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Original Research Paper

Surgery

APPLICATION OF POMPP SCORING SYSTEM TO PREDICT POST OPERATIVE MORTALITY IN PATIENTS WITH PERFORATED PEPTIC ULCER: IS IT REALLY A PRACTICAL SCORE FOR INDIAN POPULATION?

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ABSTRACT

Background: The POMPP (Practical scoring system of mortality in patients with perforated peptic ulcer) score is a simple method which is new and easily applicable scoring system. Our aim is to predict the post operative mortality rate in patients with perforated peptic ulcer by using POMPP scoring system in Indian population.

Method: A prospective study of total 100 patients of perforated peptic ulcer operated in J.L.N. Hospital, Ajmer were included in our study. Three parameters corresponding score 1 for each are included in this multivariate analysis which are age > 65 years, albumin ≤ 1.5 g/dl and BUN (Blood urea nitrogen) > 45 mg/dl. All data that may be potential predictors with respect to hospital mortality were analyzed and compared with previous studies.

Results: In our study of 100 patients with M: F ratio 7.33 around 17 deaths was recorded out of which 14 were males and 3 were females. We have observed that mortality rates were significantly affected by the parameters of POMPP scoring system with 0%, 11.76%, 35.29% and 52.95% mortality for scores 0, 1, 2 and 3 respectively. We also observed out of 17 deaths 15 deaths were seen in age group > 65 years, 11 deaths were associated with albumin < 1.5gm/l and 16 deaths were associated with blood urea nitrogen > 45mg/dl. Data analysis was done using chi square method.

Conclusion: POMPP scoring system consists only age and routinely measured two simple laboratory tests (albumin and BUN), its application is easy and prediction power is satisfactory. It provides early detection of high risk peptic perforation cases; allow other supportive treatment modality apart from surgery which can decrease the mortality.

KEYWORDS : Peptic ulcer, Perforation, Mortality, POMPP (Practical scoring system of mortality in patients with perforated peptic ulcer) score, Peptic Ulcer Perforation Score (PULP), ASA (American Society of Anesthesiologists) .

INTRODUCTION:

Peptic ulcer disease and its complications (haemorrhage, perforation and obstruction) have been a major threat globally over the past two centuries with a high morbidity and mortality at estimated 50% and 30% respectively.[1] The knowledge of etiopathogenesis of peptic acid disease has evolved from acid-driven disease to an infectious disease. This in turn, has opened up this topic for various studies to find the best possible options for management of this disease.[2] Mortality prediction for PPU (Perforated peptic ulcer) has already been done through various scoring systems such as Boey, Peptic ulcer perforation score (PULP), Jabalpur score and ASA (American Society of Anaesthesiologists). PULP score appears to have the greatest predictability of mortality however it is impractical with its complexity. Boey score is a more practical but with varying predictability as found in several studies. Well history taking is required in both scoring systems to detect the duration of symptoms and co-morbidities. However; this data cannot be taken reliably from some elderly patients. The Jabalpur score (Mishra et al., 2003) used multiple regression analysis and developed a scoring system based on six identified risk factors which included age, co-morbid illness, perforation to surgery time interval, preoperative shock, heart rate and serum creatinine levels to predict post-operative mortality. [21]

ASA is a non-specific scoring system is for PPU whose predictability is not superior to the others with a major drawback of its subjective assessment. Early detection of the patients with high risk for mortality after PPU surgery can enable other treatment modality except surgery or can necessitate some extra care protocols to decrease the mortality.

The POMPP (Practical scoring system of mortality in patients with perforated peptic ulcer) score is a simple quantitative method which is new and easily applicable scoring system to predict the postoperative mortality rate in patients with PPU. This scoring system is simply based on only age and routinely measured two simple laboratory tests (albumin & BUN). Age > 65 Years, blood albumin ≤ 1.5 and blood urea nitrogen > 45mg/dl were given one point each.[26] [Table 1]

Table 1- The POMPP score system:

Parameters	Cut off values	Score assigned
Age	>65 years	1
Albumin	≤ 1.5 gm/l	1
BUN	>45 mg/dl	1
Total		3

AIMS & OBJECTIVES:

To evaluate the accuracy of POMPP scoring system to post-operative mortality among patients with PPU in correlation with age > 65 years and two laboratory tests (Albumin ≤ 1.5gm/l & BUN > 45mg/dl).

MATERIAL AND METHODS:

We conducted our study in tertiary care centre government hospital, Ajmer in central Rajasthan (India) after ethical clearance and include 100 patients, who presented to emergency and surgical outpatient department during periods of January 2017 to January 2018 with sign and symptoms of PPU. From our study we have excluded patients below 12 years of age, patient with history of abdominal trauma, faecal fistula and malignant perforated tumours. After initial assessment of patients presenting with sign and symptoms suggestive of perforated peptic ulcer, who met inclusion criteria admitted and are initially subjected for detailed history taking, clinical examination and investigations like haematological investigations, X-ray

abdomen/chest, USG abdomen and CT scan if required.

Patients with perforated peptic ulcer were divided into four groups based on POMPP scoring system (score 0-3).[Table 2]

Table 2- Group Allocation According To Score.

Group	Score
Group 1	Score 0
Group 2	Score 1
Group 3	Score 2
Group 4	Score 3

A specially designed Performa was filled in for each patient who was operated for PPU. These Performa's had general information about the patients plus three variables based on POMPP scoring system. The score of each patients was sum total of three independent risk factors (Age > 65 years, blood albumin ≤ 1.5 gm/dl & blood urea nitrogen > 45 mg/dl) a value of 1 was assigned to each factor. Both the values of albumin and blood urea nitrogen were included according to the pre operative samples taken.

In each and every case of perforated peptic ulcer during laparotomy primary closure with omental grafting was performed. A feeding jejunostomy was added in cases of larger perforations based on the surgeon's decision. Procedures other than primary closure with omentoplasty were not included in the study. An intra-abdominal drain was usually placed after thorough peritoneal lavage using normal saline in all cases.

Prompt evaluation for mortality was done during postoperative period. Patients with uneventful recovery were discharged from the hospital when they had a good appetite and were ambulatory. Patients with complications were managed accordingly. All patients were called for follow up 15 days after surgery and after that as per requirement.

RESULTS

In our study of 100 (88 males and 12 females) patients with M: F ratio of 7.33: 1, highest number of patients (44%) was observed in age group 41 to 60 and least number of patients (4%) in age group 21 years and below. Mean age of patients in our study was 47.76 years. Group wise distribution of albumin with the highest (64%) percentage of patients was in between ranges of 2.6-3.5 and group wise distribution of blood urea nitrogen with the highest (43%) percentage of patient falling between ranges of 21-45. Out of 17 deaths 14 were males while remaining 3 were females. In our study 15 deaths have been reported in age group ≥ 65 years and 2 deaths in < 65 years of age, Out of 12 patients with albumin ≤ 1.5g/L, 11 patients have died while only one has survived and in the other group, out of 88 patients with albumin > 1.5 only 6 have died. In our study we have observed that out of 79 patients with BUN ≤ 45 mg/dl, only one death was reported and in another group out of 21 patients with blood urea nitrogen > 45 mg/dl, 16 deaths were reported. There was an inverse correlation between age and albumin suggesting that increasing age is associated with decreasing levels of albumin and direct correlation seen between age and blood urea nitrogen suggesting increasing age is associated with raised level of blood urea nitrogen probably due to deranged renal function with increasing age. We also observed an inverse correlation between Blood urea nitrogen and albumin suggesting increasing blood urea nitrogen level associated with decreasing levels of albumin. We have observed that mortality rates were significantly affected by the parameters of POMPP scoring system with 0%, 11.76%, 35.29% and 52.95% mortality for scores 0, 1, 2 and 3 respectively. [Table 3].

Table 3- POMPP Score And Mortality Of The Study:

Score	Mortality (Number- 17)	Percentage
0	0	0%
1	2	11.76%
2	6	35.29%
3	9	52.95%

DISCUSSION

A perforated ulcer is a condition in which an untreated ulcer can burn through the wall of the stomach allowing digestive juices and food to leak into the abdominal cavity. Immediate surgery is generally required. An erect abdominal/chest X-ray (seeking air under the diaphragm) is generally taken to reach diagnosis. Many perforated ulcers have been attributed to the bacterium Helicobacter pylori, smoking and non steroidal anti-inflammatory drugs (NSAIDs).

The incidence of Perforation is about 2-10% in patients with Peptic ulcer disease and accounts for more than 70% of death associated with peptic ulcer disease.[3] The incidence of duodenal perforation is 7-10 cases/1,00,000 adults per year.[4] The perforation site usually involves the anterior wall of the duodenum (60%), although it may involve the antrum (20%) and lesser curvature (20%). The first part of duodenum (66 patients) was the most common site of perforated peptic ulcer, encountered in our study, followed by pre pyloric region (28 patients) and body of stomach (6 patients). This observation was similar to that of other investigators like in their study 1st part of duodenum was the site of perforation in 60 patients (76.92%). Pyloric antrum was the site of perforation in 15 patients (19.23%) and stomach was the site of perforation in 3 patients (3.84%).[5]

In our study we observed that out of 17 deaths after surgery (exploratory laparotomy with repair by Graham's patch) for perforated peptic ulcer, patients with a score zero were having no mortality i.e., 0%. While two patients died by fulfilling the criteria for POMPP score 1 with a percentage of 11.76%. Among the POMPP score 2, total six patients died with percentage of 35.29% and greatest amount of patients among the deaths were of POMPP score 3 comprising 52.94% which were 9 patients. **[Table 3]**

The initial study by Menekse et al [26] (2015) showed that in the first group, with a score 0, there was no mortality. The second group included patients with POMPP score 1, who had a 7.1% risk of mortality; this group comprised approximately 1.8% of the cohort. The Third group, comprising approximately 4.8% of the patients, included those with a POMPP score of 2 whose risk of mortality 34.4% and last group with a POMPP score of 3 who had an 88.9% risk of mortality; this group comprised about 3.5% of the cohort.

In the study done by Menekse et al [26] (2015) a study population group of 227 patients were undertaken. Our study sample includes 100 patients, they have concluded that the three independent parameter viz., age > 65 years, albumin ≤ 1.5 g/L and blood urea nitrogen > 45 mg/dl with their raising values significantly affected in raising the post operative mortality rate among patients with peptic ulcer disease.

Similarly to POMPP scoring system, PULP or Boey scores were found that age over 60 or 65 was an independent risk factor for mortality.[8] Advanced age had been reported in several studies as an independent risk factor on mortality in PPU patients[7,8,9,10].

Another parameter of POMPP scoring system was blood urea nitrogen level regulated as a result of several conditions such as protein catabolism, steroid intake and gastrointestinal bleeding, regardless of renal functions; it is also accepted as a marker of a severity of disease[11].

Hypoalbuminemia alone had been shown as marker of increased risk of mortality and morbidity in PPU patients. Thorsen et al.[13] found that hypoalbuminemia was a strong

factor which might determine mortality solely. Strong correlation between hypoalbuminemia and mortality in PPU patients is not surprising when reduction of albumin synthesis is considered in cases of dehydration, hepatic dysfunction, critical clinical course, systemic inflammatory response syndrome and sepsis.[12,13,14]

Boey scoring system of is more practical than the PULP. However, prediction values of Boey scoring system were quite varying in several studies as compared to PULP scoring system. On the other hand, Boey scoring system didn't involve advanced age which is generally an important parameter for mortality in PPU.[6]

POMPP score is reliable since the three very clear parameters (age, albumin and BUN) can be easily adopted in the clinical practice to predict the surgical mortality of PPU patients. Respiratory support, circulatory stabilisation, preoperative and postoperative care in ICU, frequent monitoring and perioperative care protocols can be added to the high risk patients with PPU. It is demonstrated that if the high risk patients got extra perioperative care, the hospital mortality rate could be reduced from the standard care patients (17% and 27%, respectively, $p = 0.005$)[15]. Therefore, a simple and easy applicable system for predicting mortality for PPU may provide a reduction in mortality rates.

In our study, overall mortality was 17%, but it rise threefold to 52% in patients with all three POMPP risk factors. Overall mortality variation after surgery for PPU in recent studies range from 6% to 14% and remains at approximately 30-60% in patients with a Boey score of 2 or more.[16]

Many newer prognostic systems have been introduced to predict outcomes in severely ill patients. 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 Mannheim Peritonitis Index (MPI). Their utility on a large scale has not been proven as either some of them are applicable only in certain conditions or some take into consideration so many factors that calculating scores become too complex. [Table 4]

Table 4: Scoring Systems Used For Outcome Prediction In Perforated Peptic Ulcer

Scoring systems (reference)	Year of report	Target population	Outcome measured	Parameters evaluated
Boey[6]	1987	Patients with PPU	30 day mortality	Presence of major medical illness, preoperative shock, and perforation longer than 24 hr.
Jabalpur score[21]	2003	Patients with PPU	30 day mortality	Time from perforation to operation, mean systolic blood pressure preoperatively, heart rate, serum creatinine, age, comorbidity.
PULP[12]	2012	Patients with PPU	30 day mortality	PULP is a seven-variable score (range=0–18), based on age >65 years, liver failure, AIDS/active cancer, concomitant use of steroids, shock on admission, time from admission to surgery >24h, serum creatinine >130 (μmol/l) and ASA score
ASA[17]	2010	General surgical populations	Preoperative risk assessment for surgical patients	ASA, based on patients' pre-existing co-morbidity, considers the present clinical condition at admission and is graded 1–5 increasingly indicating a healthy person, mild systemic disease, severe systemic disease, severe systemic disease that is a constant threat to life and a moribund person not expected to survive without operation
Mannheim peritonitis index[18]	2002	General peritonitis	Peroperative prediction of outcome in patients with peritonitis	Age, gender, organ failure, duration of peritonitis, site of perforation, diffuse peritonitis, level of exudate
APACHE II[19]	1985	Critically ill patients	Prediction of outcome for ICU patients	Aids, metastatic cancer, liver failure, immunosuppression, chronic renal insufficiency, haemotologic malignancy, lymphoma, leukemia, age, heart rate, systolic blood pressure, respiratory rate, temperature, GCS, WBC, creatinine, blood gas, potassium, sodium, patient origin
SAPS II[20]	1993	Critically ill patients	Prediction of outcome for ICU patients	Aids, metastatic cancer, hematologic malignancy, age, heart rate, systolic blood pressure, temperature, GCS, urine output, WBC, bilirubin, urea, Potassium, sodium, Patient origin
POMPP[26]	2015	Patients with PPU	30 day mortality	Age > 65 years, BUN > 45 mg/dl, serum albumin ≤ 1.5g/l

PULP scoring system data was a result of a national data created by testing a large patient population. Even though, mortality predictive power of PULP scoring system was a little better than the POMPP scoring system (PULP AUC: 0,955 vs. POMPP AUC: 9,931; $p > 0, 5$), it is not easy to use the PULP in clinical practice. PULP is based on partially patient's account of their medical history and admission time was defined as the end of time interval which didn't reflect total duration of abdominal contamination. Additionally, three variables were included. Moller et al.[12] have given AUC value of 0.83 for mortality prediction for PULP scoring system. In a recent study by Thorsen et al. [13] found the AUC value as 0.79. Where as in POMPP score it was found as 0.95. [Table 5]

Table 5: Scoring accuracy of mortality prediction in PPU patients

Scoring systems evaluated	Mishraet al[21]	Lohsiriwat et al 22]	Koc et al [23]	Møller et al [24]	Buck et al [25]	Menekse et al(26)
	Mortality rate	Mortality rate	Mortality rate	Mortality rate	Mortality rate	Mortality rate
	10.7%	9.0%	10.6%	27.0%	17.0%	15.36%
	Area under the ROC Curve (AUC)					

ASA		0.91		0.78	0.73	
Boey	0.85	0.86		0.70	0.63	
Apache II			0.87		0.76	
Modified Apache II	0.84					
Jabalpur score	0.92					
PULP				0.83		
POMPP						0.931

The accuracy of POMPP scoring system in predicting post operatives death in peptic perforation patients has been reaffirmed in our study. The odds ratio of developing mortality increased progressively with increasing number of the POMPP score. 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 outcomes with a high degree of precision and the scores should be easy to calculate.

CONCLUSION:

POMPP is a very simple consists only age and routinely measured two simple laboratory tests (albumin and BUN), its application is easy and prediction power is satisfactory, appropriate scoring system for Indian population that may allow surgeon to perform a rapid analysis and may help in predicting mortality rate. Early detection of high risk peptic perforation cases, allow other supportive treatment modality apart from surgery which can decrease the mortality.

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