Ann Surg Oncol (2019) 26:2773–2778
https://doi.org/10.1245/s10434-019-07411-x

Annals of
SURGICAL ONCOLOGY
OFFICIAL JOURNAL OF THE SOCIETY OF SURGICAL ONCOLOGY

ORIGINAL ARTICLE – BREAST ONCOLOGY

Omitting Postoperative Wound Drainage After Mastectomy With Skin-Flap Quilting

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ABSTRACT

Background. Seroma is the most frequent complication after mastectomy (ME) and axillary lymph node dissection (ALND). The quilting suture technique, in which skin flaps are sutured to the underlying muscle, was previously investigated and found to reduce seroma incidence after ME and ALND. This study aimed to investigate whether postoperative wound drainage can safely be omitted when quilting sutures are applied.

Methods. Two groups with a total of 251 consecutive patients who underwent ME, ALND, or both were retrospectively compared. The first group underwent quilting sutures with wound vacuum drainage, and the second group underwent quilting sutures without wound drainage. The primary outcome was the incidence of postoperative clinically significant seroma (CSS). The secondary outcomes were the incidence of postoperative infection, bleeding complications, wound dehiscence, and flap necrosis.

Results. The group without a postoperative drain (n = 166) had a significantly lower CSS incidence (8.4%) than the group with a postoperative drain (n = 85, 21.2%) ($p < 0.05$). In the multivariate analysis, no significant predictors were found for seroma formation. Wound complications significantly decreased, from 31.8% in the group with a drain group to 17.5% in the group without a drain ($p < 0.05$).

Conclusion. This study showed that the postoperative drain can be omitted when quilting sutures are applied in ME, ALND, or both. This facilitates day care mastectomy, eliminating drain-related care, discomfort, and related expenses.

Currently, one in seven women in the Netherlands and one in eight women in the United States will receive a breast cancer diagnosis during their lifetime.[1–3] One in three women with breast cancer will undergo mastectomy (ME), sometimes in combination with axillary lymph node dissection (ALND).[4]

The most common complication after breast cancer surgery is seroma formation. Seroma is a collection of fluid that can arise beneath the skin flaps after ME, ALND, or both.[5] The reported incidence varies from 15.5 to 92% depending on various factors such as the type of surgery or the preventive methods used.[6–8]

Seroma formation is associated with an increase in other complications such as surgical-site infection (SSI), flap necrosis, hematoma, delayed wound healing, and lymphedema.[9–11] Because seroma interferes with wound healing, it can lead to a prolonged postoperative hospital stay, increased costs, and sometimes a delay of adjuvant treatment.[12,13]

Both the pathophysiology and preventive measures regarding seroma formation are much discussed topics. Many different techniques to prevent seroma formation have been studied, including fibrin glue, bovine thrombin, external compression, and shoulder immobilization, all without a significant impact on seroma incidence.[14–17] However, mechanical closure of the dead space after mastectomy was found to reduce the formation of seroma.[18–20] Two studies on quilting found a significant reduction in seroma incidence after ME and ALND ranging from 40 to 10 and from 80 to 22%.[21,22]

First Received: 5 November 2018;
Published Online: 29 May 2019

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Despite lack of evidence, postoperative wound drainage still is standard practice to reduce seroma formation. Postoperative drain policy varies widely in terms of what type of drain is used, how long the drain is left in situ, and how many drains are inserted.[23–26] Drains are associated with increased patient discomfort, postoperative pain, and longer hospital stay.[23,27,28] No difference in seroma formation after breast cancer surgery has been found between patients who had postoperative drainage and those who had no postoperative drainage.[25–27] These results suggest that a postoperative drain can be omitted, albeit with residual seroma.

The quilting suture technique without a postoperative drain has been investigated in a small number of studies. The incidence of seroma differed significantly between the group with quilting but no drain and the group with conventional closure using a drain. It did however result in a significantly shorter hospital stay.[12,24,29,30] In the study of Ouldamer et al.[31] the occurrence of seroma was significantly less frequent in the group with quilting but no drain (17%) than in the group with conventional closure using a drain (51.7%).

At the dedicated breast center part of a teaching hospital, we have applied the quilting suture technique since 2010.[18] It drastically decreased the seroma incidence and in time led to omitting the postoperative drain. We retrospectively analyzed two consecutive groups of patients after ME, ALND, or both. The first group received quilting sutures with wound drainage, and the second group received quilting sutures without wound drainage. The current study aimed to investigate the effect that omitting postoperative wound drainage for quilted patients had on the incidence of seroma and other wound complications.

METHODS

We retrospectively analyzed 251 consecutive patients who underwent ME, ALND, or both with quilting sutures in a high-volume breast center. This included ALND with breast-conserving surgery, in which only the axilla is quilted. Data were extracted from the clinical records. All patients 18 years or older since implementation of the quilting suture technique were included in the study. This included primary and recurrent disease as well as prophylactic mastectomy. The surgeries were performed between October 2010 and August 2017. The patients who received an immediate reconstruction of the breast were not quilted and thus were excluded from this study. Male patients and patients with distant metastases (stage M1) diagnosed before surgery or within 30 days after surgery were excluded as well. The research was reported to and approved by the local medical ethical committee (2019-5277).

Surgical Technique

With the quilting suture technique, the skin flaps are sutured to the underlying pectoralis major muscle, with the aim of leaving the pectoral fascia intact during surgery. The sutures, multifilament, size 0, and large needle are applied in parallel evenly spaced rows. The ALND encompasses levels 1 and 2.

The quilting stitches start cranially and run in a caudal direction. Suturing of the latissimus dorsi muscle, the anterior serratus muscle, the subcutaneous tissue, and the lateral margin of the major pectoral muscle is performed. A detailed description of the quilting sutures technique is presented in the study by ten Wolde et al.[22]

In the current study, for the postoperative drainage group, one low-vacuum suction drain was placed in simple ME or ALND, and two were placed in the case of ME with ALND. After every surgery, butterfly stitches were applied longitudinally to the surface of the wound, and a large surgical gauze was placed on top. A compressive bandage (Tubigrip, Mölnlycke Health Care BV, Breda, Netherlands) was applied over the gauze to keep it in place. The compressive bandage was removed within a couple of days depending on patient comfort. Postoperative shoulder movement was encouraged. If applied, drains were removed on the day of discharge regardless of the drain production, or no later than 36 h after surgery. All patients remained in the hospital overnight and were discharged the next day.

End Points

The primary outcome in this study was the incidence of clinically significant seroma (CSS). Seroma was classified as CSS when an aspiration of fluid or other intervention was needed. For the patient group with postoperative drainage, this was after removal of the drain. The total amount of drainage was not registered.

The secondary outcomes were surgical-site infections (SSI), bleeding complications, and other wound complications such as wound dehiscence and flap necrosis. These complications were scored only when an intervention was necessary or when additional clinical visits were needed. We used the Clavien-Dindo classification to score the severity of the complication.[32] Complications had to occur within 30 days of surgery. Per protocol, follow-up assessment consisted of a outpatient clinic visit 10–14 days after surgery. Complications diagnosed during additional unscheduled visits at the patient's initiative within the 30-day period were included in the analysis.

Relevant patient characteristics were selected based on the literature. Age, smoking, body mass index (BMI), American Society of Anesthesiology (ASA) classification, neoadjuvant therapy, and tumor stage were analyzed as potential risk factors for seroma development and thus were relevant patient characteristics. Type of surgery, ME, ALND, and the combination of ME and ALND were analyzed as potential risk factors for the development of CSS.[33]

Statistical Analysis

Statistical analysis was performed using SPSS version 22 (IBM Corp, Armonk, NY, USA). Continuous data are presented as mean or median ± SD, and a Student's *t* test was used to analyze normally distributed data. Non-normally distributed data were analyzed by the Mann–Whitney *U* test. Categorical data are presented as frequency and percentage and were compared using the Chi square test and Fisher's exact test. The Cochran–Mantel–Haenszel test was used to stratify for different types of surgery. All *p* values lower than 0.05 were considered significant.

RESULTS

Patient Characteristics

The study enrolled 166 patients in the quilting group without postoperative drainage and 85 patients in the quilting group with postoperative drainage. The patient characteristics were similar between the two groups, except for the type of surgery (Table 1).

Primary Outcomes

The incidence of CSS decreased from 21.2 to 8.4% ($p = 0.004$) when a postoperative drain was omitted. The number of SSIs was similar between the two groups, with an incidence of 10.6% in the group with postoperative drainage and 7.8% in the group without postoperative drainage. Overall, wound complications decreased significantly, from 31.8% in the group with the drain and 17.5% in the group without the drain ($p = 0.010$) (Table 2).

Of the 251 patients, 164 underwent ME (group A), 35 underwent ALND (group B), and 52 underwent ME and ALND (group C) (Table 3). Using the Cochran–Mantel–Haenszel test to stratify for the different types of surgery, the drain was not shown to be associated with a higher incidence of CSS (odds ratio [OR] with drain, 2.18; 95% confidence interval [CI], 0.99–4.84), although it was nearly significant ($p = 0.054$).

TABLE 1 Patient characteristics

Characteristics	With drain ($n = 85$) *n* (%)	Without drain ($n = 166$) *n* (%)	*p* Value
Median age (years)	63 ± 13.68	61 ± 13.10	0.322
Median BMI (kg/m^2)	28 ± 4.84	26 ± 5.68	0.097
Smoking	10 (11.8)	36 (21.8)	0.052
ASA classification			
1	22 (26.5)	49 (29.7)	0.692
2	54 (65.1)	99 (60.0)	
3	7 (8.4)	15 (9.1)	
4	0 (0)	2 (1.2)	
Type of surgery			
ME	38 (44.7)	126 (75.9)	0.000
ALND	20 (23.5)	15 (9.0)	
ME and ALND	27 (31.8)	25 (15.1)	
TNM stage			
In situ	6 (7.1)	14 (8.5)	0.928
1	19 (22.4)	41 (24.8)	
2	40 (47.1)	70 (42.4)	
3	17 (20.0)	30 (18.2)	
ypT0N0	2 (2.4)	7 (4.2)	
No malignancy	1 (1.2)	3 (1.8)	

BMI body mass index, *ASA* American Society of Anesthesiology, *ME* mastectomy, *ALND* axillary lymph node dissection

TABLE 2 Comparison of outcomes

	With drain ($n = 85$) *n* (%)	Without drain ($n = 166$) *n* (%)	*p* Value
Total wound complications	27 (31.8)	29 (17.5)	0.010
Clinically significant seroma	18 (21.2)	14 (8.4)	0.004
Surgical-site infections	9 (10.6)	13 (7.8)	0.465
Hematoma	1 (1.2)	2 (1.2)	0.735
Other wound complications	4 (4.7)	4 (2.4)	0.267

In addition, a multivariate logistic regression analysis of seroma development was performed. The variables included were age, BMI, smoking, ASA classification, type of surgery, tumor-node-metastasis (TNM) stage, and use of a drain. None of the variables were found to be significant predictors for seroma development.

TABLE 3 Comparison of outcomes for subgroups

	With drain	Without drain	*p* Value
Group A: ME	*n* (%)	*n* (%)	
(*n* = 164)	*n* = 38	*n* = 126	
CSS	5 (13.2)	8 (6.3)	0.181
SSI	3 (7.9)	11 (8.7)	1.000
Total complications	8 (21.1)	20 (15.9)	0.457
Group B: ALND	*n* = 20	*n* = 15	
(*n* = 35)			
CSS	4 (20.0)	3 (20.0)	1.000
SSI	3 (15.0)	1 (6.7)	0.619
Total complications	7 (35.0)	3 (20.0)	0.458
Group C: ME and ALND	*n* = 27	*n* = 25	
(*n* = 52)			
CSS	9 (33.3)	3 (12.0)	0.068
SSI	3 (11.1)	1 (4.0)	0.611
Total complications	12 (44.4)	6 (24.0)	0.122

DISCUSSION

The results of this study show that omitting the postoperative drain when quilting sutures are applied in ME, ALND, or both significantly decreased the incidence of CSS without increasing the risk of other wound complications. The total rate of wound complications also was significantly less in the group without a postoperative drain. The incidence of CSS in our study population was 21.2% in the group with the postoperative drain versus 8.4% in the group without the postoperative drain.

Other studies have described seroma incidences varying from 17 to 61% for groups in which the drain was omitted when quilting sutures were applied.[24,30,31] This large variety in observed seroma incidence might have been due to the use of different grading scales for seroma severity and thus a different definition of seroma. Some researchers have discovered seroma in 92% of their patients based on ultrasound. However, not even half of these patients (42%) required aspiration. Other authors have even aspirated any clinically palpable seromas.[5,32] Notably, the rate of CSS in our study was considerably lower although CSS was defined in a way comparable with other quilting studies and was scored only when an aspiration or other treatment was necessary.[29]

The incidence of CSS was significantly lower in our patient group without the postoperative drain. This difference can partially be explained by the learning curve effect. The group treated with postoperative drainage underwent surgery shortly after the introduction of the quilting technique. Furthermore, we hypothesized that the drain impedes proper quilting with tight sutures, and thus skin flap fixation is less effective due to looser sutures. Multivariate analysis showed no significant effect of omitting drainage on seroma formation.

In our hospital, the drain was first omitted for patients undergoing simple ME, resulting in a higher number of ME in the group without a postoperative drain. To stratify for the type of surgery, a Cochran–Mantel–Haenszel test with an odds ratio of 2.18 ($p = 0.054$) and a multivariate regression analysis were performed. Both demonstrated no significant influence of type of surgery on seroma formation.

The standard practice of using postoperative wound drainage after breast cancer surgery has been questioned for years. In a systematic review, He et al.[33] came to the conclusion that drainage does reduce seroma formation after ALND. This contrasts with multiple studies that found no difference in the rate of seroma formation with or without the use of postoperative drainage.[23,34–36]

In our study, omitting the drain was associated with a significant decrease in the incidence of CSS. Ouldamer et al.[31] also found a decrease in seroma with omission of a drain, although in their study, not all the patients received the quilting sutures technique. In several studies, the use of a postoperative drain was associated with a higher incidence of SSIs.[35,37]

Although the rate of SSI was higher in the group with a postoperative drain in our study, these results were not significant. Seroma also can lead to the development of other wound complications such as SSI, wound hematoma, and flap necrosis. Therefore, a lower incidence of seroma is expected to result in fewer other wound complications.[6,25] We observed a nonsignificant decrease in other wound complications. However, significance might not have been reached due to the small number of events.

To our knowledge, we are the first to investigate the role of the postoperative drain in patients who received the quilting suture technique. Omitting the postoperative drain in combination with quilting sutures has previously been compared with conventional closure using a postoperative drain.[12,24,29,30] Our results show that omitting the postoperative drain is feasible when patients are quilted, without increasing seroma formation or other surgical complications.

The limitations of this study were its retrospective nature and the small number of patients in the subgroup analysis. In group A (ME) a disparity in the number of patients existed between the group with a postoperative drain and the group without a drain. In group B (ALND) and group C (ME and ALND), the numbers probably were too small for statistical significance to be reached. Because this study was retrospective, it carried a risk of missing

data collected from the patient files. Overall the electronic patient files were complete, thus providing a complete database.

A prospective multicenter study will be performed in which the quilting suture technique without drainage will be compared with the standard treatment (conventional wound closure with postoperative drainage) used in the vast majority of hospitals. Together with seroma and other wound complications, postoperative pain, shoulder function, cosmetic outcome, and time to adjuvant therapy will be studied.

In conclusion, the postoperative drain should be omitted after ME, ALND, or both when quilting sutures are applied. This opens the possibility of offering surgery for patients in daycare and eliminates drain-related care, complications, discomfort, and associated expenses.

DISCIOSURE The authors declare that they have no conflict of interest.

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