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Frequency of Post Operative Complications of Mesh Repair in Patients with Paraumbilical Hernia

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ABSTRACT

Background: Paraumbilical hernia is a common ventral abdominal wall defect frequently managed by mesh repair to reduce recurrence rates. Despite its advantages, mesh implantation may predispose patients to early postoperative complications. This study aimed to determine the frequency of postoperative complications following mesh repair in patients with paraumbilical hernia. **Methods:** This is a cross-sectional descriptive study, which was carried out at the Department of Surgery, Lady Reading Hospital, Peshawar, between 2 December 2024 and 2 May 2025. One hundred and twenty patient's anesthetics for elective open mesh repair were included in the study population based on non-probability sequential sampling between 18 and 65 years. Patients that were incarcerated or had their hernias strangled and those that were undergoing active infection were locked out. In all cases, polypropylene mesh was positioned in the sublay position. The 15 days evaluation period included the postoperative complications such as wound infection, seroma, and hematoma. The data were examined with SPSS version 21, and there was the stratification in order to detect relations to demographic and clinical variables. **Results:** The average age was 41.8 +11.6 years and 56.7% of the patients were females. The general incidence of postoperative complications was 17.5 percent. The most frequent complication was wound infection (8.3%), then seroma (5.8%) and hematoma (3.3%). Diabetes mellitus (p = 0.03) and smoking status (p = 0.04) had significant associations with complications whereas age, gender, BMI, and hypertension did not have significant association with complications. **Conclusion:** Mesh repair of paraumbilical hernia showed a satisfactory initial morbidity. Surgical outcomes can be further enhanced by optimization of modifiable risk factors like diabetes and smoking.

INTRODUCTION

Abdominal wall hernias are major constituents of general practice surgical practice in all countries and generate an enormous amount of morbidity in a variety of populations [1, 2, 3]. The hernia can be considered as the bulge of the intra-abdominal or preperitoneal contents via the lapse of the musculofascial layers of the abdominal wall [4, 5]. Of all the abdominal wall hernias, umbilical and paraumbilical hernias comprise about 6-14% of all cases of abdominal wall hernias in adults, second to inguinal hernias in occurrence. According to the European Hernia Society, umbilical hernias are hernias of the abdominal wall of the ventral in the range of 3 cm above and 3 cm below the umbilicus [6, 7]. A related entity is paraumbilical hernia, which are adjacent to rather than through the umbilical ring, usually defects that come about through gradual weakening of the linea alba.

The paraumbilical hernias are more commonly seen in adults, especially in women and patients who have predisposing factors like obesity, multiparty, recurrent cough and ascites and conditions that are known to elevate the intra-abdominal pressure [8]. Physiologically, patients normally exhibit a periumbilical protrusion with discomfort or pain, which can aggravate as a result of physical activity [9, 10]. Despite some hernias being asymptomatic in the long term, paraumbilical hernias have a relatively high risk of complications in the form of irreducibility, obstruction, strangulation, skin rupture, and, in rare cases, spontaneous rupture; the risk of complications is higher than that of other ventral hernias. Elective surgical repair is thus as a rule advised in symptomatic patients to help avoid life threatening sequelae.

Surgical treatment of paraumbilical hernia has developed

significantly over the last decades. The use of mesh-based procedures has replaced most instances of traditional primary suture repair, which was the primary way of treatment, due to unacceptable high recurrence rates of tissue approximation alone [11]. Prosthetic mesh has transformed the concept of the abdominal wall reconstruction by re-enforcement of the fascial defect and evenly spreading tension over the abdominal wall repair site [12, 13]. Various randomized trials and meta-analyses have revealed that mesh repair has a significant decrease in recurrence relative to suture repair in both ventrally situated and umbilical hernia [14, 15, 16]. Consequently, the use of mesh reinforcement has become the new standard of care in the majority of adult patients with paraumbilical hernia, especially where the defect is over 1-2 cm [17, 18].

Mesh implantation presents its own challenges despite being obvious benefits that would help decrease recurrence. Placement of foreign body in the surgical field can predispose to postoperative complications, the most common of them being surgical site infection (SSI), seroma, hematoma, chronic pain and in extreme cases mesh rejection or fistula formation. Surgical site infection is the most important of them, and it can lead to extended treatment with antibiotics, re-surgery, or removal of mesh, undermining patient outcomes and raising healthcare expenses [19, 20]. The rate of early postoperative complications reported with mesh repair of umbilical and paraumbilical hernias has been different between studies; the wound infection rates ranged between 5 to 10 percent, seroma 5-20 percent and hematoma rates are generally less than 5 percent [21]. This variability in the reported outcomes can be explained by differences in the patient selection, comorbid burden, type of surgical technique, type of mesh, and perioperative regimes.

Notably, demographic variations affecting patients including diabetes mellitus, obesity, smoking, as well as high blood pressure have also been identified as possible moderators of postoperative morbidity. The compromised glycemic control and microvascular damage induced by nicotine are specifically related to the delayed wound healing and the additional vulnerability to infection. Thus, it is critical to know the local occurrence and pattern of postoperative complications, and the related risk factors to optimize the perioperative management and improve surgical practice [22].

Even though the international literature offers a lot of evidence on the outcome of mesh repair in ventral hernias, the information on low- and middle-income countries is still scarce. Variations in the patient demographics, availability of the resources, the practices in the infection control, and the follow-up systems can affect the complication rates in such settings. Published data with specific references to early postoperative complications after mesh repair of paraumbilical mesh hernia are considered rare in Pakistan. Producing context-specific evidence is essential in benchmarking institutional results, quality improvement efforts, and in clinical decision-making.

Thus, the given study was conducted to identify the prevalence of early postoperative complications: wound infection, seroma, and hematoma, after mesh repair in patients with paraumbilical hernia in one of the tertiary care hospitals. This study will advance the existing literature by critically examining the results of early surgical procedures to make a contribution toward the field and offer clinically significant advice to improve patient safety and the surgical efficacy of the management of paraumbilical hernia.

METHODOLOGY

The study was a descriptive cross-sectional study carried out at the Department of Surgery, Lady reading Hospital, Peshawar, between 2 December 2024 and 2 May 2025. This study was to be done to identify the rate of occurrence of post-operative complications after the mesh repair among patients who were diagnosed in paraumbilical hernia.

The WHO sample size calculator was used to compute a sample size of 120 patients considering a predicted rate of hematoma after mesh repair of 3.5 percent, a 95 percent confidence limit, and an absolute precision of 3.3 percent. Non-probability consecutive sampling was used to recruit patients. Participants were adult patients of either sex, aged 18–65 years, diagnosed with paraumbilical hernia based on clinical examination (a visible hernia around the umbilicus accompanied by a pain score greater than 3 on the Visual Analog Scale, particularly during physical activity). The patients who reported incarcerated or strangulated hernia, active infection, morbid obesity, or dermatitis at the hernia area were not included in the study.

Written informed consent was obtained, and demographic data, such as age, gender, body mass index (BMI), profession, education, status, residence, and socioeconomic status were obtained. Clinical variables that included smoking status and comorbidity (diabetes mellitus and hypertension) were also recorded. Elective open mesh repair was performed on all registered patients. The hernia sac was located and removed in regular aseptic conditions. The sublay was positioned in between the defect with a polypropylene mesh, with a 3-4 cm protrusion around the hernia margins. A mesh was attached to healthy tissue around the umbilicus using non-absorbable polypropylene sutures and the umbilicus attached to the underlying fascia. Each of the procedures was conducted under a consultant surgeon who had been in the field not less than five years after the completion of the fellowship experience to guide procedure uniformity.

The measurement of the post-operative complications was made within 15 days of operation. Clinical definition of wound infection: the patient had erythema, edema, pain (VAS >3), and discharge was purulent or foul-smelling. Seroma was diagnosed by swelling, palpable: fluctuant mass or pain on the surgical site, which is proved by careful palpation, which proved that there is an accumulation of fluid. Hematoma was detected through local pain (vascular activity score (VAS) 3 or more), edema, tenderness, skin color change, and tense or fluctuant swelling based on the accumulation of blood. All the postoperative measurements were undertaken with the help of a standardized proforma, which was designed to collect data in a standardised way.

The information was inputted and processed in SPSS

version 21. The Shapiro-Wilk test was used to test whether the continuous variables were normally distributed. The summary of continuous variables (age, BMI, length of stay in the hospital, etc.) was performed as either mean + standard deviation or median with standard interquartile range depending on the application. Categorical variables (gender, smoking status, comorbidities, and post-operative complications (wound infection, seroma and hematoma)) were reported in the form of frequencies and percentages. The stratification of post-surgical complications was conducted according to age, gender, BMI, length of stay, smoking, diabetes, hypertension, occupation, education level, housing, and socioeconomic status with the aim of identifying the possible effect modifiers. The chi-square test was used to conduct post-stratification comparisons with Fisher's exact test where necessary with a p-value of less than or equal to 0.05 as the threshold that can be regarded as statistically significant.

RESULTS

They included 120 patients who experienced elective mesh repair of paraumbilical hernia in the final analysis. The participants mean age was 41.8 +11.6 years (Min. 19, Max. 65 years). Most of the patients were women (n = 68, 56.7%). The mean BMI was 27.4 ± 3.9 kg/m^2. The proportion of smokers was 26.7 (32 patients). There were 28 (23.3) and 34 (28.3) patients with diabetes mellitus and hypertension, respectively. The median length of stay in hospital was 3 days (IQR: 2-4 days).

Post-operative complications were found in 21 patients (17.5% within 15 days of follow-up). The most common complication was wound infection (n = 10, 8.3%), seroma (n = 7, 5.8%), and hematoma (n = 4, 3.3%). They had no mortality over the period.

Table 1

Baseline Demographic and Clinical Characteristics (n = 120)

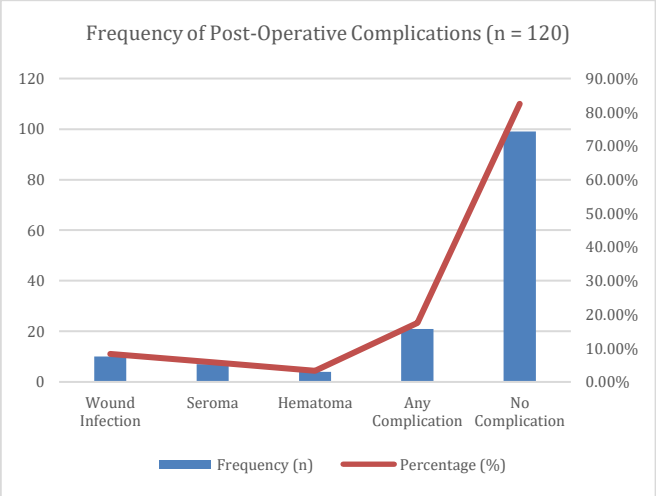
Variable		Value
Age (years), mean ± SD		41.8 ± 11.6
BMI (kg/m^2), mean ± SD		27.4 ± 3.9
Hospital stay (days), median (IQR)		3 (2–4)
Gender	Male	52 (43.3%)
	Female	68 (56.7%)
Smoking Status	Smoker	32 (26.7%)
	Non-smoker	88 (73.3%)
Diabetes Mellitus	Yes	28 (23.3%)
	No	92 (76.7%)
Hypertension	Yes	34 (28.3%)
	No	86 (71.7%)

Table 2

Frequency of Post-Operative Complications (n = 120)

Complication	Frequency (n)	Percentage (%)
Wound Infection	10	8.3%
Seroma	7	5.8%
Hematoma	4	3.3%
Any Complication	21	17.5%
No Complication	99	82.5%

Figure 1



The stratification analysis showed that diabetic patients (p=0.03) and smokers (p = 0.04) had more post-operative complications. We did not find any statistically significant correlation with respect to age group, gender, BMI category, and hypertension (p > 0.05).

Table 3

Stratification of Post-Operative Complications by Selected Variables

Variable		Complication Present n (%)	Complication Absent n (%)	p-value
Gender	Male (n=52)	8 (15.4%)	44 (84.6%)	0.62
	Female (n=68)	13 (19.1%)	55 (80.9%)	
Smoking	Smoker (n=32)	10 (31.3%)	22 (68.7%)	0.04*
	Non-smoker (n=88)	11 (12.5%)	77 (87.5%)	
Diabetes Mellitus	Yes (n=28)	9 (32.1%)	19 (67.9%)	0.03*
	No (n=92)	12 (13.0%)	80 (87.0%)	

*Statistically significant at p ≤ 0.05

On balancing, mesh repair of paraumbilical hernia was linked to a comparatively very low rate of early post-operative complications, independent of the wound infection which was the most widely encountered adverse outcome.

DISCUSSION

The total rate of complications during 15 days was 17.5 with wound infection being the most common (8.3), then seroma (5.8) and hematoma (3.3). The results support the idea that in spite of a standardized and well-accepted mesh repair option as a method of ventral hernia repair [113], early postoperative morbidity remains a clinically significant issue, especially in patients that are exposed to modifiable risk factors.

Compared to the previously reported rate of wound infection, the observed percentage (8.3) is within the boundaries of 5 to 10 percentage in the elective circumstances contexts of ventral and paraumbilical hernia repair [18,21]. The implantation of the prosthetic mesh though considerably lowering recurrence rates as compared to suture repair [11,18], will raise a foreign body which fosters bacterial colonization and infection of

the surgical site [1,4,9]. Our results support the fact that careful surgical performance, aseptic measures and proper optimization of patients before surgery is crucial [16,20]. In environments with resource constraints, where perioperative practices variability can occur, particularly, it is essential to have standardised infection prevention strategies [16,17,20].

The formation of seroma, which was found in 5.8% of patients, is also a known sequela of mesh-based abdominal wall reconstruction [9,10,21]. Seroma pathophysiology is a multifactorial process, which includes the formation of dead spaces, disruptive effects of lymphatic, and an inflammatory reaction to prosthetic material [8,9]. Even though majority of the seromas are self-limiting, their presence can slow the healing process, raise patient visits and in certain instances predispose to secondary infection. The relatively low seroma rate in this group can be due to the sufficiency of mesh overlap (3 to 4 cm over margins of defects) and the care applied to the tissues during their dissection and removal of the sac [10,21].

The occurrence of hematoma was 3.3%, which is very similar to the rates observed in the modern literature [18,23]. The development of hematoma is usually connected with poor hemostasis, coagulopathy, or high-pressure in the abdomen after surgery. Considering that all the operations have been executed under the supervision of consultants using standardized operative procedure, the low hematoma rate indicates that the intraoperative hemostatic control has been effective. However, close observation in the postoperative period is still necessary, especially in patients with comorbidities or in patients taking antiplatelet therapy [22].

One of the key results of the research was that there was statistically significant association between postoperative complications and modifiable risk factors, namely diabetes mellitus and smoking. The rate of complications was higher among diabetes patients, probably due to poor wound healing, microvascular damage, and dysfunctional immune reaction [16,19,20]. On the same note, smoking has been known to impair tissue oxygenation and collagen synthesis thus predisposing to wound infection and delayed healing [16,17]. These observations highlight the need to have preoperative risk stratification and optimization through glycemic control and smoking cessation counseling as part of perioperative management [16,17,20].

Conversely, the cooperation between complications and age, gender, BMI or hypertension did not show any statistically significant association. Although obesity is mentioned as a risk factor of wound-related morbidity in abdominal wall surgery [5,16], the lack of any significant association in this cohort might be attributed to the exclusion of morbidly obese clients and rather moderate mean BMI. This demonstrates the need to have clear eligibility criteria when comparing complication profiles in different studies [5,21].

The overall results of this research study indicate that polypropylene mesh repair can be used to continue repairing paraumbilical hernia, and has an acceptable early complication profile in a tertiary care environment [9,11–13,21]. Nonetheless, the fact that the surgical site complication rates cannot be neglected implies the necessity of continuous quality improvement efforts, the development of consistent perioperative practices, and specific risk reduction measures [16,17,20]. Prospective, multicenter, longer-term follow-up studies are desirable in the future to provide insight into long-term outcomes, such as recurrence rates and mesh-related chronic morbidity, and, thereby, help to offer a more sufficient account of the safety/efficacy of mesh-based repair in this patient group [12,13,21].

CONCLUSION

Mesh patch is another safe and successful method of surgical management of paraumbilical hernia that has a relatively low count of early postoperative complications in this study. The most frequent adverse event was wound infection, then seroma, and hematoma and no mortality was reported. The results emphasize the important role of personal risk assumptions, especially diabetes mellitus and smoking, on postoperative morbidity. The findings highlight the necessity of a meticulous selection of patients, strict aseptic practices, and extensive preoperative optimization, such as glycemic management and smoking termination interventions. The demographic factors, age, gender, BMI, and hypertension did not significantly relate with complications, but continuous close observation in perioperative care is necessary. Multicentric study involving long-term follow-up is suggested in the future to assess long-term outcomes, recurrence, and mesh related complications so that the surgery management guidelines can be further optimized.

REFERENCES

1. Surek A, Gemici E, Ferahman S, Karli M, Bozkurt MA, Dural AC, Donmez T, Karabulut M, Alis H. Emergency surgery of the abdominal wall hernias: risk factors that increase morbidity and mortality—a single-center experience. Hernia. 2021 Jun;25(3):679-88. https://doi.org/10.1007/s10029-020-02293-5
2. Köckerling F, Sheen AJ, Berrevoet F, Campanelli G, Cuccurullo D, Fortelny R, Friis-Andersen H, Gillion JF, Gorjanc J, Kopelman D, Lopez-Cano M. The reality of general surgery training and increased complexity of abdominal wall hernia surgery. Hernia. 2019 Dec;23(6):1081-91. https://doi.org/10.1007/s10029-019-02062-z
3. Pandya, B., Huda, T., Gupta, D., Mehra, B., & Narang, R. (2021). Abdominal wall hernias: An epidemiological profile and surgical experience from a rural medical college in central India. *The Surgery Journal*, *7*(01), e41-e46. https://doi.org/10.1055/s-0040-1722744
4. See CW, Kim T, Zhu D. Hernia mesh and hernia repair: a review. Engineered Regeneration. 2020 Jan 1;1:19-33. https://doi.org/10.1016/j.engreg.2020.05.002
5. Henriksen NA, Montgomery A, Kaufmann R, Berrevoet F, East B, Fischer J, Hope W, Klassen D, Lorenz R, Renard Y, Garcia Urena MA. Guidelines for treatment of umbilical and epigastric hernias from the European Hernia Society and Americas Hernia Society. Journal of British Surgery. 2020 Feb;107(3):171-90. https://doi.org/10.1002/bjs.11489
6. Aluja-Jaramillo F, Cifuentes-Sandoval S, Gutiérrez FR, Bhalla S, Menias CO. Pre-and postsurgical imaging findings of abdominal wall hernias based on the European Hernia

Society (EHS) classification. Abdominal Radiology. 2021 Nov;46(11):5055-71. https://doi.org/10.1007/s00261-021-03211-8
7. Chowbey P, Wadhawan R, Subramanian D, Bhandarkar D, Gandhi J, Kumari KL, Baijal M, Khetan M, Kathalagiri MS, Khandelwal P, Lal P. Ventral hernia repair in India: a Delphi consensus. Hernia. 2024 Oct;28(5):1511-23. https://doi.org/10.1007/s10029-024-03062-4
8. Ezeme C, Mackenzie P, Newton RC. Ventral hernias: understanding the pathogenesis, prevention and repair. Surgery (Oxford). 2024 Jan 1;42(1):22-32. https://doi.org/10.1016/j.mpsur.2023.11.007
9. Porrello G, Vernuccio F, Alvarez-Hornia Pérez E, Brancatelli G, Cannella R. The benign side of the abdominal wall: a pictorial review of non-neoplastic diseases. Diagnostics. 2022 Dec 17;12(12):3211. https://doi.org/10.3390/diagnostics12123211
10. Mughal M, Ross D. Management of the post-pregnancy abdomen: the plastic surgical perspective. Hernia. 2021 Aug;25(4):929-38. https://doi.org/10.1007/s10029-021-02478-6
11. Corduas F, Lamprou DA, Mancuso E. Next-generation surgical meshes for drug delivery and tissue engineering applications: materials, design and emerging manufacturing technologies. Bio-Design and Manufacturing. 2021 Jun;4(2):278-310. https://doi.org/10.1007/s42242-020-00108-1
12. Najm A, Niculescu AG, Gaspar BS, Grumezescu AM, Beuran M. A review of abdominal meshes for hernia repair—current status and emerging solutions. Materials. 2023 Nov 10;16(22):7124. https://doi.org/10.3390/ma16227124
13. Pogson-Morowitz K, Porras Fimbres D, Barrow BE, Oleck NC, Patel A. Contemporary abdominal wall reconstruction: Emerging techniques and trends. Journal of clinical medicine. 2024 May 13;13(10):2876. https://doi.org/10.3390/jcm13102876
14. Shrestha D, Shrestha A, Shrestha B. Open mesh versus suture repair of umbilical hernia: meta-analysis of randomized controlled trials. International Journal of Surgery. 2019 Feb 1;62:62-6. https://doi.org/10.1016/j.ijsu.2018.12.015
15. Aiolfi A, Cavalli M, Micheletto G, Bruni PG, Lombardo F, Morlacchi A, Bonitta G, Campanelli G, Bona D. Open mesh vs. suture umbilical hernia repair: systematic review and updated trial sequential meta-analysis of randomized controlled trials. Hernia. 2020 Aug;24(4):707-15. https://doi.org/10.1007/s10029-020-02146-1
16. Zhou H, Shen Y, Zhang Z, Liu X, Zhang J, Chen J. Comparison of outcomes of ventral hernia repair using different meshes: a systematic review and network meta-analysis. Hernia. 2022 Dec;26(6):1561-71. https://doi.org/10.1007/s10029-022-02652-4
17. Lam K, Smith A, Slater K. Umbilical hernia: could it be the 'canary in the coal mine'for a more significant abdominal wall problem? ANZ Journal of Surgery. 2022 Oct;92(10):2517-23. https://doi.org/10.1111/ans.17956
18. Ertekin SC, Ergenc M. Comparing laparoscopic and open umbilical hernia repair: quality of life and outcomes. Current Problems in Surgery. 2024 Aug 1;61(8):101527. https://doi.org/10.1016/j.cpsurg.2024.101527
19. Wilson RB, Farooque Y. Risks and prevention of surgical site infection after hernia mesh repair and the predictive utility of ACS-NSQIP. Journal of Gastrointestinal Surgery. 2022 Apr 1;26(4):950-64. https://doi.org/10.1007/s11605-022-05248-6
20. Long DR, Cifu A, Salipante SJ, Sawyer RG, Machutta K, Alverdy JC. Preventing surgical site infections in the era of escalating antibiotic resistance and antibiotic stewardship. JAMA surgery. 2024 Aug 1;159(8):949-56. https://doi.org/10.1001/jamasurg.2024.0429
21. Dias Rasador AC, da Silveira CA, Lima DL, Nogueira R, Malcher F, Sreeramoju P, Cavazzola LT. Mesh versus suture for elective primary umbilical hernia open repair: a systematic review and meta-analysis. Hernia. 2024 Dec;28(6):2069-78. https://doi.org/10.1007/s10029-024-03106-9
22. Myers SP, Kulkarni SS, Malik SM, Tevar AD, Neal MD. Hernia management in cirrhosis: risk assessment, operative approach, and perioperative care. journal of surgical research. 2019 Mar 1;235:1-7. https://doi.org/10.1016/j.jss.2018.09.052
23. Mohamedahmed AY, Zaman S, Ghassemi N, Ghassemi A, Wuheb AA, Abdalla HE, Hajibandeh S, Hajibandeh S. Should routine surgical wound drainage after ventral hernia repair be avoided? A systematic review and meta-analysis. Hernia. 2023 Aug;27(4):781-93. https://doi.org/10.1007/s10029-023-02804-0