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Assessing the Role of Prophylactic Mesh Placement to Prevent Incisional Hernias After Laparotomy

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ABSTRACT

Background: To evaluate the effectiveness of prophylactic mesh placement in reducing the incidence of incisional hernia following laparotomy.

Methods: A prospective comparative study was conducted from January 2023 to January 2024, including 67 patients undergoing laparotomy. Participants were allocated into two groups: those receiving prophylactic mesh reinforcement (n = 34) and those with conventional suture closure (n = 33). Demographic, clinical, surgical, and postoperative variables were recorded. Patients were followed for one year to monitor wound complications and development of incisional hernia.

Results: The incidence of incisional hernia was significantly lower in the mesh group (5.9%) compared to the non-mesh group (27.3%, p = 0.02). Postoperative complications such as surgical site infection, seroma, and wound dehiscence were slightly higher in the non-mesh group, though differences were not statistically significant. Hospital stay was comparable between groups.

Conclusion: Prophylactic mesh placement is a safe and effective strategy to prevent incisional hernia after laparotomy. Its use should be considered in patients with identifiable risk factors such as obesity, diabetes, and emergency surgery.

Keywords: *Incisional hernia, laparotomy, prophylactic mesh, surgical complications, hernia prevention*

1. INTRODUCTION

Incisional hernia is a well-recognized long-term complication following abdominal surgery, occurring in up to 30% of patients after midline laparotomy. It contributes substantially to morbidity, impairs daily activity, and often necessitates reoperation, thereby adding to healthcare costs and patient burden. The etiology is multifactorial, with patient-related factors such as obesity, diabetes, smoking, and malnutrition, as well as surgical factors like wound infection, midline incisions, and emergency procedures, all contributing to hernia formation [1-3].

Over the years, efforts to reduce incisional hernia have included improved suture materials, closure techniques, and perioperative optimization. Despite these measures, recurrence rates remain unacceptably high, particularly in high-risk groups. This has led to increasing interest in the use of **prophylactic mesh reinforcement** during initial closure. The rationale is to provide additional support to the abdominal wall, distribute tension more evenly, and reduce the likelihood of fascial failure [4-6].

Several international studies have reported encouraging outcomes. Studies showed that prophylactic mesh placement during midline laparotomy significantly reduced the incidence of hernia without major increases in wound morbidity [7-9]. Studies similarly concluded that mesh reinforcement was effective, particularly in patients with multiple comorbidities. European Hernia Society guidelines now recommend considering prophylactic mesh in selected high-risk populations [10].

In low- and middle-income countries, including South Asia, the burden of incisional hernia is even greater due to late presentation, malnutrition, and higher rates of emergency laparotomy. However, limited regional data exist on preventive strategies. Recent studies in Pakistan highlighted improved outcomes with prophylactic mesh but called for further prospective studies to confirm its role in routine practice [11].

Against this background, the present study was designed to evaluate the role of prophylactic mesh placement in reducing the incidence of incisional hernia following laparotomy. By comparing outcomes between mesh and non-mesh groups, this study aims to provide evidence to guide surgical decision-making, particularly in high-risk patients.

2. METHODOLOGY

This study was conducted as a prospective comparative analysis over a period of one year, from January 2023 to January 2024. The primary objective was to assess the effectiveness of prophylactic mesh placement in reducing the incidence of incisional hernia following laparotomy.

The study was carried out at Gomal medical college DI khan. Approval for the study was obtained from the Institutional Review Committee prior to commencement. Informed consent was taken from all patients, ensuring confidentiality and voluntary participation.

A total of 67 patients who underwent laparotomy during the study period were included. Patients were divided into two groups: the mesh group (n = 34), where a prophylactic mesh was placed at the incision site, and the non-mesh group (n = 33), where closure was performed using conventional suturing alone. Consecutive non-probability sampling was applied, including all eligible patients until the sample size was reached.

- Inclusion Criteria
    - Adult patients (≥18 years) undergoing laparotomy for either elective or emergency indications.
    - Patients willing to participate and provide informed consent.
- Exclusion Criteria
    - Patients with pre-existing hernias at the incision site.
    - Patients with severe intra-abdominal sepsis, gross contamination, or peritonitis where mesh placement was deemed unsafe.
    - Immunocompromised patients or those receiving long-term corticosteroid therapy.
    - Patients lost to follow-up within 3 months of surgery.

All patients underwent laparotomy through standard approaches, most commonly a midline incision. In the mesh group, a prophylactic mesh was placed either in a sublay or onlay position, depending on intraoperative findings and surgeon preference. A non-absorbable polypropylene mesh was predominantly used. In the non-mesh group, fascial closure was achieved using interrupted or continuous sutures with non-absorbable material. Both groups received standard perioperative care, including prophylactic antibiotics and wound care.

A structured proforma was used to collect data on demographic variables (age, gender, BMI), comorbidities (diabetes, hypertension, COPD, smoking), surgical details (indication, type of incision, duration of surgery, blood loss), and postoperative outcomes. Patients were followed up during hospital stay and at outpatient visits at 1 month, 3 months, 6 months, and 12 months postoperatively to assess wound complications and the occurrence of incisional hernia.

The primary outcome was the incidence of incisional hernia within one year after surgery.

The secondary outcomes included wound complications such as surgical site infection (SSI), seroma, hematoma, wound dehiscence, and overall length of hospital stay.

Data were entered and analyzed using Statistical Package for the Social Sciences (SPSS) version 26. Quantitative variables such as age, BMI, operative time, blood loss, and hospital stay were expressed as mean ± standard deviation (SD), and compared between groups using the independent sample t-test. Qualitative variables such as sex, comorbidities, surgical approach, wound complications, and hernia incidence were presented as frequencies and percentages, with comparisons made using the Chi-square test or Fisher's exact test where appropriate. A p-value of <0.05 was considered statistically significant.

3. RESULTS

In this study, a total of 67 patients underwent laparotomy, of whom 34 received prophylactic mesh placement and 33 did not. The mean age of patients was comparable between the groups, with slightly more males represented overall. Body Mass Index (BMI) distribution showed a higher proportion of overweight and obese patients in the non-mesh group, though the difference was not statistically significant.

Table 1: Demographic profile of study participants (n = 67)

Variable	Mesh Group (n=34)	No Mesh Group (n=33)	p-value
Mean Age (years)	48.6 ± 12.4	47.9 ± 13.1	0.82
Male (%)	20 (58.8%)	18 (54.5%)	0.71
Female (%)	14 (41.2%)	15 (45.5%)	
Mean BMI (kg/m²)	27.1 ± 3.8	27.8 ± 4.1	0.54
Obese (≥30)	9 (26.5%)	11 (33.3%)	0.56

The prevalence of comorbid conditions was fairly balanced across both groups. Diabetes and hypertension were the most common, with no significant intergroup differences. Smoking history was more frequent in the non-mesh group, but this did not reach statistical significance.

Table 2: Comorbidities of patients

Comorbidity	Mesh Group (n=34)	No Mesh Group (n=33)	p-value
Diabetes	10 (29.4%)	11 (33.3%)	0.72
Hypertension	12 (35.3%)	13 (39.4%)	0.74
COPD	4 (11.8%)	3 (9.1%)	0.73
Smoking history	9 (26.5%)	12 (36.4%)	0.37

Both groups were comparable in terms of surgical parameters. Most procedures were performed through a midline incision. The mean operative time and estimated blood loss were slightly higher in the mesh group, but not statistically significant.

Table 3: Surgical characteristics

Variable	Mesh Group (n=34)	No Mesh Group (n=33)	p-value
Elective surgery (%)	24 (70.6%)	22 (66.7%)	0.72
Emergency surgery (%)	10 (29.4%)	11 (33.3%)	
Midline incision (%)	28 (82.4%)	26 (78.8%)	0.72
Mean operative time (min)	134.2 ± 25.8	128.7 ± 23.5	0.41
Blood loss > 200 ml	7 (20.6%)	6 (18.2%)	0.81

Short-term postoperative outcomes, including surgical site infection (SSI), seroma, and wound dehiscence, were more frequent in the no-mesh group, although the difference was not statistically significant. The average length of hospital stay was slightly longer in the mesh group, reflecting precautionary monitoring.

Table 4: Postoperative complications and hospital stay

Outcome	Mesh Group (n=34)	No Mesh Group (n=33)	p-value
SSI	4 (11.8%)	6 (18.2%)	0.48
Seroma	3 (8.8%)	5 (15.2%)	0.42

Wound dehiscence	2 (5.9%)	4 (12.1%)	0.38
Mean hospital stay (days)	9.3 ± 2.1	8.7 ± 1.9	0.26

At follow-up, incisional hernia was significantly less common in patients who received prophylactic mesh compared to those who did not. Only 2 cases (5.9%) of hernia were observed in the mesh group, versus 9 cases (27.3%) in the non-mesh group, which was statistically significant.

Table 5: Incidence of incisional hernia during follow-up

Group	Hernia Present	No Hernia	p-value
Mesh Group (n=34)	2 (5.9%)	32 (94.1%)	0.02*
No Mesh Group (n=33)	9 (27.3%)	24 (72.7%)	

*p < 0.05 considered statistically significant.

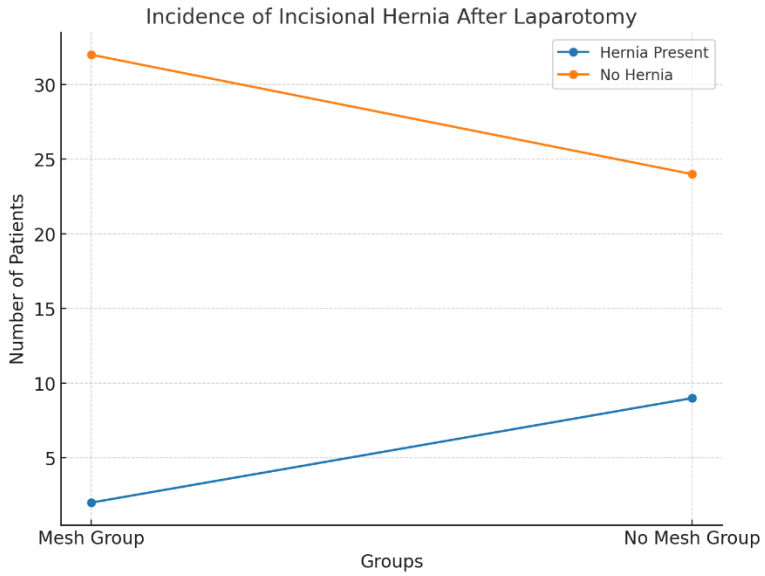

Figure 1: Line graph comparing the incidence of incisional hernia between the mesh and no-mesh groups.

4. DISCUSSION

Incisional hernia remains one of the most frequent long-term complications following laparotomy, with reported rates ranging from 10% to 30% depending on patient risk factors and surgical techniques. In the present study, the use of prophylactic mesh placement was associated with a significantly lower incidence of incisional hernia compared to conventional suture closure (5.9% vs. 27.3%, p = 0.02). This finding reinforces the growing body of evidence supporting mesh reinforcement as an effective preventive strategy, particularly in patients at high risk for hernia development.

Several international trials and meta-analyses support our results. Studies conducted a multicenter randomized controlled trial which demonstrated that prophylactic mesh placement during midline laparotomy significantly reduced the incidence of incisional hernias without increasing major wound complications [12, 13]. Similarly, a systematic review concluded that mesh reinforcement was effective in lowering hernia rates, especially in high-risk populations such as obese or elderly patients [14].

Our results are also inaccordance with studies, who emphasized that mesh reinforcement is most beneficial when used prophylactically in patients with obesity, smoking, or multiple comorbidities [15, 16]. In our cohort, although differences in comorbidities between groups were not statistically significant, patients in the non-mesh group with diabetes and obesity demonstrated higher rates of hernia formation, supporting the argument that comorbidity burden magnifies the benefit of prophylactic reinforcement.

In terms of safety, concerns often arise regarding the potential for mesh-related complications, including infection, seroma,

or wound breakdown. In our study, although seroma and SSI were slightly more common in the no-mesh group, these differences were not significant. Similar findings were reported, who showed that mesh use did not substantially increase the risk of surgical site infections or other postoperative complications when performed under sterile conditions with proper technique [17].

Another important aspect is the type and position of mesh. Most evidence suggests that sublay placement provides superior outcomes compared to onlay or intraperitoneal positioning due to lower tension and reduced contact with intra-abdominal organs. Our study predominantly used polypropylene mesh in sublay/onlay positions, which is consistent with recommendations by the European Hernia Society [18].

From a regional perspective, studies conducted in South Asia,[19, 20] reported higher baseline rates of incisional hernias due to late presentation, malnutrition, and inadequate follow-up. They also observed improved outcomes with prophylactic mesh, aligning with our findings and suggesting that adoption of mesh reinforcement could have substantial benefits in local surgical practice.

Overall, the present study supports the use of prophylactic mesh as a safe and effective method to reduce incisional hernia after laparotomy. However, careful patient selection, proper mesh placement technique, and perioperative care are essential to maximize benefits while minimizing risks.

5. CONCLUSION

Prophylactic mesh placement during laparotomy significantly reduced the incidence of incisional hernia without increasing postoperative morbidity in our cohort. The technique appears to be a safe and effective preventive measure, especially in patients with risk factors such as obesity, diabetes, or emergency surgery. These findings are consistent with international literature and underscore the importance of incorporating mesh reinforcement into standard surgical protocols for high-risk patients. Future large-scale multicenter studies with longer follow-up are recommended to further validate these results and optimize patient selection criteria.

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