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Research Article

Analysis of Mannheim peritonitis index scoring in predicting outcome in patients with peritonitis secondary to hollow viscous perforation

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ABSTRACT

Background: Despite advances in critical care medicine, prognosis in peritonitis due to hollow viscous perforation remains poor especially when associated with multi-organ dysfunction. Various grading systems are available to analyse and stratify patients by different parameters and predict outcome. In a prospective non randomised observational study, the efficacy of Mannheim peritonitis Index (MPI) was analysed in predicting the outcome in patients treated for peritonitis due to hollow viscous perforation.
Methods: A total of 100 consecutive patients with peritonitis undergoing surgical treatment at SDM College of Medical Sciences Hospital Dharwad, were included in study. Demographic, clinical data, evaluation with surgical treatment, outcome details were documented and analyzed using SPSS software.
Results: The mean MPI score in this study was 23.81 with 11 lowest and 39 as the highest. The overall mortality was 14% and morbidity 35%. MPI scores of <21, 21-29 and >29 had an overall mortality of 0%, 3%, and 11% respectively. MPI score of 29 had sensitivity of 87.21%, specificity of 78.57% and predictive power of 0.945 in predicting mortality. Higher mortality rates were associated with presence of multi- organ failure, duration of symptoms of more than 24 hours, faecal peritonitis and presence of malignancy. The sensitivity and specificity for morbidity at MPI score of 29 were 86.14% and 83.58% respectively.
Conclusions: The study clearly suggests increasing risk of mortality, morbidity and overall hospital stay with increasing MPI score. The MPI scoring system is simple and effective in predicting outcome of patients with peritonitis.

Keywords: Peritonitis scoring, Duodenal ulcer, Perforated appendix, Faecal peritonitis, MPI

INTRODUCTION

Peritonitis secondary to hollow viscous perforation is a potentially life threatening condition. Despite development in diagnosis and management the prognosis of peritonitis remains poor, the mortality rates are still high, ranging from 10-20%. Early identification of patients with peritonitis may help in selecting patients for accurate surgical treatment.[1-3] A good scoring system is useful in comparing various groups of patients, different treatment modalities, evaluating new therapies, in monitoring resources for effective use and improving standard of care.[4,5] Many scoring systems are available to grade the severity of acute peritonitis for example, Acute physiology and chronic health evaluation (APACHE) II score, Simplified acute physiology score (SAPS), sepsis

severity score (SSS), Ranson score, Imrite score, Mannheim peritonitis index (MPI).[6,7] MPI was developed by Wacha and Linder in 1983.[8] Amongst the various scoring systems Mannheim peritonitis Index (MPI) is a specific, simple with a good accuracy and provides an easy way to handle with clinical parameters, allowing the prediction of the individual prognosis of patients with peritonitis.[9]

Main objective of the study was to evaluate Mannheim Peritonitis Index in predicting the outcome of surgery in patients with peritonitis.

METHODS

This was a prospective observational study conducted in single surgical unit in the Department of General Surgery at SDM College of Medical Sciences Hospital, Dharwad, Karnataka, India, from January 2011- May 2014. Patients were enrolled in study only after informed written consent. A total of 100 consecutive patients diagnosed with peritonitis secondary to hollow viscous perforation and treated surgically were included. Patients with primary peritonitis occurring in conditions like liver or renal failure, chemical peritonitis due to postoperative bile leakage, peritonitis secondary to trauma, age less than 16 years, peritonitis patients with laparotomy done elsewhere or transferred out to continue treatment elsewhere were excluded from the study, also patients managed conservatively were not included in the study. Initial preoperative work up and resuscitation with intravenous fluids, antibiotics, analgesics, nasogastric decompression was done in all the cases. Site of hollow viscous perforation along with extent of peritonitis and character of exudate were documented. Appropriate surgical procedure was performed based on Etiology and patient condition. Thorough peritoneal lavage was given in all cases. Further resuscitation and ICU care was continued as and necessary. The followed up was continued postoperatively till one the various outcomes i.e. mortality, morbidity or discharge. Morbidity during the follow up period was determined by identification of one or more of the following complications: chest infection, surgical site infection, superficial wound gape, wound dehiscence, deep vein thrombosis, pulmonary embolism etc. The MPI scoring (Table 1) was applied along with other clinical and biochemical parameters recorded in pre-structured proforma. Total patient MPI score was the sum total of all the positive risk factor scores. Prediction was categorized into 3 groups: i) score <21 ii) score 21-29 iii) score >29. This was conducted regularly every alternate day following the initial visit until patient's discharge or death. Data obtained was analyzed for predicting mortality and morbidity.

Statistical analysis

It was performed using SPSS (Version 22). 95% confidence intervals applied as necessary and risk ratio calculated for each group. Chi-square test was used for intergroup comparisons. The level of significance was fixed at p-value of <0.05. Morbidity and mortality rates for the stratified MPI scores were calculated and the predictive power of the MPI, sensitivity and specificity derived from receiver-operator characteristic (ROC) curve analysis.

Table 1: Mannheim peritonitis index scoring system.

Risk Factor	Weightage, if any
Age >50 years	5
Female gender	5
Organ failure*	7
Malignancy	4
Pre-operative duration of peritonitis > 24 hours	4
Origin of sepsis not colonic	4
Diffuse generalised peritonitis	6
Exudates	
Clear	0
Cloudy, purulent	6
Faecal	12

*Definitions of organ failure: Kidney: creatinine >177 µmol/L, urea >167 µmol/L, oliguria <20 ml/h; Lung: pO2 <50 mmHg, pCO2 >50 mmHg; Shock: hypodynamic or hyperdynamic; Intestinal obstruction (only if profound): Paralysis >24 h or complete mechanical ileus.

RESULTS

From January 2011 to May 2014, 100 patients with peritonitis secondary to hollow viscous perforation, confirmed during surgical intervention were included in the study. Of the 100 patients, 20 were female and 80 were male. The age of patients ranged from 21 to 79 years with a mean of 45.64 years. The mean preoperative duration of symptoms was 4.2 days and ranged from 1-8 days. Amongst the Etiology (Table-2) duodenal ulcer perforation was the commonest (42%) and Ileal perforations were presumed to be due to enteric fever.

Table 2: Etiological distribution with mortality.

Etiology	Males	Females	Total	Overall deaths
Duodenal ulcer	35	7	42	6
Gastric ulcer	14	3	17	2
Jejunal + ileal ulcers	13	5	18	4
Appendix	16	5	21	1
Colo-rectal	2	0	2	1
Total	80	20	100	14

Total number of patients in each etiological group along with sex distribution and overall mortality.

Primary Closure of perforation with Omental Patch was done in 57% cases, Appendicectomy in 19%, simple closure of perforation in 14% cases, resection and primary anastomosis in 5%, resection with ileostomy in 2%, and right hemi-colectomy in 2% of cases with one (1%) patient undergoing colectomy and stoma formation. Outcome is summarized in (Table 3). Mean hospital stay in our study was 14.8 days (range 8 to 37 days). In our study we encountered 14 deaths (14%), of which 11 patients died of sepsis with multi- organ dysfunction, two patients died of Acute Renal Failure and one patient died of Cardiogenic Shock. In this study, the mean MPI score was 23.81 with score of 11 as the lowest and 39 as the highest. In all the three MPI groups studied, the influence of MPI score was statistically highly significant with regard to mortality, morbidity and overall hospital stay. MPI score of 29 was taken as a threshold and dichotomous analysis performed using ROC curve (Figure 1). The two MPI intervals above and below the score of 29 studied also showed MPI scores were statistically significant in predicting mortality, complications and duration of hospital stay. The ROC curve for mortality showed a predictive power of 0.945 with a sensitivity of 87.21% (range78.27 – 93.44) and specificity of 78.57% (range 49.20% to 95.34%). (Table 4). MPI score of 29 and more was associated with 11% overall mortality (p value <0.001) and in the group of patients with MPI score more than 29 the mortality rate was 50%. In this study higher mortality rates were associated with presence of multi- organ failure, duration of symptoms of more than 24 hours, faecal peritonitis and presence of malignancy. MPI score evaluation for morbidity showed an overall 35% morbidity in our study. Superficial wound infection in 24% cases, Respiratory complications in 21% cases, Intra-abdominal abscess 2%, partial wound dehiscence 2%, complete wound dehiscence 1% and Subclavian vein thrombosis due to central line on right side was seen in one (1%) case. Sensitivity of 86.14% and specificity of 83.58% were observed for morbidity in our study at score of 29 (p value<0.001).

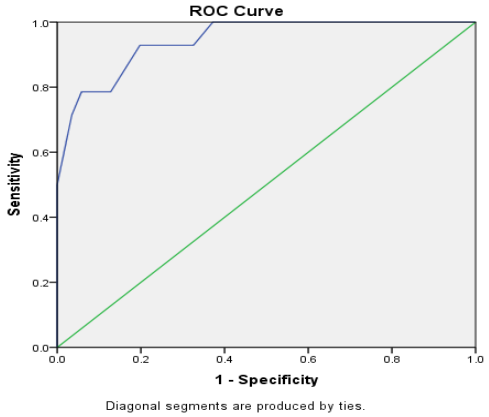
Table 3: MPI risk factors and observed mortality distribution.

MPI criteria	Total	Death
Age > 50	36	6
Female	20	3
Organ failure	64	14
Malignancy	2	2
Duration >24 hours	74	14
Origin of sepsis not colonic	78	11
Generalised peritonitis	94	14
Exudates		
Clear	24	0
Purulent	54	7
Faecal	22	7

Table 4: Distribution of patients in MPI groups and observed mortality in each group.

Score	<21	21-29	>29
No of patients	30	48	22
Mortality*	0	3	11

Sensitivity 87.21% (range78.27-93.44), specificity 78.57% (range 49.20% to 95.34%) at MPI score of 29. *P value < 0.001.



Area under the curve-0.945

Figure 1: Receiver-operating characteristic (ROC) curve analysis for mortality.

DISCUSSION

Peritonitis secondary to hollow viscous perforation is one of the commonest reasons for emergency surgery done even today. Various factors like age, sex, organ failure, malignancy, extent of peritonitis, type of contamination, site of perforation, surgical interventions are all known to influence mortality and morbidity. Effective preoperative management, timely surgery and proper post-operative care will decide the outcome. Different studies have mortalities ranging from 6.4% to 17.5%. According to the literature MPI is an effective, independent and objective scoring system in predicting mortality and has advantages over the other scoring systems.[10-13] In a meta-analysis of results from 7 centres involving 2003 patients, Billing et al reported an average group mortality rate of 2.3% for MPI score <21, 22.5% at score of 21-29 and 59% with score >29.[14] In a study conducted by Qureshi AM et al, in the group of patients with score of <21 had mortality of 1.9%, score of 21-29 had 21.9% and score >29 had mortality of 28.1%. Mortality rate for MPI score more than 26 was 28.1% while for scores less than 26 it was 4.3%.[15] Kusumoto Yoshiko et al., evaluated the reliability of the MPI in predicting the outcome of patients with peritonitis in 108 patients. A comparison of MPI and mortality showed patients with MPI score of 26 or less had mortality of 3.8%, where as those with a score more than 26 had mortality of 41.0%.[16]

In our study, the patients with MPI scores of <21, 21-29, >29 had a group mortality of 0%, 6%, and 50%

respectively and on dividing the patients into two intervals at threshold score of 29 a statistically significant difference in mortality with 6% for MPI score <29 and 50% for MPI > 29 (p- value<0.001) was observed. This clearly suggests increasing risk of mortality with increasing MPI score. Seiler et al analyzed 258 patients with generalized peritonitis and reported mean MPI score of 27.1.[17] Bielecki et al found mean MPI score of 24.2 among patients with large bowel perforation.[18] In our study, the mean MPI score was 23.81and 48% of our patients were in the MPI score group of 21-29. In our study higher mortality and morbidity was associated with presence of multi-organ failure, duration of symptoms more than 24 hours, faecal peritonitis and presence of malignancy. Wabwire et al found female gender, age above 50 years, presence and number of organ dysfunction, character of exudate and extent of peritonitis as significant factors in prediction of complications and mortality.[19] Melero reported gender was not a significant factor[20] and Seiler et al concluded preoperative duration significantly influences the outcome in addition to other factors mentioned[17] In analysis of ROC curve for mortality, Billing et al reported a mean sensitivity of 86% (54%-98%) and specificity of 74% (58%-97%) at MPI score of 26.[14] Biondo et al reported a predictive power of 0.725 at an MPI score of 26.[21] In our study the predictive power of mortality at MPI score of 29 was 0.945 with sensitivity of 87.21% (range 78.27-93.44) and specificity of 78.57.8% (range 49.20% to 95.34%). Various studies show overall mortality rates ranging from 6% to 42%.[8,14,17,22-25] We encountered 14% overall mortality rate. In our study the mean age of patients was 45.6 years. Studies from Western population showed relatively older age group ranging from 44-64.8 years, even in centres where the etiological spectrum closely resembled our findings.[8,9,14,17,26] With regard to etiology, studies from Western population show colonic perforation due to diverticular disease and cancer (16-70%) as the leading cause followed by gastro duodenal peptic ulcer perforation (16%) and perforated appendicitis (8%).[14,17,23,24,27] In our study, the most common (58%) cause of peritonitis was secondary to duodeno-gastric peptic ulcer perforations. Overall morbidity rates in various studies for surgery in perforative peritonitis vary widely ranging from 18% to 67%.[8,14,17,27] In our study the overall morbidity rate was 35% with sensitivity of 86.14% and specificity of 83.58% at MPI score of 29.

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