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Original Research Article

A Clinical Study on Predictors of Abdominal Wound Dehiscence in Laparotomy Patients

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Abstract

Introduction: Laparotomy, especially midline, is vital for abdominal access in emergencies and complex surgeries despite the rise of minimally invasive techniques. It remains crucial in cases of severe ascites, intestinal obstructions, and trauma. However, high wound failure rates necessitate proper closure techniques. This study aims to identify predictors of abdominal wound dehiscence post-laparotomy.

Methods: This interventional prospective study included patients over 18 undergoing elective or emergency midline laparotomy, who consented to participate. A structured questionnaire assessed incision types and postoperative complications. Follow-up at intervals monitored wound dehiscence and incisional hernia risks. Predictor variables included surgery duration, illness duration, procedure type, and wound management practices.

Results: In this study, 50 participants were included with a male-to-female ratio of 3.5. Emergency surgeries (76%) showed significantly higher wound dehiscence rates than elective ones (13.8%). Most dehiscence cases occurred in midline incisions (75%), with hollow viscus perforation as the leading cause (37.5%). Postoperative wound infection rates differed but lacked statistical significance.

Conclusion: Abdominal wound dehiscence (AWD) remains a significant postoperative risk, especially in midline incisions and emergency surgeries. Factors like hollow viscus perforation, patient nutrition, and postoperative infections contribute to AWD. Effective prevention strategies and reinforced closure techniques are crucial for improving outcomes. Continued research and vigilance are essential for reducing AWD incidence.

Keywords: Abdominal wound Dehiscence, Complications, Surgical Outcomes, Prevention, Risk Factors.

Introduction

Laparotomy, particularly midline laparotomy, is a common surgical technique to access the abdominal cavity and peritoneum. Despite the rise of minimal access surgery, laparotomy remains essential in cases where minimal access is challenging and when the risk of vital organ injury outweighs its benefits. [1] This technique is crucial for quick abdominal exploration with less blood loss and for identifying occult injuries not seen in imaging. [2]

Laparotomy is particularly beneficial in scenarios involving multiple adhesions from previous surgeries, intestinal obstructions with distended intestines, and severe ascites from end-stage liver disease. It is also vital in emergencies like intraperitoneal bleeding, blunt or penetrating abdominal injuries, perforated hollow viscus, severe gastrointestinal bleeding, and intraperitoneal sepsis. [1, 3] Additionally, it remains preferred for certain elective procedures, such as intestinal transplants and pancreaticoduodenectomy. [4]

However, the use of laparotomy has decreased due to advances in minimally invasive surgery, robotics, and patient preference, mainly due to the high incidence of wound failure, manifesting as acute wound dehiscence or late incisional hernia. Proper wound closure is crucial to prevent these complications, which are often exacerbated by factors like poor nutrition, sepsis, obesity, smoking, steroid use, and collagen synthesis issues. [5] These factors are particularly significant in India due to delayed patient presentations and poor nutritional

status. The aim of this study was to examine the predictors of abdominal wound dehiscence in patients who had undergone laparotomy.

Materials and Methods

It was an interventional prospective study, conducted in the department of General Surgery, Rangaraya Medical College, Kakinada. Study was conducted between January 2021 to December 2022. Study protocol was approved by the Institutional Ethics committee. An informed consent was taken from the parents.

The inclusion criteria consisted of patients > 18 years, patients who underwent either elective or emergency midline laparotomy, and patients who provided consent for the study. The exclusion criteria were patients <18 years, pregnant women, patients who had undergone previous abdominal surgery, and patients who were on any drugs or therapy that could affect the study's outcome.

A structured questionnaire, adapted from previous studies, was employed. It categorized incisions into types, such as those without muscle division, with muscle splitting, and with muscle division. Follow-up involved monitoring for discharge, hematoma, and wound dehiscence. Wound management included daily antiseptic dressings and antibiotics. Discharge was cultured, and intravenous antibiotics were administered accordingly. Patients were followed up at 1, 2, and 4 weeks post-surgery for wound dehiscence risk, then every 2 months for a year for incisional hernia risk. Predictor variables studied included surgery duration (>2 hours or ≤2 hours), illness duration (<3 days or ≥3 days), operative procedure, intraoperative findings, fascial closure technique, wound condition, suture material, patient's general condition, postoperative antibiotics, wound soakage, primary dressing status, wound collection type, antiseptics used, wound status on days 5, 8, and 14, and parameters related to wound dehiscence, if present. Wound dehiscence was defined according to ICD-10 classifications.

Statistical Analysis: The data was analyzed using SPSS version 20. The data was presented in mean and percentages. The mean difference between the continuous data was analysed using t-test, for follow-up data paired t-test and for categorical data Chi-square test was used to determine the significance between the parameters observed in this study.

Results

Total 50 members were included male, female ratio was 3.5 and majority (51.7%) were 41 – 60 years, 38 underwent emergency surgery's. Patients undergoing emergency surgery had a higher wound dehiscence rate (86.2%) compared to elective surgery patients (13.8%), with statistical significance ($p<0.05$). Most instances of wound dehiscence occurred in midline incisions (75%), followed by McBurney's (12.5%), Pfannensteil, and Kocher's incisions (6.3% each). In patients with wound dehiscence, closure of perforations was the most common procedure (50%), followed by resection & anastomosis (31.2%), appendicectomy (12.5%), and other explorative surgeries (6.2%). Hollow viscus perforation was the leading cause (37.5%), followed by duodenal perforation (25%), appendicitis (18.8%), malignancy (12.5%), and intestinal obstruction (6.3%). Among these patients, underweight individuals comprised 37.9%, normal BMI 44.8%, and overweight 17.2%. Postoperative wound infection was higher in the emergency group (76%) compared to elective (23.3%), without statistical significance. The mean hospital stay was 19 days, with burst abdomen typically occurring between 6 to 10 days postoperatively. Follow-up for complications showed no incisional hernias within a year.

Discussion

In a cohort of 50 patients, the male-to-female ratio was 3.5:1, indicating a higher prevalence of males undergoing laparotomy. The age group predominantly affected was 41-60 years, accounting for 51.7% of the cases. A significant proportion (76%) underwent emergency surgery, and these patients exhibited a notably higher rate of abdominal wound dehiscence (AWD) at 86.2%, compared to a 13.8% rate in those who had elective surgery, demonstrating statistical significance ($P<0.05$). This observation aligns with existing literature, underscoring that emergency surgeries are a substantial risk factor for AWD due to factors such as suboptimal preoperative preparation and higher stress conditions. [6, 7] Additionally, the urgency and complexity of emergency surgeries often necessitate rapid surgical interventions, which may compromise meticulous wound closure. Optimization of perioperative care and rigorous postoperative monitoring are critical in reducing AWD incidence among these high-risk patients.

In this cohort study, the distribution of AWD varied significantly with the type of surgical incision. Midline incisions were the most frequently associated with AWD, accounting for 75% of cases. This predominance is consistent with existing literature, as midline incisions, commonly used for their rapid access and flexibility, are known to have higher tension and a greater propensity for wound complications. Conversely, McBurney's incisions, typically used for appendectomies, accounted for 12.5% of AWD cases. Pfannenstiel and Kocher's incisions, representing 6.3% each, are associated with lower rates of dehiscence due to their strategic locations and the lower tension they endure. Regarding the procedures leading to AWD, the closure of

perforations emerged as the most common, comprising 50% of dehiscence cases. This is likely due to the compromised tissue integrity and the presence of infection or contamination, which are inherent risks in surgeries involving perforations. Resection and anastomosis procedures, involving significant manipulation and suturing of bowel segments, followed closely at 31.2%. These procedures can predispose patients to AWD due to the extensive dissection and potential for anastomotic tension or leakage.

Appendicectomy was implicated in 12.5% of dehiscence cases, aligning with the lower complexity and typically smaller incisions used in such procedures. The remaining 6.2% involved various explorative surgeries, where the underlying pathology and the emergent nature of the procedures could contribute to the increased risk of AWD. These findings underscore the importance of meticulous surgical technique and postoperative care, especially in high-risk incisions and procedures. [8] Enhanced strategies for wound closure, such as using reinforced sutures or adjunctive therapies, could potentially reduce the incidence of AWD in these contexts. [9]

Hollow viscus perforation was identified as the predominant cause of AWD in this study, accounting for 37.5% of cases. This condition, which includes perforations in organs such as the stomach, small intestine, and large intestine, poses a high risk for AWD due to severe peritonitis and the resultant compromised tissue integrity. Duodenal perforations followed at 25%, reflecting the vulnerability of duodenal tissue to dehiscence when exposed to gastric and pancreatic fluids. [10] Appendicitis accounted for 18.8% of AWD cases, which, although less frequent, still poses significant risk, particularly in complicated or ruptured cases. Malignancies were responsible for 12.5% of dehiscence incidents, likely due to the associated malnutrition, immunosuppression, and tissue frailty seen in cancer patients. Intestinal obstruction was the least common cause at 6.3%, which could be attributed to the variable presentations and surgical approaches for this condition.

In terms of patient demographics, a notable proportion of those experiencing AWD were underweight (37.9%). Malnutrition is a well-documented risk factor for impaired wound healing due to insufficient protein and micronutrient levels essential for tissue repair. Patients with normal BMI comprised 44.8%, while 17.2% were overweight, indicating that while BMI can influence wound healing, AWD can occur across a range of body weights. Postoperative wound infections were significantly higher in the emergency surgery group (76%) compared to the elective group (23.3%). Although this difference was not statistically significant, the trend highlights the inherent risks of emergency surgeries, which often preclude optimal preoperative preparation and sterilization. [11] The average hospital stay for these patients was 19 days, a reflection of the complex recovery associated with AWD and its management. Burst abdomen typically occurred between 6 to 10 days postoperatively, a critical period for wound healing where the integrity of the surgical closure is tested by factors such as intra-abdominal pressure and early ambulation . Follow-up over a year revealed no incisional hernias, suggesting effective management and possibly the use of reinforced closure techniques in the initial surgery. [12]

In conclusion, AWD remains a significant postoperative complication, particularly prevalent in midline incisions and emergency surgeries. Factors such as hollow viscus perforation, patient nutritional status, and postoperative wound infections substantially contribute to AWD risk. Effective prevention strategies, including optimizing patient nutrition, meticulous surgical techniques, and vigilant postoperative care, are essential. The absence of incisional hernias at one-year follow-up suggests successful initial management and highlights the importance of reinforced closure techniques. Continued research and clinical vigilance are crucial in reducing AWD incidence and improving surgical outcomes.

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