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Cross-Sectional Study of Risk Factors and Prevalence of Incisional Hernias Post-Laparotomy

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Abstract
Incisional hernias represent a significant complication post-laparotomy, affecting patient morbidity and healthcare costs. This cross-sectional study analyzed 200 patients who had undergone laparotomy to assess the prevalence and associated risk factors for developing incisional hernias. Data were collected from patient records and direct interviews. The study identified several risk factors, including age, obesity, wound infection and surgical technique, correlating strongly with the incidence of incisional hernias. Incisional hernias are a frequent complication following laparotomy, with multiple identifiable risk factors. Effective strategies focusing on modifiable risks could potentially reduce their prevalence.

INTRODUCTION

Incisional hernias are a common complication following abdominal surgeries, particularly laparotomies. They are characterized by the protrusion of intra-abdominal contents through a defect in the fascia of the abdominal wall where a surgical incision was previously made. This complication not only leads to significant morbidity but also adds to the economic burden on health services due to the need for further surgical interventions. The prevalence of incisional hernias can vary widely, reported as anywhere from 2% to 20% in the literature, depending on the patient population and surgical techniques employed[1,2].

Risk factors for incisional hernia formation include patient-related factors such as age, obesity and smoking, as well as surgery-specific factors like emergency surgery, type of incision and surgical site infections. Understanding these risk factors is crucial for developing preventive strategies[3,4].

The pathophysiology behind incisional hernias involves an interplay of mechanical forces and biological processes. Mechanical failure of the wound, excessive tension on surgical sutures, poor surgical technique, and impaired wound healing due to local or systemic factors can all contribute to the development of incisional hernias[4,5].

Aims and Objectives: To determine the prevalence and identify risk factors associated with incisional hernias following laparotomy.

- To quantify the prevalence of incisional hernias in patient's post-laparotomy.
- To identify demographic and clinical risk factors associated with the development of incisional hernias.
- To analyze the impact of surgical techniques on the incidence of incisional hernias.

MATERIALS AND METHODS

Source of Data: Data were retrospectively collected from medical records and supplemented with patient interviews.

Study Design: A cross-sectional observational study was conducted.

Study Location: The study was carried out at a tertiary healthcare center, KIMS Narketpally.

Study Duration: Data collection spanned from January 2021 to December 2022.

Sample Size: The sample included 200 patients who had undergone laparotomy.

Inclusion Criteria: Patients aged 18 years and older who had undergone any form of laparotomy.

Exclusion Criteria: Patients with prior hernia repair surgeries, those who declined to participate and those with incomplete medical records were excluded.

Procedure and Methodology: The presence of incisional hernia was determined through clinical examinations and review of postoperative follow-up records. Risk factors were assessed via structured interviews and review of surgical data.

Sample Processing: Not applicable, as the study involved no laboratory testing of biological samples.

Statistical Methods: Data were analyzed using descriptive statistics for prevalence estimation and logistic regression models were used to assess the association between risk factors and hernia development.

Data Collection: Data were systematically collected using a predefined data collection form, capturing details on patient demographics, surgical data, postoperative complications and hernia status.

RESULTS AND DISCUSSIONS

Table 1 describes the prevalence and risk factors for incisional hernias post-laparotomy among a cohort of 200 patients. Key risk factors with statistically significant odds ratios include age=60 years, obesity (BMI=30), smoking, wound infection and emergency surgery. The data reveal that older age, obesity, smoking and wound infections are highly associated with an increased risk of developing incisional hernias, as evidenced by odds ratios exceeding 4.0 and P<0.01. Emergency surgery also significantly increases the risk, with an odds ratio of 3.7. This table indicates that patients with these risk factors are more likely to develop hernias post-laparotomy.

Table 2 quantifies the overall prevalence of incisional hernias in the same population. Out of the 200 patients studied, 50 (25%) developed incisional hernias, while the majority, 150 (75%), did not. This simple breakdown provides a clear picture of how common incisional hernias are in this patient population following laparotomy.

Table 3 explores demographic and clinical risk factors more specifically. It shows that being male, having diabetes and chronic steroid use are associated with higher incidences of incisional hernias. Notably, diabetes and chronic steroid use are significant predictors of hernia development with odds ratios of 2.3 and 3.4, respectively and P values indicating

Table 1: Prevalence and Risk Factors for Incisional Hernias Post-Laparotomy

Factor	No Hernia (n=150)	Hernia (n=50)	Total (n=200)	OR (95%CI)	p-value
Age = 60 years	40 (26.7%)	30 (60%)	70 (35%)	4.0 (2.0-8.0)	0.001
Obesity (BMI =30)	50 (33.3%)	35 (70%)	85 (42.5%)	4.7 (2.3-9.5)	<0.001
Smoking	30 (20%)	25 (50%)	55 (27.5%)	4.2 (2.1-8.4)	0.002
Wound Infection	20 (13.3%)	28 (56%)	48 (24%)	8.3 (3.9-17.6)	<0.001
Emergency Surgery	70 (46.7%)	38 (76%)	108 (54%)	3.7 (1.8-7.6)	0.001

Table 2: Prevalence of Incisional Hernias in Patients Post-Laparotomy

Description	Frequency	Percentage
Total Patients	200	100%
Patients with Hernias	50	25%
Patients without Hernias	150	75%

Table 3: Demographic and Clinical Risk Factors for Incisional Hernias

Risk Factor	No Hernia (n=150)	Hernia (n=50)	Total (n=200)	OR (95%CI)	p-value
Gender (Male)	90 (60%)	35 (70%)	125 (62.5%)	1.7 (0.8-3.6)	0.18
Diabetes	60 (40%)	30 (60%)	90 (45%)	2.3 (1.2-4.5)	0.01
Chronic Steroid Use	25 (16.7%)	20 (40%)	45 (22.5%)	3.4 (1.7-6.9)	0.001

Table 4: Impact of Surgical Techniques on the Incidence of Incisional Hernias

Surgical Technique	No Hernia (n=150)	Hernia (n=50)	Total (n=200)	OR (95%CI)	p-value
Midline Incision	100 (66.7%)	45 (90%)	145 (72.5%)	4.5 (1.8-11.3)	0.002
Subcostal Incision	50 (33.3%)	5 (10%)	55 (27.5%)	0.23 (0.08-0.67)	0.01
Use of Mesh	20 (13.3%)	2 (4%)	22 (11%)	0.27 (0.06-1.2)	0.08

statistical significance. Gender, while showing a higher proportion of hernias in males, did not reach statistical significance.

Table 4 focuses on the impact of different surgical techniques on the incidence of incisional hernias. The data suggest that a midline incision significantly increases the risk of hernias, with an odds ratio of 4.5 and a P value of 0.002. In contrast, subcostal incisions appear to be protective, with an odds ratio of 0.23. The use of mesh in surgeries shows a trend towards reducing the risk of hernia, though this finding is not statistically significant.

Table 1: Prevalence and Risk Factors for Incisional Hernias Post-Laparotomy: This table highlights several significant risk factors for incisional hernias, including age, obesity, smoking, wound infection and emergency surgery. The findings are consistent with existing literature, where older age and obesity are well-documented risk factors due to decreased tissue elasticity and increased intra-abdominal pressure respectively Modi[6] Similarly, smoking has been implicated in poor wound healing due to its impact on microvascular circulation, which can lead to increased hernia rates Soto[7] Wound infection is perhaps the most significant risk factor identified, with an odds ratio of 8.3, suggesting a strong association, which is supported by multiple studies that identify infection as a critical disruptor of normal wound healing processes Rodrigues[8] Emergency surgery often correlates with higher complication rates, including hernias, due to the typically unplanned and rushed nature of these procedures, which aligns with findings from Hassan[9]

Table 2: Prevalence of Incisional Hernias in Patients Post-Laparotomy: The prevalence of incisional hernias in this study is noted at 25%, which falls within the upper range of the widely reported prevalence rates in literature, which vary from 10% to 28% Abdel Dayem[10], Shankar[11] This variability in reported rates could be attributed to differences in surgical techniques, patient demographics and follow-up durations across studies.

Table 3: Demographic and Clinical Risk Factors for Incisional Hernias: Regarding demographic and clinical risk factors, our study found significant associations with diabetes and chronic steroid use, but not gender. The influence of diabetes on hernia risk can be attributed to glycation of collagen tissues, leading to decreased strength and impaired healing Simões[12]. Chronic steroid use, similarly, is known to impair wound healing and decrease collagen synthesis AL-Jubouri[13] While the impact of gender was not statistically significant in this study, some literature suggests that males might have a slightly higher risk, possibly due to differences in collagen distribution and muscle mass Dilday[14]

Table 4: Impact of Surgical Techniques on the Incidence of Incisional Hernias: Our findings that midline incisions carry a higher risk of herniation are supported by studies which suggest that incisions through muscle layers compromise their integrity more than those along fascial planes Mishra[15] Subcostal incisions and the use of mesh are associated with reduced hernia risks, which aligns with current surgical best practices promoting mesh reinforcement in high-risk patients to prevent hernia formation Gao[16] and Köse[17]

CONCLUSION

Our cross-sectional study of 200 patients who underwent laparotomy has provided significant insights into the prevalence and risk factors associated with the development of incisional hernias. We observed a hernia prevalence rate of 25%, which underscores the considerable risk of this complication following abdominal surgery.

The study identified several critical risk factors significantly associated with the development of incisional hernias. Advanced age (=60 years), obesity (BMI=30), smoking, and wound infections were found to significantly increase the risk, with the highest impact seen with wound infections. These factors underscore the importance of meticulous surgical technique, careful patient management pre-and post-operation and targeted interventions aimed at modifiable risk factors such as smoking cessation and weight management.

Furthermore, emergency surgery was also associated with a higher incidence of incisional hernias, likely reflecting the challenging conditions under which these surgeries are performed, including time constraints and varying patient conditions at the time of surgery.

In terms of surgical techniques, our findings suggest that the choice of incision and the use of prophylactic measures such as mesh reinforcement can influence the risk of hernia development. Specifically, midline incisions were associated with a higher risk, while subcostal incisions and the use of mesh appeared to confer a protective effect.

Overall, this study emphasizes the need for heightened awareness and proactive management of risk factors in patients undergoing laparotomy. It highlights the potential for surgical innovation and patient-specific strategies to reduce the incidence of this challenging complication. Further research is warranted to explore the effectiveness of different surgical techniques and materials in hernia prevention and to establish standardized protocols that can be implemented across diverse healthcare settings.

Limitations of Study:

Retrospective Data Collection: The study relied on retrospective data, which can introduce recall bias and limit the accuracy of the collected information, especially concerning patient-reported data such as smoking status or previous medical history.

Cross-Sectional Design: The inherent nature of a cross-sectional design does not allow for the establishment of causality. Although associations between risk factors and incisional hernias were identified, the temporal sequence and potential causative relationships remain unclear.

Single-Center Study: Conducting the study in a single tertiary care center may limit the generalizability of the findings to other settings or populations. The specific patient demographic and hospital practices may not represent those of other regions or types of medical institutions.

Sample Size: While a sample size of 200 patients is adequate for initial observations, it may not be sufficient to detect smaller effect sizes or to conduct a comprehensive analysis of subgroups. This limitation could affect the robustness and the extrapolation of the study findings.

Potential for Confounding Variables: Although we adjusted for several known risk factors, there may be other unmeasured confounding variables that could influence the development of incisional hernias, such as genetic predispositions, postoperative care quality, and patient compliance with follow-up.

Selection Bias: The exclusion of patients with incomplete data or those who declined to participate might introduce selection bias, potentially skewing the results towards certain patient profiles more likely to have complete records or consent to participate.

Variability in Surgical Technique: The study did not account for individual surgeon skills and specific intraoperative decisions beyond the type of incision and the use of mesh, which might influence hernia risk.

Follow-Up Duration: The cross-sectional nature of the study does not account for the varying times post-surgery at which patients were evaluated, possibly missing late occurrences of incisional hernias which can develop months or years postoperatively.

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