MANNHEIM PERITONITIS INDEX (MPI)- PREDICTING OUTCOMES IN CASES OF SECONDARY PERITONITIS FOLLOWING HOLLOW VISCOUS PERFORATION

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ABSTRACT

BACKGROUND

Secondary peritonitis is defined as infection of the peritoneal cavity due to spillage of organisms into the peritoneum, usually associated with bowel perforation and presents as acute abdomen. It is also termed as Perforation peritonitis. In developing countries like India, secondary peritonitis still remains the most common cause of intra-abdominal sepsis with unacceptably high mortality. The outcome of perforation peritonitis depends on complex interaction of many factors. Various scoring systems do exist for assessing the prognosis of these patients. However, MPI index appears to be more practical and more reliable means of risk evaluation than other scoring systems, such as APACHE-II, which is time consuming, requiring more blood investigations and may be impossible to apply in clinical setting of intra-abdominal sepsis.

MATERIALS AND METHODS

Source of Data- All patients who were admitted under the department of general surgery with the diagnosis of secondary peritonitis and taken up for exploratory laparotomy.
Type of Study- A Prospective, longitudinal case study.
Sample Size- 30 patients.

RESULTS

Patients with increased MPI score had corresponding increase in the rate of complications, which was found to be both clinically and statistically significant. There was delay in initiation of oral diet in patients with increased MPI score. Average hospital stay was three times more in patients with increased MPI score.

CONCLUSION

Mannheim Peritonitis Index is a simple, reliable accurate index in the assessment of prognosis in patients of peritonitis. High MPI score predicts increased risk of complications, delay in post-operative day of initiation of oral feeds and increased duration of hospital stay.

KEYWORDS

MPI - Mannheim Peritonitis Index.

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BACKGROUND

Peritonitis is defined as the inflammation of the serosal membrane lining the abdominal cavity and contained viscera.[1,2] Secondary peritonitis is defined as infection of the peritoneal cavity, due to spillage of organisms into the peritoneum, usually associated with bowel perforation and presents as an acute abdomen.[3] It is also termed as perforation peritonitis. Perforation of any part of the bowel leads to peritonitis and intra abdominal sepsis.

Secondary peritonitis represents the most severe form of intra abdominal infection and is the second most common cause of SIRS (systemic inflammatory response syndrome), sepsis, septic shock and MOF (Multi Organ Failure) syndrome. It is also important to note that the high cost and the extreme degree of stress due to treatment which is complex and requires prolonged hospital stay, hence these patients are termed as "the marathon runners of the intensive care".[4,5]

The incidence of secondary peritonitis is decreasing in many parts of the world.[1,6] However, in developing countries like India, secondary peritonitis still remains the most common cause of intra abdominal sepsis with unaccept high mortality.[1,7]

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It is to be noted that it has been almost a century after Lawson Tait from Birmingham (1987) for the first time successfully performed a surgical intervention in a patient diagnosed of acute peritonitis,[7] but still its management is complex with a high mortality among the other surgical emergencies, despite the advancement in surgical techniques, antimicrobial therapy and intensive care support.[1,8-10]

"The perforation of a hollow viscus leads to contamination of peritoneal cavity. This leads to a cascade of infective processes, sepsis, disseminated intravascular coagulation and multi-system organ failure and death in the presence of irreversible damage to the vital organs."[11,12]

The outcome of perforation peritonitis depends on complex interaction of many factors and the success rate greatly depends on the early recognition of the seriousness of the disease and an accurate assessment of the patient's risks.

Henceforth, in order to asses patient morbidity and mortality during an event of peritonitis, many scoring systems has been developed, like Mannheim peritonitis index, APACHE- II (Acute physiology and chronic health evaluation) score that considers 12 physiological variables, SAPS (simplified acute physiology score), Ranson score, Imrie score.[13]

MPI index appears to be more practical and more reliable means of risk evaluation[13] than other scoring systems, such as APACHE-II, which is time consuming, requiring more blood investigations and may be impossible to apply in clinical setting of intra-abdominal sepsis.[14]

Mannheim peritonitis index was developed by Wacha and Linder in 1937. This index was developed based on the retrospective analysis of data from 1253 patients with peritonitis, in which 20 possible risk factors were considered. Out of the 20 risk factors, only 8 proved to be of prognositcally relevant, hence only these 8 risk factors were included under Mannheim peritonitis index (MPI) according to their predictive power. Patients with MPI score exceeding 26 were identified to have a high mortality rate and vice versa.

The identified 8 risk factors included various aspects like epidemiological factors such as age, sex, preoperative factors such as duration of peritonitis, generalized or localized peritonitis, associated organ failure and intra operative factors such as source of sepsis, malignancy as a cause for peritonitis. Each risk factor based on its predictive power carries a score. Adding the score of all risk factors gives the mean MPI index. If the total score exceeds 26, the score points to poor outcome of the patient.[15]

MPI is a specific score (i.e.) a disease-based score, designed exclusively for patients with peritonitis. MPI scoring system has a good accuracy and at the same time easy way to handle as it involves only simple clinical parameters, and requires only information routinely in surgical registers, hence has the advantage of doing the study retrospectively also. When compared to the other complex scoring systems and stands as one of the most simple and reliable index to asses outcomes following secondary peritonitis.[16,17]

MPI scoring system is helpful to the surgeon in the following ways:

1. Ratify the effectiveness of different treatment regimens
2. Scientifically compare surgical intensive care units
3. Helps to indicate individual risk
4. Be able to clearly inform patient's relatives with greater objectivity.[17]

Aims and Objectives

1. To assess the efficacy of Mannheim peritonitis index (MPI) in predicting the outcome in cases of secondary peritonitis following hollow viscus injury.
2. To determine the Mannheim peritonitis score for patients operated for secondary peritonitis.
3. To correlate Mannheim peritonitis score with outcome during hospital stay following surgery.

MATERIALS AND METHODS

Source of Data- All patients who were admitted under the department of general surgery with the diagnosis of secondary peritonitis and taken up for exploratory laparotomy.

Type of Study

A Prospective, longitudinal case study.

Period of Study

October 2013 to June 2015

Sample Size

30 patients.

Study Population

All the Patients who underwent open surgery for secondary peritonitis following a Hollow viscus perforation in Pondicherry institute of medical sciences.

Inclusion Criteria

1. Peritonitis secondary to hollow viscous perforation.
2. Age group -15 – 80 yrs.
3. Duodenal perforation
4. Ileal and jejunal perforation
5. Colonic perforation
6. Appendicular perforation
7. Traumatic perforation
8. Malignant perforation.

Exclusion Criteria

1. Poly trauma.
2. Primary peritonitis (Spontaneous bacterial peritonitis)
3. Post operative peritonitis due to anastomosis leak, etc.
4. Age group less than 15 yrs. and more than 80 yrs.

RESULTS

Parameter	Finding	Points
Age (in Yrs.)	<50 >50	0 5
Gender	Male Female	0 5
Organ Failure	Absent Present	0 5
Presence of Malignancy	Absent Present	0 4
Preoperative Duration for > 24 hrs.	Absent Present	0 4
Primary Focus	Non – Colonic Colonic	0 4
Diffuse Generalized Peritonitis	Absent Present	0 6
Nature of Exudate	Clear Viscous Purulent Faeculent	0 6 6 12
Mannheim's Peritonitis Index (MPI) Criteria used		

Organ Failure	Finders
1. Kidney	Blood Urea > 100 mg/dl Creatinine > 2 mg/dl Oliguria < 20 ml/hr
2. Lung	PaO2 < 50 mmHg PaCO2 > 50 mmHg
3. Shock	Hypodynamic Hyperdynamic
4. Intestinal Obstruction	Paralysis > 24 hrs. Complete mechanical ileus
Organ Failure Criteria	

Organ failure is considered to be present if the above criteria are met.

MPI score = SUM of points parameters present

Interpretation

- Maximum score – 47
- Score > 26 indicates poor outcome.

Age

- Score of 5 points was given to patients with more than 50 years of age.

Gender

- In this study, female sex was given a score of 5 and male sex as score of 0.

Organ Failure

- Presence of organ failure was given a score of 5 points and its absence as 0 points.

Presence of Malignancy

- Presence of malignancy was given a score of 4 and its absence as 0 points

Preoperative Duration for > 24 hrs

- If the preoperative duration is >24 hrs., 4 points is given against 0 points for duration < 24 hrs.

Primary Focus

- If the primary focus was colonic, a score of 4 was given and it if was non-colonic score 0 was given.

Diffuse Generalized Peritonitis

The diffuse generalized peritonitis is given 6 points and 0 points for localized peritonitis.

Nature of Exudate

Depending upon the nature of the exudates, score is given as follows:

* Clear exudates – 0 points
* Purulent exudates – 6 points
* Feculent exudates – 12 points

The above-mentioned score was applied to all patients on the day of surgery, who were operated – exploratory laparotomy with the diagnosis of secondary peritonitis. All patients were followed up till hospital stay or death. The following were the parameters assessed during the patient's course in the hospital.

1. Post operative day in which oral feeds was started.
2. Complication encountered in the post operative period.
3. Total days of hospital stay.

The surgical procedure performed depended upon the operative findings and the surgeon's choice, as no guidelines could be laid down to the varied aetiology.

Statistical Analysis

Statistical analysis was done using SPSS 20.0 version.

Chi-square test was used to assess the statistical significance.

One-way analysis of variants (ANOVA) was done to find the mean difference between the groups.

P value of less than 0.05 was taken as significant.

Mann Whitney and Kruskal Wallis test was also used to assess the statistical significance.

Causes of Peritonitis

Sl. No.	Diagnosis	Total Cases	Percentage
1.	Gastric Perforation	1	3
2.	Duodenal Perforation	4	12
3.	Small Bowel Perforation • Jejunum • ILEUM	 2 2	 6 6
4.	Colonic Perforation	2	6
5.	Appendicular Perforation	19	63
Table 1. Distribution of Cases as per Anatomical Site of Perforation			

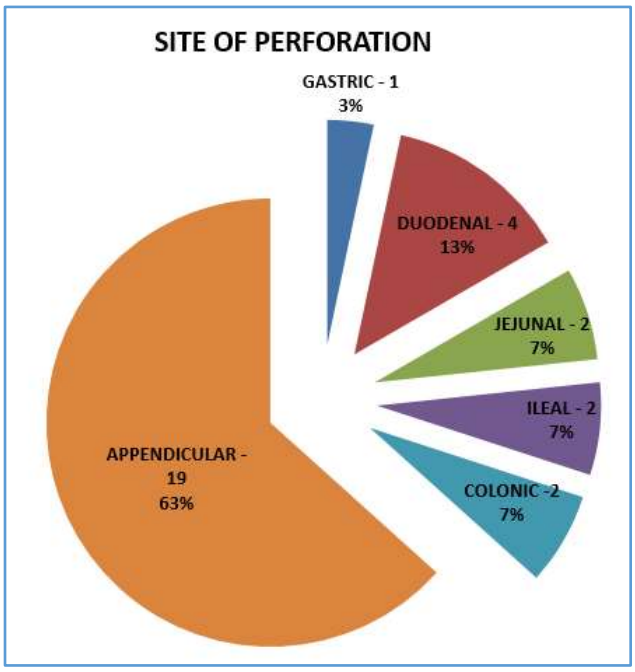

Figure 1. Distribution of Study Population by Site of Perforation

Sl. No.	Diagnosis	Total Cases	Average Score	Average Score (%)	Pod of Oral Feeds	Hospital Stay	p Value
1.	Gastric Perforation	1(3%)	32	68	10	29	
2.	Duodenal Perforation	4(13%)	17	36	5	20	
3.	Small Bowel Perforation • Jejunum • Ileum	 2(6%) 2(6%)	 23 19	 48 40	 7 7	 19 18	0.05
4.	Colonic Perforation	2(6%)	21	39	7	16	
5.	Appendicular Perforation	19(63%)	11	26	3	11	

Table 2. Distribution of Outcome According to the Site of Perforation

Among the five groups, appendicular perforation had more patients – 19 (63%).

Outcome was assessed based on post operative day of initiation of oral feeds, development of complications during hospital stay and total duration of hospital stay.

DISCUSSION

Peritonitis is still one of most important surgical emergencies. Despite the progress in antimicrobial agents and intensive care treatment, the present mortality due to diffuse peritonitis ranges between 10 to 20% and continues to be unacceptably high.

In an attempt to reduce the mortality in peritonitis by early identification of those who are at high risk, many scoring systems have been introduced so that early and objective classification of severity of peritonitis may help reduction of mortality.[18,19]

Various other scoring systems have been used to assess the prognosis and outcome of peritonitis. Those used include the Acute Physiological and Chronic Health Evaluation score (APACHE II), the Peritonitis Index Altona (PTA), the Sepsis Score, and the Physiological and Operative Severity Score for Enumeration of Mortality and Morbidity (POSSUM). Among all of these the MPI scoring system and APACHE II found to be very useful.[20,21]

APACHE II, which was introduced by Knaus and co-workers integrates various physiologic variables during the first 24 hours in the intensive care unit (ICU) with age and chronic health status of the patient.[22,23] This initial stratification of risk factors and a predictive equation estimates patient outcome. They are, however, complex, cumbersome and time consuming, may be impossible to apply in the setting of intra-abdominal sepsis[24,25] and need software to assess the mortality. And the APACHE II score has been found to underestimate or overestimate death, especially in high-risk patients and also found to have a lesser sensitivity and specificity than MPI score. MPI has got an advantage of being simple, rapid, peritonitis specific and easily applicable.[26]

The present study is done with aim of assessing the prognosis of patients with peritonitis using Mannheim's peritonitis index.

Complications

The average MPI score in patients with complications (21) was almost double compared to the score of the patients without complications (11.5).

This was found to be clinical and statistically significant.

Thus, there was significant clinical as well as statistical significance noted in the average MPI score of patients with complications and those without complications. (p value - 0.05)

The postoperative day in which oral feeds for patients with complications (6th POD) were started was delayed twice compared to those without complications (3rd POD), which was also proved statistically significant. (p value – 0.05)

The average hospital stay was also prolonged almost three times for patients with complications (20 days) when compared with patients without complications (6 days), which was also proved statistically significant (p value - 0.03)

Incidence of complications noted in the study: 40%.

The most commonly encountered complication in the study is SSI (surgical site infection).

Summary

In a study of 30 patients, conducted in Pondicherry institute of medical sciences, the Mannheim peritonitis score was applied to all patients who underwent exploratory laparotomy, who were admitted with the diagnosis of secondary peritonitis. The following were the findings noted:

1. Increase in MPI score was associated with increased mortality and morbidity
2. Increased MPI score also predicted.
    - Delay in initiation of oral feeds in the post operative period.
    - Prolonged hospital stay.
    - Increased risk of surgical complications.
3. The commonest site of perforation is appendicular.
4. The commonest complication encountered is surgical site infection.
5. Overall Morbidity and Mortality of peritonitis has been decreased over the years.

Among the individual parameters of MPI score, Nature of exudates and presence of organ failure played a major role in the outcome of peritonitis.

CONCLUSION

1. The Mannheim Peritonitis Index is a simple, reliable accurate index in assessment of prognosis in patients with peritonitis.
2. High MPI score predicts increased risk of complications, delay in post-operative day of initiation of oral feeds and increased duration of hospital stay.

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