



Original Article

A Study on Liaison between Boey Score and Perforated Peptic Ulcer in View of Postoperative Morbidity and Mortality

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ABSTRACT

Introduction: Several factors associated with poor outcome in perforated peptic ulcer have been identified: delay in diagnosis, coexistent medical illness, shock on admission, leukocytosis, and old age. Such factors increase morbidity and mortality in perforated peptic ulcer disease. Careful resuscitation and perioperative optimization play a significant role in reducing morbidity and mortality associated with perforated peptic ulcer disease.

Methods: A prospective study of 60 cases who were operated for perforated peptic ulcer was done at Sheth L.G. Municipal General Hospital affiliated with AMCMET Medical College & Research Centre, Ahmedabad. Categorization of these patients was done according to Boey score and their outcome was accessed.

Objective: The aim of this study was to appraise and analyze Boey score in operated cases of perforated ulcer disease.

Results: The morbidity and mortality rate in this study were 31.67% and 11.67%, respectively. The morbidity rate increased gradually with increase in Boey score: 8.69, 36.84, 50, and 62.5% for 0, 1, 2, and 3 score, respectively ($p < 0.01$). The mortality rate was increased progressively with increasing Boey score: 0, 5.26, 30, and 37.5% for 0, 1, 2, and 3 score, respectively, and this relationship was statistically significant (p -value < 0.01). The mean duration of hospital stay was 9.43 ± 4.10 days and p -value was less than 0.001. The area under curve in receiver-operating characteristic curve analysis was 0.854 and 0.751 for mortality and morbidity, respectively.

Conclusion: Boey score is simple, clinically relevant and can precisely predict postoperative morbidity and mortality and the length of hospital stay.

Keywords: Perforated peptic ulcer disease, Boey score, Outcome

INTRODUCTION

Patients with peptic ulcer perforation typically complain of sudden onset of frequently severe epigastric pain. For many, it is their first symptom of ulcer disease.^[1] Pain is caused when the peritoneum comes in contact with highly caustic gastric secretions. Pain is often instantaneous and remains constant. Peritoneal irritation is usually intense and causes most patients to avoid movement. Physical examination reveals fever, diminished bowel sounds, rigidity of the abdominal musculature, and guarding upright abdominal radiographs demonstrate pneumoperitoneum in 80% of cases. If free air is not present, computed tomography of the abdomen is very sensitive for demonstrating perforation. Occasional reports have described nonoperative treatment of this complication, but this approach is not appropriate for the large majority of patients with perforated

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peptic ulcer. Perforation is a strong indication for surgery in most circumstances. Laparotomy or laparoscopy affords the opportunity to relieve intraperitoneal contamination and to close the perforation.^[2]

Perforation has the highest mortality rate of any complication of ulcer disease, approaching 15%.^[1] Several factors associated with poor outcome in perforated peptic ulcer have been identified: delay in diagnosis, coexistent medical illnesses, shock on admission, leukocytosis, and old age. Such factors increase morbidity and mortality in perforated peptic ulcer. A delay in treatment of greater than 24 hours is associated with a sevenfold increase in mortality, threefold risk of morbidity, and a twofold increase in hospital stay.^[3]

The elderly patients are particularly vulnerable and often more difficult to diagnose because of poorly localized symptoms and signs and fewer preceding symptoms. Careful resuscitation and perioperative optimization play a significant role in reducing morbidity and mortality associated with perforated peptic ulcer disease.^[4]

The mortality associated with emergency surgery for ulcer perforation is most clearly correlated with the existence of preoperative shock, coexisting medical illness, and the presence of perforation for more than 48 hours.^[5] For stable patients who receive prompt surgical attention, the surgery can be performed with safety.^[6]

AIMS AND OBJECTIVE

- To discover the accuracy of Boey score in predicting mortality in perforated peptic ulcer disease.
- To predict the morbidity in view of postoperative complication and hospital stay with Boey score in perforated peptic ulcer disease.

MATERIALS AND METHODS

A prospective study of 60 cases who were operated for perforated peptic ulcer was done at Sheth L.G. Municipal General Hospital affiliated with AMC MET Medical College & Research Centre, Ahmedabad, from April 2019 to January 2022.

Inclusion criteria

Patients with age more than 15 years presenting with perforated peptic ulcer disease went through exploratory laparotomy.

Exclusion criteria

Patients presenting with perforated peptic ulcer disease but not willing to undergo surgery or patients with traumatic and malignant peptic perforation were excluded from the study.

Table 1: Boey score.^[6,7]

Risk factors	Points
Time from perforation to admission >24 hours	1
Preoperative blood pressure <90 mm Hg	1
Any one or more systemic illness: Heart disease, liver disease, renal disease, diabetes mellitus	1
None of above factors	0
Total	3

After the initial resuscitation of patient and achieving hemodynamic stability, we recorded data of patients such as age, sex, occupation, any medical illness, vitals of patients, routine blood investigation, and necessary imaging studies and documented the Boey score and categorized patients according points of Boey score (0–3) [Table 1].

Exploratory laparotomy was done under general anesthesia after written consent for surgery was obtained from patients and their relative. In surgery, closure of perforation was done with a Graham's live omental patch followed by through peritoneal lavage with placement of intraperitoneal drain. The patient was shifted to the postoperative ward with Ryle's tube and Foley catheter still in place and was managed with intravenous antibiotics, fluids, and other supportive treatment. Oral fluids followed by diet were allowed usually on the third to fifth postoperative days after surgery once bowel sound with peristalsis resumed. The drain was removed after the patient passed the stool, mostly after 4 days of surgery and the patient was discharged after the general condition improved. Postoperative events such as number of hospital stays, complications, morbidity, and mortality were recorded and analyzed with Boey score.

STATISTICAL ANALYSIS

All of the statistical analysis was performed using IBM SPSS software version 22 and MS Office Excel software. Chi-squared test was used for comparison group in morbidity, length of hospital stay, and mortality and *p*-value <0.05 was considered as significant. With regard to the prediction of morbidity and mortality with Boey score, the odds ratio and 95% confidence interval of each score were compared with outcome of "0" score. Logistic regression analysis and receiver-operating characteristic (ROC) curve analysis were used to estimate the prediction ability of Boey score in assuming postoperative morbidity and mortality. The area under curve (AUC) indicated the probability of concordance between the predicted probability of postoperative morbidity or mortality and the actual postoperative state.

RESULTS

Of the 60 patients who were studied, the range of age was 16 to 70 years and the mean age was 42.38 ± 14.71 years. There

Table 2: Number of patients with risk factors of Boey score.

Risk factors of Boey score	No. of patients	Percentage
Time from perforation to admission >24 hours	31	51.6
Preoperative blood pressure <90 mm Hg	17	28.3
Any one or more systemic illness	15	25

were 51 males (85%) and 9 females (15%) and the male:female ratio was 5.66:1.

Thirty-nine patients (65%) had a history of alcohol consumption, 27 patients (45%) had a habit of smoking, and 17 patients (28.3%) had perforation following taking drugs like nonsteroidal anti-inflammatory drugs (NSAIDs) [Table 2].

Thirty-one patients took more than 24 hours for admission to the hospital after the onset of symptoms and 17 patients presented with less than 90 mm Hg blood pressure in the preoperative period. Of the 15 patients who presented with one or more systemic illness, 4 patients had a history of heart disease such as ischemic heart disease (IHD) and hypertension, 1 patient had a history of IHD with diabetes mellitus (DM), 1 patient had chronic renal failure, 3 patients presented with renal disease with DM, 2 patients presented with cirrhosis of liver, and 4 patients had a history DM.

Of the total 60 patients, 23 patients, who were hospitalized within 24 hours after the onset of symptoms with more than 90 mm Hg blood pressure and without any systemic illness, were assigned a Boey score of 0 and 8 patients, who were hospitalized after 24 hours after the onset of symptoms with less than 90 mm Hg blood pressure and one or more systemic illness, were assigned a Boey score of 3.

Of the 31 patients who were hospitalized after 24 hours after the onset of symptoms (mentioned earlier), 8 patients were assigned a Boey score of 3, 5 patients who had less than 90 mm Hg blood pressure assigned a Boey score of 2, 3 patients who presented with systemic illness were assigned a Boey score of 2, and remaining 15 patients who took more than 24 hours to be hospitalized after the onset of symptoms with more than 90 mm Hg blood pressure and without any systemic illness were assigned a Boey score of 1.

Out of the 17 patients who had less than 90 mm Hg blood pressure, 8 patients were labeled as Boey score 3 (mentioned previously), 5 patients who were admitted after 24 hours with less than 90 mm Hg blood pressure were assigned a Boey score of 2 (mentioned previously), 2 patients who presented with systemic illness were assigned a Boey score of 2, and remaining 2 patients who had less than 90 mm Hg blood

Table 3: Number of patients in each category of Boey score.

Boey score	No. of patients	Percentage
0	23	38.33
1	19	31.67
2	10	16.67
3	8	13.33
Total	60	100

Table 4: Postoperative complications.

Complication	No. of patients	Percentage
Bronchopneumonia	9	15
Wound infection	8	13.33
Fever	6	10
Paralytic ileus	2	3.33
Intraabdominal collection	1	1.66
Leak	1	1.66

pressure but hospitalized with 24 hours without systemic illness were assigned a Boey score of 1.

Of the 15 patients who had one or more systemic illness, 8 patients were assigned a Boey score of 3 (mentioned previously), 3 patients admitted after 24 hours were categorized as Boey score 2 (mentioned previously), 2 patients who had less than 90 mm Hg blood pressure were assigned a Boey score of 2 (mentioned previously) and remaining 2 patients who had systemic illness but admitted within 24 hours with more than 90 mm Hg blood pressure were assigned a Boey score of 1 [Table 3].

The maximum number of patients (38.33%) had a Boey score 0 and the minimum number of patients had a Boey score 3 (13.33%) [Table 4].

Out of the 60 patients, 19 patients (31.66%) had postoperative complications. The most common complications were bronchopneumonia and wound infection. Out of nine patients who had bronchopneumonia, one patient had a postoperative leak with fever and bronchopneumonia, two patients had a bronchopneumonia with fever. Of the eight patients who had a wound infection, two patients had wound infection with fever, one patient had a paralytic ileus with wound infection and one patient had intra-abdominal collection with fever [Tables 5 and 6].

The morbidity rate increased gradually with increase in Boey score: 8.69, 36.84, 50, and 62.5% for 0, 1, 2, and 3 score, respectively, and *p*-value was also 0.01, suggesting that relationship was statistically significant. The OR also increased with increase in Boey score, suggesting that the rate of postoperative complications increased with increase in Boey score in cases of perforated peptic ulcer [Tables 7 and 8].

Table 5: Boey score and morbidity.

Boey score	Total no. of patients	Morbidity		No. of morbidity	
		No. of patients	Percentage	No. of patients	Percentage
0	23	2	8.69	21	91.31
1	19	7	36.84	12	63.16
2	10	5	50	5	50
3	8	5	62.5	3	37.5
Total	60	19	31.67	41	68.33

Chi-squared statistic: 10.91
p-Value: 0.01

Table 7: Boey score and mortality.

Boey score	Total no. of patients	Mortality		No. of mortality	
		No. of patients	Percentage	No. of patients	Percentage
0	23	0	0	23	100
1	19	1	5.26	18	94.74
2	10	3	30	7	70
3	8	3	37.5	5	62.5
Total	60	7	11.67	53	88.33

Chi-squared statistic: 12.24
p-value: 0.006

Table 9: Boey score and length of hospital stay.

Boey score	Total no. of patients	Length of hospital stay		
		5-8 days	9-12 days	>12 days
		No. of patients	No. of patients	No. of patients
0	23	20 (86.96%)	3 (13.04%)	0 (0%)
1	18	9 (50%)	9 (50%)	0 (0%)
2	7	2 (28.57%)	3 (42.86%)	2 (28.57%)
3	5	0 (0%)	0 (0%)	5 (100%)
Total	53	31 (58.49%)	15 (28.30%)	7 (13.21%)

Chi-squared statistic: 49.41
p-Value: <0.0001

The mortality rate in this study was 11.67%. Out of the seven patients who died, four patients died due to septicemia followed by multiorgan failure, two patients died due to respiratory complication, and one patient died due to leak of perforation and its complications. The mortality rate increased progressively with increase in Boey score: 0, 5.26, 30, and 37.5% for 0, 1, 2, and 3 score, respectively and this relationship was statistically significant (p-value=0.006). The OR also increased gradually with increase in Boey score, which indicated that the rate of mortality increased with increase in Boey score in cases of perforated peptic ulcer [Table 9].

Table 6: Adjusted odds ratio (Boey score with morbidity).

Boey score	Total no. of patients	Morbidity		Adjusted odds ratio (95% confidence interval)
		No. of patients	Percentage	
0	23	2	8.69	
1	19	7	36.84	6.12 (1.09-34.34)
2	10	5	50	10.5 (1.56-70.76)
3	8	5	62.5	17.5 (2.28-134.29)

Table 8: Adjusted odds ratio (Boey score with mortality).

Boey score	Total no. of patients	Mortality		Adjusted odds ratio (95% confidence interval)
		No. of patients	Percentage	
0	23	0	0	
1	19	1	5.26	3.8 (0.14-99.08)
2	10	3	30	21.9 (1.01-474.92)
3	8	3	37.5	29.9 (1.34-667.43)

Seven patients who died were excluded from length of hospital stay. The mean duration of hospital stay was 9.43 ± 4.10 days. p-Value was less than 0.001 which suggested that the relationship between Boey score and length of hospital stay was statistically significant.

Receiver-operating characteristic curve analysis

The AUC in ROC analysis was 0.854 and 0.751 for mortality and morbidity, respectively [Figures 1 and 2]. So, although the Boey score was a good predictor of mortality and morbidity, its predictive ability was higher for mortality.

DISCUSSION

The male:female ratio in this study was 5.66:1, the same as the 6:1 and 6.6:1 ratios in the Mac^[8] and Boey *et al.*^[6] study, respectively. In this study, the mean age was 42.38 ± 14.71 years that was almost same as 39.48 ± 16.44 years in the Koirala *et al.*^[9] study. In this study, the presentation age was lower compared with patients from other Western studies.^[4] The proportionately higher number of smokers and drinkers and relatively low incidence of NSAID use may be explained by younger male patients in this study.

Perforation occurs in 2 to 10% of patients with peptic ulcer disease and accounts for 70% of the mortality.^[10] The overall mortality rate was 11.67% in this study. In the Agarwal *et al.*^[11] study, the overall mortality was 13.9%. The initial study by Boey *et al.*^[6] showed that patients with risk factors 0, 1, 2, and all 3 had mortality rates of 0, 10, 45.5 and 100%, respectively. But in this study, patients with risk factors 0, 1, 2, and all 3 had

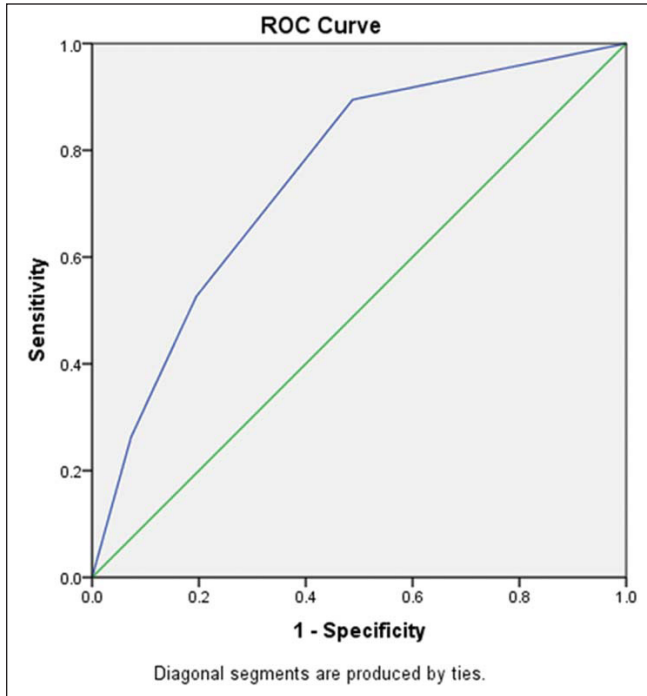


Figure 1: Receiver-operating characteristic (ROC) curve of Boey score and morbidity.

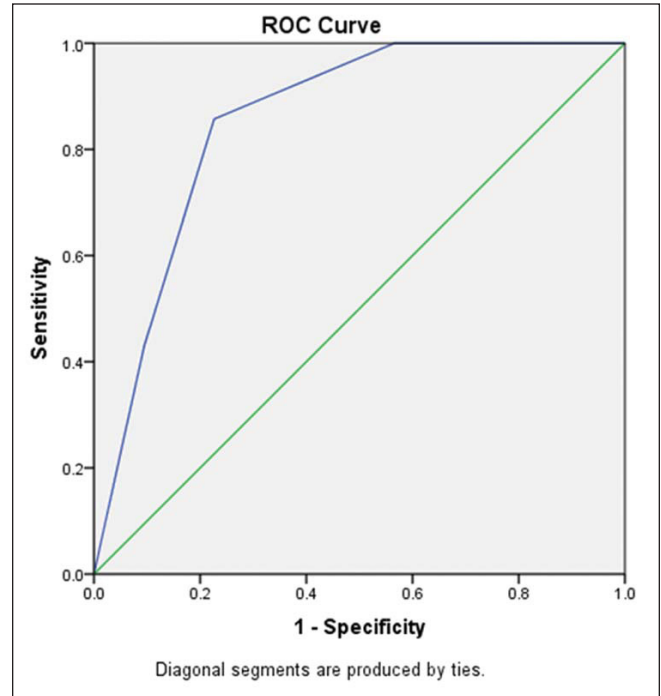


Figure 2: Receiver-operating characteristic (ROC) curve of Boey score and mortality.

Area under the curve (AUC)				
Test result: Boey score and morbidity				
Area (AUC)	Standard error	p-value	Asymptomatic 95% confidence interval	
			Lower bound	Upper bound
0.751	0.066	0.002	0.621	0.881

Area under the curve (AUC)				
Test result: Boey score and mortality				
Area (AUC)	Standard error	p-value	Asymptomatic 95% confidence interval	
			Lower bound	Upper bound
0.854	0.059	0.002	0.739	0.970

mortality rates of 0, 5.26, 30, and 37.5%, respectively. Progress and development in critical care over the years have helped to reduce mortality rates dramatically. A study by Agrawal *et al.*^[11] reported mortality rates of 1.9, 7.1, 31.7, and 40% for 0, 1, 2, and 3 scores, respectively.

Overall, the postoperative complication rate in the literature ranges from 17% to 63%.^[12,13] In this study, the overall morbidity rate was 31.67% that was slightly less than that in Agarwal *et al.*^[11] study (43.9%). The morbidity rate in this study was 8.69, 36.84, 50, and 62.5% for Boey score of 0, 1, 2, and 3, respectively, which indicated that morbidity also correlated with Boey score. In Agarwal *et al.*^[11] study, the morbidity rate was 13, 45.7, 70.7, and 73.7% for Boey score of 0, 1, 2, and 3, respectively.

The length of hospital stay with the higher score was longer in this study and was significant ($p < 0.0001$). This has been corroborated by other studies. Menekse *et al.*^[14] found that the mean length of hospital stay was 7.9 ± 9.0 days. Another

study conducted by Gulzar *et al.*^[15] compared the length of hospital stay with different Boey score groups and concluded length of hospital stay increases with an increase in Boey score with p -value < 0.01 .

Over the years, so many scoring systems were available for the prediction of morbidity and mortality in peptic ulcer perforation. These include scoring indices such as the Acute Physiology and Chronic Health Evaluation (APACHE) score, the Simplified Acute Physiology Score (SAPS), the Jabalpur Index, the Multi Organ Failure (MOF) Score, the Peptic Ulcer Perforation Score (PULP), and the Mannheim Peritonitis Index (MPI). The APACHE, SAPS, and MOF scores have so many factors that calculating scores become too complex. The major drawback of MPI score is that it requires intraoperative information; therefore, MPI may not be an ideal preoperative scoring system to identify high-risk patients who might need intensive care prior to the operation. The PULP and Jabalpur Index score requires the use of laboratory investigations.

Early and accurate identification of patients with increased risk of adverse outcomes is needed to plan monitoring and treatment. Thus, a clinical scoring system should be able to predict adverse outcome with a high degree of precision and the score should be easy to calculate. The Boey score, as described, is specific for PPU and because it is based on only three factors, it is easy to calculate. In this study, the liaison between Boey score and predication of morbidity and mortality in peptic ulcer perforation can be easily established.

LIMITATION OF BOEY SCORE

- Sample size was 60 patients.
- Patient's nutritional status and BMI are not taken into account that might influence postoperative complications.
- Laparoscopic surgeries are popular worldwide for peptic ulcer perforation nowadays, but it was not being done at emergency in our setup till now. All surgical procedures were performed by open laparotomy by surgical residents under guidance of experienced surgeon.
- Sometimes patients had multiple comorbidities and their combined effects could not be calculated in the Boey score.

CONCLUSION

Even though the Boey score has limitations, it is one of the scores that can easily be applicable in peptic ulcer perforation. The Boey score is simple, clinically relevant, and can precisely predict postoperative morbidity and mortality and length of hospital stay.

Conflict of interest

None declared.

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