

Original Research Article

Effectiveness of Mannheim peritonitis index scoring system in predicting the morbidity and mortality in peritonitis due to hollow viscous perforation

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ABSTRACT

Background: To study the spectrum and prognostic factor in perforation peritonitis. To evaluate the outcome of patients and identification of high risk patients using Mannheim peritonitis index.

Methods: 80 patients with hollow viscous perforation admitted in the Dept. of Surgery Adhichuchanagiri Institute of Medical sciences from January 2019 to June 30 2020 were included in the study. Necessary data was collected; MPI score was calculated for each patient and analysis done.

Results: The number of post-operative complications, hospital stay and mortality proportionately increased with the MPI score. In our study Age >50 years, Organ failure at admission pre operatively and MPI scoring found to be statistically significant. Out of the 8 variables used in this scoring system, age more than 50 years and organ failure on admission carried more significance in predicting the morbidity and mortality in the post operative period than the other variables.

Conclusions: Mannheim peritonitis index is a simple and effective method in predicting the mortality and morbidity of patients with hollow viscous perforation.

Keywords: Peritonitis, Scoring systems, Outcome predictors

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.

METHODS

Source of data

A prospective study has been conducted at Department of surgery, Adichunchungiri institute of medical sciences, mandya, India, between January 2019 and June 2020 comprising of 80 patients with peritonitis due to hollow viscous perforation.

Diagnosis of peritonitis due to hollow viscous perforation made by: history and clinical examination, all required biochemical investigations available in institution to be done on admission and relevant clinical details to be noted, radiography of chest and abdomen suggestive of intestinal perforation, standard operative procedures was followed for different causes of perforative peritonitis.

Mortality defined as any death occurring during the hospital stay.

Morbidity assessed in terms of post-operative complications such as- pneumonia or lung atelectasis, wound infection, acute respiratory distress syndrome, acute myocardial infarction or heart failure, intra-abdominal collection, acute renal failure and urinary tract infection.

Inclusion criteria

Patients who are clinically diagnosed as peritonitis due to hollow viscus perforations and later confirmed with operative findings. Hollow viscus perforations anywhere in Gastro Intestinal Tract from Stomach till Rectum.

Exclusion criteria

Patients with associated traumatic injuries to other organs. Patients with any other significant illness which is likely to affect the outcome more than the disease in study.

Once diagnosis of peritonitis had been determined by operative findings, the patient was enrolled into the study. Using history, clinical examination and lab values risk factors found in MPI were classified according to values indicated and individual variable scores were added to establish MPI score. The cases were first grouped into three, as described by Billing: those below 21 pts, between 21-29 pts, and those above 29 pts.

In addition to personal data such as name, age, sex, etc., the following information was registered: file number; dates of admission and discharge from the hospital; days hospitalized; date of surgery and information related to illness (surgical findings, medical treatment and evolution of illness).

Patient evaluation was followed, occurrence of complications and discharge due to improvement or death. Time elapsed from initial diagnosis to moment of event (death or discharge from hospital) was determined.

Outpatient follow up was continued for 30 days to establish perioperative morbidity and mortality. The minimum possible score was zero, if no adverse factor were present, and maximum was 47 if presence of all were confirmed. Analysis was done with each variable in the scoring system as an independent predictor of morbidity or mortality and the scoring system as a whole.

Statistical analysis

The data was analyzed using Statistical package for social sciences (SPSS) software version 16.3. Each variable in the MPI score along with other patient variables was analyzed using chi square analysis with various outcomes that were noted in the study. P value <0.05 was taken as significant in this study. The results were averaged (mean + standard deviation) for each parameter for continuous data and numbers and percentage for categorical data presented in table and figure. Proportions were compared using Chi-square test of significance

Ethical committee clearance

Approved by Institutional Ethical committee, Adichunchungiri institute of medical sciences, BG Nagar, Mandya district, Karnataka.

RESULTS

A total 80 patients with hollow viscus perforation were studied in our institute. Out of which 26 persons were above 50 years and 54 were below 50 years. The mean age of study group is 39 years. In our study incidence of male sex was 83% while that of female sex was 16%. 21 patients presented with in 24 hr of onset of symptoms while 59 patients presented after 24 hr. 76% of the patients presented with generalizes peritonitis while 23% presented with localized peritonitis. Duodenal perforation was most common with 48 patients and 2 patients had colonic perforation. 26 patients presented with organ dysfunction involving renal and respiratory system. (Table 1).

Out of the 80 patients 9 patients died and 71 patients survived. Morbidity was 48% involving wound, pulmonary and renal complications.

Duration of presentation

Patients presented with various symptoms like abdominal pain, vomiting, fever, distention of abdomen, constipation, not passed urine, breathlessness. 21 patients presented in less than 24 hrs while 59 patients after 24 hr from the onset of symptoms. Pain abdomen and vomiting were the most common symptoms (Table 2).

Table 1: Information of 80 patients with peritonitis.

Patient characters		Number	Percent age
Age	10-19	6	7.5
	20-29	19	23.75
	30-39	19	23.75
	40-49	10	12.5
	>50	26	32.5
Sex	Male	67	83.75
	Female	13	16.25
Duration of symptoms	<24	21	26.25
	1-5 days	49	61.25
	>5 days	10	12.5
Type of peritonitis	Generalized	61	76.25
	Localized	19	23.75
Site of perforation	Gastric	6	7.5
	Duodenal	48	60
	Jejunal	3	3.75
	Ileal	21	26.5
	Colon	2	2.5
Organ failure	Yes	26	32.5
	No	54	67.5
Morbidity	Yes	39	48.75
	No	41	51.25
Mortality	Yes	9	11.25
	No	71	88.75

Table 2: Duration of presentation.

Duration of presentation	Frequency	Percentage
<24 hours	21	26.25
1 to 5 days	49	61.25
>5days	10	12.5
Total	80	100

Perforation site

In our study patients presented with peritonitis secondary to perforation at various sites like stomach, duodenum, jejunum, ileum and colon. Duodenal perforation was most common with 48 patients followed by ileal perforation with 21 patients and 2 patients had colonic perforation and 3 patient had jejunal perforation.

The perforation of the proximal gastro intestinal tract were more common in India as noted by the earlier studies as compared to distal gastro intestinal tract in western studies.

Type of exudate

In our study intra operatively intra-abdominal collection found out to be clear, purulent and feculent. In our study 87% of patients presented with purulent/ cloudy, and 2.5% presented with feculent and 10% of patients presented with clear fluid exudate.

In our study wound complication are found to be higher in purulent and fecal exudates than clear exudates. Purulent and fecal exudates are associated with delayed presentation and presence of varying degree of septicemia.

Type of peritonitis

In our study 76% patients presented with a diffuse form of peritonitis while remaining 23% presented with localized peritonitis. Diffuse peritonitis is associated with a severe inflammatory reaction and development of sepsis and multi organ failure. Localization of peritonitis is body's defense mechanism and will lead to formation of abscess.

In our study all 9 patients who died had generalized peritonitis. Wound dehiscence and wound infection and pulmonary complication were common in generalized peritonitis.

Evaluation by scoring system

Based on the MPI Scoring patients were categorized into three groups. 42% of patients having scores <21 categorized as low risk group and 23% of patients with scores 21-29 are categorized as moderate risk and 23% of patients with scores>29 are categorized as high risk group.

Patients with organ failure on admission, pre operative longer duration of presentation, generalized peritonitis, malignancy, colonic origin of peritonitis feculent and purulent exudates were more likely to have higher scores and hence fall into high risk group than their counterparts. Higher morbidity is seen in scores 21-29 and scores>29. Higher mortality seen in patients with score>29.

Risk factor of Mannheim peritonitis index in three MPI intervals studied to mortality

Each risk factors of Mannheim peritonitis index were studied to mortality. Mortality was higher in patients with age>50 years, presence of organ failure, presence of malignancy, longer pre-operative duration of presentation, colonic origin of peritonitis, and purulent and fecal exudates. It is also seen in our study that higher the score mortality is higher and the details as shown in the (Table 3).

Table 3: Risk factor of MPI in three intervals studied to mortality.

Risk factor MPI group	Mortality					
	<21		21-29		>29	
	NO of Pts	Dead	No of Pts	Dead	No of Pts	Dead
Age >50 years	2	0	12	0	12	6
Age <50 years	32	0	15	1	7	2
Female	0	0	6	0	7	3
Male	34	0	21	1	12	5
Presence of organ failure	0	0	10	1	16	8
Absence of organ failure	34	0	17	0	3	0
Presence of malignancy	0	0	0	0	2	1
Absence of malignancy	34	0	27	0	17	0
Time >24 h	17	0	26	1	16	8
Time < 24 h	17	0	1	0	3	0
Non colonic origin	34	0	27	1	17	7
Colonic origin	0	0	0	0	2	1
Generalized peritonitis	15	0	27	1	19	8
Localized peritonitis	19	0	0	0	0	0
Clear peritoneal fluid	8	0	0	0	0	0
Purulent/cloudy peritoneal fluid	26	0	27	1	17	7
Fecal peritoneal fluid	0	0	0	0	2	1

Table 4: Comparison of MPI groups and outcome.

Outcome		MPI Scores		
		<21	21-29	>29
		Frequency	Frequency	Frequency
Mortality	Yes	0	1	8
	No	34	26	11
Complication	Yes	10	13	16
	No	24	14	3
Hospital stay	<15 days	25	8	8
	>15 days	9	19	11

Table 6: Determinants of clinical outcome among the patients.

Risk factor	Cases	Died	Survived	P value
Age group				
≥50 years	26	6	20	0.02
<50	54	3	51	
Sex				
Female	13	3	10	0.14
Male	67	6	61	
Organ failure				
Present	26	9	17	<0.001
Absent	54	0	54	
Malignancy				
Present	2	1	1	0.079
Absent	78	8	70	
Duration of symptoms				
>24 hrs	59	9	50	0.057
<24 hrs	21	0	21	
Origin				
Non colonic origin	78	8	70	0.079

Continued.

Risk factor	Cases	Died	Survived	P value
Colonic origin	2	1	1	
Type of peritonitis				
Generalized	61	9	52	0.076
Localized	19	0	19	
Peritoneal fluid				
Clear	8	0	8	0.134
Purulent	70	8	62	
Fecal	2	1	1	
MPI score				
<21	34	0	34	<0.001
21-29	27	1	26	
>29	19	8	11	

MPI groups and outcome

The duration of hospital stay is good measure of morbidity of patients due to peritonitis. In our study group 39 patients stayed in the hospital for more than 15 days (Table 4). We also found that higher the score more will be the complication like wound and pulmonary complications and higher the score their hospital stay will be longer. Presence of secondary infections, malnutrition, delayed presentation contribute for longer period of hospital stay and associated increased morbidity in our study group.

DISCUSSION

The present study was undertaken at this institute with a total of 80 patients. This study was conducted to know the morbidity and mortality in the patients of perforative peritonitis and patients were categorized into groups based on the Mannheim peritonitis index (MPI) scoring system. Patients have been categorized into three groups with scores <21, 21-29 and >29. 42% of the patients had score <21, 33% had scores 21-29 and 23% had score >29.

Patients with scores with <21 had 0% mortality, scores with 21-29 had 3.7% mortality and scores >29 had 42% mortality. We observed that as the score increase mortality also increases and findings of our study are comparable to other studies as mentioned in the (Table 6).^{11,12} Higher mortality was noted in higher scores is because more number of risk factors associated with higher scores like age >50 years with comorbid conditions, organ failure, delayed pre-operative presentation, purulent intra-abdominal collection and generalized peritonitis.

We also observed that as the MPI score increases morbidity also increases. 57% of patients with pulmonary complication had score >29, 33% of the patients with pulmonary complication had score 21-29 and 9.5% of the patients with pulmonary complication had score <21. The duration of hospital stay is a good measure of morbidity of patients due to peritonitis. In our study 11 (19) patients with score >29, 19 (27) patients with score 21-29 and 9 (34) patients with score <21 stayed in the hospital for >15 days (Table 4). As the MPI score increases wound

complications also increases (Table 7). Presence of secondary infections, malnutrition, delayed presentation contributes for longer period of hospital stay and associated increased morbidity in our study group.

Age >50 years found to be statistically significant (p value 0.02), with mortality of 23% compared to 5.5% in patients with age <50 years (Table 8).

Age above 50 years found to be risk factor associated with high mortality which is comparable with other studies (Table 8). The higher death rate among the elderly undoubtedly reflects an increased prevalence of pre-existing cardiovascular and other diseases as well as predictable decline in many physiological functions.

We also observed that as the MPI score increases patients with organ failure also increases and 84% with score >29, 37% with score 21-29, 0% of patients with score <21 had organ failure (Table 8). 32% patients showed evidence of organ failure and with a mortality rate 34.61% among the patients with organ failure.

Our findings of correlation of organ failure with mortality is in concurrence with other studies (Table 9).^{11,14,15} We also observed in our study all the 11% patients who expired had organ failure. In our study we found patients with organ failure had higher morbidity and mortality compared to patients without organ failure. Organ failure is not an all or none phenomenon, rather it is a continuation of alterations in organ function from normal function, through varying degrees of dysfunction, to organ failure. The description of organ dysfunction needs to be based on simple, easily repeatable variables specific to the organ in question and readily available. Organ dysfunction is not static and it will alter over time. The result mentioned above highlight the importance of early recognition, prevention, and treatment of organ dysfunction in our attempt to improve the short and long term outcome in patients with peritonitis.

Percentage proportion of perforation site like Duodenal perforation account for 60%, ileal perforation for 26.25%, gastric perforation for 7.5%, jejunal perforation for 3.75%,

colonic perforation for 2.5% are similar to other Indian studies (Table 10) whereas distal gastro intestinal tract perforations were more common in western studies.

The perforation of the proximal gastrointestinal tract was more common in India as noted by the earlier studies. The increased prevalence of gastro duodenal perforation is attributed to peptic ulcer as a major cause of perforation peritonitis.

In our study 76% of the patients presented with generalized peritonitis where as 23% with localized peritonitis (Table 9).^{11,14,15} Diffuse peritonitis is associated with a severe inflammatory reaction and development of sepsis and multi organ failure.

Total 26% of the patients had presented with duration of symptoms<24 hours and 74% of the patients presented with duration of symptoms>24 hours in our study (Table 2). 11% patients who had expired presented with duration of symptoms>24 hours (Table 5) and morbidity also higher for the survived patients. So pre-operative duration of presentation is an important risk factor in predicting morbidity and mortality. Delayed presentation is because of improper diagnosis, illiteracy and poverty where patients presented later with sepsis, MODS, ARDS.

We also noted purulent and fecal peritonitis is associated with higher morbidity and mortality in our study (Table 5).

As pre-operative organ failure and age>50 years found to be statistically significant, which play an important role in predicting morbidity and mortality in peritonitis due to hollow viscus perforation with similar findings seen in some of the studies, since it is a institutional based study there is further need for studies based on population.

CONCLUSION

Early evaluation of severity of illness using MPI allows us to estimate the probability of patients survival. Death rate in the present study with MPI score <21 was 0%, 21-29 was 3%, and >29 was 42% and this helps in pre operative assessment of prognosis of patients based on MPI scores. This is a validation study of the Mannheim Peritonitis Index scoring system for predicting the morbidity and mortality in patients with hollow viscus perforation. The results of this study provides that Mannheim Peritonitis Index scoring system is a simple and effective tool for assessing this group of patients, and can be used as a guiding tool to decide on the management of patient at all level of health care system.

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Conflict of interest: None declared

Ethical approval: The study was approved by the Institutional Ethics Committee

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