Boey score and Pulp score in predicting mortality and morbidity in perforated peptic ulcer

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Abstract

Introduction: Perforation is one of the important complications of peptic ulcer. peptic ulcer perforations. Numbers of scoring systems for outcome prediction have been reported. Among the most frequently used are the American Society of Anesthesiologists (ASA) physical status classification system, the Boey score and the more recently introduced peptic ulcer perforation (PULP) score. However, only the Boey and PULP scores are designed specifically for the prediction of mortality for Perforated peptic ulcer patients. Hence this study to compare the Boey score and Pulp score in prediction of morbidity and mortality in perforated peptic ulcer was carried out.

Methodology: This study is prospective observational study. Clinical examination was done to find out the various modes of presentation, its progression. X-Ray abdomen upright was done for the presence of free gas under diaphragm. As soon as the diagnosis was made, resuscitation was done and then the patient was posted for surgery. In each case of perforated peptic ulcer during laparotomy, primary closure with omental grafting was performed. Morbidity was elicited by the following parameters: Surgical site infections, wound

dehisence, intra-abdominal collection, post op leak, prolonged hospital stay. All patients were called for follow up after 30 days of surgery and as per requirement then after. Patients with perforated peptic ulcer were divided into four groups based on the Boey scoring system. Based on the PULP scoring system, patients were divided into two groups.

Conclusion: In the present study, The BOEY score was found to be the better prognostic scoring system for post-operative morbidity and mortality in surgically treated patients of Perforated peptic ulcer than PULP score.

Keyword: Peptic ulcer, BOEY Score, PULP Score.

Introduction

Peptic ulcer is one of the most common health issues that affect mankind in south India. Though lot of work has been done on the etiology of this condition, one specific etiological agent cannot be incriminated in the causation of this particular disease especially in our part of country. Peptic ulcer can be gastric ulcer or duodenal ulcer.

Perforation is one of the important complications of peptic ulcer. As rightly stated by Lord Moynihan "Perforation of gastric or duodenal ulcer is one of the most serious and most overwhelming catastrophe that can befall a human being". The disease continues to have a substantial impact on our society. Among abdominal emergencies, perforations of peptic ulcers are third in frequency, acute appendicitis and acute intestinal obstruction being more common.

There is decline in incidence of peptic ulcers which is attributed to the era of H2 blockers and proton pump inhibitors, which provides symptomatic relief to patient. But the percentage of patients with perforation has not declined, probably due to increased inadvertent use of NSAIDS, corticosteroids and because of irregular use of H2 antagonist drugs.

Although outcomes from bleeding ulcers have improved with modern endoscopic and interventional radiological strategies, the outcomes of perforations have remained fairly unchanged. Even in recent reports, the mortality from perforated peptic ulcer (PPU) remains up to 27 % and complications are reported in 20–50 % of the patients.

Although morbidity from perforated peptic ulcer is decreasing, the incidence of perforated ulcer remains relatively constant. Prompt recognition of the condition is very important and only by early diagnosis and treatment it is possible to reduce the still relatively high mortality. Perforated ulcers are decreasing in incidence in younger age patients and are increasingly being observed in the elderly and in women.

In spite of better understanding of disease, effective resuscitation and prompt surgery under modern anesthesia techniques, there is high morbidity and mortality. Hence, attempt has been made to analyze the various factors, which are affecting the morbidity/mortality of patients with peptic ulcer perforations.

Numbers of scoring systems for outcome prediction have been reported. Among the most frequently used are the American Society of Anesthesiologists (ASA) physical status classification system, the Boey score and the more recently introduced peptic ulcer perforation (PULP) score. However, only the Boey and PULP scores are designed specifically for the prediction of mortality for Perforated peptic ulcer patients.

Hence this study to compare the Boey score and Pulp score in prediction of morbidity and mortality in perforated peptic ulcer was carried out.

Aims and Objectives

Aim: The aim of this study was to compare known risk scores The BOEY score and The PULP score in the prediction of mortality and morbidity in patients surgically treated for perforated peptic ulcer.

Objectives

1. Prediction of mortality
2. Prediction of morbidity in terms of
3. Surgical site infections
4. Wound dehiscence
5. Post op leak
6. Prolonged hospital stay
7. Intra-abdominal collection

Inclusion Criteria

- All operated patients of peptic ulcer perforation aged >= 18 years

Exclusion Criteria

- Perforations due to trauma.
- Non surgically treated patients.
- Patients unfit for general anaesthesia, not giving consent.
- Patients operated with surgeries other than omentopexy like gastrectomy.

Study and Methodology

Study Setting: Clinical setting, Dept. Of Surgery, Medical College, SSGH, Baroda.

Study Population: Operated Patients in SSG Hospital for Perforated Peptic Ulcer aged>=18 years between completion of SRC to November 2022 were included in the study.

Study Duration: After completion of SRC to November 2022.

Study Design: Prospective Observational study

Sample Size Calculation: A total sample size of 100 patients were needed in this study to achieve 80% power with 5% risk calculated using open EPI software. A total of 100 consecutive diagnosed patients with perforated peptic ulcer were included in the study.

Statistical Analysis

All the collected data was compiled and results were obtained

The comparison of normally distributed continuous variables between the groups was performed using the Student's t test.

Nominal categorical data between the groups was compared using the Chi-square test or Fisher's exact test as appropriate with regard to the prediction of morbidity and mortality by Boey and PULP score risk stratification For all statistical tests a p value of < 0.05 was considered statistically significant.

Logistic regression analysis and receiver-operating characteristic (ROC) curve analysis was used to estimate the predictive ability of the Boey score and PULP score in assessing the postoperative morbidity and mortality.

The area under the ROC curve (AUC) indicates the probability of concordance between the predicted probability of postoperative morbidity or mortality and the actual postoperative state.

Informed Written Consent from Patient: Yes

Methodology: This study is prospective observational study.

Detailed history of the patient was taken.

Clinical examination was done to find out the various modes of presentation, its progression.

All routine blood investigations were done.

X-Ray abdomen upright was done for the presence of free gas under diaphragm.

In cases which were not diagnosed by X-ray. USG abdomen was done.

These investigations were done to confirm the diagnosis or to find whether the patient could be posted for emergency laparotomy.

As soon as the diagnosis was made, resuscitation was done and then the patient was posted for surgery.

In each case of perforated peptic ulcer during laparotomy, primary closure with omental grafting was performed. Feeding jejunostomy was performed in larger perforations.

Thorough peritoneal lavage was given using normal saline, peritoneal fluid was sent for culture and an intra-abdominal drain was placed in all cases.

Postoperatively, intravenous antibiotics (Ceftriaxone, Metronidazole) was given initially and was subsequently changed according to culture and sensitivity.

During postoperative period, evaluation was done regarding morbidity and mortality.

Morbidity was elicited by the following parameters: Surgical site infections, wound dehisence, intra-abdominal collection, post op leak, prolonged hospital stay.

In case of uneventful recovery, patients were discharged when they had a good appetite and were ambulatory.

If patients developed complications, they were managed accordingly.

All patients were called for follow up after 30 days of surgery and as per requirement then after.

Patients with perforated peptic ulcer were divided into four groups based on the Boey scoring system.

Based on the PULP scoring system, patients were divided into two groups.

Boey Score

Concomitant medical illness (severe heart disease, renal disease, liver disease, DM)

Preoperative shock (systolic BP <90mmhg)

Duration of perforation more than 24 hours

Score: 0-3 (each factor scores 1 point if positive)

Group	Score
I	0
II	1
III	2
IV	3

Pulp Score

Age > 65 years	3
Comorbid active malignant disease or AIDS	1
Comorbid liver cirrhosis	2
Concomitant use of steroids	1
Shock on admission	1
Systolic BP < 100 mm Hg	
Heart rate > 100/minute	
Time from perforation to admission>24 hours	1
Serum creatinine >1.4 or >130 µmol/L	2
ASA scores	
2	1
3	3
4	5
5	7

GROUP	SCORE
I(low risk)	0-7
II(high risk)	8-18

Result and Analysis

Total of 100 patients operated in SSG Hospital for perforated peptic ulcer ≥18 years were included in the study after taking consent. Among all the study participants, 75% were males and 25% were females. The median age of the study participants was 40.5 years with inter-quartile range of 25 to 60 years.

Table 1: Age wise distribution of participants

Age group	Frequency	Percentage
≤65	91	91.0%
>65	9	9.0%
Total	100	100.0%

Table 2: Complication wise distribution of study participants

Complications	Frequency	Percentage
Present	57	57%
Surgical Site Infection	57	100%
Wound Dehiscence	16	28%
Intra-abdominal collection	5	9%
Post op leak	3	5%

Among all 100 participants, 57 of the study participants developed complications. Surgical site infection was found in all 57 study participants and among them 16 participants developed wound dehiscence, 5 developed intra-abdominal collection and 3 developed post-operative leak.

Table 3: Correlation of BOEY score with Surgical site infection

Boey score	Surgical Site Infection			
	Yes	No	Total	
0	2	6	8 (8.0%)	Chi-square for trends = 14.678 P= 0.0001
1	26	33	59 (59.0%)	
2	25	2	27 (27.0%)	
3	4	2	6 (6.0%)	
Total	57 (57.0%)	43 (43.0%)	100	

Above table shows that there was correlation of BOEY score with surgical site infection which was found to be statistically significant. So, with the increase of BOEY

score there was significant rise in the surgical site infection rate. (Chi-square for trends= 14.68; p<0.0001)

Table 4: Correlation of BOEY score with Wound dehiscence

Boey score	Wound dehiscence			
	Yes	No	Total	
0	1	7	8 (8.0%)	Chi-square for trends = 7.466 P = 0.0063
1	4	55	59 (59.0%)	
2	9	18	27 (27.0%)	
3	2	4	6 (6.0%)	
Total	16 (16.0%)	84 (84.0%)	100	

Above table shows that there was correlation of BOEY score with wound dehiscence which was found to be statistically significant. So, with the increase of BOEY score there was significant rise in the wound dehiscence rate. (Chi-square for trends= 7.46; p=0.0063)

Table 5: Correlation of BOEY score with Intra-abdominal collection

Boey score	Intra-Abdominal Collection			
	Yes	No	Total	
0	0	8	8 (8.0%)	Chi-square for trends = 10.721 P=0.0133
1	0	59	59 (59.0%)	
2	4	23	27 (27.0%)	
3	1	5	6 (6.0%)	
Total	5(5.0%)	95 (95.0%)	100	

Above table shows that there was correlation of BOEY score with intra-abdominal collection, which was found to be statistically significant. So, with the increase of

BOEY score there was significant rise in intra-abdominal collection rate. (Chi-square for trends= 10.72; p=0.0133)

Table 6: Correlation with BOEY score with Post-operative leak

Boey Score	Post-operative leak			
	Yes	No	Total	
0	0	8	8 (8.0%)	Chi square for trends = 2.981 P=0.0842
1	0	59	59 (59.0%)	
2	3	24	27 (27.0%)	
3	0	6	6 6.0%)	
Total	3 (3.0%)	97 (97.0%)	100	

Above table shows that there was no correlation of BOEY score and post-operative leak, which was not found to be statistically significant. (Chi-square for trends= 2.98; p=0.084)

Table 7: Correlation with PULP score with Surgical site infection

PULP-score	Surgical Site Infection			
	Yes	No	Total	
8-18	1	2	3 (3.0%)	Chi-square = 0.062 P= 0.8036
0-7	56	41	97 (97.0%)	
Total	57 (57.0%)	43 (43.0%)	100	

Above table shows that there was no correlation of PULP-score with surgical site infection, which was not found to be statistically significant. (Chi-square= 0.062; p=0.803)

Table 8: Correlation with PULP score with Wound dehiscence

PULP-score	Wound dehiscence			
	Yes	No	Total	
8-18	1	2	3 (3.0%)	Chi-square= 0.001 P = 0.97
0-7	15	82	97 (97.0%)	
Total	16 (16.0%)	84 (84.0%)	100	

Above table shows that there was no correlation of PULP-score with wound dehiscence, which was not found to be statistically significant. (Chi-square= 0.001; p=0.97)

Table 9: Correlation with PULP score with Intra-abdominal collection

PULP-score	Intra-Abdominal Collection			
	Yes	No	Total	
8-18	0	3	3 (3.0%)	Chi-square = 0.886 P = 0.35
0-7	5	92	97 (97.0%)	
Total	5 (5.0%)	95 (95.0%)	100	

Above table shows that there was no correlation of PULP-score with intra-abdominal collection, which was not found to be statistically significant. (Chi-square= 0.886; p=0.35)

Table 10: Correlation with PULP score with Post-operative leak

PULP-score	Post-Operative Leak			
	Yes	No	Total	

8-18	1	2	3 (3.0%)	Chi-square= 1.985
0-7	2	95	97 (97.0%)	
Total	3 (3.0%)	97 (97.0%)	100	P = 0.16

Above table shows that there was no correlation of PULP-score with post-operative leak, which was not found to be statistically significant. (Chi-square= 1.96; p=0.16)

Table11: Correlation of BOEY score with mortality

Boey score	Deceased	Discharge	Total	
0	0	8	8 (8.0%)	Chi-square for trend= 14.040
1	1	58	59 (59.0%)	P = 0.0002
2	7	20	27 (27.0%)	
3	2	4	6 (6.0%)	
Total	10 (10.0%)	90 (90.0%)	100	

Above table shows that there was correlation of BOEY score with the outcome of the study participants. So, the death of the study participants increased with the increase of BOEY score.

Table 12: Correlation of PULP score with mortality

PULP score	Deceased	Discharge	Total	
8-18	3	0	3 (3.0%)	Chi-square= 18.480
0-7	7	90	97 (97.0%)	P= < 0.0001
Total	10 (10.0%)	90 (90.0%)	100	

Above table shows that there was correlation of PULP score with the outcome of the study participants. So, the death of the study participants is higher in the high-risk patients categorized by PULP score.

Figure 1: Comparison of ROC curve for BOEY score and PULP score
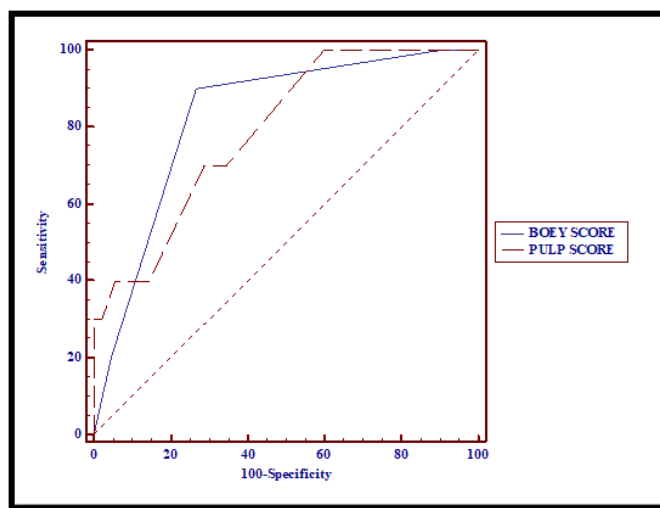
Based on above ROC curve comparisons there is no statistically significant difference between BOEY score and PULP score in predicting the mortality of the study participants (AUC of BOEY score=82.78%, AUC of PULP score=78.94% with difference between two areas of BOEY score and PULP score= 3.83%; p=0.49)

Discussion

Present study was conducted among 100 patients who were treated for perforated peptic ulcers aged more than 18 years while being admitted at department of general surgery, Sir Sayajirao general hospital, Baroda, Gujarat during June 2021 to November 2022 with aim to compare known risk scores i.e the BOEY score and the PULP score in the prediction of mortality and morbidity in patients surgically treated for perforated peptic ulcer.

The aim of this study was to to compare known risk scores The BOEY score and The PULP score in the prediction of mortality and morbidity in patients surgically treated for perforated peptic ulcer.

After applying inclusion and exclusion criteria 100 patients (75 males and 25 females) were enrolled in the study.

Detailed history of the patient was taken. Clinical examination and All routine blood investigations, X-Ray abdomen upright and USG abdomen were done to confirm the diagnosis or to find whether the patient could be posted for emergency laparotomy.

Patients with perforated peptic ulcer were divided into four groups based on the Boey scoring system. Based on the PULP scoring system, patients were divided into two groups.

The outcome was observed in terms of mortality and morbidity which consist SSI, Wound dehiscence, intra-abdominal collection and post-operative leak.

The comparison of normally distributed continuous variables between the groups was performed using the Student's t test. Nominal categorical data between the groups was compared using the Chi-square test or Fisher's exact test as appropriate with regard to the prediction of morbidity and mortality by Boey and PULP score risk stratification. For all statistical tests a p value of < 0.05 was considered statistically significant. Logistic regression analysis and receiver-operating characteristic (ROC) curve analysis was used to estimate the predictive ability of the Boey score and PULP score in assessing the postoperative morbidity and mortality.

In present study of 100 patients, 91 patients (91%) belonged to age group of <=65 years, while 9 patients (9%) belonged to age group of >65 years. Present study comprised of 75 male and 25 female patients.

Out of 100 patients, 20 patients had concomitant medical illness. In this study 90% patients presented after 24 hours of onset of symptoms.6% of patients were in shock at the time of presentation.32% of patients presented with S. Creatinine>1.47 mg/dl.76% of patients presented to the facility with ASA-score 0 followed by ASA-score 1 (23%), ASA-score 2 (0%), ASA-score 3 (1%).

Among all the participants, 57 study-participants developed complications. All 57 participants developed surgical site infection and among them 16 participants developed wound dehiscence, 5 developed intra-abdominal collection and 3 developed post-operative leak.

Incidence of mortality was 10% and they all belonged to PULP score group of >7 and BOEY score group of >1.

BOEY score is 90% sensitive and 73.3% specific in predicting mortality of study participants with positive predictive value is 27.3% and negative predictive value is 98.5% and area under the ROC curve is 82.78% which was significant (95% CI 74% to 90%, P value = <0.0001).

PULP score is 70% sensitive and 71.1% specific in predicting mortality of study participants with positive predictive value is 21.2% and negative predictive value is 95.5% and area under the ROC curve is 78.94% which was significant (95% CI 70% to 86%, P value = <0.0001).

Conclusion

The study was to compare known risk scores The BOEY score and The PULP score in the prediction of mortality and morbidity in patients surgically treated for perforated peptic ulcer which concludes-

BOEY score was found to be more sensitive in predicting mortality of study participants as compared to

PULP score. BOEY score and PULP score were equally specific in predicting mortality of study participants.

BOEY score and PULP score were equally sensitive and specific in predicting morbidity of study participants in terms of surgical site infections, wound dehiscence, intra-abdominal collection and post operative leak.In the present study, The BOEY score was found to be the better prognostic scoring system for post-operative morbidity and mortality in surgically treated patients of Perforated peptic ulcer than PULP score.

Complication

Among all the participants, 57 study-participants developed complications. All 57 participants developed surgical site infection and among them 16 participants also developed wound dehiscence, 5 developed intra-abdominal collection and 3 developed post-operative leak.

Limitations

Not all patients are the same: Each patient has their own infirmities and deficiencies eg: Vit B12, Iron, Zinc, varying degrees of malnourishment all of which contributes to varying states of Immunity and variable rates of wound healing. The levels of stress in each personal also vary. The cause for the peptic ulcer and its perforation may be varied.

The study was a single blind study. Observer bias is possible in the recording and therefore interpretation of results.

A similar study with larger sample size and longer duration in the future may give more valuable result.

Abbreviation

PPU- PERFORATED PEPTIC ULCER

ASA- AMERICAN SOCIETY ON ANAESTHESIOLOGISTS

PULP- PEPTIC ULCER PERFORATION

HSV- HIGHLY SELECTIVE VAGOTOMY

MPI- MANNHEIM PERITONITIS INDEX

APACHE- ACUTE PHYSIOLOGY AND CHRONIC HEALTH EVALUATION

SAPS- SIMPLIFIED ACUTE PHYSIOLOGY SCORE

POSSUM- PHYSIOLOGICAL AND OPERATIVE SEVERITY SCORE FOR ENUMERATION OF MORTALITY AND MORBIDITY

MPM- MORTALITY PROBABILITY MODEL

DOA- DATE OF ADMISSION

DOD- DATE OF DISCHARGE/DEATH

DOP- DURATION OF PRESENTATION

BP- BLOOD PRESSURE

CMI- CONCOMITANT MEDICAL ILLNESS

LC- LIVER CIRRHOSIS

UOS- USE OF STEROIDS

SSI- SURGICAL SITE INFECTION

WD- WOUND DEHISCENCE

IAC- INTRA-ABDOMINAL COLLECTION

POL- POST-OP LEAK

LOH- LENGTH OF HOSPITAL STAY

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