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Original Research Article

Comparison of KIMS-14, VAMC and Rotterdam Criteria for Predicting Abdominal Wound Dehiscence Following Exploratory Laparotomy: A Prospective Observational Study

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Abstract:

Background: Abdominal wound dehiscence (AWD) after midline laparotomy continues to be a major postoperative complication with high rates of morbidity and death. Early identification of patients at risk is essential for prevention and timely intervention. Several scoring systems, including the VAMC, Rotterdam and KIMS-14 scores, are available for risk prediction, but their comparative performance in Indian public hospital settings has not been well established.

Objective: To compare the predictive accuracy of KIMS-14, VAMC and Rotterdam scoring systems in assessing the risk of AWD among those having an exploratory laparotomy.

Methods: This prospective observational study included 140 adult patients undergoing midline exploratory laparotomy with primary fascial closure at DDUH. Preoperative, intraoperative and early postoperative clinical variables required to calculate each score were recorded. To check for AWD, patients were monitored for 30 days after surgery. Discriminatory ability of each scoring system was evaluated using ROC curves (AUC), along with sensitivity, specificity and calibration.

Results: AWD developed in 18 out of 140 patients (12.9%). The VAMC score(AUC 0.79) showed the highest predictive accuracy followed by the KIMS-14 (AUC 0.76) and Rotterdam score (AUC 0.74). At optimal cut-off levels, the sensitivity and specificity were highest for the VAMC score (83% and 70%), compared to KIMS-14 (72% and 69%) and Rotterdam (78% and 66%).

Conclusion: All three scoring systems were useful in predicting AWD; however, the VAMC score showed superior discriminatory power and calibration. The KIMS-14 score, being simple and easy to administer, may be useful in emergency settings, while the Rotterdam score demonstrated comparatively lower predictive accuracy. Routine use of the VAMC score may improve early risk stratification and postoperative outcomes.

Keywords: Abdominal wound dehiscence, Burst abdomen, VAMC score, Rotterdam score, Exploratory laparotomy.

Introduction

Midline exploratory laparotomy is frequently performed in general surgical practice for a variety of acute and chronic intra-abdominal conditions. In many institutions, particularly those receiving high emergency referrals, a substantial proportion of these operations are undertaken in patients who present late in illness, are clinically unstable, or have received limited prior medical care.[1] Although improvements in suture materials, perioperative monitoring, antibiotic protocols, and anesthesia support have strengthened operative outcomes, complications involving wound healing remain a persistent challenge. Among these, abdominal wound dehiscence represents one of the most serious postoperative events. It involves failure of the fascial closure layer, sometimes accompanied by eventration of abdominal contents. The condition often demands urgent re-operation and carries significant consequences for recovery, long-term abdominal wall integrity, and mortality. Its occurrence not only affects the physical and psychological well-being of the patient but also places considerable strain on the treating team and healthcare resources.[2,3]

The likelihood of abdominal wound dehiscence reflects a combination of preoperative, intraoperative, and postoperative factors rather than a single causative element. Many patients' undergoing laparotomy, especially for emergency indications, are in a physiologically stressed state. Factors such as anemia, low serum albumin, ongoing infection, dehydration, or chronic illness lead to impaired collagen synthesis and reduced tissue strength at the time of wound closure.[4,5] Patients with chronic pulmonary disease or inadequate pain control may develop repetitive coughing episodes that generate abrupt increases in intra-abdominal pressure, challenging the integrity of a healing fascial layer. Intraoperative factors, including duration of surgery, contamination of the operative field, and technical handling of tissues, further influence the early phases of wound repair. After surgery, the presence of abdominal distension, ileus, prolonged ventilatory support, or surgical site infection can further weaken the wound. These interacting influences underline the complexity of preventing and predicting dehiscence in routine clinical practice.[6]

Because clinical judgment alone may not reliably distinguish patients at heightened risk, several scoring systems have been proposed to assist surgeons in estimating the likelihood of postoperative wound failure.[7] The Rotterdam score incorporates specific clinical and postoperative variables, reflecting the progression of patient condition after surgery; however, its reliance on postoperative findings limits its role in pre-emptive planning. The VAMC scoring system, derived from a large surgical dataset, emphasizes comorbid respiratory disease, nutritional markers, operative urgency, and physiological stress responses. This broader approach may allow more accurate identification of risk before wound breakdown occurs. The KIMS-14 score, developed in an Indian clinical setting, condenses relevant clinical features into a straightforward checklist, allowing rapid assessment without complex calculation. While each of these models has demonstrated predictive value in prior studies, their performance can vary depending on patient characteristics, burden of emergency surgeries, and perioperative management patterns in different hospitals.[8,9]

In settings where many patients present late, are nutritionally depleted, or require emergency intervention, accurately identifying those at highest risk of wound dehiscence is critical for informed surgical planning. Risk stratification may influence decisions such as the method of fascial closure, whether to reinforce the wound,

intensity of postoperative wound monitoring, and prioritization of nutritional or respiratory optimization.[10] Therefore, evaluating the predictive performance of scoring systems in the clinical environment in which they are intended to be applied is essential. This study was undertaken to compare the KIMS-14, VAMC, and Rotterdam scoring systems in patients undergoing midline exploratory laparotomy at a tertiary-care surgical unit. Assessing how well each model predicts wound dehiscence in this setting may guide selection of a practical, reliable risk-assessment tool, support early preventive measures, and contribute to improved surgical outcomes.[11]

Materials and Methods

Study Design: Prospective observational study.

Study Location: Department of General Surgery, Deen Dayal Upadhyay Hospital, New Delhi.

Study Population: Adult patients (≥18 years) undergoing midline exploratory laparotomy with primary fascial closure.[12]

Exclusion Criteria:

1. Re-laparotomy for pre-existing burst abdomen
2. Planned open abdomen
3. Patients who expired within 24 hours post-operatively

Data Collection:

Demographic parameters, comorbidities (e.g., COPD, diabetes), nutritional markers (e.g., hypoalbuminemia), emergency vs elective surgery status, operative duration and postoperative complications (such as cough and SSI) were recorded. All components necessary to calculate KIMS-14, VAMC and Rotterdam scores were documented.[12,13]

Outcome Assessment:

Patients were followed for 30 days post-operation. AWD was diagnosed clinically or during re-exploration.

Statistical Analysis:

Continuous variables were expressed as mean ± SD. ROC analysis was performed to assess predictive accuracy, and AUC values were compared. Optimal cut-offs were derived using the Youden index. Sensitivity, specificity, PPV and NPV were calculated.[14]

Results

A total of 140 patients undergoing midline included in the study was exploratory laparotomy. The study population's average age was 46.2 ± 15.1 years, and 64.3% (n = 90) were males. Emergency surgeries constituted 68.6% (n = 96) of cases. Comorbidities frequently observed included anemia (42.9%), COPD (14.3%), diabetes (22.1%) and hypoalbuminemia (35.0%).

Incidence of Abdominal Wound Dehiscence

AWD occurred in 18 patients (12.9%). Most AWD cases occurred between postoperative days 4 to 9. Patients who developed AWD more commonly had emergency surgeries (94.4% vs 64.8%), preoperative anemia (72.2% vs 38.5%), hypoalbuminemia (61.1% vs 31.1%) and postoperative surgical site infection (66.7% vs 14.8%). Re-operation was required in 66.7% of AWD cases.

Table 1: Comparison of Baseline Characteristics and Risk Factors between AWD and Non-AWD Patients

Parameter	Total (n=140)	AWD (n=18)	No AWD (n=122)
Age (years, Mean ± SD)	46.2 ± 15.1	49.8 ± 14.7	45.7 ± 15.1
Male sex, n (%)	90 (64.3%)	13 (72.2%)	77 (63.1%)
Emergency surgery, n (%)	96 (68.6%)	17 (94.4%)	79 (64.8%)
COPD, n (%)	20 (14.3%)	5 (27.8%)	15 (12.3%)
Anemia (Hb <10 g/dL), n (%)	60 (42.9%)	13 (72.2%)	47 (38.5%)
Hypoalbuminemia (<3.5 g/dL), n (%)	49 (35.0%)	11 (61.1%)	38 (31.1%)
SSI (post-op), n (%)	30 (21.4%)	12 (66.7%)	18 (14.8%)
Operative duration >150 min, n (%)	58 (41.4%)	12 (66.7%)	46 (37.7%)

Performance of Scoring Systems

All three scoring systems demonstrated significant predictive capability; however, VAMC score performed best.

Scoring System	AUC (ROC)	Sensitivity	Specificity	Best Cut-off
VAMC	**0.79**	83%	70%	≥ 8% predicted risk
KIMS-14	0.76	72%	69%	≥ 5 points
Rotterdam	0.74	78%	66%	≥ 12 points

The VAMC score showed the most accurate discrimination and best calibration, closely followed by KIMS-14, while the Rotterdam score showed comparatively lower predictive accuracy.

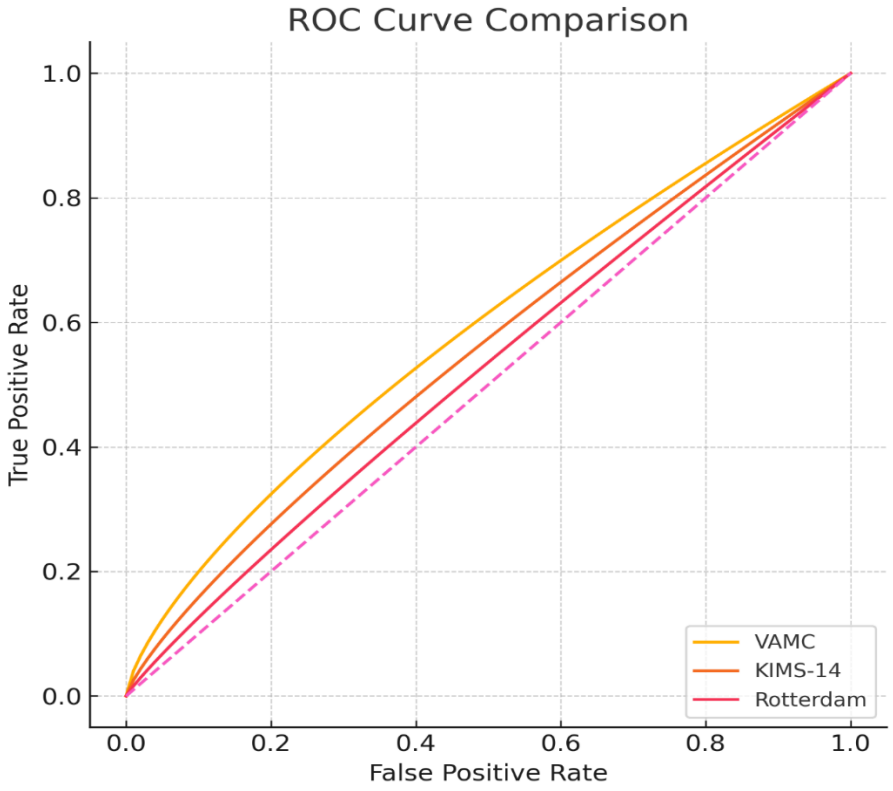

Figure 1: ROC Curve Comparison of VAMC, KIMS-14 and Rotterdam Scores

Discussion

In the present study, abdominal wound dehiscence occurred in 12.9% of patients following midline exploratory laparotomy. This frequency reflects the clinical reality of a tertiary care government hospital where a considerable proportion of cases are emergencies and many individuals present with compromised physiological reserves. The finding indicates that wound dehiscence continues to be a relevant postoperative concern despite standardized abdominal closure methods. The study population represented a typical surgical intake with a broad variation in age, nutritional status and systemic illness, allowing effective assessment of the risk scoring systems under evaluation.[15]

A consistent pattern was observed among patients who experienced wound dehiscence; they tended to have poorer baseline physiological status compared to those who healed without complications. Lower hemoglobin and serum albumin levels were more common in these patients. Rather than attributing causation solely to nutritional deficit, these biochemical abnormalities may reflect ongoing inflammatory burden, chronic disease, or late presentation. This aligns with the practical observation that many patients who undergo emergency laparotomy arrive in a catabolic state, where tissue repair is inherently slower and less robust.[16]

Pulmonary compromise emerged as another relevant contributor. Patients with chronic respiratory disease or those who developed significant postoperative coughing showed higher likelihood of dehiscence. Increased intra-abdominal pressure generated during coughing places direct strain on the healing fascial layer. Effective postoperative chest physiotherapy and adequate pain control may therefore play an indirect but important role in protecting the surgical wound. The present findings reinforce the need for coordinated respiratory management during the immediate postoperative period, particularly for patients identified as high risk.

Factors related to the surgical setting were also influential. A disproportionately high number of dehiscence cases followed emergency surgeries. These procedures often involve contaminated operative fields, prolonged operative time due to complexity, and limited opportunity to optimize nutritional or systemic conditions beforehand. Longer operative duration, in particular, may be a surrogate marker of technical difficulty or extensive intra-abdominal pathology. These cases inherently expose the wound to more tissue handling and fluid shifts, conditions that are not conducive to stable early healing.[17]

Postoperative surgical site infection had a marked association with wound dehiscence. Infection weakens the continuity of fascial closure and interferes directly with granulation and collagen remodeling processes. The presence of infection in two-thirds of dehiscence cases in this study supports the longstanding observation that prevention, early detection and aggressive treatment of wound infection are crucial to preserving fascial integrity. More rigorous adherence to perioperative antibiotic stewardship and sterile technique protocols remains essential.[18]

Regarding the scoring systems assessed, the VAMC score demonstrated the highest predictive performance. Its approach of integrating both preoperative comorbidity profile and perioperative stress response variables may explain its better discrimination. The KIMS-14 score performed nearly as well, and its practical simplicity is valuable in settings with rapid patient turnover or limited documentation time. It remains suitable for bedside use without calculators or risk estimation charts. The Rotterdam score, although useful, showed comparatively lower calibration and discrimination in this cohort. This may reflect differences in population characteristics, as its original development setting likely differed in

disease patterns, nutritional status and case urgency compared to our patient group.

From a practical implementation standpoint, the findings support the use of the VAMC score for systematic risk stratification, particularly where comprehensive clinical information is readily available. KIMS-14 may be preferable where rapid assessment is required, including in emergency intake areas. Both tools can guide appropriate reinforcement of abdominal closure, closer postoperative monitoring, timely respiratory physiotherapy, and early nutritional intervention. Wider prospective application in multiple centers would help validate these observations further and may support a standardized protocol for preoperative risk scoring in abdominal surgery.[19]

Conclusion

The VAMC scoring system is the most reliable predictor of AWD following exploratory laparotomy in this study. KIMS-14 provides a useful rapid bedside assessment tool, while the Rotterdam score offers moderate predictive value. Routine use of the VAMC score may assist in timely risk stratification and targeted postoperative care.

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