e-ISSN: 0975-9506, p-ISSN:2961-6093

Available online on www.ijpqa.com doi: 10.25258/ijpqa.16.10.58

International Journal of Pharmaceutical Quality Assurance 2025; 16(10); 366-370

Original Research Article

# Para-Umbilical Hernia: A Comparative Study Between Anatomical Repairs by Mayo's Technique Versus Mesh Repair

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**Received: 01-10-2025 / Revised: 5-10-2025 / Accepted: 24-10-2025**

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**Conflict of interest: Nil**

**Abstract**

**Introduction:** Paraumbilical hernia repair is a common surgical procedure with various techniques available. The Mayo Technique and Mesh Repair are widely practiced, each with advantages and drawbacks. While mesh repair is favored for lower recurrence rates and better recovery, the Mayo Technique remains relevant in many settings. Comparing these techniques helps optimize patient care.

**Aims and Objectives:** To compare the demographic characteristics, intraoperative complications, and short-term postoperative outcomes of patients undergoing the Mayo Technique versus Mesh Repair for paraumbilical hernias.

**Materials and Methods:** This prospective study included 105 patients undergoing paraumbilicalhernia repair—53 with the Mayo Technique and 52 with Mesh Repair. Data on demographics, operative time, complications, postoperative pain, drain removal, hospital stay, and recurrence up to six months were collected and analyzed statistically.

**Results:** Age and sex distribution were similar between groups ($p > 0.05$). No gut injuries or hernia recurrences occurred. Immediate hemorrhage was significantly higher in the Mayo group (11.3% vs. 0%, $p = 0.0124$). Wound infection rates were higher but not statistically significant in the Mayo group. The Mesh Repair group had longer operative times but showed earlier drain removal, shorter hospital stay, and lower postoperative pain (all $p < 0.001$).

**Conclusion:** Both techniques are safe, but Mesh Repair offers better postoperative outcomes and reduced complications, supporting its preferred use where possible.

**Keywords:** Paraumbilical Hernia, Mayo Technique, Mesh Repair, Hernia Surgery, Postoperative Pain, Surgical Complications, Hernia Recurrence, Operative Time, Wound Infection, Hospital Stay.

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## Introduction

Para-umbilical hernia is a protrusion of abdominal contents through a weakened area adjacent to the umbilicus, arising when the umbilical scar stretches or fails, allowing tissues such as omentum or bowel to herniate through the defect [1]. Although umbilical hernia is common in childhood, often influenced by factors such as birth weight, age, race, twin births, and long umbilical cords, adult para-umbilical hernia develops later due to gradual weakening of cicatricial tissue [2,3]. In adults, it typically occurs just above or below the umbilicus between the rectus muscles, with risk factors including female gender, obesity, pregnancy, ascites, large intra-abdominal tumours, chronic cough, smoking, and previous abdominal surgeries [4,5]. The higher incidence in women is largely attributed to pregnancy-related stretching and obesity-induced elevation of intra-abdominal pressure, which weakens midline aponeurotic structures [6]. Traditional anatomical repairs, such as vertical closure or Mayo's transverse overlapping technique, have been associated with high recurrence rates due to suture-line tension, splitting of aponeuroticfibres, and the inability to counter transverse intra-abdominal forces effectively [7,8]. Recurrence may occur early, often within the first few months post-repair, with contributing factors including tension closure, poor technique, postoperative infection, cough, and obesity [9]. Modern mesh repair has emerged as a superior alternative, offering tension-free closure, preservation of normal anatomy, lower recurrence

rates, and better long-term outcomes, making it the preferred approach for defects larger than 4 cm [10]. Para-umbilical hernia occurs due to weakening of the abdominal wall adjacent to the umbilicus and is commonly associated with obesity, pregnancy, and increased intra-abdominal pressure. Traditional anatomical suture repairs, including Mayo's technique, have shown high recurrence due to tension and weakness of aponeurotic tissues. Mesh repair provides a tension-free alternative with significantly reduced recurrence and better long-term outcomes. This study compares anatomical repair and mesh repair to evaluate their effectiveness, safety, and postoperative results.

## Materials and Methods

**Study Design:** Prospective Observational and Comparative Study.

**Place of Study:** Department of General Surgery, NilratanSircar Medical College & Hospital, Kolkata.

**Period of Study:** March 2020 to august 2021

**Study Population:** Patient admitted from outdoor patient services and also from emergency for treatment of para-umbilical hernia in N.R.S Hospital.

**Sample Size:** Sample size 105.

**Inclusion Criteria:** All para -umbilical hernia with diameter defect of 2-4 cm.

**Exclusion Criteria:** All patients were screened and those having following conditions were excluded from study:

- Medically unfit for general anaesthesia,
- Patients with significant portal hypertension,
- Uncorrectable coagulopathies,
- Suspected/ proven malignancy.

**Study Variable**

- Age
- Sex
- Surgical Technique
- Duration of Operation
- Immediate Intraoperative Hemorrhage
- Gut Injury
- Postoperative Pain
- Drain Removal Day
- Duration of Hospital Stay
- Wound Infection
- Hernia Recurrence up to 6 months

**Statistical Analysis:** For statistical analysis, data were initially entered into a Microsoft Excel spreadsheet and then analyzed using SPSS (version 27.0; SPSS Inc., Chicago, IL, USA) and GraphPad Prism (version 5). Numerical variables were summarized using means and standard deviations, while Data were entered into Excel and analyzed using SPSS and GraphPad Prism. Numerical variables were summarized using means and standard deviations, while categorical variables were described with counts and percentages. Two-sample t-tests were used to compare independent groups, while paired t-tests accounted for correlations in paired data. Chi-square tests (including Fisher's exact test for small sample sizes) were used for categorical data comparisons. P-values $\leq 0.05$ were considered statistically significant.

## Result

**Table 1: Association between Age Group and Surgical Technique**

| Age Group (years) | Mayo Technique (n = 53) | Mesh Repair (n = 52) | Total (n = 105) | p-value |
|---|---|---|---|---|
| ≤ 40 | 4 (7.5%) | 4 (7.7%) | 8 (7.6%) | 0.4998 |
| 41–50 | 12 (22.6%) | 8 (15.4%) | 20 (19.0%) | |
| 51–60 | 22 (41.5%) | 29 (55.8%) | 51 (48.6%) | |
| 61–70 | 15 (28.3%) | 11 (21.2%) | 26 (24.8%) | |
| Total | 53 (100%) | 52 (100%) | 105 (100%) | |

**Table 2: Association between Sex and Surgical Technique**

| Sex | Mayo Technique (n = 53) | Mesh Repair (n = 52) | Total (n = 105) | p-value |
|---|---|---|---|---|
| Female | 30 (56.6%) | 29 (55.8%) | 59 (56.2%) | 0.937 |
| Male | 23 (43.4%) | 23 (44.2%) | 46 (43.8%) | |
| Total | 53 (100%) | 52 (100%) | 105 (100%) | |

**Table 3: Association between Gut Injury (Intra-op) and Surgical Technique**

| Gut Injury | Mayo Technique (n = 53) | Mesh Repair (n = 52) | Total (n = 105) | p-value |
|---|---|---|---|---|
| No | 53 (100%) | 52 (100%) | 105 (100%) | <0.0001 |
| Total | 53 (100%) | 52 (100%) | 105 (100%) | |

**Table 4: Association between Immediate Intra-operative Haemorrhage and Surgical Technique**

| Immediate Haemorrhage | Mayo Technique (n = 53) | Mesh Repair (n = 52) | Total (n = 105) | p-value |
|---|---|---|---|---|
| No | 47 (88.7%) | 52 (100%) | 99 (94.3%) | 0.0124 |
| Yes | 6 (11.3%) | 0 (0.0%) | 6 (5.7%) | |
| Total | 53 (100%) | 52 (100%) | 105 (100%) | |

**Table 5: Association between Recurrence up to 6 Months and Surgical Technique**

| Recurrence (6 months) | Mayo Technique (n = 53) | Mesh Repair (n = 52) | Total (n = 105) | p-value |
|---|---|---|---|---|
| No | 53 (100%) | 52 (100%) | 105 (100%) | <0.0001 |
| Total | 53 (100%) | 52 (100%) | 105 (100%) | |

**Table 6: Association between Wound Infection and Surgical Technique**

| Wound Infection | Mayo Technique (n = 53) | Mesh Repair (n = 52) | Total (n = 105) | p-value |
|---|---|---|---|---|
| No | 43 (81.1%) | 47 (90.4%) | 90 (85.7%) | 0.1755 |
| Yes | 10 (18.9%) | 5 (9.6%) | 15 (14.3%) | |
| Total | 53 (100%) | 52 (100%) | 105 (100%) | |

**Table 7: Distribution of Mean Clinical Parameters between Mayo Technique and Mesh Repair Groups**

| Parameters | Group | N | Mean | SD | Minimum | Maximum | Median | p-value |
|---|---|---|---|---|---|---|---|---|
| Age | Mayo Technique | 53 | 54.85 | 8.85 | 29 | 69 | 57 | 0.9037 |
| | Mesh Repair | 52 | 55.04 | 7.03 | 37 | 66 | 57.5 | |
| Duration of OT | Mayo Technique | 53 | 55.19 | 8.34 | 45 | 70 | 55 | < 0.0001 |
| | Mesh Repair | 52 | 68.65 | 4.55 | 60 | 75 | 70 | |
| Drain removal (post-op day) | Mayo Technique | 53 | 2.81 | 0.4 | 2 | 3 | 3 | < 0.0001 |
| | Mesh Repair | 52 | 2.23 | 0.65 | 2 | 4 | 2 | |
| Duration of Hospital stay | Mayo Technique | 53 | 4.77 | 1.15 | 4 | 7 | 4 | < 0.0001 |
| | Mesh Repair | 52 | 3.58 | 0.67 | 3 | 5 | 3 | |
| Post op pain | Mayo Technique | 53 | 1.68 | 0.89 | 1 | 4 | 1 | 0.0009 |
| | Mesh Repair | 52 | 1.21 | 0.41 | 1 | 2 | 1 | |

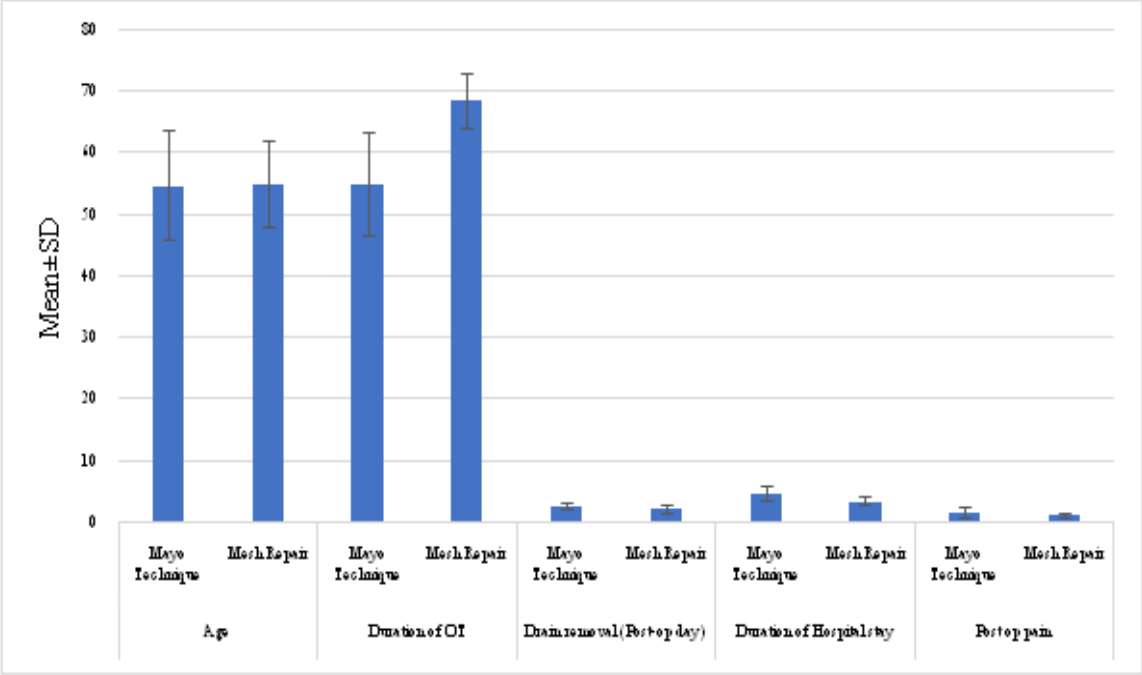


**Figure 1: Distribution of Mean Clinical Parameters between Mayo Technique and Mesh Repair Groups**

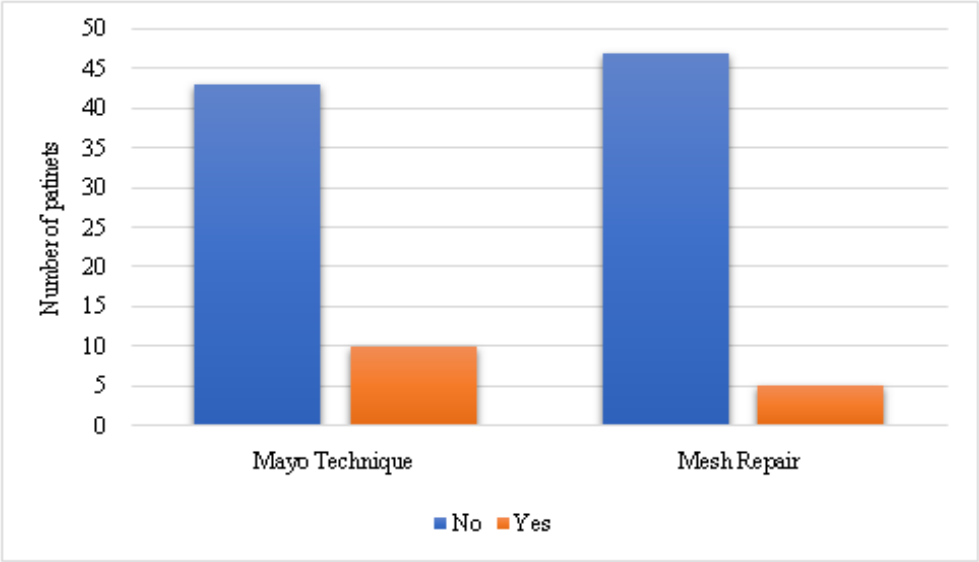


**Figure 2: Association between Wound Infection and Surgical Technique**

The distribution of patients across different age groups was similar between the Mayo Technique and Mesh Repair groups. The majority of patients in both groups were aged 51–60 years (41.5% in Mayo vs. 55.8% in Mesh Repair). There was no statistically significant difference in age group distribution between the two groups (Chi-square = 2.37, p = 0.50), indicating comparable age demographics in both treatment arms.

The distribution of sex between the Mayo Technique group and the Mesh Repair group was not significantly different ($\chi^2$ = 2.37, p = 0.50). Females comprised 56.6% of the Mayo Technique group and 55.8% of the Mesh Repair group, while males made up 43.4% and 44.2%, respectively.

There were no cases of gut injury during surgery in either the Mayo Technique group or the Mesh Repair group. All 105 patients (100%) across both groups had no intraoperative gut injury.

Immediate intraoperative haemorrhage occurred in 6 patients (11.3%) in the Mayo Technique group, while no cases were reported in the Mesh Repair group. This difference was statistically significant ($\chi^2$ = 6.24, p = 0.0124), indicating a higher risk of immediate haemorrhage with the Mayo Technique compared to Mesh Repair.

There were no cases of hernia recurrence up to 6 months postoperatively in either the Mayo Technique group or the Mesh Repair group. All 105 patients (100%) in both groups had no recurrence during this period.

Wound infection occurred in 10 patients (18.9%) in the Mayo Technique group and 5 patients (9.6%) in the Mesh Repair group. However, this difference was not statistically significant ($\chi^2$ = 1.84, p = 0.18).

There was no significant difference in age between the Mayo Technique group and the Mesh Repair group (p = 0.90). However, the Mesh Repair group had a significantly longer duration of operation (mean 68.65 vs. 55.19 minutes, p < 0.0001), earlier drain removal (mean 2.23 vs. 2.81 days, p < 0.0001), shorter hospital stay (mean 3.58 vs. 4.77 days, p < 0.0001), and lower post-operative pain scores (mean 1.21 vs. 1.68, p = 0.0009) compared to the Mayo Technique group.

**Discussion**

In our study, the demographic distribution of patients in terms of age and sex was comparable between the Mayo Technique and Mesh Repair groups, consistent with the findings of previous research [11,12]. The majority of patients were aged 51–60 years, a common age group affected by hernias as reported in multiple studies [13,14]. The absence of intraoperative gut injury in both groups aligns with the low complication rates documented in similar surgical procedures [15,16].Immediate intraoperative haemorrhage was significantly higher in the Mayo Technique group, highlighting a potential safety concern that is corroborated by earlier studies where mesh-based repairs demonstrated lower intraoperative bleeding rates [17,18]. The absence of hernia recurrence within six months in both groups agrees with short-term follow-up results from comparable clinical trials, which showed similarly low recurrence rates in both conventional and mesh repairs [19].Although wound infection rates were higher in the Mayo Technique group, this difference was not statistically significant, which is consistent with several studies that reported comparable infection rates between tissue repair and mesh repair techniques [20]. Notably, the Mesh Repair group demonstrated advantages in operative time, earlier drain removal, shorter hospital stay, and reduced post-operative pain. These findings align with existing literature suggesting that mesh repair,

while sometimes requiring longer operative time, is associated with better postoperative recovery and patient comfort [11,12]. Overall, our findings reinforce the growing evidence that mesh repair provides superior postoperative outcomes and reduced complication risks compared to the Mayo Technique, while maintaining comparable safety profiles. Future long-term studies could provide additional insights into recurrence and quality of life outcomes.

## Conclusion

In conclusion, this study demonstrates that both the Mayo Technique and Mesh Repair are effective surgical options for umbilical/paraumbilicalhernia repairs with comparable demographic characteristics and safety profiles. However, Mesh Repair offers significant benefits including reduced immediate intraoperative haemorrhage, shorter hospital stay, earlier drain removal, lower postoperative pain, and overall better postoperative recovery.

While no differences were observed in hernia recurrence or wound infection rates in the short term, the superior clinical outcomes associated with Mesh Repair suggest it may be the preferred technique. Further long-term studies are warranted to assess durability, recurrence rates, and patient quality of life over extended follow-up periods.

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