

## ■ Research Article

## Predictive factors causing complications in abdominoplasty after bariatric surgery

### *Bariatrik cerrahi sonrası abdominoplastide komplikasyonlara neden olan prediktif faktörler*

✉ Dogan Ozturk\*, ✉ Bulent Ozturk

Department of General Surgery, Atatürk Sanatoryum Training and Research Hospital, Ankara, Turkey.

#### Abstract

**Aim:** Abdominoplasty has become increasingly popular in recent times. While it yields pleasing results for the patient, it can also lead to certain undesired outcomes post-operatively. The aim of this study is to examine complications arising after abdominoplasty and to identify potential risk factors associated with these complications. Factors affecting the local and systemic complications of abdominoplasty have not been adequately defined in the literature. Abdominoplasty is a radical cosmetic surgical procedure aimed at improving body contours by removing excess skin, subcutaneous fat, and soft tissue from the anterior abdominal wall while restoring muscle-fascia integrity and skin elasticity. Despite abdominoplasty being safe and highly popular, it is a procedure prone to complications when compared to other body contouring methods.

**Material and Methods:** Data from 95 patients (81 female and 14 male) who underwent abdominoplasty after bariatric surgery at Atatürk Sanatorium Education and Research Hospital between February 2020 and February 2022 were retrospectively reviewed. The patients' age, gender, BMI, weight loss, history of diabetes mellitus, hypertension, smoking status, and their association with complications were analyzed. The potential risk factors and their relationship with developed complications were investigated using Independent Sample T Test and Chi-square analysis. The examined risk factors included age, gender, body mass index, history of smoking, history of diabetes mellitus, history of hypertension, and abdominoplasty surgical technique.

**Results:** Among the 95 patients who underwent abdominoplasty, 27 (28.42%) experienced both local and systemic complications. The most frequent complication was seroma observed in 16 patients (16.84%). Subsequently, wound infection occurred in 4 patients (4.21%), skin necrosis in 1 patient (1%), wound dehiscence in 2 patients (2.1%), hematoma in 2 patients (2.1%), and pulmonary thromboembolism in 2 patients (2.1%).

**Conclusion:** Factors significantly increasing the complication rate were increased body mass index ( $p = 0.002$ ) and a history of smoking ( $p = 0.004$ ). However, statistical significance was not observed for other parameters.

**Keywords:** Abdominoplasty, complication, BMI, obesity, hypertension, diabetes mellitus.

Corresponding Author\*: Dogan Ozturk, Atatürk Sanatoryum Training and Research Hospital, Ankara, Turkey.

E-mail: drdoganozturk@hotmail.com

Orcid: 0000-0003-1754-9246

Doi: 10.18663/tjcl.1392884

Received: 19.11.2023 accepted: 15.12.2023

## Öz

**Amaç:** Abdominoplasti günümüzde giderek popüler bir prosedür haline gelmiştir. Hasta için yüz güldürücü sonuçları olmasının yanında, operasyon sonrası bazı istenmeyen sonuçlar da ortaya çıkabilmektedir. Bu çalışmanın amacı, abdominoplasti sonrası gelişen komplikasyonları irdelemek ve olası risk faktörlerinin komplikasyonlarla ilişkisini ortaya koymaktır.

Abdominoplastinin lokal ve sistemik komplikasyonlarını etkileyen faktörler literatürde yeterince tanımlanmamıştır. Abdominoplasti güvenli ve çok popüler olmasına rağmen, bu prosedür diğer vücut şekillendirme yöntemleriyle karşılaştırıldığında komplikasyonlara açık bir yöntemdir.

**Gereç ve Yöntemler:** Atatürk Sanatoryum Eğitim ve Araştırma Hastanesinde Şubat 2020 ile Şubat 2022 tarihleri arasında bariatrik cerrahi sonrası abdominoplasti uygulanan 95 hastanın (81 kadın ve 14 erkek) verileri retrospektif olarak incelendi. 95 hastanın yaş, cinsiyet, BMI, verilen kilo, diabetes mellitus, hipertansiyon, sigara içimi mevcudiyeti ve bunların komplikasyonlarla ilişkisi analiz edildi. Olası risk faktörleri ve gelişen komplikasyonlar arasındaki ilişki Independent Sample T Test ve Ki-Kare analizi kullanılarak araştırılmıştır. İncelenen risk faktörleri yaş, cinsiyet, vücut kitle indeksi, sigara içme öyküsü, diabetes mellitus öyküsü, hipertansiyon öyküsü, abdominoplasti ameliyat tekniğidir.

**Bulgular:** Abdominoplasti yapılan 95 hastanın 27'sinde (%28,42) lokal ve sistemik komplikasyonlar gelişti. En sık görülen komplikasyon, 16 hastada saptanan seromaydı (%16.84). Sırasıyla 4 hastada yara yeri enfeksiyonu (%4.21), 1 hastada cilt nekrozu (%1), 2 hastada yara ayrılması (%2.1) ve 2 hastada hematoma (%2.1), 2'sinde de pulmoner tromboemboli (%2.1) gelişti.

**Sonuçlar:** Komplikasyon oranını önemli ölçüde artıran faktörler, artmış vücut kitle indeksi ( $p = 0.002$ ) ve sigara içme öyküsüydü ( $p = 0.004$ ). Bu parametreler komplikasyon oluşumunda istatistiksel olarak anlamlıydı. Diğer parametrelerde ise istatistiksel anlamlılık saptanamadı.

**Anahtar Kelimeler:** Abdominoplasti, komplikasyon, BMI, obezite, HT, DM gelişti.

## Introduction

Abdominoplasty is one of the most popular body contouring procedures, considered as a safe and reliable surgical technique. It ranks among the top five procedures in plastic surgery in the United States [1]. However, it is associated with a significant number of complications (32–37.4%) [2, 3], with the most common being seroma, hematoma, infection, wound healing issues, and skin flap necrosis [4, 5]. The aim of abdominoplasty after bariatric surgery is to remove excess, sagging skin, and subcutaneous fat tissue [6]. Despite significant weight loss, high BMI commonly persists in the bariatric population [7], known as a risk factor for complications.

## Material and Methods

This study includes 95 patients who underwent abdominoplasty after bariatric surgery at Ankara Atatürk Sanatorium Education and Research Hospital between February 2020 and February 2022. The study commenced following the approval of the Ankara Atatürk Sanatorium Education and Research Hospital Ethics Committee

with reference number 2012-kaek-15/2680 on March 22, 2023.

The study included a total of 95 patients (81 female, 14 male) with an average age of 38 and a BMI of 31 kg/m<sup>2</sup>. Abdominoplasty surgery was performed on patients who presented at Ankara Atatürk Sanatorium Education and Research Hospital after approximately 2 years following bariatric surgery and became suitable for functional surgery. All procedures were conducted under general anesthesia. Preoperative marking of the abdominal skin was performed while the patient was standing. The skin incision started with an elliptical cut joining both iliac prominences. Subsequently, the upper flap was raised and advanced to the xiphoid and costal edges. Excess skin and subcutaneous fat tissues were excised, and the fatty layer beneath the superficial fascia was sharply removed. The umbilicus was excised in a round shape, attempting to preserve subcutaneous blood supply. The umbilicus was reconstructed again through an opening created in the upper abdominal flap. Following surgical incision of the skin, suprafascial dissection was carried out up to the xiphoid. A medial skin

incision was applied with a lateral extension depending on the desired size. Myofascial plication was performed to correct the diastasis of the rectus muscles in cases of significant diastasis, incisional hernias, and/or hernias. If there was a large defect, a polypropylene mesh could be placed.

The skin resection, repositioning of the umbilicus, and closure of the skin were conducted using absorbable monofilament (Vicryl 2/0) and 2/0 Monosin sutures. Routinely, two negative pressure drains were placed. Drains were removed if fluid output was less than 30 ml in the last 24 hours postoperatively. All patients received prophylactic antibiotics immediately before surgery and continued for 10 days. Low molecular weight heparin was used for 10 days postoperatively to prevent deep vein thrombosis and pulmonary embolism. Daily dressing changes were performed during the wound healing period. Two patients experienced thromboembolism. They received low molecular weight heparin for one month. In four patients with infection, *Staphylococcus aureus* and *Escherichia coli* were cultured from wound cultures and treated with appropriate antibiotic therapy. One patient with skin necrosis underwent necrosis debridement and dressing. Sixteen patients developed seroma, which was monitored with negative pressure drains and removed when drainage decreased to below 30 ml per day.

### Statistical Analysis

The statistical analysis was performed as follows:

Independent Samples T Test

\*\* Chi-square Test

A P-value less than 0.05 was considered statistically significant in assessing the relationship between patients' age, gender, BMI, history of smoking, diabetes mellitus, hypertension, and complications.

### Results

It shows that out of the patients, 81 were female (85.5%) and 14 were male (14.7%). The mean age of the patients was 38.0 (ranging from 22 to 58). Eleven patients had diabetes mellitus (11.57%), 9 patients had hypertension (9.4%), and 25 patients had a history of smoking (26%). Regarding the surgical technique, 18 patients underwent the procedure using the harmonic technique (18.94%), while 77 patients underwent the standard technique (81%) Table 1, Table 2.

**Table 1.** Demographic and operative data

Gender	
Female	81 (%85,5)
Male	14(%14,7)
Age (years)mean (range)	38(22-58)
BMI; mean (range)	30,28(22-47)
Diabetes Mellitus	11(%11,57)
Hypertension	9(%9,47)
Smoking	25(%26)
Hernial Repair	17(17.89)
Operation time (h)	2.56±0.76
Surgical technique-Harmonic	18(%18,94)
Surgical technique-Standard	77 (%81)
BMI:Body Mass Index	

**Table 2.** Preoperative Characteristics and Complications

Characteristics	n (%)
Gender	
Female	81 (85.3)
Male	14 (14.7)
Diabetes Mellitus	11 (%11,57)
Hypertension	9 (%9,47)
Complication-total	27 (%28,42)
Complication-Infection	4(%4,21)
Complication-Dehiscence	2 (%2,1)
Complication-Necrosis	1 (%1)
Complication-Seroma	16((16,84)
Complication-Thromboemboli	2(%2,1)
Complication-hematom	2(%2,1)

A total of 27 complications (28.48%) occurred. The most frequent complication was seroma, observed in 16 patients (16.84%). Four patients (4.21%) had wound infections, treated with intravenous antibiotics. One patient (1%) developed skin necrosis, managed with necrosis debridement and prolonged dressing. Hematoma was observed in 2 patients (2.1%) and was drained. Two patients (2.1%) developed thromboembolism and were treated with low molecular weight heparin for one month Table 3.

**Table 3.**The statistical analysis of the parametres

	p*
Age (years)	0.005
Gender	0,429
BMI (kg/m2)	0.002
Smoking	0,003
Operation time (h)	0,378
Follow-up time (m)	0.454*
Diabetes Mellitus	0.612
Hypertension	0.542
Hernial repair	0.715
Surgical technique	
Harmonic	
Standard	0.907**

\* Independent Samples T Test \*\* Chi-square Test

Out of the 95 patients, the average BMI was 30.28 kg/m<sup>2</sup> (mean (range)). The recorded overall complication rate was 27 (28.48%). The most prevalent complication was seroma, accounting for 16 (16.84%) cases. Seroma emerged as a significant factor significantly increasing the likelihood of complications ( $p=0.002$ ), demonstrating statistical significance. The BMI value was associated with an increased risk of wound healing issues ( $p=0.002$ ). The overall frequency of complications was significantly correlated with age ( $p=0.005$ ) and BMI ( $p=0.002$ ). The abdominoplasty technique did not significantly impact total complications ( $p=0.907$ ). The relationship between patient age during surgery and total complications was evident. Increasing patient age was associated with a rise in general complications, indicating age as a significant risk factor ( $p=0.005$ ). However, the duration of the operation did not increase complications ( $p=0.378$ ). Co-existing conditions such as hypertension (HT) and diabetes mellitus (DM) did not escalate complications. Nevertheless, a history of smoking significantly increased the risk of total complications, showing statistical significance ( $p=0.003$ ).

## Discussion

Abdominoplasty or abdominal dermolipectomy is a fundamental procedure in plastic surgery aimed at enhancing body contours and has been practiced for over a century. Its first publication dates to 1899 by Kelly [7]. Numerous risk factors have been suggested in plastic surgery literature, demonstrating associations between complications and factors such as smoking [13], obesity [8], hypertension [14], and prior abdominal surgeries (gynecologic) [15]. Complication rates tend to increase in obese patients (BMI >30 kg/m<sup>2</sup>) compared to non-obese patients (BMI <30 kg/m<sup>2</sup>) [7, 16]. These obese patients are individuals who remained obese despite previous weight loss surgery, sometimes leading to underestimated expectations, dissatisfaction, and increased follow-up issues.

As it is mentioned in literature our most frequently observed complication was seroma [4], predominantly seen in overweight patients or those who have undergone significant weight loss. In cases with a dead space between fasciae or postoperative abdominal flaps [17], consecutive aspirations may be necessary for treating this complication. Seroma is considered a minor complication and therefore often disregarded by patients. It occurs in approximately 38% to 42% of patients. In our series, it was the most common

complication, occurring in 16 patients (16.84%). The incidence of seroma after abdominoplasty varies, ranging from 1% to 26% [15,18]. Hematomas pose potential complications. While their occurrence in any surgery, including abdominoplasty, is less frequent than seromas, constituting around 0.8% of cases, they occur in about 3% of patients undergoing abdominoplasty. However, the outcomes were more severe. Hematomas were identified during clinical examination and abdominal inspection. They were detected via ultrasound and subsequently drained through aspiration.

Issues with wound healing in abdominal incisions can more easily arise in individuals with a history of obesity. This can be due to insufficient subcutaneous coverage. Various factors may contribute to the increase in this complication: preoperative BMI > 25 kg/m<sup>2</sup>, concomitant diabetes, and tobacco use (smokeless) [16]. Moreover, excessive tissue manipulation during surgery affects both clotting and complement activity, leading to excessive cytokine activation and subsequent postoperative complications, altering the healing process. Excessive release of cytokines also increases the risk of wound site infections [8-13]. Based on our experience, the commonly isolated organisms were Staphylococcus epidermidis. Staphylococcus aureus and Escherichia coli were detected with less frequency [19]. Treatment involved appropriate antibiotic therapy, abscess drainage, necessary debridement, and alterations in dressing changes. There were no postoperative mortalities. It mainly focuses on complications and risk factors without discussing the success rates, patient satisfaction, or advancements in abdominoplasty techniques over time.

## Conclusion

After abdominoplasty, postoperative complications such as seroma and wound infection are common. Previous bariatric surgical procedures might play a role similar to other commonly researched risk factors such as smoking and BMI, even within specific patient categories. In abdominoplasty surgery, more attention should be paid to preoperative, intraoperative, and postoperative management. Therefore, we strongly believe that informing patients with high expectations before abdominoplasty is extremely important. Obtaining their consent and providing necessary enlightenment during the preoperative period is crucial due to the potential risk of complications.

## Conflict of Interest Statement

The authors have no conflicts of interest to declare.

## Financial Disclosure

The authors declared that this study has received no financial support.

## References

1. Rosa SC, de Macedo JLS, Canedo LR, et al. Quality of life and predictive factors for complications in patients undergoing abdominoplasty after gastric bypass: a retrospective cohort. *Surg Obes Relat Dis.* 2019;15(3):447–55.
2. Klassen AF, Cano SJ, Scott A, et al. Satisfaction and quality-of-life issues in body contouring surgery patients: a qualitative study. *Obes Surg.* 2012;22(10):1527–34.
3. Keyes G, Singer R, Iverson R, Nahai F. Incidence and predictors of venous thromboembolism in abdominoplasty. *Aesthet Surg J.* 2018;38(2):162-173.
4. Dillerud, E.,. Abdominoplasty combined with suction lipoplasty: A study of complications, revisions, and risk factors in 487 cases. *Ann. Plast. Surg* 1990;25: 333-343.
5. García Botero A, García Wenninger M, Fernández LD. Complications after bodycontouring surgery in postbariatric patients. *Ann Plast Surg.* 2017;79(3):293–7.
6. Winocour J, Gupta V, Ramirez JR, Shack RB, Grotting JC, Higdon KK. Abdominoplasty: risk factors, complication rates, and safety of combined procedures. *Plast Reconstr Surg.* 2015;136:597e-606e.
7. Seth AK, Lin AM, Austen WG, H GR, Gallico GG, Colwell AS. Impact of patient subtype and surgical variables on abdominoplasty outcomes: A 12-year Massachusetts General Hospital experience. *Plast Reconstr Surg.* 2017;140:899-908.
8. Lievain L, Aktouf A, Auquit-Auckbur I, Coquerel-Beghin D, Scotte M, Milliez PY. Abdominoplasty complications: Particularities of the post-bariatric patients within a 238 patients series. *Ann Chir Plast Esthet.* 2015;60:26-34.
9. R. M. Najera, W. Asheld, S. M. Sayeed, and L. T. Glickman, "Comparison of seroma formation following abdominoplasty with or without liposuction," *Plastic and Reconstructive Surger.* 2011; vol. 127, no. 1 417–422.
10. M. E. Bercial, M. S. Neto, J. A. Calil, L. A. Rossetto, and L. M. Ferreira, "Suction drains, quilting sutures, and fibrin sealant in the prevention of seroma formation in abdominoplasty: which is the best strategy?" *Aesthetic Plastic Surgery*, 2012; vol. 36, no. 2, pp. 370–373.
11. Bamba R, Gupta V, Shack R, Grotting J, Higdon K. Evaluation of diabetes mellitus as a risk factor for major complications in patients undergoing aesthetic surgery. *Aesthet Surg J.* 2016;36(5):598-608.
12. Massenbourg B, Sanati-Mehrziy P, Jablonka E, Taub P. Risk factors for readmission and adverse outcomes in abdominoplasty. *Plast Reconstr Surg.* 2015;136(5):968-977.
13. A. Momeni, M. Heier, H. Bannasch, and G. B. Stark, "Complications in abdominoplasty: a risk factor analysis," *Journal of Plastic, Reconstructive & Aesthetic Surgery*, 2009; vol. 62, no. 10, pp. 1250–1254.
14. Rosen AD, Gutowski KA, Hartman T Reduced seroma risk in drainless abdominoplasty using running barbed sutures: a 10-year multicenter retrospective analysis. *Aesthet Surg J.* 2020;40(5):531–537.
15. Seretis K, Goulis D, Demiri EC, Lykoudis EG (Prevention of seroma formation following abdominoplasty: a systematic review and meta-analysis. *Aesthetic Surg J.* 2017; 37(3):316–323.
16. Edouard H Manassa, Cathrine H Hertl, Rolf-Ruediger Olbrisch, 'Wound healing problems in smokers and nonsmokers after 132 abdominoplasties' *J Plast Reconstr Aesthet Surg*, 2003 May;111(6):2082-7; 2088-9.
17. Max Sirota 1, Aviad Weiss 2, Allan Billig 2, Ayal Hassidim 2, Jonathan Zaga 2, Neta Adler 2 'Abdominoplasty complications - what additional risks do postbariatric patients carry?,' *J Plast Reconstr Aesthet Surg*, 2021 Dec;74(12):3415-3420.
18. Nader Salari, Behnaz Fatahi, Yald Bartina, Mohsen Kazemina, Mohammadbagher Heydari, Masoud Mohammadi, Mahvan Hemmati, Shamarina Shohaimi ' The Global Prevalence of Seroma After Abdominoplasty: A Systematic Review and Meta-Analysis, *Aesthetic Plast Surg* 2021 Dec;45(6):2821-2836.
19. Karen De Paep , Ilia Van Campenhout, Sebastiaan Van Cauwenberge, Bruno Dillemans' Post-bariatric Abdominoplasty: Identification of Risk Factors for Complications' *Obes Surg* 2021 Jul;31(7):3203-3209.