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Original Research Article

Comparison of mannheim peritonitis index and revised multiple organ failure score in predicting mortality and morbidity of patients with secondary peritonitis

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ABSTRACT

Background: Secondary peritonitis carries high mortality and morbidity. Many scoring systems have been designed to assess its severity. This study was undertaken to compare the Mannheim peritonitis index (MPI) and revised multiple organ failure score (Revised MOFS) in predicting the mortality and morbidity.
Methods: A prospective observational study was undertaken in adults operated for gastrointestinal perforation. Clinical and biochemical parameters as required for MPI and Revised MOFS were recorded. Each of the scores were divided under four categories; MPI <14, 14-21, 22-29 and >29; Revised MOFS 0, 1, 2 and >2. Data was compared for predicting mortality and morbidity. P-value, ROC curve and 95% CI were used as statistical tools.
Results: Two thirds of 120 patients studied presented after 48 hours. MPI score of <14, 14-21, 21-29 and >29 had mortality of 0%, 2.2%, 27.2% and 50% respectively. ROC curve showed highest sensitivity and specificity of 79% and 70% respectively at MPI of 25. Significant value for mortality was obtained with MPI >25 (p= 0.000012) and with Revised MOFS >1 (p< 0.001); for morbidity with MPI >21 (p= 0.010) and with Revised MOFS >1 (p< 0.001). 20% patients with Revised MOFS zero were also morbid.
Conclusions: Both MPI and Revised MOFS systems are good in predicting the mortality, but MPI is easy scoring system and a better option for predicting morbidity. MPI score >25 for mortality and >21 for morbidity are significant.

Keywords: Mannheim peritonitis index, Mortality, Morbidity, Revised multiple organ failure score, Secondary peritonitis

INTRODUCTION

Gastro-intestinal perforation leading to secondary peritonitis has got poor prognosis in spite of advances in diagnosis and management. Identifying the patients with severity of peritonitis in its early stage may help in risk assessment of the patient and that will aid in selection of management protocol to reduce the morbidity and mortality.[1-2] Since years research is going on in grading of peritonitis basing on clinical, physiological and biochemical parameters to help in making appropriate decision, developing new therapies and mobilizing resources for cost effective health care management.[3-5]

Many scoring systems have been introduced to grade peritonitis e.g. APACHE-II (Acute Physiology and Chronic Health Evaluation Score), SAPS (Simplified Acute Physiology Score), SSS (Sepsis Severity Score), MPI (Mannheim Peritonitis Index) and Revised MOFS (Revised Multiple Organ Failure Score) etc. But none of

the scoring systems has reduced the mortality and morbidity significantly.[5] APACHE II is time consuming cumbersome procedure and may be impossible sometimes to apply in the setting of intra-abdominal sepsis.[6]

MPI was based on the research done by Wacha-Linder on 1253 patients.[7] They proposed eight risk factors of prognostic relevance, the details of which are collected at the time of admission and laparotomy (Table 1).

In 1985 Goris et al published the Multiple Organ Failure Score considering dysfunctions of CVS, Respiratory, CNS, Liver, Kidney, Heart, Blood and GI tract in 3-point scale.[8] Later on Lefering et al revised the score, GIT and CNS being taken away (Table 2).[9]

This prospective observational study was undertaken to predict the mortality and morbidity in patients with secondary peritonitis due to gastro-intestinal perforation using MPI and revised MOFS and to compare their efficacy, feasibility and suitability.

METHODS

All the patients of gastro-intestinal perforation with secondary peritonitis admitted to the Surgery Department of SCB Medical College and Hospital, Cuttack during the period from April 2016 to March 2017 were studied prospectively.

Peritonitis without identification of perforation site, peritonitis due to trauma, children up to 14 years of age, patients who were not operated and those patients who refused to give consent for this research work were excluded from the study. After resuscitation with nasogastric decompression, intravenous fluids, antibiotics, analgesics and correction of electrolyte imbalance exploratory laparotomy was done.

Perforation site was identified and dealt with as required followed by thorough peritoneal lavage. Patients were followed up post operatively with continuous resuscitation and ICU care if required and the outcome regarding the mortality and morbidity was observed. Morbidity was decided on the basis of the increase in the hospital stay, prolonged ileus, enterocutaneous fistula, wound infection and dehiscence.

Pre-operative and intra-operative clinical and biochemical parameters as required for MPI (Table 1) with maximum score 47 and pre-operative, intra-operative and post-operative parameters for Revised MOFS (Table 2) with maximum score 10 were recorded in predefined proforma. Each of the scores were divided under four categories; MPI less than 14, 14 to 21, 22 to 29 and more than 29; Revised MOFS 0, 1, 2 and more than 2. Data obtained was compared logically and analyzed statistically for predicting mortality and morbidity.

P value was calculated using chi-square test. ROC curve was utilized to choose the most appropriate cut-off value for mortality. 95% Confidence Interval was used for counting morbidity in hospital stay.

Table 1: MPI (mannheim peritonitis index).

Age >50 years	**5**
Female sex	5
Organ failure[a]	7
Malignancy	4
Pre-operative duration of peritonitis >24 hours	4
Orgin of sepsis not colonic	6
Diffuse generalised peritonitis	6
Exudate clear	0
Cloudy /purulent	6
Fecal	12

[a]Organ failure

- Kidney
- Creatinine level > 177 micromol/l
- Urea > 167 mmol/l
- Oliguria <20 ml/hr
- Lung
- PO2 <50mmhg
- PCO2 >50 mmhg
- Shock
- Hypodynamic/hyperdynamic
- Intestinal obstruction
- Paralysis >24 hours/ complete mechanical ileus

Table 2: Revised multiple organ failure score.

Organ	Normal 0	Organ dysfunction 1	Organ failure 2
Lung	No mechanical ventilation	Mechanical ventilator with PEEP<10, FiO2<0.4	PEEP >10 FiO2 >0.4
Heart	Normal blood pressure	Systolic BP >100 with low dose vasoactive drugs	Systolic BP < 100 with high dose vaso active drugs
Kidney	Serum Creatinine <2mg/dl	>2 mg/dl	Hemodialysis peritoneal dialysis
Liver	Normal LFT	AST >25 U/L Total Bilirubin >2mg/dl	>50U/L >6 mg/dl
Blood	Normal count	Leucocytes > 30000 Platelet <50000	>60000 <25000

RESULTS

120 patients were included in the study, 105 males and 15 females (M: F= 7:1). Age of the patients ranges from 18 to 80 years with mean of 47.4 years. Duodenal ulcer perforation was seen in 73 patients, appendicular perforation was in 21, ileal perforation was in 15, gastric perforation was in eight and colonic perforation was in three.

Time of presentation to the hospital is less than 24 hours in 18 patients and 1-2 days in 22 and more than 2 days in 80 patients. The mean time of presentation is 3.5 days. The time taken for resuscitation is up to 6 hours.

Post operatively 24 patients died and 27 suffered. 70 patients in the study were above 50 years of age and 17 among them died. The mean age of patients who died was 54.78. Out of 15 female patients 10 died and 2 were morbid. Average hospital stay was 9.26 days with 95% confidence interval of 7.66 to 10.86.

In our study, the MPI score of <14, 14-21, 21-29 and >29 had mortality of 0%, 2.2%, 27.2% and 50% respectively. After analyzing MPI score with mortality using ROC curve, it was found that highest sensitivity and specificity of 79% and 70% respectively was obtained taking 25 as the threshold value (Figure 1).

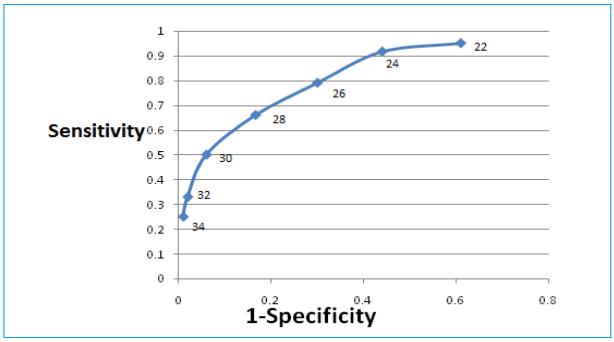

Figure 1: ROC curve of MPI score for mortality.

The mortality rate of patients having MPI more than 25 is 39.5%, while less than or equal to 25 is 6.9% and the values are statistically significant (p= 0.000012) (Table 3).

Table 3: Distribution of MPI score and mortality.

MPI	Mortality (n=24)	%
<14(n=9)	0	0
14-21(n=45)	1	2.2
22-29(n=44)	12	27.2
>29 (n=22)	11	50
>25 (n=48)*	19	39.5
≤25(n=72)	5	6.9

*statistically significant (p=0.000012)

Morbidity with MPI more than 21 is 39.2%, while less than or equal to 21 is 15.5% and the values are statistically significant (p=0.010). When 25 is taken as threshold, the morbidity rate of patients with MPI more than 25 is 48.3 % and less than or equal to 25 is 19.4 % (Table 4).

Table 4: Distribution of MPI score and morbidity.

MPI	Morbidity (N= 27)	%
<14(n=9)	0	0%
14-21(n=44)	7	15.9%
22-29(n=32)	16	50%
>29(n=11)	4	36.3%
>21(n=51)*	20	39.2%
≤21(n=45)	7	15.5%
>25(n=29)	14	48.2%
≤25(n=67)	13	19.4%

*statistically significant (p=0.010)

The average Revised MOFS of total patients in the study is 0.92, of the patients who died 2.95 and that of survivors 0.44. The mortality of patients with revised MOFS more than 1 is 86.3% and less than or equal to 1 is 5% and the values are statistically significant (p<0.001) (Table 5).

Table 5: Distribution of revised MOFS and mortality.

Revised MOFS	Mortality(n=24)
0 (n=61)	0 (0%)
1(n=37)	5(13.5%)
2(n=8)	5(62.5)
>2(n=14)	14(100%)
>1(n=22)*	19 (86.3%)
≤1(n=98)	5 (5.1%)

*statistically significant (P<0.001)

The morbidity of patients with revised MOFS more than 1 is 66.6% and less than or equal to 1 is 26.8%, the values are statistically significant (p<0.001) (Table 6).

Table 6: Distribution of revised MOFS and morbidity.

Revised MOFS	Morbidity (n=27)
0 (n=61)	12 (19.6%)
1(n=32)	13 (40.6%)
2(n=3)	2 (66.6%)
>2(n=0)	-
>1(n=3)*	2 (66.6%)
≤1(n=93)	25 (26.8%)

*statistically significant (p<0.001)

20% of patients with Revised MOFS zero were also morbid. So, we faced difficulty in predicting morbidity using Revised MOFS and biochemical parameters were to be obtained mostly in ICU after score 1, when the patient is already morbid. Rather with MPI using mostly

clinical and some biochemical parameters we could predict morbidity easily and in appropriate time.

DISCUSSION

Hollow viscus perforation causing secondary peritonitis has got high mortality rate in spite of modernization in health care. Mortality may be influenced by the factors like age, gender, delay in presentation and intervention, site of perforation etc. In our study of 120 cases between 18 to 80 years of age with male to female ratio of 7:1 and 66.6% presenting after 48 hours of peritonitis the mortality rate is 20%. Different studies show mortality rates varying from 6.4% to 17.5%.[10-11] Increase in mortality rate may be due to delay in presentation of cases in this locality. In a prospective study of 204 cases by Doklestic et al, 26.9% patients presented within 24 hours of peritonitis and 59.8% after 48 hours with a mortality of 8.82%.[12] In Krishna V M et al, 86% presented after 24 hours and the mortality rate of the study was 28%.[13]

MPI and Revised MOFS have high significance in predicting the mortality in secondary peritonitis. Malik A. A. et al., did the prospective study in 101 patients of secondary peritonitis and the mortality was 0% with MPI below 15, 4% in patients scoring 16-25 and 82.3% in those with score more than 25.[14] Yoshiko K et al. studied 108 patients in which 41 % mortality was observed in the patients having MPI score more than 26 and 3.8% in patients having MPI score less than 26.[15] In our study, the MPI score of <14, 14-21, 21-29 and >29 had mortality of 0%, 2.2%, 27.2% and 50%respectively.

By using ROC curve for mortality, the highest sensitivity and specificity of 79% and 70% respectively was obtained at MPI 25. The mortality rate having MPI more than 25 is 39.5% and statistically significant. So, we recommend those patients with MPI >25 to be categorized under high risk group and managed accordingly.

Notash et al did a prospective study on 80 patients having secondary peritonitis with mean revised MOFS of 1.07, that of survivors was 0.3 and of non-survivors was 4.8.[10] In our study the mean revised MOFS was 0.92 with that of non-survivors and survivors was 0.44 and 2.95 respectively.

In a study of 50 cases by Muralidar et al with overall morbidity of 38% and MPI score >26 had 5.72 times higher risk of morbidity.[11] In another study of 100 patients by Krishna VM, MPI more than 27 have 76.2% morbidity and less than 27 have 6.55%. And in our study morbidity of patients with MPI more than 25 is 48.3% and less than 25 is 19.4%.[13] But statistically significant figure is obtained in relation to morbidity with MPI more than 21.

Morbidity of patients with revised MOFS more than 1 is 66.6% and less than or equal to 1 is 26.88%. It is difficult to predict morbidity when MOFS is zero. The parameters for revised MOFS after score 1 are to be obtained mostly in ICU when the patient is already morbid. So MPI is easier and better to predict the morbidity in such cases.

CONCLUSION

Both MPI and revised MOFS systems have a comparable ability in predicting the mortality of patients with secondary peritonitis. But MPI is better option than revised MOFS in predicting morbidity. Compared to revised MOFS, MPI is an easy scoring system. Patients having MPI score more than 25 should be considered under high risk group and managed accordingly. Significant morbidity is predicted in our series with MPI more than 21.

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REFERENCES

1. Bohnen J, Boulanger M, Meakins JL, McLean AP. Prognosis in generalized peritonitis. Relation to cause and risk factors. Arch Surg. 1983;118:285-90.
2. Giessling U, Petersen S, Freitag M, Kleine-Kraneburg H, Ludwig K. Surgical management of severe peritonitis. Zentralbl Chir. 2002;127:594-7.
3. Bion J. Outcome in intensive care. BMJ. 1993;307; 953-54.
4. Knaus WA, Drapper EA, wagner DP, Zimmerman JE. APACHE severity of disease classification system. Crit Care Med. 1985;13:818-29.
5. Koperna T, Schulz F. Prognosis and Treatment of Peritonitis. Do we need new scoring systems? Arch Surg 1996;131(2):180-6.
6. Bosscha K, Reijnders K, Hulstaert PF, Algra A, Van der Werken C. Prognostic scoring systems to predict outcome in peritonitis and intra-abdominal sepsis. Br J Surg. 1997;84(11):1532-34.
7. Wacha H, Linder MM, Feldman U, Wesch G, Gundlach E, Steifens RA. Mannheim peritonitis index –prediction of risk of death from peritonitis: construction of a statistical and validation of an empirically based index. Theor Surg. 1987;1:169-77.
8. Goris RJA, Boekhorst TPA, Nuvtinck JKS, Gimbrare JSF. Multiple-organ failure: generalized autodestructive inflammation. Arch Surg. 1985; 44:937-46.
9. Lefering R, Goris RJA, Nieuwenhowen EJ, van Neugehauer E. Revision of the Multiple Organ Failure Score. Arch Surg. 2002;387:14-20.
10. Notash AY, Salimi J, Rahimian H, Fesharaki MH, Abbasi A. Evaluation of Mannheim peritonitis index and multiple organ failure score in patients with

peritonitis. Indian J Gastroenterol. 2005;24(5):197-200.
11. Muralidhar VA, Madhu CP, Sudhir S, Srinivasarangan M. Efficacy of Mannheim Peritonitis Index (Mpi) Score in Patients with Secondary Peritonitis. J Clin Diagn Res. 2014:8(12): NC01.
12. Doklestic SK, Bajec DD, Djukic RV, Bumbasirevic V, Dentanac AD, Detanac SD, et al. Secondary peritonitis-evaluation of 204 cases and literature review. J Med Life. 2014;7(2):132-8.
13. Krishna VM, Joseph PKT, Vattikutti V, Garika G. Evaluation of Mannheims Peritonitis Index in Predicting the prognosis of Hollow Viscus Perforation. Int J Med Sci. Public Health. 2017; 6:250-6.
14. Malik AA, Wani KA, Dar LA, Wani MA, Wani RA, Parray FQ, et al. Mannheim Peritonitis Index and APACHE II- prediction of outcome in patients with peritonitis. Ulus Travma Acil Cerrahi Derg. 2010; 16(1):27-32.
15. Yoshiko K, Masayuki N, Watanabe A, Ishikawa H, Sakaguchi T, Yamada T, et al. Study of Mannheim Peritonitis Index to Predict Outcome of Patients with Peritonitis. Jpn J Gastroenterol Surg. 2004; 37(1):7-13.

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