Original Research

A COMPARATIVE STUDY OF MAYO'S REPAIR AND MESH REPAIR IN THE MANAGEMENT OF PARAUMBILICAL HERNIA

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ABSTRACT

Background: Paraumbilical hernia is a common abdominal wall defect occurring through the linea alba adjacent to the umbilicus. It is more prevalent in adults and frequently associated with factors that increase intra-abdominal pressure, such as obesity, pregnancy, and chronic cough. Surgical repair is the definitive treatment, with Mayo's repair traditionally used for many years. However, due to relatively higher recurrence rates with suture-based techniques, mesh repair has emerged as the preferred method for reinforcement of the abdominal wall. Comparative evaluation of these two techniques is important to determine the most effective approach in terms of operative outcomes, complications, and recurrence rates.

Methods: This prospective cross-sectional hospital-based study was conducted in the Department of General Surgery at ACS Medical College and Hospital over a period of two years. A total of 120 patients diagnosed with paraumbilical hernia were included using simple random sampling. Patients underwent either Mayo's repair (n=43) or mesh repair (n=77). Data were collected using a structured proforma including demographic details, BMI, smoking history, hernia type, defect size, operative details, postoperative complications, and recurrence. Statistical analysis was performed using SPSS software, with significance considered at $p < 0.05$.

Results: Among the 120 patients studied, 64.2% underwent mesh repair and 35.8% underwent Mayo's repair. The mean age of patients was comparable between groups. Female predominance was observed in both groups (approximately 72%). Paraumbilical hernia was the most common type. The mean duration of surgery was significantly shorter in mesh repair (77.21 ± 11.79 minutes) compared to Mayo's repair (82.49 ± 14.31 minutes). Hospital stay was also significantly shorter in the mesh repair group (3.49 ± 0.93 days) than in the Mayo's repair group (5.98 ± 1.68 days). Post-operative complications were lower in mesh repair (32.5%) compared to Mayo's repair (76.7%). Recurrence was observed only in the Mayo's repair group (9.3%), while no recurrence was reported in the mesh repair group.

Conclusion: Mesh repair demonstrated superior outcomes compared to Mayo's repair, including shorter operative time, reduced hospital stay, fewer postoperative complications, and lower recurrence rates. Therefore, mesh repair can be considered a more effective and reliable technique for the management of paraumbilical hernia.

Keywords: ParaumbilicalHernia, Mayo's Repair, Mesh Repair, Hernia Recurrence, Surgical Outcomes.

INTRODUCTION

Paraumbilical hernias are a type of midline abdominal wall hernia that occur through a defect in the linea alba adjacent to the umbilicus.

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They may appear either above or below the umbilicus and usually present as a visible swelling or bulge in the abdominal wall. These hernias arise due to weakness or defects in the abdominal musculature, allowing protrusion of preperitoneal fat or intra-abdominal contents. Although paraumbilical hernias can occur in all age groups, they are more frequently observed in adults due to conditions that increase intra-abdominal pressure, such as obesity, chronic cough, and pregnancy.[1]

Paraumbilical hernias are relatively common in the general population and show a higher prevalence

among females, with an estimated female-to-male ratio of approximately 3:1. Nearly 90% of cases in adults are considered acquired, largely resulting from factors that increase abdominal pressure and weaken the abdominal wall. Because of this, paraumbilical hernias represent a significant clinical problem and often require surgical management to prevent complications such as incarceration and strangulation.[2,3]

Traditionally, paraumbilical hernias were treated using Mayo's repair, a technique that involves overlapping sutures to reinforce the fascial defect in the linea alba. Although this method was widely practised, studies have reported recurrence rates ranging from 28% to 30%, which has limited its long-term effectiveness.[4,5] With advances in surgical techniques and the introduction of prosthetic materials, mesh repair has increasingly become the preferred approach. Mesh repair provides a tension-free reinforcement of the abdominal wall and has been associated with significantly lower recurrence rates compared to traditional suture repair.[6]

Several studies support the superiority of mesh repair. Arroyo et al.,[7] demonstrated through a randomized clinical trial that mesh repair provides better long-term outcomes than suture repair. Similarly, Celdranet al.,[8] highlighted the benefits of tension-free mesh techniques in reducing recurrence and postoperative complications.

Aims and Objectives

The aim of this study was to compare the outcomes of Mayo's repair and mesh repair in the treatment of paraumbilical hernia. The objectives of the study were to evaluate and compare the recurrence rates following Mayo's repair and mesh repair, to analyze the post-operative complications associated with both surgical procedures, and to assess the recovery time and overall patient satisfaction between the two techniques in order to determine the more effective approach for paraumbilical hernia management.

MATERIALS AND METHODS

Study Design- The present study was a prospective cross-sectional hospital-based study conducted in the Department of General Surgery at ACS Medical College and Hospital over a period of two years (24 months). A total of 120 patients diagnosed with paraumbilical hernia and undergoing elective surgical repair were included in the study. All eligible patients were selected based on predefined inclusion and exclusion criteria, and their demographic details, clinical findings, surgical procedures, and outcomes were analyzed to compare the effectiveness of Mayo's repair and mesh repair in the management of paraumbilical hernia.

Inclusion and Exclusion Criteria- The study included patients diagnosed with paraumbilical hernia who underwent elective surgical repair, irrespective of age and gender. Patients who were not willing to participate in the study were excluded. Additionally, patients with severe comorbid conditions such as severe cardiopulmonary disease and uncontrolled ascites were excluded. Patients with recurrent hernia, paediatric patients, and those undergoing emergency surgery were also excluded from the study to maintain uniformity in the study population and ensure accurate comparison of surgical outcomes.

Data Collection Tools- Data were collected using a structured proforma designed to record relevant demographic, clinical, operative, and postoperative variables. The proforma included details such as patient name, age, sex, BMI (Body Mass Index), smoking history, type of hernia, defect size, presenting signs and symptoms, type of surgical repair performed, duration of surgery, content of the hernial sac, intra-operative complications, duration of hospital stay, postoperative complications, and recurrence. The collected data were entered into Microsoft Excel 2013 and later analyzed using SPSS version 26. Prior to analysis, the dataset was carefully reviewed to identify missing values, blank entries, and typing errors to ensure data accuracy and reliability.

Data Collection Procedure- Data collection was carried out by trained postgraduate residents after obtaining approval from the Institutional Ethics Committee. The study procedure was explained to the patients in their native language and written informed consent was obtained. Each patient underwent detailed clinical evaluation, including history, physical examination, and necessary investigations such as ultrasound or CT scan when required. Preoperative laboratory tests were performed to assess the general health status of the patient. After ensuring fitness for surgery, patients underwent either Mayo's repair or mesh repair under appropriate anaesthesia. During surgery, relevant intra-operative details were recorded. Post-operatively, patients were monitored for complications such as pain, infection, and seroma, and early mobilization was encouraged. All patients were followed up to assess recovery and detect any postoperative complications or recurrence.

Statistical Analysis- The collected data were analyzed using SPSS software. Continuous variables such as age, BMI, defect size, and duration of surgery were expressed as mean and standard deviation, while categorical variables including age category, sex, smoking history, hernia type, signs and symptoms, type of repair, content of sac, intraoperative complications, postoperative complications, and recurrence were presented as frequencies and percentages. The independent

sample t-test was used to compare the means between two groups, while the chi-square test and Fisher's exact test were applied to analyze associations between qualitative variables. A p-value of less than 0.05 was considered statistically significant.

RESULTS

Table 1: Distribution of Surgical Technique among Study Participants

Type of Hernia Repair	Number (n)	Percentage (%)
Mesh Repair	77	64.2
Mayo's Repair	43	35.8
Total	**120**	**100**

Table 1 illustrates the distribution of surgical techniques among the study participants. Out of 120 patients included in the study, 77 patients (64.2%) underwent mesh repair, while 43 patients (35.8%) underwent Mayo's repair, indicating that mesh repair was the more frequently performed surgical technique.

Table 2: Demographic Characteristics of Study Participants

Variable	Mesh Repair (n=77)	Mayo's Repair (n=43)	p-value
Age < 50 years	41 (53.2%)	20 (46.5%)	
Age > 50 years	36 (46.8%)	23 (53.5%)	0.416
Mean Age (in years)	50.69 ± 5.12	51.53 ± 5.98	
Male	21 (27.3%)	12 (27.9%)	
Female	56 (72.7%)	31 (72.1%)	0.941

Table 2 observes the demographic characteristics of patients undergoing mesh repair and Mayo's repair. The mean age of patients in both groups was comparable and the majority of patients were above 50 years. Females constituted the majority of participants in both groups. No statistically significant difference was observed between the groups with respect to age or gender distribution.

Table 3: Clinical Characteristics of Study Participants

Variable	Mesh Repair	Mayo's Repair	p-value
Paraumbilical Hernia	62 (80.5%)	29 (67.4%)	
Umbilical Hernia	15 (19.5%)	14 (32.6%)	0.941
Normal BMI	9 (11.7%)	5 (11.6%)	
Overweight	55 (71.4%)	34 (79.1%)	
Obese	13 (16.9%)	4 (9.3%)	0.327
Smoking History (Yes)	19 (24.7%)	6 (14.0%)	0.166

Table 3 presents the clinical characteristics of patients undergoing the two surgical procedures. Paraumbilical hernia was the most common type observed in both groups. Most patients were overweight. Smoking history was present in a smaller proportion of patients. No statistically significant difference was noted between the two groups for these variables.

Table 4: Defect Size and Presenting Symptoms

Variable	Mesh Repair	Mayo's Repair	p-value
Mean Defect Size (cm)	5.39 ± 1.10	5.51 ± 0.90	0.537
Swelling	63 (81.8%)	31 (72.1%)	0.215
Pain	13 (16.9%)	5 (11.6%)	0.439
Vomiting	10 (13.0%)	3 (7.0%)	0.310
Discharge	10 (13.0%)	7 (16.3%)	0.620
Excoriation	5 (6.5%)	0 (0%)	0.088

Table 4 demonstrates the comparison of defect size and presenting symptoms between the two surgical groups. The mean defect size was similar in both groups. Swelling was the most common presenting symptom, followed by pain, vomiting, discharge, and excoriation. No statistically significant differences were observed between the groups.

Table 5: Operative Characteristics

Variable	Mesh Repair	Mayo's Repair	p-value
Mean Duration of Surgery (minutes)	77.21 ± 11.79	82.49 ± 14.31	0.036
Hospital Stay (days)	3.49 ± 0.93	5.98 ± 1.68	<0.001

Table 5 shows the comparison of operative characteristics between the two repair methods. The mean duration of surgery was significantly shorter in the mesh repair group compared to Mayo's repair. Additionally, patients undergoing mesh repair had a significantly shorter duration of hospital stay.

Table 6: Content of Hernial Sac

Content of Sac	Mesh Repair	Mayo's Repair	p-value
Colon	2 (2.6%)	2 (4.7%)	
Omentum	39 (50.6%)	18 (41.9%)	
Small Intestine	36 (46.8%)	23 (53.5%)	0.591

Table 6 illustrates the distribution of hernial sac contents among the two surgical groups. Omentum was the most commonly observed sac content, followed by small intestine and colon. There was no statistically significant difference between the groups.

Table 7: Post-Operative Complications and Recurrence

Outcome	Mesh Repair	Mayo's Repair	p-value
No Complications	52 (67.5%)	10 (23.3%)	
Prolonged Pain	13 (16.9%)	21 (48.8%)	
Fever	7 (9.1%)	9 (20.9%)	
Wound Infection	0 (0%)	3 (7.0%)	
Mesh Infection	4 (5.2%)	0 (0%)	
Haematoma	1 (1.3%)	0 (0%)	<0.001
Recurrence	0 (0%)	4 (9.3%)	0.015

Table 7 highlights postoperative complications and recurrence rates in both groups. Mesh repair demonstrated significantly fewer postoperative complications compared to Mayo's repair. Recurrence was observed only in the Mayo's repair group, suggesting better long-term outcomes with mesh repair.

DISCUSSION

Paraumbilical hernias are among the commonly encountered abdominal wall hernias requiring surgical management. The choice of surgical technique plays a crucial role in determining postoperative outcomes, recurrence rates, and patient recovery. The present study compared Mayo's repair and mesh repair in the management of paraumbilical hernia with respect to demographic characteristics, operative parameters, postoperative complications, and recurrence rates.

In the present study, a total of 120 patients were included, of which 77 patients (64.2%) underwent mesh repair and 43 patients (35.8%) underwent Mayo's repair. The mean age of patients undergoing mesh repair was 50.69 ± 5.12 years, whereas the mean age in the Mayo's repair group was 51.53 ± 5.98 years. The age distribution between the two groups was statistically comparable. Similar findings were reported by Arroyo et al.[9] and Aslani and Brown[10] who observed that age did not significantly influence the choice of repair technique. Their studies also demonstrated that both younger and older patients could benefit from mesh repair depending on the clinical condition and defect size.

Gender distribution in this study showed a clear female predominance, with females constituting 72.7% in the mesh repair group and 72.1% in the Mayo's repair group. This observation is consistent with the findings of Bedewi et al.,[11] who reported a higher prevalence of paraumbilical hernia among females, primarily due to factors such as pregnancy and repeated stretching of the abdominal wall muscles. These physiological factors contribute to the weakening of the linea alba, thereby increasing the susceptibility to hernia formation.

In terms of hernia type, paraumbilical hernia was more commonly treated using mesh repair (80.5%) compared to Mayo's repair (67.4%). This observation is in agreement with the findings of Gaetan et al.,[12] who reported that mesh reinforcement is generally preferred for larger defects due to its ability to provide stronger support and reduce recurrence. Mesh-based techniques offer a tension-free repair which improves surgical outcomes.

BMI was found to be similar in both groups, with a mean BMI of 27.51 ± 2.05 kg/m² in the mesh repair group and 27.89 ± 2.08 kg/m² in the Mayo's repair group. Previous studies by Ulrich et al.[13] and Afzal et al.,[14] have suggested that obesity increases intra-

abdominal pressure and predisposes patients to hernia formation and recurrence. However, in the present study, BMI distribution was comparable in both groups, suggesting that BMI alone did not significantly influence the choice of surgical technique.[15]

Smoking is another important risk factor affecting wound healing and postoperative outcomes. In the present study, a history of smoking was observed in 24.7% of patients in the mesh repair group and 14% of patients in the Mayo's repair group. Smoking has been associated with delayed wound healing and increased post-operative complications, as reported by Chiang et al.[16] However, the proportion of smokers in this study was relatively low and did not significantly affect surgical outcomes.

The mean defect size was 5.39 ± 1.10 cm in the mesh repair group and 5.51 ± 0.90 cm in the Mayo's repair group. Previous studies by Luijendijk et al.[17] and Madsen et al.,[18] have demonstrated that mesh repair significantly reduces recurrence rates in hernias larger than 3 cm. The findings of the present study support the concept that mesh reinforcement provides better structural support and reduces tension on the repair site.

Regarding clinical presentation, swelling was the most common symptom observed in both groups, followed by pain, vomiting, discharge, and excoriation. These findings are consistent with the observations of Burger et al.,[19] who reported swelling as the predominant presenting complaint in patients with abdominal wall hernias. The similarity in symptom distribution between the groups indicates that clinical presentation does not significantly influence the choice of repair technique.

The duration of surgery was significantly shorter in the mesh repair group (77.21 ± 11.79 minutes) compared to the Mayo's repair group (82.49 ± 14.31 minutes). This difference was statistically significant. Chung et al.,[20] also reported that suture-based repairs often require longer operative time due to meticulous tissue approximation and layered suturing techniques.

Hospital stay was significantly shorter among patients who underwent mesh repair (3.49 ± 0.93 days) compared to those who underwent Mayo's repair (5.98 ± 1.68 days). This finding is consistent with the results of Bay-Nielsen et al.,[21] who reported that tension-free mesh repair facilitates faster postoperative recovery and early mobilization, thereby reducing hospitalization.

Postoperative complications were significantly lower in the mesh repair group compared to the Mayo's repair group. In the present study, 67.5% of patients in the mesh repair group had no postoperative complications compared to only 23.3% in the Mayo's repair group. The most common complication in the Mayo's repair group was prolonged pain. Similar findings were reported by Dana et al.,[22] and Kaufmann et al.,[23] who demonstrated that mesh repair provides better anatomical support and reduces tissue tension, thereby lowering complication rates.

Recurrence is one of the most critical parameters in evaluating the success of hernia repair. In the present study, no recurrence was observed in patients who underwent mesh repair, whereas recurrence occurred in 9.3% of patients in the Mayo's repair group. This difference was statistically significant. Studies conducted by Winsnes et al.[24] and Linas et al.,[25] have also reported higher recurrence rates following suture-based repairs compared to mesh repairs. The tension-free nature of mesh repair plays a major role in preventing recurrence.

The findings of this study support the growing body of evidence favouring mesh repair for paraumbilical hernias. Mesh repair demonstrated advantages including shorter operative time, reduced hospital stay, fewer postoperative complications, and lower recurrence rates compared to Mayo's repair. These results reinforce the recommendation that mesh repair should be considered the preferred surgical technique for paraumbilical hernia repair in suitable patients.

Limitations

The present study has certain limitations. The sample size was relatively small (120 patients) and the study was conducted in a single centre, which may limit the generalizability of the findings. The follow-up period was short, which may not fully reflect long-term outcomes such as recurrence. In addition, potential confounding factors such as patient comorbidities and variations in surgical techniques were not fully controlled. The study also did not extensively evaluate the influence of surgeon expertise. Furthermore, as the study was observational and non-randomized, there is a possibility of selection bias.

CONCLUSION

This study compared Mayo's repair and mesh repair in patients with paraumbilical hernia by evaluating demographic characteristics, surgical outcomes, post-operative complications, and recurrence rates. The results showed that mesh repair was associated with shorter hospital stays, fewer post-operative complications, and lower recurrence rates compared to Mayo's repair. Although both procedures were performed in similar patient populations, Mayo's repair was associated with longer operative duration and a higher incidence of complications such as prolonged pain, fever, and wound infection. Recurrence was observed only in the Mayo's repair group. Overall, mesh repair appears to be a more effective and reliable technique for paraumbilical hernia repair, providing better post-operative outcomes and faster recovery. However, further

studies with larger sample sizes and longer follow-up are required to confirm these findings.

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