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STUDY OF LONG-TERM OUTCOMES OF ONLAY VS SUBLAY MESH REPAIR FOR PARA-UMBILICAL HERNIAS

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Abstract

Objectives: *To perform the comparison of long-term outcomes of para-umbilical hernia patients managed surgically through onlay versus sublay mesh repair.*
Study Design: *Comparative cohort study.*
Place and Duration of Study: *Combined Military Hospital, Abbottabad from September 2024 to Feburary 2025.*
Methodology: *A total of 56 patients who underwent mesh repair of para-umbilical hernia three months prior to inclusion in the study were divided into Group-O (Onlay) and Group-S (Sublay) based on type of mesh repair technique. Intergroup comparative analysis of long-term outcomes (recurrence, chronic pain at operative site and patient satisfaction status) was done using Chi-square test.*
Results: *A total of 56 patients were included who were divided into two groups. Median age of patients with paraumbilical hernia was 39.50 (22.75) years. There were 27 (48.20%) male and 29 (51.80%) female patients. Median BMI was 33.54 (4.77) kg/m2. Median hernia size was 5.44 (2.59) cm. At 06-months follow-up visit, frequency of recurrence and chronic pain at operative side was 1 (1.80%) and 3 (5.40%), respectively. Regarding satisfaction status, 52 (92.90%) patients were satisfied with their surgical outcome while 4 (7.10%) were not satisfied. There was no statistically significant difference based on any of the long-term outcomes including recurrence ($p = 0.313$), chronic pain at operative site ($p = 0.553$) and patient satisfaction level ($p = 0.299$).*
Conclusion: *Both the techniques of para-umbilical mesh repair provide comparable long-term outcomes without any statistically significant difference.*

INTRODUCTION

A defect in the normal architecture of the abdominal wall leads to herniation of the normal anatomical contents into an abnormally protruded out pouch. Globally, abdominal wall hernia is highly common and according to recently conducted epidemiological analysis, this type of hernia has been reported to have a prevalence of 5%. [1] Para-umbilical hernia is one of the type of abdominal hernia and has been reported to constitute approximately 14% of cases of this class of hernia, and its repair is among most widely performed surgery globally. [2,3]

The ethiopathological process that leads to this type of hernia is the abnormally increased intra-abdominal pressure primarily due to obesity. [4] Other causes include prior surgery of this region, multiparity, malnutrition, smoking, chronic constipation, long-term use of steroids, benign hyperplasia of prostate and rectus abdominis diastasis. [5,6] Irrespective of the cause, the only curative therapy for hernia defect is the surgical repair which mostly involves the use of a surgical

mesh due to better surgical durability and the procedure is performed through various techniques. [7] Two such techniques are onlay mesh repair (OMR) and sublay mesh repair (SMR) which have widely been studied previously in terms of short-term post-procedural outcomes.

As far as early post-operative and short-term outcomes are concerned (like surgical wound infection, seroma formation and hospitalization length), SMR has shown a clear superiority over OMR based on the results of previous studies. [8,9] However, when it comes to long-term outcomes, particularly the chronic operative site pain, recurrence and overall patient satisfaction rates, no concrete evidence exists in favor of either of the aforementioned procedures. To address and fill this research gap, present study was conducted with the aim of performing a comparative analysis of the long-term outcomes of these two commonly used techniques of para-umbilical hernia repair to determine whether there was any significant difference between the two techniques.

METHODOLOGY

This comparative cohort study was held in the Department of Surgery of Combined Military Hospital, Abbottabad spanning between September 2024 to Feb 2025, after approval was provided by the ethical review board.

Female and male patients who were aged above 18 years, who underwent mesh repair surgery of their para-umbilical hernia three months prior and came for their three months follow up were included. Females who were or had history of previous pregnancy, patients with prior surgery of the abdomen, recurrent hernia, co-morbidities including diabetes, hypertension, pulmonary tuberculosis, lung fibrosis, chronic obstructive pulmonary disease, poor controlled asthma and/or ischemic heart disease, hernia size >8cm or <3cm, malnutrition, smoking, constipation after surgery, steroids use for a systemic disease and benign hyperplasia of prostate were excluded from the study.

To calculate appropriate sample size for this study, WHO sample size calculator software was used in which section of hypothesis testing for two population proportions was used. A sample size of 56 (28 in each group) was calculated based on assumption of level of significance of 5%, power of 90% and anticipated frequencies of recurrence with SMR and OMR of 0% and 30%, respectively. [10] Selection of sample was done consecutively by non-probability sampling.

A written informed consent proforma was signed by every patient before being included in this study. Demographic data of all the patients including age, gender, body mass index (BMI) and size of operated hernia was documented. Based on the technique used for performing their surgery, patients were divided into two groups. In Group-OMR, patients who underwent OMR of their para-umbilical hernia were included while those who underwent SMR were allocated in Group-SMR. Each patient was requested to follow up on three monthly basis till completion of 12 months from the time of their surgery. At the completion of 12 months, each patient was assessed for the last time for the long-term surgical outcomes including the recurrence, chronic pain at the operated site and patient satisfaction status. Chronic pain was defined as presence of persistent feeling of pain in the peri-umbilical region for most days in a week which caused distress to patient making them seek medical help for the pain till completion of 12 months since surgery. Patient satisfaction was scaled through patient satisfaction visual analogue scale score as satisfied (score between 7-10) and unsatisfied (score < 7).

Statistical analysis of the collected data was performed by inputting data into the Statistical Package for Social Sciences (SPSS) software version 20. To check whether the quantitative data was distributed normally, Shapiro-Wilk test was used which showed that age, BMI and size of operated hernia was not distributed normally and was therefore presented as median interquartile range (IQR). For representing quantitative data frequency and percentage were utilized. Intergroup comparative analysis of quantitative data (age, BMI and size of operated hernia) was done using Mann Whittney U-test. Intergroup comparative analysis of qualitative data (gender, recurrence, chronic pain at the operated site and patient satisfaction status) was done using Chi-

square test. A p-value of ≤ 0.05 was considered statistically significant.

RESULTS

In this study, 56 patients were included. Median age of patients with paraumbilical hernia was 39.50 (22.75) years. There were 27 (48.20%) male and 29 (51.80%) female patients. Median BMI was 33.54 (4.77) kg/m2. Median hernia size was 5.44 (2.59) cm. Intergroup patient demographics comparison is given in Table-I:

Table-I: Intergroup patient demographics comparison (n = 56)

Demographics	Study groups		p-value
	Group-OMR (n = 28)	Group-SMR (n = 28)	
Median age (years)	45.50 (22.50)	36.50 (22.75)	0.628 [a]
Gender			0.789 [b]
Male	14 (50.00%)	13 (46.43%)	
Female	14 (50.00%)	15 (53.57%)	
Median BMI (kg/m2)	33.69 (5.33)	33.15 (4.12)	0.902 [a]
Median hernia size (cm)	5.34 (2.33)	5.44 (2.70)	0.749 [a]

BMI = Body mass index, kg = kilograms, m2 = meters squared, cm = centimeters, a = Mann Whittney U-test, b = Chi-square test

At 12-months follow-up visit, frequency of recurrence and chronic pain at operative side was 1 (1.80%) and 3 (5.40%), respectively. Regarding satisfaction status, 52 (92.90%) patients were satisfied with their surgical outcome while 4 (7.10%) were not satisfied. Intergroup comparative analysis of long-term outcomes is given in Table-II:

Table-II: Intergroup comparative analysis of long-term outcomes (n = 56)

Outcome	Study groups		p-value
	Group-A (n = 28)	Group-B (n = 28)	
Recurrence	1 (3.57%)	0 (0.00%)	0.313 [b]
Chronic pain at operated site	2 (7.14%)	1 (3.57%)	0.553 [b]
Patient satisfaction			0.299 [b]
Satisfied	25 (89.29%)	27 (96.43%)	
Unsatisfied	3 (10.71%)	1 (3.57%)	

DISCUSSION

Present study focused on determining the better mesh placement technique among OMR and SMR technique for surgically managing para-umbilical hernia based on the long-term outcomes of the surgery. Outcomes that were focused in present study were recurrence, chronic pain at operated site and patient satisfaction status. To assess the satisfaction of the patients towards the surgery, patient satisfaction VAS was used. This scale has been widely accepted, easy to use and validated tool for quantifying level of satisfaction of the patients who undergo various types of surgery. [11]

Upon analysis of the gender distribution of para-umbilical hernia, it was observed that this condition was almost equally distributed among genders with 48.20% of cases being male and 51.80% being female. In comparison, a study addressed the clinical characteristics of the patients suffering from this type of hernia and they reported a clear female predominance in this regard with females constituting 62% of the patients with this type of hernia. [12] Similarly, one

study focused on the same surgical morbidity as of present study and reported majority of patients with hernia of the abdominal wall to be of female gender constituting 59% of the study population. [13] This predominance in previous studies can be attributed to the natural differences in male and female abdominal muscular physiology combined with higher risks of abdominal wall laxity women after pregnancies and cesarean sections. [14, 15] However, in this study, this difference was not evident because the criteria of selection was quite strict for female patients since any female with history of abdominal surgery or pregnancy was excluded to avoid the confounding effect of these factors on the long-term outcomes of the surgery.

Upon analysis of body mass index of the hernia patients that were included in present study, it was observed that most patients who had para-umbilical hernia had BMI ranging in obese range with median BMI being 33.54 kg/m2. This can be attributed to a strong association of obesity and development of the para-umbilical hernia secondary to persistently raised abdominal pressure that puts strain on the abdominal musculature contributing to its progressive weakening. [16, 17]

Composite recurrence rate of paraumbilical hernia was 1.80% with no significant difference existing between OMR and SMR ($p = 0.313$). Composite frequency of chronic pain at operated site was 5.40% with no significant difference existing between OMR and SMR ($p = 0.553$). In present study, 92.90% of the patients were satisfied with their surgical outcomes while only 7.10% were not satisfied. However, upon intergroup comparative analysis of this outcome, no significant difference was observed ($p = 0.299$). In comparison, a study was conducted recently in Pakistan in which various post-procedural outcomes of these two mesh repair techniques were compared and it was reported that among patients who underwent repair through OMR had recurrence rate of their pathology of 2.86% while none of the patients in SMR group reported such event ($p > 0.05$). [18] In another study, long-term recurrence rates of OMR and SMR were compared in cases of paraumbilical hernia and it was reported that none of the patients in SMR group and 6% patients in OMR group reported with recurrence of their hernia during the two years follow up period. [19] In one study, a comparison of operative outcomes of 30 patients (divided into two groups containing 15 patients each who underwent either OMR or SMR) with abdominal hernia was performed in which it was found that 3/15 (20%) patients who underwent OMR and 1/15 (6.7%) patients who underwent SMR reported recurrence event ($p = 0.07$). [20]

In contrast to the above-mentioned studies as well to the results of current study, a study which compared same two techniques in patients of paraumbilical hernia who were surgically managed, reported completely opposite results. In their study, they found that the recurrence rate with SMR was much higher compared to OMR, instead of the other way around (17% in SMR versus 8% in OMR). [21] One possible reason for such discrepant result could be the shorter period of follow up in their study (six months) as compared to present study in which it was twelve months. Secondly, differences in the sample sizes, criteria of patient selection, expertise of operating team, level of surgical facilities and adherence to the effective post-operative management techniques could have also contributed to the variability in the results of present and previous studies.

Based on the results of present study, it is evident that when it comes to long-term outcomes, either technique among sublay and onlay is appropriate since both the techniques provide equally better outcomes in the long run. The limitation of present was smaller sample size but it was a necessity since the criteria of selection was kept very strict to avoid exposure to any factor that could have directly impacted the outcomes of either of the procedure. In addition, to comparative analysis of recurrence rates of present study and previous research has been done owing to availability of large body of data but other two outcomes, i.e., chronic pain at the operated site and patient satisfaction status have not been researched previously in the form a comparative analysis of the two techniques that were focus of present study. Due to this, comparative analysis of

these two outcomes was not possible which added to the limitations of present study.

CONCLUSION

For management of para-umbilical hernia sublay and onlay mesh placement provide comparable results based on long-term outcomes with no significant difference between the two techniques based on recurrence, chronic pain at the operated site and patient satisfaction status.

CONFLICT OF INTEREST

None

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