

Validation And Analysis of Mannheim Peritonitis Index Scoring In Predicting Outcome in Patients With Perforation Peritonitis – A Prospective Study in Tertiary Care Centre

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Abstract:

Background: Despite advances in diagnosis, management and critical care of patients with perforation peritonitis, prognosis remains poor. Early assessment by scoring systems will influence the management and prognosis. Over the years, many prognostic systems have been developed to stratify critical patients into different categories. Some are complex in their application whereas some are not specific for the disease condition. Mannheim peritonitis index (MPI) is one such prognostic system that helps us to estimate the probability of patient survival in cases of perforation peritonitis.

Aim of our study is, to confirm the predicative value of MPI and analysis of different parameters among patients with intra-operative diagnosis of perforation peritonitis.

Materials and Methods: The study was conducted from May 2014 to April 2015 on 100 patients undergoing surgery for perforation peritonitis.

Result: Of the 100 patients, 85 were male and 15 were female. On dividing the patients into two groups based on the MPI score (<26 and ≥26), it was found that there was absence of deaths in patients with scores <26, and increased mortality and morbidity in those with score ≥26 confirmed the predicative value of MPI among patients with perforation peritonitis.

Higher mortality rates were associated with presence of age >50, female sex, multi-organ failure, duration of symptoms of more than 24 hours, faecal peritonitis and presence of malignancy.

Conclusion: The MPI is one of the simplest scoring systems in use that allows the surgeon to easily determine the outcome risk during initial surgery and probability of patient survival. Also, because of its simplicity of application it can be a very useful tool in countries such as India where there is limitation of resources and lack of ICU facilities.

Keywords: MPI, Perforation peritonitis, Mortality, Outcome

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I. Introduction

Peritonitis is still one of most important infectious problem that a surgeon has to face. Despite of the progress in antimicrobial agents and intensive care treatment, the present mortality due to diffuse perforation peritonitis from 10 to 20% continues to be unacceptably high(1,2). Reproducible scoring systems that allow a surgeon to determine the severity of the intra-abdominal infection are essential to: 1) ratify the effectiveness of different treatment regimens, 2) scientifically compare surgical intensive care units, 3) help indicate individual risk to select patients who may require a more aggressive surgical approach and 4) be able to inform patient's relatives with greater objectivity [3].

A good scoring system is useful in comparing various groups of patients, different treatment modalities, evaluating new therapies, in monitoring resources for effective use and improving standard of care.[4], Many scoring systems are available to grade the severity of acute peritonitis for example, 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).[5,6]. Presently, one of the most accepted scores is APACHE II (Acute Physiology and Chronic Health Evaluation II), which integrates various physiologic variables during the first 24 h within the ICU with age and chronic health status of the patient. This initial stratification of risk factors and a predicative equation estimate patient outcome. They are, however, both complex and time-consuming [7]. Most of Indian hospitals are required to deal with serious shortage of equipment and lack of staff. In 1986, Wacha H et al. published the Mannheim peritonitis index

(MPI) based on analysis of 17 possible risks factors in patients with peritonitis; only eight factors were truly relevant to prognosis (age, sex, organ failure, cancer, duration of peritonitis, involvement of colon, extension of spread and character of peritoneal fluid) and were finally included in the index. The score considers clinic risk factors routinely found in preoperative and trans-operative registers[8]. This information is obtained during first laparotomy to establish an initial classification. Early evaluation of severity of illness using MPI allows us to estimate the probability of patient survival [9, 10]. The MPI is one of the simplest scoring systems in use that allows the surgeon to easily determine outcome risk during initial surgery. The recollection of retrospective data is possible and valid, because MPI only requires information routinely found in surgical registers[10].

Table 1 Mannheim peritonitis index

Study variable	Adverse factor	Points	Favourable factor	Points
Age	>50 years	5	<50 years	0
Sex	Female	5	Male	0
Organ failure	Present	7	Absent	0
Malignancy	Present	4	Absent	0
Evaluation time	>24 hours	4	<24 hours	0
Origin	Non colonic	4	Colonic	0
Extension of Peritonitis	Generalised	6	Localised	0
Exudate	Fecal =12 points	Purulent 6 points	Clear = 0 points	

Aim of our study was, to confirm the predicative value of MPI among patients with intra-operative diagnosis of perforation peritonitis at the surgical department of SMS hospital, Jaipur (Rajasthan) was undertaken, to evaluate severity of peritonitis and to make a prognosis of survival-mortality, considering the risk factors analysed in this index.

II. Material And Methods

This was a prospective, descriptive and observational study conducted in single surgical unit in the Department of General Surgery at SMS Medical College Jaipur, Rajasthan, India, from May 2014 to April 2015. Patients were enrolled in study only after informed written consent. A total of 100 consecutive patients diagnosed with perforation peritonitis and treated surgically were included. Patients with primary peritonitis occurring in conditions like liver or renal failure, chemical peritonitis due to postoperative bile leakage, peritonitis secondary to trauma, age less than 16 years, peritonitis patients with laparotomy done elsewhere or transferred out to continue treatment elsewhere were excluded from the study, also patients managed conservatively were not included in the study. Initial preoperative work up and resuscitation with intravenous fluids, antibiotics, analgesics, nasogastric decompression was done in all the cases. Site of hollow viscous perforation along with extent of peritonitis and character of exudate were documented. Appropriate surgical procedure was performed based on etiology and patient condition. Thorough peritoneal lavage was given in all cases. Further resuscitation and ICU care was continued as and necessary. The followed up was continued postoperatively till one the various outcomes i.e. mortality, morbidity or discharge.

The MPI scoring (Table 1) was applied along with other clinical and biochemical parameters recorded in pre-structured proforma. Total patient MPI score was the sum total of all the positive risk factor scores. The minimum possible score is zero, if no adverse factors are present and maximum is 47 if presence of all factors can be confirmed. Patients were divided into two groups according to the following categories of the MPI score: <26 and ≥26. These categories and useful clinical reference at 26 MPI points were considered as was done in the study published by Billing et al.[10] A life table was constructed to compare patient survival with peritonitis severity according to the MPI score in terms of mortality and morbidity. To validate each risk factor, patients who survived were separated from non-survivors, studying each parameter of the MPI.

A table was constructed to analyse the presence or absence of adverse factors and results (death vs survival) to calculate odds ratio (OR). All the collected data were compiled and results obtained using Epi Info version 7.2.1.0.

III. Results

Of the sample of 100 patients, 15 were females and 85 were males. Group mean age was 40.61years with median of 35 years and a range from 16 to 80 years of age. Mean age of survivor was 38.12years (SD±15.33); among non- survivor, mean age was 60.73years (±15.72) p<0.05MPI

Table 2. Risk factor analysis of Mannheim's peritonitis index

Risk Factor	Subgroup	No. of Patient	Death	% Death	P value
Age	> 50 years	33	9	27.27%	<0.001
	<50 years	67	2	2.99%	

Sex	Female	15	5	33.3%	0.011
	Male	85	6	7%	
Organ Failure	Yes	19	10	52.60%	<0.001
	No	81	1	1.20%	
Malignancy	Yes	2	2	100%	0.004
	No	98	9	9.2%	
Time	>24 hour	67	11	16.4%	0.033
	<24 hour	33	0	0%	
Origin	Non colonic	91	11	12.2%	0.584
	Colonic	9	0	0%	
Peritonitis	Generalised	94	11	11.7%	0.830
	Localised	6	0	0%	
Exudate	Clear	38	0	0%	0.002
	Purulent	37	4	10.8%	
	Fecal	25	7	28%	

Origin of perforation peritonitis was from 6 different anatomic sites and was due to various causes (Table 3). Maximum number of patients had duodenal perforation (49%), followed by ileal perforation(23%).Surgical treatment of perforation peritonitis was done according to etiology and patient condition Primary Closure of perforation with Omental Patchrepair, Appendectomy, simple closure of perforation, resection with ileostomy etc. Mean hospital stay in our study was 8.69 days (range 3 to 32 days).

In our study we encountered 11 deaths (11%). In this study, the mean MPI score was 23.51 with score of 11 as the lowest and 42 as the highest. In both MPI groups studied, the influence of MPI score was statistically highly significant with regard to mortality, morbidity and overall hospital stay. MPI score of 26 and more was associated with 26.83% overall mortality and in <26 MPI mortality is 0% (p value <0.001). In this study higher mortality rates were associated with presence of multi- organ failure, duration of symptoms of more than 24 hours, faecal peritonitis and presence of malignancy. Overall morbidity rates in various studies for surgery in perforation peritonitis vary widely ranging from 18% to 67%[8]. MPI score evaluation for morbidity showed an overall 26% morbidity in our study. Superficial wound infection in 21% cases, Respiratory complications in 14% cases, partial wound dehiscence 2%, complete wound dehiscence 3%, fecal fistula in 3% cases.

Table 3: Showing anatomical site of perforation in study patients

Site of perforation	frequency	%
Duodenal	49	
Ileal	23	
Jejunal	11	
Colonic	9	
Appendicular	5	
Gastric	3	

Table 4: Showing correlation of MPI score with incidence of mortality

MPI	Outcome	
	Discharged	Death
<26	59	00
%	100%	0%
≥26	41	11
%	73.17%	26.83%

IV. Discussion

Peritonitis secondary to hollow viscous perforation is one of the commonest reasons for emergency surgery done even today. Various factors like age, sex, organ failure, malignancy, extent of peritonitis, type of contamination, site of perforation, surgical interventions are all known to influence mortality and morbidity. Effective preoperative management, timely surgery and proper post-operative care will decide the outcome. In this study mortality for MPI score more than 26 was 26.83%,while for <26 was 0%. In our study a total of 67 patients were less than 50 years of age, mortality rate was 2.99% ,while out of 33 patients with age more than 50 years 27.27% patients died (Chi-square = 10.957 with 1 degree of freedom; P <.001). In correlation between Age > 50 years with incidence of mortality, our study showed statistically significant result with p <0.001. Cecilie Svanes [11] et al in their study found that patients with age < 49, 18 patients died i.e. a mortality of 3.09%, while in patients with age >49 years the mortality was 11.94%. . The higher death rate among the elderly undoubtedly reflects an increased prevalence of pre-existing cardiovascular and other diseases as well as

a predictable decline in many physiological functions. In our study total of 85 patients belong to the male sex among which 6 died resulting in a mortality of 7 %. Similarly, female sex had a mortality of 33.3 %. & thus female sex has adverse outcome (Chi-square = 6.507 with 1 degree of freedom; P = 0.011). In correlation with female sex incidence of mortality, our study showed statistically significant result with $p < 0.05$. Yoshiko Kusumoto [12] et al found out in their study of 108 patients operated for intra-abdominal infections the mortality was 5.3% in men and 15.2% in women.

In our study a total of 19 patients showed evidence of organ failure. 10 patients died among this 19 patients, thus resulting a mortality rate of 52.63 %. 1 patients out of 81 patients who showed no evidence of organ failure died resulting in a mortality of 1.3% (Chi-square = 36.443 with 1 degree of freedom; P = 0.000). In correlation of organ failure with incidence of mortality p value in our study was < 0.05 which is statistically significant. In the study by Rodolfo L et al [13] 11 patients died and all of them presented with the variable of organ failure. A systemic inflammatory response induced by the peritoneal infection may further progress to septic shock and multi organ failure. . The high rate organ failure in our study denotes a delay in presentation of most cases.

In our study 2 patients had malignancy. Both patients expired thus placing the mortality rate in presence of malignancy to a whopping 100 % (Chi-square = 8.538 with 1 degree of freedom; P = 0.003 statistically significant). Chao- Wen Hsu [14] in their study of colorectal perforations found out that although the overall mortality was 36.9% the highest disease specific mortality was due to malignancy (61.5%). Many disturbances of the immune system have been identified in oncologic patients, such as destruction of the anatomic barriers and derangement in the phagocytic activities and humoral and cellular responses. A consumption of opsonins may occur in the course of severe infection leading to failure of the immune system.

In our study out of the 18 patients with a preoperative duration of peritonitis of less than 24 hrs no patient died. Out of the 82 patients who have preoperative duration of peritonitis of more than 24 hrs, 11 patients died thus placing the mortality rate of 13.41 % (Chi-square = 4.526 with 1 degree of freedom; P = 0.033, statistically significant). In the study by Rodolfo L [13] all the patients who died were having a preoperative duration of greater than 24 hours. Intervention time may be considered the main determinant of mortality in patients with peritonitis, since intervention time is a modifiable prognostic factor while many other factors are not. Therefore in cases of perforation peritonitis after the initial resuscitation of the patient's immediate laparotomy should be done as a surgical emergency.

Non-colonic origin is also considered an adverse factor, 11 of 91 (12.2%) patients having non-colonic origin died, as opposed to 0 of 9 patients having colonic origin. (Chi-square = 0.299 with 1 degree of freedom; P = 0.584). In correlation with peritonitis incidence of mortality, p value in our study was 0.583 which is statistically not significant & shows contrast results with MPI, it's may be due to less number (9) of patient in this group). In the study by Rudolf L [13] 12.64% of patient's had colonic origin of sepsis.

In our study 94 patients had diffuse peritonitis and 6 patients had localized peritonitis. There was no mortality in patients with localized peritonitis while in patients with diffuse peritonitis there were 11 deaths with a mortality of 13.14%. Chi-square = 0.046 with 1 degree of freedom; P = 0.83, p value in our study is 0.83 which is statistically not significant & shows contrast results with MPI, it's may be due to less number (6) of patient in this group. Wahl N and associates [15] have rated diffuse peritonitis with mortality of 47% as one of the most unfavourable factor. As expected the extension of the peritoneal inflammation process was related to increased mortality. In our study 38 patients with clear exudates no one died, while with purulent and fecal exudate mortality rates were 10.8% and 28% respectively (Chi-square = 12.078 with 2 degrees of freedom; P = 0.002, statistically significant). In the study of Rodolfo L [13] clear fluid had a mortality of 5.8% (7/121), purulent fluid had a mortality of 6.3% and faecal fluid had a mortality of 25%.

In this study, the mean MPI score was 23.51 with score of 11 as the lowest and 42 as the highest. Bielecki et al found mean MPI score of 24.2 among patients with large bowel perforation [16]. In both MPI groups studied, the influence of MPI score was statistically highly significant with regard to mortality, morbidity and overall hospital stay. MPI score of 26 and more was associated with 26.83% overall mortality and in < 26 MPI mortality is 0% (p value < 0.001). Different studies have mortalities ranging from 6.4% to 17.5%. Mortality rate for MPI score more than 26 was 28.1% while for scores less than 26 it was 4.3% [17]. In this study higher mortality rates were associated with presence of multi-organ failure, duration of symptoms of more than 24 hours, faecal peritonitis and presence of malignancy.

V. Conclusion

Mannheim Peritonitis index is a useful method to determine study group outcome in patients with perforation peritonitis. In the past 30 years, many prognostic scoring systems have been developed for critical patients. Presently one of the most accepted scores is APACHE II score which integrates various physiological variables during the first 24 hours within the ICU. They are however both complex and time consuming. The MPI is one of the simplest scoring systems in use that allows the surgeon to easily determine the outcome risk

during initial surgery and probability of patient survival. Also, because of its simplicity of application it can be a very useful tool in countries such as India where there is limitation of resources and lack of ICU facilities. Mortality and morbidity can be further reduced by early arrival of the patients to hospital and early intervention.

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