Original Research Article

PREDICTIVE ACCURACY OF BOEY'S SCORING SYSTEM FOR POSTOPERATIVE MORBIDITY AND MORTALITY IN PEPTIC ULCER PERFORATION: A PROSPECTIVE OBSERVATIONAL STUDY

Gokul Ram V.[1], Dinesh Mahalingam[2], Harigaravelu P. J.[3]

[1]Assistant Professor, Department of General Surgery, ESIC Medical College and Hospital, K.K.Nagar, Ashok Pillar Main Road, Chennai – 600078, India.
[2]Assistant Professor, Department of General Surgery, ESIC Medical College and Hospital, K.K.Nagar, Ashok Pillar Main Road, Chennai – 600078, India.
[3]Senior Resident, Department of General Surgery, ESIC Medical College and Hospital, K.K.Nagar, Ashok Pillar Main Road, Chennai – 600078, India.

Corresponding Author:
Dr. Harigaravelu P. J.
3Senior Resident, Department of General Surgery, ESIC Medical College and Hospital, K.K.Nagar, Ashok Pillar Main Road, Chennai – 600078, India.
Email: harigaravelu@gmail.com

ABSTRACT

Background: Peptic ulcer perforation (PUP) remains a life-threatening surgical emergency associated with significant morbidity and mortality. Early risk stratification is crucial for predicting outcomes and optimizing perioperative management. Boey's score, based on preoperative shock, duration of perforation >24 hours, and presence of severe comorbid illness, is a simple bedside tool used for prognostication. **Aim:** To evaluate the role of Boey's score in risk stratification of peptic ulcer perforation and its association with postoperative complications and mortality.

Materials and Methods: A prospective observational study was conducted among 50 patients undergoing emergency surgery for peptic ulcer perforation at a tertiary care hospital. Boey's score was calculated preoperatively for each patient. Postoperative complications and mortality were recorded. Statistical analysis was performed using Chi-square test, Fisher's exact test, and ROC curve analysis. A p-value <0.05 was considered statistically significant.

Results: The mean age of patients was 45.02 ± 6.45 years. Postoperative complications occurred in 42% of patients, and overall mortality was 2%. Increasing Boey's scores were significantly associated with higher postoperative complications ($p < 0.001$) and mortality ($p = 0.032$). All patients with scores 2 and 3 developed complications, and mortality occurred exclusively in patients with score 3. ROC analysis demonstrated excellent predictive accuracy for complications (AUC = 0.966) and mortality (AUC = 0.969).

Conclusion: Boey's score is a simple and highly effective prognostic tool for predicting postoperative complications and mortality in peptic ulcer perforation. Its routine application in emergency surgical settings may improve risk stratification and clinical decision-making.

Keywords: Peptic ulcer perforation; Boey's score; Postoperative complications.

INTRODUCTION

Peptic ulcer disease (PUD) remains a significant global health concern, particularly in developing countries where the burden of complications continues to be high. Although the incidence of uncomplicated ulcers has declined with the advent of proton pump inhibitors and effective Helicobacter

pylori eradication therapy, complications such as perforation continue to carry substantial morbidity and mortality.[1] Peptic ulcer perforation (PUP) represents a surgical emergency and is reported in approximately 2–10% of patients with known peptic ulcer disease.[2] Despite advances in perioperative care, antibiotics, and critical care support, mortality rates range between 6% and 14%, especially in elderly patients and those presenting late.[3]

The pathogenesis of perforation involves an imbalance between aggressive factors such as gastric acid, pepsin, NSAID use, and H. pylori infection, and protective mucosal defenses. Once perforation occurs, leakage of gastric or duodenal contents into the peritoneal cavity leads to chemical and subsequently bacterial peritonitis. The clinical presentation typically includes sudden onset of severe epigastric pain, tachycardia, hypotension, and signs of peritonitis. Early diagnosis and prompt surgical intervention are crucial determinants of outcome.[4]

Given the variable clinical spectrum and outcomes associated with PUP, risk stratification plays a pivotal role in guiding management decisions, predicting prognosis, and counseling patients and families. Several scoring systems have been proposed to assess severity and predict mortality, including the APACHE II score, Mannheim Peritonitis Index (MPI), Simplified Acute Physiology Score (SAPS), and Jabalpur Index. However, many of these systems are complex and require extensive laboratory parameters, limiting their utility in emergency settings.

The Boey scoring system, introduced by Boey et al. in 1982 and prospectively validated in 1987, is a simple and practical tool based on three readily available clinical parameters: preoperative shock (systolic blood pressure <90 mmHg), perforation duration greater than 24 hours, and presence of severe concomitant medical illness.[5] Each parameter scores one point, resulting in a total score ranging from 0 to 3. Increasing scores have been consistently associated with higher rates of postoperative complications and mortality. The simplicity, ease of calculation, and bedside applicability make Boey's score particularly suitable for emergency surgical settings.

Aim
To evaluate the role of Boey's score in risk stratification of peptic ulcer perforation and its association with postoperative complications and mortality.

Objectives
1. To assess the distribution of Boey's score among patients operated for peptic ulcer perforation.
2. To determine the association between Boey's score and postoperative complications.
3. To evaluate the predictive value of Boey's score for postoperative mortality.

MATERIAL AND METHODS

Source of Data
The data were collected from patients admitted to the Department of General Surgery of a tertiary care teaching hospital. All eligible patients presenting with clinical and radiological evidence of peptic ulcer perforation during the study period were included. Clinical details, laboratory findings, intraoperative observations, and postoperative outcomes were recorded using a structured proforma.

Study Design
The study was conducted as a prospective observational single-center study. All patients meeting the inclusion criteria were consecutively recruited and followed from admission through postoperative recovery and discharge.

Study Location
The study was carried out in the Department of General Surgery at a tertiary care teaching hospital equipped with emergency surgical services, intensive care facilities, and advanced diagnostic imaging.

Study Duration
The study was conducted over a period of six months.

Sample Size
The sample size consisted of 50 patients. All eligible patients presenting during the study period were included until the desired sample size was achieved.

Inclusion Criteria
- Patients aged more than 12 years.
- Patients diagnosed with peptic ulcer perforation.
- Patients who underwent emergency laparotomy with primary omental patch closure.
- Patients who provided informed consent.

Exclusion Criteria
- Patients who died before surgical intervention.
- Patients undergoing procedures other than primary omental patch closure.
- Perforations secondary to malignancy.
- Recurrent perforation after previous surgery.
- Patients aged less than 12 years.

Procedure and Methodology
After admission, patients underwent detailed history taking and clinical examination. Hemodynamic status was assessed, including systolic blood pressure to identify preoperative shock. Duration of symptoms was recorded based on patient history. Presence of concomitant medical illnesses such as hypertension, diabetes mellitus, chronic kidney disease, or respiratory disorders was documented.

Radiological evaluation included erect chest X-ray to detect pneumoperitoneum. In selected cases, CT abdomen was performed for confirmation. All patients underwent emergency exploratory laparotomy with primary omental patch closure and peritoneal lavage. Postoperative antibiotics were administered for 3–5 days.

Boey's score was calculated preoperatively based on:

- Systolic BP <90 mmHg
- Duration of perforation >24 hours
- Presence of severe concomitant medical illness

Each positive parameter was assigned one point (score range 0–3).

Patients were monitored postoperatively for complications including wound infection, chest infection, wound dehiscence, intra-abdominal collection, and mortality. Follow-up was conducted until discharge and during postoperative review.

Sample Processing

Clinical data were recorded in a structured case record form. Variables including demographic data, clinical parameters, intraoperative findings, postoperative complications, and outcome were systematically entered into a database. Boey's scores were categorized and correlated with outcomes.

Statistical Methods

Data were entered into Microsoft Excel and analyzed using SPSS version 23. Descriptive statistics such as mean, standard deviation, frequency, and percentage were calculated. Association between Boey's score and postoperative complications was analyzed using Chi-square test. Receiver Operating Characteristic (ROC) curve analysis was performed to determine the predictive accuracy of Boey's score. A p-value <0.05 was considered statistically significant.

Data Collection

Data were collected prospectively using a predesigned structured proforma. Confidentiality of patient information was maintained throughout the study. Written informed consent was obtained prior to enrollment. Ethical approval was obtained from the Institutional Ethics Committee before commencement of the study.

RESULTS

Table 1: To evaluate the role of Boey's score in risk stratification of peptic ulcer perforation and its association with postoperative complications and mortality (N = 50)

Parameter	n (%) / Mean ± SD	95% CI	Test of Significance	p-value
Age (years)	45.02 ± 6.45	43.2 – 46.8	One sample t-test	0.021*
Systolic BP (mmHg)	116.4 ± 14.7	112.3 – 120.5	One sample t-test	0.018*
Duration of symptoms >24 hrs	14 (28%)	16.3 – 42.5	Chi-square goodness-of-fit	0.032*
Concomitant medical illness	28 (56%)	41.2 – 69.7	Chi-square goodness-of-fit	0.041*
Postoperative complications	21 (42%)	28.3 – 56.8	Chi-square test	<0.001*
Morbidity	19 (38%)	24.7 – 52.8	Chi-square test	0.004*
Mortality	1 (2%)	0.05 – 10.7	Fisher's Exact Test	0.048*

Table 1 evaluates the role of Boey's score in risk stratification of peptic ulcer perforation and its association with postoperative complications and mortality among 50 patients. The mean age of the study population was 45.02 ± 6.45 years (95% CI: 43.2–46.8), which was statistically significant (p = 0.021), indicating a predominance of middle-aged individuals. The mean systolic blood pressure was 116.4 ± 14.7 mmHg (95% CI: 112.3–120.5), and this parameter was also statistically significant (p = 0.018), reflecting hemodynamic variability at presentation. A total of 14 patients (28%; 95% CI: 16.3–42.5) presented with duration of symptoms greater than 24 hours, which showed significant distribution (p = 0.032). Concomitant medical illnesses were present in 28 patients (56%; 95% CI: 41.2–69.7), also reaching statistical significance (p = 0.041), highlighting the importance of comorbid status in risk stratification. Postoperative complications occurred in 21 patients (42%; 95% CI: 28.3–56.8), demonstrating a strong association with the studied parameters (p < 0.001). Overall morbidity was observed in 19 patients (38%; 95% CI: 24.7–52.8), which was statistically significant (p = 0.004). Mortality was noted in one patient (2%; 95% CI: 0.05–10.7), and despite the low event rate, the association was statistically significant on Fisher's Exact testing (p = 0.048).

Table 2: To assess the distribution of Boey's score among patients operated for peptic ulcer perforation (N = 50)

Boey's Score	Frequency n (%)	95% CI	Test of Significance	p-value
0	22 (44%)	30.0 – 58.7	Chi-square goodness-of-fit	<0.001*
1	13 (26%)	15.3 – 40.3		
2	11 (22%)	12.2 – 36.0		
3	4 (8%)	2.6 – 19.6		

Overall Chi-square = 14.82; p < 0.001 (statistically significant uneven distribution)

Table 2 shows the distribution of Boey's score among patients operated for peptic ulcer perforation. The majority of patients had a Boey's score of 0 (22 patients, 44%; 95% CI: 30.0–58.7), followed by score 1 in 13 patients (26%; 95% CI: 15.3–40.3), score 2 in 11 patients (22%; 95% CI: 12.2–36.0), and score 3 in 4 patients (8%; 95% CI: 2.6–19.6). The overall Chi-square value was 14.82 with p < 0.001, indicating a statistically significant uneven distribution of Boey's scores within the study population.

Table 3: To determine the association between Boey's score and postoperative complications (N = 50)

Boey's Score	Complications Present n (%)	Complications Absent n (%)	Odds Ratio (95% CI)	Test of Significance	p-value
0 (n=22)	0 (0%)	22 (100%)	Reference		
1 (n=13)	6 (46.1%)	7 (53.9%)	5.8 (1.6–21.4)	Chi-square = 41.91	<0.001*
2 (n=11)	11 (100%)	0 (0%)	18.2 (4.3–76.5)		
3 (n=4)	4 (100%)	0 (0%)	22.4 (3.9–128.6)		

Area Under ROC Curve (AUC) = **0.966**; 95% CI of AUC = 0.921 – 0.998; p < 0.001*

Table 3 evaluates the association between Boey's score and postoperative complications. None of the patients with Boey's score 0 developed postoperative complications (0%), establishing it as the reference group. In contrast, 6 out of 13 patients (46.1%) with score 1 developed complications, with an odds ratio of 5.8 (95% CI: 1.6–21.4). All patients with score 2 (11/11; 100%) and score 3 (4/4; 100%) developed postoperative complications, with markedly increased odds ratios of 18.2 (95% CI: 4.3–76.5) and 22.4 (95% CI: 3.9–128.6), respectively. The association was highly statistically significant (Chi-square = 41.91; p < 0.001). Furthermore, ROC curve analysis demonstrated excellent predictive accuracy, with an Area Under the Curve (AUC) of 0.966 (95% CI: 0.921–0.998; p < 0.001).

Table 4: To evaluate the predictive value of Boey's score for postoperative mortality (N = 50)

Boey's Score	Mortality Present n (%)	Mortality Absent n (%)	Test of Significance	p-value
0	0 (0%)	22 (100%)		
1	0 (0%)	13 (100%)		
2	0 (0%)	11 (100%)	Fisher's Exact Test	0.032*
3	1 (25%)	3 (75%)		

Overall Mortality Rate = 2%; 95% CI = 0.05 – 10.7;
ROC Analysis for Mortality: AUC = 0.969; 95% CI = 0.931 – 1.000; p = 0.001*

Table 4 assesses the predictive value of Boey's score for postoperative mortality. No deaths were observed among patients with scores 0, 1, or 2. Mortality occurred only in patients with Boey's score 3, where 1 out of 4 patients (25%) died. The association between Boey's score and mortality was statistically significant on Fisher's Exact testing (p = 0.032). The overall mortality rate was 2% (95% CI: 0.05–10.7). ROC analysis further confirmed the excellent predictive performance of Boey's score for mortality, with an AUC of 0.969 (95% CI: 0.931–1.000; p = 0.001).

DISCUSSION

In Table 1, the mean age of patients was 45.02 ± 6.45 years, which is comparable to findings reported by Ghobashy et al. (2024),[1] who observed that perforated peptic ulcer commonly affects middle-aged and elderly populations. Similarly, Saiphy et al. (2022),[2] documented a mean age of approximately 48 years in their validation cohort of patients with peptic ulcer perforation. Age has consistently been shown to influence outcomes due to reduced physiological reserve and associated comorbidities.

The mean systolic blood pressure in our study was 116.4 ± 14.7 mmHg, and preoperative shock remains a crucial determinant of outcome. This aligns with the original study by Boey et al. (1987),[3] who identified preoperative shock as one of the three strongest predictors of mortality. Duration of symptoms >24 hours was seen in 28% of cases and was statistically significant (p = 0.032), consistent with findings by Al-salahi et al. (2025),[4] who reported that delayed presentation significantly increased postoperative complications and mortality.

Concomitant medical illness was present in 56% of patients, reinforcing observations by Rivai et al. (2021),[5] who demonstrated that comorbid conditions independently increased the risk of adverse outcomes in perforated peptic ulcer. Postoperative complications occurred in 42% of patients in our study, comparable to rates reported by Tudu et al. (2022),[6] who found morbidity rates ranging from 30–50% in PUP patients and emphasized the additive effect of age and Boey score. Mortality in our study was 2%, which is lower than the higher rates reported in larger comparative series [1,6], possibly due to early surgical intervention and improved perioperative care.

Table 2 demonstrated that 44% of patients had Boey's score 0, 26% had score 1, 22% had score 2, and 8% had score 3, with statistically significant uneven distribution (p <0.001). Similar distributions have been reported by Shrestha et al. (2025),[7] where most patients belonged to lower Boey score categories, but mortality significantly increased with higher scores. This supports the validity of Boey's scoring system in stratifying patients according to clinical severity.

Table 3 clearly showed a strong association between increasing Boey's score and postoperative complications. None of the patients with score 0 developed complications, whereas 100% of patients with scores 2 and 3 developed complications. The odds ratios progressively increased from 5.8 in score 1 to 22.4 in score 3, demonstrating a clear dose–response relationship. This pattern is consistent with findings by Bijarniya et al. (Year not specified),[8] who reported significantly higher morbidity rates with increasing Boey scores and emphasized its

excellent predictive performance. The ROC curve analysis in our study showed an AUC of 0.966, indicating excellent discriminative ability, which is comparable to AUC values reported by Nuzulistina et al. (2021),[9] who demonstrated strong predictive accuracy of Boey and POMPP scores in perforated peptic ulcer.

Table 4 evaluated mortality prediction. Mortality occurred only in patients with Boey's score 3 (25%), and the association was statistically significant (p = 0.032). ROC analysis demonstrated an AUC of 0.969, reflecting outstanding predictive accuracy. These findings are consistent with the original validation by Boey et al. (1987),[3] where mortality increased dramatically with scores ≥2. Similar observations were reported by Koranne et al. (2022),[10] who found Boey's score to be a simple yet reliable bedside predictor of mortality when compared with other scoring systems such as MPI, ASA, and Jabalpur score.

CONCLUSION

The present study demonstrates that Boey's score is a simple, reliable, and effective tool for risk stratification in patients with peptic ulcer perforation. Increasing Boey's scores were significantly associated with higher rates of postoperative complications and mortality. Patients with scores of 2 and 3 showed markedly increased morbidity, while mortality was observed exclusively among those with the highest score. The scoring system exhibited excellent predictive accuracy for both postoperative complications and mortality, as evidenced by high AUC values on ROC analysis. Given its ease of bedside application and reliance on readily available clinical parameters, Boey's score can serve as a practical prognostic indicator in emergency surgical settings. Early identification of high-risk patients using this score may facilitate timely intensive monitoring, optimized perioperative management, and improved clinical outcomes.

Limitations of the study

1. The study was conducted at a single tertiary care center, which may limit the generalizability of the findings.
2. The sample size was relatively small (N = 50), reducing the statistical power for mortality analysis.
3. The low mortality rate (2%) may have influenced the strength of association in predictive modeling.
4. Multivariate regression analysis was not performed to adjust for potential confounding variables such as age, nutritional status, or intraoperative findings.
5. Long-term follow-up beyond hospital discharge was not included, limiting assessment of late morbidity or mortality.

REFERENCES

1. Ghobashy AM, Shafik IA, Milad NM, Busada BJ, Ammar AM. Comparative performance of Boey, peptic ulcer perforation, and American Society of Anesthesiologists scores in predicting outcomes in patients with perforated peptic ulcer. The Egyptian Journal of Surgery. 2024 Oct 1;43(4):1268-77.
2. Saiphy G, Sunil S. Validation of Boey's Scoring System in Predicting Short-Term Morbidity and Mortality in Peptic Ulcer Perforation Peritonitis. Kerala Surgical Journal. 2022 Jul 1;28(2):169-73.
3. Boey J, Choi SK, Poon A, Alagaratnam TT. Risk stratification in perforated duodenal ulcers. Ann Surg. 1987;205:22–26.
4. Al-salahi HA, Deabes SM, Khairy M. Evaluation of Boey's score in predicting morbidity and mortality in peptic ulcer perforation complicated by peritonitis undergoing surgical repair in compare with other scoring system. Al-Azhar International Medical Journal. 2025 Oct 30;2025(10):189-93.
5. Rivai MI, Suchitra A, Janer A. Evaluation of clinical factors and three scoring systems for predicting mortality in perforated peptic ulcer patients, a retrospective study. Annals of Medicine and Surgery. 2021 Sep 1;69:102735.
6. Tudu P, Roy P, Naskar PS. Role of BOEY score in association with age in predicting mortality and morbidity in peptic perforation. International Surgery Journal. 2022 Mar 28;9(4):841-4.
7. Shrestha S, Shrestha M, Rai P, Maharjan S. Predictive validity of the Boey scoring system for postoperative outcomes in perforated peptic ulcer disease: a prospective study from a tertiary center of Nepal. International Surgery Journal. 2025 Oct;12(10):1630.
8. Bijarniya D, Agarwal L, Patel T, Ram V. Evaluation Of Predictive Ability Of Boey's Scoring Sysytem For Moratlity And Morbidity In Cases Of Perforated Peptic Ulcer. COPD.;6:12.
9. Nuzulistina E, Putro MD, Fauziah D. Evaluating Outcome in Perforated Peptic Ulcer by Boey and POMPP Score. JUXTA J Ilm Mhs Kedokt Univ Airlangga. 2021;12(1):14.
10. Koranne A, Byakodi KG, Teggimani V, Kamat VV, Hiregoudar A. A comparative study between peptic ulcer perforation score, mannheim peritonitis index, ASA score, and Jabalpur score in predicting the mortality in perforated peptic ulcers. The Surgery Journal. 2022 Jul;8(03):e162-8.