Section: General Surgery

Original Research Article

COMPARATIVE STUDY BETWEEN MESH UNDER THE ANTERIOR LAMINA OF THE RECTUS SHEATH REPAIR (MUAR) AND ONLAY MESH REPAIR FOR UNCOMPLICATED UMBILICAL AND PARAUMBILICAL HERNIAS

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ABSTRACT

Background: Umbilical and paraumbilical hernias are common anterior abdominal wall defects in adults and are commonly treated with open mesh repair. Onlay mesh repair is widely practiced but is associated with higher wound-related complications. Mesh placement under the anterior lamina of the rectus sheath (MUAR) may reduce postoperative morbidity. The aim is to compare clinical outcomes of MUAR and onlay mesh repair in uncomplicated umbilical and paraumbilical hernias. **Materials and Methods:** This comparative cross-sectional study was conducted at Government Thoothukudi Medical College from May 2023 to October 2024. Sixty adult patients were equally allocated to MUAR (n = 30) or onlay mesh repair (n = 30). Outcomes included postoperative pain, seroma formation, surgical site infection, mesh infection, drain duration, hospital stay, and operative time. **Result:** Baseline characteristics were comparable between groups ($p > 0.05$). Seroma formation was lower with MUAR than onlay repair (8 vs. 30 patients; $p < 0.001$). Surgical site infection occurred in 1 MUAR and 8 onlay patients ($p = 0.026$), and mesh infection in 2 and 9 patients, respectively ($p = 0.045$). Mean pain scores were lower in the MUAR group (2.1 vs. 3.9; $p < 0.001$). Drain removal time (2.1 vs. 5.03 days) and hospital stay (3.07 vs. 6.57 days) were significantly shorter with MUAR ($p < 0.001$). Operative duration was comparable between techniques ($p = 0.18$). **Conclusion:** MUAR is associated with fewer complications and faster recovery compared with onlay mesh repair, without increasing operative time, and may be preferred for uncomplicated umbilical and paraumbilical hernias.

INTRODUCTION

Umbilical and paraumbilical hernias are commonly seen in adult surgical practice and form a significant portion of primary ventral hernias requiring elective repair. These hernias develop when there is focal weakness in the linea alba, often exacerbated by factors such as obesity, pregnancy, chronic cough, or conditions that raise intra-abdominal pressure. Although small hernias may remain asymptomatic for a period, many patients experience discomfort, cosmetic concern, or pain as the defect enlarges, and a small percentage may develop complications such as incarceration. Elective surgical repair with mesh reinforcement is widely advocated in adult patients to improve outcomes and reduce recurrence, with mesh repair associated with a significantly reduced risk of recurrence rates than suture repair in elective umbilical hernia surgery.[1-3]

Recent surgical practice now favours tension free mesh techniques because of their durable results and lower long term recurrence rates compared with suture repair. However, in open mesh repair, the optimal plane of mesh placement remains under evaluation. Onlay mesh repair, where the mesh is placed superficial to the anterior rectus sheath after fascial closure, is commonly performed and widely used. Several studies have reported that onlay placement is associated with higher rates of postoperative wound complications such as seroma formation and surgical site infections, likely related to the extensive subcutaneous dissection required.[4-6] In comparison, mesh positioned in a deeper plane, such as beneath the anterior lamina of the rectus sheath or in the sublay space, minimises subcutaneous dissection and has been associated in comparative studies with lower complication rates and improved postoperative recovery. Sublay mesh

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repair techniques have demonstrated favourable outcomes compared with onlay repair in terms of seroma formation, wound infection, and duration of hospital stay, although operative time may be slightly longer.[5,7,8]

Recent meta-analyses and systematic reviews evaluating open ventral hernia repair techniques suggest that deeper mesh placement is associated with lower overall postoperative morbidity while achieving comparable or reduced recurrence rates when compared with onlay mesh repair.[7,9] These data support careful selection of mesh position in open hernia surgery. The widespread use of both onlay and sublay approaches, the preferred plane remains uncertain regarding the most appropriate mesh placement strategy for uncomplicated umbilical and paraumbilical hernias. Comparative evaluation of operative time, postoperative pain, seroma formation, surgical site infection, recurrence, and patient satisfaction is essential to guide evidence based surgical decision-making.[9,10] This study aims to compare mesh under the anterior lamina of the rectus sheath (MUAR) with onlay open mesh repair in uncomplicated umbilical and paraumbilical hernias to determine the technique that offers optimal postoperative outcomes.

Aim: To compare the clinical outcomes of mesh under the anterior lamina of the rectus sheath (MUAR) and ONLAY open mesh repair in the management of uncomplicated umbilical and paraumbilical hernias.

Objective: To evaluate and compare postoperative outcomes following MUAR and ONLAY open mesh repair in uncomplicated umbilical and paraumbilical hernias.

MATERIALS AND METHODS

Study Design and Setting: This comparative cross-sectional study was conducted at Government Thoothukudi Medical College from May 2023 to October 2024.

Study Population: Patients presenting to the hospital with uncomplicated umbilical and paraumbilical hernias during the study period were included. Eligible patients were categorised into two groups based on the surgical procedure performed:

- **Group A:** Onlay mesh repair
- **Group B:** Mesh under the anterior lamina of the rectus sheath (MUAR)

Inclusion Criteria

Patients of both sexes aged more than 18 years and less than 60 years who presented with uncomplicated umbilical or paraumbilical hernias were included in the study.

Exclusion Criteria

Patients aged less than 18 years or more than 70 years were excluded from the study. Pregnant patients, immunocompromised individuals, and patients with collagen disorders were also excluded. In addition, patients presenting with obstructed or strangulated hernias and those with recurrent hernias were not included in the study.

Ethical Considerations: Approval was obtained from the Institutional Ethical Committee before the commencement of the study. Written informed consent was obtained from all participants.

Methods: All patients underwent preoperative evaluation, including detailed history, physical examination, and routine investigations such as complete blood count, renal and liver function tests, and coagulation profile. Ultrasonography of the abdomen was performed in selected cases to assess the hernia defect. Patients underwent either MUAR repair or onlay mesh repair. In the MUAR technique, a midline or infraumbilical incision was made, the hernia sac was isolated with reduction of contents and excision when required, and the anterior rectus sheath was incised to create a sub-laminar plane. A polypropylene mesh with a minimum overlap of 3–4 cm was placed beneath the anterior lamina, after which the sheath was closed over the mesh and the wound closed in layers with a closed suction drain. In the onlay technique, following a midline incision and reduction of hernia contents, the fascial defect was closed primarily, and a polypropylene mesh was placed over the anterior rectus sheath in the subcutaneous plane with adequate overlap, with placement of a closed suction drain and standard skin closure. Postoperative care included standard analgesia and antibiotic prophylaxis. Drains were monitored daily and removed based on output, with early ambulation and regular wound inspection. Postoperative outcomes included seroma formation, surgical site infection, mesh infection, postoperative pain scores, duration of drain placement, length of hospital stay, time to discharge, and duration of surgery. Data were recorded using a structured proforma, and pain was assessed using a standardised 0–10 scale. Data analysis was performed using appropriate statistical software. Quantitative variables were expressed as mean ± standard deviation, and categorical variables as frequency and percentage. Group comparisons were made using the Chi-square or Fisher's exact test for categorical variables and Student's t-test for continuous variables, with a p-value < 0.05 considered statistically significant.

RESULTS

The mean age was 51.3 ± 8.89 years in the MUAR group and 49.43 ± 11.33 years in the Onlay group, with statistically no significant (NS) difference ($P = 0.481$). Gender distribution and the type of hernia were comparable between the two groups ($P = 0.6$ and $P = 0.551$) [Table 1].

Seroma formation occurred in 8 MUAR and 30 onlay patients ($P < 0.001$). Surgical site infection was seen in 1 MUAR and 8 onlay patients ($P = 0.026$), while mesh infection occurred in 2 and 9 patients, respectively ($P = 0.045$). Mean postoperative pain

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score was 2.1 in the MUAR group and 3.9 in the onlay group (P < 0.001). Mean drain removal time and hospital stay were 2.1 vs. 5.03 days and 3.07 vs. 6.57 days, respectively (P < 0.001). Duration of surgery was similar in both groups (P = 0.180) [Table 2].

Table 1: Baseline Characteristics of Study Population

Parameter	MUAR (n=30)	Onlay (n=30)	P value
Mean age (years)	51.3 ± 8.89	49.43 ± 11.33	0.481 (NS)
Male : Female	16:14	19:11	0.6 (NS)
Umbilical hernia	21	24	0.551 (NS)
Paraumbilical hernia	9	6	0.551 (NS)

Table 2: Comparison of Postoperative Outcomes

Outcome	MUAR	Onlay	P value	Interpretation
Seroma formation	8	30	<0.001	Highly significant
Surgical site infection	1	8	0.026	Significant
Mesh infection	2	9	0.045	Significant
Postoperative pain (mean)	2.1	3.9	<0.001	Highly significant
Drain removal (days)	2.1	5.03	<0.001	Highly significant
Hospital stay (days)	3.07	6.57	<0.001	Highly significant
Duration of surgery	~3 hrs	2–3 hrs	0.18	Not significant

DISCUSSION

This study compares the outcomes of mesh placement under the anterior lamina of the rectus sheath with conventional onlay mesh repair in uncomplicated umbilical and paraumbilical hernias. The discussion places our findings in the context of existing comparative literature, focusing on baseline patient characteristics, postoperative morbidity, and recovery-related outcomes.

In our study, the MUAR and onlay groups were similar in terms of age, gender distribution, and type of hernia, with no significant differences observed between the groups. Shah et al. reported that patients undergoing onlay and sublay mesh repair for ventral hernias were largely middle-aged, with no significant difference in gender distribution between the groups. Similarly, Ibrahim et al. observed same demographic characteristics among patients treated with sublay and onlay mesh repair, which allowed for appropriate comparison of postoperative outcomes. Deherkar et al. whose comparative analysis of sublay and onlay mesh repair for ventral hernia reported broadly similar baseline demographic characteristics between the two groups, allowing for unbiased outcome comparison. The similarity in patient demographics and hernia characteristics across these studies is likely related to comparable inclusion criteria and patient selection, supporting the reliability of outcome comparisons in our study.[5,11,12]

In our study, MUAR repair experienced fewer postoperative complications, less pain, earlier drain removal, and a shorter hospital stay compared to those who underwent onlay mesh repair. The duration of surgery was comparable between the two techniques. Reddy et al. reported that sublay mesh repair resulted in lower rates of seroma formation and deep surgical site infection, along with a shorter hospital stay, when compared with onlay mesh repair. Similarly, Pervin et al. reported that patients treated with sublay mesh repair had earlier drain removal and shorter hospital stay compared with those who underwent onlay mesh repair. They also noted a higher occurrence of seroma formation and surgical site infection in the onlay group, while outcomes were better in the sublay group. Similarly, Shaukat et al. reported in a recent meta-analysis that sublay mesh repair was associated with lower postoperative complication rates, including fewer seromas and surgical site infections, and a shorter hospital stay compared with onlay mesh repair, although operative time was generally shorter in the onlay group. The present results match these reports, where MUAR, a deeper mesh placement technique, was associated with lower complication rates and shorter hospital stay.[13-15]

CONCLUSION

MUAR is a safe and effective technique for repairing uncomplicated umbilical and paraumbilical hernias. Compared with onlay mesh repair, MUAR was associated with significantly lower postoperative morbidity, including reduced seroma formation, fewer surgical site and mesh infections, less postoperative pain, earlier drain removal, and shorter hospital stay, while operative time remained comparable. These findings indicate that deeper mesh placement improves wound healing and recovery. MUAR is a suitable alternative to onlay mesh repair in appropriately selected adult patients undergoing elective hernia surgery.

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