

Quilting: A Cost-effective Technique to Reduce Seroma after Mastectomy

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ABSTRACT

Introduction: Seroma is the most common complication after mastectomy. Various previously reported methods have all been ineffective in preventing seroma and therefore, drains are traditionally used. Mechanical closure of the dead space using quilting sutures has been found to reduce the incidence of seroma. The aim of this study was to examine the effect of quilting on postoperative seroma formation after mastectomy in patients who underwent quilting compared to those who underwent conventional wound closure.

Methods: We retrospectively reviewed all patients who underwent a mastectomy between 2020 and 2023. In the quilting technique, mastectomy skin flaps were sutured to the pectoralis major muscle or fascia by interrupted deep dermal sutures using size 3/0 absorbable multifilament suture with round-body needle. Only one drain was used and it was removed if output was less than 30 ml per 24 hours for 3 consecutive days.

Results: 44 patients underwent conventional wound closure and 32 had quilting suture. On the first postoperative day, patients who underwent quilting had approximately 33% less volume of drainage than those with conventional wound closure (71.7 vs 106.7 ml, $P = 0.006$). Quilting suture was associated with a shorter time to drain removal (8.35 vs 13.1 days, $P = 0.007$). There was no difference in terms of surgical site infection and other wound complications, including hematoma and wound dehiscence.

Conclusion: Quilting sutures after mastectomy reduces postoperative seroma and time to drain removal by 30-40% compared to conventional wound closure. Quilting reduces healthcare consumption through reduction in wound complications, less clinic visits, shorter hospital stays and less patient discomfort.

Keywords

Mastectomy, Post mastectomy seroma, Quilting sutures, Prolonged drain output, Breast cancer.

Introduction

Despite a trend for breast conserving surgery (BCS), a third of patients with breast cancer still undergo mastectomy, with or without axillary dissection [1]. The most common complication following breast cancer surgery is seroma underneath the skin flaps [2]. The reported incidence of seroma after mastectomy in the literature ranges between 15-90%, depending on several risk

factors such as type of surgery, drainage system and instrument used for tissue dissection [3-6]. Seroma formation is associated with an increase in other complications, including haematoma, skin flap necrosis, wound infection, delayed wound healing and lymphoedema, with repeated visits to the outpatient clinic, increased healthcare costs and delay in starting adjuvant therapy, all leading to patient anxiety and discomfort [7-9].

Various methods to prevent seroma formation have been reported, including fibrin glue, thrombin sealants, pressure dressing and shoulder immobilization, all of which have shown to be ineffective

in preventing seroma, and some are costly [10-14]. The conventional method of reducing seroma formation is suction drainage [1], however, drains are associated with patient discomfort, risk of infection, prolonged hospital stay (in institutions where patients are discharged only after drain removal) or need for drain care at home and postoperative wound care in the outpatient clinic [15]. Mechanical closure of the dead space after mastectomy was found to be an effective way to reduce the incidence of seroma postoperatively [16]. The quilting suture technique, which involves fixation of the skin flaps to the underlying pectoralis major muscle to obliterate the dead space, has been reported to significantly reduce the formation of seroma [17-20]. Recent literature even suggests that flap fixation with quilting sutures obviates the need for wound suction drainage [8].

We have been applying the quilting suture technique at our tertiary oncology center since 2020. The aim of this retrospective study was to examine the effect of quilting on postoperative seroma formation, determined by the drain volume and timing of drain removal, in mastectomy patients who underwent quilting compared to those who underwent conventional wound closure.

Materials and Methods

The study method was reviewed and approved by the Institutional Review Board (IRB) of King Fahad Specialist Hospital in Dammam, Saudi Arabia (IRB study number SUR0354). Female and male patients over the age of 18 who underwent mastectomy for breast cancer and those who had risk-reducing mastectomies were included in the study. Patients who had BCS or immediate breast reconstruction after mastectomy were excluded. Data was collected from electronic medical records and patients' drain charts. For patients who met the inclusion criteria, the following data was retrospectively analyzed: age at diagnosis, body mass index (BMI), menopausal status, co-morbidities, history of neoadjuvant systemic therapy, type of surgery, technique of wound closure, drain output, time to drain removal, incidence of surgical site infection (SSI) and wound complications (including dehiscence and haematoma).

Descriptive analyses were used to summarize the data and compare variables between the quilting technique and conventional wound closure. Continuous variables were compared using the Student's *t* test. Categorical variables were evaluated using the Fisher's exact test. Statistical analysis was performed using the SPSS package, version 29.0 (SPSS Inc, Chicago, IL) We considered a *P* value of less than 0.05 as significant.

Surgical Technique

In all patients, dissection of the mastectomy skin flaps was done using unipolar diathermy and Ligasure was used for axillary lymph node dissection (ALND), if it was indicated. Our method of conventional wound closure following mastectomy is closing the skin incision by deep dermal sutures using 3/0 absorbable suture, followed by 4/0 monofilament absorbable subcuticular suture for the skin. A low vacuum closed suction drain was placed beneath the skin flaps and the drain was removed if output was less than 30 ml per 24 hours for 3 consecutive days.

In the quilting suture technique, mastectomy skin flaps were sutured to the pectoralis major muscle fascia by alternating, interrupted deep dermal sutures, using size 3/0 absorbable multifilament suture with round-body needle (Figure 1). If the pectoralis fascia was very thin or was excised with the breast, the sutures would be fixed to the pectoralis muscle fibers. The sutures were placed about 3-5 cm apart. The superior skin flap was quilted from top to bottom in a few alternating rows, from medial to lateral. The inferior skin flap was quilted from bottom to top, in the same manner. Deep dermal and skin sutures at the incision were similar to those of the conventional wound closure. Similarly, a drain was used and removed using the same criteria for removal as outlined previously. Only one drain was used for each patient. If ALND was performed, the drain was kept in the cavity of the dissected axilla rather than beneath the mastectomy skin flap.

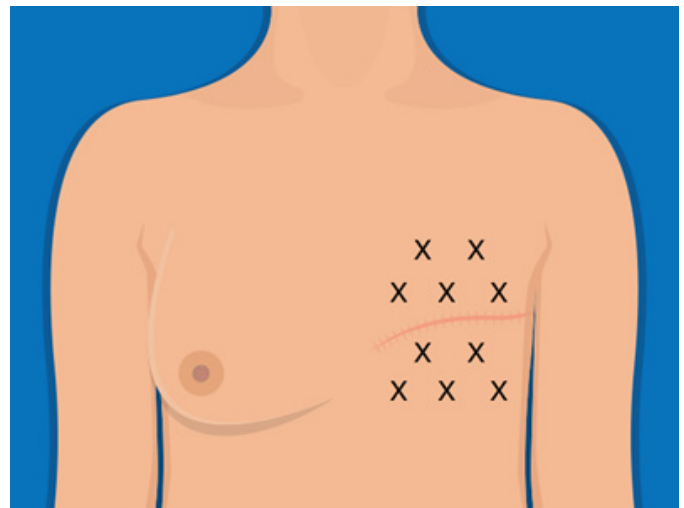


Figure 1: Illustration of interrupted quilting suture technique.

Results

A total of 76 patients were included in the study: 44 patients underwent conventional wound closure and 32 had quilting suture. The mean age was 51 years (range 27-73). 41 (53.9%) patients had left-sided mastectomy. Approximately two third of the patients underwent neoadjuvant systemic therapy. 11.8% of patients had mastectomy with no axillary surgery. The majority (58%) underwent sentinel lymph node biopsy (SLNB) and 21 (27%) patients underwent ALND. Of the mastectomies performed, 61 were for invasive ductal carcinoma, 7 for invasive lobular carcinoma, 4 for ductal carcinoma in situ and 1 for a patient with large Phyllodes tumour. There were 3 cases of risk-reducing mastectomy, two for lobular carcinoma in situ and one for pathogenic BRCA1 mutation. There were no significant differences in baseline characteristics between the two groups (Table 1).

Outcome data are presented in Table 2. On the first postoperative day, patients who underwent quilting had significantly less volume of drainage compared to those who underwent conventional wound closure (71.7 vs 106.7 ml, *P* = 0.006). Overall, the daily average drain output was lower in the quilted group (41 vs 36 ml), but this difference did not achieve statistical significance (*P* = 0.205).

Quilting suture was significantly associated with a shorter time to drain removal (13 vs 8 days, $P = 0.007$). There were no significant differences between the two groups in terms of SSI (6.25% vs 13.6%, $P = 0.455$) and wound complications (3.12% vs 6.81%, $P = 0.634$), including hematoma and wound dehiscence. After drain removal, there was no reported seroma in both groups within 3 months follow up.

Age	Conventional closure (n = 44)	Quilting suture (n = 32)	P value
Mean	50 ± 11.25	53 ± 13.03	0.140
BMI			
Mean	28.7 ± 5.88	28.1 ± 7.15	0.355
Menopausal status			
Premenopausal	26	17	
Postmenopausal	18	15	0.604
Co-morbidities			
Hypertension	11	8	0.939
Diabetes mellitus	9	4	0.312
Dyslipidaemia	3	2	0.873
Hypothyroidism	2	3	0.439
Neoadjuvant therapy			
Yes	29	22	0.943
Type of axillary surgery			
None	5	4	0.947
SLNB	26	18	0.604
ALND	13	10	0.713
Laterality			
Left breast	23	18	
Right breast	21	14	0.731

Table 1: Clinical characteristics of the study population.

	Conventional closure	Quilting suture	P value
Postoperative day 1 drain output (in ml)	106.7 ± 46.5	71.7 ± 34.6	0.006
Mean daily drain amount (in ml)	40.8 ± 28.5	35.7 ± 15.5	0.205
Time to drain removal (in days)	13.1 ± 7.1	8.35 ± 3.99	0.007
SSI	13.6%	6.25%	0.455
Wound complications	6.81%	3.12%	0.634

Table 2: Outcome comparisons between the two groups.

Discussion

In the present study, we evaluated the effect of quilting after mastectomy on postoperative seroma formation. We found that quilting reduces the drain output on first postoperative day after mastectomy by almost 33%. Additionally, quilting shortens the time to drain removal by approximately 40%. To our knowledge, this is the first study from the Middle East comparing simple interrupted quilting sutures with conventional wound closure after mastectomy.

We did not record the operation time for cases where quilting was performed, compared with those undergoing conventional wound closure. However, in our experience, it takes approximately 10 minutes to perform quilting sutures. This is supported by a study

that found, when quilting suture was applied, it required 10-20 more minutes to operate than the conventional way [8]. Another study revealed no significant difference in operative time between the two wound closure methods [15]. Quilting is a very simple technique, has a fast learning curve and can be performed by resident surgeons in training. Cosmetic result, including skin dimpling and scar retraction, have been previously reported as drawbacks of the quilting technique [1]. This sign is only observed in obese patients with thick skin flaps. If the skin flaps are not very thick, the dimpling on the skin disappears as the skin flaps are pulled to the center once the skin incision is closed. If the skin dimpling persists at the end of the operation, it eventually fades at follow-up after the absorption of the suture, resulting in a smooth closure of the overlying skin. Skin dimpling usually resolves within 2-3 weeks in our experience. This has also been previously observed by other authors [18]. We hypothesize that using short half-life absorbable sutures prevents the persistent tethering of the skin. It has also been reported that there are no differences in skin appearance 1 year after surgery, with significantly better patient reported cosmetics with quilting sutures [15].

Another concern is that the tight closure resulting from quilting sutures, and hooking the skin to the underlying muscle may induce more pain and patient discomfort, with need for prolonged duration of analgesics in the postoperative period [18]. We have not observed an increase in patient's reported pain or in duration of analgesia consumption. One study found that the type and duration of analgesic use did not differ between patients who had quilting or conventional wound closure [19]. Another study reported that quilting was associated with less pain compared to conventional closure [1]. Seroma is a risk factor for the development of SSI [6]. Quilting has been found to be associated with less frequent aspirations, flap necrosis and SSIs [8,18]. A similar decrease in seroma and associated complications, such as hematoma, delayed wound healing and wound dehiscence, has also been reported in patients undergoing quilting [1,15]. We believe that quilting reduces these wound complications by reducing the duration of drain use and reducing the tension on the incision. The multiple-point quilting technique distributes the wound tension on the whole flap area, ensuring tension-free closure at the incision. Hence, preventing wound dehiscence, delayed healing and infection. Our study shows that quilting is associated with approximately 50% decreased rate of SSIs and wound dehiscence compared to the other group, however, this was not statistically significant, likely due to small sample size and small number of events. The rate of hematoma was not different in both groups, although the idea of placing sutures into the muscle may be concerning for bleeding complications. The trick is to use a round-body needle and to place the suture in the fascia of the muscle whenever possible. We do not routinely excise the pectoralis fascia during mastectomy unless it is necessary to secure a negative deep margin at the site of the tumor.

The mechanism of seroma formation is probably multifactorial and is still poorly understood [18]. Nevertheless, mechanical closure of the dead space is key to preventing seroma formation [6]. A variety of different techniques in reducing seroma have been

tried, including fibrin glue, steroids and thrombin sealants, all have been demonstrated to be ineffective and costly [11-13]. Quilting, however, appears to be more clinically effective in restoring the integrity of tissue planes and a cost-effective method to reduce seroma after mastectomy, while potentially lowering the costs of postoperative complications like, prolonged hospitalization, additional clinic visits and longer postoperative recovery [15].

Limitations of our study include its retrospective design and a relatively small sample size. Due to the significant increase in BCS rates, especially after the implementation of oncoplastic surgery, and the availability of immediate implant reconstruction after mastectomy, there are less patients undergoing simple mastectomy without reconstruction, and this explains the small sample size in our study. Our single-surgeon experience aimed to standardize the surgical technique and postoperative wound care for all patients, which helps eliminate bias and reduce confounding variation of multiple surgeons. Although the providers who performed follow-up examination were not blinded to the techniques of wound closure, we followed a strict drain removal policy as outlined earlier. Nevertheless, our study shows potentially practice-changing results for mastectomy wound closure in favor of quilting suture technique.

Conclusion

The quilting suture technique after simple mastectomy significantly reduces postoperative seroma and time to drain removal, compared to conventional wound closure, while retaining the use of a drain. Quilting reduces healthcare consumption and patient discomfort. This result encourages omitting the use of a drain in patients undergoing quilting sutures after mastectomy, an ongoing research at our center.

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