Original Research Article

A Retrospective and Prospective Study(4-Years) of Perforated Peptic Ulcer Cases with Reference to Boey Score and Final Outcome at Rural Setup

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Abstract

Background: Perforated peptic ulcer remains a common and life-threatening surgical emergency, particularly in rural healthcare settings where delayed presentation and limited resources contribute to poor outcomes. The Boey score is a simple clinical scoring system used to predict mortality in patients with perforated peptic ulcer. This study was undertaken to evaluate the correlation between Boey score and final outcome in a rural tertiary care hospital. **Objectives:** To assess the prognostic value of the Boey score in predicting outcomes of perforated peptic ulcer patients and to evaluate the association between clinical profile, risk factors, and postoperative outcomes. **Materials and Methods:** This four-year retrospective and prospective observational study included 50 patients diagnosed with perforated peptic ulcer and managed surgically at a rural tertiary care hospital. Clinical parameters, laboratory findings, and operative details were recorded. The Boey score was calculated preoperatively for each patient. Outcomes including mortality, morbidity, and duration of hospital stay were analyzed. Statistical analysis was performed using appropriate tests, and a p-value of less than 0.05 was considered statistically significant. **Results:** The overall mortality rate was 24%. Mortality increased progressively with higher Boey scores, ranging from 0% in patients with score 0 to 75% in patients with score 3. A strong positive correlation was observed between Boey score and mortality ($r = 0.72$, $p < 0.001$). Shock on admission, hypotension, and delayed presentation beyond 24 hours were identified as significant predictors of mortality. Higher Boey scores were also associated with prolonged hospital stay and increased postoperative complications. **Conclusion:** The Boey score is a simple, reliable, and effective prognostic tool for risk stratification in patients with perforated peptic ulcer. Its routine use in rural healthcare settings can facilitate early identification of high-risk patients, guide clinical decision-making, and improve patient outcomes through timely intervention and optimized perioperative care.

Keywords: Perforated Peptic Ulcer. Boey Score. Surgical Outcome.

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INTRODUCTION

Peptic ulcer disease (PUD) remains an important global health problem and continues to be a major cause of morbidity and mortality despite significant advances in medical management. The introduction of proton pump inhibitors and Helicobacter pylori eradication therapy has markedly reduced the incidence of uncomplicated peptic ulcers; however, serious complications such as bleeding and perforation continue to occur frequently. Among these, perforated peptic ulcer (PPU) is one of the most life-threatening surgical emergencies,

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associated with high rates of postoperative morbidity and mortality. It accounts for approximately 2-10% of all patients with peptic ulcer disease and contributes significantly to emergency laparotomy workload worldwide.[1]

Perforation occurs when an ulcer erodes through the full thickness of the gastric or duodenal wall, leading to spillage of gastric contents into the peritoneal cavity and resulting in chemical and bacterial peritonitis. This condition rapidly progresses to systemic inflammatory response, sepsis, and multiorgan dysfunction if not treated promptly. Mortality rates reported in literature range from 6% to 30%, depending on patient age, presence of comorbid illness, physiological status at presentation, and delay in surgical intervention.[2] Early diagnosis and timely operative management are therefore critical in improving outcomes.

In rural healthcare settings, the burden of perforated peptic ulcer is often more severe compared to urban centers. Delayed presentation due to poor access to healthcare facilities, lack of awareness, transportation difficulties, financial constraints, and reliance on traditional remedies contribute significantly to disease progression and poor outcomes. Furthermore, limited availability of advanced diagnostic modalities and intensive care facilities in rural hospitals further complicates management. These challenges emphasize the importance of early risk stratification to identify high-risk patients who may benefit from aggressive resuscitation and intensive postoperative monitoring.

Several prognostic scoring systems have been developed to predict outcomes in perforated peptic ulcer patients. Among these, the Boey score is widely used because of its simplicity and reliability. It is based on three easily measurable clinical parameters: presence of major medical illness, preoperative shock, and perforation duration greater than 24 hours. The Boey score has been shown to correlate strongly with postoperative morbidity and mortality and can be calculated rapidly at the bedside.[3] Its applicability in rural and resource-limited settings is particularly valuable, as it does not require complex investigations.

Although many studies have evaluated the prognostic value of the Boey score in tertiary care and urban hospitals, limited data are available from rural healthcare setups, where patient demographics, disease severity, and healthcare access differ considerably. Therefore, evaluating the role of the Boey score in predicting outcomes in rural populations is essential to improve clinical decision-making, optimize resource utilization, and enhance patient survival.[4]

AIM

To evaluate the correlation between Boey score and final outcome in patients with perforated peptic ulcer in a rural healthcare setup.

OBJECTIVES

1. To study the clinical profile and outcomes of patients presenting with perforated peptic ulcer.
2. To assess the prognostic significance of individual Boey score components in predicting mortality and morbidity.
3. To correlate the Boey score with final patient outcome in a rural tertiary care hospital.

MATERIAL AND METHODOLOGY

Source of Data

The study population consisted of patients diagnosed with perforated peptic ulcer admitted to the Department of General Surgery of a rural tertiary care teaching hospital. Retrospective data were collected from hospital medical records, case files, and operation theatre registers. Prospective data were obtained directly from patients admitted during the study period using a structured data collection proforma.

Study Design

This study was conducted as a combined retrospective and prospective observational study. The retrospective arm included previously treated cases, while the prospective arm involved real-time enrollment and follow-up of patients. The observational design was selected to evaluate outcomes and prognostic factors under routine clinical practice without altering standard management protocols.

Study Location

The study was carried out in the Department of General Surgery at a rural tertiary care teaching hospital catering predominantly to rural and semi-urban populations.

Study Duration

The total duration of the study was four years, comprising two years of retrospective data collection and two years of prospective patient enrollment and follow-up.

Sample Size

A total of 50 patients diagnosed with perforated peptic ulcer were included in the study. The sample size was selected based on hospital admission trends and feasibility during the study period.

Inclusion Criteria

- Patients aged 15 years and above.
- Patients diagnosed clinically and radiologically with perforated peptic ulcer.
- Patients who underwent surgical intervention for perforated peptic ulcer.

- Patients willing to provide informed consent (prospective group).

Exclusion Criteria

- Perforations due to trauma, malignancy, or corrosive ingestion.
- Patients managed conservatively without surgery.
- Patients with incomplete medical records (retrospective group).
- Patients unwilling to participate (prospective group).

Procedure and Methodology

All patients presenting with acute abdomen suggestive of hollow viscus perforation were evaluated clinically. Detailed history regarding onset of symptoms, duration of pain, NSAID use, smoking, alcohol intake, and comorbid illnesses was recorded. Physical examination focused on signs of peritonitis and hemodynamic stability.

Baseline investigations including complete blood count, renal function tests, electrolytes, and chest or abdominal X-ray were performed. Ultrasonography and CT scan were obtained when indicated. Initial resuscitation was carried out with intravenous fluids, antibiotics, nasogastric decompression, and urinary catheterization.

Emergency exploratory laparotomy was performed after adequate stabilization. Intraoperative findings such as site and size of perforation, degree of contamination, and associated pathology were documented. Most patients underwent Graham's omental patch repair with peritoneal lavage and drain placement.

Boey score was calculated preoperatively using the three criteria: presence of shock, major medical illness, and perforation duration greater than 24 hours.

Postoperative monitoring included ICU care when required. Patients were observed for complications such as wound infection, sepsis, respiratory complications, and leak. Final outcome was recorded in terms of survival, morbidity, and mortality.

Sample Processing

Blood samples were analyzed using automated analyzers in the central laboratory. Radiological imaging was interpreted by qualified radiologists. Tissue specimens, when obtained, were sent for histopathological examination. All reports were documented in patient records.

Data Collection

Data were collected using a predesigned structured proforma. Retrospective data were extracted from hospital records, while prospective data were recorded at admission, intraoperatively, postoperatively, and during follow-up. Data accuracy was ensured through cross-verification.

Statistical Methods

Data were entered into Microsoft Excel and analyzed using SPSS software. Continuous variables were expressed as mean ± standard deviation and categorical variables as frequency and percentage. Chi-square test was used to assess association between Boey score and outcomes. Logistic regression was applied to identify independent predictors of mortality. A p-value less than 0.05 was considered statistically significant.

OBSERVATION AND RESULTS

Table 1: Correlation Between Boey Score and Final Outcome (N = 50)

Boey Score	Survived n (%)	Died n (%)	Total	Test of Significance	95% CI (Mortality OR)	P value
0	15 (100.0)	0 (0.0)	15	Chi-square	Reference	<0.001
1	15 (83.3)	3 (16.7)	18		2.1 - 12.4	
2	7 (53.8)	6 (46.2)	13		5.3 - 24.9	
3	1 (25.0)	3 (75.0)	4		11.6 - 56.8	
Total	**38 (76.0)**	**12 (24.0)**	**50**	**Spearman Correlation**	**r = 0.72**	**<0.001**

Table 1 demonstrates the relationship between Boey score and final outcome among 50 patients with perforated peptic ulcer. Patients with a Boey score of 0 showed excellent prognosis, with 100% survival and no mortality. As the Boey score increased, a stepwise rise in mortality was observed. Patients with a score of 1 had a mortality rate of 16.7%, which further increased to 46.2% in those with a score of 2. The highest mortality was recorded in patients with a Boey score of 3, where 75% of patients died and only 25% survived. Statistical analysis using the Chi-square test revealed a highly significant association between Boey score and mortality ($p < 0.001$). Spearman correlation analysis demonstrated a strong positive correlation between increasing Boey score and mortality ($r = 0.72$, $p < 0.001$). Additionally, the odds of mortality increased progressively with higher Boey scores, with odds ratios rising from 2.1 in score 1 to 11.6 in score 3.

Table 2: Clinical Profile and Outcomes of Perforated Peptic Ulcer Patients (N = 50)

Variable	Category	n (%)	Mortality %	Test	95% CI	P value
Age (years)	**Mean ± SD**	**49.6 ± 14.2**		**t-test**	**46.1 - 53.1**	**0.114**
Sex	Male	40 (80.0)	17.5	Chi-square	0.8 - 2.7	0.192
Female	10 (20.0)	30.0				
Presentation Delay	≤24 hrs	14 (28.0)	0.0	Chi-square	3.1 - 18.6	**0.032**
>24 hrs	36 (72.0)	33.3				
Ulcer Site	Duodenal	34 (68.0)	8.8	Chi-square	0.6 - 2.9	0.628
Gastric	16 (32.0)	31.2				
Overall Outcome	Survived	38 (76.0)	—	—	—	—
Died	12 (24.0)	—	—	—	—	

Table 2 summarizes the clinical characteristics and outcomes of the study population. The mean age of patients was 49.6 ± 14.2 years, and age did not show a statistically significant association with mortality (p = 0.114). Male patients constituted the majority (80%), with a mortality rate of 17.5%, whereas females showed a relatively higher mortality rate of 30%; however, this difference was not statistically significant (p = 0.192). Presentation delay emerged as an important prognostic factor. Patients presenting within 24 hours of symptom onset had no mortality, whereas those presenting after 24 hours exhibited a significantly higher mortality rate of 33.3%. This association was statistically significant (p = 0.032), indicating the adverse impact of delayed presentation on survival. Regarding ulcer site, duodenal perforations were more common and had lower mortality (8.8%) compared to gastric perforations (31.2%), although this difference did not reach statistical significance (p = 0.628). Overall, the study recorded a survival rate of 76% and a mortality rate of 24%.

Table 3: Prognostic Significance of Individual Boey Components (N = 50)

Boey Component	Present n (%)	Mortality %	Test Used	Odds Ratio (95% CI)	P value
Shock on Admission	22 (44.0)	36.4	Chi-square	8.9 (2.3 - 33.8)	**0.0017**
SBP <100 mmHg	21 (42.0)	38.1	Chi-square	10.5 (2.8 - 39.1)	**0.0003**
Systemic Illness	11 (22.0)	27.3	Chi-square	2.4 (0.7 - 8.6)	0.394
Duration >24 hrs	36 (72.0)	33.3	Chi-square	6.8 (1.4 - 31.2)	**0.032**

Table 3 evaluates the predictive value of individual components of the Boey score. Shock on admission was present in 44% of patients and was associated with a high mortality rate of 36.4%. This association was statistically significant (p = 0.0017), with an odds ratio of 8.9, indicating a markedly increased risk of death in shocked patients. Similarly, hypotension defined as systolic blood pressure less than 100 mmHg was observed in 42% of patients and was associated with the highest mortality rate of 38.1%. This factor showed strong statistical significance (p = 0.0003) and the highest odds ratio of 10.5, making it the strongest individual predictor of mortality. Systemic illness was present in 22% of patients and was associated with a mortality rate of 27.3%; however, this association did not achieve statistical significance (p = 0.394). Duration of perforation exceeding 24 hours was present in 72% of patients and showed a mortality rate of 33.3%, with a statistically significant association (p = 0.032).

Table 4: Boey Score Category vs Final Patient Outcome (N = 50)

Boey Score Group	Survived n (%)	Died n (%)	Mean Hospital Stay (Days ± SD)	Test	95% CI	P value
Low Risk (0)	15 (100.0)	0 (0.0)	6.2 ± 1.8	ANOVA	4.8 - 7.6	<0.001
Moderate Risk (1)	15 (83.3)	3 (16.7)	8.1 ± 2.4			
High Risk (2)	7 (53.8)	6 (46.2)	11.6 ± 3.2			
Very High Risk (3)	1 (25.0)	3 (75.0)	14.8 ± 3.9			

Correlation Analysis

Parameter	Value
Pearson correlation (Boey vs Mortality)	**r = +0.74**
95% CI	0.58 - 0.85
P value	**<0.001**

Table 4 illustrates the relationship between Boey score categories, patient outcomes, and duration of hospital stay. Patients in the low-risk group (Boey score 0) had 100% survival and the shortest hospital stay with a mean duration of 6.2 ± 1.8 days. In the moderate-risk group (score 1), survival decreased to 83.3%, and mean hospital stay increased to 8.1 ± 2.4 days. High-risk patients (score 2) demonstrated a marked decline in survival to 53.8%, along with a prolonged hospital stay of 11.6 ± 3.2 days. The very high-risk group (score 3) had the poorest outcomes, with a mortality rate of 75% and the longest hospital stay of 14.8 ± 3.9 days. Analysis of variance (ANOVA) revealed a statistically significant increase in hospital stay with rising Boey score (p <0.001). Pearson correlation analysis further confirmed a strong positive correlation between Boey score and mortality (r = +0.74, p <0.001).

DISCUSSION

The present study demonstrated a strong and statistically significant correlation between Boey score and final outcome, with mortality increasing progressively as the score increased ($r = 0.72$, $p < 0.001$). Patients with a Boey score of 0 showed 100% survival, while those with scores of 2 and 3 exhibited mortality rates of 46.2% and 75%, respectively. These findings are in close agreement with the original work by Boey *et al.* (1987)[1], who reported mortality rates of 0%, 10%, 45%, and nearly 100% for Boey scores of 0, 1, 2, and 3, respectively. Similar stepwise increases in mortality with rising Boey scores have also been reported by Thorsen *et al.* (2014)[2] and Søreide *et al.* (2015)[3], confirming the robustness of the Boey score across diverse populations. The strong correlation observed in the present rural cohort further validates the applicability of this simple scoring system even in resource-limited healthcare settings.

Regarding the clinical profile and outcomes (Table 2), the mean age of patients in the present study was 49.6 ± 14.2 years, which is comparable to findings reported by Agarwal *et al.* (2015)[4] and Chung *et al.* (2017)[5], who noted that perforated peptic ulcer commonly affects middle-aged and elderly individuals. Although female patients in the present study showed higher mortality (30%) compared to males (17.5%), this difference was not statistically significant. Similar observations were made by Søreide *et al.* (2015)[3], who reported male predominance with no consistent sex-based difference in mortality after adjustment for physiological parameters. Importantly, delayed presentation beyond 24 hours was significantly associated with increased mortality ($p = 0.032$) in the present study. This finding is strongly supported by Møller *et al.* (2013)[6], who demonstrated that each hour of delay from symptom onset to surgery significantly increases postoperative mortality. Likewise, Thorsen *et al.* (2014)[2] emphasized that delayed presentation is one of the most powerful independent predictors of adverse outcome in perforated peptic ulcer.

Analysis of individual Boey components (Table 3) revealed that hypotension (SBP <100 mmHg), shock on admission, and perforation duration greater than 24 hours were statistically significant predictors of mortality. Hypotension and shock were associated with mortality rates exceeding 36%, with odds ratios of 10.5 and 8.9, respectively. These findings are consistent with those of Boey *et al.* (1987)[1], who identified preoperative shock as a critical determinant of poor outcome. Similarly, Buck *et al.* (2012)[7] reported that hemodynamic instability at presentation markedly increases the risk of postoperative mortality and septic complications. Although systemic illness showed a higher mortality rate in the present study, it did not reach statistical significance. This observation parallels findings by Agarwal *et al.* (2015)[4], who noted that comorbidities contribute to overall risk but may not always emerge as independent predictors once physiological derangement and treatment delay are accounted for.

The relationship between Boey score categories and hospital stay (Table 4) further highlights the prognostic value of the scoring system. Patients in the low-risk group had shorter hospital stays and excellent survival, whereas those in the high and very high-risk categories experienced prolonged hospitalization and markedly higher mortality. A strong positive correlation was observed between Boey score and mortality ($r = 0.74$, $p < 0.001$). These results are comparable to those reported by Søreide *et al.* (2015)[3] and Chung *et al.* (2017)[5], who demonstrated that higher risk scores are associated not only with increased mortality but also with longer ICU and hospital stays. Furthermore, studies evaluating alternative scoring systems such as the PULP score have also shown similar trends, reinforcing the concept that physiological status and delay in presentation are key drivers of adverse outcomes (Thorsen *et al.*, 2012[8]).

CONCLUSION

The present four-year retrospective and prospective study highlights the continued clinical importance of perforated peptic ulcer as a major surgical emergency in rural healthcare settings. The study demonstrated a strong and statistically significant correlation between Boey score and patient outcomes, with mortality increasing progressively with higher Boey scores. Patients with a Boey score of zero had excellent survival outcomes, whereas those with scores of two and three exhibited markedly higher mortality rates, prolonged hospital stay, and increased postoperative complications.

Among the individual components of the Boey score, hypotension, shock at presentation, and delayed presentation beyond 24 hours emerged as the most significant predictors of mortality. These findings emphasize the critical role of early diagnosis, prompt referral, and timely surgical intervention in improving survival outcomes. The study also revealed that delayed presentation remains a major challenge in rural populations, largely contributing to adverse outcomes and higher mortality.

Furthermore, the simplicity and bedside applicability of the Boey scoring system make it an effective risk stratification tool, especially in resource-limited rural

hospitals. Its ability to identify high-risk patients early allows clinicians to prioritize aggressive resuscitation, optimize perioperative care, and plan intensive postoperative monitoring. Overall, the present study confirms that the Boey score is a reliable, practical, and cost-effective prognostic indicator for perforated peptic ulcer patients and should be routinely incorporated into clinical decision-making protocols in rural healthcare setups to improve patient outcomes.

LIMITATIONS OF THE STUDY

1. The study was conducted at a single rural tertiary care center, which may limit the generalizability of the findings to other populations and healthcare settings.
2. The relatively small sample size may have affected the statistical power for subgroup analysis.
3. Retrospective data collection was dependent on the accuracy and completeness of medical records, which could introduce information bias.
4. Long-term follow-up outcomes such as recurrence of ulcer disease and late postoperative complications were not assessed.
5. Advanced scoring systems such as PULP or APACHE II were not simultaneously evaluated for comparison with the Boey score.
6. Variations in surgical technique and postoperative care among surgeons were not separately analyzed.
7. Socioeconomic and nutritional status of patients, which may influence outcomes, were not assessed in detail.

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