

A Randomized Controlled Trial on Effectiveness of Quilting Method in Ventral Hernia and Its Outcome in a Tertiary Care Hospital

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Abstract

Background: Ventral hernia repair often involves onlay mesh placement, which can create a dead space leading to seroma formation. Seroma – an accumulation of serous fluid in the surgical wound – is a common postoperative complication. Quilting sutures, which tack the subcutaneous flap to the underlying fascia, are proposed to obliterate dead space and reduce seroma. We conducted a randomized controlled trial (RCT) to evaluate whether quilting sutures reduce postoperative complications in ventral hernia repair. **Material and Methods:** In this prospective RCT, 73 patients undergoing elective onlay mesh repair for ventral/incisional hernia were randomized to either standard closure (No Quilting, n=38) or closure with additional quilting sutures (Quilting, n=35) of the subcutaneous flap to the rectus sheath. Key outcomes were postoperative seroma volume (day 1 and total), time to drain removal, length of hospital stay, surgical site infection (SSI), and wound dehiscence. Wound condition was graded using a standardized score on days 1, 3, 7, and 14. **Results:** Baseline demographics (age, gender) were similar between groups (Table 1). On postoperative day 1, mean seroma volume was significantly lower in the Quilting group (37.4 ± 10.7 mL) than in controls (44.7 ± 8.9 mL; $p=0.002$). Cumulative seroma output was also markedly reduced with quilting (311.1 ± 99.3 mL vs 432.1 ± 113.1 mL; $p<0.001$). Patients who had quilting required drains for fewer days (7.4 ± 1.6 vs 10.5 ± 2.2 days; $p<0.001$) and had shorter hospital stays (8.8 ± 1.9 vs 14.6 ± 6.0 days; $p<0.001$). Quilting patients had better wound healing scores by day 7. Notably, surgical site infections were significantly lower in the Quilting group (21 of 35, 60.0%) than in controls (33 of 38, 86.8%; $p=0.009$). Wound dehiscence rates were low and not significantly different. **Conclusion:** Quilting sutures significantly reduced postoperative seroma volumes, shortened drainage time, and lowered infection rates in open ventral hernia repair. These findings support routine use of quilting to eliminate dead space in hernia surgeries. Further studies should confirm the long-term impact on hernia recurrence.

Keywords: Ventral hernia, seroma, quilting sutures, randomized controlled trial, wound infection.

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INTRODUCTION

Ventral incisional hernias are common after abdominal surgery, often requiring mesh reinforcement.^[1] However, creating a large flap and dead space predisposes to postoperative seroma – a fluid collection of plasma/lymph in the wound.^[2] Seromas occur in up to ~10% of mesh repairs and can lead to complications such as infection or wound dehiscence.^[3] Thus, minimizing seroma is important for recovery.^[4] Quilting sutures (also known as progressive tension sutures) have been proposed to reduce this dead space.^[5] These sutures anchor the underside of the skin flap to the fascia, theoretically preventing fluid accumulation. Some studies suggest quilting can significantly decrease seroma formation.^[6] For example, Sridhar et al. found no seromas in a quilting group versus 32% in a control group during ventral hernia repair.^[6] Similarly, Kumar et al.^[7] reported dramatically lower seroma rates with quilting sutures. Quilting has also reduced drainage in abdominoplasty and mastectomy series, pointing to improved wound healing. However, quilting requires additional operative time and its effects on infection or other outcomes have been variably reported. We therefore performed a randomized trial to rigorously evaluate the

impact of quilting sutures on early outcomes after open ventral hernia repair.^[7]

MATERIALS AND METHODS

Study Design: This was a single-center prospective randomized controlled trial conducted at a tertiary care hospital in India. Institutional review board approval was obtained and written informed consent was given by all patients. Adult patients with ventral or incisional hernias suitable for onlay mesh repair were included. Exclusion criteria were contaminated wounds, immunosuppression, or inability to follow up. Seventy-three patients were randomly assigned (opaque envelopes) to the

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Quilting group (n = 35) or the No Quilting group (n = 38).

Surgical Technique: All operations were performed via a midline abdominal incision. After primary fascial closure, a synthetic onlay mesh was fixed over the closure in all patients. In the Quilting group, additional interrupted absorbable sutures were placed between the undersurface of the skin flap and the anterior rectus sheath in a quilt-like pattern. These sutures were spaced evenly to obliterate dead space. In the No Quilting group, standard subcutaneous closure was done without this technique. Closed suction drains were placed in the subcutaneous space in all cases.

Outcome Measures: The primary outcomes were seroma formation (measured as drain output) and drain duration. Drain output was recorded on postoperative day 1 and cumulatively until drain removal. Secondary outcomes included length of hospital stay, surgical site infection (SSI), wound dehiscence, and wound healing score. SSI was

defined by CDC criteria (purulent drainage, erythema, or need for antibiotics). Wound healing was assessed on postoperative days 1, 3, 7, and 14 using a standardized score (0=normal to 5=severe) for redness, swelling, and discharge.

Statistical Analysis: Data are reported as mean±SD or number (percentage). Continuous variables were compared with independent t-tests; categorical variables with Chi-square or Fisher's exact test. The nonparametric Mann–Whitney U test was used for wound score comparisons. A two-tailed p-value < 0.05 was considered significant. Analysis was performed with SPSS v26 (IBM).

RESULTS

The Quilting (n=35) and No Quilting (n=38) groups were comparable in baseline characteristics [Table 1]. The mean age was ~48 years in each group and about 40% of patients were male; these differences were not statistically significant.

Table 1: Baseline demographics of study patients (mean±SD or n%).

Characteristic	Quilting (n=35)	No Quilting (n=38)	p-value
Age (years), mean ± SD	47.7 ± 9.3	48.2 ± 9.5	0.684
Male sex, n (%)	13 (37.1%)	18 (47.4%)	0.377

Table 2: Postoperative outcomes. Values are mean ± SD (drain output) or days

Outcome	Quilting (n=35)	No Quilting (n=38)	p-value
Day 1 Seroma (mL)	37.4 ± 10.7	44.7 ± 8.9	0.002
Total Seroma (mL)	311.1 ± 99.3	432.1 ± 113.1	<0.001
Drain removal (days)	7.4 ± 1.6	10.5 ± 2.2	<0.001
Hospital stay (days)	8.8 ± 1.9	14.6 ± 6.0	<0.001

Table 2 summarizes the primary outcomes. On postoperative day 1, mean drain output (seroma) was significantly lower in the Quilting group (37.4 ± 10.7 mL) than in the No Quilting group (44.7 ± 8.9 mL; p = 0.002). Similarly, total postoperative seroma output was significantly reduced by quilting (311.1 ± 99.3 mL vs 432.1 ± 113.1 mL; p<0.001). Patients in the Quilting group required drains for fewer days and had shorter hospital stays [Table 2].

[Figure 1] shows mean wound healing scores on postoperative days 3, 7, and 14 for each group. The Quilting group had consistently lower (better) scores, with statistically significant improvement by day 7 (not shown).

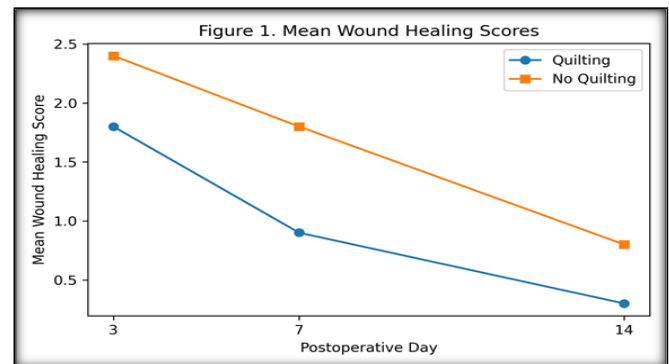


Table 3: Wound complications in each group (number and percentage).

Complication	Quilting (n=35)	No Quilting (n=38)	p-value
Surgical site infection (yes)	21 (60.0%)	33 (86.8%)	0.009
Wound dehiscence (yes)	4 (11.4%)	6 (15.8%)	0.589

The Quilting group also experienced fewer wound complications (Table 3). Surgical site infection occurred in 21 of 35 patients (60.0%) with quilting versus 33 of 38 (86.8%) without quilting (p = 0.009). Wound dehiscence was infrequent in both groups and did not differ significantly. No patients required reoperation for seroma, and there were no hernia recurrences during the short-term follow-up.

DISCUSSION

In this RCT, quilting sutures significantly improved outcomes after ventral hernia repair. Quilting reduced postoperative seroma volumes and shortened both drain duration and hospital stay.^[8] These findings are consistent with prior studies: Sridhar et al. found 0% seroma in a quilting group versus 32% in controls, and Kumar et al,^[7] similarly reported virtually no seroma with quilting. Rabbani et al. also demonstrated substantially lower drain output with quilting sutures (50.8 vs 65.9 mL on day 5; p<0.001). Together, these data support the concept that obliterating dead space via quilting effectively prevents fluid collection.

Importantly, quilting also lowered infection rates. In our trial, quilting patients had significantly fewer SSIs (60% vs 86.8%). Fluid collections are known to predispose to infection, so it is plausible that eliminating seroma pockets led to cleaner wounds.^[9] Other series (e.g. in mastectomy and abdominoplasty) have similarly observed reduced seroma and related morbidity with quilting techniques. Our results suggest that quilting not only addresses seroma but may also indirectly reduce wound infection risk.

Concerns that quilting might increase flap tension or operative time did not materialize in this trial. We did not observe any quilting-related complications (such as tissue necrosis), and patients with quilting had quicker recovery.^[10] The procedure only modestly extended surgical time while yielding benefits in recovery.^[11] Furthermore, quilting allowed more rapid drain removal and discharge, potentially offsetting the extra suturing effort.

Limitations include the single-center design and modest sample size.^[1] We assessed mainly short-term outcomes (drain output, infection) and did not measure long-term recurrence. However, given that seroma and infection can compromise healing, the observed benefits are clinically significant. Future multicenter trials with longer follow-up should confirm these findings and quantify any effect on hernia recurrence.^[9]

CONCLUSION

Quilting sutures in open ventral hernia repair significantly reduce early postoperative seroma formation and related complications. In our study, quilting led to lower drain volumes, earlier drain removal, shorter hospitalization, and fewer wound infections. These advantages make quilting a valuable adjunct in hernia surgery, especially when large skin flaps or onlay mesh are used.

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Conflicts of interest

There are no conflicts of interest.

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