International Surgery Journal
Saravanan KV R et al. Int Surg J. 2017 Oct;4(10):3245-3248
http://www.ijsurgery.com
pISSN 2349-3305 | eISSN 2349-2902

DOI: http://dx.doi.org/10.18203/2349-2902.isj20174103

Original Research Article

A prospective study to evaluate the utility of Mannheim peritonitis index in predicting prognosis of perforation peritonitis at our tertiary care centre

Saravanan K. V., Gowri Sankar Alagarsamy*, Udhaya Sankar

Department of General Surgery, Government Vellore Medical College, Vellore, Tamil Nadu, India

Received: 12 August 2017
Accepted: 21 August 2017

***Correspondence:**
Dr. Gowri Sankar Alagarsamy,
E-mail: drgowri_2k@yahoo.co.uk

ABSTRACT

Background: This study was aimed to evaluate the validity of Mannheim Peritonitis Index (MPI) in predicting the outcome in patients with perforation peritonitis.
Methods: A prospective study was designed for a study period of 2 years, 75 patients who underwent operation for perforation peritonitis were included in the study. Post evaluation done with predesigned proforma, MPI score was calculated and analyzed for each patient who underwent surgery, death being the main outcome measure. The MPI scores were divided into three categories. MPI scores <15 (category 1), 16-25 (category 2), and >25 (category 3).
Results: Present study consisted of 60 males and 15 females (male:female ratio of 4:1) with the mean patients age 37.96±17.49 years. 47, 26, and 27 cases belonged to MPI score categories 1, 2, and 3. The dominating source of perforation was small intestinal. The individual parameters of MPI score were assessed against the mortality, age >50 years (P = 0.015), organ failure (P = 0.0001), noncolonic origin of sepsis (P = 0.002), and generalized peritonitis (P = 0.0001) were the factors significantly associated with mortality. The sensitivity of MPI was 92% and specificity was 78% in receiver operating characteristic curves.
Conclusions: MPI is an effective tool for prediction of mortality in cases of perforation peritonitis.

Keywords: Mannheim peritonitis index, Perforation peritonitis, Receiver operating characteristic curve

INTRODUCTION

Peritonitis is inflammation of the peritoneum /peritoneal cavity due to localized or generalized infections. Most cases of peritonitis are due to the invasion of the peritoneal cavity by bacteria from the gut as a consequence of perforation. So, early prognostic evaluation of abdominal sepsis is indicated to select high-risk patients for aggressive therapeutic procedures early and to provide classification for severity of the disease.[1-3]

Treatment is primarily surgical. Different scorings are used to predict the outcome in patients with peritonitis. These scoring systems can be a good tool to predict outcome and the priority of treatment for better care in case of peritonitis.[4] Performing risk analysis helps in predicting prognosis and outcome. Scoring systems have been developed with parameters including demographic and clinical features.[5-8] The present study was aimed to assess the utility of Mannheim peritonitis index (MPI) score system in predicting the outcome of patients with perforation peritonitis.[6,9]

METHODS

After obtaining the Institutional Ethical Committee clearance this prospective study was planned to evaluate the validity of MPI in predicting prognosis in patients admitted with perforation peritonitis to the Department of General Surgery at our tertiary care centre. During the

study period of 2 years from December 2014 to December 2016 a total of 75 patients with secondary peritonitis were enrolled in the present study after obtaining informed consent. They underwent exploratory laparotomy through a midline vertical incision. All patients had confirmed diagnosis of perforation peritonitis.

Inclusion criteria

Patients aged >15 years with perforation peritonitis were only included in the study.

Exclusion criteria

- Cases of primary peritonitis
- Cases that are ruled out after investigations
- Cases refused or unfit for surgery.

Following evaluation using a predesigned performa, MPI score was calculated for each patient and the patients were followed-up till death or discharge from the hospital Table 1.

Table 1: Mannheim peritonitis index.

Risk factor	Scores
Age >50 years	5
Female gender	5
Organ failure*	7
Malignancy	4
Preoperative duration of peritonitis	4
Origin of sepsis not colonic	4
Diffuse generalized peritonitis	6
Exudates	
Clear	0
Purulent	6
Faecal	12

*Kidney failure = >177umol/l or urea level >167mmol/l or oliguria <20ml/h; Pulmonary insufficiency = PO2 <50mmhg or PCO2 >60mmhg.

Death was the main outcome measure against which the MPI scores were analyzed. The MPI scores were divided under three categories; scores <15 (category 1), 16-25 (category 2), and >25 (category 3). The patient's data were analyzed statistically.

Statistical analysis

The statistical analysis was done by Pearsons Chi-square test for qualitative data, students t-test for quantitative data. The receiver operating characteristic (ROC) curves were plotted with sensitivity against 1-specificity.

RESULTS

During the period of 2 years, among the 75 cases of perforation peritonitis, who underwent emergency laparotomy, there were 80 males and 20 females (male:female ratio 4:1). The mean patient age in the present study was 37.96±17.49 years. 47, 26, and 27 patients belonged to MPI score categories 1, 2, and 3 respectively.

Table 2: Individual mortality risk of components of MPI.

Risk factor	Deceased %	Survived %	p
Age >50 years	7 (30.43)	16 (69.57)	0.015
Female sex	5 (27.78)	13 (72.22)	0.072
Organ failure	10 (43.48)	13 (56.52)	0.0001
Malignancy	0 (0)	4 (100)	0.545
Origin of sepsis non-colonic	11 (17.46)	52 (82.54)	0.002
Diffuse generalised peritonitis	13 (36.11)	23 (63.89)	0.0001
Preop duration > 24 hours	12 (17.65)	56 (82.35)	0.098
Exudate			
Clear	0 (0)	7 (100)	0.053
Purulent	6 (10.71)	50 (89.29)	
Fecal	3 (33.33)	9 (66.67)	

The mean patient age was 33.52±13.22 years, 37.15±19.60 years and 37.15±19.4 years in MPI score category 1, 2, and 3 respectively. The mean age of patients who survived and did not survive was similar (P = 0.22). Significantly greater numbers of female patients were in MPI category 3 compared to category 1 or 2. The most common origin of sepsis was duodenal (Figure 1), with small intestine dominating the source of perforation. The gastric perforation was second to the small intestine in presenting as peritonitis followed by ileal.

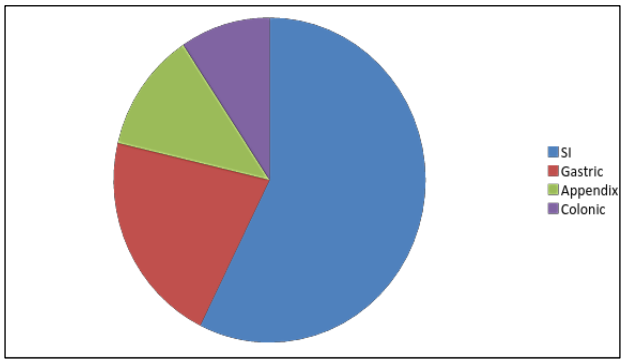

Figure 1: Distribution of origin of sepsis.

When the individual parameters of MPI score were assessed against the mortality only, age >50 years (P = 0.015), organ failure (P = 0.0001), noncolonic origin of sepsis (P = 0.002) and generalized peritonitis (P = 0.0001) were significantly associated with mortality (Table 2).

The mortality rates observed were higher in category 3 of MPI. The difference in mortalities among MPI score categories were observed to be highly significant (P < 0.0001) (Table 3).

On plotting the ROC curve, the sensitivity was 92%, and specificity was 78% with area under curve (AUC) being 0.9 at a cut-off of 21 MPI score Figure 2.

Table 3: Survival within MPI score categories.

MPI score categories	Outcome	Total	
	Survived	Died	
<15			
Count	35	0	35
% with in total	54.65	0	35
16-25			
Count	17	3	20
% with in total	26.74	21.43	20
>25			
Count	12	8	20
% with in total	18.60	78.57	20
Total	64	11	75

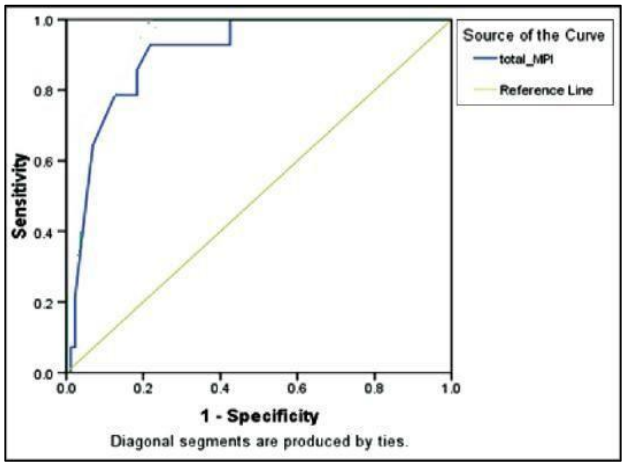

Figure 2: Receiver operating characteristic curve.

DISCUSSION

Various studies have reported efficacy of MPI as an independent prognostic scoring system in predicting outcome in secondary peritonitis. We have compared our study findings with previously reported studies (Table 4).

Table 4: Comparative validity assessment of MPI scores in predicting prognosis of peritonitis.

Study	Sample size	Sensitivity %	Specificity %	AUC
Billing et al	2003	86	74	-
Demmel et al	108	93	16	
Correia et al	89	87.3	41.2	0.69
Notash et al	80	86	74	0.972
Batra et al	160	100	65.54	0.89
Muralidhar et al	50	72.09	71.43	-
Present study	75	92	78	0.90

In the present study, the sensitivity and specificity of MPI were 92% and 78%, respectively, at a cut-off of 21 MPI score. The area under ROC curve was 0.9. Present results are comparable to previous reports.[6,10-14] Although a minor higher sensitivity and lower specificity observed may be attributed to differences in sample sizes and setting of cut-off values.

Correia et al, retrospectively analyzed data of 89 cases with perforation peritonitis and found the mean MPI score to be 26.6 points (range: 5-47), with a sensitivity of 87.3%, and a specificity of 41.2%. The best accuracy (69.7%) was reached at a score of 21.[11]

Notash et al, did a prospective study on 80 consecutive cases of perforation peritonitis and compared MPI with the multiple organ failure score.[12] The AUC of ROC for MPI was 0.972. MPI of 21 had a sensitivity of 100% and specificity of 79%. With MPI of 29 the sensitivity was 79%, and specificity was 96%. These results were comparable to the findings of the present study.

Batra et al, calculated MPI score in a cross-sectional study of 160 patients of perforation peritonitis to evaluate MPI scoring system in defining the prognosis of the patients and to be able to deliver better patient care and furnish efficient management.[13] The cut-off from ROC curve was 26. Sensitivity and specificity of MPI in predicting mortality were calculated to be 100% and 65.54%, respectively. The rate of mortality was 5.7%. This was a pioneering study in India where MPI scoring system was applied specifically for patients of perforation peritonitis in a hospital in the rural area. The results of the present study were comparable, and the increase in mortality with the increment of MPI scores deduced that MPI score proved to be a useful tool to predict the mortality in patients of peritonitis. However, the validity results of MPI in the present study was not comparable to Demmel et al, Ohmann et al and Delibegovic et al, despite similar AUC of ROC curves, which may be due to variations in the sample sizes and cut-off values.[10,15-17]

In a prospective study of 108 cases of severe intraabdominal infections managed by open treatment, Demmel et al, compared MPI and acute physiology and chronic health evaluation II (APACHE II) scores.[13] Statistical validation showed a sensitivity of 93% and a specificity of 16% for MPI. The peritonitis study group performed a multicentric study and compared APACHE II, MPI and peritonitis index altona scores in 271 cases of laparotomies for perforation peritonitis.[15] The sensitivity and specificity of MPI were 60% and 80%, respectively. The AUC of ROC for a cut-off point of 26 was 0.79. We conclude that MPI scoring is a reliable predictor of death in perforation peritonitis patients and can be helpful in planning and evaluating future treatments with great ease.

CONCLUSION

This study reveals MPI is an effective tool for prediction of mortality in cases of perforation peritonitis along with supports from other studies.

Recommendations

Authors would like to recommend its use in the prognostic evaluation of secondary peritonitis cases.

Funding: No funding sources
Conflict of interest: None declared
Ethical approval: The study was approved by the institutional ethics committee

REFERENCES

1. Bohnen J, Boulanger M, Meakins JL, McLean AP. Prognosis in generalized peritonitis. Relation to cause and risk factors. Arch Surg. 1983;118:285-90.
2. Farthmann EH, Schöffel U. Principles and limitations of operative management of intraabdominal infections. World J Surg. 1990;14:210-7.
3. Giessling U, Petersen S, Freitag M, Kleine-Kraneburg H, Ludwig K. Surgical management of severe peritonitis. Zentralbl Chir. 2002;127:594-7.
4. Knaus WA, Drapper EA, Wagner DP, Zimmerman JE. APACHE severity of disease classification system. Crit Care Med. 1985;13:818-29.
5. Rix TE, Bates T. Pre-operative risk scores for the prediction of outcome in elderly people who require emergency surgery. World J Emerg Surg. 2007;2:16.
6. Billing A, Fröhlich D, Schildberg FW. Prediction of outcome using the Mannheim peritonitis index in 2003 patients. Peritonitis study group. Br J Surg. 1994;81:209-13.
7. Koç M, Yoldas O, Kiliç YA, Göçmen E, Ertan T, Dizen H, et al. Comparison and validation of scoring systems in a cohort of patients treated for perforated peptic ulcer. Langenbecks Arch Surg. 2007;392:581-5.
8. Lee FY, Leung KL, Lai BS, Ng SS, Dexter S, Lau WY. Predicting mortality and morbidity of patients operated on for perforated peptic ulcers. Arch Surg. 2001;136:90-4.
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. Theor Surg. 1987;1:169-77.
10. Demmel N, Muth G, Maag K, Osterholzer G. Prognostic scores in peritonitis: The Mannheim peritonitis index or APACHE II?. Langenbecks Arch Chir. 1994;379:347-52.
11. Correia MM, Thuler LC, Velasco E, Vidal EM, Schanaider A. Prediction of death using the Mannheim peritonitis index in oncologic patients. Rev Bras Cancerologia. 2001;47:63-8.
12. Notash AY, Salimi J, Rahimian H, Fesharaki MS, Abbasi A. Evaluation of Mannheim peritonitis index and multiple organ failure score in patients with peritonitis. Indian J Gastroenterol. 2005;24:197-200.
13. Batra P, Gupta D, Batra R, Kothari R, Deshmukh PR. Mannheim peritonitis index as an evaluative tool in predicting mortality in patients of perforation peritonitis. CIB Tech J Surg. 2013;2:30-6.
14. Muralidhar VA, Madhu CP, Sudhir S, Srinivasarangam M. Efficacy of Mannheim peritonitis index (MPI) score in patients with secondary peritonitis. J Clin Diagn Res. 2014;8:NC01-3.
15. Ohmann C, Wittmann DH, Wacha H. Prospective evaluation of prognostic scoring systems in peritonitis. Peritonitis study group. Eur J Surg. 1993;159:267-74.
16. Delibegović S, Nuhanovic A. Artificial neural network in prediction of the outcome of critically ill patients with perforative peritonitis. Acta Med Acad. 2008;37:106-12.
17. Delibegovic S, Markovic D, Hodzic S. APACHE II scoring system is superior in the prediction of the outcome in critically ill patients with perforative peritonitis. Med Arh. 2011;65:82-5.

Cite this article as: Saravanan KV, Alagarsamy GS, Sankar U. A prospective study to evaluate the utility of Mannheim peritonitis index in predicting prognosis of perforation peritonitis at our tertiary care centre. Int Surg J 2017;4:3245-8.