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Original Research Article

Risk factors associated with wound dehiscence in post-laparotomy patients: a prospective observational study

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ABSTRACT

Background: Wound dehiscence is a serious post-operative complication following laparotomy, associated with increased morbidity, prolonged hospitalization, and additional surgical interventions. Understanding the risk factors is crucial for prevention and improved patient outcomes. This study aimed to evaluate the risk factors associated with wound dehiscence in post-laparotomy patients.
Methods: A prospective observational study was conducted at Shri Bhausaheb Hire Government Medical College and Hospital, Dhule, Maharashtra from March 2023 to December 2024, including 80 patients who developed wound dehiscence following laparotomy. Data collected included demographics, clinical presentation, nature of surgery, comorbidities, laboratory parameters, and management strategies.
Results: The mean age was 52.4±14.2 years with male predominance (67.5%). Emergency surgeries accounted for 73.75% of cases. Ileal perforation (21.25%) and intestinal obstruction (18.75%) were the most common diagnoses. Anemia (67.5%), hypoalbuminemia (58.75%), and diabetes mellitus (47.5%) were prevalent comorbidities. Surgical site infection was present in 80% of patients. Most cases presented on postoperative day 6-7 (63.75%). Conservative management was successful in 70% of cases.
Conclusion: Wound dehiscence is multifactorial, with significant associations to emergency surgery, anemia, hypoalbuminemia, diabetes mellitus, and surgical site infection. Early identification of risk factors and appropriate perioperative management may reduce incidence and improve outcomes.

Keywords: Wound dehiscence, Burst abdomen, Laparotomy, Risk factors, Surgical site infection

INTRODUCTION

Abdominal wound dehiscence, commonly referred to as burst abdomen, represents one of the most serious complications in the postoperative period following laparotomy procedures.[1] It is defined as the postoperative separation of the abdominal musculoaponeurotic layers and is associated with significant morbidity, mortality, and economic burden on healthcare systems. The reported incidence varies from 0.5% to 3% in elective surgeries and can be as high as 10-15% in emergency procedures.[2]

Wound dehiscence typically manifests within the first postoperative week, with the critical period being between postoperative days 5 to 8.[3] Clinical presentation may vary from serosanguinous discharge from the wound to complete separation of fascial layers with evisceration of abdominal contents. The condition necessitates urgent management and often requires surgical re-intervention, leading to prolonged hospital stays and increased healthcare costs.[3]

Multiple factors contribute to the development of wound dehiscence, broadly categorized into patient-related and surgery-related factors. Patient-related factors include advanced age, malnutrition, anemia, hypoalbuminemia,

diabetes mellitus, obesity, chronic obstructive pulmonary disease, malignancy, and immunosuppressive conditions. Surgery-related factors encompass emergency procedures, contaminated or dirty wounds, inadequate surgical technique, wound infection, increased intra-abdominal pressure, and postoperative complications such as cough, vomiting, and abdominal distension.[4]

Despite advances in surgical techniques and perioperative care, wound dehiscence remains a challenging complication.[5] Understanding the specific risk factors in different populations and healthcare settings is essential for developing effective prevention strategies. Limited data exists from tertiary care centres in India regarding the comprehensive evaluation of risk factors associated with wound dehiscence.

This study was designed to systematically evaluate the various risk factors involved in wound dehiscence following laparotomy in a tertiary healthcare setting in northern Maharashtra. By identifying modifiable and non-modifiable risk factors, we aim to contribute valuable insights that may guide clinical decision-making and improve patient outcomes.

METHODS

Study design and setting

This prospective observational study was conducted in the Department of General Surgery at Shri Bhausaheb Hire Government Medical College and Hospital, Dhule, Maharashtra over a period of 21 months from March 2023 to December 2024. The study protocol was approved by the institutional ethics committee, and informed consent was obtained from all participants.

Study population

A total of 80 patients who developed wound dehiscence following laparotomy were included in the study. Patients of all ages and both genders who underwent laparotomy and subsequently developed wound dehiscence (evidenced by separation of layers of the abdominal wall) were included. Patients who underwent laparotomy for gynecological conditions, those unwilling for investigation and treatment, and patients undergoing relaparotomy were excluded from the study.

Data collection

Detailed clinical history was obtained from all patients, including demographics, presenting complaints, comorbid conditions, and nature of the primary surgical procedure. Clinical examination was performed to document the type of wound dehiscence and associated features.

The following parameters were systematically recorded:

Patient demographics: Age, gender.

Clinical presentation: Type of discharge (purulent/serosanguinous/wound gaping), postoperative day of presentation.

Nature of surgery: Emergency or elective.

Primary diagnosis necessitating laparotomy

Type of surgical procedure performed

Incision type: Midline, paramedian, or transverse.

Suture material used: Polydioxanone (PDS), Prolene, or Ethilon.

Comorbidities: Anemia, hypoalbuminemia, diabetes mellitus, obesity, chronic kidney disease, tuberculosis.

Postoperative complications: Cough, vomiting, abdominal distension, surgical site infection.

Laboratory parameters: Hemoglobin, serum protein, urea, creatinine, electrolytes.

Microbiological culture from wound discharge.

Hospital stay duration

Management approach: Conservative or surgical.

laboratory investigations

renal function tests, serum protein levels, and electrolyte assessment. Wound discharge samples were sent for culture and sensitivity testing using standard microbiological techniques.

Management protocols

Patients presenting with wound dehiscence were managed based on clinical severity. Conservative management included wound care with regular dressing, appropriate antibiotics based on culture sensitivity, nutritional support, and management of comorbid conditions. Surgical management was undertaken for patients with complete fascial dehiscence, evisceration, or failure of conservative management, involving wound debridement, tension sutures, or secondary closure.

Statistical analysis

Data were entered into Microsoft Excel and analyzed using appropriate statistical software. Continuous variables were expressed as mean ± standard deviation, and categorical variables were presented as frequencies and percentages. Descriptive statistics were used to characterize the study population and identify the prevalence of various risk factors.

RESULTS

Demographic characteristics

During the study period, 80 patients who developed wound dehiscence following laparotomy were included. The age distribution ranged from 6 to 80 years, with a mean age of 52.4±14.2 years. The highest incidence was observed in the 61-70 years age group (21.25%), followed by the 31-40 years and 51-60 years groups (each 18.75%). Male patients constituted 67.5% (n=54) of the study population, while females accounted for 32.5% (n=26), showing a male-to-female ratio of approximately 2:1.

Table 1: Distribution of patients according to age.

Age (years)	Frequency	Percentage (%)
<20	3	3.26
21–30	12	13.04
31–40	15	16.30
41–50	10	10.87
51–60	15	16.30
61–70	17	18.48
71–80	8	8.70
Total	80	100

Table 2: Distribution of patients according to gender.

Gender	Frequency	Percentage (%)
Male	54	67.5
Female	26	32.5
Total	80	100

Primary diagnosis and surgical procedures

Ileal perforation was the most common diagnosis requiring laparotomy (21.25%), followed by intestinal obstruction (18.75%) and duodenal perforation (13.75%). Other diagnoses included abdominal trauma (11.25%), appendicular perforation (8.75%), gastric/pre-pyloric perforation (7.5%), ruptured liver abscess (5.0%), and less common conditions such as jejunal perforation, caecal perforation, obstructed hernia, colorectal malignancy, and superior mesenteric artery thrombosis. The most frequently performed surgical procedure was exploratory laparotomy with resection and anastomosis (26.25%), followed by modified Graham's patch repair (17.5%), and exploratory laparotomy with adhesiolysis (13.75%). Primary closure and appendectomy during laparotomy were each performed in 8.75% of cases. Other procedures included ileostomy formation, right hemicolectomy, splenectomy, peritoneal lavage and drainage, liver repair, and colostomy formation.

Nature of surgery and incision type

Emergency surgeries accounted for 73.75% (n=59) of all cases, while only 26.25% (n=21) were elective procedures. Midline incision was used in 91.25% of cases, paramedian incision in 7.5%, and transverse incision in 1.25%. Regarding suture material for fascial closure, Prolene was most commonly used (47.5%), followed by Ethilon (30%) and polydioxanone (22.5%). All closures were performed using continuous suturing technique.

Table 3: Distribution of patients according to diagnosis.

Diagnosis group	Frequency	%
Ileal perforation	17	21.25
Intestinal obstruction	15	18.75
Duodenal perforation	11	13.75
Appendicular perforation	7	8.75
Gastric/pre-pyloric perforation	6	7.5
Abdominal trauma	9	11.25
Ruptured liver abscess	4	5.0
Jejunal perforation	3	3.75
Caecal perforation	2	2.5
Obstructed hernia	2	2.5
Colorectal malignancy	2	2.5
Sma thrombosis	1	1.25

Clinical presentation

Purulent discharge was the most common presenting feature, observed in 53.75% of patients, followed by serosanguinous discharge in 32.5%, and wound gaping in 13.75% of cases. The timing of presentation showed that most patients developed wound dehiscence on postoperative day 6 (32.5%) and day 7 (31.25%), accounting for 63.75% of all cases. Other presentations occurred on day 5 (16.25%), day 8 (12.5%), day 9 (2.5%), and day 4 (1.25%).

Postoperative complications

Surgical site infection was the most prevalent complication, present in 80% (n=64) of patients. Postoperative cough was documented in 71.25% (n=57) of cases, potentially contributing to increased intra-abdominal pressure. Abdominal distension was noted in 46.25% (n=37) of patients, and postoperative vomiting occurred in 45% (n=36) of cases.

Comorbidities

Anemia was the most common comorbidity, affecting 67.5% of patients, followed by hypoalbuminemia in 58.75%. Diabetes mellitus was present in 47.5% of cases, obesity in 28.75%, and chronic kidney disease in 17.5%. Tuberculosis was documented in only 1.25% of patients. Many patients had multiple overlapping comorbidities.

Laboratory parameters

The mean hemoglobin level was 10.5±1.9 g/dl, indicating prevalent anemia in the study population. Mean serum

protein was 5.8±1.2 g/dl, below the normal range, suggesting poor nutritional status. Mean urea was elevated at 46.2±17.5 mg/dl, and mean creatinine was 1.4±0.6 mg/dL, slightly above normal limits. Electrolytes including sodium (138.5±5.2 mEq/l), potassium (4.3±0.7 mEq/l), and chloride (102.4±4.8 mEq/l) were within normal ranges.

Microbiological culture

Microbiological culture of wound discharge showed no growth in 76.25% of samples, possibly due to prior antibiotic administration. Among positive cultures, Escherichia coli was the most frequently isolated organism (16.25%), followed by Klebsiella species (5.0%) and Proteus species (2.5%).

Hospital stays and management

The majority of patients (47.5%) had hospital stays between 11-20 days, followed by 21-30 days (30%), less than 10 days (16.25%), and more than 30 days (6.25%). Conservative management was successful in 70% (n=56) of cases, involving wound care, antibiotics, and nutritional support. Surgical intervention was required in 30% (n=24) of patients, including wound debridement, tension sutures, or secondary closure procedures.

Table 4: Distribution of patients according to surgery performed.

Surgery performed	Frequency	Percentage (%)
Exploratory laparotomy with resection and anastomosis (RA)	21	26.25
Modified graham's patch repair/graham's patch repair	14	17.50
Exploratory laparotomy with adhesiolysis	11	13.75
Exploratory laparotomy with primary closure	7	8.75
Exploratory laparotomy with appendectomy	7	8.75
Exploratory laparotomy with ileostomy	3	3.75
Right hemicolectomy	2	2.50
Splenectomy (exploratory laparotomy splenectomy)	2	2.50
PLPD (peritoneal lavage and peritoneal drainage)	3	3.75
Liver repair	2	2.50
Colostomy	2	2.50
Ileal primary repair	1	1.25
Mesenteric injury repair	1	1.25
Liver abscess drainage	1	1.25
Transverse colostomy	1	1.25
Total	80	100

Table 5: Distribution of patients according to Nature of Surgery.

Nature of surgery	Frequency	Percentage (%)
Emergency	59	73.75
Elective	21	26.25
Total	80	100

Table 6: Distribution of patients according to comorbidities.

Comorbidity	Frequency	Percentage (%)
Anaemia	54	67.5
Hypoalbuminemia	47	58.75
Obesity	23	28.75
Tuberculosis	1	1.25
Diabetes mellitus	38	47.5
CKD	14	17.5

Table 7: distribution of patients according to hospital stay duration.

Hospital stay duration	Frequency	Percentage (%)
0-10 days	13	16.25
11-20 days	38	47.50

Continued.

Hospital stay duration	Frequency	Percentage (%)
21-30 days	24	30
>30 days	5	6.25
Total	80	100

Table 8: Distribution of patients according to management of wound dehiscence.

Management	Frequency	Percentage (%)
Conservative	56	70
Surgical	24	30
Total	80	100

DISCUSSION

Wound dehiscence remains a significant postoperative complication following laparotomy, with implications for patient morbidity, mortality, and healthcare costs. This prospective observational study evaluated 80 patients who developed wound dehiscence at a tertiary care centre, providing insights into the various risk factors and their prevalence in the Indian healthcare setting.

Age and gender distribution

The mean age of patients in our study was 52.4 years, with the highest incidence in the 61-70 years age group. This finding is consistent with previous studies by Spiliotis et al[6], who reported a mean age of 69.5 years, and Waqar et al[7], who found a mean age of 39.67 years. The variation in mean age across studies may reflect differences in patient populations and healthcare-seeking behaviors. Advanced age is recognized as a risk factor for wound dehiscence due to age-related changes in tissue healing, reduced collagen synthesis, decreased elasticity of tissues, and higher prevalence of comorbid conditions.

Male predominance was evident in our study, with 67.5% of patients being male, consistent with findings by Penninckx et al.[8] and Van Ramshorst et al[9], who reported 75% male patients, and Spiliotis et al, who found 60% male predominance. This gender disparity may be attributed to higher rates of emergency surgeries in males, lifestyle factors including smoking and alcohol consumption, and delayed healthcare-seeking behavior leading to complicated presentations requiring emergency interventions.

Nature of surgery and emergency procedures

Emergency surgeries accounted for 73.75% of cases in our study, significantly higher than elective procedures. This aligns with findings from multiple studies, including Afzal et al[10], who reported 90% emergency surgeries, Spiliotis et al[6] with 60%, and Waqar et al[7] with 72%. Emergency surgeries are associated with several factors predisposing to wound dehiscence: inadequate preoperative optimization, higher contamination rates, bowel edema and distension increasing fascial tension, suboptimal nutritional status, and presence of peritonitis or sepsis. These findings emphasize the importance of meticulous surgical technique and postoperative monitoring in emergency settings.

Timing of presentation

The mean postoperative day of presentation in our study was day 6, with most cases occurring between days 6 and 7 (63.75%). This is consistent with Spiliotis et al.[7] and Van Ramshorst et al[9], who reported mean presentation on day 9, and Jaiswal et al, who found presentation around day 7. This critical period corresponds to the inflammatory phase of wound healing when the wound has minimal tensile strength before adequate collagen formation. Serosanguinous discharge often precedes frank dehiscence, serving as an important early warning sign that warrants immediate clinical attention.

Comorbidities and systemic factors

Anemia was the most prevalent comorbidity in our study (67.5%), consistent with Jaiswal and Shekhar et al, who reported 73% incidence.[11] Anemia impairs oxygen delivery to healing tissues, reduces cellular energy metabolism, and compromises immune function, all critical for wound healing. Hypoalbuminemia, present in 58.75% of our patients, was similarly reported by Choudhury et al. (76.79%) and Jaiswal et al. (58%).[11,12] Low protein levels impair collagen synthesis, reduce wound tensile strength, and indicate overall poor nutritional status.

Diabetes mellitus was documented in 47.5% of our patients, comparable to Mahey et al, who reported 42% incidence.[13] Diabetes contributes to wound dehiscence through multiple mechanisms: impaired immune function and increased infection risk, microvascular complications affecting tissue perfusion, altered inflammatory response, and delayed wound healing due to hyperglycemia. Obesity, present in 28.75% of cases, increases intra-abdominal pressure, reduces tissue oxygenation, and is associated with increased surgical site infections.

Surgical site infection

Surgical site infection was the most significant postoperative complication, present in 80% of patients. This high prevalence underscores the critical role of infection in wound dehiscence pathogenesis. Infection compromises fascial integrity through enzymatic breakdown of suture material, inflammatory mediators weakening tissue, increased local tissue edema, and necrosis of fascial edges. The predominance of Escherichia coli (16.25%) among positive cultures reflects the enteric nature of most procedures, particularly perforations and obstructions.

The high proportion of negative cultures (76.25%) likely reflects prior broad-spectrum antibiotic administration before culture sampling. This finding highlights the importance of obtaining microbiological samples before antibiotic initiation whenever possible to guide targeted antimicrobial therapy.[14]

Primary diagnosis and surgical procedures

Ileal perforation (21.25%) and intestinal obstruction (18.75%) were the most common diagnoses, consistent with the high burden of peritonitis and acute abdominal conditions in emergency surgical practice.[15] These conditions are associated with contaminated surgical fields, bowel edema, peritoneal contamination, and compromised tissue quality, all contributing to increased wound dehiscence risk. The predominance of resection and anastomosis procedures (26.25%) reflects the severity of underlying pathology and the need for definitive surgical management

Postoperative complications

Postoperative cough, present in 71.25% of patients, represents a significant mechanical factor increasing intra-abdominal pressure and placing tension on the fascial closure. This finding emphasizes the importance of adequate pain control, respiratory physiotherapy, and management of respiratory complications in the postoperative period. Similarly, abdominal distension (46.25%) and vomiting (45%) contribute to increased intra-abdominal pressure and mechanical stress on the wound.

Management strategies

Conservative management was successful in 70% of cases, involving meticulous wound care, appropriate antibiotic therapy based on culture and sensitivity, nutritional support with protein supplementation, management of comorbid conditions, and close monitoring. Surgical intervention in 30% of cases included wound debridement, tension suture placement, negative pressure wound therapy in selected cases, and secondary closure after infection control.

Limitations

This study has several limitations. The single-centre design may limit generalizability of findings to other settings. The relatively small sample size of 80 patients may not capture the full spectrum of risk factors. As an observational study, causal relationships cannot be definitively established. Some potential confounding variables may not have been fully accounted for in the analysis.

Clinical implications

The findings of this study have important clinical implications for prevention and management of wound dehiscence. Preoperative optimization should focus on correcting anemia and hypoproteinemia, achieving glycemic control in diabetic patients, and improving nutritional status. Intraoperative considerations include appropriate antibiotic prophylaxis, meticulous surgical technique with adequate fascial bites (4:1 suture length to wound length ratio), selection of appropriate suture material (slowly absorbable or non-absorbable monofilament), and tension-free closure. Postoperative management should emphasize early mobilization while avoiding excessive strain, respiratory care to minimize cough, prevention and early treatment of surgical site infections, management of factors increasing intra-abdominal pressure, and close monitoring during the critical period (days 5-8). High-risk patients may benefit from prophylactic mesh placement or retention sutures.

CONCLUSION

Wound dehiscence following laparotomy is a multifactorial complication with significant implications for patient morbidity and healthcare resources. This study identified several key risk factors including advanced age, male gender, emergency surgery, anemia, hypoalbuminemia, diabetes mellitus, and surgical site infection. The critical period for wound dehiscence presentation is postoperative days 6-7, highlighting the need for vigilant monitoring during this timeframe.

The predominance of emergency surgeries, contaminated wounds from perforations and obstructions, and high rates of surgical site infections emphasize the challenging clinical scenarios contributing to wound dehiscence. The success of conservative management in 70% of cases demonstrates that early recognition and appropriate non-operative management can be effective for many patients.

Prevention strategies should focus on preoperative optimization of modifiable risk factors, particularly correction of anemia and hypoproteinemia, glycemic control, and nutritional support. Meticulous surgical technique, appropriate suture material selection, and comprehensive postoperative care including infection prevention are crucial. Future research should focus on developing validated risk stratification tools to identify

high-risk patients who may benefit from preventive interventions such as prophylactic mesh placement or enhanced postoperative monitoring protocols.

Early identification of patients at risk, coupled with targeted preventive strategies and vigilant postoperative surveillance, has the potential to significantly reduce the incidence of this serious complication and improve patient outcomes.

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