MAK HILL Publications Research Journal of Medical Sciences

Research Article
doi: 10.59218/makrjms.2024.2.237.242

Mannheim Peritonitis Index as an Evaluative Tool in Predicting Morbidity and Mortality in Patients of Perforation Peritonitis

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ABSTRACT

The mortality rate for perforation peritonitis is still high even with advances in surgical therapy, modern intensive care units, novel antibiotics and a better knowledge of pathogenesis. The complex interaction of multiple factors and the degree of success attained through the application of focused treatment measures dictate the outcome of an abdominal infection. Furthermore, the outcome is contingent upon the precise identification of the severity of the illnesses and a meticulous evaluation and categorization of the patient's vulnerabilities. This study aims to examine the predictive value of the Mannheim Peritonitis Index scoring system in individuals suffering with hollow viscous perforation-related peritonitis. Furthermore, we want to assess how well it works as a clinical tool for dividing up these patients into groups according to each patient's unique surgical risk. To assess the effectiveness of MPI as a valuable, uncomplicated, replicable and prudent method for categorizing patients with peritonitis into high-and low-risk groups. The study was conducted from January 2022 to January 2024 in the Department of General Surgery at the Agartala Government Medical College in Agartala, West Tripura. It was a cross-sectional and observational study. This study involved 42 patients. Among the discharged patients, 38 individuals (76.0%) underwent Omental Patch Repair, while 12 individuals (24.0%) underwent Primary Closure during the intraoperative procedure. Among the deceased patients, 2 (20.0%) underwent Colostomy, 2 (20.0%) underwent Primary Closure, 4 (40.0%) underwent Rectal Advancement with Ileostomy and 2 (20.0%) underwent Resection and Anastomosis during the intraoperative procedure. The average Total Score (mean±s.d.) for discharged patients was 20.2800±6.2107.The average Total Score (mean±s.d.) of deceased patients was 34.0000±5.1208. The statistical significance of the difference was seen in the distribution of the mean Total Score with Outcome. ($p<0.0001$). A number of MPI characteristics that are associated with unfavorable outcomes were examined in the study. These characteristics included the presence of malignancy the occurrence of organ failure, durations longer than 24 hours, patients over 50 years of age, broad expansion of peritonitis and type of exudate. Two of these variables were shown to be statistically significant in predicting both mortality and morbidity the presence of organ failure and a time elapsed that exceeded 24 hours.

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Key Words

Mannheim peritonitis index, morbidity, mortality, organ failure and peritonitis

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Received: 24 December 2023
Accepted: 18 January 2024
Published: 23 January 2024

Citation: Ashish Kumar Anand, Sunil Kumar Ghosh and Kishore Kumar Das, 2024. Mannheim Peritonitis Index as an Evaluative Tool in Predicting Morbidity and Mortality in Patients of Perforation Peritonitis. Res. J. Med. Sci., 18: 237-242, doi: 10.59218/makrjms.2024.2.237.242

INTRODUCTION

Despite the use of surgical intervention, sophisticated critical care units, cutting-edge antibiotics and enhanced pathophysiological comprehension the fatality rate for perforation peritonitis continues to be high[1]. The prognosis of an abdominal infection is determined by the intricate interplay of numerous factors and the efficacy achieved via the implementation of targeted therapeutic interventions. Moreover, the result depends on an accurate recognition of the seriousness of the conditions as well as a careful assessment and classification of the patient's vulnerabilities. In order to identify patients at high risk and establish whether more aggressive treatment options, including as radical debridement, lavage system, open management, and planned relaparotomy, are necessary, it is crucial to do an early prognostic assessment of peritonitis. To enable prospective and appropriate comparison research, a precise risk index classification is necessary to set a baseline for comparing patient groups and various treatment approaches. There is currently no readily accessible laboratory test that can accurately predict the severity or prognosis of patients with peritonitis[2]. There is disagreement on the subject, but everyone agrees that carrying out prospective controlled clinical trials is crucial when it comes to intraabdominal infections. For evaluating the clinical efficacy of treatment plans, randomized controlled clinical trials are the preferred method. They serve as a crucial intermediary connecting advancements in fundamental scientific research with enhancements in healthcare. Hence, it is imperative to implement all necessary steps to conduct clinical studies of exceptional quality in this domain. Medical study terminology and definitions, disease severity evaluation, case selection and exclusion criteria, confounding variables, research objectives and the generalizability of findings are just a few of the challenges that scoring systems can successfully handle. Prognostic indicators have been proposed to be scoring systems because they simplify the assessment process by reducing various clinical characteristics to a single numerical number[3].

It is crucial to have a scoring system that can be replicated and used by surgeons to assess the seriousness of intra-abdominal infections. This is required to compare surgical critical care units scientifically, assess the efficacy of different treatment options, determine which high-risk patients require more aggressive surgery and give more unbiased information to the family of the patients[4].

MATERIALS AND METHODS

Study Design: Cross sectional study.

Study Type: Observational study.

Study Place: Department of General Surgery, Agartala Government Medical College, Agartala, West Tripura.

Study Period: Two years.

Study Population: All Cases of Perforative Peritonitis in Agartala Government Medical College and GB Pant Hospital, Agartala, West Tripura.

Sample Size: All patients fulfilling inclusion and exclusion criteria during one and half year study period. Last year number of cases admitted with perforation peritonitis was 42.

Sampling Method: Since all patients fulfilling inclusion and exclusion criteria are being included, census method sampling technique followed.

Inclusion Citeria: All Patients with clinical suspicion and investigatory support for the diagnosis of peritonitis due to hollow viscous perforation who are later confirmed by intra oprative findings. Age >18 years Patients with blunt injury abdomen causing only hollow viscous perforation.

Exclusion Criteria:

- All patients with tertiary peritonitis - Patients with peritonitis due to anastomotic dehiscence or leak
- All patients with primary peritonitis (Spontaneous bacterial peritonitis)
- Patients not willing to participate in the study

RESULTS

In Discharged patients, 42 (84.0%) patients were <50 years of age and 8 (16.0%) patients were >50 years of age. In outcome of died patients, 10 (100.0%) patients were >50 years of age. Age and Outcome Had a Statistically Significant Association (p<0.0001). In Discharged patients, 2 (4.0%) patients had Organ Failure. In outcome of died patients, 8 (80.0%) patients had Organ Failure. Organ failure and outcome had a statistically significant relationship (p<0.0001). In Discharged patients, 8 (16.0%) patients were <24 hours Evolution Time and 42 (84.0%) patients were >24 hours Evolution Time. In outcome of died patients, 10 (100.0%) patients were >24 hours Evolution Time. The relationship between evolution time and result was not statistically significant (p = 0.1742) (Table 1).

In Discharged patients, 48 (96.0%) patients had Generalised Peritonitis and 2 (4.0%) patients had Localised Peritonitis. In outcome of died patients, 10 (100.0%) patients had Generalised Peritonitis. Association of Extension of Peritonitis with Outcome was not statistically significant (p = 0.5200). In Discharged patients, 20 (40.0%) patients had Duodenum Perforation, 22 (44.0%) patients had

Table 1: Association between outcomes with all parameters

	Outcome			
Age	Discharged	Expired	Total	p-value
<50	42	0	42	
Row%	100.0	0.0	100.0	<0.0001
Col%	84.0	0.0	70.0	
Row%				
>50	8	10	18	
Col%	44.4	55.6	100.0	
	16.0	100.0	30.0	
Total	50	10	60	
Row%	83.3	16.7	100.0	
Col%	100.0	100.0	100.0	
Organ failure				
Absent	48	2	50	
Row%	96.0	4.0	100.0	
Col%	96.0	20.0	83.3	
Present	2	2	10	
Row %	20.0	80.0	10100.0	
Col %	4.0	80.0	16.7 <0.0001	
Total	50	10	60	
Row%	83.3	16.7	100.0	
Col%	100.0	100.0	100.0	
Evolution time				
<24hrs	8	0	8	
Row%	100.0	0.0	100.0	
Col%	16.0	100.0	13.3	
>24 hrs	42	10	52	
Row%	80.8	19.2	100.0	
Col%	84.0	100.0	86.7 0.1742	
Total	50	10	60	
Row%	83.3	100.0	100.0	
Col%	100.0	16.7	100.0	
Extension of peritonitis				
Generalised	48	10	58	
Row%	82.8	17.2	100.096.7	
Col%	96.0	100.0	0.5200	
Localised	2	0	2	
Row%	100.0	0.0	100.0	
Col%	4.0	0.0	3.3	
Total	50	10	60	
Row%	83.3	16.7	100.0	
Col%	100.0	100.0	100.0	
Anatomical site of perforation				
Colon	0	4	4	
Row%	0.0	100.0	100.0	<0.0001
Col%	0.0	40.0	6.7	
Duodenum				
Row%	20	2	22	
Col%	90.9	9.1	100.0	
Gastric	40.0	20.0	36.7	
Ileum	22	0	22	
Row%	100.0	0.0	100.0	
Col%	44.0	0.0	36.7	
Ileum	8	4	12	
Row%	66.7	33.3	100.0	
Col%	16.0	40.0	20.0	
Total	50	10	60	
Row%	83.3	16.7	100.0	
Col%	100.0	100.0	100.0	
Intra operative procedure				
Colostomy	0	2	2	
Row%	0.0	100.0	100.0	
Col%	0.0	20.0	3.3	
Omental patch repair	38	0	38	
Row%	100.0	0.0	100.0	
Col%	76.0	0.0	63.3	
Primery closer	12	2	14	
Row%	85.7	14.3	100.0	
Col%	24.0	20.0	23.3	
RA with Ileostomy	0	4	4	
Row%	0.0	100.0	100.0	
Col%	0.0	40.0	6.7 <0.0001	
Resection and anastomis	0	2	2	
Row%	0.0	100.0	100.0	
Col%	0.0	20.0	3.3	
Total	50	10	60	
Row%	83.3	16.7	100.0	
Col%	100.0	100.0	100.0	
Low	48	2	50	
Row%	96.0	4.0	100.0	
Col %	96.0	20.0	83.3	
Total	50	10	60	
Row%	83.3	16.7	100.0	
Col%	100.0	100.0	100.0	

Table 2: Distribution of mean total score outcome

Total score	Number	Mean	SD	Minimum	Maximum	Median	p-value
Discharged	50	20.2800	6.2107	9.0000	38.0000	20.0000	<0.0001
Expired	10	34.0000	5.1208	25.0000	38.0000	36.0000	

Gastric Perforation and 8 (16.0%) patients had Ileum Perforation. In outcome of died patients, 4 (40.0%) patients had Colon Perforation, 2 (20.0%) patients had Duodenum Perforation and 4 (40.0%) patients had Ileum Perforation. Association of Anatomical site of Perforation with Outcome was statistically significant (p<.0001) (Table 2).

In Discharged patients, 38 (76.0%) patients had Omental Patch Repair and 12 (24.0%) patients had Primery Closer in Intra Operative Procedure. In outcome of died patients, 2 (20.0%) patients had Colostomy, 2 (20.0%) patients had Primery Closer, 4 (40.0%) patients had RA with Ileostomy and 2 (20.0%) patients had Resection and Anastomis in Intra Operative Procedure. In Discharged patients the mean Total Score (mean±s.d.) of patients was 20.2800±6.2107. In outcome of died patients, the mean Total Score (mean±s.d.) of patients was 34.0000±5.1208. The mean Total Score distribution with the outcome was statistically significant (p<0.0001).

DISCUSSIONS

Spectrum of Perforation Peritonitis

AGE:

- A total of 60 patients were examined.
- The age range is from 18 to 79 years

The number of patients in the age group <50 years were 42 i.e. 70% and 18 patients of the study population i.e. 30% were in the age group >50 years The higher frequency of perforations in the 20-50 age group in our study can be linked to the higher prevalence of etiological risk factors like alcoholism, smoking and NSAID abuse in this age group, as well as the fact that gastro duodenal perforations caused by peptic ulcer disease are a major cause of perforation peritonitis in our study. The incidence of perforations has decreased in younger people and increased in older people in the past ten years, following a sharp increase at the start of the 20th century. These changes can be attributed to the cohort phenomenon: ulcer perforation risk is particularly common in the cohorts born after the turn of 20 century and is less common in previous and succeeding cohorts. It is also attributed to the increased numbers of traumatic perforations in the younger age group leading to parallel increase in the overall prevalence of perforation peritonitis in this age group.

Site of Perforation: In our study duodenal perforations account for 36.7%, ileal perforations for 20%, gastric perforations for 36.7%, colonic perforations for 6.7% In a study by Rajender Singh Jhobta *et al*.[5] the result was as below duodenum and gastric 60%, jejunal 3%, ileal 15%, colonic 4% . In a study by Avinash *et al*.[6] duodenal perforation 48%, gastric perforation 4%, colonic perforation 4%. The higher incidence of acid peptic disease is the cause of the higher number of duodenal perforations in our investigation. Previous research from India have revealed that the proximal gastrointestinal tract perforations were six times more common than the distal gastrointestinal tract perforations. Studies from wealthy nations show that distal gastrointestinal tract perforations are more common, which stands in stark contrast to this.

Intraoperative Procedures Done:

- Exploratory laparotomy and omental patch Repair was done in patients with duodenal and gastric perforation i.e. 38 (63.3%)
- Primary closure of perforation was done in 14 (23%) patients. While in 2(3.3%)patients ileostomy was done along with primary closure of perforation
- Ileostomy was done in 2 (3.3%) patients
- 2 (3.3%) patients underwent resection and anastomosis and in 4(6.7%) patients ileostomy was done along with resection and anastomosis

No patient in our study had their acid reflux illness treated with a final procedure. At the time of discharge, proton pump inhibitors were provided for each patient with gastroduodenal perforation brought on by acid peptic illness. In every incidence of gastroduodenal perforations of peptic etiology, primary closure of the perforation was performed using an omental patch and an edge biopsy. In the study by Rajinder Singh Jobta 5304 individuals, or 60% of the total, had their perforations simply closed, while 46 patients, or 9% of the total, underwent resection and anastomosis. Sixty four patients had resection without anastomosis and a mucous fistula ileostomy or colonostomy.

Origin of Sepsis: In our study 4(6.7%) patients had colonic origin of sepsis, while in the rest 56(93.3%) patients the origin of sepsis was non-colonic. In the study by Rajendra Singh Jobhta5 3.76% of patients had

colonic origin of sepsis. The various causes of the perforation of the colon are trauma, diverticulum perforation, perforated malignancy and mesenteric ischaemia. Colonic perforation presents with faecal exudates and a severe form of peritonitis.

Outcome: Among the 60 patients studied by us 10 patients expired thus placing the mortality at 16.7%. The mortality rate in various studies on perforation peritonitis ranges between 20-40%. Thus, the mortality from perforation peritonitis remains high even with advances in medical management the availability of new broad-spectrum antibiotics and extensive advancements in the field of intensive care with easy access to life support and intensive care. Sepsis and the onset of organ failure are significant predictors of death. Therefore, in order to develop novel and more effective treatment techniques, research and development should focus on understanding the pathophysiology and evolution of these components. Enhancing mobility options and bolstering referral services are two ways to address delays in seeking appropriate treatment.

Correlation Between Age And Mortality: In our study a total of 42 patients were less than 50 years old and 18 patients were more than 50 years old. Out of 42 patients of age less than 50 years no patients expired while out of 18 patients of age more than 50 years 10 (55.5%) patients expired. In a study by Mulari *et al*.[2] the mean age of the survivors was 37 years (SD±16.64), among non-survivors mean age was 74 years (SD±18.94).Thorsen *et al*.[7] confirms that the risk of in hospital death was higher in patients aged above 60 years. The elderly always have worse outcomes from severe surgical sickness, including death, than do younger patients and it is commonly known that age negatively affects the prognosis from abdominal sepsis in particular. Undoubtedly, a higher incidence of pre-existing cardiovascular and other disorders, along with a predictable deterioration in many physiological processes, contribute to the higher death rate among the elderly.

Coincident diseases are more common in older persons. A normal creatinine level may not always translate into a decrease in the physiological reserve, such as a decline in the glomerular filtration rate. Tissue hypoperfusion, acidity from vomiting, fluid loss into the gastrointestinal system, or bleeding in the elderly population might exacerbate the underlying condition that necessitates surgery. Our research demonstrates that there is an increased risk of death for people over 50 who are having emergency laparotomy surgery. Age-related increases in mortality following surgery are probably there but it's also possible that older adults have more comorbid medical disorders.

Correlation Between Sex and Mortality: In our study total of 44 patients belong to the male sex among which 10 expired resulting in a mortality of 22.7%. Similarly, female sex had a mortality of 0% Thorsen *et al*.[7] discovered that, with an odds ratio of 0.21, female sex is one of the parameters linked to death.

Correlation Between Preoprative Duration of Peritonitis and Mortality: None of the eight patients in our research who had peritonitis for less than 24 hours prior to surgery passed away. Out of the 52 patients who have preoperative duration of peritonitis of more than 24 hours, 10 patients expired thus placing the mortality rate of 19.2%. Avinash *et al*.[6] found mortality of 21% in patients presenting within 24 hrs of the onset of symptoms while the mortality was 79% in patients presenting late. In the study by Notash *et al*.[4] all the patients who presenting within 24 hours of the onset mortality was. 16% and those who presented after 24 hours mortality was 84%.

The management of perforated peritonitis involves the slow progression from sepsis to resuscitation in the natural course of the condition. Surgical intervention to clear septic debris and control the infection source are crucial components of this management approach. Empirical broad-spectrum antibiotics are also recommended. Scapellato suggests that Since intervention time is a changeable prognostic factor while many other factors are not, it may be thought of as the primary determinant of death in patients with peritonitis. Therefore, an early laparotomy should be performed as a surgical emergency in cases with perforation peritonitis following the patient's initial resuscitation.

Correlation Between Malignancy and Outcome: In our study 4 patients had malignancy. 4 out of the 4 patients expired. Thus, placing the mortality rate in presence of malignancy to 100 %.In a study by Avinash *et al*.[6] 2 patients had malignancy with mortality rate 100%. Ruptures in the viscoelastic membrane are typically the cause of peritonitis in cancer patients. Fever, widespread stomach discomfort, nausea, vomiting, and abdominal pain are the characteristic clinical symptoms. Paralytic ileus, rebound tenderness, and tenderness. Recent surgical status, immunological depression, concurrent antibiotic usage and aging may all cause a delay in diagnosis. The increased fatality rates associated with peritonitis in individuals with cancer are mostly caused by the severity of the underlying ailment.

Serious infections are less likely to be survived by these patients. Numerous immune system abnormalities, including the breakdown of anatomical barriers, disruption of phagocytic activity and disruption of humoral and cellular responses, have

been found in cancer patients. Opsonin intake can happen during a serious infection that causes the immune system to malfunction.

Correlation Between Type of Peritonitis and Mortality: In our study 58 patients had generalised peritonitis and 2 patient had localized peritonitis. individuals with localized peritonitis did not have any mortality, whereas individuals with generalized peritonitis experienced 10 deaths of 17.2%. In the study by Rajender Singh Jhobta5generalized peritonitis corresponded to 83% of the study group. In the study by Kusumoto *et al*.[8] generalized peritonitis corresponded to 68%. Anticipatedly, a longer peritoneal inflammatory process was linked to a higher death rate.

Correlation Between Origin of Sepsis (Colonic/ Noncolonic) and Mortality: In our study 4 patients had colonic origin of sepsis out of which 2 patients expired resulting in a mortality of 50% while in non-colonic origin of sepsis the mortality rate in our study was 14.2%. Therefore, compared to non-colonial origins of sepsis, colonic origins of sepsis are linked to a worse outcome (higher mortality). As a result, this study demonstrated the importance of the septic focus and demonstrated that, although stomach and duodenal perforations had a fair recovery rate, colonic perforations are associated with a higher risk.

Corelation Between Character of Exudate and Mortality: In our study among the 12 patients with clear exudate none expired. 4 (10.5%) patients expired among the 38 patients with purulent exudates 6 (60%) patients expired among 10 patients with faecal exudates. In the study of Rajender Singh Jhobta5 clear fluid had a mortality of 15%, purulent fluid had a mortality of 71% and faecal fluid had a mortality of 13%. The type of exudate and its mortality are directly correlated with the quantity of microorganisms present. Since clear exudates are typically sterile at first, sepsis develops slowly. Endotoxaemia and septic shock are caused by a large number of microorganisms found in purulent and faecal exudates, many of which are gram negative anaerobes.

Morbidity of Patients With Peritonitis: A reliable indicator of a patient's morbidity from peritonitis is the length of their hospital stay. In our study population, the presence of secondary infections, malnourishment, and delayed presentation are related with longer hospital stays and higher morbidity rates.

CONCLUSION

Mannheim In patients with peritonitis, the peritonitis index is a helpful tool for determining study group outcome. Among the MPI variables of adverse outcome namely, presence of organ failure, time elapsed >24 hours, presence of malignancy, age >50 years, generalized extension of peritonitis and type of exudate, Organ Failure and time >24 hours showed statistical significance in predicting mortality and morbidity.

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