Reducing the seroma volume by quilting suture after breast reconstruction with a latissimus dorsi flap: Single institutional experience
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Reducing the seroma volume by quilting suture after breast reconstruction with a latissimus dorsi flap: single institutional experience.

Réduction du sérome grâce au capitonnage dans la reconstruction mammaire par lambeau de grand dorsal.

Running head: Quilting suturing for preventing seroma formation

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Abstract

INTRODUCTION: After breast reconstruction (BR) with latissimus dorsi flap (LDF) postoperative seroma is a frequent source of functional discomfort. The aim of this study was to evaluate the quilting suture on reducing the seroma volume by reducing the dead space created by LDF harvest for BR. MATERIAL AND METHODS: This retrospective monocenter study was designed to compare patients who underwent BR using LDF with or without quilting suture. The primary endpoint was the seroma volume drained during hospitalization and percutaneous puncture. Complications and painful or functional sequelae were also evaluated in both groups. RESULTS: One hundred eight patients were included in the study. The mean (Standard Deviation, SD) age of our population was 49.7 years (9.3) and the mean body mass index (BMI) 26.9 kg/m$^2$ (4.1). Sixty-nine patients (63%) underwent quilting suturing in the latissimus dorsi compartment, 41% with overedge and 59% with simple stitches. The mean total volume of fluid drainage was 1238 mL (1111). In multivariate analysis, the use of quilting suture was associated with a significant reduction in the total volume of drainage (-502 mL, p=0.03); reduction was greater using overedge stitches than simple stitches (p=0.02). The beneficial effect of quilting suture appears to be more important in patients with a BMI greater than 30 kg/m$^2$ (interaction test, p=0.01). CONCLUSION: This study shows the efficacy of quilting suture in reducing postoperative seroma formation in BR using LDF. Efficacy was greater when overedge stitches were used. Obese patients benefited more from quilting suture than patients with BMI <25.

Keywords: Breast reconstruction; Latissimus Dorsi Flap; Seroma prevention; Quilting suture.

Résumé

INTRODUCTION : Après reconstruction mammaire (RM) par lambeau de dorsal (LGD), le sérome postopératoire est une source fréquente de séquelle fonctionnelle. Le but de cette étude était d'évaluer le bénéfice du capitonnage sur la réduction du volume de sérome en réduisant l'espace mort lié au prélèvement du LGD. MATÉRIEL ET MÉTHODES : Nous avons réalisé une étude monocentrique retrospective comparant les patientes ayant subi une RM par LGD avec ou sans capitonnage. Les critères d'évaluation étaient le volume de sérome drainé, les complications, les séquelles douloureuses ou fonctionnelles. RÉSULTATS : Cent huit patientes ont été incluses dans l'étude. L'âge moyen (écart type) était de 49,7 ans (9,3) et l'indice de masse corporelle moyen (IMC) de 26,9 kg / m2 (4,1). Soixante-neuf patients (63%) ont eu un capitonnage du site de prélèvement dorsal, 41% avec un surjet et 59% avec des points simples. Le volume total moyen de drainage (1238 mL) était significativement réduit par le capitonnage (en analyse multivariée, - 502 ml, p = 0,03). Le bénéfice était plus grand lorsque la technique du capitonnage était un surjet comparé à des points simples (p = 0,02). Le bénéfice du capitonnage était plus important chez les patientes présentant un IMC supérieur à 30 kg / m2 (test d'interaction, p = 0,01). CONCLUSION : Cette étude montre l'efficacité du capitonnage dans la réduction de la formation de séromes postopératoires pour les reconstructions mammaires par LGD. Le bénéfice est supérieur chez les patients obèses et lorsqu'un surjet est utilisé.

Mots-clés : Reconstruction mammaire, Lambeau de grand dorsal, Prévention des séromes, capitonnage
INTRODUCTION

Breast reconstruction using the latissimus dorsi flap (LDF), described for the first time by Transini in 1896 [1], is currently widely used in France. This technique allows for a natural breast reconstruction that is associated to a high level of patient satisfaction and a low complication rate.

The main disadvantage of this technique lies in the formation of dorsal seroma, which occurs in over 60% of cases [2]. Seromas are characterized by a fluctuant swelling in the dead space that forms in the compartment of latissimus dorsi muscle after its removal. Several patient-related factors can contribute to seroma formation such as advanced age, elevated body mass index (BMI) and intervention-related factors such as axillary surgery (sentinel lymph node or axillary node dissection), the presence of a positive lymph node, the extent of flap dissection and the type of adjuvant treatments [3-6]. Seroma causes functional discomfort and back pain, and can lead to complications such as delayed dorsal healing or infection. Although it can be gradually reabsorbed, it often requires repeated punctures.

Several techniques to reduce the dorsal dead space and the subsequent seroma formation have been described, including muscle-sparing latissimus dorsi [7, 8].

The efficacy of quilting suture after breast reconstruction using LDF has been extensively reported in the literature [9-12]. In our surgery unit, this technique is used since 2016. However, since no recommendations exist regarding indications, the procedure is done according to surgeon’s discretion and experience.

The aim of this study was to report the early experience of our surgical team in the seroma prevention by quilting suture of LDF in BR.

MATERIALS AND METHODS
This retrospective monocenter study was conducted in a French Cancer centre. The study was conducted in compliance with the MR003 reference methodology from the National Commission on Informatics and Liberty (CNIL). All patients meeting the eligibility criteria were included consecutively in the study provided that they signed a non-opposition form allowing to use their data for research purposes.

Eligibility criteria
A patient was eligible if she had an autologous breast reconstruction (immediate or delayed) with LDF between 1st January 2016 and 31st December 2017. Patients were identified through the French Computerized Medical Information Systems Program (PMSI) (surgical procedure codes: QEFA013 or QEMA008).

Demographic, clinical, surgical and follow-up data were collected retrospectively from computerized medical records.

Treatment and monitoring
Following general anesthesia, patients received a locoregional anesthesia by « PECS bloc » (infiltration of local anesthetic between the pectoralis major muscle and the pectoralis minor muscle under ultrasound guidance). No locoregional anesthesia was used in the LDF compartment. The procedure was carried out using either a classical LDF or muscle-sparing LDF [7, 8]. An implant could be used for reconstruction if necessary. Patients were placed in lateral decubitus position for the flap removal and placed back in supine position for breast reconstruction. During the intervention, a monopolar or bipolar cautery was used. Quilting suture was done with simple or overedge stitches, depending on the surgeon. Two drains were fitted, one in the latissimus dorsi compartment and one in the breast reconstruction compartment. After the intervention, drains were removed wen less than 100 mL/24 hours of fluid was drained. Discharge was allowed after drain removal.
Patients were seen in consultation 5 days after discharge and a nurse punctured the seroma if considered symptomatic with pain or discomfort. Punctures were repeated if necessary.

Endpoints

The primary endpoint was the total seroma volume, which corresponded to the sum of the volume drained during hospitalization and the volume punctured during consultation, in patients with quilting suture and those without.

The secondary endpoints were the postoperative drainage volume, the formation of a seroma (defined by the occurrence of a symptomatic collection of fluid in the LDF compartment requiring a puncture after discharge), the volume punctured after discharge, duration of postoperative drainage, total drainage time (defined as the time from the date of surgery to the date of the last puncture), the occurrence and type of post-operative complications, graded according to the Clavien-Dindo classification, [13] the occurrence of functional sequelae (evaluated at 4 weeks and at 3 months) and post-operative pain. As the seroma was punctured if the patient was symptomatic, we didn’t studied the number of puncture considered highly variable and preferred to study the volume of fluid drained.

Pain during hospitalization was evaluated using the mean scores of the numerical scale (NS) collected daily. Long-lasting pain was assessed by the surgeon in consultation at 4 weeks and then at 3 months.

Statistical analysis

Data were analyzed using descriptive statistics. Quantitative variables were expressed as mean and standard deviation (SD), and qualitative variables as numbers and percentages. In order to identify a potential indication bias and account for it in the analyzes, we first assessed the association between placing quilting sutures in the latissimus dorsi compartment and the characteristics of patients or those of the surgical procedure.
Univariate analyses were performed using the Chi$^2$ or the Fisher exact tests for categorical data, and the Student or the Welch test for continuous variables. A multivariate logistic regression was used to estimate odds ratios (OR) and their 95% confidence intervals (CI). Details are provided in Appendix 1. The variables of interest (drainage volumes, puncture volume, total drainage time, durations, complications) were described according to quilting suture (yes/no) and the between-group (with vs without quilting suture) differences were analyzed using the Chi$^2$ or Fisher exact test for categorical variables and by Student or Welch tests for quantitative variables.

The total volume of drainage according to whether quilting suturing was done or not was analyzed by a multivariate linear regression adjusted for the variables potentially associated with quilting suture and those associated with seroma risk. The adjustment variables considered were: age, BMI, surgeon's level of experience (confirmed or not: defined by more than 10 LDF with quilting performed over the study period), the timing of breast reconstruction (immediate vs delayed), axillary surgery during the intervention (axillary node or sentinel lymph node dissection), and the surgical technique (classical LDF vs muscle-sparing LDF).

Continuous variables were included in the analysis without transformation, after verifying the absence of deviation from the linearity assumption using a spline function (detail in Appendix 2 for BMI).

In order to evaluate the effect of quilting suture according to BMI, an interaction term between the quilting suture variable and the BMI, categorized in three classes (BMI "normal" <25, overweight 25-30, obese ≥30), was included in the multivariate model.

A secondary analysis was performed considering the type of quilting suture as an explanatory variable. For this analysis, three groups were considered: no quilting suture, quilting suture with stitches, quilting suture with overedge stitches.
The comparison between groups - with vs without quilting suture – for each of the other endpoints was carried out using a multivariate model (linear regression with continuous variables, logistic regression with qualitative binary variables) considering the same co-variables as those listed for the analysis of the primary endpoint.

The analysis of risk factors (drainage volumes, durations, complications) was carried out by flap given that a patient could have a bilateral reconstruction.

All statistical analyzes were performed using STATA version 15.0 (StataCorp. 2017. Stata Statistical Software: Release 15. College Station, TX: StataCorp LLC).

Significance level was set at a p value of 0.05 for all analyses.

**RESULTS**

Description of the population and surgical procedures

Between 1st January 2016 and 31st December 2017, 110 patients who underwent breast reconstruction (immediate or delayed) using LDF were eligible to participate in the study. Of these, 108 were included; one patient declined and one was lost to follow-up. A total of 110 reconstructions were carried out: two patients underwent a bilateral mastectomy with immediate breast reconstruction. The primary endpoint analysis included 105 patients and 107 flaps (data were missing for 3 patients) (Figure 1).

During the study period, nine surgeons performed breast reconstructions using LDF, the number of interventions ranging from 3 to 30 per surgeon.

Table 1 details the general characteristics of the patients and the surgical technique, overall and based on whether a quilting suturing was carried out or not. The characteristics of the patients are usual for this population. Patients had a mean age of 49.7 years (9.3), 19% were smokers and 30% presented with ductal carcinomas in situ. The mean BMI was 26.9 kg/m² (4.1), 41 interventions (37%) were
performed in patients with a BMI<25, 45 (41%) in overweight patients and 24 (22%) in obese patients.

Quilting suture was performed in 69 cases (63%), and was significantly more frequent in immediate breast reconstruction than in delayed reconstruction (48/62 [77%] versus 21/48 [44%], \(p<0.001\)). Muscle-sparing LDF was used in 8 cases, including 3 with quilting suture, while a conventional latissimus dorsi flap was used in 102 cases, including 66 with quilting suture (38% versus 65%, \(p=0.15\)). Performing quilting suturing was surgeon-dependent (\(p<0.001\)) and was not related to the level of experience. In addition, there was no difference between cases with or without quilting suture in terms of characteristics of patient or disease. In multivariate analysis, quilting suture was significantly more frequent in immediate breast reconstruction (\(p<0.001\)) and classical latissimus dorsi flap compared to muscle-sparing (\(p=0.02\)) (detail of logistic regression in Appendix 1).

Out of the 63 reconstruction cases with informative quilting suture, 26 (41%) were done with overedge stitches and 37 (59%) with simple stitches.

Evaluation of the association between quilting suture and total drained volume

The mean total volume drained was 1238 mL (1111), with a median of 910 mL (range 30-7545). As shown in Figure 2, interventions with quilting suture led to a smaller total volume of drained lymph, but the difference was not significant in univariate analysis (1100 mL vs 1461 mL, corresponding to a difference of -361 mL, \(p=0.15\)). However, 3 patients had a total volume > 4000 mL, all three after LDF without quilting suture.

In order to account for potential confounding factors, the difference between groups was estimated by a multivariate analysis adjusted for age, patient BMI, number of acts performed by the surgeon, timing of reconstruction (immediate vs delayed), axillary surgery during the intervention and the surgical technique. Further
details are provided in Appendix 3. After adjusting for these covariates, the analysis revealed a significant difference of -502 mL between groups (SD = 231, p=0.03).

Compared with the group without quilting suture, a significantly smaller total volume of drained fluid was collected in patients in which quilting suture was used (-372 mL) and, in particular, with overedge stitches (-795 mL) (p=0.02) in multivariate analysis).

The difference in total drainage volume between the groups with and without quilting suture varies significantly according to the patient’s BMI (interaction test, p=0.01): while the difference associated with quilting suture is negligible for non-obese patients (-161 mL for women with BMI<25 and -42 mL for overweight women with BMI 25-30), it was -1819 mL for obese women (BMI ≥30).

Assessment of the association between quilting suture and other variables of interest

As summarized in Table 2, quilting suture was significantly associated with punctured volume after discharge (p=0.03) and with a lower incidence of pain 4 weeks after the operation (p=0.04). However, we did not observe any association with drainage volume or drainage duration during hospitalization, the occurrence of punctured seroma, the total duration of drainage, the complications or sequelae after the intervention.

DISCUSSION

Results on our series of 108 patients undergoing breast reconstruction with LDF shows a benefit of quilting suture which significantly decrease the total volume of fluid drained. In addition, the benefit of quilting suture for reducing drained fluid volume was significantly greater in obese women (BMI> 30) compared with non-obese women.
Performance of a quilting suture of the LD flap compartment in breast reconstruction was associated with a significant reduction in total fluid volume (with vs without quilting suture, -502 mL, p = 0.03). Our results are consistent with data from retrospective studies that also show a decrease in volume of post-operative seroma, seroma formation and duration of drainage, the latters not being significant in our study [5-13].

The surgical technique used to perform quilting suture can have a great impact on its efficacy. In our study, overedge stitching was superior to simple stitches in reducing the volume of the postoperative seroma leading to a significant decrease in the drained and punctured volume. In a retrospective study including 70 patients, the occurrence of seroma decreased in the overedge stitching group (0/47 in the quilting suture group vs 7/23 (30%) in the non quilting suture group) [14].

Other techniques to reduce the dead space in the latissimus dorsal compartment exist, and can also be associated with the quilting suturing [15-17]. In 2017, Hart et al. compared quilting suture vs other techniques (biological glue, triamcinolone acetonide or placebo) in a randomized monocenter study involving 96 patients [17]. Quilting suture was superior to other techniques in reducing the incidence of lymphocele and allowing earlier removal of the drains. A meta-analysis by Lee et al. in 2015, including 14 studies, showed a reduction in post-operative seroma formation, which was a result of the combined efficacy of quilting suture and fibrin adjunction [18].

Muscle-sparing LDF should also be favored because it decreases in our experience as reported the literature post-operative seroma. Indeed the limited dorsal dissection reduce the dead space, regardless of the use of quilting suture [7, 8].

Our study differs from most in that it involved a high proportion of obese women (22%) [9, 6, 16]. In obese patients, fluid production is greater than in patients
with normal BMI due to a larger dorsal dead space (see Appendices 2 and 3) [3, 4, 19].

In our study, the mean BMI was 26.9 kg/m² and the mean seroma volume was 1238mL (1111). In the study by Yan et al. carried out in 24 patients with a lower mean BMI of 21.3 kg/m², had lower seroma volume: 524 mL [6]. It is also for obese women that quilting suture is the most difficult to carry out, due to the lack of exposure and the difficulty to reach the limits of the cavity. We show that, obese patients benefited more from quilting suture than patients with a “normal” BMI in terms of reduced lymph volume.

In our series, quilting suturing did not increase the complication rate, which was low and comparable to that reported in the literature (9% of Grade 3 complications according to the Clavien Dindo classification) [9-11, 6].

The impact of quilting suture on back pain and the occurrence of functional sequelae is debatable. Firstly in our experience it didn’t increase the pain either immediately after surgery or at 3 months. However, it seems to have decreased the numerical scale reported 4 weeks after surgery (p=0.04). Only one study by Daltrey et al. reports similar results, with a decrease in the amount of level 1 analgesic on the first post-operative week in the group of patients with quilting suture [9].

On the other hand this result differs from previous reports in a prospective study, comparing from a functional point of view, a population having benefited or not from quilting suture [20]. Button et al showed a significant increase in the DASH score (clinical score based on a self-questionnaire on the ability of patients to perform daily life activities) translating a functional degradation immediately after intervention, at 3 and 6 weeks for patients with quilting suture but this difference was no longer significant on the long term.
The limitations of our study are related to its retrospective nature. Some patient data are missing, such as the quilting technique used (simple stitches or overedge stitches) or the pain and functional sequelae evaluation. Quilting suturing was carried out by 9 surgeons without a standardized approach. Surgical procedures such as quilting suture, as well as the choice of simple stitches or overedge stitches, depend on the surgeon. The dissection of the LDF can also be more or less extensive depending on the practice of the surgeon. The heterogeneity in practice limits the interpretation and comparison of the differences observed. The main strength of our study is the large number of patients included (108) and their representativeness of the population having LDF breast reconstruction. This allowed to carry out statistical analyses with a rigorous methodology of 69 flaps in the quilting group and 41 in the group without quilting.

CONCLUSION

According to our experience, LDF compartment quilting reduces significantly the total volume of drained lymph. The study also shows that this intervention is essential in obese women, who benefit more from quilting suture than BMI patients <25.

Conflit d’intérêt : aucun.
REFERENCES


FIGURES LEGENDS

Figure 1: Patient flow chart

Figure 2: Box-Plot of the total volume of lymph drained, depending on the realization or not of a quilting suture (description per flaps, N=107)
Figure 1: Patient flow chart

Box1: 110 patients with breast reconstruction by latissimus dorsi flap in 2016-2017
Box2: Exclusion, N=2
  - Opposition to data processing, N=1
  - Patient lost to follow up, N=1
Box3: 108 patients included in the study
  110 flaps
Box4: 40 patients without quilting suture
  41 flaps
  40 patients with available data
  41 flaps
Box5: 68 patients with quilting suture
  69 flaps
  Missing data, N=3
  65 patients with available data
  66 flaps
The lower and upper limits of each rectangle represent the 1st and 3rd quartiles of the distribution. The horizontal line inside the box represents the median value. The ends of whiskers are the values adjacent to 1.5 times the interquartile gap (the distance between the 1st and 3rd quartile). The dots above represent extreme values. Note: In the group without quilting suture, 2 values at 4380 and 4385 mL are superimposed.
<table>
<thead>
<tr>
<th>Characteristics</th>
<th>Total N=110</th>
<th>Without quilting N=41</th>
<th>With quilting N=69</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age in years, mean (standard deviation, SD)</td>
<td>49.7 (9.3)</td>
<td>49.8 (9.6)</td>
<td>0.82</td>
<td></td>
</tr>
<tr>
<td>Comorbidities</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Body Mass Index (BMI), kg/m², mean (SD)</td>
<td>26.9 (4.1)</td>
<td>27.0 (3.6)</td>
<td>0.83 (1)</td>
<td></td>
</tr>
<tr>
<td>Tobacco, N (%), 2 missing values (MV)</td>
<td>20 (19)</td>
<td>10 (15)</td>
<td>0.18</td>
<td></td>
</tr>
<tr>
<td>Histology type (2 missing values(2))</td>
<td></td>
<td></td>
<td>0.12 (3)</td>
<td></td>
</tr>
<tr>
<td>DCIS, N (%)</td>
<td>32 (30)</td>
<td>8 (21)</td>
<td>24 (35)</td>
<td></td>
</tr>
<tr>
<td>IDC, N (%)</td>
<td>73 (68)</td>
<td>29 (74)</td>
<td>44 (64)</td>
<td></td>
</tr>
<tr>
<td>Other, N (%)</td>
<td>3 (3)</td>
<td>2 (5)</td>
<td>1 (1)</td>
<td></td>
</tr>
<tr>
<td>Adjuvant therapy</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chemotherapy, N (%)</td>
<td>55 (50)</td>
<td>33 (30)</td>
<td>0.55</td>
<td></td>
</tr>
<tr>
<td>Radiotherapy, N (%)</td>
<td>62 (56)</td>
<td>37 (34)</td>
<td>0.45</td>
<td></td>
</tr>
<tr>
<td>Hormone therapy, N (%)</td>
<td>59 (54)</td>
<td>36 (33)</td>
<td>0.69 &lt;0.00 1</td>
<td></td>
</tr>
<tr>
<td>Breast reconstruction timing</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Immediate, N (%)</td>
<td>62 (56)</td>
<td>48 (70)</td>
<td>0.19 (4)</td>
<td></td>
</tr>
<tr>
<td>Delayed, N (%)</td>
<td>48 (44)</td>
<td>21 (30)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Axillary surgery (1 missing value)</td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Axillary node dissection, N (%)</td>
<td>46 (42)</td>
<td>26 (38)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sentinel lymph node dissection, N (%)</td>
<td>53 (49)</td>
<td>38 (55)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>None, N (%)</td>
<td>10 (9)</td>
<td>5 (7)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Surgical technique</td>
<td></td>
<td></td>
<td>0.15 (4)</td>
<td></td>
</tr>
<tr>
<td>Classical latissimus dorsi, N (%)</td>
<td>102 (93)</td>
<td>66 (96)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Muscle-sparing, N (%)</td>
<td>8 (7)</td>
<td>3 (4)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Type of quilting suture (6 missing values)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Quilting suture with overedge stitches, N (%)</td>
<td></td>
<td>26 (41)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Quilting sutures with simple stitches, N (%)</td>
<td></td>
<td>37 (59)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

SD = standard deviation  
DCIS = ductal carcinoma in situ, IDC = infiltrating duct carcinoma, other = lobular carcinoma  
(1) Welch test for mean comparison, performed due to rejection of the variance equality hypothesis.  
(2) Two prophylactic mammectomies not described  
(3) Chi² test comparing DCIS versus IDC and other  
(4) Fisher's exact test performed due to limited numbers in some categories  
The sum of percentages in column may differ from 100% due to rounding.
Table 2: Post-operative data, overall and according to the realization or not of a quilting suture (description per flaps, N = 110)

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>Total N=110</th>
<th>Without quilting N=41</th>
<th>With quilting N=69</th>
<th>P Univariat e analysis</th>
<th>P multivariat e analysis</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total drainage volume in mL, mean (SD) (3 MV)</td>
<td>1238 (1111)</td>
<td>1461 (1451)</td>
<td>1100 (817)</td>
<td>0.15 (1)</td>
<td>0.03</td>
</tr>
<tr>
<td>Drainage volume during hospitalization in mL, mean (SD)</td>
<td>586 (299)</td>
<td>580 (335)</td>
<td>589 (277)</td>
<td>0.88</td>
<td>0.40</td>
</tr>
<tr>
<td>Puncture volume after hospital discharge in mL, mean (SD) (3 MV)</td>
<td>655 (938)</td>
<td>881 (1241)</td>
<td>516 (661)</td>
<td>0.09 (1)</td>
<td>0.03</td>
</tr>
<tr>
<td>Punctured seroma, N (%) (1 MV)</td>
<td>84 (77%)</td>
<td>34 (83%)</td>
<td>50 (74%)</td>
<td>0.26</td>
<td>0.17</td>
</tr>
<tr>
<td>Post-operative drainage duration in days, mean (SD)</td>
<td>4.5 (1.1)</td>
<td>4.4 (1.2)</td>
<td>4.5 (1.0)</td>
<td>0.85</td>
<td>0.67</td>
</tr>
<tr>
<td>Total drainage time in days, mean (SD) (2 MVs)</td>
<td>42.5 (65.7)</td>
<td>50.2 (62.4)</td>
<td>37.1 (67.5)</td>
<td>0.28</td>
<td>0.33</td>
</tr>
<tr>
<td>Occurrence of complication</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No, N (%)</td>
<td>88 (80)</td>
<td>33 (80)</td>
<td>55 (80)</td>
<td>0.78 (4,5)</td>
<td>0.99</td>
</tr>
<tr>
<td>Grade I, N (%)</td>
<td>12 (11)</td>
<td>4 (10)</td>
<td>8 (12)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Grade IIb, N (%)</td>
<td>10 (9)</td>
<td>4 (10)</td>
<td>6 (9)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Presence of sequelae at 4 weeks or 3 months</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sequelea at 4 weeks, N (%) (40 MV)</td>
<td>30 (27)</td>
<td>9 (22)</td>
<td>21 (30)</td>
<td>0.23</td>
<td>0.28</td>
</tr>
<tr>
<td>Sequelea at 3 months, N (%) (39 MV)</td>
<td>28 (39)</td>
<td>8 (30)</td>
<td>20 (44)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sequelea type</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Amplitude problem, N (%) (36 MV)</td>
<td>23 (21)</td>
<td>8 (20)</td>
<td>15 (22)</td>
<td>0.84</td>
<td>0.74</td>
</tr>
<tr>
<td>Stiff skin feeling, N (%) (36 MV)</td>
<td>10 (14)</td>
<td>1 (4)</td>
<td>9 (19)</td>
<td>0.08 (4)</td>
<td>0.12</td>
</tr>
<tr>
<td>Pain</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Numerical scale, mean (SD)</td>
<td>2.6 (1.1)</td>
<td>2.6 (1.0)</td>
<td>2.6 (1.2)</td>
<td>0.97</td>
<td>0.80</td>
</tr>
<tr>
<td>Presence of pain at 4 weeks, N (%) (35 MV)</td>
<td>33 (44)</td>
<td>15 (54)</td>
<td>18 (38)</td>
<td>0.20</td>
<td>0.04</td>
</tr>
</tbody>
</table>

SD = standard deviation

MV= Missing value

(1) p-value associated with quilting effects in a multivariate model adjusted with age, body mass index, surgeon experience level, timing of breast reconstruction (immediate versus delayed), the realization or not of an axillary act in the same operative time, and the operative technique (classical latissimus dorsi versus muscle-sparing).

The sum of percentages in column may differ from 100% due to rounding.

(2) Welch test for mean comparison, performed due to rejection of the variance equality hypothesis.

(3) The evaluation includes all acts, with a volume equal to 0 in case there was no puncture after hospital discharge.

(4) Fisher’s exact test performed due to limited numbers in some categories.

(5) Comparison of the distribution between the absence of a complication and the occurrence of a complication.

(6) Complication graded according to the Clavien –Dindo classification.