



Original Research Article

Assesment of Risk Factors in Abdominal Wound Dehiscence Using Rotterdam Score: A Validation Study

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Abstract: Background: Abdominal wound dehiscence is a severe postoperative complication with an incidence of 0.3–3.5% in adults and up to 10% in elderly patients, associated with mortality as high as 45%. It results from mechanical failure of wound healing influenced by patient, operative, and postoperative factors. The Rotterdam Risk Index Score was developed to identify patients at risk and guide preventive measures. This study was conducted to validate the Rotterdam score in predicting abdominal wound dehiscence and to assess risk factors in patients undergoing laparotomy. **Methodology:** This was a prospective descriptive observational study conducted in the Department of General Surgery, Dr. S.N. Medical College and Associated Hospitals, Jodhpur, from November 2022 to July 2025. A total of 102 patients undergoing elective or emergency laparotomies were included after informed consent. Patients were assessed using the Rotterdam Risk Index Score, which incorporates ten risk factors. Clinical data, operative details, postoperative complications, and wound outcomes were collected and analyzed. Statistical tests included Chi-square, Fisher's exact test, Mann-Whitney U test, and ROC curve analysis. **Results:** Out of 102 patients, 57 (55.8%) developed wound dehiscence. Significant associations were observed with type of surgery- small Bowel surgeries ($p = 0.014$), postoperative cough (91.2%, $p < 0.001$), postoperative wound infection (98.2%, $p < 0.001$), vertical midline incision (86.4%, $p = 0.043$), longer surgery duration ($p = 0.037$), and prolonged hospital stay ($p = 0.001$). No significant association was noted with age, gender, anemia, jaundice, COPD, diabetes, malignancy, smoking, or alcohol use. The mean Rotterdam score was significantly higher in the dehiscence group (5.57 ± 1.13) compared to non-dehiscence (2.77 ± 0.87 , $p = 0.001$). ROC analysis showed an AUC of 0.96 with a sensitivity of 90.9% and specificity of 99.93% at a cut-off score >3.85 . **Conclusion:** The Rotterdam Risk Index Score is a reliable tool for predicting abdominal wound dehiscence. It allows early identification of high-risk patients and facilitates preventive strategies such as correction of nutritional deficiencies, optimization of comorbidities, meticulous surgical technique, and rigorous postoperative care. Dehiscence was strongly associated with postoperative cough and infection, emphasizing the importance of pulmonary care and infection control. The study concludes that abdominal wound dehiscence is predictable and preventable using the Rotterdam scoring system, which can help reduce morbidity, mortality, and healthcare burden.

Keywords: Abdominal wound dehiscence, Rotterdam Risk Index Score, Wound healing.

INTRODUCTION

Abdominal wound dehiscence (burst abdomen, fascial dehiscence) is a grave post-operative complication described as partial or complete disruption of an abdominal wound with or without

protrusion and evisceration of abdominal contents. Abdominal wound dehiscence is the premature bursting of a wound along surgical suture, resulting from poor wound healing.¹ The incidence in the adult population is reported as 0.3-3.5%, and among the

elderly it is as high as 10%. It carries mortality as high as 45%.² There are two basic types of wound dehiscence, partial or complete, depending on the extent of separation. In partial dehiscence, only the superficial layers or part of the tissue layers reopen. In complete wound dehiscence, all layers of the wound thickness are separated, revealing the underlying tissue and organs, which may protrude out of the separated wound. The importance of this clinical entity is due to the fact of it causing significant impact on general population - inconvenience of a discharging wound, entero cutaneous fistula, septicemia later often incisional hernia. It may need immediate intervention and there is a possibility of recurrence. Surgical wound infection can also occur with incisional hernia formation.³

Several risk factors identified which are responsible for wound dehiscence can be broadly classified into three factors. The first factor is patient related factors such as advanced age >65 years, systemic diseases (uremia, diabetes mellitus), malnutrition (hypoalbuminemia, anemia). The second factor is operative related factors which include emergency surgery and type of surgical wound. The third factor is post-operative factors which include cough, vomiting, and distension. Despite advances in perioperative care and suture materials, incidence, and mortality rates in regard to abdominal wound dehiscence have not significantly changed over the past decades. This may be attributable to increasing incidences of risk factors within patient populations outweighing the benefits of technical achievements.

Two scoring systems are available for predicting wound dehiscence namely the Veterans Affairs Medical Center score and the Rotterdam risk score, to assess both preoperative and postoperative factors responsible for wound dehiscence.⁴ Considering wound problems quite common in developing countries like India, the goal of the underlying study was to evaluate the incidence of postoperative wound dehiscence and to identify the possible risk factors for its occurrence and to assess the Rotterdam risk index model based on independent risk factors and to plan alternative closure techniques (mesh placement and tension sutures) in high-risk patients aimed at decreasing the tension at wound edges.

MATERIALS AND METHODOLOGY

RESULTS

The overall incidence of wound dehiscence in the study was 55.9%. Incidence was higher in age group <40 years amounting to 42.1% followed by 19.3% in 40-49 years age group followed by 17.5% in >70 years age group. Higher prevalence of wound dehiscence was noted in males (68.4%) than in females (31.6%) with M:F ratio was 2.5:1. Incidence of wound dehiscence was significantly high in emergency patients 64.9% as compared to 35.1% in elective cases. Type of surgery, type of incision, postoperative cough, postoperative wound infection, duration of surgery, and length of hospital stay were significantly associated with the occurrence of wound dehiscence. Vertical midline incisions, small and large intestinal surgeries were found to have a higher risk of dehiscence. Among postoperative

This study was a prospective Descriptive Observational study conducted in the department of General surgery, Dr S.N. medical college, Jodhpur and associated group of hospitals over 2 year period from November 2022 – July 2025. The study was designed to assess utility of Rotterdam score in assessment of risk factors causing abdominal wound dehiscence. The study included adult patients 18 years and older who underwent both elective and emergency abdominal surgeries during study period. Exclusion criterias were patients with gynecological and urological surgeries, those undergoing laparoscopic surgeries, those known to be suffering from collagen vascular disease, connective tissue disorders, patients with disseminated malignancy, Patients with bleeding disorders or those on anticoagulants. A total of 102 participants were enrolled in the study. Sample size calculated based on AUROC for RS considering expected area of 0.76 and proportion of wound dehiscence 25%. Sample size assuming width of CI =0.25.

Detailed history was taken along with preoperative clinical examination and investigations were performed for underlying conditions. Then the patients were planned for elective or emergency abdominal surgeries after taking informed written consent. The total duration of surgery, mode of Anesthesia, incision site, type of wound and intra operative findings were recorded. Patients post operatively were observed for erythema, serosanguinous discharge, purulent discharge, pain and tenderness along local site and depth of involvement. Then wound swab was obtained and sent for culture and sensitivity. The probability of occurrence of abdominal wound dehiscence was calculated for each patient using Rotterdam Risk Index Score. Total risk score was calculated by adding the weights of various variables in the Rotterdam Risk Model. Theoretical score (min- max) 0 -10.6. After calculating scores for all the patients, data was analyzed using following statistical plan. The association between two categorical variables was evaluated using the Chi-square test. In cases where the expected frequency in any cell was less than 5, Fisher's Exact Test was employed. The Mann-Whitney U test was used to assess the change in mean across the independent groups. Statistical significance was determined at a 5% level of significance.

factors, cough ($p < 0.001$) and wound infection ($p < 0.001$) showed the strongest correlation, highlighting their importance in postoperative management and preventive care. Microbiological analysis revealed that *E. coli* (56.1%) and *Klebsiella* (19.3%) were the most common organisms isolated in wound infections associated with dehiscence.

Prolonged surgery duration ($p < 0.001$) and extended hospital stay ($p < 0.001$) were also significantly related to poor wound outcomes. The Rotterdam Score proved to be a highly reliable predictor of wound dehiscence, with a mean score of 5.57 ± 1.13 in the dehiscence group versus 2.77 ± 0.87 in the non-dehiscence group ($p < 0.001$). The ROC analysis demonstrated excellent diagnostic accuracy ($AUC = 0.96$, $p < 0.001$) with a cutoff > 3.85 yielding 90.9% sensitivity and 99.9% specificity, confirming its clinical utility as a simple and effective risk assessment tool. No statistically significant association was found with age, gender, anemia, jaundice, COPD, diabetes, smoking, alcohol intake, tuberculosis, malignancy, or type of wound.

Table 1: Rotterdam Score and wound dehiscence

Variable	No Dehiscence group (%)	Dehiscence group (%)	p-value
Rotterdam Score	2.77±0.87	5.57±1.13	0.001
Age Group			
<40	25 (55.6)	24 (42.1)	0.260
40-49	10 (22.2)	11 (19.3)	
50-59	5 (11.1)	5 (8.8)	
60-69	2 (4.4)	7 (12.3)	
>70	3 (6.7)	10 (17.5)	
Gender			
Male	34 (75.6)	39 (68.4)	0.428
Female	11 (24.4)	18 (31.6)	
COPD	2 (4.4)	4 (7)	0.583
Ascites	0 (0)	0 (0)	-
Anaemia	12 (26.7)	25 (43.9)	0.073
Jaundice	5 (11.1)	11 (19.3)	0.259
Surgery Type			
Emergency	33 (73.3)	37 (64.9)	0.363
Surgery			
GB	3 (6.67)	7 (12.28)	0.014
GD	7 (15.56)	11 (19.30)	
SI	21 (46.67)	23 (40.35)	
LI	2 (4.44)	12 (21.05)	
V	0 (0)	0 (0)	
Other	12 (26.67)	4 (7.02)	
Post op Cough			
Absent	42 (93.3)	5 (8.8)	<0.001
Present	3 (6.7)	52 (91.2)	
Post-Operative Wound Infection			
Absent	42 (93.3)	1 (1.8)	<0.001
Present	3 (6.7)	56 (98.2)	

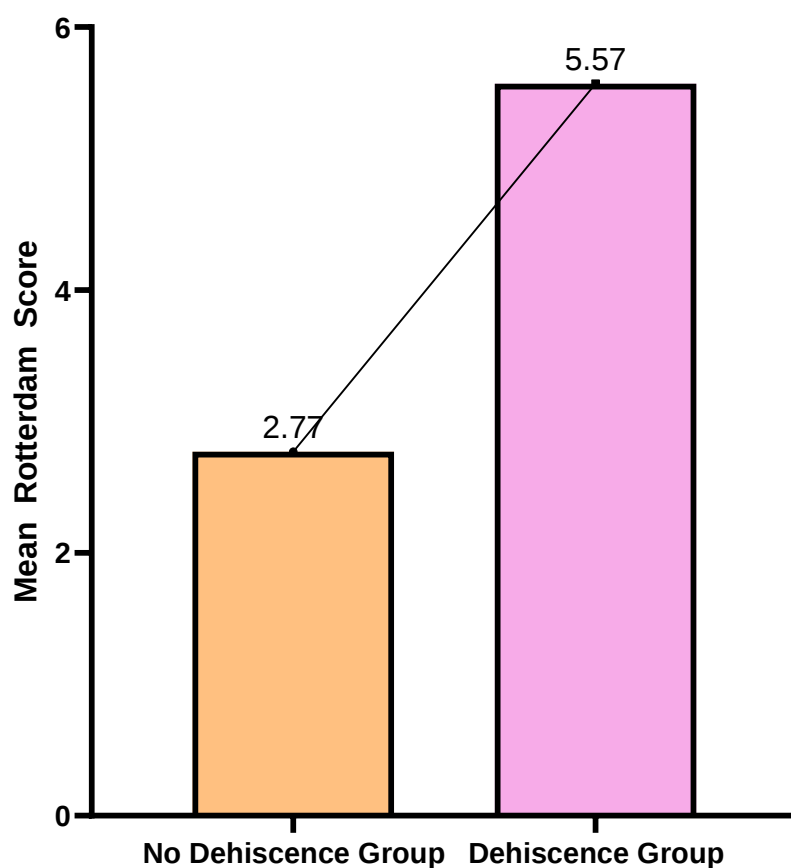


Figure 1: Rotterdam score and wound dehiscence

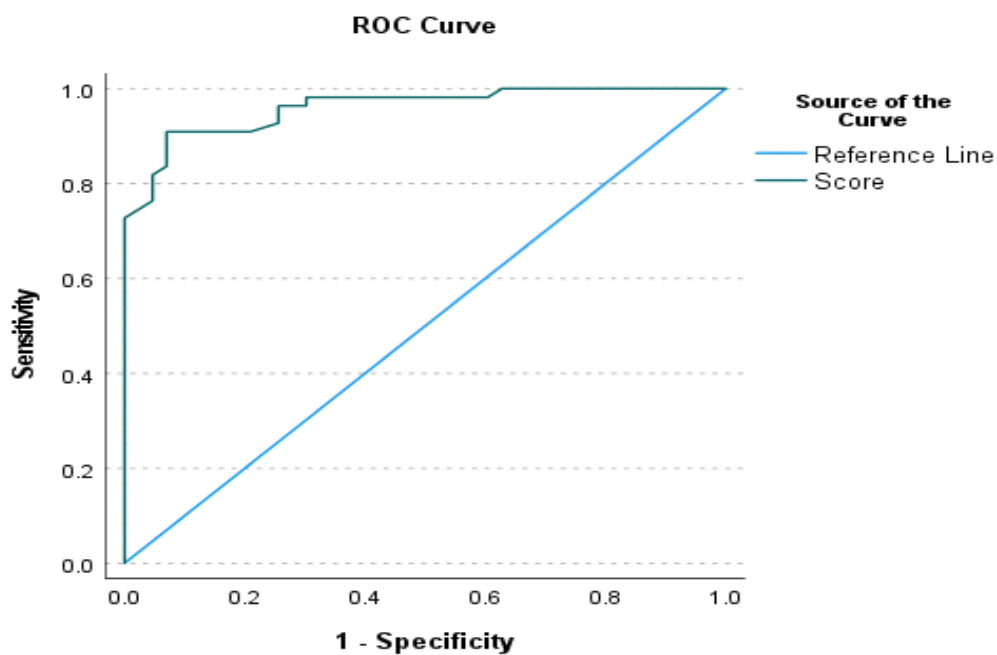


Figure 2: Predictive value of Rotterdam Score for Wound Dehiscence

The receiver operating characteristic (ROC) curve demonstrates excellent predictive performance of the Rotterdam Score for identifying patients at risk of wound dehiscence. The area under the curve (AUC) is 0.96 (95% CI: 0.93-0.99; p-value: <0.001) indicating outstanding discrimination between those who developed dehiscence and those who did not dehiscence. At a cut-off score of >3.85, the model achieves a sensitivity of 90.9%, meaning it correctly identifies 90.9% of patients with wound dehiscence. The specificity is 99.93%, indicating it correctly excludes nearly all patients without dehiscence. The association is statistically significant (p-value < 0.001), and the model has strong clinical utility as evidenced by an odds ratio (OR) of 9.81 with a 95% confidence interval (CI) of 4.0–24.0. This means patients with a Rotterdam score >3.85 are approximately 9.8 times more likely to develop wound dehiscence than those with lower scores.

DISCUSSION

The discussion on the subject of abdominal wound dehiscence is as old as the history of modern operative surgery.³ Postoperative wound disruption or evisceration is the inescapable responsibility of the surgeon who made the wound. Ever since exploratory laparotomy is practiced, wound dehiscence is a common complication faced by surgeons, which if not treated accordingly, can lead to life threatening situations. Wound dehiscence also termed as burst abdomen needs early detection and prompt treatment, failure of which leads to disastrous consequences. Varying frequency of wound dehiscence has been reported in international and local literature.⁵ This study assess the risk factors of wound dehiscence and Rotterdam risk score to predict wound dehiscence preoperatively in every patient undergoing laparotomy both elective and emergency surgeries. Rotterdam risk score is based on 10 risk factors in predicting wound dehiscence, out of which 8 are preoperative and 2 are post-operative. Risk factors of abdominal wound dehiscence analysed in each patient by calculating total risk score and thus the probability of dehiscence according to Rotterdam risk score can be predicted.

No period of life appears to be exempt for dehiscence. Old age is considered an individual risk factor for development of wound dehiscence which is attributed to the poor tissue repair mechanism and increased SSI due to delayed T cell infiltration into the wound area with alteration in chemokine production and reduced macrophage capacity.⁶ Webster et al found no significance of age in dehiscence thus age was not included in calculating risk in VAMC model but in Rotterdam model age is considered significant with higher incidence of dehiscence in increasing age group.^{1,7} In this study, the highest incidence of wound dehiscence (55.6%) was recorded in the age group of <40 years, probably because of higher incidence of acute abdomen in this decade. Our study found no correlation of the increased incidence of dehiscence with the increasing age. Similarly, Halasz et al also did not find significant correlation between age and wound dehiscence⁸. Ramneesh et al also found higher incidence of dehiscence in age group 31- 40 years.⁹

In present study higher incidence of wound

dehiscence was present in males (68.4%) with M:F ratio was 2.5:1, the difference is not statistically significant. Riou JP et al, also studied, the abdominal wound dehiscence incidence was more common in male gender (61%) as the M:F ratio was 1.74:1.¹⁰ R Sharma et al found that male patients had a higher risk of Wound dehiscence, with odds of 1.9 (95% confidence interval (CI): 1.1-3.3, p= 0.021).¹¹ In our study 7% had COPD who had wound dehiscence (p=0.583). Abbas et al proved the role of smoking in increased incidence of wound dehiscence in the midline laparotomies. A history of heavy tobacco use (> or =20 pack-years) was more prevalent in those who had AFWD (46%) (P = 0.0002; odds ratio 3.7).¹² In our study raised total bilirubin level >1.3mg is associated with wound dehiscence, 19.3% patients with jaundice have wound dehiscence. It is not proven to be statistically significant probably due to the fact that jaundice in the study population were borderline, with malignant obstructive jaundice being excluded in the study. Verma S et al observed that out of 50 cases of wound dehiscence, 8 patients had serum bilirubin >1.2mg/dl and 30 patients had hypoalbuminemia (serum albumin) ¹³. In our study, most of the patients were non-diabetic (98.2%) and rest 1.8% with diabetes, which is not significant. It is due to limited number of patients in the study. Van Ramshorst et al showed that diabetes was an independent risk factor (OR ~1.9, p<0.05)¹

One of the significant findings in our study is that 64.9% patients who had developed wound dehiscence had undergone emergency laparotomy. Penninckx et al., also observed that wound dehiscence rate was found more in emergency laparotomy (6.7%) than elective cases (1.5%).¹⁴ Parmar et al also found that, the incidence of burst abdomen was much higher in patients operated as emergency surgery (93%) in comparison to elective surgery (7%).¹⁵ R Sharma et al found that emergency surgery was associated with a higher incidence of WD (odds ratio (OR):4.1, 95% CI: 1.5-10.4, p = 0.017).¹¹ Most of the patients (91.2%) had developed post op cough, which is statistically significant (p <0.001). Al-Khayat et al observed that in a prospective study of 305 patients, chronic cough and COPD were significantly associated with wound dehiscence (p < 0.01, OR= 3.6).¹⁶ Srivastava et al did a case-control study on 60 patients and reported that

65% of patients with wound dehiscence had postoperative cough as a prominent symptom in the preceding days.¹⁷

In our study, 98.2% patients had post-operative wound infection which is statistically significant ($p < 0.001$). Frank infection accompanying or preceding wound dehiscence was described by Del Junco *et al.*¹⁸ It is hard to escape the conclusion that a causal relationship exists. Durand *et al* found that SSI occurred in 15–25% of patients with wound dehiscence vs. only 5–7% without dehiscence.¹⁹ In our study, most of the patients with wound dehiscence had vertical midline incision 86.4%. Keill *et al* noticed a lower incidence of dehiscence in transverse incisions when compared to midline incisions.²⁰ In present study, most of the patients who had wound dehiscence was either clean-contaminated or dirty or contaminated 94.7%. Van Ramshorst *et al* showed that dirty wounds had a significantly higher rate of fascial dehiscence and burst abdomen compared to clean or clean-contaminated wounds.¹

CONCLUSION

Abdominal wound dehiscence (burst abdomen, fascial dehiscence) is a grave post-operative complication described as partial or complete disruption of an abdominal wound with or without protrusion and evisceration of abdominal contents. The incidence in the adult population is reported as 0.3-3.5%, and among the elderly it is as high as 10%. It carries mortality as high as 45%.² Although both VAMC and Rotterdam Risk index score can be used, the former having most of its variables in the postoperative period could not be used for preoperative preventive measures. Thus Rotterdam Risk Index Score can be used to predict preoperatively, the risk of wound dehiscence in patients undergoing laparotomy, so that the information can guide the clinician in targeted treatment interventions. Thus from our study we conclude that dehiscence is predictable, using Rotterdam Risk Index Score and thus preventable. Thus the economic burden, morbidity and mortality can be reduced. The probable drawback of this study is its small sample size. Etiology of wound dehiscence being multifactorial, higher sample size could have established clinical significance in some variables which could not be proved in our study due to small sample size.

Conflict of interest: No

REFERENCES

1. Van Ramshorst GH, Nieuwenhuizen J, Hop WC, Arends P, Boom J, Jeekel J, *et al.* Abdominal wound dehiscence. *World J Surg*. 2010; 34(1):20-7.
2. Carlson MA. Acute wound failure. *Surg Clin North Am*. 1997; 77:607-36.
3. Afzal S, Bashir MM. Determinants of wound dehiscence in abdominal surgery in public sector Hospital. *Ann K E Med Coll*. 2008; 14:110-5.
4. Kenig J, Richter P, Lasek A, Zbierska K, Zurawska S. Efficacy of risk scores for predicting abdominal wound dehiscence. *BMC Surg*. 2014; 14:65.
5. Agrawal V, Sharma N, Joshi MK, Minocha VR. Role of suture material and technique of closure in wound outcome following laparotomy for peritonitis. *Trop Gastroenterol*. 2009 Oct-Dec; 30(4):237-40.
6. Swift ME, Burns AL, Gray KL, DiPietro LA. Age-related alterations in the inflammatory response to dermal injury. *J Invest Dermatol*. 2001 Nov; 117(5):1027-35.
7. Webster C, Neumayer L, Smout R, Horn S, Daley J, Henderson W, *et al.* Prognostic models of abdominal wound dehiscence after laparotomy. *J Surg Res*. 2003 Feb; 109(2):130-7.
8. Halasz NA. Dehiscence of laparotomy wounds. *Am J Surg*. 1968 Aug; 116(2):210-4.
9. Ramneesh G, Sheerin S, Surinder S, Bir S. A prospective study of predictors for post laparotomy abdominal wound dehiscence. *J Clin Diagn Res*. 2014 Jan; 8(1):80- 3.
10. Riou JP, Cohen JR, Johnson H. Factors influencing wound dehiscence. *Am J Surg*. 1992 Mar; 163(3):324-30.
11. Sharma R, Lonare SB, Arora P, Al-Dwla H, Vadher A, Hersi M. Risk Factors and Predictive Accuracy of the Rotterdam Risk Index for Wound Dehiscence Following Abdominal Surgery. *Cureus*. 2025 Jan 1;17(1):e76769.
12. Abbas SM, Hill AG. Smoking, is a major risk factor for wound dehiscence after midline abdominal incision; case-control study. *ANZ J Surg*. 2009 Apr; 79(4):247-50.
13. Verma, S., Patil, S. M., & Bhardwaj, A. (2018). Study of risk factors in post-laparotomy wound dehiscence. *International Surgery Journal*, 5(7), 2513–2517.
14. Penninckx FM, Poelmans SV, Kerremans RP, Beckers JP. Abdominal Wound Dehiscence in Gastroenterological Surgery. *Ann Surg*. 1979 Mar; 189(3):345-52.
15. Parmar G, Gohil A, Hathila V. Burst abdomen: A grave postoperative complication. *Internet J Surg*. 2008; 20:1-8.
16. Al-Khayat, H., *et al.* "Risk factors for abdominal wound dehiscence: A case-control study." *International Journal of Surgery* 5.5 (2007): 365–368.
17. Srivastava, A., *et al.* "Abdominal wound dehiscence: risk factors and outcomes." *Wound Medicine* 13 (2016): 24–28.
18. Del Junco T, Lange HJ. Abdominal wound disruption with eventration: report of forty cases. *Am J Surg*. 1956 Aug; 92(2):271-86.

19. Durand M, Berthet B, Cugy M, et al. Surgical site infection and burst abdomen following emergency midline laparotomy: risk factors and outcomes. *JAMA Surg*. 2017;152(7):e171095.
20. Keill RH, Keitzer WF, Nichols WK, Henzel J, DeWeese MS. Abdominal wound dehiscence. *Arch Surg*. 1973 Apr; 106(4):573-7.