorical values				
	n	M(min-max)	z	p
Gender				
Female	14	1,15(0,2-3,5)	-3,737	<0.001
Male	37	4,7(0-22)		
Smoking status				
No	25	2,1(0-13,3)	-1,885	0.59
Yes	26	3,35(0,9-22)		
Comorbid medical disease				
No	37	3,1(0-16,3)	-,760	0.447
Yes	14	5,1(0,2-22)		
Number of antipsychotics				
1	16	2,95(0,2-22)	-,122	0.903
>1	35	3,3(0,2-16,3)		
Use of olanzapine or clozapine				
No	24	3,3(0,4-13,3)	-,293	0.77
Yes	27	2,88(0-22)		

Table-2: Relationship between numerical variables and Framingham risk scores										
		CGI	GAF	Duration of disease	Age	Duration of stay in nursing home	HDL	Systolic blood pressure	Number of anti-psychotics	Number of psychotropics
FHR	r	,142	-,016	,284*	,538**	,363**	-,172	,013	-,022	-,080
	p	,321	,909	,044	<0,001	,010	,227	,929	,877	,578
	n	51	51	51	51	50	51	51	51	51

DISCUSSION

The 10-year cardiovascular risk of schizophrenia patients living in nursing homes and followed by the community mental health center, was calculated as 4.65 with the Framingham risk score and it was found that the increase in risk was related to being male, duration of illness, age and length of stay in nursing home in our study.

In the literature, there are many studies that show that cardiovascular risk increases in chronic mental diseases, especially in pattients with schizophrenia, and leads to premature death.In the meta-analysis from 92 studies, conducted by Correll et al it was shown that the frequency of CVD in serious mental illnesses was 9.9%, the risk of developing CVD in patients increased by 78%, and the risk of death due to CVD increased by 85% 5. A 24-year follow-up study in Sweden found that deaths due to CVD were 6 times higher and 10 years earlier in people with schizophrenia than in the general population 16. A meta-analysis of 13 cohort studies showed a 53% increase in CVD risk in this patient group compared to the healthy population 4. In the studies conducted with FRS analysis, which is stated as the most common calculation method recommended for this purpose, it was confirmed that the cardiovascular risk was high in schizophrenia patients. The 10-year cardiovascular risk we identified with FRS is 4.65%. This score was found to be lower than the results (5,16% and 5,90%) of studies conducted with schizophrenia patients in our country despite the mean ages and ratios of male gender of them were higher than our study sample [11,17]. These results may suggest that nursing home conditions may be effective. The most important factors increasing cardiovascular risk in the schizophrenia patient group are unhealthy lifestyle behaviors characterized by decreased physical activity, unhealthy diet rich in carbohydrates and fats, excessive amounts of smoking, alcohol or substance use[12]. For patient families and physicians, the prominence of patients' management and treatment of chronic psychiatric symptoms and stigma can lead to not pay adequate attention to patients' physical illnesses. A meta-analysis published in 2011 showed that patients with schizophrenia had a 47% lower rate of invasive coronary interventions compared with people without mental illness[18]. The living conditions and medical care of the patients living in the nursing home, which constitutes our study sample, are under control differently from the patients living with their families. In nursing homes, the staff in charge restricts the amount of cigarettes smoked daily in smoking patients, does not allow the use of alcohol and drugs, the meals of the patients consist of menus created by the dietitian and the patients are motivated to activities during the day. The personnel responsible for psychiatric and medical care ensure that the patients are brought to the community mental health center regularly, regardless of their will[19]. Some researchers have found that a lifestyle change program that includes diet and exercise is effective in reducing the risk of cardiovascular disease, that key variables affecting risk continue to decrease with three-month follow-up after the program, and that some effects persist even at six and twelve months of follow-up[12,20]. This regulated living conditions of the patients in nursing homes may have contributed to lower FRS scores.

Another of the most likely causes that may cause increased cardiovascular risk in people with schizophrenia is the presence of comorbid diseases such as DM, hypertension and hyperlipidemia, although the underlying pathophysiology cannot be elucidated yet. In recent studies showed that 66.1% of schizophrenia patients have comorbid cardiovascular diseases, DM is accompanied by 28%, hypertension is 57%, and hyperlipidemia is 30% 4. In our patient group, 27.5% of patients had comorbid diseases and hypertension was detected in 3 patients and DM in 6 patients. The fact that the comorbid diseases seen in our patient group are lower than the rates detected in previous studies may also explain to low cardiovascular risk rates.

One of the factors responsible for the increase in cardiovascular risk is the use of antipsychotics. Among the second generation antipsychotic drugs (especially olanzapine

and clozapine) whose use has risen in recent years, have been shown to cause weight gain, deterioration in glucose tolerance and DM that increase cardiovascular risk[4,16]. However, there are also studies in the literature showing that there is no significant relationship between first or second generation antipsychotic use and increased cardiovascular risk[21]. It has even been suggested that patients who adhere to antipsychotic treatment reduce the risk of CVD due to the ability to provide their own care and that antipsychotics reduce deaths due to CVD due to the anti-inflammatory effects at the molecular level[22]. In a recent cohort study comparing mortality rates of patients with first-episode or chronic schizophrenia, using first-generation, second-generation antipsychotic drugs or none, under oral and long acting injection treatment showed that the highest mortality rate was in those who did not use antipsychotics and that second-generation antipsychotics used orally reduced mortality rates[23,24]. However, in another study mortality rates due to CVD increased in those who did not take any antipsychotics or high-dose antipsychotics. Although our study sample consisted mostly of chronic patients who had to receive more than one antipsychotic treatment, the cardiovascular risk score was not high and the number of antipsychotics used or the use of olanzapine/clozapine was not found significantly related with the risk score in line with the literature showing that the risk was reduced in the patients under treatment. This suggests that the disease, which cannot be treated rather than the metabolic side effects of drugs, increases the cardiovascular risk.

In studies evaluating the risk of CVD with FRS in schizophrenia patients, gender has been shown to interfere with the risk[25,26]. In the study conducted by Goff et al., the 10-year risk of coronary disease was found to be 9.4% in men and 6.3% in women[25]. In the Cardiovascular Lipid and Metabolic Outcomes Study in Schizophrenia (CLAMORS study) of Bobes et al., the total risk of CVD in 10 years was determined to be 6.8% in schizophrenia patients, and it was shown that the risk was significantly higher in men (8.3%-4.5%) than in women[26]. In our study, similarly, FRS was found to be significantly higher in men.

As the age progresses, the risk of cardiovascular disease increases in the general population. In a cohort study that screened 3.6 million people aged 40 years and older, it was shown that the frequency of all vascular diseases increased markedly every decade[27]. The risk is similarly increased in people with schizophrenia. In a study on the factors affecting the mortality rate in schizophrenia patients, it was stated that the average age of the patients who died at the end of 11-year follow-up was 48.9 and the survivors were 41.9 and that there was a statistically significant difference between the two groups in terms of age, and that advanced age was a risk factor for death. is an expected result28. In our patient group, advanced age is one of the factors that increase the risk of CVD.

In a study investigating the mortality of schizophrenia patients due to CVD, the mean age of onset of schizophrenia in deceased patients was 25.6 years, and 28.3 in the survivors, and the difference was found to be statistically significant[29]. The advanced age of onset of the disease indicates good prognosis of schizophrenia and reduces the cardiovascular risk as it shortens the time spent with the disease. The number of studies measuring cardiovascular risk and disease severity is limited. In deficit schizophrenia, in which negative symptoms predominate, patients have been shown to be at greater risk[30]. In a recent study conducted in our country, no significant relationship was found between disease symptom severity and FRS, and cardiovascular risk was mostly related to disease duration and number of hospitalizations[11]. In our sample, in accordance with the literature, FRS was found to be reduced in patients with low disease duration. Similarly, although we did not measure disease severity in detail in our sample, it was determined that functionality and recovery levels were not related to cardiovascular risk and that the risk increased as the duration of the disease was prolonged. In addition, the risk was affected by the duration of nursing

home of patients. Although this result seems contrary to our suggestion that nursing home conditions reduce the cardiovascular risk, as the age and duration of illness of people living in nursing homes increases, the length of stay in nursing homes also increases. Since there is no control group in our study, these confounding effects could not be analyzed.

The limitations of our research are that it does not include a control group consisting of schizophrenia patients living with their own families, the cause and effect relationship cannot be fully established and generalized due to its cross-sectional nature, and the data are collected by retrospective file scanning and the number of samples was low. In addition, since a scale that measures positive, negative and cognitive symptoms could not be used, the severity of the disease could not be evaluated comprehensively. Further larger scale studies are needed to clarify the issue.

As a result, our data show that schizophrenia patients living in nursing homes lead to mandatory changes in living conditions due to the rules of the nursing home, slightly reducing the cardiovascular risk known to increase in the disease. In addition to the psychiatric treatment, medical care should be taken in this neglected group and attention should be paid to the treatment and life condition changes for cardiovascular diseases.

Declarations

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Declaration of Competing Interest

The authors declare that they have no conflicts of interest.

Ethical Approval

The study has been approved by the Ethics Committee of SBU Erenköy Mental and Nervous Diseases Training and Research Hospital (date/number: 07.03.2022/13).

Authorship Contributions

Concept: RT, BA; Design: BA, HK, RT; Data Collection: RT, BA; Analysis and/or Interpretation: RT, BA; Literature Review: RT, BA; Writing Manuscript: BA, RT; Critical Review: HK.

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RESEARCH ARTICLE / *Araştırma Makalesi*

Efficacy of Videothoracoscopic Sympathectomy For Concurrent Palmo-Axillary Hyperhidrosis: Quality 0f Life Change and Patient Satisfaction

Eşzamanlı Palmo-Aksiller Hiperhidrozis Tedavisinde Videotorakoskopik Sempatektominin Etkinliği: Yaşam Kalitesi Değişimi ve Hasta Memnuniyeti

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Abstract

Introduction	Primary hyperhidrosis is a condition of excessive sweating that severely limits a person's social life. We aimed to investigate factors affecting the quality of life and patient satisfaction in patients undergoing videothoracoscopic sympathectomy for concurrent palmo-axillary hyperhidrosis.
Materials and Methods	We evaluated 126 patients who underwent videothoracoscopic sympathectomy for primary concurrent palmo-axillary hyperhidrosis. The data were analyzed retrospectively in terms of postoperative complications and factors affecting the quality of life.
Results	A total of 251 videothoracoscopic sympathectomy operations were performed, 53.2% (n:67) of the patients were female and 46.8% (n:59) were male. The mean age was 24.3±7 (min-max:15-51), whereas the mean body mass index was 23.5±4 (min-max:16.9-34.9). The mean length of hospital stay was 1.3±0.9 days (Min-Max: 1-6). Ten (7.9%) patients underwent T3 sympathectomy, and 116 (92.1%) patients underwent T3 and T4 sympathectomy. Complications were observed in a total of 13 (10.3%) patients. The most common complication was pneumothorax (n:10, 7.9%). Compensatory hyperhidrosis was observed in 23 patients (18.3%). A significant correlation was detected between compensatory hyperhidrosis and patient satisfaction ($p<0.001$). A statistically significant improvement was observed in the quality of life of all patients after videothoracoscopic sympathectomy ($p<0.001$).
Conclusion	Videothoracoscopic sympathectomy improves the postoperative quality of life in patients with concurrent palmo-axillary hyperhidrosis. The complication rate is low, and the chance of success is quite high in sympathectomies performed at T3 and T3-T4 levels. As the severity of sweating increased, patient satisfaction decreased.

Keywords Hyperhidrosis, sympathectomy; compensatory hyperhidrosis; thoracoscopy; quality of life

Öz

Amaç	*Primer hiperhidrozis, kişinin sosyal yaşantısını ciddi şekilde kısıtlayan, vücudun bir veya birden fazla bölgesinde görülen aşırı terleme durumudur. Eşzamanlı palmo-aksiller hiperhidrozis nedeniyle videotorakoskopik sempatektomi uygulanan hastalarda, postoperatif komplikasyonları değerlendirdik ve cerrahinin sonuçlarının, hasta memnuniyeti ve yaşam kalitesi üzerine etkisini araştırdık.*
Yöntem ve Gereçler	*Primer eşzamanlı palmo-aksiller hiperhidrozis nedeniyle videotorakoskopik sempatektomi uygulanan 126 hastanın verileri, postoperatif komplikasyonlar ve yaşam kalitesini etkileyen faktörler açısından retrospektif olarak incelendi. Kompansatuar hiperhidrozis insidansı ve hasta memnuniyeti ilişkisi analiz edildi.*
Bulgular	*Hastaların %53.2 'ü (n:67) kadın ve %46.8'i (n:59) erkek idi. Ortalama yaş 24.3±7 (mim.max:15-51), vücut kitle indeksi 23.5±4 (min-max:16.9-34.9).Ortalama hastanede kalış süresi 1.3±0.9 gündü (Min-Max: 1-6). On (%7.9) hastaya T3 seviyesinde, 116 (%92.1) hastaya T3 ve T4 seviyesinde sempatektomi uygulandı. Toplam 13 (%10.3) hastada komplikasyon görüldü. En sık görülen komplikasyon, pnömotoraks idi (n:10, %7.9). Yirmi üç hastada (%18.3) kompansatuar hiperhidrozis gözlendi. Kompansatuar hiperhidrozis en sık sırt ve ayak bölgesinde izlendi (n:14, %11). Kompansatuar hiperhidrozis ile hasta memnuniyeti arasında istatistiksel açıdan anlamlı ilişki bulundu ($p<0.001$). Postoperatif komplikasyonları etkileyen istatisksel açıdan anlamlı bir parametre saptanmadı ($p<0.05$) (Tablo 2). Videotorakoskopik sempatektomi sonrası tüm hastaların yaşam kalitesinde istatistiksel olarak anlamlı iyileşme gözlendi ($p<0.001$).*
Sonuç	*Videotorakoskopik sempatektomi, eşzamanlı palmo-aksiller hiperhidrozis hastalarında posteperatif yaşam kalitesini artırmaktadır. T3 ve T3-T4 seviyelerinde yapılan sempatektomilerde komplikasyon oranı düşük olup başarı şansı oldukça yüksektir. Kompansatuar hiperhidrozis şiddeti arttıkça hasta memnuniyeti azalır.*

Anahtar Kelimeler *Hiperhidroz; sempatektomi; kompansatuar hiperhidroz; torakoskopi; yaşam kalitesi*

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INTRODUCTION

Primary hyperhidrosis is, excessive sweating caused by abnormal stimulation of sweat glands by the sympathetic nervous system. This situation significantly limits the person's daily activities, causing serious social and psychological problems. Hyperhidrosis affecting regions axilla, palms, face, and feet, can be observed in only one of these regions or several regions simultaneously. Palmo-axillary hyperhidrosis brings about a significant deterioration in the quality of life of patients.[1]

Although there are many current methods in the treatment of primary hyperhidrosis, only sympathectomy provides curative results. Videothoracoscopic sympathectomy (VTS) is accepted as the gold standard method in the treatment of primary hyperhidrosis.[2]

Sympathectomy is mostly preferred in the primary hyperhidrosis treatment in the palmar, axillary, and facial regions. The success rate in patients undergoing VTS is quite high. Compensatory hyperhidrosis (CH) occurred after VTS surgery, emerges as a crucial problem in the postoperative period.[3]

Although there are many studies in the literature about the level of sympathectomy and complications limited data on the relationship between postoperative CH, long-term patient satisfaction, and quality of life are encountered.[4] We think that patient satisfaction and quality of life change are the fundamental factors showing the long-term effectiveness of thoracoscopic sympathectomy.

In our study, in which we examined the early and long-term results of patients who underwent sympathectomy due to concurrent palmo-axillary hyperhidrosis (PAH), we aimed to reveal the factors affecting patient satisfaction. Besides, we evaluated the impact of VTS on quality of life.

MATERIALS and METHODS

The ethics committee approval of this study was acquired from the institutional review board (No: E-71522473-050.01.04-145717-161) and conducted in accordance with the principles of the Declaration of Helsinki.

A retrospective analysis was conducted with 126 patients undergoing VTS for primary PAH between 2015 and 2020. Preoperative hemograms, biochemistry, and coagulation tests of all patients were examined. Possible metabolic diseases were excluded, especially thyroid function tests (T3, T4, TSH) were routinely evaluated. Cardiac evaluations were carried out by electrocardiogram. Postoperative complications, factors affecting the quality of life and relationship between the incidence of CH and patient satisfaction were investigated. The data of the patients' gender, age, weight, height, body mass index (BMI), sweating area, developing complications, and length of stay in hospital were obtained from the hospital registry system and patient files.

Patient selection and definitions

The patients included in the study had severe sweating complaints in the concurrent axilla and palms, negatively affecting their daily lives. Patients with only palmar or only axillary hyperhidrosis were excluded from the study. Patients with facial or plantar hyperhidrosis were also excluded from the study.

CH was defined as a new excessive sweating condition developed in another part of the body after a sympathectomy.[5]

Mild CH was defined as sweating generally being tolerated and not requiring a change of clothing, moderate CH was sweating in which the amount of sweating was higher but still did not require a change of clothing, and severe CH was excessive sweating requiring one or more clothing changes.[5] Outpatient follow-up of all patients was performed in the first week, 3rd month, 1st year, and 2nd year postoperatively. Control was assumed by questioning sweating conditions and performing a physical examina-

tion. In the case of CH, the region of sweating and the degree of sweating were recorded.

Evaluation of patient satisfaction was carried out using the Visual Analogue Scale (VAS).[6] Patients were classified into four groups: the completely satisfied group; who were completely satisfied with the improvement in their quality of life without complaints after VTS (VAS score ≥9), the satisfied group; who were satisfied with the improvement in their quality of life even with minor complaints (VAS score ≥6–8), the partially satisfied group; not improving their quality of life after sympathectomy (VAS score ≥3–5), and the group that would not recommend sympathectomy to other patients (VAS score ≤2). All patients were contacted by phone. After communicating and informing all patients by telephone, scale and scoring were performed. Patients were evaluated out of ten points.6 Life qualities of patients were grouped as excellent, very good, good, poor, and very poor.[7]

Surgical technique

The surgery was performed under general anesthesia, and all patients were intubated with a double-lumen endotracheal tube. The patients were placed in a semi-sitting position with the both arms in abduction. All were performed uniportal video-thoracoscopic sympathectomy. As a standard, one incision was performed from the anterior axillary line, and the thorax was entered through the third intercostal space using a single port. A five mm 0° or 30° videothoracoscope was used in the operation.

After the sympathetic chain visualized, the parietal pleura was cut at the level of the third and fourth ribs to expose the sympathetic chain. T3 or T3-T4 sympathetic ganglia were cut with endoscopic hook electrocautery after suspending. Due to possible alternative nerve innervations, the relevant third or third and fourth rib surface was cauterized for 3 cm proximally. The lung was inflated with positive pressure ventilation. Following the evacuation of the air in the thorax using the catheter, the procedure was terminated by removing the catheter. A chest tube was not inserted in the thorax. Later, the same procedure was performed on the opposite side in the same session. Routinely, the right side was preferred first for the procedure.

Postoperative follow-up

Patients were awakened from anesthesia in the operating room and were followed up in the surgical intensive care unit until their general conditions stabilized. Patients were followed up by being monitored in the service for at least one day. Palmar temperature elevation was controlled. Postoperative P-A chest radiographs of the patients were routinely followed. In case of inadequate expansion in the chest X-ray; if there is an inadequate expansion below 20%, nasal oxygen therapy was performed on the patients. If the inadequate expansion was > 20%, the patients were treated with closed underwater drainage by inserting a thorax tube. The patients were followed up with chest radiographs. Physical follow-up examinations were provided in the outpatient clinic for two years, including the first week, third month, first and second year postoperatively. The region of CH and the degree of sweating were recorded.

Statistical analysis

Descriptive analyses were performed to provide information on the general characteristics of the study population. The Kolmogorov-Smirnov test was used to evaluate whether the distribution of variables was normal. Mann–Whitney U-test was used to compare the clinical and socio-demographic characteristics between the groups. The numerical variables were presented as the median and interquartile range (IQR). Categorical variables were compared by Chi-Square test and presented as a count and percentage. A p-value <0.05 was considered significant. Analyses were performed using commercial software (IBM SPSS Statistics, Version 23.0. Armonk, NY: IBM Corp.).

RESULTS

A total of 251 successful VTS procedures were performed

on 126 patients. The mean age was 24.3±7 (Min-Max 15-51). 53.2% (n= 67) of the patients were female, and 46.8% (n= 59) were male. The mean BMI was 23.5±3.9 kg/m2 (Min-Max 16.9-34.9). The mean length of stay was 1.2±0.9 (Min-Max 1-6) days. Ten (7.9%) patients underwent T3 sympathectomy, and 116 (92.1%) patients underwent T3 and T4 sympathectomy. VTS was not performed on the left side in one patient due to the development of bradycardia. Palmar temperature elevation was observed in all patients postoperatively. Palm and axilla drynesses were achieved in all patients.

Postoperative complications were observed in 13 (10.3%) patients. The most common early-period postoperative complication was pneumothorax (n:10, 8%). Six of these patients were treated with nasal oxygen. Therefore, four patients had more severe pneumothoraxes and were treated with tube thoracostomy. Hemothorax was observed in two patients (1.6%). Both of these patients were those whose pleural adhesions were debrided during surgery due to pleuroparenchymal adhesions. All patients underwent revision with videothoracoscopy. Bradycardia developed in one patient (0.8%) while cutting the right T3. Bradycardia was medically treated. Mortality and Horner's syndrome were not observed in any patient (Table 1).

No significant prognostic factor affecting postoperative complications was found (p<0.05) (Table 2).

Table 1. Patient's demographic data

		n (%)
Sex	**Male**	59 (46,8)
	Female	67 (53,2)
BMI, kg/m2 group	**Underweight**	9 (9,2)
	Normal weight	54 (55,1)
	Overweight	31 (31,6)
	Obese	4 (4,1)
Surgical level	**T3**	10 (7,9)
	T3-T4	116 (92,1)
Complication	**No**	113 (89,7)
	Yes	13 (10,3)
Complications	**Bradycardia**	1 (7.7)
	Hemothorax, revision	2 (15.3)
	Pneumothorax/right side	5 (38.5)
	Pneumothorax/left side	5 (38.5)
Compensatory Hyperhidrosis	**Yes**	103 (81,7)
	No	23 (18,3)
Severity of Compensatory Hyperhidrosis (CH)	**Mild CH**	14 (60,9)
	Moderate CH	9 (39,1)
	Severe	0 (0)
Site of CH	**Sole**	6 (26.1)
	Chest area	3 (13)
	Inguinal	2 (8.7)
	Back	5 (21.7)
	Back, sole	2 (8.7)
	Back, facial area	1 (4.3)
	Back, inguinal	2 (8.7)
	Back, facial area	1 (4.3)
	Inguinal, abdomen	1 (4.3)

Table 2. Analysis of factors associated with postoperative complications

		Complication		**p**
		No (n=113)(%)	**Yes (n=13)(%)**	
Sex	**Male**	52 (46)	7 (53,8)	0,809
	Female	61 (54)	6 (46,2)	
Age/years		22 [8]	23 [5]	0,984
Body Mass Index (BMI)		23 [6,9]	21,3 [2]	0,155
BMI, kg/m2 group	**Underweight**	9 (9,7)	0 (0)	0,232
	Normal weight	49 (52,7)	5 (100)	
	Overweight	31 (33,3)	0 (0)	
	Obese	4 (4,3)	0 (0)	
Surgical Level	**T3**	7 (6,2)	3 (23,1)	0,068
	T3-T4	106 (93,8)	10 (76,9)	
Data were shown as median [IQR] and n (%).				

Compensatory hyperhidrosis, patient satisfaction and quality of life CH was detected in 23 (18.2%) patients (Figure 1).

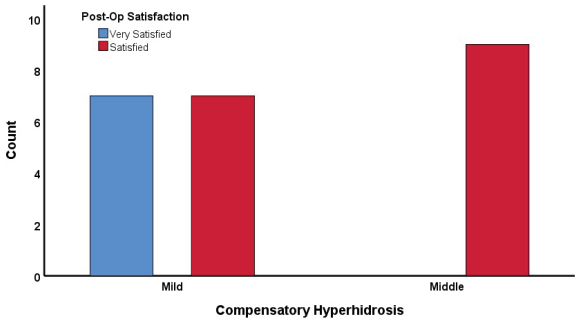

Figure 1. Comparison of postoperative patient satisfaction and severity of compensatory hyperhidrosis. As the severity of sweating increased, patient satisfaction decreased (p=0.019).

While CH developed in 21 of these patients in the first three months, it was observed in the second year in two patients. CH was most common in the back (n: 11), soles (n: 8), and inguinal region (n: 5) (Table 1). No significant correlation was found between surgical level (T3, T3-4) and CH (p=0.688). No relationship was found between CH and patient characteristics (Table 3).

No recurrence was observed in any of our patients during the follow-up. The satisfaction of the patients was measured with the VAS scale. All of our patients reported that they were satisfied in the first week postoperatively. As a result of the two-year follow-up, 87.3% (n: 110) of our patients were very satisfied, 11.9% (n: 15) were satisfied, and 0.8% (n: 1) were partially satisfied. There was no patient who would not recommend sympathectomy to other patients. CH developed after VTS was found to be closely associated with patient satisfaction (p<0.001). As the severity of sweating increased, patient satisfaction decreased (p=0.019) (Figure 1). Other factors related to patient satisfaction were shown in the table 4.

Table 3. Relationship between patient's characteristics and compensatory hyperhidrosis

		Compensatory Hyperhidrosis		p
		No (n=103)	**Yes (n=23)**	
Sex	**Male**	45 (43,7)	14 (60,9)	0,207
	Female	58 (56,3)	9 (39,1)	
Age/years		23 [9]	22 [6]	0,972
Length of hospital stay/day		1 [0]	1 [0]	0,326
Body Mass Index		22,9 [6,9]	23,7 [7,7]	0,790
BMI, kg/m2 group	**Underweight**	6 (7,5)	3 (16,7)	0,382
	Normal weight	46 (57,5)	8 (44,4)	
	Overweight	24 (30)	7 (38,9)	
	Obese	4 (5)	0 (0)	
Surgical Level	**T3**	9 (8,7)	1 (4,3)	0,688
	T3-T4	94 (91,3)	22 (95,7)	
Complication	**No**	94 (91,3)	19 (82,6)	0,254
	Yes	9 (8,7)	4 (17,4)	

Data were shown as median [IQR] and n (%).

Table 3. Relationship between patient's characteristics and compensatory hyperhidrosis				
		Patient satisfaction		**p**
		very satisfied (n=110)	**Satisfied**	
Sex	**Male**	(n=16)	14 (60,9)	0,997
	Female	51 (46,4)	8 (50)	
Age/years		59 (53,6)	8 (50)	0,800
Length of hospital stay/day		23 [9]	22 [6]	0,953
Body Mass Index		1 [0]	1 [0]	0,830
BMI, kg/m2 group	**Underweigh**	22,9 [6,9]	22,9 [5,8]	0,742
	Normal weigh	7 (8,2)	2 (15,4)	
	Overweight	47 (55,3)	7 (53,8)	
	Obese	27 (31,8)	4 (30,8)	
Surgical Level	**T3**	4 (4,7)	0 (0)	1,000
	T3-T4	9 (8,2)	1 (6,3)	
Complication	**No**	101 (91,8)	15 (93,8)	0,670
	Yes	99 (90)	14 (87,5)	
	No	11 (10)	2 (12,5)	**<0,001**
	Yes	103 (93,6)	0 (0)	
	Mild CH	7 (6,4)	16 (100)	**0,019**
	Moderate CH	7 (100)	7 (43,8)	
	Severe CH	0 (0)	9 (56,3)	
Data were shown as median [IQR] and n (%).				

Preoperatively, 85.7% (n:108) of the patients defined their quality of life as poor, and 18% (n:18) were very poor. Postoperatively, 86.5 (n:109) of the patients defined their quality of life as excellent, 12.6% (n:16) as very good, and 0.8% (n:1) as good. There was a significant improvement in the quality of life of all patients (p<0.001).

DISCUSSION

PAH requires treatment because it is a condition affecting the quality of life of the individual and causing many psychosocial problems that limit daily activities. The treatment aims to increase the patient's quality of life by eliminating excessive sweating.

Currently, VTS is accepted as the gold standard treatment method for primary hyperhidrosis.[2] Considering the literature results, being a minimally invasive method and offering a reliable, effective, and curative treatment are the biggest advantages of VTS. A complete response in the range of 90%-100% is obtained in patients undergoing VTS. It is a very high success rate.[3,8]

There is a majority of opinion in the literature that the sympathectomy level has an effect on the success of the surgery. In a study comparing surgical levels, higher success was reported to be obtained in the T3-T4 sympathectomy group than in the T3 sympathectomy group.[8]

In another study comparing the group undergoing only T3 sympathectomy and the group undergoing only T4 sympathectomy, significantly higher success was explained to be achieved in the group undergoing T3 sympathectomy.[9] Cutting the T3 and T4 sympathetic ganglia together was clarified to increase the surgical success rate, and the success rate of isolated T4 sympathectomy in palmar sweating was low in the other research.[10]

In the current study, complete response was achieved in both palmar and axillary regions in all patients for whom we performed VTS. Contrary to the literature, there was no difference between the T3 sympathectomy group and the T3-T4 sympathectomy group.

CH is an undesirable situation for both the surgeon and the patient, which is common and difficult to cope with after a sympathectomy. Therefore , there are many studies in the literature about the factors affecting CH.[11,12] Compensatory sweating is observed at rates ranging from 11-96% after sympathectomy.[13,14] Yazbek et al.[12] reported that compensatory hyperhidrosis developed in 70% of the patients one year after the surgery in their prospective study.

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Xie et al. reported that CH developed in 43% of patients undergoing T3 sympathectomy alone and in 12% of patients undergoing only T4 sympathectomy.[9] In another study, Yang et al. stated that the frequency of CH was observed more frequently in the T3-T4 sympathectomy group than in the T3 sympathectomy group.[8]

In contrast, Soares et al. reported that compensatory hyperhidrosis developed in 85% of patients after sympathectomy, and only 10% of these were intolerable. In the same study, they remarked that a significant relationship between surgical level and CH could not be found.[2]

On the other side, in many studies in the literature, there is an opinion related to a significant relationship between high body mass index and CH.[3,15]

Preoperatively, all of our patients had severe or very severe sweating in the palmo-axillary region. CH was seen in 18% of the patients postoperatively. There was no significant difference in the incidence of CH in patients undergoing only T3 or T3-T4 sympathectomy. The CH incidence was also independent of BMI. T2 sympathectomy is not preferred for palmar and axillary hyperhidrosis in our hospital. We think that the most significant reason for the lower incidence of CH compared to the literature is our choice of this surgical level.

Pneumothorax is the most common postoperative complication after VTS.[9,11] Salim et al. indicated that pneumothorax developed in 23% of the patients in their study conducted with 120 patients.[6]

In the current study, the most common postoperative complication after VTS was pneumothorax (8%). In our opinion, this rate is high. However, we would like to point out that we do not routinely perform thoracic drains on patients in VTS surgery. On the other hand, inadequate drainage of the pleural cavity and residual pneumothorax without parenchymal damage explain this high rate. Although pneumothorax was observed in ten patients, the fact that only four of them required tube thoracostomy confirms this.

Patient satisfaction after VTS was reported between 66% and 97%.[16,17] In their study, Sobrinho et al. reported that after VTS, 88% of the patients were satisfied, 7% were partially satisfied, and 5% were unsatisfied.[4] Toolabi et al.[3] explained that 9% of the patients were not satisfied with the ETS surgery, and 4% did not recommend the surgery. In the study, low BMI was reported as an important factor determining patient satisfaction. Pure axillary hyperhidrosis is also stated as a negative predictor factor in patient satisfaction.[3]

In Yoon and Rim's study comparing the two groups undergoing T2-T3 sympathectomy and only T3 sympathectomy, CH was indicated to be detected more frequently after T2-T3 sympathectomy, and patient satisfaction decreased significantly after this surgery level.[16]

Horslen et al. reported 84% of CH after thoracoscopic sympathectomy. Despite this high rate, 93% of the patients pointed out that they would recommend ETS surgery to their friends in a similar situation.[17]

De compos et al. reported in their study that 96% of CH is observed after sympathectomy, and 37% of this is severe. On the other hand, they state that only 1.7% of the patients are not satisfied with the surgical procedure and do not recommend the operation. In the same study, an increase in BMI is specified to be associated with the development of CH.[14]

In our study, 87% of our patients stated that they were very satisfied with the VTS surgery, while 13% of the patients were satisfied or partially satisfied. The only factor impacting patient satisfaction after surgery was reported as the presence of CH. As the severity of CH increased, patient satisfaction decreased significantly.

The main goal in the treatment of primary hyperhidrosis is to enhance the quality of life. Quality of life measures has, thus, an essential place in evaluating the effectiveness of treatment. In the literature, there are some studies evaluating the quality of life before and after sympathectomy in patients with primary hyperhidrosis.[2,4,14]

In the long-term results published by Compos et al., 91% of the patients deduced that their quality of life improved after a sympathectomy. In the same study, researchers indicated that CH has a significant negative effect on the quality of life.[14]

In another study, in which a very high postoperative CH was reported, 86% of the patients showed an improvement in the long-term quality of life after surgery, and only 3% of the patients mentioned a decrease in their quality of life compared to the preoperative period.[17]

In a study consisting of patients with preoperative 95% poor or very poor quality of life, all patients were indicated to have a remarkable improvement in their quality of life after sympathectomy.[2]

Following the VTS, a significant improvement in the quality of life of all our patients was observed compared to the preoperative period.

Our study has some limitations. First, it has a retrospective design. Second, questionnaires were used to assess quality of life and patient satisfaction in patients with hyperhidrosis. It is difficult to reach reliable statistical results with questionnaires in a retrospective study. Despite these limitations, applying standardized procedures in these surgeries in our center is the strength of the study.

CH reduces patient satisfaction after a sympathectomy. Nevertheless, there is a distinct improvement in the patients' quality of life developing CH compared to the preoperative situation. It is possible to explain this situation by the fact that CH detection after surgery is more tolerable than the severity of sweating observed before surgery and affects less the quality of life.

In conclusion, VTS significantly improves the quality of life of patients with primary palmo-axillary hyperhidrosis. The severity of CH is the most crucial factor determining patient satisfaction in sympathectomy. Sympathectomy should be preferred in the treatment of PAH despite the adverse effects of CH.

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RESEARCH ARTICLE / *Araştırma Makalesi*

Development and Treatment of CSF Fistula, Post-Operative Headache, Cerebellar Ptosis In 62 Patients Who Underwent Posterior Fossa Cranioplasty or Not Following Posterior Fossa Surgery

Posterior Fossa Cerrahisinde Kraniyoplasti Yapılan Ve Yapılmayan 62 Hastada BOS Fistülü, Postoperatif Baş Ağrısı, Serebellar Pitozis Gelişimi Ve Tedavisi

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Abstract

Introduction	The approaches in posterior fossa surgery are used for accessing various tumors and vascular lesions including neuro-glial tumors, vestibular Schwannomas, inclusion tumors, meningiomas.
Materials and Methods	A total of 62 patients who underwent operation due to infra-tentorial intra-cranial mass lesion in Neuro-Surgery Clinic between 2014 and 2018 were included in the study.
Results	The study was conducted with 62 patients of whom 61.3% (n=38) were males and 38.72% (n=24) were females between 2014 and 2018. While 33.9% (n=21) of the patients underwent cranioplasty, 66.1% (n=41) did not undergo cranioplasty.
Conclusion	The preliminary study suggests that cranioplasty is useful for headache and cerebellar ectopy however insufficient for prevention of CNF fistula development.
Keywords	posterior fossa; cranioplasty; cerebro-spinal fluid fistula; post-operative headache; cerebellar ptosis

Öz

Amaç	*Posterior fossa cerrahi yaklaşımları nöro-glial tümörler, vestibüler Schwannomlar, inklüzyon tümörleri, meningiomlar gibi çeşitli tümörlere ve vasküler lezyonlara ulaşmak için kullanılmaktadır*
Yöntem ve Gereçler	*2014-2018 yılları arasında Nöroşirürji Kliniği'nde infratentoryal intrakranial kitle lezyonu nedeniyle opere edilen toplam 62 hasta çalışmaya dahil edildi.*
Bulgular	*Çalışma 2014-2018 yılları arasında %61,3 (n=38) erkek ve %38,72 (n=24) kadın olmak üzere 62 hasta ile gerçekleştirildi. Hastaların %33,9'una (n=21) kraniyoplasti yapılırken, 66,1 % (n=41) kranyoplasti geçirmedi.*
Sonuç	*Bizim bu çalışmamız, kranioplastinin baş ağrısı ve serebellar ektopi için yararlı olduğunu ancak BOS fistül gelişimini önlemede yetersiz olduğunu düşündürmektedir.*
Anahtar Kelimeler	*Posterior fossa; kranioplasti;beyin omurilik sıvısı fistül; ameliyat sonrası baş ağrısı; serebellar ptoz*

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INTRODUCTION

Incidence and location of intra-cranial tumors vary depending on age. Intra-cranial tumors are located in supra-tentorial region in the ratio of 75% in adults and in infra-tentorial region in the ratio of 70% in children. Posterior fossa tumors lead to elevated intra-cranial pressure due to circulation disorders of cerebro-spinal fluid (CSF) and pressure on the neural structures.[1]

The approaches in posterior fossa surgery are used for accessing various tumors and vascular lesions including neuro-glial tumors, vestibular Schwannomas, inclusion tumors, meningiomas.[1,2] Post-operative cerebellar ptosis, CNF fistula and headache are the most important problems which impair quality of life of the patients besides neural complications following posterior fossa operations. Post-operative CSF fistula and headache are still the most important problems following these approaches.[2] Incidence of post-operative CSF fistula varies between 0% and 22%; and incidence of post-operative headache varies between 0% and 73% for recto-sigmoid approaches which is a posterior fossa intervention although varies depending on approach types.[2]

According to literature, the most protective factor for prevention of headache and CSF fistula is following the procedures carefully during surgical closure including meticulous dura repair and bone cranial reconstruction.[2] Dural closure using waterproof material or grafts (temporalis muscle tissue, artificial dura), closing bony openings using wax and wound follow up with lumbar drainage were reported as the most effective methods for prevention of CSF fistula.[2]

The most common causes of post-operative headache include CSF fistula, dural adhesion-related CSF circulation disorders and cerebellar ptosis (CP) although it may result from various causes. While various authors report different techniques in literature, posterior fossa reconstruction including both all-grafts and auto-grafts is the most recommended method to minimize post-operative headache and cerebellar ptosis.[2-6] These techniques have varying success. So no consensus is available about the best method for prevention of post-operative CSF fistula and headache.[2]

In this paper, we have planned to compare post-operative outcomes of the patients who underwent or who did not undergo posterior fossa surgery due to various reasons.

MATERIAL and METHOD

In the present study, 62 patients who underwent operation due to infra-tentorial intra-cranial mass lesion in Neuro-Surgery Clinic between 2014 and 2018 were evaluated retrospectively. The patients who did not come for regular post-operative controls were not included in the study. Local ethics committee approval was obtained prior to the study (IEAH: 28.09.2018:1446).

Patients were evaluated with regard to pre-operative diagnosis, age, gender, location of the pathology (parenchymal, extra-parenchymal), post-operative complications, presence of CSF fistula, alterations in headache.

The investigated parameters included post-treatment CSF fistula (incisional, otorrhea), type and duration of treatment, presence and radiologic measurement of post-operative cerebellar ptosis, incidence and severity of post-operative headache, duration of follow up. Post-operative headache severity (PHS) values on months 1,3 and 6 were recorded at the final follow up visit according to the scoring system defined by Catalano et al.7 Classification of headache was as follows: 0: no, 1: minor, not requiring medication, 2: requiring regular use of non-steriod anti-inflammatory drugs or acetaminophen, 3: requiring the use of high doses and effective analgesics, 4: severe, drug-resistant.

Statistical analyses

Statistical analyses were done using NCSS (Number Cruncher Statistical System) 2007 (Kaysville, Utah, USA)

program. Descriptive statistics (mean, standard deviation, median, first quartile, third quartile, frequency, percent, minimum, maximum) were used for assessment of data. Normality distribution of qualitative data was tested with Shapiro-Wilk test and plots. Mann-Whitney U test was used for inter-group comparisons of qualitative data which were not normally distributed. Friedman test was used for in-group comparisons of qualitative data which were not normally distributed and Bonferroni correction Wilcoxon signed-ranks test was used for assessment of paired comparisons. Quantitative data were compared using Fisher's exact test. A p level of <0.05 was accepted as statistically significant.

Surgical technique

All operations were performed in the same clinic. Decisions for indications and surgical strategies were made in the oncology council held weekly. Standard recto-sigmoid craniectomy was performed for cerebello-pontin angle pathologies, sub-occipital craniectomy was performed for cerebellar pathologies. Dura was closed using 4/0 vicryl and silk, auto-graft and allo-graft materials were used for a waterproof closure, when required. Open mastoid cells were closed using bone wax for obstructing any connections with middle ear. In the next stage of repair, it was ensured that there was no visible CSF leak from dural suture line and fibrin glue adhesive was applied on. Afterwards, cranioplasty was performed so as to completely close bone margins using a standard allograft cranioplasty material, poly-methyl-crylate (PMMA) (Figure 1). Skin and subcutaneous tissues were closed in accordance with anatomic layers using a standard method. Mastoid- suboccipital pressure wound dressing was done during post-operative 48 hours. Post-operative lumbar drainage was not used.

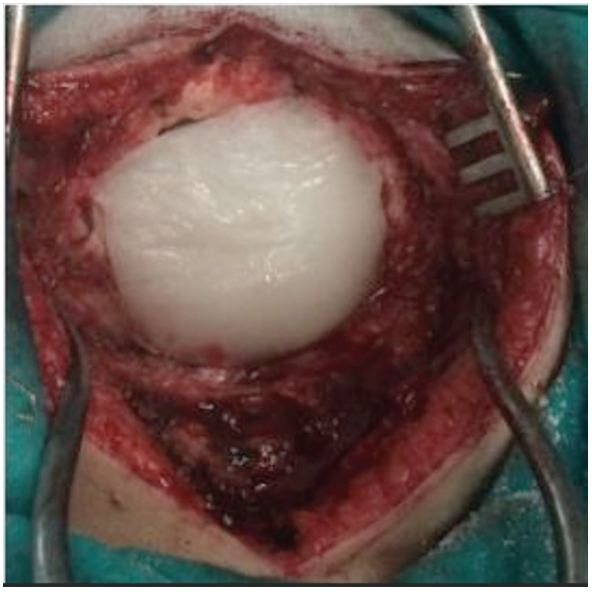

Figure 1. Cranioplasty so as to completely close bone margins using poly-methyl-methacrylate (PMMA), a per-operative allograft cranioplasty material

RESULTS

The study was conducted with 62 patients of whom 61.3% (n=38) were males and 38.72% (n=24) were females between 2014 and 2018. Mean age was 53.74 ±16.17 years (range 13-82). While 33.9% (n=21) of the patients underwent cranioplasty, 66.1% (n=41) did not undergo cranioplasty.

PHS on month one varied between 0 and 3 (mean 1.63 ±0.75), PHS on month 3 varied between 0 and 3 (mean 1.19±0.79) and PHS on month 6 varied between 0 and 2 (mean 0.97 ±0.75). Location of the pathology, number of operations, presence of CSF fistula, presence and size of cerebellar ptosis are summarized in Table 1.figure 2

Table 1. Distribution of patient characteristics((PHS: Postoperative headache severity)		
Cranioplasty	+	21 (33,9)
	-	41 (66,1)
PHS (1. Month)	Min-Max	0-3 (2)
	mean±Sd	1,63±0,75
PHS (3. Month)	Min-Max	0-3 (1)
	mean±Sd	1,19±0,79
PHS (6. Month)	Min-Max	0-2 (1)
	mean±Sd	0,97±0,75
Second Surgery	-	51 (82,2)
	+	11 (17,8)
CSF fistula	-	53 (85,5)
	+	9 (14,5)
Cerebellar ptosis	-	52 (83,9)
	+	10 (16,1)
Cerebellar ptosis(mm)	Min-Max	2-9 (4,5)
	mean±Sd	4,80±2,30

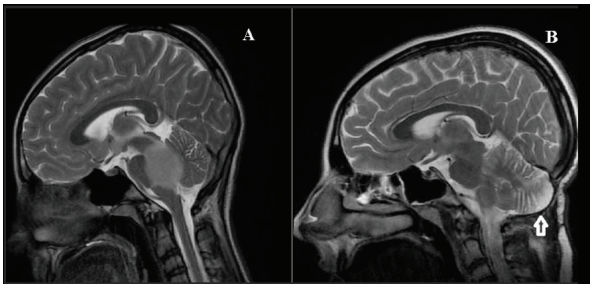

Figure 2. A demonstrative case with cerebellar ectopy. A. Pre-operative cranial sagittal MRI, B. Post-operative cranial sagittal MRI (white arrow: cerebellar ectopy)

Month 1,3 and 6 PHS was found statistically significantly lower among patients who underwent cranioplasty compared to the ones who did not undergo cranioplasty (p=0,015; p<0,05; p=0,001; p<0,01; p=0,009; p<0,01)(Table 2). A statistically significant difference was detected between the patients who underwent cranioplasty or not with regard to month 1,3,6 PHS scores (p=0.001; p<0.01). According to the paired comparisons done for detection of difference, mean 0.67 ±0.91 units of reduction in month 6 PHS scores compared to month 1 PHS scores was found to be statistically significant in patients who underwent cranioplasty (p=0.049, p<0.05), mean 0.66 ±0.85 units of reduction in month 6 PHS scores compared to month 1 PHS scores was found to be statistically significant in patients who did not undergo cranioplasty (p=0.001, p<0.01). A statistically significant difference was not found between the changes in month 1 and month 3 PHS scores with regard to undergoing cranioplasty (p>0.05) and a statistically significant difference was not found between the changes in month 1 and month 6 PHS scores with regard to undergoing cranioplasty (p>0.05) (Table 2) (Figure 3).

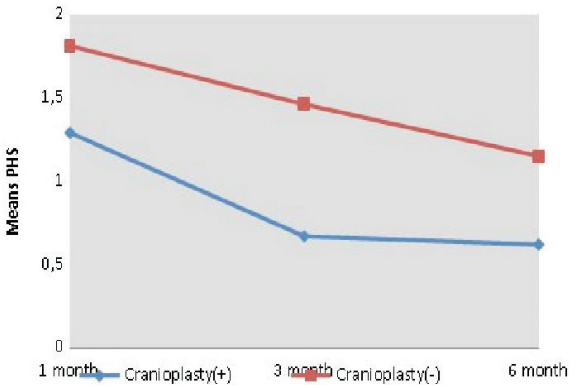

Figure 3. Distribution of PHS according to the groups with or without cranioplasty

A statistically significant difference was not found between presence of CSF fistula with regard to undergoing cranioplasty (p>0.05). Ratio of cerebellar ptosis was found statistically significantly lower in patients who underwent cranioplasty compared to the ones who did not undergo cranioplasty (p=0.012, p<0.05) (Table 3).

Table 3. Assessment of CSF fistula and cerebellar ectopy with regard to undergoing cranioplasty (CSF: Cerebro-spinal fluid)				
		Cranioplasty		
		Yes (n=21)	**No (n=41)**	**p value**
CSF fistula	-	17 (81,0)	36 (87,8)	χ2:0,526
	+	4 (19,0)	5 (12,2)	‘**0,472**
Cerebellar ptosis	-	21 (100,0)	31 (75,6)	χ2:6,107
	+	0 (0,0)	10 (24,4)	‘**0,012***
cFisher’s Exact Test				

Table 2. Assessment of severity of post-operative headache severity with regard to undergoing cranioplasty (PHS: Post-operative headache severity). Assessment of CSF fistula and cerebellar ectopy with regard to undergoing cranioplasty (CSF: Cerebro-spinal fluid)

		Cranioplasty		
		Yes (n=21)	**No (n=41)**	**p value**
PHS (1. Month)	Min-Max	0-3 (1)	1-3 (2)	Z:-2,438
	mean±Sd	1,29±0,78	1,81±0,68	[a]**0,015***
PHS (3. Month)	Min-Max	0-2 (1)	0-3 (2)	Z:-3,849
	mean±Sd	0,67±0,58	1,46±0,74	[a]**0,001****
PHS (6. Month)	Min-Max	0-2 (1)	0-2 (1)	Z:-2,621
	mean±Sd	0,62±0,59	1,15±0,76	[a]**0,009****
	p value	χ2:16,270; **0,001****	χ2:20,959; **0,001****	
1 - 3 (Month)	Difference	-0,62±0,74	-0,34±0,85	Z:-0,915
	p	**0,076**	**0,160**	[a]**0,360**
1 – 6 (Month)	Difference	-0,67±0,91	-0,66±0,85	Z:-0,166
	p	**0,049***	**0,001****	[a]**0,868**
3 - 6 (Month)	Difference	-0,05±0,38	-0,32±0,79	Z:-1,687
	p	**1,000**	**0,328**	[a]**0,092**
CSF fistula	-	17 (81,0)	36 (87,8)	χ2:0,526
	+	4 (19,0)	5 (12,2)	[c]**0,472**
Cerebellar ptosis	-	21 (100,0)	31 (75,6)	χ2:6,107
	+	0 (0,0)	10 (24,4)	[c]**0,012***

[a]Mann Whitney U Test [b]Friedman Test *p<0,05 **p<0,01
[c]Fisher's Exact Test *p<0,05

A statistically significant difference was not found between month one PHS scores with regard to the location of the surgical pathology (parenchymal or extra-parenchymal) (p>0.05). Month 3 PHS scores were found statistically significantly lower in patients who had extra-pyramidal pathology compared to the ones with parenchymal pathology (p=0.003, p<0.01). Month 6 VAS scores were found statistically significantly lower in patients who had extra-pyramidal pathology compared to the ones with parenchymal pathology (p=0.022, p<0.05). A statistically significant difference was found between month 1,3,6 PHS scores in in-group comparisons of the patients with extra-parenchymal and parenchymal pathology (p=0.001, p<0.01) (Table 4, Figure 4).

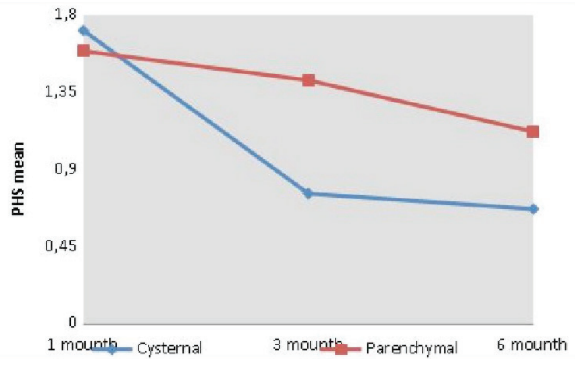

Figure 4. PHS distribution by cisternal-parenchymal

Table 4. Assessment of PHS scores with regard to the location of surgical pathology (parenchymal-extraparenchymal) (PHS: Post-operative headache severity)

		Extraparenchymal (n=21)	Parenchymal (n=41)	p value
PHS (1. Month)	Min-Max	0-3 (2)	0-3 (2)	Z:-0,864
	mean±Sd	1,71±0,85	1,59±0,71	[a]**0,388**
PHS (3. Month)	Min-Max	0-2 (1)	0-3 (1)	Z:-3,019
	mean±Sd	0,76±0,77	1,42±0,71	[a]**0,003****
PHS (6. Month)	Min-Max	0-2 (1)	0-2 (1)	Z:-2,285
	mean±Sd	0,67±0,73	1,12±0,71	[a]**0,022***
	p value	χ2:25,333; **0,001****	χ2:13,654; **0,001****	
1 - 3 (Month)	Difference	-0,95±0,74	-0,17±0,74	Z:-3,427
	p	**0,004****	**0,673**	[a]**0,001****
1 – 6 (Month)	Difference	-1,05±0,86	-0,46±0,81	Z:-2,361
	p	**0,001****	**0,028***	[a]**0,018***
3 - 6 (Month)	Difference	-0,10±0,70	-0,29±0,68	Z:-0,640
	p	**1,000**	**0,502**	[a]**0,522**

DISCUSSION

Operations performed for therapeutic purposes achieved the goal. It is difficult to associate all pre-operative complaints with etiology. Therefore the complaints on follow up were considered through excluding the symptoms related with etiologic factors and surgery as in many other studies.2 In this study, we have planned to compare the patients who underwent and who did not undergo posterior fossa craniotomy with regard to headache, CSF fistula, cerebellar ptosis. Skull reconstruction is important both for cosmetic purposes and also for protection from trauma.[8] The ideal reconstructive material should be easy to form, long standing, inexpensive, bio-compatible and resistant to infections.[9] While auto-grafts are more bio-compatible, allo-grafts reduce operative time and they have a higher potential to cause infections. Calvarial bone, subcutaneous fat tissue, muscle temporalis or nucal muscle and temporal fascia are among the widely used auto-grafts. Hydroxyapatite cement (HAC), poly methyl methacrylate (PMMA) bone cement, titanium web and poly-ethylene are the commonly used allo-grafts.2.[9] Poly methyl methacrylate (PMMA) bone cement was used in our patients. Post-operative CSF leakage may result from dural incisions, wound incisions, air cells transferred to middle ear and eustacian tube.[10] CSF otores may also develop following tympanic membrane penetration for intra-operative observation of cochlear nerve, tear of the connection between external canal and bony cartilage, although less frequent.[10] So a careful dural repair, closure of temporal bone air cells, meticulous closure of are required for prevention of post-operative CSF leakage.

It is important to close dura using sutures or allo-plastic dural patch in a waterproof way for prevention of post-operative dural leakages. Waterproof dural covers may be provided with various techniques including primary suture closure of temporal fascia graft, fibrin glue, suture closure in combination with Gelfoam.[2] Use of post-operative lumbar drainage does not seem necessary for prevention of CSF leakage even if this repair technique is applied carefully.[2] Lumbar drainage was not applied in post-operative early period in our serial.

The etiology of post-operative headache following posterior fossa craniectomy could not be fully understood however several hypotheses were proposed. Potential causes

of post-operative headache include dural tension due to tight closure of dura, mastoid in bone region, displacement of the bone dust which arise during touring around the internal acustic canal toward subarachnoid space, attachment of subcutaneous tissues and muscles to dura and increased tension with head movements and neurogenic inflammation.[2,11,12] Schaller et al.[13] have reported a reduction in the incidence of new onset post-operative headache when they compared dura-plastic closure together with dura graft and direct dural closure. In our study, primary or secondary dural closure was not found to be associated with new onset post-operative headache. Spread of free bone dust to subarachnoid space may be prevented with a careful aspiration during bone drilling. Catalano et al. found the incidence of post-operative headache significantly low when they compared the incidence and severity of headache with regard to performing craniotomy.[7] Ling et al. have proposed that headache would be less with a careful aspiration and leaving the cisterns durable. We also consider that cranioplasty following craniectomy would prevent adhesions, in consistent with dural adhesion theory.[2,14] In our study, PHS was found statistically significant in patients who underwent cranioplasty ($p<0.001$).

CP was first defined by Williams in 1978.15 This severe complication has pulled little attention since its definition and several authors have published their experiences of CP management following sub-occipital craniectomies. Incidence of CP is not fully known and data from various authors are in a wide range. After the first definition of this condition, Duddy and Williams have reported CP in four out of seventeen patients who had MRIs before and after cranio-vertebral decompression.16 Downward ptosis of brainstem was observed in no patients who underwent posterior fossa reconstruction and in 7 out of 10 patients who underwent the operation in the study of Sahuquillo et al.17 Batzdorf et al.18 have reported CP in six patients who were managed with duraplasty and tonsil reduction, posterior cranial fossa decompression in their study conducted with 177 patients. In our series, CP was observed in no patients who underwent cranioplasty, varying degrees of statistically significant CP was observed in 10 out of 41 patients who did not undergo cranioplasty. Various rates in literature suggest that the magnitude of craniectomy seems to be an effective factor for CP. The present study reflects the outcomes of a single surgical team. Headaches resulting from cisternal evacuation and iatrogenic contamination were prevented through applying correct and standard techniques. We consider that this is associated with controlled surgical methods at cisternal level, leading to unnecessary cisternal impairment and prevention of transfer to the other cisterns through barriers. We consider that reconstruction of cranioplasty region is the most important factor for prevention of cerebellar ectopy.

CONCLUSIONS

The present preliminary study suggests that cranioplasty is useful for headache and cerebellar ectopy however insufficient for prevention of CSF fistula. It could be useful to evaluate headache, CSF fistula, cerebellar ptosis with further studies conducted with larger study populations including a control group.

Disclosures

Human subjects: All authors have confirmed that this study did not involve human participants or tissue.

Animal subjects

All authors have confirmed that this study did not involve animal subjects or tissue.

Conflicts of interest

In compliance with the ICMJE uniform disclosure form, all authors declare the following: Payment/services info: All authors have declared that no financial support was received from any organization for the submitted work.

Financial relationships

All authors have declared that they have no financial relationships at present or within the previous three years

with any organizations that might have an interest in the submitted work. Other relationships: All authors have declared that there are no other relationships or activities that could appear to have influenced the submitted work.

Authors' Contributions

O.T.,M.K.,D.C., B.T., O.F.S.: conceptualization, data collection, and writing, statistical analysis, and writing; O.B., A.C..K., M.A.A.: conceptualization, data collection, supervision, and writing

Ethics committee approval

The Declaration of Helsinki was complied with while conducting the research, and approval was obtained from the Non-Interventional Clinical Research Ethics Committee of IEAH: 28.09.2018:1446

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ARAŞTIRMA MAKALESİ / *Research Article*

İç Hastalıkları Polikliniğine Başvuran Geriatrik Diyabetik Hastalarda Anemi Sıklığı ve Morfolojik Olarak Dağılımı

The Prevalence and Morphological Distribution of Anemia in Geriatric Diabetic Patients Applying to the Internal Medicine Polyclinic

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Öz

Amaç	Hastanemiz iç hastalıkları polikliniklerine başvuran 65 yaş ve üzerindeki tip 2 diyabetes mellitusun eşlik ettiği hastalarda anemi sıklığını saptamayı ve aneminin morfolojik olarak dağılımını değerlendirmeyi amaçladık.
Yöntem ve Gereçler	Dereli İlçe Devlet Hastanesi iç hastalıkları polikliniğine 01.01.2021– 01.01.2022 tarihleri arasında başvuran 65 yaş ve üzerindeki tip 2 dm'nin eşlik ettiği hastalar, retrospektif olarak incelenerek çalışmaya alındı. Hastaların hemogram ve biyokimya tetkikleri değerlendirildi. Hastaların anemi sıklığı ile yaş, cinsiyet, kronik renal yetmezlik ilişkileri değerlendirildi. Veriler SPSS programına kaydedilip, istatistiksel analizler yapıldı.
Bulgular	Çalışmamızda anemi sıklığı %24,4 olarak saptandı. Anemisi olan hastalar MCV değerlerine göre %26' sı (26) mikrositer, %72' si (72) normositer, %2' si (2) makrositer anemi olarak sınıflandırıldı. Çalışmamızda kadınlarda, erkeklere göre anemi sıklığı açısından istatistiksel anlamlı farklılık tespit edildi (p=0,016). Artan yaş grupları ile anemi sıklığı arasında istatistiksel anlamlı farklılık gözlenmedi (p=0,088). Geriatrik diyabetik hastalarda kronik renal yetmezlik ile anemi arasında istatistiksel anlamlı farklılık tespit edildi (p=0,008).
Sonuç	Çalışmamızdaki hastalarda anemi sıklığı literatürle uyumlu olarak %24,4 olarak saptandı. Geriatrik diyabetik hasta popülasyonu gittikçe artmaktadır. Ülkemizde geriatrik gruptaki diyabetik hastalarda anemi ile ilgili çalışmalar kısıtlı olup, çok merkezli prospektif çalışmalara gereksinim duyulmaktadır.
Anahtar Kelimeler	anemi; geriatrik; diyabet; renal; kreatinin

Abstract

Introduction	*It was aimed to determine the prevalence and morphological distribution of anemia in patients aged 65 years and above with type 2 diabetes mellitus who applied to the internal medicine outpatient clinics of our hospital.*
Materials and Methods	*Patients aged 65 years and above with type 2 DM, who visited Dereli District State Hospital internal medicine outpatient clinic between 01.01.2021 and 01.01.2022 were included and retrospectively examined in the study. Hemogram and biochemistry examinations of the patients were assessed. The relationship between the prevalence of anemia and age, gender, and chronic renal failure was evaluated. The data were recorded in the SPSS software and statistical analyses were performed.*
Results	*The prevalence of anemia was determined as 24.4% in the study. Based on patients' MCV values, 26% (26) of the cases were classified as microcytic anemia, 72% (72) as normocytic anemia, and 2% (2) as macrocytic anemia. A statistically significant difference was identified in the study in terms of the prevalence of anemia in women compared to men (p=0.016). No statistically significant difference was found between the increasing age groups and the prevalence of anemia (p=0.088). A statistically significant difference was determined between chronic renal failure and anemia in geriatric diabetic patients (p=0.008).*
Conclusion	*In line with the literature, prevalence of anemia in the study was calculated as 24.4%. Population of geriatric diabetic patients is gradually increasing. Studies on anemia in diabetic patients in the geriatric group are limited in our country, and multicenter prospective studies are needed.*
Keywords	*anemia; geriatric; diabetes; renal; creatinine*

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GİRİŞ

Anemi, geriatrik kişilerde sık görülen bir bulgudur. Geriatrik hastalarda kalp yetmezliğinin sık oluşu ve bozulmuş serebrovasküler dolaşım nedeniyle, anemiyi tolere etmek zorlaşmaktadır. Anemi bir bulgu olup, altta yatan nedeni bulmak ve tedavi etmek önem arz etmektedir[1].

Geriatrik hastalarda aneminin başlıca sebepleri; beslenme eksiklikleri, kronik hastalıklar, tümörler ve bazı hematolojik maligniteler olarak gözlenmektedir[1].

Geriatri bilimi tarafından; 65-74 yaş aralığı genç yaşlı, 75-84 yaş arası orta yaşlı, 85 yaş ve üzeri ise ileri yaşlı olarak değerlendirilmektedir. 2010 yılında Avrupa'daki yaşlı oranı, popülasyonun %17,66 'sını oluşturmaktaydı. 2020 yılında bu oranın %20,78' e yükseldiği görülmüş olup, gelecek dekatlarda oranın artması beklenmektedir[1].

Dünya Sağlık Örgütü anemiyi, hemoglobin düzeyinin erkeklerde 13 gr/dl, kadınlarda 12 gr/dl' nin altında olması olarak tanımlamıştır[1].

Anemi prevalansı toplumlara göre farklılık göstermekle birlikte; erkeklerde %2,9-61, kadınlarda ise %3,3-41 oranında izlenmektedir[2]. 65 yaş üzerindeki 85.409 kişiden oluşan 34 çalışmayı içeren bir sistemik değerlendirmede; anemi prevalansı sırasıyla evinde yaşayanlarda, hospitalize olanlarda ve huzurevinde yaşayanlarda %12, %40 ve %47 olarak bulunmuştur[3].

Diyabetes mellitus (dm), renal anemiye sonuçlanan kronik renal yetmezliğin en sık nedenidir. Diyabetik nefropatili hastalarda anemi, diyabetik olmayan kronik renal yetmezliği olan hastalara göre daha erken ortaya çıkmakta ve ağır formda izlenmektedir[4].

Ülkemizde iç hastalıkları polikliniğine başvuran tip 2 dm tanılı geriatrik hastalardaki anemi sıklığı ile ilgili çalışmaların kısıtlı olması nedeniyle, bu çalışmada hastanemiz iç hastalıkları polikliniklerine başvuran 65 yaş ve üzerindeki tip 2 dm' un eşlik ettiği hastalarda anemi sıklığını saptamayı ve aneminin morfolojik olarak dağılımını değerlendirmeyi amaçladık.

GEREÇ ve YÖNTEMLER

Çalışmamız gözlemsel tipte retrospektif hasta kayıtları taraması şeklinde planlandı. 01.01.2021– 01.01.2022 tarihleri arasında Dereli İlçe Devlet Hastanesi iç hastalıkları polikliniğine başvuran 65 yaş ve üstü, tip 2 dm' un eşlik ettiği hastalar çalışmaya alındı. Hastaların anamnez ve sistemik muayene bilgilerinden sonra hemogram tetkikleri incelendi. Hemoglobin değerinin erkek hastalar için 13 gr/dl ve kadın hastalar için 12 gr/dl'den düşük saptanması anemi olarak kabul edildi. Saptanan anemi, ortalama eritrosit hacmine (MCV) göre mikrositer (MCV<80), normositer (MCV: 80-100) ve makrositer (MCV>100) olmak üzere 3 gruba ayrıldı. Çalışmamızda kronik renal yetmezlik değerlendirmesi retrospektif olarak hastaların serum kreatinin düzeylerine bakılarak yapıldı. Hastaların bazal serum kreatinin düzeyleri belirlendi, kreatinin düzeyi 1,3 mg/dl ve üzeri olanlar kronik renal yetmezlik olarak değerlendirildi. Elde edilen verilerin analizinde kategorik değişkenleri birbiriyle karşılaştırmak için pearson ki-kare ve Fisher's exact testleri kullanıldı. Nitel bağımsız verilerin analizinde pearson ki kare testi, ki-kare test koşulları sağlanmadığında Fisher testi kullanıldı. İstatistiksel analizler SPSS Statistics v22 (SPSS, IBM Corp., USA) ile yapıldı. $p<0.05$ değeri istatistiksel olarak anlamlı kabul edildi.

BULGULAR

Çalışmamıza 01.01.2021 ve 01.01.2022 tarihlerinde Dereli İlçe Devlet Hastanesi iç hastalıkları polikliniklerine başvuran 65 yaş ve üzerindeki tip 2 dm' un eşlik ettiği 409 hasta dahil edildi. Hastaların 143'ü erkek (%35), 266'sı kadın (%65) idi. Hastalar yaş gruplarına göre üç gruba ayrıldı. 65-74 yaş aralığında 268 (%65,5), 75-84 yaş aralığında 101 (%24,7), 85 ve üzerinde ise 40 (%9,8) hasta mevcuttu. Hastalarda anemi oranı %24,4 (100) olarak tespit edildi. Anemisi olan hastalar MCV değerlerine göre; %26' sı (26) mikrositer, %72'si (72) normositer, %2'si (2) makrositer anemi

olarak sınıflandırıldı. Hastaların %15,6 (64)'sına kronik renal yetmezlik eşlik ederken, %84,4 (345)'ünde kronik renal yetmezlik gözlenmedi. Çalışmaya dahil edilen hastaların cinsiyet, yaş aralığı, anemi ve kronik renal yetmezlik yönüyle dağılımı tablo 1'de gösterildi. Hastaların cinsiyetleri ile anemi varlığı arasındaki ilişki tablo 2'de gösterildi. Hastaların yaş grupları ile eşlik eden anemi arasındaki ilişki tablo 3'te gösterildi. Hastalarda eşlik eden kronik renal yetmezlik ile anemi arasındaki ilişki tablo 4' te gösterildi.

Tablo 1: Hastaların cinsiyet, yaş aralığı, anemi ve kronik renal yetmezlik yönüyle dağılımı

	Frekans (f)	Yüzde (%)
Cinsiyet		
Erkek	143	35,0
Kadın	266	65,0
Yaş Aralığı		
65-74 yaş	268	65,5
75-84 yaş	101	24,7
85 ve üzeri yaş	40	9,8
Anemi Durumu		
Var	100	24,4
Mikrositer	26	6,4
Normositer	72	17,6
Makrositer	2	0,4
Yok	309	75,6
Kronik renal yetmezlik		
Var	64	15,6
Yok	345	84,4
Katılımcı sayısı = 409		

Tablo 2: Cinsiyetle anemi arasındaki ilişki

	Anemi Durumu				
	Yok	**Var**	**X^2**	**SD**	**p**
Erkek	118 (%82.5)	25 (%17,5)	5,778	1	0,016
Kadın	191 (%71,8)	75 (%28,2)			

Tablo 3: Yaş grupları ile anemi durumu arasındaki ilişki

	Anemi Durumu				
	Yok	**Var**	**X^2**	**SD**	**p**
65-74 Yaş arası	211 (%51,5)	57 (%14,0)	4,872	2	0,088
75-84 Yaş arası	72 (%17,6)	29 (%7,1)			
85 Yaş ve yukarısı	26 (%6,3)	14 (%3,5)			

Tablo 4: Kronik renal yetmezlik ile anemi arasındaki ilişki

		Anemi Durumu				
		Yok	**Var**	**X^2**	**SD**	**p**
Böbrek Hastalığı	**Yok**	269 (%78)	76 (%22)	6,995	1	0,008
	Var	40 (%62,5)	24 (%37,5)			

Cinsiyet ile anemi durumu arasında anlamlı bir ilişki olup olmadığını incelemek için pearson ki-kare bağımsızlık testi yapıldı. Kadınlarda, erkeklere göre anemi sıklığı açısından istatistiksel anlamlı farklılık tespit edildi ($X2(1) = 5,778$, $p<0.05$).

Hastaların yaş grupları ile anemi arasında istatistiksel anlamlı bir ilişki olup olmadığını incelemek için pearson ki-kare bağımsızlık testi yapıldı. Hastaların yaş grupları ve anemi durumları arasında istatistiksel anlamlı bir ilişki olmadığı tespit edildi ($X2(2) = 4,872$, $p>0.05$).

Hastalarda eşlik eden kronik renal yetmezlik ile anemi arasında istatistiksel anlamlı bir ilişki olup olmadığını incelemek için pearson ki-kare bağımsızlık testi yapıldı. Geriatrik diyabetik hastalarda nefropati ile anemi arasında istatistiksel anlamlı bir ilişki olduğu tespit edildi.
($X2(1) = 6,995$, $p<0.05$).

TARTIŞMA

Toplum içinde yaşayan 65 yaş ve üzerindeki bireylerin %10'undan fazlasında Dünya Sağlık Örgütü kriterlerine (kadınlarda hemoglobin < 12 g/dl, erkeklerde < 13 g/dl) göre anemisi bulunmaktadır. Dünyada geriatrik popülasyonun artması ile birlikte, artan yaş ile anemi görülme sıklığı artmaktadır. 50 yaşından sonra anemi prevalansı ilerleyen yaş ile birlikte artmakta, 85 yaş ve üzerinde anemi prevalansı %20'yi geçmektedir[5]. Anemi prevalansı toplumlara göre farklılık göstermekle birlikte; erkeklerde %2,9-61, kadınlarda ise %3,3-41 aralığında izlenmektedir[2]. Çalışmamızda anemi sıklığı literatürle uyumlu olarak %24,4 olarak tespit edildi.

Çalışmamızda geriatrik diyabetik erkeklerde anemi sıklığı %17,5, kadınlarda ise %28,2 olarak saptanmıştır. Çalışmamızda kadınlarda, erkeklere göre anemi sıklığı açısından istatistiksel anlamlı farklılık tespit edildi (p=0,016). Guralnik ve arkadaşları yaptıkları çalışmada geriatrik popülasyonda anemi sıklığının erkeklerde, kadınlara oranla daha yüksek olduğunu bildirmişlerdir[6]. Ülkemizde Şahin ve arkadaşları yapmış oldukları çalışmada, acil servise başvuran geriatrik hastalarda anemi sıklığının erkeklerde, kadınlara göre daha yüksek olduğunu saptamışlardır[7]. Kadınlarda ve erkeklerde anemi sıklıkları, bölgesel farklılık göstermekle birlikte hastaların hospitalizasyon durumlarına, eşlik eden komorbit durumlara göre değişkenlik göstermektedir. Çalışmamızda 266 hasta (%65) kadın, 143 (%35) hasta erkek idi. Çalışmamızdaki kadın sayısının fazla olması da anemi sıklığının kadınlarda yüksek bulunmasındaki faktörlerden biri olabileceği düşünüldü.

Çalışmamızda geriatrik diyabetik hastalar yaş gruplarına göre genç yaşlı, orta yaşlı ve ileri yaşlı olarak üç gruba ayrıldı. Anemi tablosu geriatrik popülasyonda yaygın olarak görülmekle birlikte, artan yaş ile anemi sıklığı artmaktadır[1]. Literatürden farklı olarak çalışmamda artan yaş grupları ile anemi sıklığı arasında istatistiksel anlamlı farklılık gözlenmedi (p=0,088). Bu durum çalışmaya katılan en fazla kişi sayısının, çalışma popülasyonunun %65,5 oranındaki 268 kişiden oluşan 65-74 yaş arasındaki genç yaşlı grubunda olması ile açıklanabilir. En fazla anemi gözlenmesi beklenen grup olan ileri yaş grubunun, diğer gruplara kıyasla en az kişi sayısına (40 kişi) sahip olması da etken olarak değerlendirilmektedir.

Çalışmamızda literatürle uyumlu olarak geriatrik diyabetik hastalarda kronik renal yetmezlik ile anemi arasında istatistiksel anlamlı farklılık tespit edildi (p=0,008). Çalışmamızda kronik renal yetmezliğin eşlik ettiği hastalarda anemi sıklığı %37,5 olarak saptandı. Taşar ve arkadaşlarının hospitalize edilen geriatrik hastalarda yaptığı çalışmada kronik böbrek yetmezliğine ikincil anemi oranı %20 ,8 olarak bulunmuştur[8]. 405 geriatrik hastanın incelendiği bir çalışmada kronik renal yetmezliğe bağlı anemi oranı %19,4 olarak bulunmuştur[9]. Kronik böbrek hastalığında aneminin şiddeti, böbrek fonksiyonlarındaki azalma ile doğrudan ilişkilidir. Böbrek fonksiyonlarındaki azalma ile birlikte anemi görülme oranı artmaktadır. Dünya Sağlık Örgütü anemi tanımları kullanıldığında glomerüler filtrasyon hızı (GFR) 25 ml/dak altında olan ancak henüz diyalize girmeyen hastaların %87'de anemi saptanmaktadır[10]. Çalışmamızdaki geriatrik hastalarda kronik hastalık anemisi nedeni olan tip 2 dm eşlik etmektedir. Bu nedenle çalışmamızdaki geriatrik hastalarda anemi oranının diğer çalışmalara kıyasla daha yüksek saptandığı görüldü. Çalışmamızda kronik renal yetmezlik değerlendirmesi; retrospektif olarak hastaların bazal serum kreatinin düzeyleri incelenerek, serum kreatinin düzeylerine bakılarak yapıldı. Kreatinin düzeyi 1,3 mg/dl ve üzeri olanlar kronik renal yetmezlik olarak değerlendirildi. Hastaların diyabetik nefropati değerlendirilmesinin yapılamaması, GFR hesaplanmaması, kronik renal yetmezlik evrelerinin belirlenmemesi çalışmamızın kısıtlı yönü olarak düşünüldü.

Sonuç olarak, geriatrik diyabetik hasta popülasyonu gittikçe artmaktadır. Geriatrik hastalarda anemi sık gözlenmektedir. Ayaktan hastaneye başvuran ve hospitalize edilen geriatrik diyabetik hastaların anemi yönüyle kapsamlı bir biçimde değerlendirilip, etyolojiye yönelik tanı ve tedavi-

lerinin planlanması hastaların mortalite ve morbidite durumları açısından önem arz etmektedir. Ülkemizde geriatrik gruptaki diyabetik hastalarda anemi ile ilgili çalışmalar kısıtlı olup, çok merkezli prospektif çalışmalara gereksinim duyulmaktadır.

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Yazarlar arasında herhangi bir çıkar çatışması bulunmamaktadır.

Yazar katkısı

Dizayn veri toplama yazım; K.E; literatür taraması; K.E, İ.K

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ARAŞTIRMA MAKALESİ / *Rerseasrch Article*

Evaluation of Internet, Social Networks, and Social Media Usage of Assistant Physicians Using Smartphones

Akıllı Telefon Kullanan Asistan Hekimlerin İnternet, Sosyal Ağlar ve Sosyal Medya Kullanımlarının Değerlendirilmesi

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Öz

Amaç Tüm dünyada internet kullanımının yaygın hale gelmesindeki ana etkenlerden biri de kuşkusuz akıllı telefonlardır. Sağlık çalışanları arasında da yaygın şekilde kullanılan akıllı telefonlar ile özellikle de doktorlar arasında anlık iletişim programları klinik pratikte kendine önemli bir yer edinmiştir. Biz bu çalışmada akıllı telefon kullanan hekimler arasında internetin, sosyal ağların ve sosyal medyanın kullanım yaygınlığını ve bu platformların hekimler arasında mesleki açıdan kullanım şekillerini belirlemeyi amaçladık.

Yöntem ve Gereçler Tanımlayıcı ve kesitsel özellikte olan bu araştırma için görüşme tekniklerinden anket yöntemi kullanıldı. Çalışmada kullanılan anket formu araştırmacılar tarafından hazırlanmış olup toplamda beş bölümden oluşma idi. (1) sosyodemografik özellikler, (2) internet kullanım amaçları, (3) mobil uygulama kullanım amaçları, (4) anlık mesajlaşma uygulamalarının kullanım amaçları ve (5) sosyal medya uygulamalarının kullanım amaçları sorgulandı. Elede edilen verilerin analizinde; tanımlayıcı istatistikler ortalama, standart sapma, frekans ve yüzde değerleri ile sunuldu. Kategorik değişkenlerin karşılaştırılmasında Pearson ki-kare testi kullanıldı. İstatistiksel önemlilik düzeyi $p \leq 0.05$ olarak kabul edildi.

Bulgular Kırk farklı uzmanlık alanından, hepsi araştırma görevlisi (asistan) doktor; toplamda 203 kişi çalışmaya dahil edildi. Katılımcıların hepsi akıllı telefon kullanmaktaydı. Yaş ortalaması 28.77±3.3 idi. Katılımcıların %56.2'si erkek cinsiyette idi. Katılımcıların %52.7'si (n=107) en fazla 3 yıllık hekimlik tecrübesine sahipti. Hekimlik mesleğindeki tecrübesi 3 yıl ve altında olanların makale okumak amacıyla interneti kullanım oranları 4 yıl ve üzerinde hekimlik tecrübesi olanlara göre anlamlı derecede daha düşüktü ($p<0.001$). Katılımcıların %73.9'u (n=150) tıbbi bilgi kaynağı olarak dijital ortamı tercih etmekte olup kalan %26.1 (n=53)'lik kesim de tıbbi bilgi kaynağı olarak kitap ya da broşürleri tercih etmekteydi. Hekimlerin %86.2 'si (n=175) mobil uygulamaları iletişim veya anlık haberleşme amaçlı kullanmaktaydı. Akademik veya mesleki amaçlı mobil uygulama kullanım oranı ise %22.7 (n=46) idi. Hekimlerin %98'inin anlık iletişim programı olarak WhatsApp kullandığı; mesleki açıdan WhatsApp uygulamasını %70.4 oranında telekonsultasyon işlemlerinde kullandığı ve en sık telekonsultasyonun acil servis hekimleri ile (%43.3) yapıldığı görüldü. Hekimlerin %48.8'i hastaların tıbbi amaçlı olarak görüntülerini paylaşırken hastalardan izin almadıklarını bildirdi. Hekimlerin %92.1'inin en az bir sosyal medya hesabına sahip olduğu ve sosyal medya hesaplarını tıbbi amaçlı en sık vaka paylaşımı yapan hekimleri takip etmek için kullandıkları görüldü

Sonuç Hekimlik mesleği için akıllı telefon, internet ve sosyal medya platformlarının kullanımı günümüzde yadsınamaz bir gerçektir. Hekimler için de dijital ortamdan okuma oranları artık daha ön plana çıkmaktadır. Hekimler anlık mesajlaşma uygulamalarını telekonsültasyon için sıklıkla tercih ederken en sık iletişim kurulan birim ise acil servislerdir.

Abstract

Introduction *One of the main factors in the widespread use of the internet all over the world is undoubtedly smartphones With smartphones, which are also widely used among healthcare professionals, instant communication programs have gained an important place in clinical practice, especially among doctors. In this study, we aimed to determine the prevalence of the internet, social networks, and social media usage among physicians using smartphones and the professional use of these platforms among physicians.*

Materials and Methods *The questionnaire method, one of the interview techniques, was used for this descriptive and cross-sectional study. The questionnaire form used in the study was prepared by the researchers and consisted of five parts in total. (1) sociodemographic characteristics, (2) internet usage purposes, (3) mobile application usage purposes, (4) instant messaging applications usage purposes, and (5) social media applications usage purposes were questioned. In the analysis of the obtained data; descriptive statistics were presented with mean, standard deviation, frequency, and percentage values. Pearson chi-square test was used to compare categorical variables. The statistical significance level was accepted as $p \leq 0.05$.*

Results *Doctors from forty different specialties, all research assistants (assistant doctors); A total of 203 people were included in the study. All of the participants were using smartphones. The mean age was 28.77±3.3 years. 56.2% of the participants were male. 52.7% (n=107) of the participants had a medical experience of at most 3 years. The rate of using the internet to read articles was significantly lower in those with 3 years or less of experience in the medical profession than those with 4 years or more of medical experience ($p<0.001$). 73.9% (n=150) of the participants preferred digital media as a source of medical information, and the remaining 26.1% (n=53) preferred books or brochures as a source of medical information. 86.2% (n=175) of the physicians used mobile applications for communication or instant communication. The rate of using mobile applications for academic or professional purposes was 22.7% (n=46). 98% of physicians use WhatsApp as an instant communication program; Professionally, it was seen that 70.4% used WhatsApp applications in teleconsultation processes and the most frequent teleconsultation was done with emergency physicians (43.3%). 48.8% of the physicians reported that they did not get permission from the patients while sharing the images of the patients for medical purposes. It was observed that 92.1% of the physicians had at least one social media account and they used their social media accounts to follow the physicians who shared the most frequent cases for medical purposes.*

Conclusion *The use of smartphones, the internet, and social media platforms for the medical profession is an undeniable reality today. For physicians, reading rates from digital media is now more prominent. While physicians frequently prefer instant messaging applications for teleconsultation, the most frequently contacted unit is the emergency services.*

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INTRODUCTION

It is known that today, among the world population of nearly eight billion, the rate of internet usage is 69% based on June 30, 2022, while this rate is 84.5% in Turkey, and almost one-tenth (9.7%) of all European internet users are in Turkey.[1]

Undoubtedly, smartphones are one of the main factors in the widespread use of the internet, not only in Turkey but all over the world. Smartphones, which are also widely used among healthcare professionals, and instant communication programs, especially among doctors, have gained an important place in clinical practice.[2] Increases in internet speed, improvements in internet access, improved processor speeds of smartphones, improved battery times, and wide screens that provide ease of reading, contribute to this process by providing the opportunity to benefit from smartphones under all conditions and at any time.[3]

In addition to newspapers, radio, and television, which are defined as traditional media, the use of social media platforms has progressed in parallel with the use of the internet. The use of social media has increased significantly all over the world in the last few years, with nearly three billion active Facebook users, close to one and a half billion active Instagram users, and more than 400 million active Twitter users; It is known that the use of WhatsApp, an instant messaging and communication application, where the use of Youtube exceeds two and a half billion, is also at the level of two billion.[4]

The use of social media and social networks in health services has increased, and this has allowed efficient communication between physicians in clinical practice for the management of patients.[5] This system, which seems to be advantageous, can sometimes lead to disadvantageous results due to the inability of physicians to balance their professional and private lives.

In this study, we aimed to determine the prevalence of the internet, social networks, and social media usage among physicians using smartphones and the professional use of these platforms among physicians.

The primary aim of the study; To determine the deficiencies in the correct use of the medical profession by researching the use of the internet, social networks, and social media among assistant doctors working in a tertiary health institution and to create resources for the health managers to plan the correct use of these platforms for the physicians.

MATERIALS and METHODS

This descriptive and cross-sectional study was conducted among the residents of Karadeniz Technical University Faculty of Medicine Hospital. For the study, a signed informed consent form was obtained from the participants, in accordance with the Declaration of Helsinki, with the approval of the Karadeniz Technical University Faculty of Medicine Non-Interventional Research Ethics Committee (Date: 17.09.2018, protocol number: 2018/157). The questionnaire method, one of the research interview techniques, was used.

The population of the research consisted of assistant physicians working at Karadeniz Technical University Faculty of Medicine Hospital. The sample size to be reached for the research was determined as 201 using the sample size formula used in cases where the number of individuals in the population is known in the estimation of population ratios, with a confidence interval of 95%.[6]

Data collection form

The questionnaire form used in the study was prepared by the researchers and consisted of five parts in total. The first part consists of questions about the sociodemographic characteristics of the participants such as age, gender, specialty, duration of practice, daily time spent with a smartphone, and smartphone features, the second part consists of questions about internet usage purposes and the third

part questions about mobile application usage purposes. , the fourth part consisted of questions about the purposes of use of instant messaging applications and the fifth part consisted of questions about the purposes of use of social media applications.

Statistical analysis

Statistical analysis of the data was performed using the "Statistical Package for the Social Sciences-SPSS 24.0 for Windows" package program. In the analysis of data; descriptive statistics were presented with mean, standard deviation, frequency, and percentage values. Pearson chi-square test was used to compare categorical variables. The statistical significance level was accepted as $p \leq 0.05$.

RESULTS

Questionnaires were filled face-to-face by 203 people, all of whom were research assistants (assistant doctors). All of these 203 doctors who participated in the survey were using smartphones. The demographic characteristics of the participants are presented in Table 1. It was observed that the mean age was 28.77±3.38 years, and those who participated in the survey were mostly male (56.2%). Among the questionnaires filled out by doctors from 40 different specialties, the clinical branches with the highest participation rate were internal medicine, emergency medicine, family medicine, and pediatrics; it was seen that more than half of the participants (52.7%, n=107) had a maximum of 3 years of practice as a physician. It was determined that 84.2% (n=171) of the participants spent at least one hour with phone applications, either medically or non-medically.

Table 1. Demographic Characteristics of Participants

Demographic characteristics	**n (%)**
Age*	28.77±3.38
Gender	
Female	89 (43.8)
Male	114 (56.2)
Profession	
Emergency medicine	23 (11.3)
Pediatrics	16 (7.9)
Cardiology	10 (4.9)
Internal medicine	33 (16.3)
Anesthesia and reanimation	11 (5.4)
Family medicine	16 (7.9)
Medical experience (years)	
0-3	107 (52.7)
4-6	65 (32)
7-10	24 (11.8)
>10	7 (3.4)
Time spent with phone apps (hour)	
<1	32 (15.8)
1-3	123 (60.6)
4-6	31 (15.3)
>6	17 (3.4)
Smartphone operating system	
IOS	101 (49.8)
Android	102 (50.2)
* mean ± standard deviation	

Internet usage features

Categorized data regarding the academic, social and recreational use of the internet by physicians are presented in Table 2. Accordingly, among physicians, the internet was most frequently used for reading articles academically, for banking and shopping transactions socially, and for watching movies or videos for entertainment purposes. The rate of using the internet to read articles was significantly lower in those with 3 years or less of experience in the medical profession than those with 4 years or more of medical experience ($p<0.001$).

93.1% (n=189) of the participants reported that they used the phone or social media professionally. UpToDate® was

Table 2. Distribution of internet usage areas among physicians				
		Medical experience (years)		
Academic	**n (%)**	**≤3 (n=107)**	**≥4 (n=96)**	**p**
Article reading	137 (67.5)	60 (43.8)	77 (56.2)	<0.001
Literature follow-up	111 (54.7)	52 (46.8)	59 (53.2)	0.066
Watching video-lessons	80 (39.4)	41 (51.3)	39 (48.8)	0.737
File sharing	26 (12.8)	12 (46.2)	14 (53.8)	0.612
reading ebooks	22 (10.8)	13 (59.1)	9 (40.9)	0.683
Social				
Make friends	33 (16.3)	14 (42.4)	19 (57.6)	0.270
Picture-video sharing	98 (48.3)	54 (55.1)	44 (44.9)	0.509
Language learning	11 (5.4)	6 (54.5)	5 (45.5)	0.900
Acquiring new hobbies	34 (16.7)	17 (50)	17 (50)	0.874
Banking-shopping	134 (66)	69 (51.5)	65 (48.5)	0.484
Reading a blog	32 (15.8)	14 (43.8)	18 (56.3)	0.361
Follow popular accounts	51 (25.1)	27 (52.9)	24 (47.1)	0.969
Fun				
Online game	35 (17.2)	16 (45.7)	19 (54.3)	0.468
Betting	0 (0)	-	-	-
Watching sports	35 (17.2)	23 (65.7)	12 (34.3)	0.132
Listen to music	102 (50.2)	57 (55.9)	45 (44.1)	0.442
Watching movies-videos	144 (70.9)	79 (54.9)	65 (45.1)	0.337

in first place with a rate of 76.8% as the source of the most professional information. Google® (70%) and PubMed® (66%) were second and third (Table 3).

Table 3. Applications are seen as sources of medical information	
Resources	**n (%)**
Facebook	56 (27.6)
UpToDate	156 (76.8)
Twitter	19 (9.4)
Google	142 (70)
PubMed	134 (66)
WhatsApp	91 (44.8)
Medscape	68 (33.5)
Instagram	54 (26.6)
Wikipedia	37 (18.2)
Youtube	90 (44.3)
Clinical Key	4 (2)

Physicians use the internet most frequently (94.6%) to access information, and books are reported as the second most common means of accessing information after the internet. 73.9% (n=150) of the participants preferred digital media as a source of medical information, and the remaining 26.1% (n=53) preferred books or brochures as a source of medical information. The data consisting of the answers given by the participants about the superiority of reading from a digital environment to reading from a book or reading from a book to reading from a digital environment are presented in Table 4. Ease of access was seen as the most common reason for the superiority of reading from the digital environment, while the most common reason for the superiority of reading from a book was that the book was seen as more suitable for writing and taking notes.

Table 4. The reasons why reading from digital media and books is superior to each other	
	n (%)
What is the advantage of digital reading over book reading?	
Easy to carry, does not wear out	100 (49.3)
Easy to access	177 (87.2)
Cost less	83 (40.9)
Can be used in any environment, no space problem	124 (61.1)
What is the advantage of book reading over digital reading?	
Habit	47 (23.2)
No radiation effect	56 (27.6)
More permanent in terms of protection and storage	75 (35.9)
More convenient for writing and taking notes	167 (82.3)

Usage features of mobile applications

Physicians mostly used mobile applications for communication or instant communication (86.2%, n=175). The rate of using mobile applications for academic or professional purposes was 22.7% (n=46). While the rate of physicians using mobile applications for reading news was 30% (n=61), the rate of using mobile applications for entertainment or games was 28.1% (n=57).

73.4% (n=149) of the physicians reported that they started to use the applications that they thought to be professionally beneficial upon the advice of their teachers or colleagues. While the rate of physicians who declared that they started using these applications as a result of their research was 35% (n=71), the rate of physicians who stated that they started using these applications as a result of the information they obtained from symposiums or congresses was 10.3% (n=21). The effect of advertisements in this area was 5.4% (n=11).

The data obtained from the answers given to the question of which purpose mobile applications are most used in terms of the medical profession are presented in Table 5. Physicians mostly used mobile applications to increase the quality of bedside care and to search the literature.

Table 5. Professional usage purposes of mobile applications	
	n (%)
For what purpose do you use mobile applications most professionally?	
Literature search	86 (42.4)
Providing quality of care at the bedside (drug doses, differential diagnosis)	92 (45.3)
Practice with apps that provide case examples	43 (21.2)
Measuring and updating information	77 (37.9)
Calculation and formulation	72 (35.5)
Teleconsultation	37 (18.2)

Usage features of instant messaging applications

It was determined that 82.8% (n=168) of the physicians always use instant messaging applications professionally, while 13.3% (n=27) use instant messaging applications occasionally. It was seen that the most preferred application as an instant messaging application was WhatsApp with a rate of 98%. When the medical purposes of the WhatsApp application were questioned, the most common purposes were to provide communication within the department, to consult patients by sharing lesion images, and to share radiology images (Table 6).

Table 6. Preferred instant messaging applications and WhatsApp usage purposes	
	n (%)
Preferred apps for instant messaging	
WhatsApp	199 (98)
Messenger	21 (10.3)
Facebook	13 (6.4)
Instagram	34 (16.7)
Telegram	3 (1.5)
Medical purpose of WhatsApp application	
Ensuring intra-departmental communication coordination	186 (91.6)
Sharing new medical resources	57 (28.1)
Sharing the lesion images of patients with other physicians or consulting physicians, asking for consultation	143 (70.4)
Visually sharing a problem encountered during examination or surgery and getting ideas from seniors or faculty members	97 (47.8)
Sharing radiology images	127 (62.6)
Sharing ECG images	99 (48.8)
Communicate with patients about lesion images, laboratory results, and radiology results	87 (42.9)
To help other physician friends who want consultation about their patients	112 (55.2)

It was seen that physicians performed teleconsultation with instant messaging applications most frequently in emergency service (43.3%), internal medicine (14.3%), cardiology (8.4%), and pediatrics (7.4%) branches, respectively, apart from their branches. In addition to all these, almost half of the physicians (48.8%) reported that they did not get permission from the patients while sharing their images for medical purposes.

Social media usage features

The vast majority of physicians (92.1%) reported that they have at least one social media account. 43.8% of those who do not have a social media account reported that they did not have a social media account because they saw social media as a waste of time. While 50.2% of the physicians answered "yes" to the question "Do you think every doctor should have a social media account?", 15.8% answered "no". The rate of physicians who were undecided on this issue was 34%. While 36.9% of the physicians thought of acquiring a social media account or using existing accounts more actively in the later stages of the medical profession, the ratio of physicians who were undecided was 35%.

57.6% (117/187) of physicians who had a social media account were spending more than one hour daily on social media. The rate of those who spent more than four hours on social media platforms was 7% (13/187). Almost half of the physicians (49.7%) who have a social media account reported that they opened an account because they were curious about the social media environment. The data on the factors in physicians' social media accounts and their social media usage purposes are presented in Table 7.

Table 7. Factors for physicians to acquire social media accounts and their social media usage purposes	
	n (%)
Factors in acquiring a social media account	
Friend recommendation	56 (29.9)
Recommendation	14 (7.5)
Be curious	93 (49.7)
Advertisements	24 (12.8)
Social media usage purposes	
Introduce yourself	25 (13.4)
Make friends	36 (19.3)
Opportunity to organize	24 (12.8)
Video, audio recording, image sharing	65 (34.8)
Acquiring new hobbies	38 (20.3)
desire to learn	85 (45.5)
Developing communication skills	59 (31.6)
Communicating with patients	31 (15.3)

While 62.6% of the physicians who participated in the survey had social media accounts, the number of followers on social media was between 100 and 500, while the rate of physicians with more than 1000 followers was 2.1%, and 78.8% of the physicians reported that the number of followers was not important to them. Looking at the social media accounts of physicians, it was seen that Instagram,

Facebook, and Twitter were in the first three places. All three social media accounts were used to follow the physicians who shared the most frequent cases for medical purposes (Table 8).

Table 8. Social media accounts used and medical uses

	n (%)
Social media account used and medical purpose	
Instagram	153 (81.8)
Follow the latest published articles and current practices	28 (13.8)
Sharing different and interesting case examples	34 (16.7)
Follow the physicians who share the case	74 (36.5)
Facebook	145 (77.5)
Follow the latest published articles and current practices	26 (12.8)
Sharing different and interesting case examples	32 (15.8)
Follow the physicians who share the case	88 (43.3)
Twitter	78 (41.7)
Follow the latest published articles and current practices	17 (8.4)
Sharing different and interesting case examples	7 (3.4)
Follow the physicians who share the case	38 (18.7)
Linkedin	8 (4.3)
Periscope	6 (3.2)
Pinterest	4 (2.1)

When the participant physicians were asked whether they had a social media account belonging to the institution they worked for, it was concluded that the majority of them (44.2%) did not have any information.

DISCUSSION

Almost 70% of the world's population uses the internet.1 In fact, in a review study examining its change over time, it was observed that the internet even became an addiction.7 Internet use with smartphones has also become more practical. Access to the internet and internet-requiring applications over the phone affects people in many occupational groups as well as physicians. When we look at the internet usage times among the physicians in our study, it was seen that the vast majority (84.2%) spent more than one hour a day with phone applications. Almost one out of every five physicians (18.7%) in our study was spending at least 4 hours of their daily time on phone applications. Even this situation makes us think that there is internet addiction among physicians. In a study by Özsoy et al., the frequency of internet and mobile phone use among physicians was found to be much higher.[8] Despite these data, we think that it is not possible to measure the daily real-time spent by physicians on smartphones.

Not only for social life and entertainment but also professional and academic purposes, people can get support from the internet. Especially the development of health literacy in the last 25 years suggests that people's research on health has also increased.[9] It is a fact that especially physicians benefit from the advantages of the internet in a professional sense, while health literacy rates have increased so much even outside of healthcare professionals.

In this study, in which we questioned the internet usage purposes of physicians, we can say that there is an intense use of the internet for academic, social, and entertainment purposes. We have determined that the rate of reading articles for academic purposes is higher in those with more medical experience in years. This situation makes us think that using the internet as a tool to reach the right information is learned through experience. In addition, considering that the participants in the study were assistant physicians and the time required to reach the thesis stage is more than three years for an assistant, this seems more logical. UpToDate®, Google®, and PubMed® were the sites that physicians most frequently used as internet-based professional information sources. According to our study data, it is relatively rare for physicians to consider social media platforms as a source of medical information. Although social media platforms are not seen as a source of medical information, we have determined that physicians use social media for medical purposes most frequently to follow the physicians who share cases.

According to a study conducted on patients and healthcare personnel, the most trusted social shares of people are; it was seen that physicians, nurses, and hospitals shared.[10] However, misuse of the internet, social networks, and social media, which are widely used among physicians, may also cause some legal problems.[11,12] Social media platforms can be used more easily by younger physicians.[13,14] Nearly half of the physicians in our study reported that they did not get permission from the patients or their relatives while sharing the images of the patients. The fact that the physicians included in the study were young and did not have enough knowledge in terms of legal aspects may have caused this situation.

All of the physicians in our study were using smartphones and the internet. In addition, the rate of physicians using social media was 92.1%. In many studies, this rate was found to be similarly high. The fact that the participants in our study were assistant physicians can be seen as the reason for the low average age. As a matter of fact, in the study of Low et al., it was reported that the age of physicians who do not have a social media account is generally over 45.5 In the study of Brown et al., it was emphasized that age-related social media usage differences among physicians may also affect the interaction between physicians and patients in the same institution in different ways.[14]

Although the duration of social media use in the work environment of the participants in our study was not questioned, when the time they spent on social media platforms was examined, it was seen that more than half of them spent at least two hours a day on social media platforms. Studies are reporting that the duration of social media use by doctors in Australia and the United States is similarly high.[14,15]

It is known that physicians mostly prefer WhatsApp as an instant messaging application in their working environments.[16] The data in our study also supports this information. WhatsApp application is used for fast communication, quick solution of problems, sharing clinical images of patients' diseases, and management of diseases. In this way, consultation times are shortened, and the health services provided to patients are improved by creating a collaborative environment.[17] Physicians in our study preferred the WhatsApp application most frequently in consultation procedures with emergency physicians, except for their branches. It reveals the importance of WhatsApp applications in the rapid and effective management of patients in countries with crowded emergency services such as Turkey. However, sharing the clinical information of patients with the WhatsApp application for the European Community was restricted by a contract in 2018.[18,19] It was even recommended that physicians stop sharing patients' data via WhatsApp.[16] Since the physicians in our study did not have sufficient knowledge on this subject, the center where the study was conducted is in Turkey, and all clinics especially crowded emergency services, want to speed up the management of patients, it can be thought that WhatsApp is the first application in sharing patient data among physicians.

Limitations

The fact that our study was conducted only in a tertiary hospital and only among residents did not provide the opportunity to make sufficient comparisons. Physicians in our study did not distinguish between smartphone, computer or tablet use as an internet tool for accessing the questioned areas. In addition, the fact that the study was conducted before the COVID-19 pandemic and the changes in the characteristics of the internet and social media usage that occurred during the pandemic period could not be evaluated. We think that multicenter and broad participation studies should be conducted on this subject.

CONCLUSION

The use of smartphones, the internet, and social media platforms for the medical profession is an undeniable reality today. For physicians, reading rates from digital media

is now more prominent. While physicians frequently prefer instant messaging applications for teleconsultation, the most frequently contacted unit is the emergency services.

Ethics Committee Approval: For the study, a signed informed consent form was obtained from the participants, in accordance with the Declaration of Helsinki. Our study was approved by the Karadeniz Technical University Faculty of Medicine Non-Interventional Research Ethics Committee (Date: 17.09.2018, protocol number: 2018/157).

Conflict of Interest

No conflict of interest was declared by the authors.

Author Contributions

Concept-MY, YK; Supervision-MY, YK, İY, SP; Materials-İY, Mİ, MÇ, NÖY; Data Collection and/or Processing-MY, YK, NÖY, MÇ; Analysis and/or Interpretation-MY, SP, Mİ, MÇ; Writing-MY, NÖY, BBY.

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ARAŞTIRMA MAKALESİ / *Rerseasrch Article*

Gastrointestinal Stromal Tümörlerin Kliniko-patolojik ve Cerrahi Özellikleri: 13 yıllık 3.Basamak Merkezi Deneyimi ve Literatür Derlemesi

Clinico-pathological and Surgical Characteristics of Gastrointestinal Stromal Tumors: 13-year Experience of the 3rd Level Center and Literature Review

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Öz

Amaç	Gastrointestinal stromal tümörler (GIST) sindirim sisteminde görülen mezenkim kaynaklı nadir tümörlerdir. Bu çalışmada cerrahi tedavi uygulanmış olan GIST hastalarının erken dönem cerrahi sonuçları sunulmaktadır.
Yöntem ve Gereçler	Sakarya Üniversitesi Eğitim Araştırma Hastanesi Genel Cerrahi Kliniğinde 2008-2021 tarihleri arasında opere edilen ve histopatolojik olarak GIST tanısı doğrulanan hastaların sonuçları retrospektif olarak incelendi. Hastalar demografik veriler, klinik-patolojik özellikleri ve erken dönem cerrahi sonuçları açılarından ayrıntılı olarak değerlendirildi.
Bulgular	Ameliyat edilen 55 hastanın E/K oranı 3/2, yaş ortalaması 57.82 yıl (45-81 yıl) idi. Karın ağrısı (%67.2) en sık başvuru şikayetiydi. Mide(%67.2) en sık etkilenen organdı. CD117 pozitifliği %96.3 oranında görüldü ve Ulusal Sağlık Enstitüsü (NIH) kategorisine göre hastaların %56.6'sı yüksek risk sınıfı olarak kategorize edildi. Primer cerrahi rezeksiyon %94.6 oranında uygulandı. En sık açık ameliyat (%72,7) tercih edildi, çalışmanın son 6 yılı için ise açık/laparoskopi tercih edilme oranı 1/1 olarak belirlendi. Segmental rezeksiyon (%52,7) açık veya laparoskopik en sık uygulanan rezeksiyon tipi idi. Tümör boyutları ortalama 7.03 cm (1-18 cm), ortalama hastanede yatış süresi 10.44 gün (5-45 gün) idi, enterokütan fistül gelişen bir hasta çalışma dışı bırakıldığında ise ortalama hastane yatış süresi 8.2 gün (5-19 gün) olarak belirlendi.
Sonuç	GIST, uygun endikasyonlarda, açık veya laparoskopik teknikle, deneyimli kliniklerde, primer tedavi şekli komplet cerrahi rezeksiyon olarak, kabul edilebilir komplikasyon oranlarıyla güvenle tedavi edilebilir.
Anahtar Kelimeler	GIST; Stromal tümör; segmental rezeksiyon; wedge rezeksiyon;

Abstract

Introduction	*Gastrointestinal stromal tumors (GIST) are the most common mesenchymal tumors of the gastrointestinal system. In this study, early surgical results of GIST patients who underwent surgical treatment are presented.*
Materials and Methods	*The results of the patients who were operated in Sakarya University Training and Research Hospital General Surgery Clinic between 2008-2021 and whose histopathological diagnosis of GIST were confirmed were analyzed retrospectively. Patients were evaluated in detail in terms of demographic data, clinical-pathological characteristics and early surgical results.*
Results	*The M/F ratio of 55 patients who underwent surgery was 3/2, and the mean age was 57.82 years (45-81 years). Abdominal pain (67.2%) was the most common complaint. The stomach (67.2%) was the most frequently affected organ. CD117 positivity was seen in 96.3%, and 56.6% of the patients were categorized as high risk class according to the National Institutes of Health (NIH) category. Primary surgical resection was performed in 94.6% of patients. Open surgery was most frequently preferred in 72.7% of patients, and the rate of preference for open/laparoscopy for the last 6 years of the study was determined as 1/1. Segmental resection was the most common type of resection, open or laparoscopic, with 52.7%. The mean tumor size was 7.03 cm (1-18 cm), mean hospital stay was 10.44 days (5-45 days).*
Conclusion	*GIST can be safely treated with acceptable complication rates in experienced clinics as complete surgical resection as the primary treatment method with open or laparoscopic technique in appropriate indications.*
Keywords	*GIST; Stromal tumor; segmental resection; wedge resection;*

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GİRİŞ

Gastrointestinal Stromal Tümörler (GIST) sindirim sisteminin nadir görülen, mezenkimal tümörleridir.[1] Nadir görülmelerine rağmen GIST'ler doğal yapıları, yerleşim yerleri, agresif davranış biçimleri ile medikal ve cerrahi tedavi ile kombine olarak tedavi edilirler.[2] Medikal ve cerrahi tedavinin kombine kullanımında hastalığın bireysel özelliklerine göre karar vermek gereklidir.[3] Cerrahi tedavi rezektabl vakalarda ilk seçenek olmasına rağmen ideal cerrahi yaklaşım ile ilgili net fikir birliği yoktur.[4–6] Çalışmada GIST tanısı ile opere edilen hastaların kliniko-patolojik sonuçlarının sunulması amaçlanmıştır.

GEREÇ ve YÖNTEMLER

Sakarya Üniversitesi Eğitim Araştırma Hastanesi Genel Cerrahi Kliniği'nde 2008-2021 yılları arasında GIST nedeniyle opere edilen hastaların verileri retrospektif olarak değerlendirildi. Çalışma için Sakarya Üniversitesi Tıp Fakültesi Etik Kurul Komitesinden etik kurul onayı alındı. Radyolojik olarak GIST ön tanısı mevcut veya histopatolojik olarak doğrulanmış GIST tanısı olan, cerrahi olarak tedavi edilen ve takip edilmekte olan hastalar çalışmaya dahil edildi. Hastalar demografik ve klinik özellikleri, tümör lokalizasyonu, tümör boyutu, mitotik index, histolojik tipi, Ulusal Sağlık Enstitüsü (NIH) kategorisi, neoadjuvan-adjuvan tedavi, ameliyat tipi, rezeksiyon şekli ve postoperatif erken dönem cerrahi sonuçları açısından değerlendirildi.

BULGULAR

Çalışmaya 55 hasta dahil edildi. Erkek hasta sayısı 33, kadın hasta sayısı 22 idi ve hastaların yaş ortalaması 57.82 yıl (41-85) idi. Karın ağrısı en sık (37 hasta - %67.2) başvuru şikayeti olurken diğer şikayetlerin sırasıyla gastrointestinal sistem (GİS) kanama, kilo kaybı ve disfaji olduğu belirlendi. Tümör en sık mide (37 hasta-%67.2) yerleşimli iken diğer lokalizasyonlar sırasıyla şu şekildeydi: ince bağırsak 15 hasta (%27,2), kolo-rektal 4 hasta (%7,2), özefagus 1(%1.8) hasta ve GİS dışı 1 hasta (%1.8). Mide tümör yerleşim yeri Resim 1'de gösterilmektedir. Ameliyat tipi olarak 40 hastaya (%72,7) açık ameliyat uygulandı, laparoskopik teknikle 15 hasta (%27,3) opere edildi. Hastalara en sık %52,7 ile (29 hastaya) mide, ince bağırsak veya kolon rezeksiyonu uygulandı, bundan sonra sırasıyla %32,7 (18 hasta), %10,9 (6 hastaya) ve %3,6 ile (2 hastaya) wedge rezeksiyonu, subtotal gastrektomi ve kitle eksizyonu uygulandı. Peroperatif ameliyat görüntüleri Resim 2'de gösterilmektedir. Histopatolojik incelemede en sık (39 hasta, %70.9) iğsi hücreli tip belirlendi. Hastalardaki ortalama tümör boyutu 7.03 cm (alt-üst sınır) olarak belirlendi. Mitotik index 50 büyütmede 5< oranında 33 hastada (%60) ve 5< oranında 22 hastada (%40) mevcuttu. İmmunohistokimyasal çalışmada CD117 pozitifliği 53 hastada (%96.3), CD34 pozitifliği 33 hastada (%60) idi. Patolojik piyes örnekleri Resim 3'te gösterilmektedir. Ulusal sağlık enstitüsü (NIH) tarafından hastalığın prognozunu belirlemek için modifiye Fletcher kriterleri geliştirilmiştir (Tablo 2).

Tablo 2. Miettinen risk sınıflama sistemi-modifiye Fletcher kriterleri

tümör parametreleri		lokalizasyon/ilerleyici hastalık riski (%)			
mitotik aktivite /50 büyütme	boyut/cm	gastrik	duodenal	İnce bağırsak	Rektal
⩽5	⩽2	yok	yok	yok	yok
	>2 - ⩽5	(1.9)	(4.3)	(8.3)	(8.5)
	>5 - ⩽1	(3.6)	(2.4)	yetersiz veri	yetersiz veri
	>10	(10)	(52)	(34)	(57)
>5	⩽2	vaka sayısı az	vaka sayısı az	yetersiz veri	(52)
	>2 - ⩽5	(15)	(73)	(50)	(54)
	>5 - ⩽10	(55)	(85)	yetersiz veri	yetersiz veri
	>10	(86)	(90)	(50)	(71)

Çalışmada Ulusal Sağlık Enstitüsü kategorisine göre hastaların %58.8'sının en sık yüksek riskli grupta olduğu belirlendi. Hastaların ortalama hastane yatış süresi 10.44 gün (5-45) idi. Enterokütan fistül gelişen bir hasta çalışma dışına çıkarıldığında ortalama hastane yatış süresi 8.2 gün (5-19 gün) olarak belirlendi. Komplikasyon olarak iki hastada

anastomoz kaçağı (%3.6), altı hastada yara yeri enfeksiyonu (%10.9) ve bir hastada (%1.8) entero-atmosferik fistül görüldü. Bulgular Tablo 1'de gösterilmektedir.

Tablo 1. Gist demografik, kliniko-patolojik özellikleri

	n=55
yaş-y/ort.(min-max)	57.82 (41-85)
cinsiyet/k n(%)	22 (40)
klinik/karın ağrısı	37(67,2)
hematokezya/melena	16(29)
kilo kaybı	1(1,8)
disfaji	1(1.8)
lokalizasyon/mide	37(67,2)
ince bağırsak	15(27,2)
kolo-rektal	4(7,2)
osefagus	1(1.8)
Gastrointestinal sistem dışı	1(1.8)
histolojik tip-n(%)/iğsi hc.li	39(70.9)
epiteloid	6(10.9)
mikst	10(18.1)
Tümör boyutu cm/ ort.(min-max)	7.03(1-18)
mitotik index-50 büyütme no(%)/ 5	33(60)
>5	22(40)
CD117 (+)	52(94.6)
CD34 (+)	33(60)
*NIH kategori-n(%)/yüksek	32(58.8)
orta	5(9.09)
düşük	12(21.8)
çok düşük	6(10,9)
cerrahi rezeksiyon	52(94.6)
neoadjuvan tdv.-n(%)	3(5.4)
ameliyat tipi-n(%). açık	40(%72,7)
laparoskopi	15(%27,3)
açık/lap oranı (n/n)	
ilk 7 yıl	6(30/5)
son 6 yıl	1(10/10)
rezeksiyon tipi. wedge rezeksiyon	18(%32,7)
segmental rezeksiyon	29(%52,7)
subtotal gastrektomi	6(%10,9)
kitle eksizyonu	2(%3,6)
komplikasyon-n(%)/kaçak	2(3.6)
yara yeri infeksiyon fistül	6(10.9)
yara yeri infeksiyon fistül	1(1.8)
yatış süresi/gün ortalama(min-max)	10.44(5-45)

***NIH** Ulusal Sağlık Enstitüsü

TARTIŞMA

Gastrointestinal stromal tümör dünyada yılda 1/6-15 milyon yeni tanı ile oldukça nadir görülen bir klinik antitedir.7 Bunun yanında GIST sindirim sisteminin mezenkim kaynaklı görülen tümörleri arasında en sık bulunur.8 İlk olarak 1983'te Mazur ve Clark tarafından mezenkimal malignite olarak tanımlanmışlardır.[9] GIST %70-80 semptomatik olup, %20 insidental olarak saptanır veya otopsi serilerinde fark edilir.[10] Genelde yavaş büyüyen tümörlerdir, fakat tümör boyutu, lokalizasyonu ve büyüme paterni klinik presentasyon ile ilişkilidir.[11] Çalışmada hasta grubunda, literatür ile uyumlu olarak erkek hastalar çoğunlukla yer almakta ve 5-6. dekadda hastalığın görülme sıklığı artmakta idi. GİST submukozal yerleşimli tümörlerdir ve klinik, kitle büyük boyutlara ulaşıncaya kadar semptomsuz olabilmektedir. Yakın zamanlı NCCN kılavuzu Avrupa referans datasına göre hastaların en sık başvuru nedeninin GİS kanama olduğu bildirilmiştir.[12] Çalışma grubunda literatürden farklı olarak en sık görülen başvuru şikayeti karın ağrısı idi. İkinci sıklıkta üst/alt gis kanama görüldü, daha az sıklıkla da disfaji ve kilo kaybı ile başvuru oldu. Çalışmaya dahil edilen hastalarda tümör en sık mide yerleşimli idi, bunu azalan sıklıkla ince bağırsak, kolon-rektum, özefagus ve GİS dışı yerleşim izledi. İğsi hücreli tıp en sık görülen patolojik varyant olup, ikinci sıklıkta epiteloid tip ve 3. sıklıkta mikst tip görüldü. Mitotik index daha sık olarak 5 ve altı olarak ölçüldü. Çalışma sonuçlarına göre tümörün görülme sıklığı, lokalizasyonu, patolojik tipi ve mitotik index oranları, literatür bilgisi ile uyumlu bulunmuştur.

GIST'lerin %80'i benign karakterde olmasına rağmen, karın ağrısı ve GİS kanama gibi semptomları nedeniyle zaman içerisinde yönetiminde cerrahi ana tedavi seçeneği olarak yerini almış, ancak cerrahinin sonuçları tek başına yeterli olmamıştır.[13] Klinik pozitif lenf nodu tutulumu yok ise, lenf nodu diseksiyonu olmadan komplet cerrahi rezeksiyon önerilmektedir.[14] Ancak, şimdiye kadar standart bir terapotik yaklaşım hakkında fikir birliği yoktur. GIST cerrahisinde genel olarak komplet cerrahi rezeksiyon yapılabildiği sürece, minimal invazif cerrahi giderek popülarite kazanmaktadır.[15–17] Uygun endikasyonlarda ve yeterli deneyim varlığında, lokalizasyon ve risk grubundan bağımsız olarak laparoskopi önerilmektedir.[18,19] Buradaki risk faktörünün tümör boyutu olduğu belirtilmiş, özellikle 10 cm ve üstü tümörlerde laparoskopik rezeksiyonun rölatif kontrendike olduğu bildirilmiştir.[20] Minimal invazif cerrahi benzer operasyon süreleri, benzer onkolojik sonuçlar ve daha düşük hastane yatış süreleri vadetmektedir.[21–23] Xu ve arkadaşlarının yaptıkları çalışmada zaman içerisinde mide GİST'lerinde artan deneyim ve gelişen teknoloji ile minimal invazif cerrahinin kullanılma oranının arttığı bildirilmiştir.[24] Çalışmamız değerlendirildiğinde, ilk 7 yıllık zaman diliminde açık cerrahinin tercih edilme yüzdesi 6 kat fazla iken, son 6 yıllık zaman diliminde her iki teknik eşit oranda tercih edilir hale gelmiştir. Bu değişimde zaman içerisinde, cerrahi ekibin doğal olarak artan deneyim ve becerisinin de belirleyici olduğu düşünülebilir.

Literatürde GİST prognozunda en önemli prognostik faktörler Miettinen ve Lasota tarafından 2006 yılında yayınladıkları çalışmada tümör boyutu ve mitotik index olarak bildirilmiştir.[25] Günümüzde revize edilen ESMO kılavuzuna göre anatomik lokalizasyon, histolojik tip, invazyon derinliği ve diferensiyasyon derecesi prognostik faktörlere ilave edilmiştir.[26] Çalışmamızda hastalar çoğunlukla NIH yüksek riskli grupta yer almaktaydı. Çalışma hasta grubunda ortalama tümör boyutu yaklaşık 7 cm olarak ölçülürken, 1 cm'den 18 cm'ye kadar farklı boyutlarda tümörler saptandı. Hastaların tamamına cerrahi rezeksiyon uygulanırken %94.6'sında cerrahi ilk tedavi olarak seçildi ve uygulandı. GİST tedavisinde medikal terapotik ajanlar uzun süredir kullanılmaktadır.[27] Başlangıçta, medikal tedavi postoperatif dönemde nükslerin engellenmesi için kullanılırken, zamanla tümör boyutunun küçültülmesi, metastatik yayılımın azaltılması, hastalıksız ve genel sağ kalım sürelerinin arttırılması için kullanılır hale gelmiştir.[28] Literatürde GİST hastalarında yukarıda sıralanmış olan endikasyonlar ile tedaviye tirozin kinaz inhibitörleri ile neoadjuvan tedaviye başlanabileceği bildirilmiştir.[29] Bu

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ARAŞTIRMA MAKALESİ / *Rerseasrch Article*

Temiz Aralıklı Kateterizasyon Yapan Hastalarda İdrar Isısı ile Üriner Sistem Enfeksiyonu Takibi

Follow-Up of Urinary System Infection with Urine Temperature in Patients Performing Clean-Intermitted Catheterization

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Öz

Amaç	Nörojen Mesane tanısı ile Temiz Aralıklı Kateterizasyon yapan hastalarda üriner enfeksiyon sık görülmekte, tanısında gecikme ve zorluklar yaşanmaktadır. Çalışmamızda Temiz Aralıklı Kateterizasyon yapan hastalarda idrar ısısı ölçümünün üriner sistem enfeksiyonu tanısına katkısını araştırmayı amaçladık.
Yöntem ve Gereçler	Nörojen mesane tanısı ile kliniğimizde takip edilen 9 kız ve 3 erkek hastanın toplam 33 idrar değerlendirmesi çalışmaya dâhil edildi. Hastalar, poliklinik başvurusunda bilgileri kaydedildikten sonra ailesi tarafından Temiz Aralıklı Kateterizasyon odasına alındı. Nonkontakt klinik termometre ile hastaya ve idrar numunelerine temas etmeden vücut ısıları, idrar kabındaki idrar ısısı ve kateterdeki idrar ısısı Temiz Aralıklı Kateterizasyon hemşiresi tarafından kaydedildi. Hasta daha sonra idrar kültürü, idrar tetkiki, hemogram ve CRP testlerini verdi. Hastanın idrar ısısından bilgisi olmayan aynı hekim tarafından hasta değerlendirilerek tedavisi planlandı.
Bulgular	Üriner sistem enfeksiyon tanısı konulan hastaların vücut ısıları, üriner sistem enfeksiyonu tanısı konulmayan hastalarla benzer bulunmuştur. Üriner sistem enfeksiyon tanısı konulan hastaların Temiz Aralıklı Kateterizasyon kateterinden gelen ilk idrar ısıları 30,53±1,84oC olarak ölçülürken üriner sistem enfeksiyonu olmayan hastalarda 28,97±1,67oC olarak ölçülmüş ve aralarında istatistiksel olarak anlamlı fark bulunmuştur. Temiz Aralıklı Kateterizasyon sonrası idrarın toplandığı idrar kabındaki ısı üriner sistem enfeksiyonu tanısı konulan hastalarda 33,53±2,38oC olarak saptanırken, üriner sistem enfeksiyonu tanısı olmayan hastalarda 31,66±2,59oC olarak saptanmış ve aralarında istatistiksel olarak anlamlı fark bulunmuştur.
Sonuç	Temiz Aralıklı Kateterizasyon yapan hastalar içerisinde, üriner sistem enfeksiyonu tanısı konulan fakat vücut ısısı artmamış grupta idrar ısısında anlamlı bir ısı artışı mevcuttur. Bu artışın sebebinin enfeksiyon bölgesinde oluşan enflamasyona ikincil olabileceğini düşünmekteyiz.
Anahtar Kelimeler	Nörojen Mesane, İdrar Yolu Enfeksiyonu; İdrar Isısı

Abstract

Introduction	*Urinary infection is common in patients undergoing Clean Intermittent Catheterization with the diagnosis of Neurogenic Bladder, and there are delays and difficulties regarding its diagnosis. In our study, we aimed to investigate the contribution of urine temperature measurement to the diagnosis of urinary tract infection in patients undergoing Clean Intermittent Catheterization.*
Materials and Methods	*A total of 33 urine evaluations of 9 female and 3 male patients who were monitored in our clinic with the diagnosis of neurogenic bladder were included in the study. Patients were taken to the Clean Intermittent Catheterization room by their families after their information was recorded at the outpatient clinic. Body temperature, urine temperature in the urine container and urine temperature in the catheter were recorded by the Clean Intermittent Catheterization nurse without touching the patient and urine samples with a noncontact clinical thermometer. The patient then gave urine culture, urinalysis, hemogram and CRP tests. The patient was evaluated and treatment was planned by the same physician who was not aware of the patient's urine temperature.*
Results	*Body temperatures of patients diagnosed with urinary tract infection were similar to those of patients without urinary tract infection. The first urine temperature from the Clean Intermittent Catheterization catheter of the patients diagnosed with urinary tract infection was 30.53±1.84oC, while it was 28.97±1.67oC in patients without urinary tract infection and there was a statistically significant difference between them. The temperature in the urine container where the urine was collected after Clean Intermittent Catheterization was found to be 33.53±2.38oC in patients with urinary tract infection and 31.66±2.59oC in patients without urinary tract infection and a statistically significant difference was found between them.*
Conclusion	*In patients undergoing Clean Intermittent Catheterization, there is a significant increase in urine temperature in patients who are diagnosed with urinary tract infection but whose body temperature has not increased. We think that this increase may be caused by inflammation at the site of infection.*
Keywords	*Neurogenic Bladder; Urinary Tract İnfection; Urinary Temperature*

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GİRİŞ

Nörojen mesane, konjenital veya edinsel olarak spinal kordun olumsuz etkilenmesine bağlı olarak mesanenin nörojenik bağlantılarının işlev görmemesi nedeniyle oluşur. Etiyolojide sıklıkla nöral tüp defektleri izlenirken nöropatiler, travmatik spinal kord yaralanmaları ve spinal tümörler diğer sebepler arasında yer almaktadır[1]. Bozulmuş mesane innervasyonuna bağlı olarak artan mesane basıncı ve işeme disfonksiyonu sonucunda etkilenmenin süresi ile de ilişkili olmak üzere gelecek dönemlerde renal hasar gelişebilmektedir. Klinikte artan mesane içi basıncı düşürme ve işeme bozukluklarının tedavisinde standart yaklaşımın temiz aralıklı Kateterizasyon (TAK) olduğu çok sayıdaki çalışmada belirtilmiştir[2]. Ancak bu hastalarda son yıllardaki teknik gelişmeler ve hastaların daha iyi takiplerine rağmen üriner sistem enfeksiyonu, halen en sık izlenen sorun olarak karşımıza çıkmaktadır. Bununla ilişkili olarak üriner sistem enfeksiyonu tanı ile tedavisinde ciddi sorunlar yaşanmaktadır. Yüksek sağlık maliyeti ile beraber hasta için de ciddi morbitide ile karşılaşılmaktadır.

Çalışmamızda pediatrik hasta grubunda TAK yapan meningomyeloselli hastalarda üriner sistem enfeksiyonu tanısında idrar ısı takibinin değişiminin anlamlılığını araştırmayı amaçladık. Araştırmalarımıza göre, literatürde bu konuda yapılan bir çalışmayla karşılaşmadık.

GEREÇ ve YÖNTEMLER

Gaziosmanpaşa Üniversitesi Tıp Fakültesi Klinik Araştırmalar Etik Kurulundan 16-KAEK-070 kayıt numarası ile etik kurul onayı alındı. Çocuk Cerrahisi Kliniğinde takip edilen ve meningomyelosel tanısıyla ameliyat olarak nörojen mesane tanısı konulan 9'u kız ve 3'ü de erkek olmak üzere toplam 12 hasta çalışmaya dahil edildi. Meningomyelosel ameliyatı sonrasında kliniğimizde takipleri yapılmış, ürodinami ile nörojen mesane tanısı konulmuş, TAK başlanılmış ve en az 3 yıldır takip edilen; renal fonksiyonlarında kayıp olmayan, vezikoüretral reflüsü olmayan hastalar çalışmaya alındı. Hastalar ayrıntılı öykü, fizik muayene, tam idrar tetkiki, üriner ultrasonografi, direkt üriner sistem grafisi ve gerektiğinde sintigrafi ile değerlendirildi. Hastalar, TAK işleminde kendinden jelli hidrofilik TAK kateteri kullanan ve daha önce herhangi bir üriner cerrahi girişimi olmayan hastalardı. Hastalar, aylık olarak poliklinik kontrolüne çağrılarak önce muayenesi yapıldı. Sonrasında vücut ısısı ölçüldü. Vücut ısısı normal, başvuru öncesi tanı konulmuş bir enfeksiyon ve ateş öyküsü olmayan hastalar TAK yapmaları için kliniğimize yönlendirildi. TAK aile tarafından yapılırken, çalışmadan bilgisi ve çıkarı olmayan TAK eğitim hemşiresi tarafından kateterden gelen ilk idrarın ısısı ve idrar kabında biriken idrarın ısısı, Beurer 90 noncontact clinical termometer ile idrar ve hastaya temas edilmeden ölçüldü (Resim 1).

Resim 1. İdrar ısısını ölçme

Ölçüm sonrası frontal bölgeden hastanın vücut ısısı ölçülerek kayıt altına alındı. Ölçümler, aynı mevsimde TAK eğitim odasında ısı 22±0,5°C ve nem oranları % 30±5 olacak şekilde yapıldı. Daha sonra aynı idrar kabından idrar tetkiki ve idrar kültürü gönderildi. Hastalardan aynı seansta tam kan sayımı, CRP ve sedimantasyon değerleri için serum örnekleri alındı. Tüm hastalar, aynı hekim tarafından değerlendirildi. Anlamlı bakteriüri saptanan ve kültüründe üreme olan hastalar içerisinden, yan ağrısı veya karın ağrısı, idrar renk ve kokusunda değişiklik gibi aile tarafından fark edilen klinik değişiklikler tespit edilen hastalarda, enfeksiyon durumunu açıklayacak başka bir odak olmadığı sürece, üriner sistem enfeksiyonu olarak tanımland[3]. Laboratuvar tetkikleri ile hastanın kliniği beraber değerlendirilerek üriner sistem enfeksiyonu tanısı konulan hastalar, kültür sonucuna göre uygun antibiyotikle

tedavi edildi. Hastalar uygun antibiyotik kullanımı sonrası kontrole çağrılarak tedavi etkinliği değerlendirildi. Ancak üriner sistem enfeksiyonu tedavisi sonrası kontrollerdeki veriler, çalışmaya alınmadı. Aynı hastanın iki laboratuvar sonucu arasında en az bir ay geçmeden değerlendirmeye dahil edilmedi. Hastaların laboratuvar sonuçlarını inceleyen ve tedavi eden hekim idrar ısılarından çalışma bitimine kadar bilgilendirilmedi, değerler TAK eğitim hemşiresi tarafından kayıt altında tutuldu. Çalışma bitiminde TAK kateterinden gelen ilk idrarın ısısı, idrar numune kabındaki idrar ısısı, frontal vücut ısısı; tam idrar tetkikinde lökosit, eritrosit, nitrit, lökosit esteraz değerleri ve idrar kültürü sonuçları birleştirilerek istatiksel analiz yapıldı. Ayrıca hastanın yaşı, cinsiyeti ve kullandıkları profilaksi verileri sonuçlarla beraber değerlendirilmiştir.

İstatistik analiz

Veriler; ortalama standart sapma veya frekans, yüzde olarak ifade edildi. Gruplar arasındaki kantitatif değişkenleri karşılaştırmak için bağımsız örneklem t testi veya Mann Whitney U testi kullanıldı. Nitel değişkenlerin gruplar arasında karşılaştırılmasında Ki-Kare testleri kullanıldı. Her gruptaki üremeyi tahmin etmede prop sıcaklığının gücünü belirlemek için alma Receive Operating Characteristic(ROC) eğrisi uygulandı. Optimal cutoff değeri Youden Criterion olarak belirlendi. ROC analizi için R sürüm 1.1-3'teki Optimal Cutpoints paketi kullanıldı. p-değeri<0,05 anlamlı kabul edildi. Diğer analizler SPSS 19 (IBM SPSS Statistics 19, SPSS inc., an IBM Co., Somers, NY) kullanılarak yapıldı.

BULGULAR

Çalışmada 9 kız 3 erkek toplam 12 hastanın en az 1 ay ara ile yapılmış 33 sonucu değerlendirildi. Hastaların yaş ortalaması 4,1 yıl (3-7yıl) olarak saptandı. En az 36 aydır kliniğimizde takip edilen hastaların ortalama takip süresi 39 ay olarak tespit edildi. Hastaların 9 tanesi Trimetoprim/sulfametoksazol(TMP-SMX) profilaksisi, iki tanesi Sefiksim profilaksisi bir tanesi de Nitrofurantoin profilaksisi altıdaydı. Tüm hastalar, aynı zamanda en az 3 yıldır antikolinerjik olarak oksibutinin (0,3-0,4 mg/kg) tedavisi alıyordu.

Hastalarda yapılan 33 ölçümün sonucunda: 17 veri tam idrar tetkiki, idrar kültürü, lökosit, CRP ve klinik açıdan incelenerek aktif üriner sistem enfeksiyonu olarak değerlendirildi. Hastalar uygun tedavi protokolüne alındılar. 16 hastanın sonuçları normal değerler olarak değerlendirilip bir ay sonra kontrole çağrıldılar. (Tablo: 1)

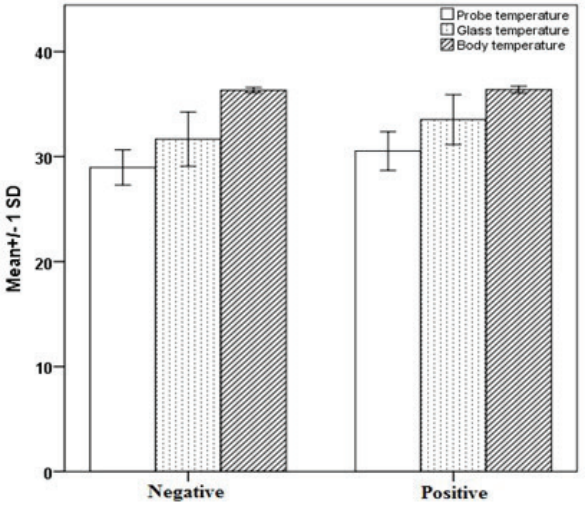
Tablo 1: Hasta verilerinin genel dağılımı

		n	%
İdrar Kültürü	Negative	17	51,50
	Positive	16	48,50
Cinsiyet	Kız	9	75
	Erkek	3	25
Profilaksi	(TMP-SMX)	19	57,60
	Cefiksiman/Nitrofurantoin	14	42,40
Antikolinerjic Ajan	Oxybutynin	12	%100

Hastaların sonuçları incelendiğinde: Üriner sistem enfeksiyonu tanısı konulan ve tedavi edilen hastaların TAK kateterinden gelen ilk idrar ısıları 30,53±1,84°C olarak ölçülürken, üriner sistem enfeksiyonu olmayan hastalarda 28,97±1,67°C olarak ölçülmüştür. Yine TAK sonrası idrarın toplandığı idrar kabındaki ısı: üriner sistem enfeksiyonu tanısı konulan hastalarda 33,53±2,38°C olarak saptanırken, bu değer üriner sistem enfeksiyonu tanısı olmayan hastalarda 31,66±2,59°C olarak saptanmıştır. Bu değerler incelendiğinde; hem TAK kateterinde hem de idrar kabında ölçülen ısıların üriner sistem enfeksiyonu tanısı konulan hastalarda istatistiksel olarak anlamlı bir yükseklik olduğu görülmektedir (Tablo 2 ve Figür 1).

Tablo 2: Üriner sistem enfeksiyonu tanısı konulan hastaların verileri

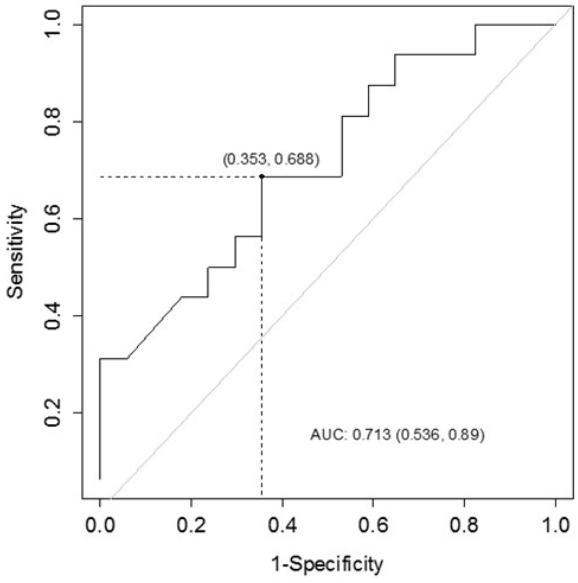
	Üriner sistem enfeksiyonu		p
	Negatif	Pozitif	
Kateter ısısı oC	**28,97±1,67**	**30,53±1,84**	0,016
İdrar kabı ısısı oC	**31,66±2,59**	**33,53±2,38**	0,039
Vücut sıcaklığı oC	36,34±0.25	36,39±0.33	0,607
Nitrite(Negative/ Positive)	17/0	6/10	<0,001
Lökosit	2 [1-3]	13[7-94]	<0,001
Lökosit Esteraz	0 [0-0]	250 [124.5-300]	<0,001
Eritrosit	1 [1-2]	5,5 [3-6]	<0,001



Figür 1. Mean+/- 1 Grupların standart sapma grafiği

Yine üriner sistem enfeksiyonu tanısında kullandığımız laboratuar değerleri incelendiğinde: Tam idrar tetkikinde lökosit, lökosit esteraz, eritrosit ve nitrit değerlerinin üriner sistem enfeksiyonu olan hastaların verileri de istatistiksel olarak anlamlı olacak şekilde yüksek olduğu tespit edildi (Tablo 2)

Değerlerin ROC analizleri yapıldığında TAK sondasındaki ilk idrar ısısına göre üriner sistem enfeksiyonu olduğunu söyleyebilmek için en iyi kesim noktasının 29,8°C olduğu izlenmiştir. TAK sondasındaki ilk idrar ısısına göre kesim noktası 29,8°C seçildiğinde, gerçekte enfeksiyon olanların %69'unda (sensitivity) üriner sistem enfeksiyonu olduğu ve gerçekte üriner sistem enfeksiyonu olmayanların %65'inde (specifity) enfeksiyon olmadığı saptanmıştır. ROC analizi sonrasında TAK sondasındaki ilk idrar ısısına göre 29,8°C ve üzeri ısı için üremenin varlığından bahsedilebilir (p=0,037)(Tablo 3). Bardak ısısı ve vücut ısısına göre üremenin olup olmadığını belirlemek için yapılan ROC analizinde istatistiksel anlamlılık bulunamamıştır.



Figür 2. Kateter idrar sıcaklığı için ROC eğrisi

Tablo 3. Değişkenler için ROC analiz sonuçları (üreme grubu sınıflandırmasına göre)

Değişkenler	Kesim değeri	AUC	95% Güven aralığı	Se	Sp	PPV	NPV	p
Kateter ısısı	>29,8	0,713	0,536-0,890	0,688	0,647	0,647	0,688	0,037

AUC: Eğri Altı Alan, Se:Sensitivite, Sp:Specificite, PPV: Pozitif Prediktif Değer, NPV:Negatif Predictif Değer

TARTIŞMA

Çeşitli patojenler tarafından vücudun farklı lokalizasyonlarında ortaya çıkan enfeksiyonlar, hemen hemen tüm kliniklerdeki hasta yükünün önemli bir kısmını oluşturmaktadır. Bunlar içerisinde üriner enfeksiyonlar, tüm enfeksiyonlar içerisinde oldukça önemli orana sahiptir. Bu enfeksiyonlar, özellikle hastanede yatan hastalarda %40'lara kadar yükselebilmektedir. Üriner enfeksiyonlar: pyeleonefrit, prostatit, orşit, üretrit ve sistit şeklinde kendini gösterebilmektedir. Mesaneyi ilgilendiren enfeksiyonlar gerek çocuklar gerek erişkinler gerekse de ileri yaşlarda oldukça sık görülmektedir. Mesane enfeksiyonlarının etiyolojisinde: konağa ait lokal ve immün faktörlerin yanı sıra üretral girişimler, hematojen yol, taşlar, darlıklar, metabolik ve sistemik hastalıklar, cinsiyet ve nörojenik faktörler yer almaktadır. İdrarın santral ve periferal sinir sisteminin koordineli olarak çalışmasına bağlı olarak depolanması ve boşaltımını sağlayan mesanenin iç ya da dış faktörlere bağlı olarak nörolojik açıdan etkilenmesi sonrası fonksiyonlarının bozulması nörojen mesane olarak adlandırılır. Nörojenik mesane tekrarlayan infeksiyonlar, böbrek yetmezliği, inkontinans, üriner sistem taş hastalığı gibi ciddi sonuçlara yol açabilmektedir. ABD'de yapılan çalışmada: Multıpl Sklerozlu hastalarda % 40-90 oranında Parkinsonlu hastalarda %37-72 oranında mesane disfonksiyonu tespit edilmiştir. Spina bifidalı hastalarda mesane disfonksiyonu da çok sık izlenmekte ve 5 yaş altı çocuklarda %40 vezikoüretral reflüye sebep olmaktadır. Aynı zamanda genç yetişkinlerde %60 ile %90 oranında üriner inkontinansa sebep olduğu belirtilmiştir[4]. Çocuklarda en sık nörojen mesane sebepleri arasında nöral tüp defektleri yer almaktadır. Bunun dışında nöropatiler, spinal kord tümörleri, spinal kord yaralanmaları ve sinir siteminin ilerleyici hastalıklarla da nörojen mesanenin diğer sebepleri olarak karşılaşılmaktadır. Nöral tüp defektlerinin çok az bir kısmı spontan idrarını yapabilmektedir[5]. Nörojen mesanesi olan hastalarda mesane detrusor kası, mesane boynu ve eksternal sfinkter, sinerjik olarak çalışması bozulmaktadır. Mesane çalışmasını düzenleyen santral ve periferik sinir sistemindeki hasarın olduğu yere göre değişik fonksiyon bozuklukları oluşmaktadır[6].

Nörojenik mesaneli hastaların tedavisinde yüksek kapasiteli ve düşük basınçlı tamamen boşaltılabilen bir mesane, ana hedeftir. Tedavide antikolinerjikler, üriner enfeksiyon profilaksisi ve TAK; en sık kullanılan yöntemlerdir[7]. Geçmiş dönemlere kıyasla son yıllarda nörojenik mesane tanısı ile takip edilen hastalarda üriner sistem enfeksiyon, vezikoüretral reflü, böbrek yetmezliği; TAK, antikolinerjik ajanlar ve gerekli cerrahi girişimler nedeniyle belirgin olarak azaldığı bildirilmişti[8]. Bu hastalar; sık olarak üriner sistem enfeksiyonu, renal fonksiyon kaybı, mesane dinamikleri ve vezikoüretral reflü açısından takip edilmelidir. Takiplerde en çok idrar tetkikleri, renal ultrasonografi sık aralıklarla yapılırken, ürodinami, renal sintigrafi ve voidingüretrosistografi daha uzun aralıklar ile yapılır.

Temiz Aralıklı Kateterizasyon(TAK), çok uzun yıllardır mesane disfonksiyonu bulunan hastalarda tüm dünyada yaygın olarak uygulanmaktadır ve üriner sistem enfeksiyonu en önemli komplikasyonu olarak karşımıza çıkmaktadır[7-9]. Bunun dışında TAK kullanımına bağlı olarak üretral darlık, üretral kanama, üretral divertikül, mesane perforasyonu diğer komplikasyonlar arasında sayılabilir 10-11. TAK yapan hastalarda üriner sistem enfeksiyonu oranı değişik çalışmalarda %12-88 arasında verilmiştir[1-2-3-12-13-14].

Ayrıca, bu hastalarda TAK kullanımına bağlı olarak bakteriüri sıklığı da artmıştır[15]. Üriner enfeksiyonu engellemek için profilaktik antibiyotik uygulaması başlamış bu da dirençli üriner sistem enfeksiyonu sıklığının artmasına neden olmuştur. Bakteriüri ve üriner sistem enfeksiyonu ayrımını yapmak ve hangi hastalara üriner sistem enfeksiyonu açısından tedavi verilmesi gerekliğini belirlemek bazı hastalarda ciddi zorluklara sebep olmaktadır[16]. Son yıllarda yapılan çalışmalar erken TAK başlamanın aslında çok risksiz bir tedavi yöntemi olmadığı konusunda tartışmaların ortaya çıkmasına yol açmıştır[8]. Özellikle TAK yapan hastalarda dirençli idrar yolu enfeksiyonları gelişmekte olduğuna dair birçok çalışma yapılmıştır. Ancak TAK ya-

pan hastalarda üriner sistem enfeksiyonun tanı, tedavisi ve takibinde tam bir ortak yaklaşım oluşturulamamıştır[8].

TAK yapılan hastalarda üriner sistem enfeksiyonu, ciddi bir morbidite ve sağlık maliyeti olarak karşımıza çıkmaktadır. Bu hastalar çok sık sağlık kuruluşlarına gelmekte ve sonrasında da yatarak veya ayaktan birçok defa üriner sistem enfeksiyonu tedavisi almaktadır. Evde hastalığın tanı ve takibine yönelik olarak idrar strip testleri kullanılmasına rağmen maliyet açısından gelişmekte olan ülkelerde bu durum yaygınlık kazanmamıştır ve bunlardan elde edilen sonuçların mutlaka idrar kültürü ile teyit edilmesi gerekmektedir[13]. Yapılan çalışmalarda, TAK yapan hastalarda enfeksiyon takip ve tedavisinde klinikler arası ortak bir protokol olmadığı izlenmektedir. Bu çalışmamızda maliyet açısından ucuz, kullanım açısından kolay ve aile uyumu açısından zorluk oluşturmayan bir tarama testi olarak; idrar ısı değişikliğinin pediatrik yaş grubunda TAK yapan hastalarda üriner sistem enfeksiyonu tespiti ve tedavisinde anlamlılığını araştırdık.

Çalışmamız sonucunda üriner sistem enfeksiyonu tanısı konulan fakat genel vücut ısısı artmamış hastalarda, idrar ısısında istatistiksel olarak anlamlı bir ısı artış olduğunu izledik. Bu artışın sebebinin infeksiyon bölgesinde oluşan enflamasyona ikincil olabileceğini belirtebiliriz. Enflamasyon bölgesinde vazodilatasyon sonucunda inflamatuar hücrelerin göçüne bağlı olarak o bölgede ödem, hassasiyet ve ısı artışı olduğu bilinmektedir[17]. Akut enflamasyonda oluşan vazodilatasyon sonucunda o bölgeye olan kan akımı ve intravasküler hidrostatik basınç artmaktadır. Basınç artışı, kapiller permabilite artışı ve lokosit ekstravazasoyunu inflamatuvar hücreler ve salgıladıkları mediatörler sayesinde oluşmaktadır. En önemli mediatörler histamin, seratonin, lizozimal enzimler iken; enflamasyonun devamında prostoglandinler, lökotrienler, platlet aktive edici faktör, nitrit oksit, sitokinler (IL-1,TNF-α) devreye girmektedir. Lokal olarak yapılan yanıta sistemik olarak da karaciğerden salgılanan Faktör XII(Hageman föktör) ve complemant aktivasyonu(C3a,C5a,C3b,C5b-9) destek olmakta ve inflamatuvar yanıt oluşmaktadır. Üriner sistem enfeksiyonu, ilk aşamasında enfeksiyon sistit olarak başlayıp sonrasında sistemik tepkiler ve semptomlar oluşmaktadır. Mesane duvarında enfeksiyon olması durumunda enflamatuvar hücreler, mesane duvarına göç etmekte ve ödem nedeniyle mesane duvar kalınlığı artmaktadır. Bu aşamada sistemik yanıt oluşmadan erken dönemde lokal yanıtlar nedeniyle mesane duvar ısısının artması beklenmektedir. Mesane duvarında oluşan ısı artışının idrar sıcaklığını da etkilediğini düşünmekteyiz.

Ancak yaptığımız ölçümlerde TAK kateterinde ve idrar kabında vücut ısısından çok uzak değerler olan 29 ^{0}C ve 30 ^{0}C civarında bir ısı olduğu izlenmiştir. Bu ısı farkının ısının yayılım mekanizmalarından kondüksiyon ve konveksiyon nedeniyle oluştuğunu düşünmekteyiz. Kateter, bardağın ve ortamın düşük sıcaklıkları ile idrarın yüksek sıcaklıkları arasındaki değişim nedeniyle meydana geldiğini düşünmekteyiz.

Çalışmamız 12 hastanın 33 anlık idrar sıcaklık verileri değerlendirilerek yapılmıştır. Daha fazla sayıda veri ve aynı hastanın uzun dönemli verileri kendi içerisinde değerlendirildiğinde daha anlamlı sonuçlar sağlayabilecektir. Çünkü vücut ısısı, kişiye göre gün içerisinde çok sayıda faktörden etkilenmektedir. Bu değişikliklerin idrar sıcaklıklarını etkileme ihtimali bulunmaktadır. Hastaların gün içerisinde birden çok sıcaklık ölçümü yapması ve ardışık günlerde alınan bu verilerin beraber olarak değerlendirilerek karar verilmesi gerektiğini düşünmekteyiz. Bu yönde daha fazla hasta ve her hastanın ardışık verilerini değerlendirilerek yeni çalışmalar planlamaktayız.

İdrar sıcaklıklarını değerlendirdiğimiz bu çalışma, bir tarama testi olarak planlanmıştır. Hasta maliyetleri ve üriner sistem enfeksiyonu erken tanısı açısından ortaya koyacağı faydalar göz önüne alındığında, özellikle düşük gelirli hastaların takip ve tedavisinde önemli bir araç olabileceğini düşünmekteyiz. Ayrıca mesanede oluşan enflamasyonu da bize gösterdiği için hala tartışmalı olan bakteriüri ve üriner

sistem enfeksiyonu ayrımında faydalı bilgilere ulaşabiliriz. Sonuç olarak, idrar sıcaklıklarının ölçümünün nörojen mesane tanısıyla TAK yapan hastalarda üriner sistem enfeksiyonu ayrımı, tanısında alternatif ve yardımcı bir yaklaşım olarak kullanılabileceğini düşünmekteyiz. Bu yaklaşım, özellikle asemptomatik bakteriüri ile üriner sistem enfeksiyonu ayrımı ve erken tanısına önemli katkılar sağlayabilir. Ancak çalışmamızın sonuçlarının doğrulanabilmesi ve daha etkin sonuçlara ulaşabilmek için geniş olgu sayısına sahip prospektif randomize klinik çalışmalar yapılması gerektiği söylenebilir.

Etik Kurul

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RESEARCH ARTICLE / *Araştırma Makalesi*

Changes in The Use of Diagnostic Imaging in Emergency Departments From 2016 To 2022: A Six-Year Analysis

2016-2022 Yılları Arasında Acil Servislerde Görüntüleme Yöntemlerinin Kullanımındaki Değişiklikler

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Abstract

Introduction	Due to the presence or proximity of medical imaging modalities in emergency departments, their use is becoming widespread in pediatric and adult emergency departments. Especially with the COVID-19 pandemic, the use of computed tomography as a rapid and sensitive method for the diagnosis of pneumonia has also increased. This study aimed to analyse the change in the trends of imaging modalities in emergency departments over the last 6 years in our country.
Materials and Methods	A retrospective descriptive study was conducted in the emergency departments of public and university hospitals in Turkey between January 1, 2016, and December 31, 2021. The numbers and percents of imaging requests (CT,MRI,radiographs,USG) were analyzed.
Results	Regarding imaging per ED visit were considered, Plain radiograph constituted the most requested examinations compared to all applications (31%-36%). Then, the rates were followed by CT (10.84%-23.40%), and the highest CT requests were found in 2020 (n=17.192.695). Overall, there was a statistically significant difference between years in terms of imaging types (X2 65.05, p<0.001, Friedman). All imaging modalities have changed statistically between the years 2016-2017 (p<0.001); 2017-2018 (p<0.001); 2018-2019 (p=0.02); 2019-2020 (p<0.001). While there was no statistical difference between 2020 and 2021 (p=0.614) also 2016 and 2021 (p=0.337), a statistically significant difference was found between 2016 and 2020 (p=0.046).
Conclusion	In our study, the use of imaging methods in the emergency departments in the last 6 years was examined, and the total footage showed a continuous increase in the pre-pandemic period. With the pandemic, significant changes were detected in the shooting modalities.
Keywords	Emergency Department, Computed Tomography, Ultrasound

Öz

Amaç	*Tıbbi görüntüleme yöntemlerinin acil servislerde bulunması veya yakın olması nedeniyle çocuk ve erişkin acil servislerinde kullanımı giderek yaygınlaşmaktadır. Özellikle COVID-19 pandemisi ile birlikte bilgisayarlı tomografinin pnömoni tanısında hızlı ve duyarlı bir yöntem olarak kullanımı da artmıştır. Bu çalışma, ülkemizde son 6 yılda acil servislerde görüntüleme modalitelerindeki eğilimlerin değişimini incelemeyi amaçlamıştır.*
Yöntem ve Gereçler	*1 Ocak 2016- 31 Aralık 2021 tarihleri arasında Türkiye'deki kamu ve üniversite hastanelerinin acil servislerinde retrospektif tanımlayıcı bir çalışma yapılmıştır. Görüntüleme isteklerinin (CT,MR,radyografi,USG) sayıları ve yüzdeleri analiz edildi.*
Bulgular	*Başvuru başına yapılan görüntülemeler değerlendirildiğinde, tüm başvurulara göre (%31-%36) en çok istenen tetkikleri düz grafiler oluşturdu. Ardından oranları BT (%10,84-%23,40) takip etti ve en yüksek BTtalepleri 2020'de (n=17,192,695) bulundu. Genel olarak, görüntüleme türleri açısından yıllar arasında istatistiksel olarak anlamlı bir fark vardı (X2 65.05, p<0.001, Friedman). 2016-2017 yılları arasında tüm görüntüleme yöntemleri istatistiksel olarak değişti (p<0.001); 2017-2018 (p<0,001); 2018-2019 (p=0,02); 2019-2020 (p<0.001). 2020 ile 2021 (p=0,614) ve 2016 ile 2021 (p=0,337) arasında istatistiksel olarak fark yokken, 2016 ile 2020 arasında istatistiksel olarak anlamlı bir fark bulundu (p=0,046).*
Sonuç	*Çalışmamızda acil servislerde son 6 yılda görüntüleme yöntemlerinin kullanımı incelenmiş, pandemi öncesi süreçte toplam çekim sürekli artış göstermiştir. Pandemiyle birlikte çekim modalitelerinde belirgin değişikler saptanmıştır.*
Anahtar Kelimeler	*Acil Servis, Bilgisayarlı Tomografi, Ultrasonografi*

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INTRODUCTION

While 92 million patients were admitted to the emergency department in Türkiye in 2016, the number of patients increased to 129 million in 2021.Imaging methods are used frequently in the diagnosis and differential diagnosis in emergency departments and the decisions for discharge and hospitalization can be made faster.[1]

The use of imaging technologies in emergency departments plays a major role in diagnosis, exclusion, and follow-up.[2] Therefore there is an increased use in diagnostic imaging in emergency departments (ED).[3,4] More than three fold increase in use of computed tomography (CT) and magnetic resonance imaging (MRI) has been shown in ten years period after 2000.[4]

Eventhough fast and effective imaging modalities helps diagnosis and support physicians in the decision of discharge or hospitalization. However, it is also important to use these tests cost-effectively and with a benefit-harm ratio since its ineffective use causes costs and longer length of stay.[2,4]

Point of care ultrasound (USG) in emergency departments is an easy accessed modality which emergency physician interpret the images of the patients fast and avoid radiation of CT[5]. It has been shown that after the use of point of care USG, the trends in the use of CT in trauma patients have decreased.[5]

However there are studies in the literature showing that the use of computed tomography has increased due to the ease of access, especially in traumatic and nontraumatic conditions.[6] More of that after the COVID-19 pandemic, the use of computed tomography as a rapid and sensitive method for the diagnosis of pneumonia has also increased.[7]

This study aimed to assess the trends of diagnostic imaging in emergency departments over six year period.

METHODS

Study design

This was a retrospective descriptive study performed with computed tomography requests in the emergency departments of public and university hospitals in Turkey between January 1, 2016, and December 31, 2021, with approval from the Ministry of Health and the local ethics committee (E2-22-1622).

Data collection

The data of the study is obtained from the archives of the General Directorate of Health Services of Ministry of Health after the approval of ethical committee and related department. We searched the total numbers of visits and diagnostic imaging modalities requests regarding their triage codes within secondary and tertiary hospitals. In our country, there are a total of 900 public hospitals, 68 university hospitals, and 566 private hospitals that provide inpatient health services with emergency departments.8 The patients are categorized regarding their urgencies as red, yellow and green as defined in the regulation of Ministry of Health.

We included the most used requests of CT, MRI, USG and radiograms. We excluded other imaging modalities as scintigraphy requested from emergency departments.

Statistical Analysis

The descriptive statistics were given as numbers and percentages of the imaging modalities and overall visits according to triage areas. We performed ANOVA, Friedman test to calculate the statistical difference among the years regarding the imaging types. We used Mann-Whitney U to compare the change between two years. SPSS IBM v27 has been used for the analysis.

RESULTS

In the study, the number of patients who were admitted to the emergency department annually between 2016 and 2021 in our country is shown in Table 1. The highest num-

ber of visits to the emergency department was in 2019 (n=97.695.872).

Computed tomography numbers are shown in Table 2. The highest number of computed tomography requests was seen in 2020 (11,830,866). The highest rate of computed tomography requests per patient was found in 2020 (23,4%).

The most requested CT examinations compared to all CTs in the emergency department according to the years was Brain CT among all times. The year in which thorax CT was requested the most was determined to be 2020, and it increased 4.21 times compared to the previous year (Figure 1).

Table 1. The Number of Emergency Department Visits as Total and According to the Areas

	2016	2017	2018	2019	2020	2021
ED visits	72.106.289	83.731.510	91.501.535	97.695.872	73.473.350	87.956.504
Triage_Non_ Green	54.288.144	63.240.240	67.850.466	70.031.987	57.260.610	71.020.157
Triage_Green	17.818.145	20.491.270	23.651.069	27.663.885	16.212.740	16.936.347

Three level triage codes are used in emergency departments. The red triage level indicates the most urgent patients and the green level is the least urgent patients.

Table 2. The distribution of CT screening by years

CT, region	2016	2017	2018	2019	2020	2021
Brain	1.755.694	2.287.017	2.546.034	2.773.063	2.196.874	988.866
Maxillo facial	93.199	139.279	171.198	187.258	148.491	64.990
Thorax	550.817	766.145	929.559	1.063.704	5.549.561	1.950.061
Abdomen	1.044.032	1.511.456	1.877.739	2.206.713	2.148.662	1.087.950
Vertebrae	453.611	602.508	706.392	763.858	693.310	295.293
Extremity	129.842	192.517	231.873	281.968	264.413	130.002
Other	3.786.513	5.194.713	6.104.740	6.853.661	6.191.384	2.902.920
Total	7.813.708	10.693.635	12.567.535	14.130.225	17.192.695	7.420.082
CT/ED visits	10,84%	12,77%	13,73%	14,46%	23,40%	8,44%

CT/ED visits ratio: Percentage of the requested CT scans among ED visits.

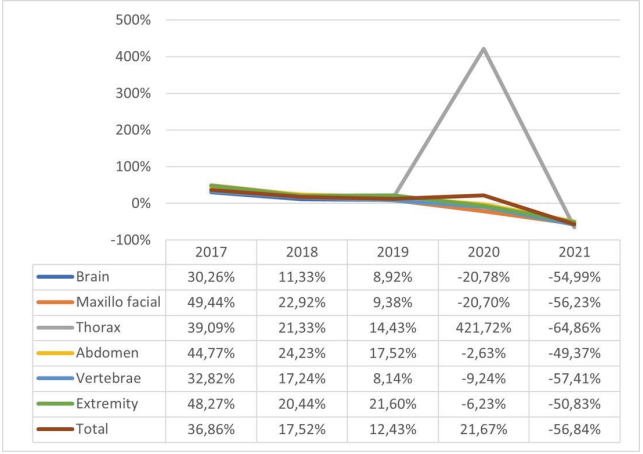

Figure 1. The rate of change in CT screening from 2017 to 2021.

The highest number of radiographic regions were determined as joints, chest and abdomen (Table 3). Chest radiography was requested the most in 2019 (n=7.835.034). The rate of change of all radiographies decreased in 2020 (Figure 2).

Diffusion weighted MRI rates among Brain MRI are higher in all years (81%,84%, 86%, 88%, 90%, 89% respectively). Musculoskeletal screening has the higher rates of joint MRI (84%, 87%,87%,88%,85%,87% from 2016 to 2021 respectively). The number of all MRI was found in 2019 (n=894.703) (Table 4)

The ultrasound numbers were highest in 2017 (n=2.797.087) and lowest in 2020 (n=1.992.401) (Table 5) (Figure 2).

Overall, there was a statistically significant difference between years in terms of imaging types (X2 65.05, p<0.001, Friedman). All imaging modalities have changed statistically between the years 2016-2017 (p<0.001); 2017-2018 (p<0.001); 2018-2019 (p=0.02); 2019-2020 (p<0.001). While there was no statistical difference between 2020 and 2021 (p=0.614) also 2016 and 2021 (p=0.337), a statistically significant difference was found between 2016 and 2020 (p=0.046). Number of USG was found decreased at a rate of 29.16% and CT has found 21.67% increase in 2020 (Figure 3).

Table 3. The distribution of plain radiographies by years

	2016	2017	2018	2019	2020	2021
Head	650.056	731.369	707.747	692.728	416.788	464.853
Chest	4.801.288	6.076.605	7.088.284	7.835.034	6.642.195	6.544.589
Abdomen	2.931.563	3.663.232	4.257.987	4.974.690	3.225.227	4.283.150
Pelvis	455.862	550.712	571.358	586.534	425.717	573.514
Joint	6.646.842	8.744.517	9.980.175	11.132.219	8.308.685	11.378.009
Other	666.3410	850.0390	909.1690	974.3190	625.9740	813.2780
Total	22.151.037	28.268.842	31.699.259	34.966.414	25.280.372	31.378.916
R/ED visits	31%	34%	35%	36%	34%	36%

R/ED visits ratio: Percentage of the requested radiographic scans among ED visits.

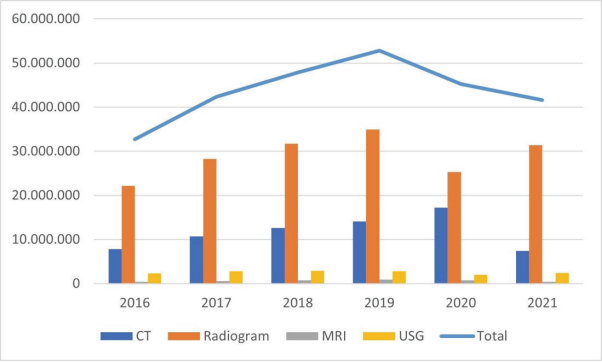

Figure 2. Distribution of emergency imaging and imaging modalities by years

Table 4. The distribution of MRI by years

MRI	2016	2017	2018	2019	2020	2021
DWI	232.392	364.034	470.783	588.041	517.613	268.049
Brain	287.322	435.608	546.331	670.592	576.604	299.574
Vertebrae, Lumbar	33.500	41.011	48.714	57.299	37.907	23.569
Vertebrae, Thoracal	5.083	6.396	7.175	8.551	7.029	4.059
Vertebrae, Cervical	15.620	18.774	22.913	28.612	17.085	11.399
Vertebrae	54.203	66.181	78.802	94.462	62.021	39.027
Lung and Mediastinum	251	246	304	260	266	110
Abdomen	7.255	8.593	10.525	11.390	8.795	4.906
Musculoskeletal (Extremity, joint)	32.095	39.717	47.907	59.405	36.091	23.246
Other	32.588	48.970	54.013	60.613	47.213	26.911
Total	411.698	597.298	735.864	894.703	728.970	391.753
MR/ED visits	0,57%	0,71%	0,80%	0,92%	0,99%	0,45%
MRI/ED visits ratio: Percentage of the requested MR imaging among ED visits.						

Table 5. The distribution of USG by years

USG	2016	2017	2018	2019	2020	2021
Total	2.328.259	2.797.087	2.849.654	2.812.628	1.992.401	2.409.797
USG/ED visits	3,229%	3,341%	3,114%	2,879%	2,712%	2,740%
USG/ED visits ratio: Percentage of the requested US scans among ED visits.						

DISCUSSION

When the last 6 years of data on the usage of imaging methods in emergency departments were examined, the statistics showed that there was a continuous increase in the number of computed tomography scans, total number of radiograms and MR scans between 2016 and 2020 before the COVID-19 pandemic. Plain radiograph has been the most frequently used method among all imaging modalities.

When the statistics of the pandemic period were analyzed, it was observed that the total increase in the number of computed tomography scans, especially with the significant increase in thoracic CT, continued in 2020, when the pandemic began, but a decrease was observed in almost all CT scans in 2021. During the pandemic period, there was a significant decrease in Plain radiograph in 2020, and it approached the former levels by 2021. When the MRI and USG are examined, a decrease in requests has been seen since the pandemic in 2020 and 2021 when compared to the prepandemic years.

In our country under normal conditions, when we ignore extraordinary periods such as pandemics, all of these statistics have shown us a continuous increase in the usage of imaging methods each year. In addition, during the COVID-19 pandemic, which is an unusual and unexpected condition, a more than fourfold increase was seen in lung CT scans, but a decrease was observed in all other imaging. This result may be due to the avoidance of hospital admissions for other reasons during the pandemic period, the existence of restrictions, and the fact that hospitals are

seen as a contagious environment.

In the analysis of the adult emergency department in the United States between 2000 and 2005, an increase of 13% was found in the number of patients, while in the same period, an increase of 51% in cranial CT, 463% in cervical CT, 226% in thorax CT, 72% in abdominal CT and 132% in other CT was found.[9,]

In a regional study comparing the changes in the use of CT in health services during the pandemic period in our country in March, April and May of 2019 and 2020, it decreased by 53-65% in public hospitals, while it decreased by 15-24% in March and April in private hospitals, and it was found that 15% more CT was requested in May 2020 than in 2019.7 Although there were no monthly comparisons in our study, it was found that the CT change rate increased by 21.67% and USG decreased by 29.16% between 2019 and 2020.

In a study comparing another pandemic in the United States and April of the previous year, it was underlined that the use of tomography was lower in the COVID-19 pandemic, critical reports were fewer, and cranial CTs were lower in the pandemic than in previous years.10 In our study, when the change in 2019-2020 was considered, it was determined that the cranial CTs decreased by 22%. This change was also found to be inconsistent with the literature although the causative factors cannot be explained. In a study conducted at the beginning of 2000 and in which a 12-year change comparison was made[11], it was seen that the rate of CT use to the number of patients increased from 2.8% to 13.9% 4.9-fold. In a 5 years period from 2016 to 2020; CT use statistically increased 120%.

Ultrasound numbers were found to be the lowest in 2020. It has also been reported in the literature that the change in the number of ultrasounds with the pandemic is due to reasons such as the difficulty of performing it with personal protective equipment and the protection aimed at minimizing exposure in all areas of the hospital.[12] Although the use of ultrasound decreased in 2020, there are no data on the use of ultrasound at bedside. However, especially in those years, its widespread use in the diagnosis and follow-up of COVID-19 due to less radiation, bedside usage and rapidity was shown in the literature.[13] Although there has been an increase in usage since 2016, the decrease in all examinations except Plain radiograph and thoracic CT because of the pandemic may have been causing delay in the follow-up of patients.[14]

The increase in emergency department visits also causes the selection of imaging methods that provide fast and detailed information in a short time. Conditions such as a pandemic cause an increase in tests for the factors caused by the pandemic but a decrease in applications for other diseases because of restrictions.[15] It has been observed that Plain radiograph, which had an upward trend, has also decreased proportionally in the last year. The reason for this may be the change in the reasons for visit to the emergency department in the last year. The increase in the lung imaging might increase due to the overtriage since triage decisions might have an effect on radiological imaging requests[16].

Limitations

In our study, no distinction regarding the use of computed tomography could be made between pediatric and adult emergency departments. In addition, the use of thoracic tomography requires a subgroup analysis for COVID-19 or trauma patients. The analysis of ultrasound according to the shooting location could not be classified according to the process diagnosis codes. The distribution of COVID-19 patients by region may also affect the regional distribution, where public hospitals and university hospitals are concentrated, for the last 2 years. There is a need for prospective studies in which the number of CT requests for preliminary diagnosis can be compared. As stated, further prospective studies can explain the causes of these changes when there are restrictions on the epidemic. Be-

sides, further studies may determine whether this increase in the use of tomography in the emergency department is preferred due to its being close to a gold standard or because of the increased need for patients. As we analyzed the previous 6 years in our analysis, the correlation and regression analysis was hard to interpret due to the small sample size. Further investigations may ve concentrated on the monthly or seasonal changes and their correlations regarding visits.

CONCLUSION

In our study, the use of imaging methods in the last 6 years in emergency departments were analyzed, and it was observed that the total number of radiological imaging requests were changed a 6-year period from 2016 to 2022.

Especially in 2020, all methods were statistically decreased except CT (+21.67%). We think that this may be due to the increase in the use of Thoracic CT during the COVID-19 period, the decrease in applications for other diagnoses due to restrictions and the choice of examinations with short duration and social distance. We think that further prospective studies can explain this when there are restrictions on the pandemic.

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Sakarya ilindeki Erişkinlerde Patella Tiplerinin Dağılımı

Dissociation of patella Types in Sakarya Cities Adult Population

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Özet **Başvuru Tarihi:** 22.10.2013 **Kabul Tarihi:** 11.12.2013

Amaç: Bu çalışma ile Sakarya ilindeki erişkinlerde patella tipleri dağılımının saptanarak patella morfolojisi ile kondromalazi patella ve lateral kompresyon sendromu gibi sık görülen patellofemoral eklem hastalıkları arasındaki ilişkilerin ortaya çıkarılması amaçlanmıştır.
Gereç ve Yöntem: Farklı hastalıklarla polikliniğimize başvuran randomize olarak seçilmiş ve dizlerinde semptomu bulunan olguların yüz adet dizi çalışmaya alındı. Olguların yaş ortalaması elli bir (18-93) idi ve hiçbirinde dizlerine ait travma ve cerrahi girişim hikayesi yoktu. Hastalara Merchant ve arkadaşlarının tanımladığı biçimde direkt tanjansiyel patella grafileri çektirildi. Wiberg ve Baumgartle sınıflamasına göre patella tipleri belirlendi.
Bulgular: Tip I patella %24, tip II patella %70 ve tip III patella %6 olarak bulundu. Hiçbir hastada tip IV patellaya rastlanmadı.
Sonuç: Wiberg ve Baumgartle sınıflamasına göre patella tiplendirmesi yapılırken kişisel farklılıklar yaşanır. Patella tipi kondromalazi patella etyolojisinde bir faktör olarak düşünülmemektedir. Ancak displazik facet anatomisi tam olmayan temasa yol açarak patellofemoral ağrıya yol açabilmektedir. Sakarya ilindeki erişkenlerin patella tiplerinin kendine has bir dağılım özelliği yoktur.
Anahtar Kelimeler: Patella, Tiplendirme, Dağılım.

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Abstract ***Aplication:*** *22.10.2013* ***Accepted:*** *11.12.2013*

Purpose: to determine the type and morphology of the patella and association with patellofemoral joint diseases, such as chondromalasia patella, lateral compression syndrom in Sakarya adult population.
Methods and Materials: One hundred knees are chosen randomly from the patients admitted to polyclinic with symptoms of knee complaint. Median age of patients is fifty -one (18-93) and none of the patients have history of knee trauma or knee surgery. Knee radiographs were performed according to Merchant et al. Patella types are determinated according to Wiberg and Baumgartle classification.
Results: It's determinated that; type I %24, type II %70 and type III %6. No type IV was founded.
Conclusion: There are inter-observer differences in Wiberg and Baumgartle classification. Patella type chondromalasia is not thought to be a factor in patella ethiology however displasic facet anathomy cause patellofemoral pain because of incomplete contact. Patella types of adults in Sakarya doesn't have spesific dissociation.

Keywords: *Patella; Type; Dissociation.*

Giriş

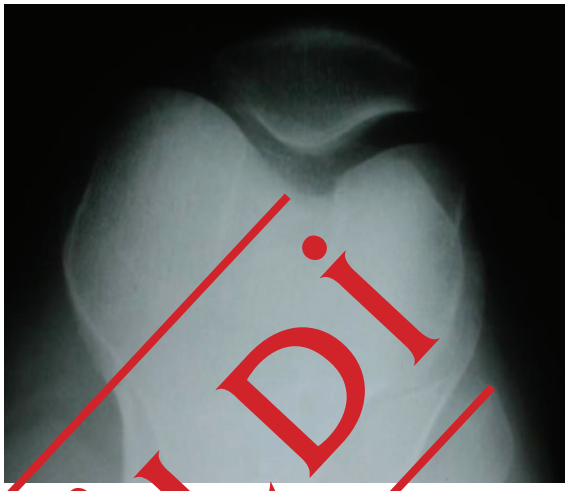
Patellofemoral eklem; ön femur sulkusu ve bununla temas eden patellanın fasetlerinden meydana gelir. İki yüzey arasındaki temas; her iki yüzeyin anatomisi yanısıra alt ekstremitenin tüm rotasyonel anatomisi ve eklem çevresindeki kaslardan etkilenir.1 Patella eklem yüzeyinde; medialde ve lateralde üçer tane ve medial tarafta bir tane ekstra faset (Odd faseti) olmak üzere yedi adet faset vardır. Her iki faset grupları birbirlerinden merkez kenarı ile ayrılır. Medial ve lateral tarafların birbirlerine göre büyüklükleri değişiktir.[1]

Wiberg patellofemoral eklemle ilgili geniş bir radyografik çalışma yapmış ve patellanın fasetlerindeki anatomik değişikleri tarif etmiştir.[2] Wiberg bu değişikliklere göre de patella morfolojisini üç tipe ayırmıştır. Daha sonra Baumgartle tarafından bir dördüncü tip patella tarif edilmiştir.[3]

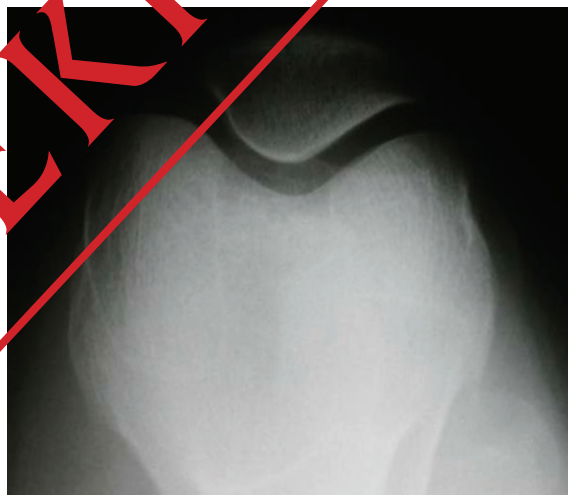
Bu sınıflamada;

- Tip I patella; medial ve lateral fasetleri vardır, her ikisi de konkav ve eşit uzunluktadır. (Şekil 1)
- Tip II patella; lateral faset medial fasete oranla daha belirgindir, medial faset düz veya konkavdır. (Şekil 2)
- Tip III patella; daha küçük medial faseti vardır, bu faset konvekstir. (Şekli 3)
- Tip IV patella; medial faseti veya merkez kenarı yoktur. Jokey şapkası diye adlandırılmıştır.

Resim 1: Tip I patella; medial ve lateral fasetleri vardır, her ikisi de konkav ve eşit uzunluktadır.



Resim 2: lateral faset medial faseta oranla daha belirgindir, medial faset düz veya konkavdır.



Resim 3: daha küçük medial faseti vardır, bu faset konvekstir.

Bu radyografik çalışma ile Sakarya ilindeki erişkinlerde patella tiplerinin dağılımını saptamayı amaçladık. Böyle bir çalışmanın Sakarya ilindeki erişkinlerin patella morfolojisi ve Türk toplumunda sık görülen kondromalazi patella ve lateral kompresyon sendromu gibi eklem hastalıklarının etiolojileri hakkında bir fikir verebileceğini düşündük.

Gereç ve Yöntem

Bu çalışma 30.09.2013 tarihili karar ile Etik Komite tarafından onaylanmış şekilde ve Helsinki İlkeler Deklerasyonuna uyularak gerçekleştirilmiştir.

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01.10.2013 – 20.10.2013 tarihleri arasında, Sakarya Üniversitesi Eğitim ve Araştırma Hastanesi Ortopedi ve Travmatoloji polikliniğine farklı diz hastalıkları ile başvuran ve çeşitli endikasyonlar ile diz artroskopisi endikasyonu konulan 100 olgunun, çekilmiş olan rutin diz grafilerinden yüz adet tanjansiyel patella grafisi tekrar değerlendirildi. Yüz olgunun altmışbiri kadın (%61), otuzdokuzu erkekti (%39). Olguların en küçüğü 18, en büyüğü 93 yaşında idi (ortalama yaş 51). Yüz adet tanjansiyel patella grafisinden 55 tanesi sol, 45 tanesi sağ dize ait grafilerdi.

Tanjasiyel patella grafileri Merchant ve arkadaşlarının tanımladığı biçimde çekildi.[4] Hastalar röntgen masasına supin pozisyonda yatırıldılar. Bacaklarını masanın dışına uzatarak dizlerini 45° fleksiyona getirdiler. Kaset krurislerinin üzerine 90° açı ile konuldu. Röntgen cihazının tüpü baş tarafından 30° açı ile dize doğru tutularak radyografiler çekildi.

Hastaların çekilmiş olan tanjansiyel patella grafileri ile patellalarının Wiberg ve Baumgartle sınıflamasına göre tipleri belirlendi.[2,3] Çekilen radyografiler iki ayrı ortopedist tarafından ayrı ayrı değerlendirilerek patellalar tiplendirildi. İki ortopedistin farklı tip olarak değerlendirdiği radyografiler üçüncü bir ortopedist tarafından da tiplendirildi.

Hangi tip patelladan kaç tane olduğu sayıldı ve görülme oranları hesaplandı. Patella tipleri cinsiyete göre ekilenen ekstremite dağılımlarına göre istatistiksel olarak karşılaştırıldı. Ki-kare (Chi square) ve Fischer Exact testleri kullanıldı ve p< 0,05 anlamlı olarak kabul edildi.

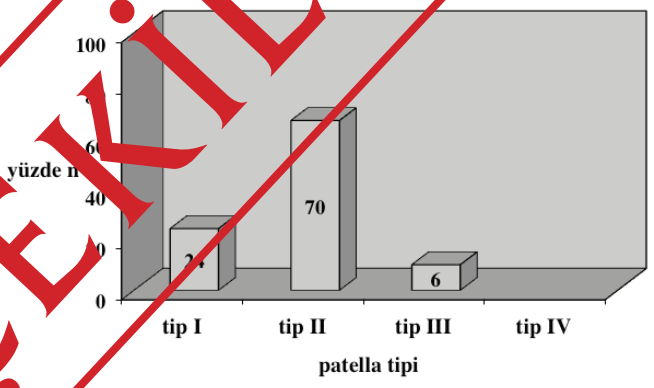
Bulgular

Merchant grafileri çekilmiş olgunun 100 dizinde patella tipleri değerlendirildi. Yirmidört patella tip I (%24), yetmiş patella tip II (%70) ve altı patella tip III (%6) olarak değerlendirildi. Hiçbir olguda tip IV patellaya rastlanmadı. (Tablo I: patella tiplerinin dağılımları)

Altmışbir kadın olguda patella tiplerinin dağılımı; kırkbeş dizde tip II patella, oniki dizde tipI patella, dört dizde tip III patella olarak tespit edildi. Otuzdokuz erkek olgudaki patella dağılımı ise; yirmibeş dizde tip II patella, oniki dizde tip I patella, iki dizde tip III patella olarak belirlendi. (Tablo II: patella tiplerinin cinsiyete göre dağılımları) Cinsiyetler arasındaki patella tiplerinin dağılımlarında istatistiksel olarak anlamlı fark saptanmadı. (p> 0,05)

Sağ ve sol dizlerdeki patella tip dağılımları karşılaştırıldığında, istatistiksel olarak tip II ve tip III patella tiplerinin görülme oranlarında anlamlı fark saptanmadı.(p> 0,05) Ancak sol dizlerde, sağ dizlere göre tip I patella daha fazla görülmekteydi. Bu fark istatistiksel olarak anlamlı bulundu. (p< 0,05) (Tablo III: patella tiplerinin dizlere göre dağılımı.)

Tablo I: Sakarya ilindeki erişkinlerde patella tiplerinin dağılımı.
(n = hasta sayısı)



Tablo II: patella tiplerinin cinsiyete göre dağılımları		
Patella tipleri	Erkek (n=39)	Kadın (n=61)
Tip I	12	12
Tip II	25	45
Tip III	2	4
Tip IV	0	0

Tablo III: patella tiplerinin dizlere göre dağılımı.		
Patella tipleri	Sağ diz (n=45)	Sol diz (n=55)
Tip I	6	18
Tip II	38	32
Tip III	1	5
Tip IV	0	0

Tartışma

Reider ve arkadaşlarının yaptıkları anatomik çalışmada; patella tiplerinin görülme oranlarını tip II patella için %57, tip I için

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%24 ve tip III için %19 olarak saptanmıştır.[5] Lateral fasetin görülme sıklığı daha fazladır. Çalışmamızda Sakarya ilindeki erişkinlerde ki oranlarda benzer olarak bulunmuştur. Patellanın şeklini üzerine olan stresin belirlediği düşünülürse, tip III ve tip IV; patellanın sulkus içinde laterale kayması sonucunda oluşur ve tip I patellada simetrik bir yüklenim söz konusudur.[6]

Bu çalışma sırasında Wiberg ve Baumgartle sınıflamasına göre patella tiplendirilmesi yapılırken özellikle tip I ve tip II ayrımı ile tip II ve tip III ayrımının güç olduğunu ve ortopedistler arasında farklı tiplendirme yapılabildiğini fark ettik. (Şekil 1,2,3)

Schutzer ve arkadaşlarının yaptıkları deneysel çalışmada, patella boyutlarının çevre yumuşak dokuların çekimlerine direkt olarak bağlı değilde, bireysel olarak bağımsızca etkilendiği ortaya çıkmıştır. Bu görüşü ise klinik olarak küçük bir patellanın konjenital çıkık olması ve cerrahi ile redükte edilememesi kanıtlamaktadır. Ancak yine bu çalışmada tip III patella ile lateral patellofemoral ligamentin genişliği arasında bir korelasyon gösterilmiştir.[7] Kalın lateral patellar ligament patellayı dışa çeker ve patella lateralindeki basıncı arttırır. Bu durum gelişme çağındaki patellada Heutor-Volkmann kanunu ile şöyle açıklanır; kompresyon epifizial büyümeyi geciktirir, tranksiyon ise stimüle eder. Tüm bunların etkisiyle; patellanın lateral fasetti belirginleşir ve femoral kondilin çıkıntısı azalır.

Laterale doğru anormal bir kuvvetin olması ve patellanın lateral fasetlerindeki yüklenmenin artması lateral patellar kompresyon sendromuna yol açar ve ağrıya neden olur. Tip III patellası olan hastalarda lateral patellar kompresyon sendromu görülmesi daha sıktır denilebilir.

Wiberg ve Outerbridge tip III patella ile kondromalazi patella arasında bir ilişki olacağına inanmışlar ancak bunu kanıtlayamamışlardır. Patella tipi kondromalazi patella etiolojisinde bir faktör olarak düşünülmemektedir. Bu araştırmacılar ve diğerleri, displazik faset anatomisinin tam olmayan temasa yol açarak patellofemoral ağrıya yol açacağına inanmışlardır.[8,9] Wiberg ve Baumgartle sınıflamasına göre patella tiplendirilmesi yapılırken bireysel farklılıklar yaşanır. Patella tipi kondromalazi patella etiolojisinde bir faktör olarak düşünülmemektedir. Ancak displazik faset anatomisi tam olmayan temasa yol açarak patellofemoral ağrıya yol açabilmektedir. Türk toplumunda patella tiplerinin dağılımı bu konuda çok fazla çalışma olmamasına rağmen başka toplumlarla benzerdir. Patella tiplerinin Sakarya iline has bir dağılım özelliği yoktur. Yapılacak kapsamlı çalışmalar ile patella tipi dağılımı ve patellofemoral hastalıklar arasındaki ilişkilerin ortaya konabileceği kanısındayız.

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