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Factors related to necrosis at the T junction in reduction mammoplasty

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The study was approved by the Ethics Committee of Balıkesir University with the decision number 2021/246.
All procedures in this study involving human participants were performed in accordance with the 1964 Helsinki Declaration and its later amendments.

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Abstract

Background/Aim: Reduction mammoplasty is an effective and patient-satisfying operation in terms of relieving physical complaints such as back pain, shoulder collapse, and intertrigo due to macromastia. The most used incision is the wise pattern, which allows for easy intervention to the excess vertical and horizontal skin. However, long incisions may cause wound healing problems. The necessity of wide dissection may cause perfusion problems in the lateral and medial flaps at the T junction, where the tips of the flaps meet with the inframamarial sulcus. In the literature, T junction dehiscence is discussed under delayed healing complications. This study aimed to reveal the specific effects of the factors that were shown to cause delayed healing in general on the T junction area.

Methods: In this retrospective cohort study, the effects of age, smoking habits, comorbidities, resection volume, and body mass index on T junction dehiscence were investigated among 56 patients who underwent reduction mammoplasty with wise pattern technique. The combined effects of all possible factors effective on dehiscence were investigated by multivariate logistic regression analysis.

Results: The median age of the patients was 44.3 (12.5) years. Their mean body mass index was 26.0 (24.0-27.0) kg/m^2, and 13% of the patients had comorbidities. The rate of dehiscence at the T junction was 28.6%. The most effective factors on the development of dehiscence were smoking and increased body mass index. Logistic regression analysis revealed that smoking increased the risk of T junction dehiscence by 8.543 times (95% Confidence Interval: 1.454-50.213) (P=0.018). No relationship was found between age, resection volume, comorbidities, and T junction dehiscence.

Conclusion: The risk of dehiscence in the T junction increased in the patients who smoked and who had a high body mass index. The effect of smoking was much greater on T junction healing than its effect on general wound healing complications. T junction dehiscence should not be considered a delayed wound healing complication solely, but as a flap perfusion problem and preoperative measures should be taken accordingly.

Keywords: Wise pattern, T junction, Perfusion, Smoking, Wound healing

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Introduction

Reduction mammoplasty is performed for aesthetic and functional reasons or symmetry after breast reconstructions [1, 2]. Although many techniques were defined, the Wise pattern is the most frequently used [3]. The Wise pattern technique effectively reduces excess vertical and horizontal skin, but long incisions cause wound healing problems [4].

Wound healing problems can occur on the horizontal or vertical legs of the incision, or around the areola. However, the most common site is the T junction. Problems related to the T junction are covered under delayed wound healing complications in most studies. Smoking, high body mass index [5-9], advanced age [8] and resection volume [10] may be related to wound healing problems.

At the T junction, randomly fed medial and lateral flaps join the inframammary sulcus and perfusion is poor. Usually, dehiscence occurs because of perfusion problems rather than those related to wound healing. Chan et al. [11] noted that the principles of flap surgery are valid in wise pattern breast reductions and Galliano et al. [12] emphasized that the tension created by the lateral flap may cause skin necrosis in the lateral or medial flap at the T junction. For this reason, we considered the dehiscence of the T junction separate from the wound healing problems occurring in other areas of the incision and aimed to investigate the effects of the factors of delayed healing on the T junction area. We believe that predicting the patient group that is expected to have problems at the T junction will be beneficial in terms of prevention.

Materials and methods

The study was conducted on 56 patients with available medical records who consented to participate, among 67 patients who underwent wise pattern breast reduction between January 2020 and August 2021. Written and verbal consent was obtained from all patients and the study was approved by the Ethics Committee of Balıkesir University with the decision number 2021/246. The effects of age, concomitant diseases, smoking, body mass index, and resection amount on the dehiscence at the T junction were investigated.

Superficial epidermal necrosis and full-thickness necrosis occurring in the lateral or medial flaps were considered T junction dehiscence, regardless of size (Figure 1, 2), while dehiscence without skin necrosis or open wounds with suture exposure was not. The smoking status of the patients was questioned, and habitual smokers and occasional smokers who had smoked within 6 weeks before the operation were considered smokers.

Statistical analysis

Whether discrete numerical variables were normally distributed was investigated with the Shapiro-Wilk test. Discrete numerical variables were expressed as mean (standard deviation) or median (25^{th}-75^{th} percentiles), while categorical variables were presented as the number of cases and percentage (%). The intergroup difference in terms of mean age was evaluated with the student's t-test, and those of body mass index and the resected volume were assessed with the Mann Whitney U test. Categorical variables were evaluated using Continuity corrected $\chi 2$, Fisher Freeman Halton, or Fisher's exact probability tests. The combined effects of all possibly effective factors on wound dehiscence were investigated by multivariate logistic regression analysis. Based on univariate statistical analysis, all variables with $P<0.25$ were included in the regression model as candidate factors. In addition, the odds ratio and 95% confidence intervals were calculated for each variable. Data analysis was performed by IBM SPSS Statistics 25.0 (IBM Corporation, Armonk, NY, USA) package program. The results were considered significant when $P<0.05$.

Results

The median age of the patients was 44.3 (12.5) (range: 19-64) years. Their mean body mass index was 26.0 (24.0-27.0) kg/m^2. Thirteen percent had comorbidities, the most common being diabetes mellitus (DM). Among all, 55.4% smoked. The total resected amount was approximately 1200 g (950-1400). Breast reduction was performed leaving the superior medial pedicle in 60.4%, the inferior pedicle in 25%, with the Thorek technique in 5%, and leaving the superior pedicle in 3%. The rate of dehiscence at the T junction was 28.6% (Table 1).

Table 1: Demographic and clinical characteristics of the patients

	n=56
Age (years)*	44.3(12.5)
Age range (years)	19-64
Body mass index (kg/m2) **	26.0 (24.0-27.0)
Concomitant disease	13 (23.2%)
DM	9 (16.1%)
HT	6 (10.7%)
Other	2 (3.6%)
Smoking history	31 (55.4%)
Resection amount **	1200 (950-1400)
Pedicle	
Superomedial	34 (60.7%)
Inferior	14 (25.0%)
Thorek method	5 (8.9%)
Superior	3 (5.4%)
Dehiscence	16 (28.6%)

*Data are presented as mean (standard deviation). ** Descriptive statistics are expressed in median (25^{th}–75^{th} percentile). DM: Diabetes Mellitus, HT: hypertension

The patients with and without T junction dehiscence were similar in terms of mean age, comorbidities (except hypertension), the amount resected, and pedicles used ($P>0.05$). On the other hand, among patients with dehiscence, the mean body mass index, and the incidences of hypertension and smoking were significantly higher ($P=0.011$, $P=0.049$, and $P=0.006$, respectively) (Table 2).

Table 2: Demographic and clinical characteristics of the patients with and without dehiscence

	With Dehiscence (n=40)	Without dehiscence (n=16)	*P*-value
Age (years) *	42.5(12.9)	48.5(10.5)	0.107†
Body Mass Index (kg/m2) **	26.0 (23.0-26.7)	27.0 (25.2-30.7)	0.011‡
Concomitant disease	8 (20.0%)	5 (31.3%)	0.486¶
DM	5 (12.5%)	4 (25.0%)	0.259¶
HT	2 (5.0%)	4 (25.0%)	0.049¶
Other	2 (5.0%)	0 (0.0%)	>0.999¶
Smoking habitus	17 (42.5%)	14 (87.5%)	0.006¥
Resection amount **	1200 (900-1475)	1200 (1125-1337.5)	0.362‡
Pedicle			0.953§
Superomedial	25 (62.5%)	9 (56.3%)	
Inferior	10 (25.0%)	4 (25.0%)	
Thorek method	3 (7.5%)	2 (12.5%)	
Superior	2 (5.0%)	1 (6.2%)	

* Data are presented as mean (standard deviation). Descriptive statistics are expressed in the median (25^{th}–75^{th} percentile). †Student's t-test. ‡ Mann Whitney U test. ¶ Fisher's exact probability test. ¥ Continuity corrected $\chi 2$ test. § Fisher Freeman Halton test. DM: Diabetes Mellitus. HT: Hypertension

The significant predictors of dehiscence were evaluated by multiple logistic regression analysis. Any variable with a p-value of <0.25 in the univariable test was considered a candidate for the multivariable model, along with all variables of known clinical importance. Hypertension was excluded from the model

because when evaluated overall, it did not have a significant or potential effect on dehiscence.

Smoking and increased body mass index were the significant predictors of T junction dehiscence. The history of smoking, for which correction was made, increased the dehiscence risk by 8.543 times (95% Confidence Interval: 1.454-50.213) (P=0.018). The probability of dehiscence also increased with body mass index (odds ratio = 1.419; 95% CI: 1.052-1.913 and P=0.022) (Table 3).

Table 3: The examination of the combined effects of all possible factors on dehiscence using multivariate logistic regression analysis

	Odds ratio	95% confidence interval		*P*-value
		Lower limit	Upper limit	
Age	1.052	0.985	1.123	0.134
Body mass index	1.419	1.052	1.913	0.022
Smoking history	8.543	1.454	50.213	0.018

Discussion

Reduction mammoplasty, an operation with high patient satisfaction, was shown to improve the quality of life by relieving the symptoms of macromastia, such as back pain, headache, and rash [13]. It can be performed by a vertical incision or the wise pattern technique. Although vertical mammoplasty has gained popularity with advantages such as less scarring and longer preservation of projection, the wise pattern method is still the most used [3, 4]. A shorter learning curve, and better control of horizontal and vertical skin excesses, especially in patients with poor skin elasticity, are the advantages of the wise pattern technique [3].

Since breast reduction operations are performed in a relatively young and healthy patient group, complications are usually mild [9]. The most common complication is wound healing disorders [5-9], which are considered minor complications in many studies [3-12]. However, the patient's need for postoperative dressing and prolonged care, as well as the increase in the number of postoperative visits reduce the cost-effectiveness of the operation [14]. Studies report wound healing complication rates of up to 100%, and associate it with smoking, high body mass index [14], and increased resected volume [8].

Wound healing complications occur mostly at the T junction area in wise pattern breast reductions. This is where the medial and lateral flaps meet with the inframammarian sulcus. Its dehiscence was mostly discussed under delayed wound healing complications and not evaluated separately [5-9]. However, in wise pattern reductions, the main problem is superficial or full-thickness skin necrosis due to ischemia in the medial or lateral flaps.

Perfusion problems at the T junction may be related to the operation technique, such as excessive undermining, damage to the subdermal plexus due to excessive traction of the flaps during the operation, and tight closure. However, other factors that may cause dehiscence at the T junction were not specifically investigated.

The patients in this study were middle-aged, relatively healthy, and normal or slightly overweight. The smoking rate was 55.4%. The rate of smoking among women in Turkey is 31.2% [15]. The reason for the high rate of smoking in our study may be due to our evaluation of occasional smokers within the smoker group. Studies show that the adverse effects of one cigarette on skin vascularity and wound healing are minimized after 6 weeks [16, 17]. Therefore, we considered occasional smokers who had smoked within 6 weeks preoperatively as smokers.

According to our study, the factor that has the greatest effect on the dehiscence at the T junction is smoking. In their study examining the effect of smoking on breast reduction operations, Chan et al. [11] reported that problems related to wound healing are increased by 3.5 times in smokers. In similar studies examining the effect of smoking on breast reduction operations, complications related to wound healing were increased most frequently in smokers at similar rates [18, 19]. We found that smoking increases the risk of dehiscence at the T-junction area by 8.5 times. This significant difference observed between the literature and our study may be because we examined the wound healing problems at the T junction area specifically. In this area, the perfusion of the medial and lateral random flaps is the weakest. Nicotine induces endothelial wall damage, inhibits capillary blood flow, and releases catecholamines [19]. The T junction may be where the adverse effects of smoking on vascularity are most pronounced. We showed that wound healing complications caused by smoking are much more common at the T junction, compared to the general wound healing problems. This result confirms that wound healing complications are not delayed healing problems but rather are related to poor perfusion.

In our study, increased body mass index also increased dehiscence risk at the T junction. Studies examining the effects of obesity on complications in breast reduction operations presented different results [20]. A study of 3558 cases by Fishcer et al. [6] found that obesity increases wound healing complications, because of the adverse effects of obesity on myofibroblast activity and collagen maturation. Nizzo et al. [21] emphasized that obesity did not increase the complications related to wound healing in the adolescent population and attributed this to the fact that the young population was not exposed to the chronic effects of obesity compared to the adult population. The breast predominantly comprising fatty tissue with poor vascularity instead of glandular structure with rich vascularity in patients with high body mass index may further weaken the flap perfusion in the T junction area. Different results presented in studies regarding the effect of obesity on wound healing complications can be eliminated by specific studies on T junction dehiscence.

Among our patients, age, resection volume, and comorbidity did not affect T junction dehiscence. Although meta-analyses present different results regarding age, it is a common opinion that increased resection amount and comorbidity increase wound healing complications [6,7,9]. The fact that our study was conducted with a relatively small number of patients (for example, there were 6 patients with hypertension, which is also shown to affect dehiscence), may be the reason for this discrepancy.

T junction dehiscence is more common among smokers and obese patients. This makes it necessary to take additional precautions for T junction dehiscence in planned breast reduction operations among these patients. Some authors require smoking cessation 6 weeks before the operation [18]. Likewise, obese patients may be encouraged to lose weight. However, the

applicability of these recommendations is controversial. Studies on obese patients showed that the quality of life increased after the operation despite minor complications, and breast reduction operations were cost-effective in the obese patient group as well [20]. The use of incisional vacuum therapy reduced delayed wound healing complications that may occur after breast reduction operations [12, 14]. However, few studies are available and their effects on flap perfusion, which is the main cause of T junction problems, are not clear. In our opinion, dermal flap modifications made to reduce tension in the T junction area are quite reasonable [4, 22]. Although there is a need for controlled studies, it is a fact that decreased tension at the T junction will positively affect the perfusion of the lateral and medial flaps. Future studies may focus on the use of local vasodilator agents in flap surgery in this risky patient group to increase flap fusion at the T junction.

Conclusion

Smoking and high body mass index increase the risk of dehiscence at the T junction. High-risk patients must be informed of this complication preoperatively. Additional measures should be planned to increase flap perfusion at the T junction.

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