



COMPARATIVE STUDY OF ONLAY VERSUS SUBLAY MESH REPAIR IN VENTRAL HERNIA: A RANDOMIZED CONTROLLED TRIAL.

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ABSTRACT

Background: Ventral hernia repair is one of the most frequently performed procedures in general surgery. While mesh reinforcement has reduced recurrence, the optimal plane of mesh placement is still debated. Onlay mesh repair is technically easier but carries higher risk of wound complications. Sublay repair, though technically demanding, is thought to reduce complications.

Objective: To compare clinical outcomes between onlay and sublay mesh repair in patients undergoing ventral hernia surgery.

Methods: In this randomized controlled trial, 60 patients with primary or incisional ventral hernia were randomized to undergo onlay (n=30) or sublay (n=30) mesh repair. Data collected included operative time, surgical site infection (SSI), seroma formation, drain duration, length of hospital stay, and recurrence. Statistical analysis was performed using SPSS v20.

Results: Sublay repair was associated with significantly fewer SSIs (10% vs 30%, p=0.04) and seromas (6.6% vs 26.6%, p=0.03). The mean hospital stay was significantly shorter in the sublay group (6.2 ± 1.1 vs 8.1 ± 1.3 days, p=0.001). Operative time was longer in sublay repair (92.3 ± 15.5 vs 86.7 ± 12.9 minutes, p=0.08), but the difference was not statistically significant. At 12-month follow-up, recurrence was comparable in both groups (one case each).

Conclusion: Sublay mesh repair results in fewer complications and shorter hospitalization compared to onlay repair, despite requiring slightly longer operative time. Sublay should be considered the preferred method in elective ventral hernia surgery.

Keywords: Ventral hernia, Mesh repair, Onlay, Sublay, Randomized controlled trial.

INTRODUCTION

Ventral hernia, including both incisional and primary anterior abdominal wall hernias, constitutes a significant proportion of surgical workload. The incidence of incisional hernia following laparotomy ranges between 11–20% depending on surgical technique, patient factors, and wound infection rates^{1,2}. Mesh reinforcement has become the standard of care due to markedly lower recurrence rates compared with suture repair³. However, the plane of mesh placement remains controversial. Onlay repair, in which mesh is placed over the anterior rectus sheath, is technically

straightforward and widely practiced. Yet, it is associated with complications such as seroma, surgical site infection (SSI), and prolonged hospital stay^{4,5}. Sublay repair, introduced by Rives in 1973⁶, involves retro rectus placement of the mesh, allowing better integration with well-vascularized tissue, reduced dead space, and stronger abdominal wall reconstruction^{7,8}. Multiple studies and meta-analyses suggest superior outcomes with sublay mesh repair, but randomized controlled trials in different populations are still limited^{9,10,11}. Thus, this randomized controlled trial was conducted to compare onlay and sublay mesh repair in terms of operative outcomes, postoperative complications, hospital stay, and recurrence.

MATERIALS AND METHODS

Study design: A prospective randomized controlled trial was conducted in the Department of General Surgery, Index Medical College, Hospital and Research Centre, Indore, Madhya Pradesh

Sample size: 60 patients with ventral hernia were included, with equal allocation to onlay (n=30) and sublay (n=30) groups using computer-generated randomization.

Inclusion criteria:

- Patients aged 18–70 years.
- Primary or incisional ventral hernia with defect size 3–10 cm.
- Elective surgery candidates.

Exclusion criteria:

- Recurrent hernia.
- Contaminated or infected surgical field.
- Emergency presentation with obstruction/strangulation.
- Severe uncontrolled comorbidities.

Randomization and Allocation Procedures

Randomization Method:

Eligible patients will be randomly assigned using computer-generated random numbers with block randomization utilizing block sizes of 4 or 6 to ensure balanced allocation throughout the recruitment period. This approach maintains unpredictability while ensuring approximately equal group sizes at regular intervals.

Operative technique:

- **Onlay group:** Midline incision, hernia sac dissected, mesh placed on anterior rectus sheath and secured with polypropylene sutures, with drains placed.
- **Sublay group:** Retrorectus dissection carried out, mesh placed posterior to rectus muscles and anterior to posterior rectus sheath, secured with non-absorbable sutures, and drains inserted.

Postoperative care: All patients received prophylactic antibiotics, analgesia, and wound care. Drains were removed once output <30 ml/24 hrs.

Outcome measures:

1. Operative time (minutes).
2. Postoperative complications: SSI (CDC criteria), seroma formation.
3. Drain duration (days).
4. Length of hospital stay (days).
5. Recurrence at 12 months follow-up.

Statistical analysis: Continuous variables expressed as mean \pm SD; categorical variables as percentages. Independent t-test was used for continuous variables and Chi-square/Fisher's exact test for categorical variables. Significance was set at $p < 0.05$.

RESULT

Baseline characteristics:

The study included 60 patients, randomized equally into two groups: onlay (n=30) and sublay (n=30). Both groups were comparable with respect to age, gender distribution, BMI, and comorbidities such as diabetes and hypertension ($p>0.05$), ensuring comparability of outcomes without baseline bias.

Operative time:

The mean operative time was longer in the sublay group (92.3 ± 15.5 minutes) compared to the onlay group (86.7 ± 12.9 minutes). Although this difference of approximately six minutes was not statistically significant ($p=0.08$), it reflects the technically more demanding dissection required for retro rectus placement of the mesh. Importantly, this marginally increased operative time did not translate into greater morbidity.

Surgical site infection (SSI):

The incidence of SSI was notably higher in the onlay group (30%) compared to the sublay group (10%). This difference was statistically significant ($p=0.04$). The higher infection rate in the onlay group may be attributed to the proximity of mesh to the subcutaneous tissue and skin, where bacterial contamination is more likely. In contrast, retro rectus placement in the sublay technique offers a more vascularized environment with lower risk of infection.

Seroma formation:

Seroma was also significantly more common in the onlay group (26.6%) compared to the sublay group (6.6%) ($p=0.03$). This difference highlights the increased potential for fluid collection in the larger dead space created during onlay mesh placement. Sublay repair minimizes dead space, explaining the lower seroma rates.

Drain duration:

Drains were retained longer in the onlay group (mean 4.6 ± 1.2 days) compared to the sublay group (3.2 ± 0.8 days), and this difference was statistically significant ($p=0.002$). Shorter drain duration in the sublay group correlates with reduced postoperative seroma and fluid collection.

Hospital stay:

The average length of hospital stay was significantly longer in the onlay group (8.1 ± 1.3 days) compared with the sublay group (6.2 ± 1.1 days), with $p=0.001$. This reduction in hospital stay reflects the quicker recovery, reduced infection rates, and fewer complications in the sublay group.

Recurrence:

At 12-month follow-up, recurrence was noted in one patient from each group (3.3%). The recurrence rates were thus identical and not statistically significant ($p=0.99$). This finding suggests that both techniques provide comparable durability of repair in the short term. Longer follow-up is necessary to assess whether sublay maintains its superiority over time.

Table 1. Comparison of outcomes between Onlay and Sublay groups

Outcome	Onlay (n=30)	Sublay (n=30)	p- value
Operative time (min)	86.7 ± 12.9	92.3 ± 15.5	0.08
SSI (%)	30.0	10.0	0.04*
Seroma (%)	26.6	6.6	0.03*
Drain duration (days)	4.6 ± 1.2	3.2 ± 0.8	0.002*
Hospital stay (days)	8.1 ± 1.3	6.2 ± 1.1	0.001*
Recurrence (%)	3.3	3.3	0.99

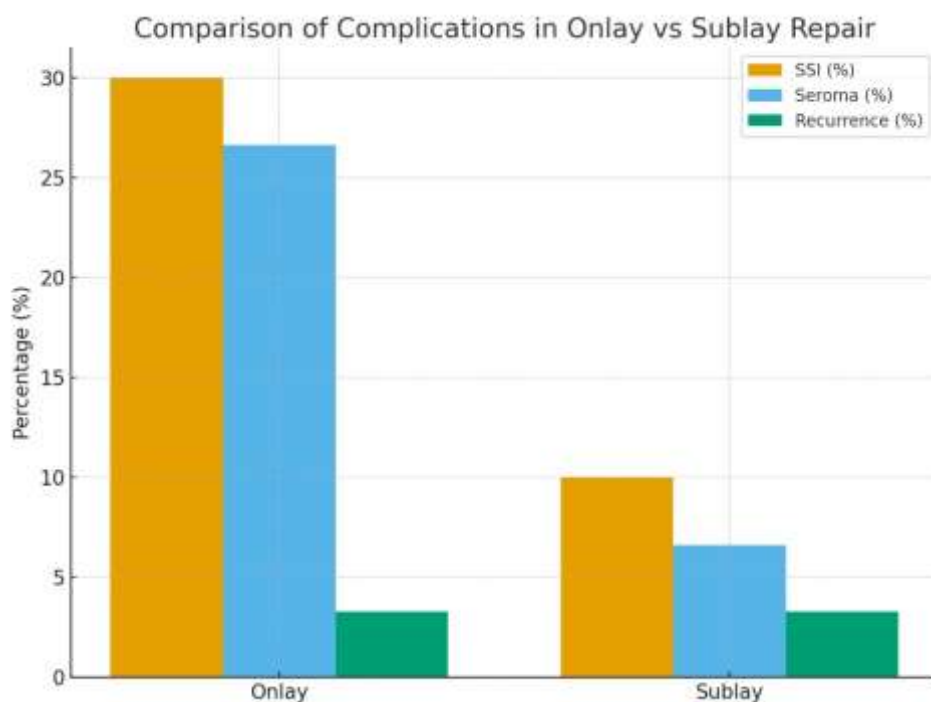


Figure 1. Comparison of complications (SSI, seroma, recurrence) in Onlay vs Sublay repair

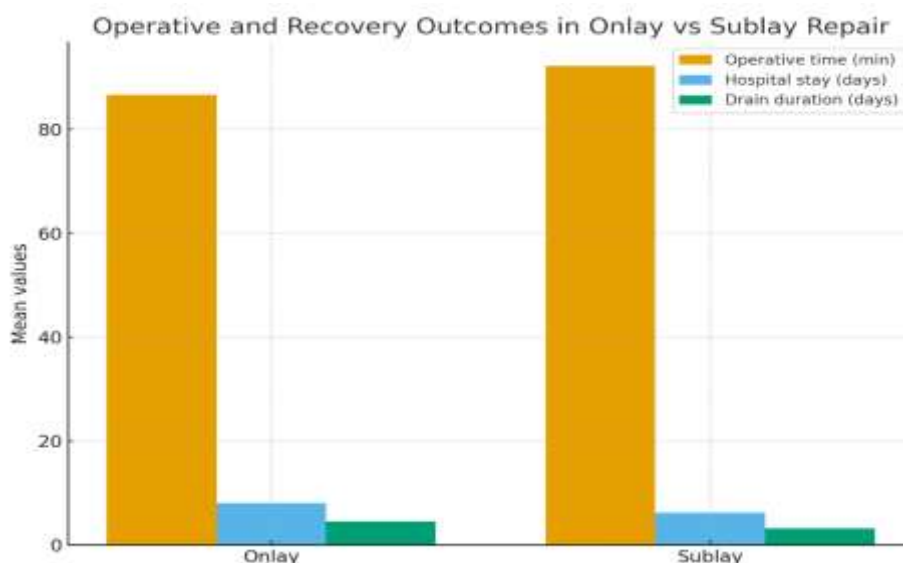


Figure 2. Operative and recovery outcomes (operative time, hospital stay, drain duration) in Onlay vs Sublay repair.

DISCUSSION

This trial demonstrates that sublay mesh repair is associated with significantly fewer postoperative complications compared to onlay repair. The incidence of SSI and seroma was considerably reduced in sublay repairs, confirming the theoretical advantage of retrorectus placement in providing a well-vascularized bed with minimal dead space.

Our findings are consistent with those of Venclauskas et al⁹, Saber et al.¹⁰, and Korenkov et al¹¹, all of whom reported reduced wound morbidity with sublay technique. Although operative time was marginally longer in sublay repair, this difference was not statistically significant and clinically acceptable given the reduced morbidity and shorter hospital stay. Recurrence rates were similar in both groups at 12 months, aligning with studies by Burger et al.³ and Schumpelick et al¹², suggesting that mesh reinforcement, irrespective of position, effectively reduces recurrence. Long-term follow-up beyond one year, however, is necessary to determine durability of repair.

Strengths: Randomized design, standardized operative protocols, and follow-up for recurrence.

Limitations: Relatively small sample size, single-centre trial, and limited follow-up duration.

CONCLUSION

Sublay mesh repair provides superior clinical outcomes compared to onlay repair, with significantly fewer wound complications and shorter hospitalization. Although technically more demanding and slightly longer in operative time, sublay repair should be considered the preferred technique in elective ventral hernia surgery.

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