Original Research Article

Effectiveness of Mannheims peritonitis index in predicting the mortality and morbidity in patients with hollow viscous perforation in GMKMCH, Salem

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Received: 25 September 2019
Revised: 16 November 2019
Accepted: 18 November 2019

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ABSTRACT

Background: Successful management of peritonitis is a challenge to surgeons inspite of various advancements in medicine and surgical techniques. The outcome depends on various factors and early intervention. This led to the development of disease severity grading systems that would help grouping the patients by individual risk factors and appropriately predict possible outcome.
Methods: The prospective study was conducted in the Department of General Surgery, Government Mohan Kumaramangalam Medical College Hospital, Salem. The study population included 100 patients presenting with perforative peritonitis in the emergency department. Preoperative data like age, gender, preoperative symptom duration and operative data like appearance of exudate, extent of exudates, source of sepsis where noted. Tissue biopsies were followed up. Duration of hospital stay and other postoperative complications were also noted. Patients were followed up till their discharge. The study end point was at patient's discharge or death.
Results: Among the patients who had the maximum score >29, 11% of the patients belonged to age group beyond 50 years. Mortality was 7%. The specificity and sensitivity of morbidity prediction was 89% and 88.9% respectively. The specificity and sensitivity of mortality prediction was 91.40% and 100% respectively. Mortality was highest in patients with score >29.
Conclusions: Mannheim peritonitis index is a simplified scoring system with variables that can be assessed preoperatively, intraoperatively and postoperatively, to assess mortality and morbidity and instil appropriate treatment protocols which will bring out a positive outcome in the patients and increase survival rate.

Keywords: Peritonitis, Emergency, Grading systems

INTRODUCTION

Peritonitis can be defined as an inflammatory process of the peritoneum, which can be either localized or generalized.[1] In spite of adequate surgical management, intensive care units with advanced technology, newly invented recent generation antibiotics and a good knowledge of the pathophysiology, the mortality rate of perforation peritonitis are is still high.

The outcome of a case of peritonitis depends on various factors and is successful only if the patient undergoes early intervention. It is also based on the assessment of the degree of the illness and stratification of the risk factors. Such assessment and stratification leads in choosing patients of higher risk for more extensive therapeutic procedure and re-laparotomy if needed. An accurate risk factor scoring system essential to group the patients according to the risk factor status and thereby

enabling them to obtain the appropriate treatment needed. But unfortunately there is no single clinical finding or laboratory that might predict the grade of severity and thereby give insight into the patient's prognosis. It is common in India for young men to present with perforative peritonitis, and most of the time the features of peritonitis are well set due to feculent or purulent contamination with features of septic shock. Proximal gastrointestinal perforations are more common than distal perforations.[2]

From historical times, peritonitis has been noted as a condition associated with increased mortality and morbidity. An historical perspective of the slow unraveling of the pathology, microbiology, and evolution of the treatment is best appreciated in "The peritoneum" by Hertzler.[3] In a carcinomatous ulcer in gastric or gastroduodenal perforation, occurrence of perforation was found to be 16.7% and 5.4% respectively by Hedberg, Welch, Hau et al.[4] Supporting articles regarding peritonitis and the associated mortality and morbidity have been found widely.

Therefore, an easily reproducible scoring system which facilitates in the grading of severity of the illness that is required for an effective care for the patient, and by which to resort to a more aggressive approach for a patient who has higher mortality and morbidity and also importantly to convey the status of the patient to the anxious relatives with a clear and definite objective is required.

The Scoring systems that have been used to grade the severity of peritonitis can be classified into two groups. A) Score specific to the disease (peritonitis): eg., Mannheim peritonitis index (MPI), left colonic perforation score, B) a non-specific scoring system for evaluation of seriously ill patients: eg., APACHE II score, multiple organ dysfunction score

This study analyses one the disease specific scoring system, Mannheim's peritonitis index and its effectiveness in predicting the mortality and morbidity in cases of perforative peritonitis.

Mannheim's peritonitis index

Mannheim's peritonitis index was described by Linder and Wacha in the year 1983.[5] who applied various prognostic factors which included clinical symptoms, laboratory investigations pre-op and post-op, intraoperative findings in 1253 patients. The study was retrospective in nature. Initially they considered 20 factors. After careful analysis, 8 factors which had significant prognostic impact were considered, and were tabulated into the Mannheim's peritonitis index.

Criteria for organ failure as published by Deitch renal failure as serum creatinine >2 mg/dl), serum urea >46.78 mg/dl, oliguria <20 ml/ hour; shock as systolic BP of <90

mmHg or a decrease of >40 mmHg from baseline, with no other apparent cause for hypotension, c) Intestinal obstruction: obstructive/ paralytic ileus >24 hours d) respiratory failure as pO_2 <50 mmHg or pCO_2 >50 mmHg.

Table 1: Mannheim peritonitis index.

Risk factors	Scores
Age >50 years	5
Female sex	5
Organ failure	7
Malignancy	4
Pre-operative duration of peritonitis >24 hour	4
Origin of sepsis not colonic	4
Diffuse generalized peritonitis	6
Exudate	
Clear	0
Cloudy, purulent	6
Fecal	12
Total	

The maximum score is 47 and least score is 0. According the score the patients were graded into three group: Patients belonging to a score ≤ 21, patients belonging to a score from 22 to 28, patients with a score ≥29.

Advantages of MPI score

The number of factors used for assessing the morbidity when compared to APACHE II score are less. Hence, it is easy to apply in emergency setting and it incorporates preoperative, intraoperative and postoperative factors.

Objectives of the Study

Successful management of peritonitis is a challenge to surgeons inspite of various advancements in medicine and surgical techniques. The outcome depends on various factors and early intervention. This led to the development of disease severity grading systems that would help grouping the patients by individual risk factors and appropriately predict possible outcome.

METHODS

It was a Prospective study conducted From December 2014 to December 2016 in 100 patients presenting with Perforative peritonitis in the Emergency department at Government Mohan Kumaramangalam Medical College and Hospital, Salem.

Patients with clinical suspicion and investigatory support for the diagnosis of peritonitis due to hollow viscous perforation who are later confirmed by intra op findings were included in the study. The following cases were excluded from the study: TB peritonitis, Chemical peritonitis due to postoperative bile leakage, Suspected

primary peritonitis occurring in the setting of renal or hepatic failure, those admitted after laparotomy done elsewhere for peritonitis or transferred out to continue treatment elsewhere, peritonitis due to trauma, Age <15 years.

A detailed history is taken and examination is done to diagnose hollow viscous perforation. Systemic examination and basic investigations done. Preoperative data like age, gender, preoperative symptom duration and operative data like appearance of exudate, extent of exudates, source of sepsis where noted. Tissue biopsies were followed up. Duration of hospital stay and other postoperative complications were also noted. Patients were followed up till their discharge. The study end point was at patient's discharge or death.

The collected data were tabulated in Microsoft Excel 2013 version and analysed with IBM. SPSS statistics software 23.0 version. To describe about the data descriptive statistics frequency analysis, percentage analysis were used for categorical variables and the mean & S.D were used for continuous variables. Morbidity and mortality rates for the MPI scores were calculated and the predictive power of the MPI, sensitivity and specificity derived from Receiver Operator Characteristic (ROC) curve analysis.

To find the statistical significance between the variables the Pearson's Chi-Square test was used. In both the above statistical tools the probability value.05 is considered as significant level.

RESULTS

Age distribution

The age of the patients ranged from 13 to 80. They were categorized into patients <50 years and patients >50 years. The two groups were further classified into groups according to MPI index
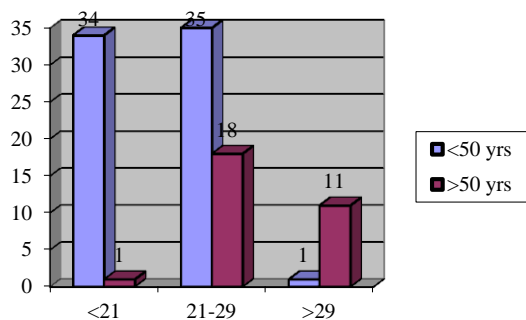

Figure 1: Age distribution according to MPI score.

Patients with score more than 29 belonged mostly to the age group >50 years. Most of the patients with a score of <21 belonged to the age group of <50 years. P value was 0.000 which was highly significant.

Site of perforation (origin of sepsis)

The Most common perforations were appendix (39%), duodenal (34%), gastric (19%). The least were traumatic perforations (1% each of jejunum, colon, ileum).
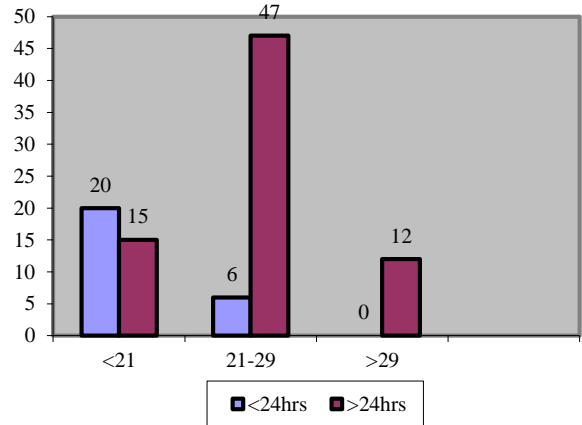
Presentation of symptoms

Figure 2: Duration of symptoms and MPI index.

Patients who had a higher score presented after 24 hours of onset of symptoms, whereas patients with lesser score presented within 24 hours.

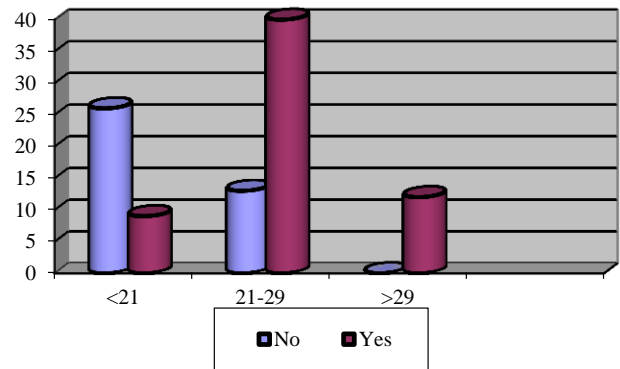### Presence/absence of organ failure

Figure 3: Organ failure and MPI score.

In our study, the patients with organ failure had higher MPI score, than those without, which was statistically significant (p:0000).

Type of peritonitis

The patients were categorized into those with localized/diffuse peritonitis. 79 patients presented with diffuse generalized peritonitis and 21 patients presented with localized peritonitis.

Nature of the exudates

The nature of the exudates was noted intraoperatively in each patient and they were categorized as clear, cloudy & purulent, feculent.

Most of the patients (82) presented with cloudy & purulent exudates. 8 patients presented with feculent exudates, 10 patients presented with clear exudates. The P value of the same was 0.003.

Mortality and MPI score

After calculating the total MPI score in each patient, Mortality of the groups were assessed. After evaluation, it was analyzed that Mortality was higher in patients with MPI score >29. P value was 0.000 which was highly significant

MPI variables and outcome in patients

Age with mortality

Table 2: Age with mortality.

| | | | Mortality | | Total |
			No	Yes	
Age range (in years)	≤50	Count	67	3	70
		%	72.0	42.9	70.0
	>50	Count	26	4	30
		%	28.0	57.1	30.0
Total		Count	93	7	100
		%	100.0	100.0	100.0

P=0.104.

Malignancy and mortality

Mortality in patients with malignancy was 28.6% and mortality in patients without malignancy was 71.4%. P was 0.003 (significant).

Extent of peritonitis and mortality

Mortality was highest among patients with diffuse peritonitis, with a p value of 0.157.

Nature of exudate and mortality

There was no mortality in patients with clear exudates. The mortality in patients with cloudy, purulent and feculent was equivocal (57.1% and 42.9%) respectively. P value was significant (0.002)

Morbidity in the study subjects

27 patients out of 100 had morbidity of various types.

Table 3: Morbidity in the study subjects.

Morbidity	No. of patients
SSI	4
Septic shock	4
Intra-abdominal abscess	3
Reperforation	4
Chest infection	3
Anastamotic breakdown	2
Pneumonia	2
Wound dehiscence	2
ECF	1
Post op Ileus	1

MPI score and morbidity

Morbidity was least in patients with score <21 and highest in patients with score 21-29. 9 patients with a score of >29 had morbidity which was statistically significant (p=0.000).
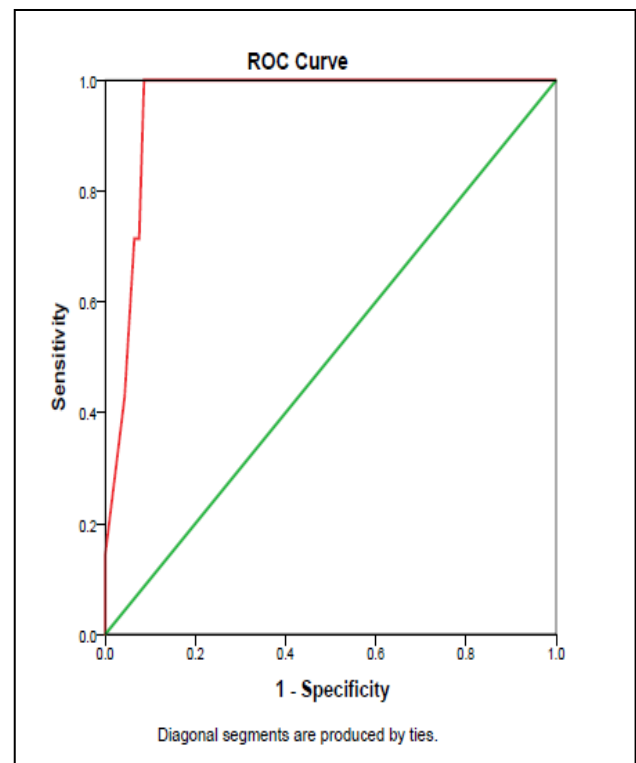
ROC curve of sensitivity and specificity of mortality

Figure 4: ROC curve for mortality.
Area under the curve: 0.955.

The ROC curve for mortality prediction indicated a predictive power of 0.955. The specificity of MPI index in predicting mortality was 91.40% and the sensitivity of MPI index in predicting mortality was 100%.

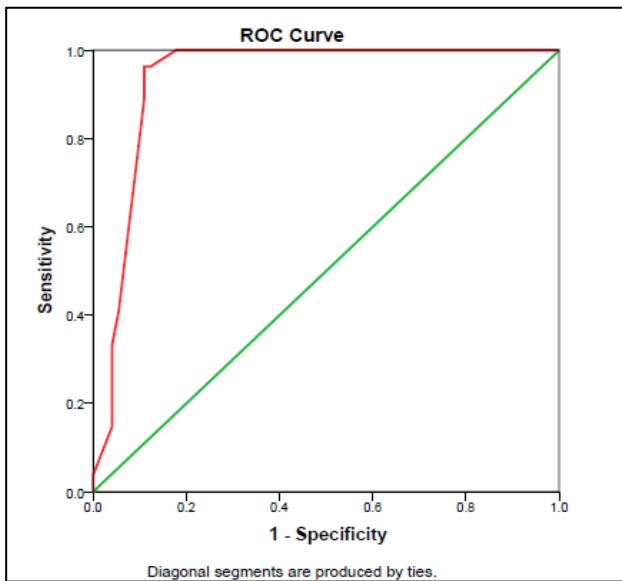*ROC curve of sensitivity and specificity of morbidity*

Figure 5: ROC curve for morbidity.
Area under the curve: 0.933.

The ROC curve for morbidity prediction indicated a predictive power of 0.933. The specificity of MPI index in predicting morbidity was 89.0 and the sensitivity of MPI index in predicting morbidity was 88.9%

DISCUSSION

In this study most of the patients who presented with perforative peritonitis were of the age group less than 50 years (70%), and in that category, the patients presenting with MPI score <21, 21-29 were equivocal (34% and 35% respectively).

Among the patients who had the maximum score >29, 11% of the patients belonged to age group beyond 50 years and most of the patients presenting with perforative peritonitis were men (80%).

Organ failure was associated with most of the patients (61%).[6]

Majority of the study subjects (74%) presented after 24 hours following the onset of the symptoms, leading to increase in the rate of mortality and morbidity.

The causes of the perforation when listed, the commonest where appendiceal perforation (39%), duodenal perforation (34%). The rarest causes were post gastrojejunostomy site perforation (1%), stab injury to the ileum (1%), traumatic small bowel perforation (1%), traumatic jejunal transection (1%), compared to a study conducted by Cukkemane et al where duodenal perforation formed 65.4% of the cause of perforation.[7] Rodolf et al 12.64% of patient's had colonic origin of sepsis.[8]

In assessing the mortality, among the 100 study subjects, 7 patients died (7%). 27% (27 patients) had morbidity.

In a study conducted by Qureshi et al, For patients with a score less than 21 the mortality rate was 1.9%, whereas for scores 21-29, and >29 it was 21.9% and 28.13% respectively (p<0.01).[9]

The complications that were developed were Surgical site infections (4%), septic shock (4%), re-perforation (4%). Wound dehiscence, pneumonia and Anastomotic breakdown occurred with an incidence of 2% each. Rare complications like enterocutaneous fistula and Ileus occurred in 1% incidence each.

Regarding extent of peritonitis, 79% had diffuse peritonitis, 21% of the study group had localized peritonitis.

The exudates of the patients were noted intraoperatively 82% had cloudy, purulent exudates, 10% had clear exudates, 8% had feculent exudate.

The degree of sensitivity and specificity of the index in predicting the mortality and morbidity is essential to choose the index, so that it aids in assessing the prognosis and helps in altering the treatment protocol for the patient.

Hence in this study it was assessed with the aid of ROC curve

The specificity and sensitivity of morbidity prediction was 89% and 88.9% respectively. The specificity and sensitivity of mortality prediction was 91.40% and 100% respectively. Mortality was highest in patients with score >29.

In a study done by Notash et al, MPI of <21 had a specificity of 79% and sensitivity of 100% and MPI of >29 had sensitivity of 79% and specificity 96% of in predicting inhospital deaths.[10]

Overall outcome in the patients with respect to MPI variables was also assessed.

On tabulating with chi-square test, significant results were associated with the age, gender, malignancy, extent of peritonitis, nature of exudate in assessing mortality.

CONCLUSION

Mannheim peritonitis index is one of the simplified scoring systems with variables that can be assessed preoperatively, intraoperatively and postoperatively, in order to assess the mortality and morbidity and hence instill appropriate treatment protocols which will bring out a positive outcome in the patients and thereby decreasing and preventing the occurrence of adverse

outcomes in patients with hollow viscous perforation and increase the survival rate.

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