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Original research article

A comparative study between onlay and sublay mesh repair in the treatment of umbilical hernia and para umbilical hernia among adults

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Abstract

Background: A hernia is a protrusion of an organ through an abnormal opening, often occurring in the abdominal wall. Para-umbilical hernias are common in middle-aged and older adults, especially in women. Obesity is a major risk factor. Surgical mesh repair is the preferred treatment, reducing recurrence but carries a risk of infection.

Methods: A study in India will involve 200 patients with umbilical and para-umbilical hernias, divided into two groups (100 each) for onlay and pre-peritoneal mesh repair. Random allocation will be done using computer-generated numbers. The primary objective is to assess postoperative seroma formation and surgical site infections over four weeks, using the Southampton and ASEPSIS systems for infection grading.

Results: In Onlay mesh repair post-operative complications seroma 11(5.5%) patients followed by purulent discharge 11(5.5%) patients followed by erythema 6(3%) patients. In sublay mesh repair seroma, purulent discharge, erythema were 6(3%), 0, 4(2%) patients respectively.

Conclusion: There is significant difference in occurrence of surgical site infections in onlay mesh repair (14%) vs. sublay mesh repair (5%). Therefore, I would like to conclude that sublay mesh repair (retrorectus and preperitoneal mesh repair) is better surgical procedure than onlay mesh repair for treating umbilical hernia and paraumbilical hernia with regards post-operative surgical site infection.

Keywords: Umbilical hernia, paraumbilical hernia, onlay, sublay, seroma, surgical site infection, Southampton wound grading system, asepsis score

Introduction

A hernia is derived from the Latin word for rupture. A hernia is refers to an abnormal protrusion of an organ or tissue through a weakness in the abdominal wall [1]. The umbilicus, a midline opening in the Linea Alba present at birth, typically closes within a week as the umbilical cord stump heals. However, an "umbilical hernia" occurs when this scar closes incompletely in childhood or fails and stretches in adulthood. "Paraumbilical hernia" refers to midline hernias occurring within 3 cm above or below the umbilicus.

While most congenital pediatric umbilical and paraumbilical hernias close over time, hernias persisting beyond 3-4 years or those larger than 2 cm often require surgical intervention. Adult umbilical and paraumbilical hernias are usually symptomatic, with no tendency to close spontaneously, and carry a higher risk of strangulation, necessitating early surgical repair. Factors such as pregnancy, obesity, and ascites, which increase intra-abdominal pressure [2], are common in adults with these hernias.

Surgical management, particularly mesh repair for defects larger than 2 cm is preferred for durable outcomes [2]. Various procedures, including onlay and sublay mesh repairs, aim to minimize recurrence and postoperative complications. This study, conducted at ESICMC PGIMSR & MODEL HOSPITAL from September 2022 to February 2023, examines the clinical presentation, management, and postoperative outcomes of umbilical and paraumbilical hernias.

Methods

Prospective observational study was conducted between September 2022–February 2024. Sample size calculated based on a previous study conducted in 2018 in India by Manish jagapat *et al*. [3] wound infection in pre peritoneal was 4% and 16% in onlay group. At 95% confidence level and 80% power, 97

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per group, considering drop-outs sample size is 100. Therefore, 100 patients in pre peritoneal group and 100 patients in onlay meshplasty group with a total sample size of 200. Patients will divide randomly into two groups by using computer generated random numbers. (Simple random allocation). All the patients with following common properties were included in the study. Patients of both gender Age between 20-60 years patients with clinical and investigatory support for the diagnosis and willingness for the surgical management of umbilical hernia and paraumbilical hernia, those who are prepared to sign the informed consent form meet the inclusion criteria.

Criteria for exclusion was

1. Patient not willing to give informed consent.
2. Patient less than 20 years and above 60 years.
3. Patient with inguinal hernia, incisional hernia, epigastric hernia, divarication of recti, recurrent hernia.
4. Immunosuppressive disorders like diabetes, HIV, hepatitis, severe renal /hepatic failure.
5. Advanced tumors/ currently treated malignancies.

The patients who met the inclusion criteria were enrolled in the study after receiving informed consent and approval from the institutional ethics committee. Patients aged 20-60 years having clinical and radiological diagnosis of umbilical and paraumbilical hernia with full filling inclusion criteria will be chosen for the study. Patients will divide randomly into two groups by using computer generated random numbers. Group a patients undergoing onlay meshplasty and group B is sublay/pre- peritoneal mesh repair. Data will be collect among patients having clinical and radiological diagnosis of umbilical hernia for hernioplasty after meticulous history taking, performing haematological investigations, ultrasonography. The primary objective of the study is post-operative seroma formation and surgical site infection for post-operative period of 4 weeks. The assessment of infection by systemic signs like tachycardia, pyrexia, raised WBC count. Grading of severity of wound infection by Southampton and asepsis system. All the data collected will be compiled and entered into a Microsoft excel worksheet. Quantitative data/continuous variable such as duration of operation will be presented mean with standard deviation. Qualitative variable such as diagnosis, surgery, will be analysed using frequency and percentage. Unpaired t test or Mann Whitney U Test will be used to compare post-operative seroma and surgical site infection in two groups with Group A patients undergoing onlay meshplasty and group B is sublay/pre-peritoneal mesh repair. The data was analysed using statistical software Statistical Package for Social Science (SPSS) 20.

Results

Prospective observational study consisting of 200 UH and PUH patients was taken up for investigating the etiology, clinical features and the factors associated with the development of paraumbilical hernia, to discuss the methods of treatment of paraumbilical hernia and to study the morbidity and postoperative complications of patients who met with the inclusion criteria were studied over a period of 1.5 years.

Table 1: Occurrence of umbilical hernia and para umbilical hernia

	Number	Occurrence rate
Total hernias operated from September 2022 to February 2024.	1278	100%
Inguinal hernia	831	65%
Umbilical and para umbilical hernia	224	17.5%
Incisional hernia	152	11.9%
Epigastric hernia	67	5.2%
Femoral hernia	04	0.3%

Total number of hernias operated were 1278 from September 2022 to February 2024 in General Surgery Department in ESI Model Hospital of which umbilical and paraumbilical hernia accounts for 17.5% of cases.

Table 2: Surgical Procedures

Procedures	Number (n=200)	Percentage
Onlay mesh repair	100	50%
sublay mesh repair	100	50%
Retrorectus	70	35%
Preperitoneal	30	15%

In our study 100 patients (50%) underwent onlay mesh repair and 100 patients (50%) underwent sublay mesh repair (retrorectus repair 70patients (35%) + preperitoneal repair 30 patients (15%)).

Table 3: Sex distribution

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	Frequency	Percentage
Female	76	38%
Male	124	62%

This table shows that 124 male (62%) and 76 female (38%).

Table 4: Precipitating factors among female sex

Precipitating factors	Frequency(n=76)	Percentage
Multiparity	35	46
Obesity	19	25
Constipation	11	14
Chronic cough	4	5

In females most common precipitating factor of paraumbilical hernia was multiparity (46%) followed by obesity (25%).

Table 5: Precipitating factors among males

Precipitating factors	Frequency(n=124)	Percentage
Smoking	64	51
Obesity	21	16
Weight lifting	14	11
Chronic cough	11	8
Constipation	4	3

In males most common precipitating factor was smoking (51%) followed by obesity (43%).

Table 6: Incidence of SSI in onlay vs sublay mesh repair

	Onlay mesh repair	Sublay mesh repair	P Value
Erythema	6	4	0.001
Seroma	11	6	
Purulent discharge	11	0	
Total	28	10	
Percentage	14	5	

In our study surgical site infections more commonly in onlay mesh repair (14%) than sublay repair (5%) With significant P-value- 0.01

Table 7: Post-operative complications and duration of surgery of each procedure

Postoperative complications	Onlay mesh repair (N=100)	Retrorectus mesh repair (N=70)	Preperiton EAL mesh repair (N=30)
Erythema	6	3	1
Seroma	11	4	2
Wound Infection	11	-	-
Wound Dehiscence	-	-	-
Requirement of Mesh Explantation	-	-	-
Duration Of Surgery In Minutes	37+/-6	70+/-5	60+/-7

This table shows incidence of post-operative complications in different surgical procedures. The duration of the surgery is more in retro-rectus mesh repair and pre-peritoneal repair mesh repair groups. For mesh explantation we need long term follow up.

Discussion

In this clinical study, 200 patients with umbilical and paraumbilical hernia were admitted and treated with different surgical procedures from September 2022 to February 2024. The two group of patients were studied for occurrence, risk factors, clinical features, treatment and postoperative complications pertaining to disease. Discussion is mainly concentrated on compare surgical site infections in two different surgical techniques.

Occurrence of different types of hernia operated in our hospital is as follows: Inguinal hernia 65%, umbilical and paraumbilical hernia-14.8%, incisional hernia-11.9%, epigastric hernia-5.2% and femoral hernia-0.3% [4]. Although exact incidence of paraumbilical hernia is not mentioned in available literature, it is considered as one of the common hernias apart from inguinal hernia (Table 1).

Umbilical and Paraumbilical hernia is more common in females. But in our study 76 patients were females and 124 patients were males. In our study ratio between male and female sex is 1.67:1. There is

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no significance difference in age distribution in males and females, as disease is more common between 3th and 5th decade in both sex. The sex ratio was found in our study is not consistent with other studies by Abo-Ryia *et al*. [7] Sangwan *et al*. [4] Daudpoto *et al*. [6], Kensarah *et al*. [5] & Malik *et al*. [8] among which the study by Sangwan *et al*. [4] shows a female to male sex ratio of 1.6:1, Whereas the study by Prasad Shah *et al*. [9] has male predominance for paraumbilical hernia with a female to male ratio of 1:1.5 which is in contrast with our study. (Table 3).

In females, most common precipitating factor was multiparity. Out of 76 patients, 35 were multiparous. This can be attributed to stretching and weakening of anterior abdominal wall musculoaponeurotic layer (Table 4). Next common precipitating factor was obesity seen in 19 patients (25%). Pathogenesis can be attributed to theory explained by Mayo; obesity causes downward traction on the abdominal wall bearing on a fixed point on umbilicus associated with an increase in vertical dimension of abdominal wall. Fat penetrates muscle bundles and layers, weakens aponeurosis and predisposes to hernia. Other less common precipitating factors were chronic cough and constipation.

In males (124) most common precipitating factor was smoking (64 patients) followed by obesity (21 patients). Smoking is an important predisposing factor in development of inguinal hernia as it causes degeneration of collagen fibres, same theory applies to paraumbilical hernia. Other precipitating factors are chronic cough (COPD), constipation and heavy manual work. Some patients had more than one precipitating factors and some did not have any precipitating factor (Table 5). Studies by Malik *et al*. [8], Daudpoto *et al*. [6], Ahmed M. Kensarah [5] & Prasad Shah *et al*. [9] show similar results regarding the risk factors in either sex.

Incidence of seroma 11 cases (11%), purulent discharge 11 cases (11%), erythema 6 cases (6%) in onlay mesh repair group of 100 cases. Incidence of seroma 6 cases (6%), purulent discharge 0 cases, erythema 4 cases (4%) in sublay mesh repair group of 100 cases with significant p value 0.001. Studies by Manish jagtap *et al*. [3], Afridi SP *et al*. [10], Bantu raj siddharth *et al*. [11] closely matches with our study. No patient required removal of mesh because of infection, as infection was superficial and responded well to antibiotics but it requires long term follow up.

Conclusion

Based on our study comparative study between the two surgical procedures of umbilical and para-umbilical hernia came out with following conclusions

- There is significant difference in occurrence of surgical site infections in onlay mesh repair (14%) vs sublay mesh repair (5%) with p value 0.001.
- Therefore, I would like to conclude that sublay mesh repair (retrorectus and preperitoneal mesh repair) is better surgical procedure than onlay mesh repair for treating umbilical hernia and paraumbilical hernia with regards post-operative surgical site infection.
- The strength of our study is that our sample size was 200.

Limitation: Duration of the study only 4 weeks.

- Require long term follow up to know about the recurrence and regarding mesh explanation of the difference procedure.
- More randomized control trials and multicentre trials are to be undertaken to know the effectiveness of the procedure

Declarations

- **Funding:** No funding was required for our study.
- **Conflict of interest:** We declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.
- **Ethical approval:** Approved.

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