

Anatomical Vs Mesh Repair Of Para Umbilical Hernia Of Size 1 To 2.5 Cm -A Comparative Study

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Abstract

Background: Paraumbilical hernia (PUH) is a prevalent type of ventral hernia in adults. The management for the defects measuring 1 to 2.5 cm is debatable with surgeons weighing the pros and cons of anatomical v/s mesh repair techniques. This study aimed to compare the clinical outcomes, recurrence rate, postoperative pain and complications related with both the types of repairs in PUH patients.

Material and Methods: A total of 54 patients were enrolled in this prospective comparative study with PUH sized between 1 to 2.5 cm in the Department of General Surgery at Geetanjali Medical College and Hospital, Udaipur. Patients were randomised in 2 groups – anatomical (n = 27) and mesh repair (n = 27). Demographic parameters, operative details and postoperative outcomes were analysed using appropriate statistical methods.

Results: Both groups were comparable in terms of age, gender, BMI and comorbidities. The anatomical group had a shorter hospital stay which was significant as compared to mesh repair (mean 2.77 ± 0.15 days, $p=0.007$). Post operative fluid discharge and drain requirement were significantly more frequent in the mesh group ($p = 0.03$ and $p<0.01$, respectively). The anatomical group reported significant lower pain scores (VAS 4.26 ± 0.1 vs. 5.71 ± 0.1 , $p<0.01$). Wound infection rates and recurrence did not differ significantly, though infection was higher in mesh group, recurrence was rare in both groups.

Conclusion: Anatomical repair for PUH offers shorter hospital stay, reduced pain post operatively and less wound discharge as compared to mesh repair with no significant in recurrence rates. Surgical technique selection should be individualized, considering patient comorbidities and risk profiles.

Key Words: Paraumbilical hernia, anatomical repair, mesh repair, recurrence, postoperative pain, surgical outcomes.

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I. Introduction

“No disease of the human body, belonging to the province of the surgeon, requires in its treatment, a better combination of accurate anatomical knowledge with surgical skill than hernia in all its varieties.” - (Cooper, 1804)

One of the most frequent types of hernia is the paraumbilical hernia which falls under the category of ventral hernia in adults. It originates close to the umbilicus, normally through a defect which is lying adjacent to the linea alba. These hernias can affect both the sexes but a higher prevalence is seen among women who are multiparous, suffering through chronic conditions which increases abdominal pressure.¹ Several factors such as ascites, chronic cough, constipation and heavy physical activity can add to the development of hernial defect. This hernial sac may be composed of preperitoneal fat, omentum or even small intestinal loops, the size of defect is highly variable ranging from a couple of millimeters to several centimeters in diameter. The larger defects specially in between 1 to 2.5 cm pose a unique challenge as they are large enough to be symptomatic which can create complications but small enough to debate regarding the most appropriate surgical intervention.²

A surgical road map for repairing hernia remains the gold standard for treatment. But due to its conservative nature, it might hold the risk of incarceration or strangulation. Different techniques have been developed which the surgeons can use are broadly bifurcated as anatomical and prosthetic mesh repair. Anatomical repair uses the primary suture based technique while the other one uses a mesh to reinforce and reduce hernial components. Anatomical repair involves approximation of the fascial edges with the help of sutures and restores the continuity of abdominal wall without the use of any foreign material. This method is considered as safe and cost effective and also avoids mesh related complications. However, recurrence rates have been historically reported to be higher, particularly as the tension created on the suture line predisposes to failure over time.³

On the contrary, mesh repairs involve the placement of a synthetic prosthesis in different positions such as onlay, inlay, underlay or preperitoneal position. It provides a tension free repair, and distributes the forces across a broader segment and In theory it also reduces the chances of recurrence. There are many studies which have reported the reduction in recurrence rate of hernias with mesh repair, especially in hernias larger than 2 cm. Mesh repair carries several potential risks as well such as surgical site infections, seroma, chronic foreign body sensation and longer operative times. Furthermore, in smaller defects such as between 1 to 2.5 cm, the balance between the benefits and risks of use of mesh repair in hernias remains an area of active debate.⁴

The decision making not only depends on majorly on the recurrence risk and also on other perioperative and postoperative outcomes. The most important long term consideration is recurrence, as it often necessitates another surgery and adversely affects patient's day to day activities and return to normal life. Post operative pain is another significant factor to be considered before choosing a surgical plan. Duration of hospital stay, wound infection rates etc. are another set of complications that need to be considered and directly affects patient care, healthcare costs, patient morbidity and functional recovery. Although mesh repair has demonstrated superior outcomes in reducing recurrence rate for larger hernias, in terms of smaller hernias, the technique have mixed results, leaving room for evidence based comparative studies.⁵

Therefore, the present study was designed to address the need of the hour to compare the outcomes of both the techniques for hernia repair. The primary objective is to evaluate and compare the recurrence rate and post operative pain between anatomical and mesh repair in patients with paraumbilical hernias measuring between 1 to 2.5 cm. Besides this, the study also compares the post operative parameters such as hospital stay, pain, wound infection etc. between both the techniques. By systematically analyzing these outcomes, this study seeks to generate clinically meaningful data that can guide tailored operative strategies for this subgroup of patients.

II. Materials & Methods

This study was conducted on patients admitted for paraumbilical hernia in the department of general surgery and the department of surgical gastroenterology at Geetanjali medical college and hospital, Udaipur.

Study design: A prospective comparative study.

Study period: 18 months

Sample size: 54

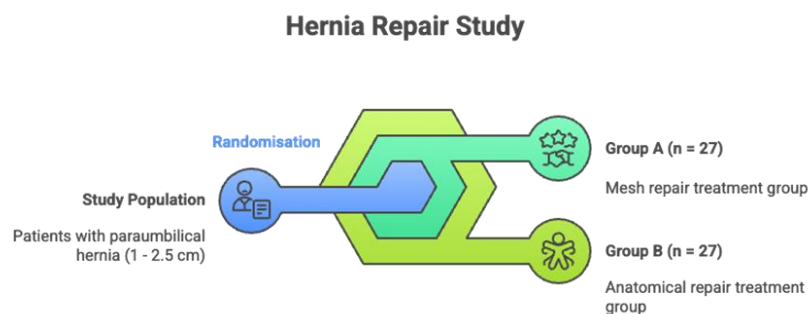
Inclusion criteria:

- Patients aged ≥ 18 years
- Patients with defect size between 1 and 2.5 cm

Exclusion criteria:

- Patients not willing to participate in the study
- Patients with obstructed or strangulated umbilical hernia
- Patients who failed to follow up.

Statistical Analysis: All the collected data was recorded in Microsoft Excel and analyzed. Categorical variables have been described as frequencies and percentages. Discrete variables have been described in terms of median and interquartile range. Continuous variables were summarized as mean and standard deviation and finally the appropriate statistical tests were applied for data analysis. p value < 0.05 was considered statistically significant.



III. Results

Demographic and Clinical profile: The study population was divided into four age categories with the absence of a statistically significant age distribution difference between the two Groups. Overall, the age distributions between Group A (anatomical) and Group B (mesh repair) were closely matched, with no significant variations detected in any age category or in the mean age.

The gender distribution between the two surgical Groups was also similarly balanced with a corresponding p-value of 0.55, indicating that the difference in sex distribution between the anatomical and mesh repair Groups was not statistically significant. The body mass index (BMI) distribution was largely similar between the anatomical and mesh repair Groups. By establishing a comparable demographic and clinical parameters, the baseline of the patients was similar and can be used for further comparison (Table 1).

Table 1: Age distribution in both the Groups

Parameters	Categories	Group A (Anatomical)	Group B (Mesh repair)	Chi square value	p value
Age Groups	18 to 30 years	1	1	0	-
	31 to 45 years	6	7	0.07	0.79
	46 to 60 years	12	12	0	-
	>60 years	8	7	0.06	0.80
Mean age		53.45 ± 2.17	52.37 ± 2.37	-	0.73
<i>p value was calculated using students' t test</i>					
Gender	Males	15	12	0.34	0.55
	Females	12	15	0.34	0.55
Residence	Rural	12	11	0.04	0.84
	Urban	15	16	0.03	0.86
BMI	Underweight (Less than 18.5)	0	0	0	-
	Normal (18.5 to 22.9)	6	2	2	0.15
	Overweight (23 to 24.9)	1	5	2.67	0.10
	Obese (>25)	20	20	0	0

Duration of symptoms and type of surgery:

The duration of symptoms prior to surgery was comparable between the anatomical and mesh repair Groups across all time intervals. Patients usually present themselves once the symptoms become unbearable. In the present study, it was observed that the duration of symptoms varied from a couple of weeks to more than 2 years also in some cases. Overall, there were no statistically significant differences in the duration of illness between the two treatment Groups. The type of surgical procedures opted for repair in both the groups was also similar (Table 2).

Table 2: Duration of symptoms and type of surgery

Parameters	Categories	Group A (Anatomical)	Group B (Mesh repair)	Chi square value	p value
Duration of symptoms	0 to 6 months	5	7	0.34	0.55
	6 to 12 months	7	4	0.81	0.36
	1 to 1.5 years	3	5	0.5	0.47
	1.5 years to 2 years	6	5	0.09	0.76
	>2 years	6	6	0	-
Type of surgery	Paraumbilical hernia	11	17	1.28	0.25
	Umbilical hernia repair	16	10	1.38	0.24

Co-morbidities recorded in both the Groups

Some common comorbidities were observed in both the groups. Conversely, infectious comorbidities such as typhoid fever and tuberculosis each occurred in one mesh repair patient and were absent in the anatomical Group. Overall, the mesh repair Group exhibited a higher prevalence of co-morbidities, driven primarily by increased rates of diabetes and coronary artery disease (Fig. 1).

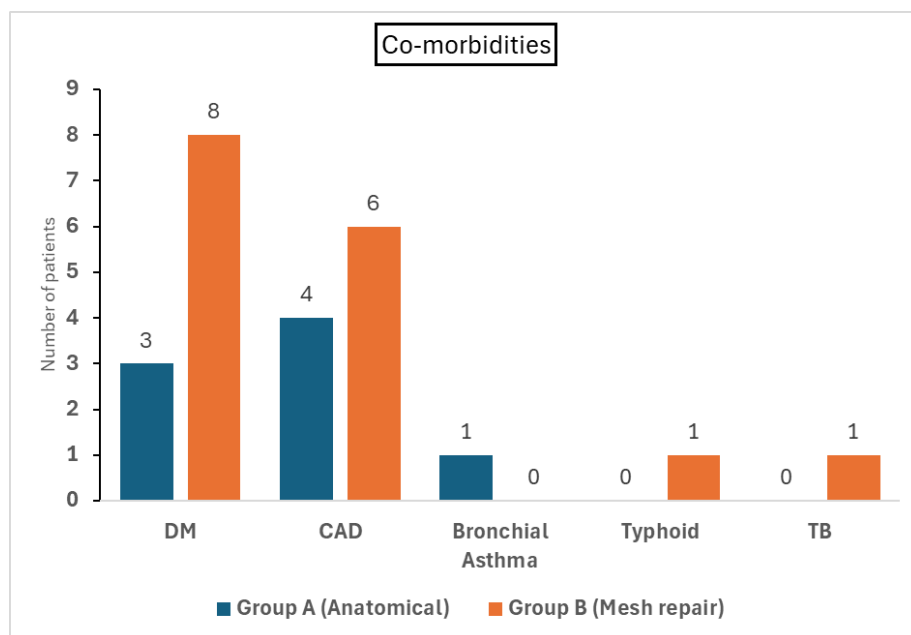


Fig. 1: Bar graphs representing co-morbidities recorded in both the Groups (n = 54, data is represented as number of patients)

Postoperative hospital stay: Postoperative hospital stay tended to be shorter in the anatomical repair Group compared with the mesh repair Group, although differences did not reach statistical significance. While anatomical repair appeared associated with shorter stays, these differences were not statistically significant (Table 3). The average postoperative hospital stay was significantly shorter for patients undergoing anatomical repair compared with those receiving mesh repair. Specifically, Group A (anatomical) had a mean stay of 2.25 ± 0.10 days, whereas Group B (mesh repair) averaged 2.77 ± 0.15 days. This difference was statistically significant ($p = 0.007$), indicating that anatomical repair is associated with a reduced length of hospitalization relative to mesh repair (Table 4).

Table 3: Duration of Post operative hospital stay

Post operative hospital stay	Group A (Anatomical)	Group B (Mesh repair)	Chi square value	p value
2 days	21	12	2.45	0.11
3 days	5	9	1.14	0.28
4 days	1	6	3.57	0.058
Total	27	27	-	-

p value was calculated using χ^2 test, $df = 1$

Table 4: Mean duration of Post operative hospital stay

Post operative hospital stay	Group A (Anatomical)	Group B (Mesh repair)	p value
Mean (days)	2.25 ± 0.1	2.77 ± 0.15	0.007**

*p value was calculated using students' t test, ** $p < 0.01$*

Postoperative fluid discharge: It was observed in 2 of the 27 patients (7.4%) undergoing anatomical repair and in 9 of the 27 patients (33%) undergoing mesh repair. Statistical analysis using the chi-square test revealed a χ^2 value of 4.45 for the comparison of discharge rates, corresponding to a p value of 0.03 which was significant. Conversely, the absence of discharge was noted in 25 (92.6%) of anatomical-repair patients versus 18 (67%) of mesh-repair patients, yielding a χ^2 value of 1.13 and a p value of 0.28, not reaching statistical significance (Table 5).

Table 5: Discharge from operative site

Discharge	Group A (Anatomical)	Group B (Mesh repair)	Chi square value	p value
Present	2	9	4.45	0.03*
Absent	25	18	1.13	0.28

Total	27	27	-	-
<i>p value was calculated using χ^2 test, $df = 1$, *$p < 0.05$</i>				

Infection and recurrence rate:

Postoperative wound infections can lead to bad outcomes and hinder patient satisfaction. Postoperative wound infection occurred in 4% who underwent anatomical repair compared to 22% who received mesh repair (Table 6). The number represented a starking difference but it was not significant implying that neither technique is directly correlated with infection. In the anatomical-repair Group, one patient experienced hernia recurrence, while no recurrences were observed among those who underwent mesh repair; this difference was not statistically significant (Table 7).

Table 6: Analysis of occurrence of infection

Wound infection	Group A (Anatomical)	Group B (Mesh repair)	Chi square value	p value
Present	1	6	2.57	0.1
Absent	26	21	0.53	0.47
<i>p value was calculated using χ^2 test, $df = 1$</i>				

Table 7: Rate of recurrence of hernia

Recurrence	Group A (Anatomical)	Group B (Mesh repair)	Chi square value	p value
Number of patients	1	0	1	0.31

Pain scores and drain requirement:

The mean VAS score for pain in the anatomical-repair Group was lower as compared to the patients who underwent mesh repair This difference between Groups was highly significant ($p < 0.01$) implying patients with anatomical repair experienced less pain (Table 8). The analysis of drain placement between the two surgical groups demonstrated statistically significant differences, indicates a highly significant association between the type of surgical repair and the need for drain placement (Table 9).

Table 8: Mean VAS scores of participants in both the Groups

	Group A (Anatomical)	Group B (Mesh repair)	p value
Vas Scores	4.26 $\pm$ 0.1	5.71 $\pm$ 0.1	0.00**

Table 9: Analysis of drain placement in the present study

Drain placement	Group A (Anatomical)	Group B (Mesh repair)	Chi square value	p value
Yes	8	27	10.31	0.0013**
No	19	0	19	0.0001**

IV. Discussion

The current study compares the anatomical repair and mesh repair techniques for paraumbilical hernias measuring between 1 to 2.5 cm in size. The correct technique will not only determine the post operative outcomes but also the quality of patient life. The study evaluated both the techniques on the basis of clinical outcomes such as postoperative pain, hospital stay, wound complications, recurrence and drain requirements. Overall, the findings are meant to provide important insights that can guide individual surgeons for decision making.

One of the most significant observations was the duration of hospital stay. Postoperative hospital stay was significantly low in anatomical repair as compared to mesh repair. This observation implies that anatomical repair may facilitate a faster initial recovery and can discharge the patient early. Less hospital stay improves patient mental health, recovery, is convenient for patient and overall improves patient satisfaction and post operative outcomes. The increased hospital stay in mesh repair can be linked to the inflammatory response or tissue adjusting to implantation of synthetic material. Unlike previous studies showing mesh repair shortens hospital stay for larger hernias, this study found faster recovery with anatomical repair in defects under 2 cm, likely due to simpler and less invasive procedures in small hernias. Khattab et al. (2019)⁶ also support primary suture repair for small paraumbilical hernias, given their lower complexity and minimal recurrence risk

Another critical aspect evaluated was post operative wound complications. The wound infection rate was higher in mesh repair group as compared to the anatomical group but the difference was not significant. However, the postoperative discharge was more frequent in mesh group with a significant p value. This finding indicates that mesh group have increased seroma or fluid collection risk due to the foreign body response and greater tissue

disruption. This can cause prolonged wound drainage and also patient discomfort. Such type of complications may also have long term implications and patient satisfaction.

Nguyen et al. (2014)⁷ reported a higher incidence of seroma formation following mesh repair for paraumbilical hernia, attributing this to foreign body reactions from the mesh material leading to local inflammation and fluid accumulation. Similarly, Hanumanthappa et al. (2025)⁸ observed more frequent wound-related complications including infection, delayed healing, and fluid collections in patients receiving mesh repair. These findings highlight that although mesh repair can lower recurrence rates, it is also associated with increased risks of postoperative complications compared to anatomical suture repair.

Recurrence rates are a major issue in hernia repair surgeries. In the present study, recurrence rate was near to nil in both the groups. Although, this difference was not statistically significant, it aligns with the previously published literature in which mesh repairs have very low recurrence in larger defects. For small size hernias, both the techniques are effective in preventing recurrence rate. Khattab et al. (2019)⁶ found no significant difference in wound complications or surgical site infections between anatomical and mesh repair for paraumbilical hernia. Madsen et al. (2020)⁹ and Dias et al. (2024)¹⁰ further confirmed that infection rates do not differ significantly between the two techniques, particularly for defects smaller than 3 cm. Thus, current evidence suggests that repair type does not substantially affect postoperative wound infection risk in small hernia defects.

Post operative pain is a very important parameter for understanding post operative outcomes and patient satisfaction. High levels of pain also hinders return to normal life of the patients and can cause mental health issues as well. In the present study, the pain scores in anatomical repair was significantly low. The high VAS scores in mesh repair can be linked to increased inflammation and surgical trauma. Lower pain levels can enhance early mobilization and improve overall outcomes. Vupputuri et al. (2019)¹¹ also reported that patients in the mesh repair group exhibited significantly higher VAS scores following hernia surgery.

Similarly, the drain placement was high in mesh repair group and was significant when compared to anatomical group. This likely reflects increased postoperative exudation and inflammatory response related to the mesh implant, necessitating additional measures to prevent fluid accumulation. Although one patient from the anatomical repair group had a recurrence of hernia after surgery, statistical analysis revealed no significant difference in the rate of recurrence for the anatomical and mesh repair groups. Recurrence occurred in 3.7% of patients in the anatomical group and in none of the mesh group; however, this was not statistically significant ($p = 0.31$). Kumar et al. (2024)¹² also noted a trend towards a lower recurrence rate in the mesh repair group; however, this reduction did not reach statistical significance.

V. Conclusions

In conclusion, the paraumbilical hernias between 1 to 2.5 cm can advantage more through anatomical repair through shorter hospital stay, less postoperative pain and reduced wound discharge. Mesh repair techniques might offer a lower risk during surgery and in recurrence rates, but with higher pain scores and wound discharge it leads to longer hospitalization. The choice of repair methodology should be based on individual patient, comorbidities, risk of recurrence and tolerance of complications. These findings support a nuanced approach in surgical planning, emphasizing the balance between efficacy and patient-centered outcomes. Further larger-scale, long-term studies are warranted to validate these results and refine guidelines for optimal hernia management in this population.

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