



A PROSPECTIVE STUDY OF PERIOPERATIVE FACTORS FOR WOUND DEHISCENCE IN ELECTIVE SURGERIES

Siddharth Singh	Professor , Department of General Surgery, G.S.V.M Medical college, Kanpur.
Ashish Kumar Chaudhary	Professor, Department of General Surgery, G.S.V.M Medical college, Kanpur.
Yukteshwar Mishra	Assistant Professor, Department of General Surgery, G.S.V.M Medical college, Kanpur.
Avinash Chaudhary*	PG. Trainee, Department of General Surgery, G.S.V.M Medical college, Kanpur. *Corresponding Author

ABSTRACT

Introduction: Surgical wound dehiscence is a critical complication post-surgery associated with increased hospital stays, patient discomfort, and mortality rates. Despite advancements in surgical techniques and perioperative care, identifying risk factors remains crucial due to its significant impact on patient outcomes. **Objectives:** This prospective study aimed to analyze perioperative factors contributing to wound dehiscence in elective surgeries at G.S.V.M. Medical College, Kanpur, from December 2022 to June 2024. **Methods:** A total of 501 patients undergoing elective surgeries were included. Data collection encompassed demographic details, surgical specifics, perioperative management, and postoperative outcomes. Statistical analysis utilized SPSS version 23, employing chi-square tests and mean comparisons to assess associations between variables. **Results:** The study cohort averaged 43.25 years with a predominance of females (53.5%). Wound dehiscence typically occurred 10.81 days post-surgery, with significant associations found between delayed ambulation ($p<0.001$), post-operative infection ($p<0.001$), and increased incidence of dehiscence. Patients with longer surgery durations and lower post-operative hemoglobin and albumin levels also showed elevated dehiscence rates. **Conclusion:** Age, sex, did not significantly influence wound dehiscence in this study. However, BMI, smoking status, delayed ambulation, post-operative infections, and poor nutritional status emerged as critical risk factors. Effective management strategies targeting these factors could mitigate the incidence of wound dehiscence and improve surgical outcomes.

KEYWORDS : Surgical wound dehiscence; perioperative factors; elective surgeries; risk factors; wound healing.

INTRODUCTION

Surgical wound dehiscence is a postoperative complication involving breakdown of surgical incision site. Despite the increased knowledge of wound healing process before and after surgery and the development of preoperative care and suture materials, wound dehiscence may increase the length of hospital stay, increase patient inconvenience and rates of re-operation. In addition, wound dehiscence after abdominal surgery is associated with mortality rates of 10.0%–44.0%.

Several studies investigated risk factors causing wound dehiscence. Patients older than 65 years are more likely to develop wound dehiscence because of deterioration in tissue repair mechanism compared with younger patients. Other well-known risk factors include hypoproteinemia, local wound infection, anemia, hypertension.¹ Risk factors that increase intra-abdominal pressure such as abdominal distension, excessive coughing, vomiting, and constipation increase the possibility of wound dehiscence after surgery. In addition, surgical experience, operative time exceeding 2.5 hours, type of incision, suture material, drain, medical history such as obesity with body mass index (BMI) greater than 30, stroke, chronic obstructive pulmonary disease (COPD), pneumonia, and malignancy also affect wound dehiscence. In particular, studies show increased wound dehiscence rates in patients with more than 5 risk factors.

Despite many studies investigating the risk factors causing wound dehiscence and efforts to control them, patients continue to suffer from wound dehiscence. The purpose of this study is to analyze the perioperative factors for wound dehiscence in elective surgeries

MATERIAL AND METHODS

This prospective study was conducted in the Department of General Surgery at G.S.V.M. Medical College, Kanpur. The study aimed to identify perioperative factors contributing to wound dehiscence in elective surgeries. The study was conducted over a period from December 2022 to June 2024. The study adhered to ethical standards and guidelines. Informed consent was obtained from all participants before their inclusion in the study. Patient confidentiality was maintained throughout the research process.

Study/Research Design: Prospective Study

Study Population: A total of 501 patients undergoing elective surgeries were included in the study.

Inclusion Criteria: Patients who experienced wound dehiscence after undergoing elective surgical procedures, up until the time of suture removal to one-month follow-up.

Exclusion Criteria: Patients with diabetes mellitus, immunocompromised conditions, or those on long-term steroid therapy. Patients who were discharged against medical advice before completing their treatment. Patients who declined to give consent for participation in the study.

Patient Demographics and other details: Demographic data including age, sex, body mass index (BMI), nutritional status, and smoking habits were collected for each patient. A comprehensive medical history was obtained, focusing on relevant comorbidities such as hypertension, cardiovascular disease, renal insufficiency, and respiratory disorders. The primary pathology that necessitated the elective surgery was recorded, including conditions like hernias, tumors, and gastrointestinal disorders.

Surgical Factors: Details of the surgical procedure were documented, including: Type of surgery (e.g., hernia repair, appendectomy), Duration of surgery, Type of incision (e.g., midline, transverse), Type of anaesthesia used. **Suture Material and Wound Closure Techniques:** Data were collected on: Type of suture material used (e.g., absorbable, non-absorbable), wound closure techniques (e.g., interrupted sutures, continuous sutures, staples), and type of dressings.

Perioperative management details were noted, including the use of prophylactic antibiotics, intraoperative blood loss, and Postoperative care protocols.

Patients were monitored daily for signs of wound dehiscence. Clinical assessments included evaluation of the wound site for infection, separation of wound edges, and any discharge. Preoperative and postoperative laboratory tests include Complete blood count (CBC), Serum albumin levels, and C-reactive protein (CRP) levels. For patients with suspected wound infection, imaging studies such as ultrasound or CT scans were performed to evaluate the extent of

infection or abscess formation. In select cases, tissue samples from wound edges were obtained for histopathological examination to identify underlying pathological changes contributing to wound dehiscence.

Statistical Analysis:

Version 23 of the Statistical Package for Social Sciences (SPSS Inc., Chicago, IL) was used to analyze and assess the data. Results for categorical variables are displayed as numbers (%), whereas results for continuous variables are shown as mean $\pm$ standard deviation (SD). To compare nominal data, one may apply the chi-square (χ^2) test. The significance threshold, or cutoff value, was set at $p < 0.05$.

OBSERVATION AND RESULTS

- The mean age of the studied cases was 43.25 ± 14.31 years with female predominance (53.5%) and males being 46.5%. The average time to wound dehiscence was 10.81 ± 3.14 postoperative days. The earliest occurrence of wound dehiscence was observed on the 6th postoperative day, while the latest was on the 16th postoperative day.
- The analysis revealed no significant differences in age ($\chi^2=0.437$, $p=0.510$), sex ($\chi^2=0.623$, $p=0.430$), and type of surgery ($\chi^2=0.281$, $p=0.596$) about wound dehiscence. But significant with BMI ($\chi^2=5.35$, $p=0.020$), smoking status ($\chi^2=17.6$, $p<0.001$), [Table 1]
- The time to first ambulation showed a significant association ($p<0.001$), with a longer time to ambulation linked to a higher incidence of dehiscence. Post-operative wound infection was also significantly associated with dehiscence ($p<0.001$), with patients having infections showing a higher rate of wound dehiscence. The mean duration of surgery was 73.10 ± 38.38 minutes for patients without dehiscence and 97.6 ± 47.6 minutes for those with dehiscence. [Table 2]
- The pre-operative haemoglobin levels differed significantly between the two groups ($p<0.001$), and post-operative difference was also statistically significant ($p < 0.05$). Also, pre and post-operative albumin levels were significantly different between both groups ($p<0.001$). [Table 2]

Table 1: Distribution Of The Studied Patients Based On Pre-operative Risk Factors

Variables		Without dehiscence (n=480)	With dehiscence (n=21)	χ^2/t value	p value
Age (Years)	≤ 50	330	13	0.437	0.510
	> 50	150	8		
	Mean $\pm$ SD	43.01 $\pm$ 14.33	48.57 $\pm$ 13.20	-1.745	0.082
Sex	Male	225	8	0.623	0.430
	Female	255	13		
BMI	Normal	303	8	5.35	0.020
	Obese	177	13		
Smoking	Yes	79	11	17.6	<0.001
	No	401	10		
Type of surgery	Laparoscopic	164	6	0.281	0.596
	Open	316	15		

Table 2: Distribution Of The Studied Patients Based On Post-operative Risk Factors

		Without dehiscence (n=480)	With dehiscence (n=21)	χ^2/t value	p value
Wound closure tech	Simple interrupted	214	11	3.620	0.164
	Mattress	203	5		
	Subcuticular	63	5		
Use of drains	Yes	285	14	0.445	0.505
	No	195	7		
Time to first ambulation (Postop day)	1	203	3	72.12	<0.001
	2	209	5		
	3	59	6		
	4	9	7		
Type of wound dressing	G - dress	164	6	0.281	0.596
	Gauze dressing	316	15		

Post-operative wound infection	Yes	18	9	60.349	<0.001
	No	462	12		
Duration of surgery (in mins)		73.10 $\pm$ 38.38	97.6 $\pm$ 47.6	2.83	0.004

Table 3: Compare the pre and post-operative hemoglobin and albumin level in study groups

		Without dehiscence (n=480)	With dehiscence (n=21)	t value	p value
Haemoglobin	Pre-operative	13.54 $\pm$ 0.94	11.9 $\pm$ 0.73	5.264	<0.001
	Post-operative	12.99 $\pm$ 4.83	10.5 $\pm$ 0.99	5.134	0.018
P value				0.105	<0.001
Albumin	Pre-operative	4.29 $\pm$ 0.46	3.70 $\pm$ 0.32	1.478	<0.001
	Post-operative	3.88 $\pm$ 0.46	2.99 $\pm$ 0.31	5.027	<0.001
P value		<0.001	<0.001		

DISCUSSION

In this present study, the mean age of the studied cases was 43.25 ± 14.31 years with female predominance (53.5%) and males being 46.5%. The average time to wound dehiscence was 10.81 ± 3.14 postoperative days. The earliest occurrence of wound dehiscence was observed on the 6th postoperative day, while the latest was on the 16th postoperative day. The analysis revealed no significant differences in age ($\chi^2=0.437$, $p=0.510$), sex ($\chi^2=0.623$, $p=0.430$), significant with BMI ($\chi^2=5.35$, $p=0.020$), significant with smoking status ($\chi^2=17.6$, $p=0.001$). However, the time to first ambulation showed a significant association ($\chi^2=72.12$, $p<0.001$), with a longer time to ambulation linked to a higher incidence of dehiscence. Post-operative wound infection was also significantly associated with dehiscence ($\chi^2=60.349$, $p<0.001$), with patients having infections showing a higher rate of wound dehiscence. Both groups exhibited significant decreases in hemoglobin and albumin levels from pre- to post-operative periods. The mean duration of surgery was 73.10 ± 38.38 minutes for patients without dehiscence and 97.6 ± 47.6 minutes for those with dehiscence ($p<0.05$). The average time to wound dehiscence was 10.81 ± 3.14 postoperative days. Of 21 cases who developed wound dehiscence, 9.5% underwent minor surgery whereas 90.5% went through major surgeries (61.9% were intra-abdominal surgeries and 38.1% were other surgeries). Of 21 wound dehiscence cases 4 (19.0%) started early ambulation and 81.0% engaged in late ambulation.

Our findings were supported by a study conducted on 107 patients with abdominal wound dehiscence over 7 years in the Department of Surgery, Cleveland Veterans Affairs Medical Centre, Case Western Reserve University USA by **Graham DJ et al**, showed that patients with Intra-abdominal infection were more likely to have undergone operations ($p<0.02$), wound dehiscence is more common in operations with higher wound classification. **Verma S et al** study showed that abdominal wound dehiscence is more common in patients operated on for peritonitis due to hollow viscus perforation and in which wounds were classified as contaminated. **Ahsan A et al** depicted that among the various risk factors present among the participants of both groups, smoking habits, tuberculosis, jaundice, bronchial asthma, anemia, edema, dehydration, obesity, and underweight were significantly higher among the wound dehiscence developed group compared to the non-developed group ($p<0.05$). The mean duration of operation was found significantly higher in patients having postoperative wound dehiscence compared to patients without wound dehiscence (1.9 ± 1.2 vs. 0.9 , $p=0.001$). Prolene suture was used in significantly higher amounts among patients. Midline incision, mass closure, and drain-given cases had significantly higher percentages of wound dehiscence cases (<0.05). Wound infection was in significantly higher cases who developed wound dehiscence (74.1%). **Meena K et al** reported that the variables that were significantly associated with wound dehiscence include anemia ($p=0.001$), hypoproteinemia ($p=0.006$), and duration of surgery ($p=0.003$). The additional postoperative factors that were found to be significant were prolonged postoperative ileus ($p=0.003$), wound infection ($p=0.000$), and postoperative pulmonary infection ($p=0.000$). Age ($p=0.096$), gender ($p=0.470$), jaundice ($p=0.644$), cause of peritonitis ($p=0.459$), wound contamination ($p=0.142$), and types of surgery ($p=0.261$) were nonsignificant variables. **Hermosa JJ**

et al, where wound dehiscence was more common in operations with higher wound classification. **Graham DJ et al** pointed that intra-abdominal infection and colonic surgery were a leading cause of wound dehiscence.

The study conducted by **Abbott DE et al**, observed primary closure is associated with a relatively high rate of recurrent wound dehiscence. Closure with polyglactin mesh interposition has a higher initial success rate but necessitates additional surgeries for the repair of the abdominal wall defect. **Teklemariam BT et al** reported that preoperative sepsis, condition at admission, the indication of surgery, the presence of postoperative wound infection, and postoperative days of hospitalization were statistically significant upon bivariable analysis. When all these factors were regressed, except for preoperative sepsis and indication for first surgery all others proved not an independent risk factor. In their study dehiscence had occurred between the first ten days in 84% of cases, and almost 99% of it had occurred in the first fifteen days postoperatively

In a study carried out by **Sivender A et al**, out of 50 cases 4(8.0%) cases had raised liver enzymes, 31(62.0%) patients had hypoalbuminemia, 16(32.0%) patients had hyperbilirubinemia and 18(36.0%) patients had elevated renal parameters. In the **Verma S et al** study, out of 50 patients, about 88% showed intra-abdominal infection. Other risk factors included were Hypoalbuminemia 60.0%, anemia 56.0%, diabetes mellitus 30.0%, uremia 28.0%, and jaundice 16.0%. **Van Ramshorst GH et al** reported 90.0% of dehiscence to have occurred in less than 15 days.

Limitations Of The Study

The single-center design and the relatively modest sample size may have curtailed the statistical power needed to unearth associations with certain risk factors or to conduct in-depth subgroup analyses.

CONCLUSION

The study's findings suggest that while age, sex, and type of surgery do not significantly influence wound dehiscence, factors such as BMI, smoking status, time to first ambulation, and post-operative wound infection play crucial roles. Smoking impairs blood flow and oxygen delivery to tissues, hindering healing. Delayed ambulation can lead to poor circulation and increased risk of complications, including dehiscence. Post-operative infections exacerbate tissue damage and inflammation, further compromising wound integrity. Additionally, significant drops in hemoglobin and albumin levels indicate poor nutritional and oxygenation status, which are vital for effective wound healing. Longer surgery durations also increase the risk of dehiscence due to prolonged tissue exposure and the potential for contamination. These factors collectively highlight the importance of managing smoking, encouraging early ambulation, preventing infections, and ensuring good nutritional status to reduce the risk of wound dehiscence.

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