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Original Research Article

A prospective study of Mannheim peritonitis index as a prognostic scale in analysis of outcome in hollow viscus perforation

Abhilash Gautham Ramesh[1]*, Kshama S. Ramesh[2]

[1]Department of Surgery, Shimoga Institute of Medical Sciences, Shimoga, Karnataka, India
[2]Department of Medicine, AJ Institute Medical Sciences, Kuntikan, Mangaluru, Karnataka, India

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***Correspondence:**
Dr. Abhilash Gautham Ramesh,
E-mail: abhilash.gautham@yahoo.com

ABSTRACT

Background: MPI as a prognostic index helps in analysis of prognosis in peritonitis in hollow viscus perforation. The factors that are considered in MPI index are routinely used in assessment of surgical patients, they are easily available, routinely performed, and helps in arrival at a prognosis in fast and effective way.
Methods: A prospective survey of patients with acute generalized peritonitis due to hollow viscus perforation was carried out in general surgical wards of our institute during the period starting from January 2014 to December 2015. Study population consisted of 150 consecutive patients with performative peritonitis, which confirmed on emergency laparotomy.
Results: The Mannheim peritonitis index emerged as a reliable marker for assessing the severity and prognosis of intra-abdominal infection with sensitivity and specificity comparable to APACHE II score which has been adopted as the gold standard by Surgical Infection Society. The score designed specifically for peritonitis, combines preoperative and operative data and is easy to apply. MPI scores were consistent with low scores among survivors and higher scores among non-survivors.
Conclusions: MPI scores in the analysis were sharp predictor of mortality.

Keywords: Hollow viscus perforation, MPI, Peritonitis

INTRODUCTION

Peritoneum inflammation, called peritonitis, presents most commonly due to localized or generalized infection caused from various probable factors. Secondary peritonitis is the most common and follows an intraperitoneal source usually from perforation of hollow viscera. Acute generalized peritonitis coming forth due to underlying hollow viscus perforation is a critical and life-threatening medical condition. It is a common surgical emergency in most of the general surgical units, across the world. It is often associated with significant morbidity and mortality.[1]

The prognosis and outcome of peritonitis depend upon the interaction of many factors, including patient-related factors, disease-specific factors, and diagnostic and therapeutic interventions. Categorizing patients into different risk groups would help prognosticate the outcome, select patients for intensive care and determine operative risk, thereby helping to choose the nature of the operative procedure, e.g. damage control vs. definitive procedure.[2] various scoring systems have been used to assess the prognosis and outcome of peritonitis. Those used include the Acute Physiological and Chronic Health Evaluation score (APACHE II) (1985), the Mannheim Peritonitis Index (MPI) (1983), the Peritonitis Index

Altona (PIA), The Sepsis Severity Score (1983), and the Physiological and Operative Severity Score for Enumeration of Mortality and Morbidity (POSSUM).[3-6]

Mannheim peritonitis index

MPI as a prognostic index helps in analysis of prognosis in peritonitis in hollow viscus perforation. The factors that are considered in MPI index are routinely used in assessment of surgical patients, they are easily available, routinely performed, and helps in arrival at a prognosis in fast and effective way.

METHODS

All patients presenting to B. L. D. E. U's Shri B. M. Patil Medical College Hospital and Research Centre Bijapur and admitted patients with acute generalized peritonitis due to hollow viscus perforation is considered from January 2014 to December 2015. A total of 150 consecutive patients with performative peritonitis which were confirmed on emergency laparotomy.

Inclusion criteria

- Peritonitis secondary to hollow viscus perforation.
- Age group more than 15 years
- Non-traumatic perforation peritonitis.

Exclusion criteria

- Perforation secondary to abdominal trauma.
- Primary peritonitis.
- Post op peritonitis due to anastomotic leak, etc.
- Performative peritonitis patients managed conservatively

Diagnosis of peritonitis due to hollow viscus perforation was made by history, clinical examination and radiologically (gas under diaphragm). Patient details suggestive of chronic health disorders such as cardiac, respiratory, renal, liver failure and immunodeficiency disorders noted. At the time of admission. The MPI analyzes 8 prognostically significant factors. Points were given to each factor as given in table 1. Points were added for each factor present and the MPI score was calculated by adding these points as given in table 1.

Statistical analysis

Data entry and management were done in Excel sheet. After cleaning and coding the data was transferred to Single master sheet and statistical analysis was done using the SPSS 19 version software. Qualitative data was presented in the form of Proportions and percentages.

RESULTS

Based upon their MPI score, the patients were divided into three groups, MPI scores of less than 15, 16-25 and more than 25. None of the patients (n=25) with score <15 had mortality. A total 82 patients scored in range of 16-25 with mortality rate of 7.32%. A 36 of 43 patients (MR=83.72) died who scored >25 as shown in table 2.

Table 1: Mannheim peritonitis index scoring system.

Risk factor		Points
Age >50yrs		5
Female sex		5
Organ failure		7
Malignancy		4
Preoperative duration of peritonitis >24h		4
Origin of sepsis not colonic		4
Diffuse generalized peritonitis		6
Exudates		
Clear		0
Cloudy, purulent		6
Fecal		12
Definitions of organ failure		
Kidney	Creatinine level	>177umol/L
	Urea	>167mmol/L
	Oliguria	<20ml/h
Lung	PO_2	<50mmHg
	PCO_2	>50mmg
Shock	Hypodynamic or hyperdynamic	
Intestinal obstruction	Paralysis >24h or complete mechanical obstruction	

Table 2: Mortality as per the MPI scores.

Cause of peritonitis	<15			16-25			>25		
	n	NS	MR	n	NS	MR	n	NS	MR
Gastroduodenal	24	0	0	60	5	83.3	25	21	84
Small intestine	1	0	0.0	18	1	5.5	13	12	92.3
Large intestine	0	0	0.0	4	0	0.0	5	3	6.0
Total	25	0	0.00	82	6	7.32	43	36	83.72

NS: Non-survivors; MR: Mortality rate

The overall mean MPI score in survivors is 18.2 (range: 10-31), while in the non-survivors, the mean score is 30.35 (range: 31-47), and the difference between groups is significant ($p<0.0001$).

Twenty-five patients scored <15 and all survived which included 24 gastroduodenal perforations and 1 small bowel perforation. 82 patients who scored between 16-25, 6 died (MR-7.32%) i e 5 of 60 gastroduodenal perforations, 1 of 18 small intestinal perforation had inpatient mortality. 36 of 43(MR-83.72%) patients who scored more than 25 had inpatient mortality, including 21 of 25 gastroduodenal perforations, 12(n=13) small intestinal perforations and 3 of 5 large intestinal perforations did not survive.

Distribution of MPI scores

Distribution of MPI among survivors and non-survivors showed a mean MPI score of 17.89 (SD 4.72) among survivors this was found statistically significant (P<0.0001). Similarly, non-survivors had mean MPI score of 30.35(SD 3.89) and was statistically significant (P>0.0001) as shown in Table 3.

Table 3: Distribution of MPI among survivors (n=108) and non-survivors (n=42).

Score	Survivors	Non-survivors	P(CI)
MPI	17.89±4.72	30.35±3.89	<0.0001(-12.4)

n:no of patients, P: P value, CI: confidence interval

Table 4: Association between MPI total score and probability of death.

MPI total score	No of deaths	Cumulative no of deaths	Proportion of deaths	Cumulative proportion of deaths
12-19	0	0	0.00	0.00
20-24	0	0	0.00	0.00
25-29	18	18	0.43	0.43
30-34	17	35	0.40	0.83
35-39	7	42	0.17	1.00
Total	42		1.00	

Sharpness

The distribution of scores, a measure for sharpness of the predictions, is shown in table 18. The distribution of MPI scores with low score values had low probabilities of death (< 0.1) for 108 of the 150 patients, (72%). MPI assigned a high risk of death (p > 0.9) to 7 of 150 patients (4.6%) of patients. But 35 patients (23.3%) were assigned a moderate risk (>0.1 and < 0.9) of death indicating that its predictions were "not sharp" in these cases.

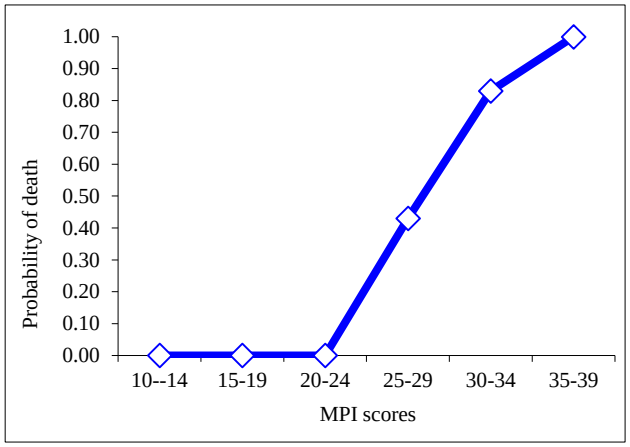

Figure 1: MPI score and comparison of actual and cumulative no of deaths probability of death.

The distribution of MPI scores with low score values and low probabilities of death (<0.1) for 108 of the 150 patients,72% of the patients had probabilities of death less than 0.10, and in only 35 of the 150 patients the predictions were "not sharp". These scores showed that MPI is sharper in predicting outcomes in peritonitis.

Association between MPI total score and probability of death

MPI scores from 12 to 24, there were no deaths and expected number of deaths was also 0. With scores of 25 to 29 actual number of death was 18 and was equal to expected number of death. For scores 30-34 actual number of death was 17 where as expected number of deaths was 35 with probability of 0.83. For scores 35-39 actual no of deaths was 7 and expected number of deaths was 42 with probability of 1.00.

DISCUSSION

MPI score

Present study had MPI score ranging from 10 to 38, the overall mean was 21.69 (SD 5.21). None of the patients (n-22) with scores >31 survived. Similarly, various studies showed 100% mortality with varied scores as shown in table 5.

Table 5: MPI Score with 100% mortality in various studies.

Studies	MPI scores with 100% mortality
Present study	>31
Ajaz et al[2]	>29
Notash et al[6]	>21
C Ohmann et al[7]	>30

Distribution of scores in MPI

Distribution of MPI among survivors and non-survivors showed mean MPI score of 17.89(4.02) among survivors this was found statistically significant(P<0.0001). Similarly, non-survivors had mean MPI score of 30.35 (SD 3.89) and was statistically significant (P>0.0001).

Thus, MPI scores were consistent with low scores among survivors and higher scores among non survivors. Mean MPI was lower in survivors than in non-survivors in our analysis and Notash et al and had statistically significant difference with P value <0.0001 in both the studies.7 Whereas in Horiuchi et al analyses mean MPI scores among survivors did not vary much from non-survivors and was not statistically significant.[8] Thus MPI score distribution was significantly better among survivors and non-survivors.

Sharpness

Sharpness is the degree of confidence associated with the predictions- for example, do most of the predictions for survival or death exceed a certain value (>0.9). Author can conclude from present study hat MPI is sharper in prediction. MPI was also found to be sharp in predicting outcome in our study was also seen in Ohmann C et al.[9] In Delibegovic S et al study MPI was not at all sharp as all 145 patients were in moderate risk category (0.1-0.9).[10]

CONCLUSION

Even to present age mortality due to secondary peritonitis remains one of the major causes of death in surgical wards. Author analyzed 150 patients with perforation peritonitis confirmed on emergency laparotomy. Mortality rate as cited in various studies ranged from 10% to 60%, our study had 28% of mortality rate. MPI score ranged from 10 to 38, the overall mean was 21.69.

MPI scores showed low values among survivors with mean 17.89±4.72 and higher values among non-survivors with mean 30.35±3.89. Thus, MPI scores were consistent with low scores among survivors and higher scores among non-survivors. MPI scores in the analysis were sharp predictor of mortality. The distribution of MPI scores with low score values and low probabilities of death (< 0.1) for 108 of the 150 patients, 72% of the patients had probabilities of death less than 0.10, thus MPI scores in our study was a sharp predictor of mortality. MPI Score considers physiological adversities of the disease which can be used easily and effectively to identify high risk patients for intensive therapy. MPI score has the advantage of being easier to calculate with very minimum basic investigations and was specifically designed as scoring system for peritonitis.

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