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Original Article

Surgery Section

Efficacy of Mannheim Peritonitis Index (MPI) Score in Patients with Secondary Peritonitis

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ABSTRACT

Background: Despite advances in diagnosis, management and critical care of patients with peritonitis due to hollow viscus perforation, prognosis remains poor. Early assessment by scoring systems will influence the management and prognosis.

Aim: Evaluation of Mannheim Peritonitis Index (MPI) score for predicting the outcome in patients with peritonitis.

Materials and Methods: Prospective study of 50 patients admitted and operated for peritonitis in JSS Medical College Hospital. The structured scoring system i.e. MPI was applied along with other clinical and biochemical parameters recorded in pre-structured proforma. Data was analysed for predicting mortality and morbidity using EPI info and SPSS software.

Results: The overall mortality and morbidity was 14% and 38% respectively. MPI scores of ≤ 20, 21-29, and ≥ 30 had a mortality of 5%, 14%, and 50% respectively. MPI score of 25 had highest sensitivity of 72.09% and specificity of 71.43% in predicting mortality, 80.65% sensitivity and 57.89% specificity for morbidity. MPI score of > 25 were associated with 6.45 times higher risk of mortality (p=0.03), 5.72 times higher risk of morbidity (p=0.005) compared to patients with MPI score ≤ 25.

Conclusion: MPI is disease specific, easy scoring system for predicting the mortality in patients with secondary peritonitis. Increasing scores are associated with poorer prognosis, needs intensive management and hence it should be used routinely in clinical practice.

Keywords: Predictor, Scoring, Sepsis

INTRODUCTION

Acute generalized peritonitis from gastrointestinal hollow viscus perforation is a potentially life threatening condition. The prognosis of peritonitis remains poor despite development in diagnosis and management. Early identification of patients with severe peritonitis may help in selecting patients for aggressive surgical approach [1-3]. Grading the severity of acute peritonitis has assisted in no small way in decision making and has improved therapy in the management of severely ill patients [4]. Empirically based risk assessment for important clinical events has been extremely useful in evaluating new therapies, in monitoring resources for effective use and improving quality of care [5,6].

Many scoring systems have been designed and used successfully to grade the severity of acute peritonitis like, 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) [7,8]. MPI was developed by Wacha and Linder in 1983 [9]. It was developed based on the retrospective analysis of data from 1253 patients with peritonitis, in which 20 possible risk factors were considered. Of these only 8 proved to be of prognostic relevance and were entered into the Mannheim Peritonitis Index, classified according to their predictive power. Patients with a score exceeding 26 were defined as having a high mortality rate [9] The Mannheim Peritonitis Index (MPI) is a specific score, which has a good accuracy and provides an easy way to handle with clinical parameters, allowing the prediction of the individual prognosis of patients with peritonitis [10]. There are no published Indian studies to assess the validity of this scoring system.

MATERIALS AND METHODS

Prospective study of 50 patients conducted in JSS Medical college Hospital, Mysore, Karnataka, India, from November 2011 – May 2013. Patients presenting with peritonitis secondary to hollow viscus perforation were included in the study. Patients with primary peritonitis, peritonitis due to trauma, age less than 15 years and patients who were managed conservatively were excluded from the study. Initial preoperative work up and resuscitation with intravenous fluids, antibiotics, analgesics, nasogastric decompression was done in all the cases. Site of peritonitis secondary to hollow viscus perforation was diagnosed during surgery and was dealt with appropriate surgical procedure. Peritoneal lavage was given in all cases. The MPI [Table/Fig-1] was applied along with other clinical and biochemical parameters recorded in pre-structured proforma. Prediction was categorized into 3 groups: i) score ≤ 20 ii) Score 21-29 iii) score ≥ 30. Further resuscitation and ICU care was given as and when was necessary. Patients were followed up postoperatively till the outcome i.e. mortality, morbidity or discharge. Data obtained was analysed for predicting mortality and morbidity.

STATISTICAL ANALYSIS

Statistical analysis was done using EPIINFO and SPSS (Version 16). Chi-squared test was used for intergroup comparisons. Risk ratio and 95% confidence interval (CI) were calculated for each group. ROC analysis was performed to identify the threshold with highest sensitivity and specificity and that threshold was used for classification in univariate and binary logistic regression analysis. The level of significance was fixed at p-value of < 0.05.

This study was conducted after obtaining the clearance from the ethical committee of the institute and informed written consent from the patients included in the study.

RESULTS

Mean age in our study was 43.8 (± 15.8) years (range 18–85). For those who survived, Mean days of hospitalization was 15.5 days.

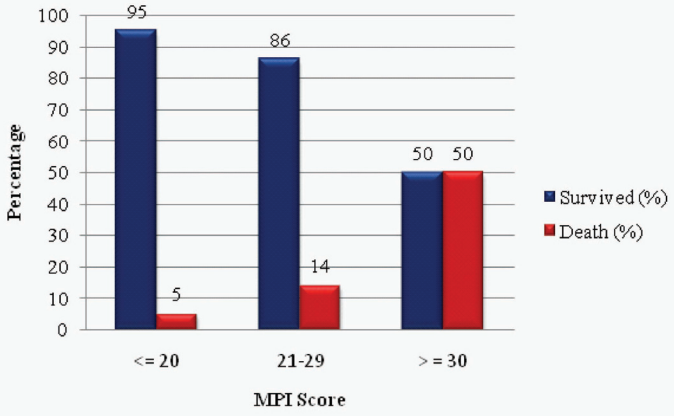
Simple closure of perforation was done in 24% cases, closure with omental graft was done in 46% cases, laparoscopic perforation closure was done in 8% cases, resection anastomosis in 2%, resection with ileostomy in 4% appendicectomy in 12%, ileo-transverse anastomosis in 2% and colostomy was done 2% case. Outcome has been summerized in [Table/Fig-2].

Risk Factor	Weightage, if any
Age >50 years	5
Female Gender	5
Organ Failure*	7
Malignancy	4
Preoperative duration of peritonitis >24 hours	4
Origin of sepsis not colonic	4
Diffuse generalised peritonitis	6
Exudates	
Clear	0
Cloudy, Purulent	6
Faecal	12

[Table/Fig-1]: Mannheim Peritonitis Index [9,11]
**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*

Site	Survived (%)	Death (%)	Total
Stomach	2(100)	0	2
Duodenum	26(96)	1(4)	27
Jejunum	0	1(100)	1
Ileum	8(73)	3(27)	11
Jejunum & ileum	1(100)	0	1
Appendix	5(83)	1(17)	6
Colorectal	1(50)	1(50)	2

[Table/Fig-2]: Site of perforation and outcome

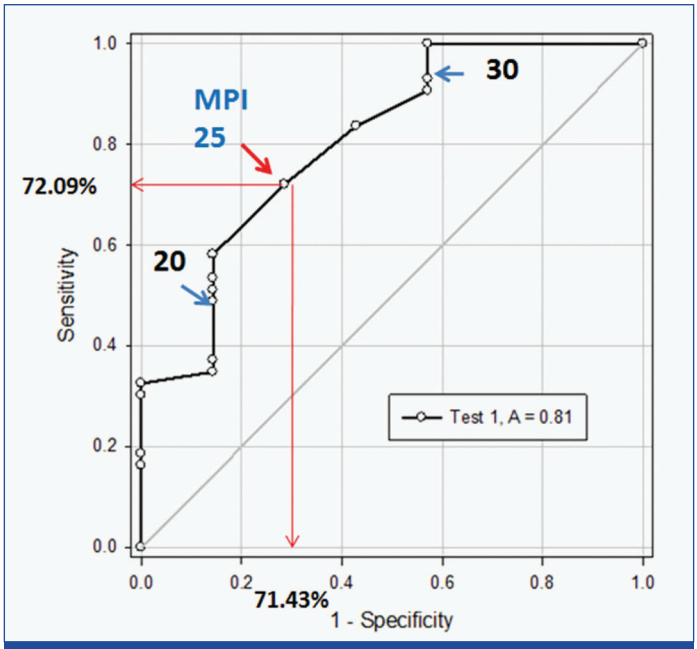


[Table/Fig-3]: Outcome distribution according to MPI score

There were seven deaths (14%) in our study, five patients died of multiple organ dysfunction and two patients died of cardiogenic shock. Only one patient in the study had perforation in the rectum due to malignancy but expired on POD 6th due to septicaemia and ARF. Mortality was 5% in patients who presented within 24 h, 13% in patients who presented between 2 to 5 d and 50% in patients who presented after 5 d.

MPI score was analysed with the mortality [Table/Fig-3]. With highest sensitivity of 72.09% and specificity of 71.43% MPI score of 25 was taken as a threshold value for dichotomous analysis using ROC curve [Table/Fig-4]. MPI score of 26 and more were associated with 29.4% mortality compared to patients with MPI score of 25 and less which was 6.1% mortality and was statistically significant (p=0.03). Summary of the MPI in our study has been depicted in [Table/Fig-5].

MPI score was also evaluated with morbidity. Overall morbidity in our study was 38%. Pulmonary complications were seen in 18% cases, surgical site infection (SSI) was seen in 16% cases, Hypotension in 6% cases, wound dehiscence was in 4% cases, Intra-abdominal abscess and ARF was observed in 2% cases respectively. According



[Table/Fig-4]: ROC curve of sensitivity and specificity of MPI score for mortality

Summary of MPI	Survived (%)	Death (%)	Total	p-value
Age >50 y	15 (83)	3 (17)	18	p=0.69
Female sex	3 (75)	1 (25)	4	p=0.46
Organ Failure	25 (78)	7 (22)	32	p=0.04
Malignancy	0	1 (100)	1	p=0.14
Preoperative duration >24 h	30 (81)	7 (19)	37	p=0.17
Origin of sepsis not colonic	37 (88)	5 (12)	42	p=0.31
Diffuse generalised peritonitis	40 (87)	6 (13)	46	p=0.46
Exudates				
Clear	12 (100)	0	12	p=0.17
Cloudy/Purulent	24 (89)	3 (11)	27	p=0.68
Faecal	7 (64)	4 (36)	11	p=0.03

[Table/Fig-5]: Summary of MPI in our study (50 cases)

to the analysis MPI score of ≥ 26 had 5.72 times higher risk of morbidity than MPI score of ≤ 25 (CI 1.60 – 20.48, p=0.005).

DISCUSSION

Peritonitis secondary to hollow viscus 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% [12-15]. According to the literature MPI is an independent, objective and effective scoring system in predicting mortality and has advantages over the other scoring systems [15-18].

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 a MPI score of 26 or less to have mortality of 3.8%, where as those with a score exceeding 26 had mortality of 41.0% [19].

In a study conducted by Qureshi AM et al., score of < 21 had mortality of 1.9%, score of 21-29 had 21.9% and score > 30 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% [20].

Malik AA et al., did prospective study using 101 consecutive patients having generalized peritonitis over a two-year period. In the MPI system, mortality was 0 in the group of patients with a score of less

than 15, while it was 4% in the patients scoring 16-25 and 82.3% in those with scores of more than 25 [21].

In our study patients with MPI scores of ≤ 20, 21-29, ≥ 30 had a mortality of 5%, 14%, and 50% respectively. Greatest sensitivity and specificity for the MPI score as a predictor of mortality was at the score of 25. We found, on dividing the patients into two groups around this threshold score a statistically significant difference in mortality with 6.1% mortality for ≤ 25 and 29.5% mortality for MPI > 25 (p=0.03).

In order to quantify the risk of mortality based on MPI scores further analysis was done by grouping the patients around the threshold MPI scores of i) 20 ii) 25 and iii) 29. We found, i) Patients with MPI score > 20 had 5.72 times higher risk of mortality compared to patients with score ≤ 20 (CI 0.63-51.6, p=0.117). ii) Patients with MPI score > 25 had 6.45 times higher risk of mortality than patients with MPI score of ≤ 25 (CI 1.1-37.9, p=0.03). iii) MPI score of > 29 had 10 times increased risk of mortality compared to MPI score ≤ 29 (CI 1.49-66.9, p=0.02). This clearly suggests increasing risk of mortality with increasing MPI score, however to determine if this relationship is linear or exponential a larger study is required.

CONCLUSION

MPI is disease specific, easy scoring system for predicting the mortality in patients with secondary peritonitis. Increasing scores are associated with poorer prognosis, needs intensive management and hence it should be used routinely in clinical practice.

REFERENCES

[1] Bohnen J, Boulanger M, Meakins JL, Mclean APH. Prognosis in generalized peritonitis: relation to cause and risk factors. *Arch Surg*. 1983;118:285-90.
[2] Giessling U, Petersen S, Freitag M, Kleine-Kraneburg H, Ludwig K. Surgical management of severe peritonitis. *Zentralbl Chir*. 2002;127:594-97.
[3] Farthmann EH, Schoffel U. Principles and limitations of operative management of intra-abdominal infections. *World J Surg.* 1990;14:210-17.
[4] Ponting GA, Sim AJW, Dudley, HAF. Comparison of local and systemic Sepsis in predicting survival. *Br J Surg*. 1987;74:75052.
[5] Bion J. Outcome in Intensive care. BMJ. 1993;307:953-54.
[6] Knaus WA, Drapper EA, Wagner DP, Zimmerman JE. APACHE severity of disease classification system. *Crit Care Med.* 1985;13:818-29.
[7] Kologlu M, Elker D, Altun H, Sayek I. Validation of MPI and PIA II in two different groups of patients with secondary peritonitis. *Hepatogastroenterology.* 2001;48:147-51.
[8] Bosscha K, Reijnders K, Hulstaert PF, Algra A, van der Werken C. Prognostic scoring systems to predict outcome in peritonitis and intra-abdominal sepsis. *Br J Surg.* 1997; 84(11):1532-34.
[9] Wacha H, Linder MM, Feldman U, Wesch G, Gundlach E, Steifensand RA. Mannheim peritonitis index – prediction of risk of death from peritonitis: construction of a statistical and validation of an empirically based index. *Theoretical Surg.* 1987;1:169-77.
[10] Correia MM, Thuler LCS, Velasco E, Vidal EM, Schanaider A. Peritonitis Index in oncologic patients. *Revista Brasileira de Cancerologia.* 2001;47(1):63-68.
[11] Billing A, Frölich D, Schildberg FW. Prediction of outcome using the Mannheim peritonitis index in 2003 patients. *Br J Surg.* 1994;81:209-13.
[12] CS Agrawal, M Niranjan, S Adhikary, BS Karki, R Pandey and PR Chalise. Quality assurance in the management of peritonitis: A prospective study. *Nepal Med Coll J. 2009;* 11(2):83-87.
[13] F Ntirenganya, G Ntakiyiruta, I Kakande. Prediction of Outcome Using the Mannheim peritonitis Index in Patients with Peritonitis at Kigali University Teaching Hospital. *East Cent Afr J Surg.* 2012;17(2):52-64.
[14] Mathikere Lingaiah Ramachandra, Bellary Jagadesh, Sathees BC Chandra. Clinical study and management of secondary peritonitis due to perforated hollow viscus. *Arch Med Sci.* 2007;1:61-68.
[15] Notash AY, Salimi J, Rahimian H, Fesharaki MH, Abbasi A. Evaluation of Mannheim peritonitis index and multiple organ failure score in patients with peritonitis. *Indian Journal of Gastroenterology.* 2005; 24(5):197-200.
[16] Demmel N, Muth G, Maag K, Osterholzer G. Prognostic scores in peritonitis: the Mannheim Peritonitis Index or APACHE II? *Langenbecks Arch Chir.* 1994;379(6):347-52.
[17] Mulari K, Leppäniemi A. Severe secondary peritonitis following gastrointestinal tract perforation. *Scand J Surg.* 2004;93(3):204-8.
[18] S Biondo, E Ramos, D Fraccalvieri, E Kreisler, J Martí Ragué, E Jaurrieta. Comparative study of left colonic peritonitis severity score and Mannheim peritonitis index. *Br J Surg.* 2006;93(5):616–22.
[19] Kusumoto Yoshiko, Neyagawa Masayuki, et al. Study of Mannheim Peritonitis Index to Predict Outcome of Patients with Peritonitis. *Japanese Journal of Gastroenterological Surgery.* 2004;37(1):7-13.
[20] Qureshi AM, Zafar A, Saeed K, Quddus A. Predictive power of Mannheim peritonitis index. *J Coll Physicians Surg Pak*. 2005;15(11):693-6.
[21] Malik AA, Wani KA, Dar LA, Wani MA, Wani RA, Parray FQ, et al. Mannheim Peritonitis Index and APACHE II - prediction of outcome in patients with peritonitis. *Ulus Travma Acil Cerrahi Derg.* 2010;16(1):27-32.

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