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Abstract: Background: Seroma is one of the most troubling complications after abdominoplasty; incidence rates of up to 25% have been reported. If it is correct that shearing forces between the two separated abdominal layers play a key role in the development of seroma, postoperative immobilization of the patient until the layers are sufficiently adhered may be a solution to the problem. Objectives: The authors examine the association between length of immobilization and the development of seroma. Methods: This retrospective study included 60 patients; half were immobilized for 24 hours (group 1) and the other half were immobilized for at least 48 hours (group 2). For thromboembolism prophylaxis, all patients received low molecular weight heparin and compression stockings. Postoperative follow-up for detection of seroma continued for at least three months. Results: Mobilization after 24 hours led to a seroma rate of 13%, whereas immobilization of at least 48 hours decreased the seroma rate to 0%. Conclusions: For abdominoplasty patients with a low or moderate thromboembolic risk, the data suggest that immobilization for at least 48 hours with chemical and mechanical thromboembolism prophylaxis significantly reduces the risk of seroma

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Prevention of Seroma After Abdominoplasty

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Abstract

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Objective: The authors examine the association between length of immobilization and the development of seroma.

Methods: This retrospective study included 60 patients; half were immobilized for 24 hours (group 1) and the other half were immobilized for at least 48 hours (group 2). For thromboembolism prophylaxis, all patients received low molecular weight heparin and compression stockings. Postoperative follow-up for detection of seroma continued for at least three months.

Results: Mobilization after 24 hours led to a seroma rate of 13%, whereas immobilization of at least 48 hours decreased the seroma rate to 0%.

Conclusions: For abdominoplasty patients with a low or moderate thromboembolic risk, the data suggest that immobilization for at least 48 hours with chemical and mechanical thromboembolism prophylaxis significantly reduces the risk of seroma.

Keywords

abdominoplasty, seroma, complications, thromboembolism prophylaxis, postoperative immobilization

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Abdominoplasty is a very popular body contouring procedure, ranking in the top five cosmetic surgery procedures in the United States last year.¹ However, classic abdominoplasty² with wide undermining is associated with a variety of complications. Recently, Spiegelman and Levine³ reported an overall complication rate of 30%; among the reported local complications, seroma has been one of the most troubling. Treatment of seroma requires repeated aspirations and elastic compression garments. If the condition becomes chronic and causes pseudobursa formation with a residual contour deformity, a second operative intervention may be required. One of the most logical strategies to avoid the development of seroma is to prevent shearing forces between the undermined, nonadherent skin flap and the underlying muscles. Therefore, Baroudi and Ferreira⁴ recommend the placement of numerous (up to 40) quilting sutures, attaching the undersurface of the adipose tissue to the underlying muscle fascia. Similarly, Pollock and Pollock⁵ place progressive tension sutures to eliminate dead space and thereby prevent the development of seroma, suggesting that this technique even makes the placement of postoperative drains unnecessary. Despite these recommended strategies, a high incidence of seroma continues to be associated with abdominoplasty.

Rates of seroma have long been variable. Hester et al⁶ reported a seroma rate of 2.5% in more than 500 patients in 1989. However, in the same year, Teimourian⁷ reported a seroma rate of 9%. In a more recent report from 2006, Spiegelman and Levine³ reported a rate of 19% to 25%. A seroma rate as high as 25% is alarming and represents a complication that may not be tolerable for patients and practitioners. If the theory of Baroudi and Ferreira⁴ and Pollock and Pollock⁵ is correct and shearing forces between the two separated abdominal layers play a key role in the development of seroma, either the application of quilting sutures or appropriate immobilization of patients until the

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two layers are sufficiently adhered should provide a definitive solution to the problem. To examine the association between length of immobilization and the development of seroma, we compared a group of patients undergoing abdominoplasty with early mobilization to a comparable group of patients with delayed mobilization.

METHODS

We enrolled 30 consecutively treated patients in a private clinic (group 1) and 30 consecutively treated patients in a public hospital (group 2). Patients were included irrespective of their weight and the number of previous pregnancies. We excluded patients who had undergone additional abdominal-surgical procedures and patients with an American Society of Anesthesiologists (ASA) Class III score (severe systemic disease, not incapacitating).

All patients underwent general anesthesia and each patient was given a dose of 1 g cefazolin intravenously at the onset of anesthesia. Foley catheters were placed in all women. All operations were carried out by the same surgeon (HW). The operative technique was a classic abdominoplasty.^{2,8} A transverse lower abdominal incision was made, and the skin and subcutaneous tissue were undermined to the xiphoid and costal margins. On the muscle fascia, only the gliding tissue remained, with no additional fat left. Hemostasis was obtained with electrocoagulation. Rectus muscle diastasis was corrected if necessary.⁹ The umbilicus was transposed to its new insertion area through an inverted "V" incision at the midline. Two drains (high-vacuum drainage, Redon suction drains French 12 in group 1; closed, gravity drainage, soft polyvinyl drains with four or five self-made slits in group 2) were inserted and led out through the wound laterally, one for each half of the abdomen.¹⁰ As the choice of drainage techniques has no published evidence bearing on postoperative seroma formation,¹¹ the different drains were selected according to standard protocol in each of the two clinics. The operating table was jackknifed, redundant abdominal tissue was resected, and the abdominal wall was closed in three layers. No liposuction was performed.

All patients received abdominal padding and a circular compression bandage that remained in place for 48 hours. Drains were removed when the collection of fluid was less than 20 mL per 24 hours, or after a maximum of five postoperative days. The overall volume of drainage was recorded. Postoperatively, patients were given low molecular weight heparin prophylaxis until they were able to ambulate completely; they wore elastic compression stockings during recovery as well.

All patients in group 1 were immobilized for 24 hours and all patients in group 2 were immobilized for at least 48 hours. Postoperative follow-up for the detection of seroma continued for at least three months. Only those instances of seroma that led to a visible swelling of the abdominal wall and necessitated aspiration were included in this study.

RESULTS

Results were analyzed using SPSS 13.0 (SPSS, Inc., and IBM Company, Chicago, Illinois). Continuous variables were summarized as mean \pm standard deviation and were compared between groups using the Mann-Whitney test. Nominal variables were presented as n (%) and differences were compared with Fisher's exact test. Correlations were derived as Spearman rank correlations. *P* values less than or equal to .05 were considered significant (two-tailed test).

Comparing both groups revealed that the overwhelming majority of patients were women (87% in group 1 and 90% in group 2). The number of previous pregnancies was between 1.0 and 5.0 for all patients and was not significantly different between the two groups. There were no significant differences in terms of age, height, weight, or body mass index (BMI). The resection weight was significantly higher in group 2 (*P* = .03) and was significantly correlated with BMI (*r* = 0.6, *P* = .00) and the volume of drainage (*r* = 0.3, *P* = .03).

The number of corrections of rectus diastasis ranged from one-fifth (group 2) to one-third of patients (group 1) and was negatively correlated to BMI (*r* = -0.6). All patients had two drains, and they were removed between the first and fifth postoperative days in both groups, with no significant differences between groups. The volume of drainage ranged from 16 to 520 mL in group 1, but was significantly lower than in group 2 (120-860 mL).

The duration of immobilization for group 1 was 24 hours for every patient. The duration of immobilization in group 2 was at least 48 hours. Sixty percent of patients in that group were immobilized for 48 hours; the remaining patients were immobilized for between three and five days.

Despite a higher resection weight in group 2 and a greater volume of drainage, the incidence of seroma was 0% in this group, in contrast to 13% in group 1. Results are shown in Table 1.

DISCUSSION

Our data show that early mobilization led to a seroma rate of 13%, whereas delayed mobilization for at least 48 hours decreased the seroma rate to 0%. As premature mobilization may lead to seroma due to nonadherent abdominal layers and as late mobilization (without thromboembolism prophylaxis) carries the risk of thromboembolic complications, there have been divergent views as to the necessary duration of immobilization as well as the exact definition of early, delayed, and late mobilization in an abdominoplasty patient. Traditionally, patients were immobilized for days and this type of operation was often a lengthy inpatient procedure. As costs have become increasingly important, the duration of immobilization has become shorter in recent decades. Today, abdominoplasty is mostly an outpatient procedure with immediate postoperative mobilization.³

Table 1. Data From 60 Patients Undergoing Abdominoplasty

| | Group 1 (n = 30) | Group 2 (n = 30) | P Value |
|--|----------------------------|----------------------------|---------|
| Age, y, mean \pm SD (range) | 45 \pm 10 (27-68) | 43 \pm 16 (17-69) | NS |
| Height, cm, mean \pm SD (range) | 168 \pm 7 (155-187) | 165 \pm 6 (150-178) | NS |
| Weight, kg, mean \pm SD (range) | 78 \pm 20 (46-125) | 80 \pm 13 (57-105) | NS |
| Body mass index, kg/m ² , mean \pm SD (range) | 27.0 \pm 5.7 (17.3-40.5) | 29.4 \pm 4.3 (19.7-40.6) | NS |
| Resection weight, g, mean \pm SD (range) | 1320 \pm 1010 (150-3600) | 1950 \pm 1410 (150-6200) | .03 |
| Volume of drainage, mL, mean \pm SD (range) | 130 \pm 120 (16–520) | 400 \pm 200(120- 860) | .00 |
| Sex (female), n (%) | 26 (87) | 27 (90) | NS |
| Partus, n (%) | 7 (23) | 7 (23) | NS |
| Mayo, n (%) | 9 (30) | 5 (17) | NS |
| Seroma, n (%) | 4 (13) | 0 (0) | .04 |

Patients in group 1 were immobilized for 24 hours and patients in group 2 were immobilized for at least 48 hours. The correlation between the resection weight and the volume of drainage is significant ($r = 0.3$, $P = .03$). NS, not significant.

A 1977 questionnaire¹² revealed that even then, 35% of surgeons had their patients walking within 24 hours, one-fourth of surgeons within 36 hours, and another one-fourth of surgeons within 72 hours. Only 10% of surgeons waited four or more days before allowing patients out of bed. Baroudi and Ferreira,⁴ although not commenting on the length of postoperative immobilization, instructed their patients to rest at home in a supine position, alternating between a standing and a semiupright position during the first week of the postoperative period. Pollock and Pollock⁵ recommended only an overnight stay for the full abdominoplasty with progressive tension sutures and they performed less extensive abdominoplasty as an outpatient procedure, reporting a seroma rate of 0%. Spiegelman and Levine³ declared that outpatient care was the standard but noted a seroma rate of 25%.

Irrespective of outpatient or inpatient care, abdominoplasty procedures typically last longer than one hour and therefore have at least a “moderate” risk for the development of thromboembolic complications.¹³ When patients undergoing an abdominoplasty are older than 40 years of age and have additional predisposing risk factors (eg, previous history of deep venous thrombosis, use of oral contraceptives, recent surgery requiring general anesthesia, obesity), the risk of thromboembolic complications increases to “high” or “highest.” In the thromboembolic risk assessment of Patronella et al¹⁴ with a summary of predisposing risk factors, one of the exposing risk factors is the length of immobilization, yet only “patients confined to bed > 72 hours” is counted as an additional risk factor. Thus, immobilization of patients who have undergone abdominoplasty for 48 hours (as we recommend) would not present a higher exposing risk than earlier mobilization. Regardless of such a definition, every effort must be undertaken to prevent thromboembolic complications.

With regard to the habits of surgeons concerning prophylactic anticoagulation, there was no evidence of regular prophylaxis in a survey of 10,490 patients with abdominoplasty in 1977,¹² but there was also no significant relationship between the onset of ambulation and the incidence of phlebitis (1.1%), pulmonary emboli (0.8%), or death.

Twenty years later, Matarasso¹⁵ wrote that he preferred the usual measures such as early ambulation, sequential venous compression devices, and regular abdominal binder administration for thromboprophylaxis and that he did not routinely use pharmacologic anticoagulation.

Today, pharmacologic anticoagulation is the standard of care in abdominoplasties.¹⁶ In our study, both groups of patients received prophylactic low molecular weight heparin from 12 hours before the operation until complete mobilization. None of the patients suffered a thromboembolic complication. However, as deep venous thrombosis and pulmonary embolism are very rare complications that cannot be eliminated but only decreased by prophylaxis (and, furthermore, are often clinically silent), it is possible that the group sample sizes were not sufficiently large to demonstrate these complications.

Another association that could not be demonstrated was that of obesity (and resection weight) with the occurrence of seroma. In 1999, Vastine et al¹⁷ reviewed 90 abdominoplasties and showed that 80% of obese patients had complications (25% seroma) compared with 33% of nonobese patients. In contrast, van Uchelen et al¹⁸ failed to detect any associations between obesity and complication rates, and Spiegelman and Levine³ also found no associations between BMI and complication rates.

We concede that our study was limited by the fact that it was a retrospective examination of consecutive patients undergoing abdominoplasty and over the study period, the length of immobilization grew shorter in group 2, so not all patients in this group had an identical length of immobilization, potentially leading to confounding data. However, no patient was allowed to mobilize prior to 48 hours after surgery.

CONCLUSIONS

Based on our data, which showed a significant difference in the rate of seroma across the two groups, it seems plausible that reducing the rate of seroma after abdominoplasties may be achieved by increasing the duration of postoperative

immobilization up to 48 hours. After being appropriately informed about the advantages and drawbacks of this regime, the patient should perhaps be invited to decide between a justifiable longer stay in bed under mechanical and chemical thromboembolism prophylaxis (without a verifiable enhanced thromboembolic risk¹⁴) or a shorter stay in bed that is accompanied by a significantly higher risk of developing a seroma. For patients seeking a recommendation regarding early or delayed mobilization, in those with low or moderate thromboembolic risk, the authors recommend immobilization for 48 hours after abdominoplasty, together with the administration of low molecular weight heparin and compression stockings. Alternatives for the prevention of shearing forces and thus the prevention of seroma, such as special compression garments or limited activities after mobilization, are not evidence-based. Quilting or progressive tension sutures that help to prevent shearing forces were not tested in this study.

Disclosures

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