

Prevalence of Seroma Formation in Mesh-based Paraumbilical Hernia Repair and Primary Repair - a Comparative Study to Evaluate Patient Outcomes

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ABSTRACT

Objective: To determine the prevalence of seroma formation in patients after undergoing primary repair of para-umbilical hernias compared to mesh-based repairs.

Study Design: Prospective comparative study.

Place and Duration of Study: Department of General Surgery, Combined Military Hospital Rawalpindi, Pakistan from Aug to Dec 2022.

Methodology: A total of 250 patients, 125 each in primary repair group (Group-A) and mesh-repair group (Group-B), who underwent elective para-umbilical hernia surgery were included. Patients in both study groups after the surgery were investigated by ultrasound imaging to confirm presence of seroma. Appropriate management was provided in case of larger seromas by aspiration of fluid.

Results: In our study, the mean age of the whole study pool was 34.44 ± 7.15 years. There were 87(34.8%) male participants while remaining 163(65.2%) participants were female. Mean BMI was 33.05 ± 2.65 kg/m². No statistically significant difference was observed between the study groups in terms of baseline characteristics. The composite frequency of seroma formation in our study was 27(10.8%). The frequency of seroma formation in Group-A was 6 (4.8%) while in Group-B it was 21(16.8%), with $p=0.002$.

Conclusion: This study showed that mesh-based hernia repair for repairing para-umbilical hernias had a higher frequency of seroma formation than by primary repair without mesh.

Keywords: Elective Abdominal Surgeries, Para-umbilical Hernias, Seroma.

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INTRODUCTION

Para-umbilical hernia is a type of ventral hernia that is characterized by presence of an abnormal abdominal swelling/defect, and affects quality of life of the suffering patient leading to hospitalizations and even death in severe cases.¹⁻³ Common causes of para-umbilical hernia include history of previous surgery, trauma, repetitive stress, obesity and repetitive weight gain and loss, leading to weakening of naturally occurring weak points in the abdominal wall.⁴

Amongst all the abdominal hernias, it has been reported that about 33.9% are para-umbilical hernias, with female predominance (63.4% in females vs 36.6% in males).^{5,6} Management of para-umbilical hernias involves surgical repair of the defect in abdominal wall for which two techniques are widely used including primary repair by suture technique (also known as keel technique) and open mesh repair

technique.⁷

A seroma can occur post-surgically, either when the drain is removed or when it is not placed after surgery, and its incidence can reach as high as 20%.⁸ It is possible that a small seroma may heal on their own without any intervention. When dealing with larger seromas, aspiration with a needle is needed. Infected seromas may call for treatment with antibiotics, and in some instances, these seromas may need surgical removal.⁹

When it comes to frequency of formation of seroma after para-umbilical hernia repair with mesh repair technique versus primary suture repair technique without the use of mesh, results have been highly variable with some studies reporting higher frequency of seroma formation in association with mesh repair technique while other reporting higher frequency in cases of primary suture repair of hernia without the use of mesh.¹⁰ We conducted this study to compare prevalence of seroma formation in patients after undergoing primary suture repair of para-umbilical hernias compared to mesh-based repairs.

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METHODOLOGY

This prospective comparative study was conducted at General Surgery unit of Combined Military Hospital Rawalpindi, Pakistan from to December 2022 after obtaining approval from the Institutional Ethical Review Board (vide ser no. 343 dated 9 February 2022).

Inclusion Criteria: Patients of either gender, aged between 18 to 60 years, who had hernial defect size of 2-4 cm and who underwent elective hernia repair either by primary suture repair technique or by mesh repair technique were included.

Exclusion Criteria: Patients who were pregnant, those with strangulated or obstructed hernias, those with a history of coagulation disorders, those who were declared unfit for surgery and those who had drains placed per operatively were excluded.

A sample size of 250 was calculated using WHO calculator by assuming anticipated frequency of seroma formation after mesh repair of para-umbilical hernia of 14.3% and anticipated frequency of seroma formation after primary repair of para-umbilical hernia of 4.1%.^{11,12}

We selected our study population by using non-probability consecutive sampling method from the patients who had undergone either primary repair for their hernias or mesh based on-lay repair. Once a study pool of 250 patients was selected, we divided these patients into 2 groups. In Group-A, we included patients who underwent repair of their para-umbilical hernia by primary suture repair technique while in Group-B, we included patients who underwent mesh repair.

Baseline characteristics of all the included study participants, including age, gender and body mass index (BMI) were documented. In our study, all patients had received standardized surgical preparation per hospital protocol, along with pre-operative intravenous antibiotic (injection ceftriaxone 2gm). A transverse incision was used to repair each hernia, and the fascia and hernia sac were dissected as well. The sac and its contents were reduced into the peritoneal cavity. Transverse closure of the hernia defect with interrupted non-absorbable sutures was used for primary repairs. An on-lay method was used to perform mesh repair. A subcutaneous space of 5 cm was created, and a polypropylene mesh with at least 3 cm of overlap was placed there after reduction of hernia and closure of fascial layer with interrupted

non-absorbable sutures in all cases. Per-operatively, drains were not placed. The skin was closed after irrigating the subcutaneous layer. Post-operatively, presence of seroma was assessed by using ultrasound to detect collection of fluid underneath the incision site. Appropriate treatment was provided in case of presence of seroma by performing its aspiration.

Data was analyzed by using Statistical Package for Social Sciences (SPSS) version 22. Quantitative data (age and BMI) was represented using mean with standard deviation. Qualitative data (gender and seroma formation) was represented using percentage and frequency. Chi-square test (for qualitative variables) and unpaired t-test (for quantitative variables) were applied, and a p -value ≤ 0.05 was taken as statistically significant.

RESULTS

In our study, a total of 250 patients [125 patients in primary suture repair group (Group-A) and 125 in mesh-repair group (Group-B)] were included. After result analysis, we found out that the mean age of the whole study pool was 34.44 ± 7.15 years. There were 87(34.8%) male participants while remaining 163(65.2%) participants were female. Mean value for body mass index (BMI) of our study participants was 33.05 ± 2.65 kg/m². These baseline characteristics are summarized in tabulated form below in Table-I.

Table-I: Baseline Characteristics of Study Participants (n= 250)

Characteristics	Values
Age in years, Mean $\pm$ SD	34.4 $\pm$ 7.1
Gender, n(%)	
Male	87(34.8%)
Female	163(65.2%)
Body Mass Index, Mean $\pm$ SD	33.0 $\pm$ 2.6 kg/m ²

We also compared these baseline characteristics between our study groups i.e., primary suture repair group (Group-A), and on-lay mesh-repair group (Group-B). In this instance, we compared the mean age of the patients between the two groups and found that mean age in Group-A was 34.44 ± 6.78 years while in Group-B the mean age was 34.49 ± 7.53 years, ($p=0.993$). We also found that in Group-A, frequency of male patients was 42(33.60%) and of female patients was 83(66.4%) while in Group-B, 45 (36.0%) were male patients while 80(64.0%) were female patients, ($p=0.690$). Mean BMI in patients belonging to Group-A was 33.48 ± 2.61 kg/m² while in patients of Group-B it was 33.44 ± 2.54 kg/m², ($p=0.902$). This comparison of

baseline characteristics between the two groups is shown in Table-II below.

Table-II: Comparison of Baseline Characteristics between Groups (n=250)

Characteristic	Group-A (n = 125) n (%)		Group-B (n = 125) n (%)		p-value
Age in years, Mean± SD	34.4±6.7		34.4±7.5 years		0.993
Gender	Male	Female	Male	Female	0.690
	42(33.6%)	83(66.4%)	45(36.0%)	80(64.0%)	
Body Mass Index, Mean±SD	33.4±2.6 kg/m ²		33.4 ±2.5 kg/m ²		0.902

The composite frequency of seroma formation in our study was 27(10.8%). We compared the frequency of seroma formation between groups, and found that frequency of seroma formation in Group-A was 6 (4.80%) while in Group-B it was 21 (16.8%), ($p=0.002$). This is represented in Figure-1 below.

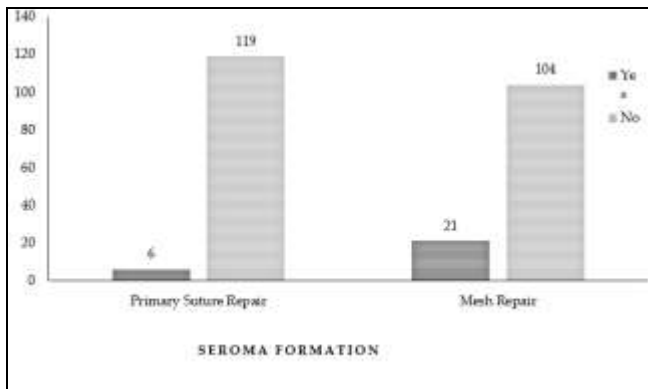


Figure-1: Comparison of Seroma Formation Between Groups (n=250)

DISCUSSION

We conducted this study with the aim of comparing the prevalence of seroma formation with primary suture repair of para-umbilical hernia versus mesh-repair. In our study we found that the frequency of para-umbilical hernia was much higher in the female participants as compared to the male participants. This finding was consistent with the findings of Afzal *et al.*, who also stated that there is a female predominance when it comes to incidence of para-umbilical hernias.¹³ This was not the case in the study conducted by Purushotham *et al.*¹⁴ This difference in the gender distribution of para-umbilical hernia may stem from the anatomical differences in abdominal wall muscles of adults.¹⁵

In our research, we also discovered that the subjects in our study population had high body mass

index (BMI) values. This was in line with the results of numerous studies showing that having a higher body mass index increases the risk of developing hernias.^{16,17}

In our study, we found that the frequency of seroma formation was higher in patients who had hernia repair through mesh-repair technique as compared to those who had primary suture repair, and the difference in the frequency between the two study groups was significant statistically. This association was also observed in the studies conducted by Berger *et al.*, Stabilini *et al.*, and Madsen *et al.*^{11,18,9}, findings of all of which were congruent with what we found in our study. However, in a study conducted by Sanjay *et al.* it was found that prevalence of seroma formation was higher with primary suture repair technique which was not aligned with the findings of our study.²⁰

Based on these the results of our study there is still a degree of variability with what has been discovered in earlier studies, while comparing the prevalence of seroma formation was in patients who have hernia repair through mesh-repair technique as compared to those who have primary suture repair of para-umbilical hernia. For this purpose, we recommend that further studies should be conducted in this regard so that an ideal surgical technique that can reduce the frequency of seroma formation can be opted for by the surgeons based on the evidence.

LIMITATIONS OF STUDY

Our study had certain limitations, including its single-center design, which limits the generalizability of the findings to other surgical populations, and a short-term follow-up that lacks data on long-term complications like chronic pain or late-onset recurrence.

CONCLUSION

In conclusion, the frequency of seroma formation is higher in patients who have hernia repair through mesh-repair technique as compared to those who had primary suture repair of para-umbilical hernia.

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Authors Contribution:

Following authors have made substantial contributions to the manuscript as under:

HAM & SRQN: Conception, study design, drafting the manuscript, approval of the final version to be published.

AK & IR: Data acquisition, data analysis, data interpretation, critical review, approval of the final version to be published.

UM: Conception, data acquisition, drafting the manuscript, approval of the final version to be published.

Authors agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

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