Research Article

Validation of Mannheim peritonitis index in a tertiary care center in Rajasthan

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Abstract

Background: 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 peritonitis.

Objectives: To study the validity of MPI as a useful, simple, reproducible, and judicious tool in stratifying patients with peritonitis into high- and low-risk categories, and to assess the use of such classification in terms of patient survival and morbidity advantage in various categories.

Materials and Methods: The study was conducted from January 2011 to November 2011 on 150 patients undergoing surgery for secondary peritonitis.

Result: Of the 150 patients, 113 were male and 37 were female. On dividing the patients into two groups based on the MPI score (0–26 and >26), it was found that there was absence of deaths in patients with scores 0–26, and increased mortality and morbidity in those with score >26 confirmed the predicative value of MPI among patients with surgically diagnosed peritonitis.

Conclusion: The MPI is a useful tool for assessing the prognosis of cases of peritonitis. It not only helps in assessing the mortality and morbidity of the patient but also helps to inform the patient's attendant with greater perspective. Also, because of simplicity in its application, it can be very useful for developing and underdeveloped countries.

KEY WORDS: Mannheim peritonitis index, secondary peritonitis, morbidity, mortality, prognosis

Introduction

Peritonitis is still one of the most important abdomen problems that a surgeon has to face. Despite the progress in antimicrobial agents and intensive care treatment, the present mortality due to diffuse suppurative peritonitis from 10% to 20% continues to be unacceptably high.[1] Reproducible scoring systems that allow a surgeon to determine the severity of the intra-abdominal infection are essential to compare the effectiveness of different treatment regimens, scientifically compare management in surgical intensive care units (ICUs), indicate individual risk to select patients who may require a more aggressive surgical approach, and provide information regarding the prognosis of high-risk patient.

In the past 30 years, many prognostic scoring systems have been developed for critical patients. Despite their design for general application, some have proven specific use in patients with sepsis.[2] The results of treatment

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Table 1: Mannheim peritonitis index

Study variable	Adverse factor	Points	Favorable factor	Points
Age	>50 years	5	≤50 years	0
Sex	Female	5	Male	0
Organic failure	Present	7	Absence	0
Malignancy	Present	4	Absence	0
Evolution time	≥24 h	4	<24 h	0
Origin	Non-colonic	4	Colonic	0
Extension of peritonitis	Generalized	6	Localized	0
Character of peritoneal fluid	Fecal—12 points	Purulent—6 points	Clear—0 points	

for peritonitis are especially difficult to evaluate because these patients may correspond to various etiologies, treatments may differ, and a lack of universally valid criteria and definitions.[3]

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.[4] Most of Indian hospitals are required to deal with serious shortage of equipment and lack of staff.

In 1986, Linder et al.[5] published the Mannheim peritonitis index (MPI) [Table 1] based on the analysis of 17 possible risks factors in patients with peritonitis; only 8 factors were found to be 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 clinical risk factors routinely found in preoperative and transoperative registers.[5] This information is obtained during first laparotomy to establish an initial classification. Early evaluation of severity of illness using the MPI allows us to estimate the probability of patient survival.[3,6]

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 the MPI only requires information routinely found in surgical registers.[6]

The objectives of this study were to evaluate the validity of MPI as a useful, simple, reproducible, and judicious tool in stratifying patients with peritonitis into high- and low-risk categories, and to assess the use of such classification in terms of patient survival and morbidity advantage in various categories.

Materials and Methods

The study was conducted at the Department of General Surgery, SMS Hospital, Jaipur, Rajasthan, India, with the permission from ethical committee and research review board. The study was a prospective, descriptive, and observational study conducted among 150 cases of peritonitis between January 17, 2011 and November 30, 2011.

Once peritonitis was diagnosed by operative finding registered in the postoperative report, the patient was included into the study. Using data recollection sheets, risk factors found in the MPI were classified according to values indicated in table and individual variable scores were added to establish initial MPI score. Patient evolution was followed for 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 used to determine perioperative morbidity and mortality. Outpatient follow-up was continued for up to 30 days to establish morbidity and mortality.

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: 0–26 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.[6] 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 nonsurvivors, studying each parameter of the MPI.

A table was constructed to analyze 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 SPSS-IBM software, version 20.

Results

Of the 150 patients, 113 were male and 37 were female. Group mean age was 37.2 years with a median of 35 years and a range from 16 to 85 years.

Origin of peritonitis was from nine anatomic sites and was due to various causes [Table 2]. Maximum number of patients had perforation associated with typhoid (28.6%) followed by peptic perforation (21.3%). Fourteen patients had abdominal

Table 2: Various etiologies in our study

Etiology	Number
Enteric perforation peritonitis	43
Peptic perforation peritonitis	32
Appendicular pathology	29
Gallbladder pathology	24
Abdominal trauma	14
Intestinal obstruction	6
Liver abscess ruptured	1
Colonic perforation	1

trauma that included assault and road traffic accident, causing either hemoperitoneum or gut injury. Other 24 patients had pathology in gallbladder, which included cholecystitis, pyocele, mucocele, or cholangitis. Of six patients with intestinal obstruction, four had a band causing obstruction whereas one each had carcinoma rectum and Meckel's diverticulum as cause of obstruction.

Discussion

Of the 150 patients that were operated on, 13 died leading to a mortality rate of 8.6%. Eighty percent survivors (105/137) evolved without complications and were discharged from the hospital.

Mean age of patients was 37.2 years (range 16–85 years) with mean age being 35.7 years (SD ± 16.65), and among nonsurvivors the mean age was 51.61 years (SD ± 16.63) (p <0.0001).

The patients spent a mean of 6.9 days in the hospital, a range 2–30 days. Mean length of stay of survivors was 7.08 days (SD ± 4.33) and for nonsurvivors 5.38 days (SD ± 4.02) (with majority of deaths occurring in first 48 h of admission).

Thirty-two patients initially operated on presented with some complications during their stay in the hospital. Subsequently, two patients were re-operated for leak, one was of enteric and another of peptic perforation. Nine patients had chest infection with or without wound infection. Twenty-eight patients had wound infection with 9 patients having abdominal wound dehiscence for which secondary suturing was performed.

With regard to spread of peritonitis, 105 patients were found with generalized peritonitis and 45 with localized peritonitis; 67% survivors (92/137) had generalized peritonitis and 33% (45/137) had localized peritonitis. Among patients who died, all patients had generalized peritonitis (100%) as compared to localized peritonitis, which did not have any mortality.

Table 3 shows survival between the two groups. On statistical analysis using χ^2-test for degree of freedom as 1 is 126.27 and p-value is <0.0001, which shows that predictability of the MPI score in predicting survival is very strong.

Table 3: Survival between different groups of MPI score

Group	Discharge	Death	Total
0–26	112	0	112
>26	25	13	38
Total	137	13	150

Table 4: Risk factor analysis between different groups of MPI score

Risk factor	0–26		>26	
	Patient	Death	Patient	Death
Age > 50 years	15	0	9	6
Age < 50 years	97	0	16	7
Female	29	0	4	4
Male	83	0	21	9
Presence of organic failure	2	0	12	11
Absence of organic failure	109	0	13	2
Malignancy (+)	1	0	1	1
Malignancy (–)	111	0	24	12
Time <24 h	14	0	1	1
Time >24 h	98	0	24	12
Non-colonic origin	83	0	25	12
Colonic origin	29	0	0	1
Localized peritonitis	45	0	0	0
Generalized peritonitis	67	0	25	13
Clear fluid	18	0	0	2
Purulent fluid	61	0	4	0
Fecal fluid	33	0	21	11

In Table 4, breakdown information of each risk factor is according to the following categories: scores of <26 and >26. In descending order, results of OR for each risk factor were the following: presence of malignancy, 5.26; age > 50 years, 5.2; fecal peritoneal fluid, 1.83; female gender, 1.21; and non-colonic origin, 3.2. Organic failure was present in 25 patients, of which 11 died. Similarly, of two cases of malignancy one died. Considering evolution time of >24 h, 12 patients of 135 died.

Group mean MPI score was 22.45 points. Among surviving patients, mean score was 21.3 points and among nonsurvivors, mean was 34.3 points (p < 0.0001).

A glance at the life table shows a difference in prognosis of the two established groups. There was absence of deaths in patients with scores 0–26 MPI points, and increased mortality and morbidity confirms the predicative value of MPI among patients with surgically diagnosed peritonitis.

In our study, overall mortality rate was 8%; other studies reported global mortality rates from 3.9% to 54%.[5,7,8] In a recent cohort study investigating patients with peritonitis, overall morbidity rate was 41% and the hospital mortality rate was 14%. In concordance with the life table, when MPI score increased, mortality increased, which coincides with other publications. In general, patients admitted at the our center had same clinical profile and similar MPI score, which is same as shown in other studies in terms of age and sex composition and had same case distribution thus have higher MPI score.

Various publications have used more than one score system to consider and determine which gives the best results.[7,9–11] Some concluded that APACHE II score and MPI correctly determine severity of intra-abdominal infection and are strongly and independently associated with prognosis, but MPI has the advantage of simplicity and easy application.[7] The combination of APACHE II system and MPI probably provides the best scoring system appropriate for clinic and epidemiologic use. The MPI score combined with APACHE II gave prognosis that was more thorough, realistic, and significant.[12] Others differ, concluding that sensitivity and specificity with the MPI is greater than that calculated with APACHE II.[13] When considering each risk factor, constructing a contingency table in which the presence or absence of adverse factor and result (death or survival) are considered, OR value obtained allows us to weigh, in descending order of significance, each risk factor as follows: presence of malignancy, age 50 years, generalized peritonitis, presence of fecal peritoneal fluid, and female gender. Even though mortality rate in the presence of malignancy was 50% (1/2), the result was not conclusive due to the small number of patients with malignancy in this series.

Although the study group excluded pediatric patients, our mean age was younger than other series that included children.[7,14,15] Other studies have similar results that with increasing age, MPI increases and mortality increases too. This can be explained with the fact that with increasing age immunity decreases, other being poor physiological reverse and decreased stress taking capacity. In other studies, patients with generalized peritonitis corresponded to 30%–66%; in our study, generalized peritonitis corresponded to 70%.[7,15,16] As expected, extension of peritoneal inflammatory process was related with mortality rate.

Among survivors, 34% had local peritonitis and generalized peritonitis was present in 66% (34% vs 66%), whereas in nonsurvivors, only generalized peritonitis was present. Mean MPI score among 45 patients with localized peritonitis was 14.84 points, with no mortality rate, whereas 105 patients with generalized peritonitis had mean score of 25.48 points, with mortality of 12.38% (13/105). Reported mortality rate among patients with local peritonitis was 0%–8% and with generalized peritonitis was 14%–28%.[5,17] Survival outcome in this study was high, but the MPI scores, both in localized and generalized peritonitis, were lower than international average MPI scores reported. This factor may be attributed to the young age group of the patient. Considering survival related with character of peritoneal fluid, we found the following gradient: clear fluid had mortality rate of 10% (2/20), purulent fluid had mortality rate of 0% (0/65), and fecal fluid had mortality of 16.9 (11/65). Approximately 24% patients were female and 76% were male, with mortality rate of 10% (4/37) and 8% (9/113), respectively. Of 13 patients died, all had organic failure except 2 (11/13), which shows that if the organic failure is present then it is associated with higher MPI score and higher incidence of mortality and morbidity. Similarly, if evolution time is >24 h, then there is high chances of mortality as only 1 of 13 deaths was associated with having evolution time of <24 h.

Non-colonic origin is also considered an adverse factor, 12 of 120 (10%) patients having non-colonic origin died, as opposed to 1 of 30 patients (3%) having colonic origin. As to influence of anatomic origin or etiology of peritonitis on prognosis independent of the MPI score of the patient, the following was observed: Although some etiologies, such as appendicitis, cholecystitis, and abdominal trauma had no or fewer deaths even though they had high MPI scores, other etiologies such as pancreatitis, small-bowel pathology, and gastric diseases had higher mortalities.

On the basis of the results, it can be summarized that MPI was a useful method to determine outcome in patients with peritonitis who are surgically evaluated and treated at our hospital. All the MPI adverse factors behaved as expected, and among them the following factors were especially significant: presence of the organic failure, time elapsed >24 h, presence of malignity, age >50 years, and generalized extension of peritonitis.

Conclusion

The results lead us to conclude that the MPI is a useful tool for assessing the prognosis of patients presenting with peritonitis. It not only helps in assessing the mortality and morbidity of the patient, but it also allows the clinician to inform the patient's attendant with greater perspective. 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.

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