Mannheim Peritonitis Index as a Predictor of Post-operative Complications, Mortality and Duration of Hospital Stay in Patients with Peritonitis due to Hollow Viscus Perforation: A Prospective Cohort Study

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ABSTRACT

Introduction: Peritonitis due to hollow viscus perforation is a common surgical emergency and can be life-threatening. Patients who undergo surgery for peritonitis require extensive counselling to fully understand the nature of the disease, the need for surgery, post-operative complications and the duration of hospital stay. Hence, scoring systems are necessary to determine the severity of the disease to provide sufficient prognostic data.

Aim: To evaluate the Mannheim Peritonitis Index (MPI) scoring system as a predictor of post-operative complications, mortality and duration of hospital stay in patients with peritonitis due to hollow viscus perforation.

Materials and Methods: The prospective cohort study was carried out in 50 diagnosed cases of perforation peritonitis admitted at the centre during the study period from November 2017 to October 2018. MPI was calculated for each patient, following which they were stratified into three risk groups- 1, 2 and 3 with scores of \( \leq 20, 21-29 \) and \( \geq 30 \), respectively. Post-operative complications, mortality, and duration of hospital stay were analysed. Statistical analysis was done using the Statistical Package for the Social Sciences (SPSS) software 24.0.

Results: Out of 50 patients included, 36 were male and 14 were female with a mean age of 41.14 years. A total of eight patients suffered mortality. The incidence of mortality in risk Group-1 was 0 out of 29 patients (0%), risk Group-2 was 3 out of 13 patients (23.1%) and risk Group-3 was 5 out of 8 patients (62.5%), respectively and hence MPI was a useful indicator of prediction of mortality in perforation peritonitis patients. The risk factors which had a higher significance in predicting mortality were found to be, organ failure at presentation and the nature of intra-peritoneal exudate with a p-value of 0.029 and <0.001, respectively. In 29 patients, there were no complications and 13 patients had a single complication, 8 patients had multiple complications. The incidence of multiple post-operative complications in a patient in risk Group-1, 2 and 3 were 1 (12.5%), 2 (25%) and 5 (62.5%) patients, respectively. The number of complications in a patient increased as the MPI score increases. Dispersion of duration of hospital stay in discharged patients according to MPI score using Pearson's correlation, showed statistical significance with the value of r being 0.6214, the p-value being 0.000011. The duration of hospital stay of patients who were discharged, increased as the MPI score increased.

Conclusion: MPI was effective in predicting post-operative complications, mortality and duration of hospital stay in patients with peritonitis due to hollow viscus perforation and hence can be used as an effective tool to facilitate counseling and educate the patient and relatives regarding the expected course of the disease in that particular patient.

INTRODUCTION

Acute generalised peritonitis due to gastrointestinal hollow viscus perforation is a common surgical condition. The prognosis of peritonitis remains poor despite intensive care treatment and antibiotics. The mortality rate due to peritonitis ranges from 6 to 27% despite recent developments in diagnosis and management [1]. Several scoring systems like Sepsis Severity Score (SSS), Acute Physiology And Chronic Health Evaluation II (APACHE II), Portsmouth-Physiological and Operative Severity Score for the enumeration of Mortality and morbidity (P-POSSUM), Peptic Ulcer Perforation (PULP) score, and Boey's score are present for the prediction of outcome in a patient of peritonitis due to hollow viscus perforation [2-6].

There is no ideal scoring system for the prediction of post-operative outcomes in patients needing emergency surgery. At present, the available scoring systems have a limitation of either having a large number of variables (e.g., SSS, APACHE II, P-POSSUM), or scoring system being specific to peptic ulceration (e.g- PULP, Boey). MPI was developed by Wacha H and Linder MM in 1983 [7]. Amongst the various scoring systems, MPI is a simple scoring system with 8 variables, which can be applied to all causes of perforation peritonitis [9]. Realising the need for a simple accurate scoring system in perforation peritonitis, the present study was undertaken to evaluate the MPI scoring system as a predictor of post-operative complications, mortality and duration of hospital stay in patients with peritonitis due to hollow viscus perforation.

MATERIALS AND METHODS

The present study was a prospective cohort study conducted from November 2017 to October 2018 at the Department of Surgery, SDM College of Medical Sciences and Hospital, Sattur, Dharwad, Karnataka, India. The study protocol was approved by the Institutional Ethics Committee (No: SDMIEC:0367:2017 dated 9/11/2017). Informed consent was obtained from all the study patients.
The sample population of 50 patients comprised all consecutive patients who had perforation peritonitis meeting the inclusion criteria. All the patients were willing to be part of the study and no patients were lost to follow-up.

**Inclusion criteria:** All the adult patients who have undergone laparotomy with clinical suspicion and investigatory support for the diagnosis of peritonitis due to hollow viscus perforation during the study period. Patients with age between 16 years and 75 years.

**Exclusion criteria:** Patients with the age of <16 years and >75 years; Patients with primary peritonitis; Peritonitis due to trauma with other associated solid organ, vascular and neurological injuries; Patients who were managed without surgery; Peritonitis patients with laparotomy were done elsewhere and transferred to continue the treatment.

**Procedure**

Diagnosis of peritonitis due to hollow viscus perforation was made by history, clinical examination, and appropriate radiological investigations. The MPI score [Table/Fig-1] of each patient was calculated at the end of the planned surgical procedure [9]. The scoring of parameters such as the nature of intra-peritoneal exudate features of malignancy, and organ of perforation was based on intra-operative findings. Patients were categorised into three risk groups according to MPI score [Table/Fig-2]. Patients were followed up post-operatively for post-operative complications till the outcome; that is, mortality or discharge.

**RESULTS**

A total of eight patients of the study population suffered mortality. The incidence of mortality in each risk group was analysed and we concluded that MPI is a useful indicator of prediction of mortality in perforation peritonitis patients [Table/Fig-5]. The risk factors which had a higher significance in predicting mortality were found to be, organ failure at presentation and the nature of intraperitoneal exudate [Table/Fig-6].

**STATISTICAL ANALYSIS**

Statistical analyses were done using SPSS Version 24.0. Armonk, NY: IBM Corp. Descriptive statistics were used and results were expressed in terms of frequency and percentages. Chi-squared test and Fisher’s-exact test were used for intergroup comparisons. The level of significance was fixed at a p-value of <0.05.
In a prospective study of 125 patients done by Karki OB et al., the overall mortality rate was 9% and morbidity was 43%. MPI score of ≤ 20 had no mortality, 21-29 had 14% mortality and ≥ 30 had a mortality of 46%. Among all the variables of MPI, generalised peritonitis, organ failure at the time of admission, and type of intra-abdominal exudate was more significant in predicting mortality and morbidity [13].

Muralidhar VA et al., conducted a prospective study of 50 patients with an overall mortality of 14% and morbidity of 38%. MPI scores of ≤20, 21-29, and ≥30 had a mortality of 5%, 14%, and 50%, respectively. Patients with an MPI score of >25 were associated with a 6.45 times higher risk of mortality (p=0.03), and a 5.72 times higher risk of mortality (p=0.005) when compared to patients with a score of ≤ 25 [14].

A total of 50 patients with peritonitis participated in a prospective observational study conducted by Patil VA et al., and found that the mortality rate was 40% with MPI score >29. The mortality rate was 5.26% in MPI 21-29. There was no mortality when the MPI score was <21. The SSI was the common morbidity in patients with MPI <21 and respiratory complications were seen commonly in MPI >21 [15].

The above studies have similar results to the present study concerning mortality, post-operative complications and duration of hospital stay. Common results in all studies are that the mortality rate is >40% when the MPI score of the patient is >29. Out of the eight components of MPI, organ failure at admission is found to carry more significance in predicting mortality [9-15].

MPI can be used to guide clinical decision-making in patients with peritonitis by assessing the severity of peritonitis, identifying high-risk patients, and guiding treatment decisions including the choice of antibiotics and the duration of hospital stay. Hence, it should be used routinely in clinical practice.

**DISCUSSION**

In the present study, there were eight post-operative mortalities i.e., Group-1 patients had a mortality of 0%, Group-2 patients had a mortality of 23.1%, and Group-3 patients had a mortality of 62.5%. MPI was a useful indicator of the prediction of mortality in perforation peritonitis patients. Out of the 42 recovered and discharged patients, the duration of hospital stay increased as the MPI score increased.

MPI index has been used as an effective tool for the prediction of post-operative mortality. In a prospective study of 80 patients conducted by Basavraj SM et al., patients with MPI scores of <21 had 0% mortality, scores of 21-29 had 3.7% mortality and scores >29 had 42% mortality. Age >50 years (p-value 0.02) and organ failure at admission pre-operatively (p-value <0.001) were found to be statistically significant in predicting mortality [10]. The findings of this study corroborate the findings of the present study.

In a prospective study conducted by Rongpi R et al., No mortality was seen with MPI less than 21, patients with MPI scores 21 to 29 had a mortality rate of 40% whereas with MPI score more than 29 mortality rate was of 60%. The mean days of hospitalisation for those who survived were 12.43±7.1 days. Preoperative duration of peritonitis, diffuse generalised peritonitis, organ failure on admission the origin of sepsis not colonic and intra-abdominal exudate (cloudy/purulent, fermenent) carried more significance in predicting both morbidity and mortality in the post-operative period than the other variables [11].

In a longitudinal observational cohort retrospectively study, conducted by Gueiros LDS et al., including 75 patients, the mortality percentage was 14.67%. They found that older than 50 years, those with the presence of malignancy and patients with organ dysfunction had statistical significance for mortality, with p<0.05 in their study [12].

**REFERENCES**


Medha Urval and Mallikarjun Desai, MPI as a Predictor of Postoperative Complications in Peritonitis


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AUTHOR DECLARATION:
• Financial or Other Competing Interests: None
• Was Ethics Committee Approval obtained for this study? Yes
• Was informed consent obtained from the subjects involved in the study? Yes
• For any images presented appropriate consent has been obtained from the subjects.

PLAGIARISM CHECKING METHODS: [Jan-08] Plagiarism X-checker: Jan 27, 2023
• Manual Googling: Mar 28, 2023
• iThenticate Software: Apr 01, 2023 (14%)

ETYMOLOGY: Author Origin

Date of Submission: Jan 23, 2023
Date of Peer Review: Feb 09, 2023
Date of Acceptance: Apr 03, 2023
Date of Publishing: Jul 01, 2023