J Surg Med. 2020;4(9):830-834.
DOI: 10.28982/josam.799157

Research article
Araştırma makalesi

Journal of Surgery and Medicine
e-ISSN=2602-2079

Evaluation of pressure ulcer risk in hospitalized patients after metabolic surgery

Metabolik cerrahi sonrası hospitalize hastalarda bası yarası riskinin değerlendirilmesi

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Ethics Committee Approval: The study was approved by the ethics committee of the University of Health Sciences, Istanbul Education and Research Hospital on 8/21/2020 with the approval number 2502. All procedures in this study involving human participants were performed in accordance with the 1964 Helsinki Declaration and its later amendments.
Etik Kurul Onayı: Çalışma 21.08.2020 tarihinde Sağlık Bilimleri Üniversitesi İstanbul Eğitim ve Araştırma Hastanesi Etik Kurulu tarafından 2502 onay numarası ile onaylandı. İnsan katılımcıların katıldığı çalışmalardaki tüm prosedürler, 1964 Helsinki Deklarasyonu ve daha sonra yapılan değişiklikler uyarınca gerçekleştirilmiştir.

Conflict of Interest: No conflict of interest was declared by the authors.
Çıkar Çatışması: Yazarlar çıkar çatışması bildirmemişlerdir.

Financial Disclosure: The authors declared that this study has received no financial support.
Finansal Destek: Yazarlar bu çalışma için finansal destek almadıklarını beyan etmişlerdir.

Published: 9/30/2020
Yayın Tarihi: 30.09.2020

Abstract

Aim: Patients who underwent surgery are in the risk group for development of pressure ulcers (PU) due to several factors including surgery time, immobilization and preexisting comorbidities. We aimed to evaluate the PU risk using The Braden Scale in patients during their hospitalization after sleeve gastrectomy with transit bipartition (SG+TB) surgery.

Methods: This is a retrospective cohort study evaluating the PU risk using The Braden Scale, which consists of six subscales including sensory perception, moisture, activity, mobility, nutrition, and friction/shear. The patients were sub-grouped in terms of PU risk based on total Braden score.

Results: The study group consisted of 33 patients who underwent SG+TB. The mean Braden score was 19.2(2.77) (range 12-23) during the hospitalization period. The Braden scores of the patients were lower on the 2nd (P<0.001), 3rd (P<0.001), 4th (P=0.005), and 5th (P=0.004) postoperative days compared to postoperative day 1, and on the 3rd, 4th, 5th, and 6th postoperative days compared to postoperative day 2 (P<0.001 for each). According to our data, the PU risk was significantly different between the 1st postoperative day and the 2nd, 3rd, 4th, and 5th postoperative days (P<0.001 for each).

Conclusion: Metabolic surgery patients have an elevated risk for PU during the hospitalization period. Protein supplementation is among the factors that might improve the nutritional status of patients and decrease PU risk during hospitalization.

Keywords: Pressure ulcer risk, Metabolic surgery, The Braden scale

Öz

Amaç: Operasyon geçiren hastalar, ameliyat süresi, immobilizasyon ve varolan komorbiditeleri nedeniyele bası yarası gelişimi için risk grubunda bulunmaktadır. Bu çalışmada sleeve gastrektomi ve transit bipartisyon (SG+TB) ameliyatı sonrası hastanede yatış sırasında bası yarası riskini Braden Ölçeği ile değerlendirmeyi amaçladık.

Yöntemler: Bu retrospektif kohort çalışmada, Braden Ölçeği değerlendirmesi, duyusal algılama, nem, aktivite, hareketlilik, beslenme ve sürtünme/yırtılma olmak üzere altı alt ölçekten oluşan çizelge ile hastanede yatış süresince günlük olarak yapıldı. Hastalar bası yarası riski açısından toplam Braden skoruna göre alt gruplara ayrıldı.

Bulgular: Çalışma grubu SG+TB uygulanan 33 hastadan oluşturuldu. Ortalama Braden skoru hastanede kalış süresi boyunca 19,2(2,77) idi (12-23 arası). Hastaların Braden skorları postoperatif 2. (P<0,001), 3. (P<0,001), 4. (P=0,005) ve 5. (P=0,004) günlerde postoperatif 1. güne göre anlamlı olarak düşüktü. Braden skorları postoperatif 3., 4., 5. ve 6. günlerde postoperatif 2. güne göre anlamlı olarak düşüktü (her biri için P<0.001). Verilerimize göre PU riski açısından oranlar ameliyat sonrası 2., 3., 4. ve 5. günlerde 1. güne göre anlamlı olarak farklıydı (her biri için P<0,001).

Sonuç: Metabolik cerrahi hastaları, hastanede kaldıkları süre boyunca yüksek bası yarası riski taşır. Protein takviyesi, hastaların beslenme durumlarını iyileştirebilecek ve hastanede yatış sırasında bası yarası riskini azaltabilecek faktörler arasındadır.

Anahtar kelimeler: Bası yarası riski, Metabolik cerrahi, Braden skalası

How to cite/Atıf için: Karaca FC, Ulusan K. Evaluation of pressure ulcer risk in hospitalized patients after metabolic surgery. J Surg Med. 2020;4(9):830-834.

Introduction

The definition of pressure ulcer (PU) is made by The National Pressure Ulcer Advisory Panel (NPUAP) as "localized injury to the skin and/or underlying tissue usually over a bony prominence, as a result of pressure, or pressure in combination with shear" [1]. A large variety of factors including nutritional imbalance and/or insufficiency, skin moisture, disturbed circulation, obesity, prolonged bed rest, improper positioning, and chronic diseases have been associated with PU development [2-4].

Patients who underwent surgery are also prone to PU particularly during the early postoperative period as a result of restricted mobility and prolonged bed rest due to pain and discomfort, and PU is a significant morbidity factor related to longer hospitalization and increased medical costs [5].

Patients who underwent bariatric and metabolic surgery procedures for the resolution of obesity and type 2 diabetes mellitus (T2DM) are at the high-risk group for the development of PU as a result of their preexisting comorbidities, difficulty in frequent position changes, folded skin regions, increased pressure of the muscle and fat tissue on the bony prominences, all of which negatively affect the circulation in these areas.

The Braden Scale is a universal PU risk evaluation tool consisting of six subcategories [6]. According to this scale, patients are evaluated in terms of their sensory perception, skin moisture, activity level, and mobility, nutrition, and friction/shear, and high-risk patients are determined and appropriate care or treatment are given in order to increase patient's life quality and decrease morbidity.

Since patients who underwent metabolic surgery are a special group of patients with impaired vascular structure and circulation as a result of T2DM, we aimed to evaluate The Braden Scale in this group of patients during their hospitalization after sleeve gastrectomy with transit bipartition (SG+TB) surgery.

Materials and methods

This is a retrospective cohort study evaluating The Braden Score data charts of patients who underwent SG+TB surgery for the resolution of T2DM. The data were collected in accordance with the principles of the Declaration of Helsinki, and written informed consent was obtained from each patient. The study was approved by the ethical committee of the University of Health Sciences, Istanbul Education and Research Hospital on 21.08.2020 with the approval number 2502.

Exclusion criteria included a previous presence of PU and a BMI of 40 kg/m^2 in order to eliminate patients with Class III obesity. From the remaining patients, the study group consisted of 33 T2DM patients who had undergone metabolic surgery. All patients had a hospitalization duration of four days after the surgery, two patients had been discharged on postoperative day 5, and 26 patients had been discharged on the 6th postoperative day.

SG+TB was indicated for obese patients with T2DM [7]. Our inclusion criteria were patients with a BMI between 30-35 kg/m2 with comorbidities and/or with a glycated hemoglobin (HbA1c) level of >7.5% despite optimum anti-diabetic therapy, or a BMI greater than 35 kg/m2 with a history of T2DM, and being obese for ≥5 years despite conservative weight loss therapy and a lifestyle modification.

All patients had been evaluated prior to surgery and confirmed for the absence of a PU that might interfere with the study data.

All patients had started multivitamin supplements two weeks before the operation, and a liquid diet was started 48 days before the procedure. All patients underwent SG+TB surgery laparoscopically between January 2018 and June 2020. In brief, the surgery procedure consisted of sleeve gastrectomy, followed by a gastroileal and jejunoileal anastomoses [8].

In the postoperative period, the patients were mobilized as early as they are available for ambulation, and encouraged to mobilize during their hospitalization. All patients were provided with air mattresses, and frequent repositioning was provided by medical staff every two hours.

Patients were given little amounts of water six hours after the surgery and consumed a liquid diet without solid particles for four-weeks post-operatively starting from the next postoperative day. All patients were initiated protein supplement with a dose of 27 g/day (Barifit, Barifit Health Products, Istanbul, Turkey).

The Braden Scale evaluation was performed every day during the hospitalization using the chart developed in the Turkish language and filled with the help of the ward nurse.

The scale consisted of six categories, and categories assessing sensory perception, moisture, activity, mobility, and nutrition status have four steps, while friction/shear is evaluated in three subscale points (Table 1). A total Braden score ranges between 6 and 23, and the patients were subgrouped in terms of PU risk as follows: Severe risk: total score ≤9; High risk: total score 10-12; Moderate risk: total score 13-14; Mild risk: total score 15-18; no risk: total score 19-23.

Statistical analysis

GraphPad Prism 8.0 software for Windows (California, USA) was used for statistical analyses. The data were presented as mean (standard deviation). Minimum and maximum values were provided for Braden scores. One-way ANOVA with Sidak's multiple comparisons test was performed for the comparison of Braden scores on the postoperative days. A chi-square test was performed for the comparison of categorical variables. A *P*-level of <0.05 was considered statistically significant.

Results

This is a retrospective study including 33 patients (17 males and 16 females) with T2DM who underwent SG+TB. The baseline characteristics of the patients were shown in Table 2.

The mean age was 49.2(7.54) years. The BMIs of the patients ranged between 31.3-39.7 kg/m2 with a mean of 37.4 kg/m2. The mean postoperative hospital stay was 5 days ranging from 4 to 6 days.

The mean albumin level was 43.3(2.6) g/L, and the mean total protein was 68.7(4.06) g/L. The mean Braden score was 19.2(2.77), ranging from 12 to 23 during the hospitalization period. The mean scores during the hospitalization in terms of postoperative days were given in Table 3.

The Braden scores of the patients were significantly lower on the 2nd, 3rd, 4th, and 5th postoperative days compared to postoperative day 1 (P<0.001, P<0.001, P=0.005 and P=0.004, respectively). The Braden scores of the patients were significantly lower on the 3rd, 4th, 5th, and 6th postoperative days compared to the postoperative day 2 (P<0.001 for each). Patients also showed a significant difference in the 4th, 5th, and 6th postoperative days compared to the 3rd postoperative day. There was no difference between the Braden scores on the postoperative 4 vs 5, 4 vs 6, and 5 vs 6 days. The daily trend of the Braden scores during the hospitalization period was presented in Figure 1.

Table 1: Subscales of the Braden Scale for predicting pressure sore risk [6]

Risk Factor	Score/Description			
	1	2	3	4
Sensory Perception	Completely limited	Very limited	Slightly limited	No impairment
Moisture	Constantly moist	Often moist	Occasionally moist	Rarely moist
Activity	Bedfast	Chair fast	Walks occasionally	Walks frequently
Mobility	Completely immobile	Very limited	Slightly limited	No limitations
Nutrition	Very poor	Probably inadequate	Adequate	Excellent
Friction and Shear	Problem	Potential problem	No apparent problem	

Table 2: Demographic data of the patients

Variable	Mean(SD)
Age (years)	49.2(7.54)
F/M	16/17
BMI (kg/m2)	37.4(1.86)
Albumin (g/L)	43.3(2.6)
Total protein (g/L)	68.7(4.06)
Postoperative hospital stay (days)	5(1)

Table 3: Braden scores of the patients who underwent SG+TB during the hospitalization period.

Braden score	Mean(SD)	Min	Max
Po day 1	22.1(0.92)	21	23
Po day 2	14.7(1.29)	12	16
Po day 3	18.6(1.45)	16	22
Po day 4	19.8(1.59)	18	22
Po day 5	20.2(1.05)	19	22
Po day 6	21.2(0.83)	20	22
Total score during the hospitalization	19.2(2.77)	12	23

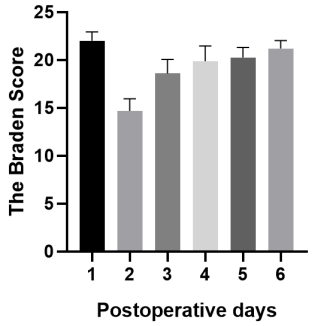

Figure 1: The postoperative daily trend of the Braden scores evaluating the pressure ulcer risk of patients who underwent metabolic surgery.

On the 1st postoperative day, all patients were in the no risk group, while, 6% of the patients were evaluated in the high risk, 8(24%) in the moderate risk group, and 19(58%) in the mild risk group on the 2nd postoperative day. On postoperative day 3, there were three patients (9%) in the moderate risk group, 16 (48%) in the mild risk group, whereas none of the patients were in the high-risk group. On postoperative day 4, the ratio of the patients was 3% in the moderate risk group, 12% in the mild risk group and 94% in the no risk group, whereas none of the patients were in the high-risk group (Table 4). None of the patients had a score of ≤9 during the follow-up period.

Table 4: Evaluation of the risk status of patients according to the Braden scores during the hospitalization period

Variables	High risk (10-12)	Moderate risk (13-14)	Mild risk (15-18)	No risk (≥19)
PO day 1 (n; %)	0	0	0	33, 100%
PO day 2 (n; %)	2, 6%	8, 24%	19, 58%	4, 12%
PO day 3 (n; %)	0	3, 9%	16, 48%	14, 43%
PO day 4 (n; %)	0	1, 3%	4, 12%	28, 85%
PO day 5 (n; %)	0	0	2, 6%	29, 94%
PO day 6 (n; %)	0	0	0	7, 100%

PO: Post-Operative

Discussion

As the number of metabolic surgery procedures increases worldwide, concerns on improved peri- and postoperative care for this specific patient group increase in order to provide a better life quality, patient safety, and decreased morbidity. The Braden Scale is a widely accepted universal tool for the determination of at-risk patients for the development of PU. In our study, we evaluated the PU risk in patients who underwent SG+TB surgery for the resolution of T2DM during their postoperative hospitalization period. According to our data, the Braden score was at its lowest on the second postoperative day, indicating a higher PU risk for the patients. The risk score started to increase initiating from the postoperative third day, and none of the patients were in the "high-risk" group starting from the postoperative day 3. The patients who underwent metabolic surgery procedures are of concern as a result of their history of chronic disease, comorbidities, and peripheral vascular disease that might interfere with the circulation of the body areas during the postoperative hospitalization period.

As the presence of T2DM, peripheral vascular diseases, and obesity are defined among the intrinsic risk factors for the development of PU, metabolic surgery patients require specific attention on the early postoperative period as a result of decreased mobility, restricted physical activity, and concomitant medical perturbances [9-12]. PU during the postoperative hospitalization period following surgery is an underestimated concern, and to our knowledge, the studies investigating the PU risk in patients who underwent metabolic procedures are limited. Surgical positioning of the patient compresses the blood vessels, increasing the tissue pressure compared to the circulation, and decreased oxygen supply to the tissues increases the risk of PU development in that phase. In addition, lymphedema and increased interstitial fluid pressure might further complicate the situation especially in patients with lower albumin and total protein levels [13-15]. Although preventive actions for the positioning of patients with table pads are related to increased costs, extra care in the immediate and early postoperative period is required for metabolic surgery patients.

Adıyeke et al. [16] defined that a higher neutrophile to lymphocyte ratio, platelet to lymphocyte ratio and mean platelet volume are independent predictors for the development of PU in intensive care patients, indicating a preexisting inflammatory state. Studies exhibited that surgery is related to the synthesis of proinflammatory cytokines, Interleukin (IL)-1, and 6, which cause decreased albumin production [17-19]. Although an albumin level lower than 35 g/L is a risk factor for PU indicating a status of malnutrition, none of our patients had an albumin level of <40 g/L [20]. However, protein supplementation starting on postoperative day 2 might have a positive effect on the

circulation and protein replacement that might lower with the synthesis of acute-phase proteins in the early postoperative period. Since proteins are essential for proper wound healing mainly through collagen synthesis and fibroblast proliferation, a positive nitrogen balance is required for the minimization of adverse events in the recovery period.

The recommended level of protein intake by The NPUAP was determined as 1.25 to 1.5 g/kg of body weight per day for patients with PU. They also concluded that the total protein leakage through the draining wounds should be of concern in order to calculate the optimum protein dose for the patient [21]. There are previous studies reporting the improving effects of the addition of high levels of protein to the daily diets of individuals with PU in terms of healing rate and decreased ulcer size [22,23]. In our study group, total protein and albumin levels were higher than those of the predetermined values for PU risk. However, the improving effect of protein supplementation on Braden scores indicates that a preoperative nutritional intervention with protein supplementation might have beneficial effects on PU in this group of patients.

Studies reported that PU can develop within hours during hospitalization, thus early identification of at-risk patients is essential in order to take certain preventive actions [24]. For the metabolic surgery patients, besides the intrinsic risk factors, the duration of the surgery and restricted mobility are among the risk factors for PU development. As most of the patients are overweight and monitored by various devices including catheters, drainage sacs, and ECG electrodes, frequent repositioning of the patient might be a burden for the medical staff, and inadequate care might be given to the patient. Thus, postoperative patient care in the early phases of hospitalization is an interdisciplinary issue, and optimum care should be given by a team of nurses and medical staff that are regularly supervised by the operating surgeon. Although the Braden scale is an effective tool for the assessment of risk status, regular inspection of the skin is crucial for the implementation of prevention and treatment strategies. Although examination of the whole body might be time-consuming and require extra effort for the caregiving team, the inspection of the skin folds is also essential especially for obese and extremely obese individuals. Previous studies reported the high-risk areas for PU development as spine, sacrum, heels, trochanter, and ischium, which are bony prominences under the pressure of skin and layers of fat and muscle [25]. Some researchers also offered the use of infrared thermometers for the detection of PU risk since increased temperature and skin moisture are among the essential risk factors for the development of PU [26,27].

Limitations

The limitations of our study include the lack of data regarding details of mobilization during the hospitalization and on other variables of nutritional status including transferrin, pre-albumin, and retinol binding protein. In addition, preexisting nutritional status of the patients had not been evaluated using proper evaluation tools by a dietitian. On the other hand, SG+TB patients are specific group of patients with their unique features, and evaluation of PU risk in this group using The Braden Score, a widely accepted universal PU evaluation tool would yield valuable data on the PU risk and life quality of metabolic surgery patients in the postoperative hospitalization period.

Conclusions

We conclude that, PU risk is increased during the postoperative period in the metabolic surgery patients, even in the early phase of hospitalization. Thus, since the patients with T2DM and obesity are among the risk group for the development of PU, certain precautions are required. The nutritional status of the patients should be evaluated prior to the surgery with proper monitoring tools, and immediate actions should be taken for at-risk individuals in order to provide a better healing process and decrease the risk of PU development. Furthermore, the PU risk should be evaluated by the caregiving team, and early protein supplementation should not be overlooked for this group of patients.

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