Section: General Surgery

Original Research Article

COMPARATIVE STUDY ON THE EFFECTIVENESS OF SEPSIS SCORE OF STONER AND ELEBUTE, MANNHEIM PERITONITIS INDEX(MPI)AND PHYSIOLOGICAL AND OPERATIVE SEVERITY SCORE FOR ENUMERATION OF MORTALITY (POSSUM) AND MORBIDITY IN PREDICTING THE MORTALITY OF PATIENTS WITH PERFORATIVE PERITONITIS

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Abstract

Background: Peritonitis due to hollow viscus perforation is one of the most common surgical emergencies to be attended by a surgeon on call duty. Several scoring systems are in place to stratify the patients with peritonitis due to hollow viscous perforation. Realizing the need for a simple accurate scoring system in these conditions the present study was undertaken to evaluate the performance of three different scoring systems in predicting the risk of mortality in patients with peritonitis due to hollow viscus perforation. The aim and objective is to calculate and compare the positive predictive value of Mannheim peritonitis index, POSSUM and Sepsis score of Stoner, and Elebute scores for each of the patients. **Materials and Methods:** A Prospective and observational analytical study done in Chengalpattu medical college, Chengalpattu for all the cases of perforative peritonitis admitted during the period of April 2021 to May 2022. **Conclusion:** While all three measures are effective predictors of death, Stoner and Elebute's sepsis scores and POSSUM score superior predictors of outcome when compared to MPI in terms of accuracy. Both POSSUM and sepsis score has less Negative predictive value compared to MPI score which concludes that Sepsis score has more reliability compared with POSSUM Score and MPI score in terms of Accuracy.

INTRODUCTION

Generalized peritonitis is a frequently fatal condition. It continues to be one of the main problems faced by doctors, surgeons and their patients around the world. Until the end of the last century, peritonitis was treated with drugs with a mortality rate of 90%. In 1926, Kirschner showed that by strict application of surgical principles, mortality from peritonitis could be reduced and the mortality rate reduced to below 50%. Whittman showed that age, duration of symptoms, white blood cell count, mechanisms, and source of infection were associated with outcome. Therefore, the outcome in most of these patients is difficult to predict.[1-5]

Placing patients into different risk groups would help predict the outcome of select patients for critical care and determine surgical risk, which would help in choosing the type of surgical procedure, e.g. Damage control vs. final procedure. Several scoring systems are in place to stratify the patients with peritonitis due to hollow viscous perforation like Peptic Ulcer Perforation (PULP) score, Acute Physiology and Chronic Health Evaluation, BOEY score. Utilization of scoring systems would be of great help in salvaging a priceless life by risk stratification with preferential care and by surgical audit.

Aims & Objectives

1. To calculate and compare the positive predictive value of Mannheim peritonitis index, POSSUM

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and Sepsis score of Stoner and Elebute scores for each of the patients.

2. Compare standard cut offs for predicting mortality with cut offs obtained in the study.

Existing Scoring Systems

	Scores predicting mortality	**Scores predicting morbidity**
Scores not requiring	ASA	APACHE-II
operative information	APACHE-II	Veltkamp Score
	Sickness Assessment	VA Pneumonia Prediction
	Boey Score	Index
		VA Respiratory Failure
	Hacetteppe Score	Score
	Physiological POSSUM	
Scores requiring operative	Mannheim Peritonitis Index	POSSUM, P-POSSUM
Information	Reiss Index	
	Fitness Score	
	POSSUM, P-POSSUM	
	Cleveland Colorectal Model	
	Surgical Risk Scale	

Mannheim Peritonitis Index

Name:
Age:
Sex:
IP no:
S.no
Diagnosis:
Procedure:

1.	Age>50 years	(5) _____
2.	Female sex	(5) _____
3.	Organ failure	(7) _____
	Creatinine level	>177 umol/L
	Urea level	>167 mmol/L
	Oliguria	<20 ml/h
	Lung PO2	<50 mmHg
	PCO2	>50 mmHg
	Paralytic ileus	>24h
	Mass in	

USG /CT/Per abdominal examination
Per rectal examination

4.	Malignancy	(4) _____
5.	Preoperative duration of peritonitis>24 hrs	(4) _____
6.	Origin of sepsis not colonic	(4) _____
7.	Diffuse generalized peritonitis	(6) _____
8.	Exudate	
	Clear	(0) _____
	Cloudy/ purulent	(6) _____
	Faecal	(12) _____

Total
Possum score

Name:		Age:	Sex:	IP NO:			S.NO
DIAGNOSIS:							
PROCEDURE:							
PHYSIOLOGICAL SCORE							
PARAMETER		OBSERVED VALUE					SCORE
AGE							
CARDIAC SIGNS							
RESPIRATORY HISTORY							
SBP							
PULSE RATE							
GCS							
HEMOGLOBIN							
WBC COUNT							
SERUM UREA							
SERUM SODIUM							
SERUM POTASSIUM							
ELECTROCARDIOGRAM							
TOTAL SCORE							
OPERATIVE SCORE							

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PARAMETER		OBSERVED VALUE					SCORE
OPERATION SEVERITY							
REOPERATION							
PERITONEAL SOILING							
MALIGNANCY							
BLOOD LOSS							
URGENCY OF SURGERY							
TOTAL SCORE							

SEPSIS SCORE Scoring of Local effects of tissue infection	
attribute	Score
Wound infection with purulent discharge/entero-cutaneous fistula Requiring only light dressing changed not more than once daily Requiring to be dressed with a pack, dressing needing to be changed more than once daily, requiring application of a bag and/or requiring suction	2 4
Peritonitis localized generalized	2 6
Chest infections clinical or radiological signs of chest infection without productive cough clinical or radiological signs of chest infection with cough producing purulent sputum full clinical manifestation of lobar/bronchopneumonia	2 4 6
Deep seated infection (subphrenic abscess, pelvic abscess, empyema Thoracis, acute or chronic osteomyelitis)	6
Scoring of pyrexia	
attribute	Score
Maximum daily temperature (degree Celsius) 36-37.4 37.5-38.4 38.5-39 >39 <36 Minimum daily temperature > 37.5 If 2 or more temperature peaks above 38.4 in 1 day If any rigors occur in a day	0 1 2 3 3 add 1 add 1 add 1
Scoring of secondary effects of sepsis	
attribute	Score
Obvious jaundice (in the absence of established hepatobiliary disease) Metabolic acidosis Compensated Uncompensated	2 1 2
Renal failure Gross disturbance of mental orientation level of consciousness and/ or other Focal neurological manifestations of pyaemia, septicaemia Bleeding diathesis (from disseminated intravascular coagulation)	3 3 3
Scoring of laboratory data	
attribute	Score
Blood culture Single positive culture Two or more positive cultures separated by 24hr Single positive culture + history of invasive procedure Single positive culture + cardiac murmur &/or tender enlarged spleen	1 3 3 3
Leucocyte count(* 109/l) 12-30 >30 <2.5	1 2 3
Haemoglobin level in the absence of obvious bleeding (g/dl) 7-10 <7	1 2
Platelet count (*103/l) 100-150 <100	1 2
Plasma albumin level(g/l) 31-35 25-30 <25	1 2 3
Plasma total bilirubin level in the absence of clinically obvious jaundice >25µmol/l	1

MATERIALS AND METHODS

Design of Study: A Prospective and observational analytical study done in Chengalpattu medical college, Chengalpattu.

Period of Study: One Year from April 2021 to May 2022

Selection of Study Subjects: All cases of perforative peritonitis, admitted in Chengalpattu medical college admitted during the period of April 2021 to May 2022.

Data Collection: Required data were collected from the complaints, history of presenting illness and past history of the patient, radiological investigations, biochemical lab values, intraoperative findings.

Ethical Clearance: Approved by the Institute of Ethical Committee, Chengalpattu Medical college.

Consent: Informed written consent from the patient obtained in the patient's mother tongue.

Analysis: All data were analysed using SPSS Version 15 for Windows software. Area under the curve was calculated using Receiver operator characteristic curves.

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Inclusion Criteria

All cases of perforative peritonitis, admitted in Chengalpattu medical college admitted during the period of April 2021 to May 2022.

Exclusion Criteria

Pateints with age< 12 years, Not given consent for surgery.

Methodology: After the relevant data were collected in printed proforma sheets containing the requisite variables necessary, they were entered into online score calculators (www.SFAR.org and www.riskpredicton.org.uk). The calculated scores were tabulated and analysed using statistical software SP.

RESULTS

The study comprised 100 diagnosed cases of perforation, 97 of which had laparotomy, 2 patients had drains inserted while under local anaesthesia, and 1 patient passed away without undergoing any treatment. Three patients underwent multiple procedures; one patient had an ileostomy after primary closure of the perforation, while the other two patients underwent resection anastomosis after primary closure. 16 people died in total, which contributed to a 16% mortality rate. The majority of patients were between the ages of 30 and 50 with a trend line of around 40 years; the median age of survivors was 40 years whereas the median age of those who passed away was 60 years. Males made up 77% of the patient population compared to females' 23%, while 64 out of 77 male patients and 20 out of 23 female patients survived. Patients who survived experienced symptoms for a median of two days but those who died did have symptoms for 4.5 days. 14 of the 21 patients, or two thirds of those in stage 3 or above of septic shock, died.

Multiple organ failure defined by creatinine level > 177 umol/L or urea level> 167mmol/L or oliguria 20ml/hour, Pulmonary insufficiency (PO2 < 50 mmHg or PCO2 > 50 mmHg), Intestinal obstruction/paralysis (> 24hours or complete mechanical ileus) and Shock (systolic blood pressure < 90 mmhg) , mean arterial pressure <60 mmhg) was present in 22 patients of which 13 expired.

47 of our patients had gastroduodenal perforations, 34 had gastric perforations, primarily in the prepyloric region, and 13 had duodenal perforations, according to the study. There were 47 gastroduodenal perforations, however none of them were caused by malignancy. Following the 27 ileal perforations, of which 4 died.There were 13 appendicular perforations, but no fatalities. 5 patients had colonic perforations, 1 of whom died, and the 4 patients who had jejunal perforations also died. We also had 1 uterine perforation. In the study, there were 3 patients who presented in the advanced stage of the disease, drains inserted under local anaesthesia in pelvic and in subhepatic regions was the only treatment two of these patients received before succumbing to the disease whereas the third patient died before any intervention could be undertaken. There were 78 patients who had generalised disease of which 15 died and those who died had either feculent or purulent exudate and all of the 21 patients with localised disease survived.

Three deaths occurred out of 67 patients who received primary closure in the study. Resection anastomosis was performed on 10 patients, of whom eight passed away. Three of these deaths were caused by Superior Mesenteric Artery thrombosis, three of the cases of tubercular perforation required extensive resections, and one case of jejunal diverticular disease involved multiple jejunal diverticuli in the mesenteric border. Following primary closure, a second surgery was performed on three individuals. Two underwent resection, anastomosis, of which one died, and an ileostomy in the remaining one.

13 patients who had appendectomies all recovered. One patient underwent a decompressive gastrostomy with pyloric exclusion, tube duodenostomy, and feeding jejunostomy as the treatment but died. This patient had a 1.5 cm perforation of the junction of the first and second halves of the duodenum. In two individuals, primary closure with proximal stoma diverting was performed. The pyometra with uterine perforation underwent hysterectomy.

DISCUSSION

The patient's prognosis is significantly influenced by the duration of the patient's preoperative symptoms. With time, the disease worsens into generalised peritonitis and multisystem involvement, all of which have a negative impact on the patient's prognosis. Patients who survived had an average hospital stay of 7 days as opposed to 3.5 days for patients who passed away. This can be explained by the fact that patients who presented later and had severe illness stages died earlier. As three cases of jejunal perforation had superior mesenteric artery thrombosis, one case had extensive diverticula with multiple diverticular perforations, and one case of multiple ileal perforations had abdominal Kochs, the aetiology complicated the mortality.[6-8]

For each one, the affected intestinal portion had to be extensively removed. The majority of the patients who passed away had advanced illnesses that required substantial resection, such as severe diverticular disease, tubercular peritonitis, and superior mesenteric artery thrombosis. Three patients with tubercular peritonitis also passed away, along with all of the patients who had ischemic bowel disease. The Mannheim Peritonitis Index is a good scoring system to predict mortality in cases with perforation peritonitis, as shown by the area under the curve of 0.987 ,when utilising the multiple logistic regression approach and Receiver Operating Characteristic (ROC) curves.[9,10]

For those who survived, the mean POSSUM score was 37.3, but for those who passed away, it was 57.75. The area under the ROC curve using multivariate logistic regression was 0.890. The

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POSSUM score is a good indicator of mortality. The mean sepsis score was 34 in those who passed away compared to 15.8 in those who survived. Area 0.98 was found under the curve. The mortality rate is very well predicted by the sepsis score. The greatest values of the score's sensitivity and specificity can be attained at an ideal cut off point, which is determined by the ROC curve. In order to plot ROC curves, sensitivity and specificity are used. Plotting the true positive rate versus the false positive rate shows specificity along the x-axis and sensitivity along the y-axis. The sensitivity and specificity of the test fluctuate throughout the curve since they are inversely proportionate. POSSUM and Sepsis scores, out of the three, provided good outcome prediction. POSSUM outperformed projected mortality. Although MPI exhibited a accuracy of prediction of outcome (93%) lagged below the other two scores.[11] Even with the cut-off point optimised, the score's application in treating specific patients is not justified by an acceptable low false positive prediction rate. These findings imply that in patients with perforative peritonitis following surgical therapy of the underlying illness, POSSUM score, with an area under curve of 0.890, predicted death more accurately than MPI (0.987) and Sepsis score of Stoner and Elebute (0.98).[12]

Table 2: Diagnosis

Diagnosis	No of patients	Percentage
Appendicular perforation	13	13%
Colonic perforation	5	5%
Gastroduodenal preforation	47	47%
Ileal perforation	27	27%
Jejunal perforation	4	4%
Unknown	3	3%
Uterine perforation	1	1%

Table 3: Diagnostic Utility of all three scores

Diagnostic Utility	MPI Score (34)	Sepsis score(29)	Possum score(62)
Sensitivity	56.25%	81.25%	62.50%
Specificity	100.00%	100.00%	100.00%
PPV	100.00%	100.00%	100.00%
NPV	92.30%	96.55%	93.30%
ACCURACY	93.00%	97.00%	94.00%

Table 4: ROC curve

SCORE	AUC	P VALUE
MPI	0.987	0.001
SEPSIS	0.982	0.001
POSSUM	0.89	0.001

CONCLUSION

Increased patient age, prolonged symptom duration, advanced disease process, generalised peritonitis with purulent or feculent exudate, shock at presentation, and the emergence of multi-organ failure are all factors that are linked to death and dramatically affect the patient's grim prognosis. The result of the patient in the same risk group is unaffected by the patient's gender. While all three measures are effective predictors of death, Stoner and Elebute's sepsis scores and POSSUM score superior predictors of outcome when compared to MPI in terms of accuracy. Both POSSUM and sepsis score has less Negative predictive value compared to MPI score which concludes that Sepsis score has more reliability compared with POSSUM Score and MPI score in terms of Accuracy.

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