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Effectiveness of Mannheim Peritonitis Index (MPI) in Predicting the Outcome in Patients with Secondary Peritonitis

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Abstract **Original Research Article**

Acute generalized peritonitis is potentially life-threatening condition if not dealt with promptly. Out of the various peritonitis, we come across secondary peritonitis more commonly in our practice. Various scoring system have been devised like the colonic sepsis score, APACHE-II, but of all Mannheim Peritonitis Index (MPI) is easier to calculate and apply in practice. It comprises of 8 variables that include preoperative and intra-operative findings. This study is aimed to assess the MPI as a predictor of morbidity and mortality in patients with secondary peritonitis.
Keywords: Emergency laparotomy, Mannheim Peritonitis Index, Morbidity predictor, Mortality predicator, Secondary peritonitis.

INTRODUCTION

Acute generalized peritonitis is a potentially life-threatening condition. The prognosis of peritonitis remains poor despite development in diagnosis and management [1]. Early identification of patients with severe peritonitis may help in selecting patients for aggressive surgical approach [2, 3]. Scoring systems have been advocated as prognostic predictors, they reduce all the clinical problems including lots of variables to a simple number [4-6] Mannheim Peritonitis Index (MPI) was originally derived from data collected from 1253 patients with peritonitis treated between 1963 and 1979, and was developed by discriminant analysis of 17 possible risk factors, by Wacha [7, 8], 8 of these were of prognostic relevance and is currently employed widely for predicting mortality from peritonitis. The information is collected at the time of admission and laparotomy.

Table-1: Risk factors considered in MPI

Sr. No	Risk Factor	Weightage if present
1	Age>50 years	5
2	Female Sex	5
3	Organ Failure	7
4	Malignancy	4
5	Preoperative duration of peritonitis >24 hr.	4
6	Origin of sepsis not colonics	6
7	Diffuse generalized peritonitis	6
8	Exudate Clear Cloudy purulent Fecal	0 6 12
Definition of organ Failure		
Kidney	Creatinine level ≥ 177 µmol/l, Urea level ≥ 167 mmole/l, Oliguria < 20 ml/h	
Lung	PO2 < 50 mmHg, PCO2 < 50 mmHg	
Shock (definition according to Shoemaker)	Hypodynamic or Hyperdynamic; Systolic BP < 90 mmHg	
Intestinal Obstruction (only if profound)	Paralysis ≥ 24 h or complete mechanical ileus.	

Aim of the study is to predict the risk of morbidity and mortality in patients with secondary peritonitis and to evaluate the prognostic value of MANNHEIM PERITONITIS INDEX (MPI) scoring system in patients with secondary peritonitis.

MATERIALS AND METHODS

In this observational study, patients coming to OPD and wards of department of General Surgery, for period of 1 year between October 2016 to October 2017 were included.

A detailed clinical history, examination and relevant investigations were carried out. Operation was performed through a midline exploratory laparotomy incision. Peritoneal fluid was sent for culture and sensitivity. Intra – operative findings recorded. All specimen removed, were sent for histopathological examination. All cases were kept on nasogastric suction and intravenous fluids and kept nil per oral till could be started orally. Intravenous antibiotics (Cefoperazone + Sulbactam, Metronidazole, Amikacin) were started empirically in standard doses and later changed as per the culture and sensitivity report. Outcome of peritonitis was predicted by Mannheim Peritonitis Index (MPI). Post-operative follow up was done clinically for 30 days. However relevant investigations were done as and when indicated.

Sample size calculated by considering the proportion of secondary peritonitis by one-week pilot survey requiring surgical intervention in the department of general surgery at tertiary care hospital, Surat as considering, 6.7% (p), q= 1-p with 95% level of significance (Z α/2 = 1.96) with allowable error as 5%(L).

$n= (Z\ \alpha/2)^2 pq/L^2$
n=100

Due to drop out of patients, 5% extra considered on sample size. Sampling Technique used was Purposive sampling.

Enrollment criteria
Inclusion criteria

Patients with clinical suspicion and investigatory support for the diagnosis of secondary peritonitis who are later confirmed by intra op finding.

Various etiologies

- Acid peptic disease
- Typhoid
- Traumatic
- Tuberculosis
- Gangrenous cholecystitis
- Appendicitis
- GI Malignancy.
- Ruptured liver abscess

Exclusion criteria

- Patients with blunt injury abdomen who had other associated solid organ, vascular, neurological injuries.
- Patients with primary peritonitis.
- Patients with tertiary peritonitis. (post anastomotic leak)
- Patients not giving consent
- Inoperable patients

Data Collection

Informed written consent was obtained from the patients coming to the Department of Surgery with secondary peritonitis and data collected using a structured pre-prepared case proforma and calculation of the MPI score was done.

Mortality rate depended in a statistically significant manner on the number of points in the MPI score. Based on the obtained MPI score, patients were assigned to one of the three groups, which limits were determined on the basis of studies conducted by authors of the scoring system.

The first group included patients who obtained points lower than 21, second group being points between 21 and 29. Third group – those who obtained more than 29 points. Based on the plotted ROC curve, the optimum cut off point was identified.

In case of MPI, patients were classified into low risk of death and high risk of death groups. To assess the predictive power of MPI, area under the curve was analyzed. The sensitivity, specificity and the effectiveness of the MPI were noted for the selected cut off point.

OBSERVATIONS AND RESULTS

In the study, in total of 100 patients, multiple secondary causes of peritonitis were found with commonest being ileal perforation. The overall mortality rate of the study was 7 % (7 / 100). Given below is the table showing mortality associated with each etiology with highest being in large bowel malignant perforation (33.33%).

Table-2: Etiology wise mortality distribution

Etiology of peritonitis	Total patient, n = 100	Mortality rate %
Peptic perforation	21	9.5
Ileal perforation	40	5
Ruptured liver abscess	8	25
Perforated appendicitis	18	0
Caecal perforation	1	0
Rectal perforation	1	0
Abdominal koch's	3	0
GB perforation	1	0
Malignant perforation	3	33.33%
Trauma	4	0

Table-3: MPI score based patient prognosis

MPI score	<21	21-29	>29	Total
Discharge <10 days	52	2	0	54
Discharge >10 days	14	22	3	39
Death	0	2	5	7
Total	66	26	8	100
Mortality rate %	0	7.6%	62.5%	

When divided into 3 sub-groups, it was found.

Now, on dividing the MPI score in two groups instead of three, with cut off being 26, one being score less than 26 and the other being score > = 26, it is found that the mortality rate is zero in the first group and 46.67 % in the second group.

Here, in 100 patients, 12 females and 88 males were included. Females showed higher mortality rate (16.66 %) and 8 / 12 showed discharge after 10 days of operation. In males, the mortality was relatively less being only 5.68 % and majority 52/ 88 are discharged within 10 days. Based on the age of distribution, mortality is higher in age > 50 years being 31.57 % and lower in < 50 years age group (1.23 %).

On taking the intra operative findings into consideration, of importance is the type of peritonitis, being localized or diffuse that again indicates the prognosis of the patient. Localized peritonitis showed a zero-mortality rate, with diffuse peritonitis showed 7.07 % rate of mortality.

Another determinant of prognosis is the duration of peritonitis > 24 hours. In this study of 100 cases, mortality rate was zero in patients who presented within 24 hours, whereas in patients who presented after 24 hours of onset of peritonitis, mortality rate was 9.72 %. Also, patients with colonic origin of sepsis showed higher mortality rate of 16.66 % than those with non-colonic sepsis (6.38 %). Presence of organ failure is again an important predictor of mortality having 16.66% mortality rate. Absence of organ failure shows zero mortality rates in the study. Of all the 100 patients, none of them had clear exudates in laparotomy. Majority of them had purulent exudates but mortality was highest with fecal exudates (16.66 %).

Table-4: Relation of prognosis and mortality rate with organ failure

Risk factors	Discharge <10 days	Discharge >10 days	Death	Total	Mortality rate %
SPo_2 < 50 mmhg	0	0	5	5	100%
Pco_2 > 50 mmhg	0	0	5	5	100%
Shock	2	27	7	36	19.4%
Creat > 177 micro/l	1	13	6	20	30%
Urea >167 micro/l	0	12	6	18	33.33%
Urine output < 20 ml / hr	0	1	4	5	80%
Ileus	3	23	6	32	18.75%

DISCUSSION

Total of 100 patients were studied, ranging from 8 to 80 years with mean age being 35.4 years showed that mortality was higher in age >50 years, probably due to associated co morbidities. These findings are comparable to the findings of Ali Yaghoobi Notash *et al*. [9] and Cecilie Svanes *et al*. [10] Mortality was higher in females, even though perforation was higher among males, of which ileal perforation was the most common etiology accounting for 40 % of the cases. However, when it comes to mortality, malignant perforation had highest mortality rate being 33.33 % in spite of having low incidence of 3 %. Patients with late presentation showed poor prognosis due to underlying septicemia. The cause of delayed presentation i.e. a preoperative duration of peritonitis more than 24 hours

was mainly related to the illiteracy among the study population and lack of proper referral services. Also, mortality rate was higher in > 24 hours duration (9.72 %).

Peritonitis in oncologic patients presents high mortality rates, which is essentially related to the severity of the underlying disease. MM Correia *et al*. [11] found that in presence of malignancy, the mortality rate under the score of 21 was of 33.3% and for score equal to or greater than 21 the mortality rate was 70.6%. 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. Thereby malignancy is an important factor in the prediction of mortality in secondary peritonitis.

Colonic perforation presents with fecal exudates and a severe form of peritonitis, therefore has a higher mortality rate than non-colonic sepsis. Purulent exudates and fecal exudates had a significant number of microorganisms, most of which are gram negative bacteria and they result in endotoxemia and septic shock.

- 66 (66%) patients had MPI score of less than 21 with zero mortality.
- 26 (26%) patients had MPI score between 21 to 29 with mortality rate of 7.6%
- 8 (8%) patients had MPI score greater than 29 with mortality rate of 62.5%

These findings were comparable to the findings in the study of A Billings *et al*.[12] Of the present prognostic scoring system, the Mannheim Peritonitis Index is one of the easiest to apply and the determination of risk is easily available during the initial operation.

Retrospective data collection is possible and valid, as only standard information available from the operation report of the patients' record is required.

In the original study by Wacha and Linder [7] the cutoff point of 26 MPI point was used. Rodolfo L *et al*. [13] in their study found out that 26 MPI point was a useful reference. By keeping the cut off as 26 in this study, the mortality rate beyond 26 becomes 46.67%.

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. These result in relation to organ failure mentioned above highlight the importance of early recognition, prevention, and treatment of organ dysfunction in the attempt to improve the short and long term outcome in patients with peritonitis.

CONCLUSION

Mannheim Peritonitis index is a useful method to determine study group outcome in patients with peritonitis. All the MPI variables of adverse outcome namely, presence of organ failure; time elapsed > 24hrs; presence of malignancy; age>50 years, female sex, generalized extension of peritonitis and type of exudate behaved as expected, except the noncolonic origin of sepsis in peritonitis.

In this study, it is found that

Colonic origin of sepsis was associated with worse outcome probably due to presence of faecal exudates which was more commonly associated with colonic origin of sepsis. Our study differs from MPI in this one variable of adverse outcome.

Mortality can be further reduced by early arrival of the patients to hospital and early intervention. Reproducible scoring systems that allow a surgeon to determine the severity of the intra abdominal infections are essential to:

- Stratify the effectiveness of different treatment regimen.
- Indicate individual risk to select patients, who may require a more aggressive surgical approach.
- Inform patients' relatives with greater objectivity.

In the past 30 years, many prognostic scoring systems have been developed for critical patients. Presently one of the most accepted score 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. Early evaluation of severity of illness using MPI allows us to estimate the probability of patient's survival.

REFERENCES

1. Bohnen J, Boulanger M, Meakins JL, McLean AP. Prognosis in generalized peritonitis: relation to cause and risk factors. Archives of Surgery. 1983 Mar 1; 118(3):285-90.
2. Giessling U, Petersen S, Freitag M, Kleine-Kraneburg H, Ludwig K. Surgical management of severe peritonitis. Zentralblatt fur Chirurgie. 2002 Jul; 127(7):594-7.
3. Farthmann EH, Schöffel U. Principles and limitations of operative management of

intraabdominal infections. World journal of surgery. 1990 Mar 1;14(2):210-7.
4. Ohmann C. Prognostic scores and design of clinical studies. Infection. 1998 Sep 1;26(5):342-4.
5. Ohmann C, Yang Q, Hau T, Wacha H. Prognostic modelling in peritonitis. European Journal of Surgery. 1997 Jan 1;163:53-60.
6. Dani T, Ramachandra L, Nair R, Sharma D. Evaluation of prognosis in patients' with perforation peritonitis using Mannheim's peritonitis index. Int J Scientific Res Publications. 2015 May;5(5):126-31.
7. Wacha H. Mannheim peritonitis index-prediction of risk of death from peritonitis: construction of a statistical and and validation of an empirically based index. Theor Surg. 1987;1:169-77.
8. Linder MM, Wacha H, Feldmann U, Wesch G, Streifensand RA, Gundlach E. The Mannheim peritonitis index. An instrument for the intraoperative prognosis of peritonitis. Der Chirurg; Zeitschrift fur alle Gebiete der operativen Medizen. 1987 Feb;58(2):84-92.
9. Notash AY, Salimi J, Rahimian H, Fesharaki MS, Abbasi A. Evaluation of Mannheim peritonitis index and multiple organ failure score in patients with peritonitis. Indian journal of gastroenterology. 2005 Sep 20;24(5):197.
10. Svanes C, Salvesen HE, Espehaug B, Søreide O, Svanes KN. A multifactorial analysis of factors related to lethality after treatment of perforated gastroduodenal ulcer. 1935-1985. Annals of surgery. 1989 Apr; 209(4):418.
11. O Mannheim PD. Prediction of death using the mannheim peritonitis index in oncologic patients. Revista Brasileira de Cancerologia. 2001;47(1):63-8.
12. Billing A, Fröhlich D, Peritonitis Study Group. Prediction of outcome using the Mannheim peritonitis index in 2003 patients. British journal of surgery. 1994 Feb;81(2):209-13.
13. Bracho-Riquelme RL, Melero-Vela A, Torres-Ramírez A. Mannheim peritonitis index validation study at the hospital general de durango (Mexico). Cirugía y Cirujanos. 2002;70(4):217-25.