

## Original Article / Orijinal Araştırma

# Outcomes of acute appendicitis in elderly patients: a 5-year experience at a single institution

### Yaşlı hastalarda akut apandisit sonuçları: bir merkezin 5 yıllık sonuçları

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### Abstract

**Aim.** Outcomes after elective surgical procedures are seemed as if similar in younger and older patients; however, urgent surgeries may cause significant morbidity and mortality in older patients. The aim of study was to present our management experience on acute appendicitis in elderly patient group. **Methods.** Patients who underwent appendectomy for acute appendicitis between 2007- 2012 were included in the study. Individuals with other reasons of acute abdomen not defined as acute appendicitis were excluded. With these criteria, 1382 patients were included in the study. Patients were divided into three age groups: group I; younger than 29, group II; 29 to 65, and group III; 65 and older. Variables selected for analysis included age, sex, duration of symptoms, duration of hospitalization (total and preoperative), operative approach, operative findings, operative time, morbidity and mortality rates, and pathological confirmation. **Results.** Duration of symptoms and hospitalization (total and preoperative) were higher in the group III. Post-operative outcomes were worse in the group III compared to the other groups. However, miss diagnosis rate was lower in that age group. **Conclusions.** Acute appendicitis in the elderly remains a challenge for practicing surgeons and continues to be associated with high morbidity. With increasing life expectancy, more such cases are likely to be encountered in the future.

**Keywords:** Appendicitis, aged, outcome

### Özet

**Amaç.** Genç ve yaşlı hastalarda elektif cerrahi işlemlerin sonuçları benzer görülse de, yaşlılarda acil cerrahiler önemli morbidite ve mortaliteye yol açabilir. Bu çalışma yaşlı hasta grubunda akut apandisit yönetimindeki tecrübemizi sunmak amacıyla yapıldı.

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**Yöntem.** 2007-2012 yılları arasında akut apandisit nedeniyle apandektomi yapılan hastalar çalışmaya alındı. Diğer akut batın nedenleri saptanan olgular çalışma dışı tutuldu. Bu koşullara göre 1382 olgu çalışma kapsamında değerlendirildi. Çalışmaya alınan olgular üç yaş grubuna bölündü: grup I, yaş <29; grup II, yaş 29-65; ve grup III, 65 yaş ve üzeri. Yaş, cinsiyet, belirtilerin süresi, hastanede yatış süresi (toplam ve preoperatif), ameliyat tipi, bulguları ve ameliyat süresi, morbitite ve mortalite oranları ve patolojik bulguların uyumluluğu verileri değerlendirildi. **Bulgular.** Belirtilerin süresi ve hastanede yatış süresi (toplam ve preoperatif) grup III'de daha fazla bulundu. Postoperatif sonuçlar grup III olgularda diğer gruplara göre daha kötü bulundu; ama yanlış tanı oranı diğer gruplara göre daha düşüktü. **Sonuçlar.** Yaşlılarda akut apandisit cerrahi pratiğinin zor kısımlarından biridir ve daha yüksek morbidite ile birliktedir. Yaşam süresinin artması ile birlikte gelecekte bu olgularla daha fazla karşılaşılacağı beklenilmelidir.

**Anahtar sözcükler:** Apandisit, yaşlılık, klinik sonuç

## Introduction

The developed world is experiencing a demographic transition in which the proportions of people in the oldest age groups are increasing, and the proportions in the youngest age groups are decreasing [1]. Outcomes after elective surgical procedures are seem as if similar in younger and older patients, however elderly patients have higher rates of death and complications after emergency operations [2].

The symptoms of appendicitis overlap considerably with other clinical conditions, which include urinary tract infection, gastro-enteritis, and pelvic inflammatory disease. There is no single diagnostic test that can accurately diagnose appendicitis in all cases. Furthermore, diagnosis is frequently missed by health professionals at the first examination due to low prevalence rate or delayed due to lack or absence of support from guardians, economic reasons, and fear of visiting hospital. The definitive treatment of acute appendicitis is urgent appendectomy [3, 4].

Acute appendicitis is a particularly challenging problem in elderly patients, because appendicitis are more frequently present with atypical symptoms, delays in diagnosis, and perforation in this age group [2, 5-7].

Most patients with acute appendicitis have uncomplicated disease. However, complicated appendicitis with perforation, gangrene, or abscess is relatively common, with an incidence that may be similar for all age groups [6, 8]. On the other hand increased rate of peri-operative complications in elderly patients is well documented and the most common specific perioperative complications are post-operative wound infection and gastrointestinal disturbances, with general complications including pneumonia and cardiovascular problems [9-12].

The aim of study was to present our management experience on acute appendicitis in elderly patient group who were underwent appendectomy operation and compares the results with adult and young-adult appendicitis.

## Methods

After the study received institutional ethic committee approval, patient records from Cumhuriyet University Hospital were reviewed from January 2007 to June 2012. Individuals meeting inclusion criteria for the study were those who underwent appendectomy for clinically suspected acute appendicitis. Individuals with significant missing clinical data or other reasons of acute abdomen not defined as acute appendicitis were excluded (n=42). With these criteria, 1382 patients were included in the study. Patients were divided into three age groups: Group I; younger than 29, group II; 29 to 65, and Group III; 65 and older. Variables selected for analysis included age, sex, duration of symptoms, duration of hospitalization (total and preoperative), operative approach, operative findings, operative time, morbidity and mortality rates, and pathological confirmation.

Common comorbidities including coronary artery disease (CAD), diabetes mellitus (DM), chronic obstructive pulmonary disease (COPD), chronic renal insufficiency (CRI), hypertension (HTN), and congestive heart failure (CHF) were recorded for participants if they were listed in the participant's past medical history during standard preoperative clinical evaluation.

## Statistical analysis

Sex comorbidity, duration of symptoms, duration of preoperative hospitalization, perioperative outcomes (duration of total hospitalization, operative approach perioperative mortality, morbidity), of the groups were compared. Values were given as mean  $\pm$  standard error or percentages as appropriate. Kruskal-Wallis test with Mann-Whitney test for post hoc comparisons and chi-square tests were used for analysis of clinical data. A p value  $<0.05$  was considered to be significant.

## Results

A total of 1382 patients met inclusion criteria for the study and were divided into three groups based on age. Group I (n=806) was composed of patients younger than 29 years of age, group II (n=448) was composed of patients between 29 and 65 years of age, and group III (n=128) was composed of patients older than 65 years of age. Demographic parameters and comorbidities of the patients were exhibited in Table 1. The eldest patient was 85 years old in the group III and the youngest one was 16 years old in the group I. There was statistically significant difference between the groups in terms of sex distribution (p=0.001). Male dominancy was detected in the groups I and II (1/2.3, 1/1.78, respectively) whereas no dominancy was detected in the group III. Comorbidities was observed lowest in the groups I and II when compared to the group III as expected (p=0.001). HTN (34.8% and 66.4%) and DM (17.9% and 27.3) were the most detected comorbidities in the groups II and III, respectively.

Pre-operative outcomes including duration of symptoms before the admission (based on days), duration of preoperative hospitalization (time required for diagnosis pre-operative evaluation, based in hours), pain shift, and CT requirement were detailed in Table 2 (CT was routinely performed in 70+ patients in or institution). While duration of symptoms before the admission was detected shorter in the groups I and II (p=0.001) when compared to the group III, duration of preoperative hospitalization was similar in the groups II and III. Shift of abdominal pain was detected at least in the group III when

compared to the groups I and II ( $p=0.001$ ). The requirement of CT for the confirmation of diagnosis was higher in the group III ( $p=0.001$ ), when compared to other the groups as expected.

Operative outcomes including type of operation, type of incision for open procedures, operative time were detailed in Table 3. Laparoscopic approach was applied less in the group in the group III (0.001) when compared to other two the groups; however, there was no difference between the groups I and II ( $p=0.663$ ). In open procedures, vertical incisions including right para-median, and midline were detected higher in the groups II and III ( $p=0.001$  when compared to the group I; however, there was no difference between the groups II and III in terms of incision type. Operation time was detected longer in the group III when compared to the groups I and II ( $p=0.001$ ); whereas no difference was detected between the groups I and II ( $p=0.199$ ). Signs of perforation in operation were higher in the group III when compared to the groups I and II ( $p=0.001$ ).

**Table 1. Comorbidities of study population.**

	Group I (n = 806)	Group II (n = 448)	Group III (n = 128)	Significance
Age (mean ± SD)	21.85 ± 3.54	42.6 ± 9.5	71 ± 5.1	0.001
Female/Male	244 / 562 (1/2.3)	161/287 (1/1.78)	63/65(1/1.03)	0.001
Comorbidities, n (%)				
CAD	1(0.01)	27 (6)	16 (12.5)	0.001
DM	8 (1)	80 (17.9)	35 (27.3)	0.001
COPD	0 (0)	34 (7.6)	16 (12.5)	0.001
CRI	1(0.01)	10 (2.2)	4 (3.1)	0.001
HTN	0 (0)	156 (34.8)	85 (66.4)	0.001
CHF	0 (0)	5 (1.1)	3 (2.3)	0.005

**Table2. Selected pre-operative data of study population.**

	Group I (n=806)	Group II (n=448)	Group III (n=128)	Significance
Duration of symptoms (mean ± SD ,day)	1.3±0.5	1.69±0.6	2.1±0.7	0.001
Pain shift, n (%)	710 (88.1)	306 (68.3)	43 (33.6)	0.001
Requirement of CT, n (%)	137 (17)	188 (42)	63 (49.2)	0.001
Duration of preoperative hospitalization (mean ± SD, hours)	3.1± 2.9	3.6±2.3	4.1±4.6	0.001
Duration of total hospitalization (mean ± SD ,day)	1.9±01.1	2.1±1.2	4.2±1.6	0.001

Post-operative outcomes including duration of total hospitalization, pathologic confirmation of acute appendicitis, post-operative wound problems were detailed in table 4. There was no difference between group I and group II ( $p=0.224$ ) in terms of duration of total hospitalization; however, patients in group III required hospitalized for a longer time when compared to groups I and II ( $p=0.001$ ). Similarly, wound problems was

detected higher in group III when compared to groups I and II ( $p=0.001$ ); whereas, no difference was detected between group I and group II ( $p=0.199$ ). Pathologic confirmation of appendicitis was detected most in group III ( $p=0.01$ ). No mortality was detected.

**Table3. Operative outcomes.**

	Group I (n=806)	Group II (n=448)	Group III (n=128)	Significance
Operative Approach				
Laparoscopic	232 (28.8)	91 (26.6)	11 (8.6)	0.001
Open	574 (71.2)	329 (73.4)	117 (91.4)	
Incision type in open procedures				
Mc-Burney or Rocy-Davis	525 (91.4)	248 (75.3)	89 (76.0)	0.001
Right paramedian	32 (5.5)	53 (16.1)	21 (17.9)	
Lower-midline	17 (3.1)	28 (8.6)	7 (6.1)	
Operative time (mean $\pm$ SD, min)	51.1 $\pm$ 17.1	52.9 $\pm$ 21.6	70.6 $\pm$ 21.7	0.001
Sign of perforation in operation	120 (14.9)	129 (28.8)	51 (39.8)	0.001

**Table4. Post-operative outcomes of study population.**

Characteristic	Group I (n=806)	Group II (n=448)	Group III (n=128)	Significance
Duration of total hospitalization (mean $\pm$ SD ,day)	1.9 $\pm$ 0.1	2.1 $\pm$ 1.2	4.2 $\pm$ 1.6	0.001
Pathologic confirmation of appendicitis	694 (86.4)	398 (88.8)	126 (98.4)	0.001
Wound Problems				
Seroma	110 (13.6)	141 (31.5)	55 (43.0)	0.001
Wound sepsis	19 (2.4)	60 (13.6)	18 (14.1)	
Total	129 (16.0)	201 (44.8)	73 (57.1)	
Mortality	0	0	1 (0.7)	0.670

## Discussion

Acute appendicitis is generally considered a disease of youth, with a peak incidence in the second and third decades of life [13]. However, acute appendicitis can affect all age groups [4-6, 8, 13]. Because of the sharp increase in the elderly population, the prevalence of senile appendicitis has also increased, and this trend will continue [3]. However, the number of 65+ patients receiving appendectomies was below the level of any other decade-grouping of all other adult patients operated on. Approximately, % 1 of our appendicitis population was in that age group. This, along with the equal gender distribution, is in both keeping with other data from studies in Western Europe and our study for patients in this age group [14]. Additionally, acute appendicitis in the elderly is associated with significant morbidity. There is usually a delay in the diagnosis because

abdominal laxity may hide the clinical signs. Progression to perforation is rapid with significant increase in morbidity and mortality [5].

The results of this study show that delayed onset of symptoms at presentation and delayed surgical treatment due to the absence of classical sign of appendicitis is a significant factor associated with advanced stage appendicitis and postoperative complications. The most important cause of increased postoperative complications, and elongation of duration of total hospitalization appears to be the high rate of perforation of appendix in elderly patients in our trial, but there are controversies as to whether pre-admission or post-admission delay is more important [15]. Migrating pain from the epigastric or periumbilical area to the right lower quadrant is the classical and most discriminating historical feature, which has high sensitivity which has high sensitivity and specificity. This shift of pain in elderly group was detected less in our study may be an important factor in delaying surgical intervention.

Although the basic surgical technique for acute appendicitis is open surgery a laparoscopic appendectomy for elderly patients with appendicitis has also been applied by many centers since it was introduced with safe and advantage of early recovery [16-18]. Although the rate of laparoscopic procedures was detected lower in elderly group in our trial an increasing trend of choosing laparoscopic procedures was denoted in time, because most of the (75%) laparoscopic appendectomies in elderly patients were done in last 4 years.

This study showed that long operation duration, sign of perforation in operation, vertical incisions in open appendectomy, and post-operative wound problems are seen more frequently in elderly patients. These situations could be due to lack of classical signs of appendicitis, delayed on admissions or time required for preoperative diagnostic work up. It is hard to mention which one of those factors is more important.

As a result, we assume that acute appendicitis in the elderly remains a challenge for practicing surgeons and continues to be associated with high morbidity. With increasing life expectancy, more such cases are likely to be encountered in the future.

### Competing interests

The authors declare that they have no competing interests.

### Authors' contributions

Gokakin AK performed surgical procedures, participated in the study concept and design and critically revised the manuscript. Atabey M conceived the study, performed statistical analysis, drafted the manuscript, analyzed and interpreted the data. Karakus BC performed surgical procedures, assisted in the study concept and design and revised the manuscript. Koyuncu A performed surgical procedures, assisted in the study concept and design and revised the manuscript.

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