Comparison of Different Scoring System in Predicting the Severity and Prognosis of Acute Pancreatitis

Dr. Pradeep Ghimire MS, FRCSED[1], Sandeepa Ghimire M.Sc. Biochemistry

Surgical Department, Fishtail Hospital and Research Centre, Pokhara Nepal.
*Corresponding Author: Dr. Pradeep Ghimire MS, FRCSED

Abstract:
Introduction:*Various prognostic scoring systems have been used, all aimed at predicting persistent organ failure, particularly respiratory, cardiac and renal. Severity stratification assessments should be performed in patients at 24 hours, 48 hours and 7 days after admission. Acute pancreatitis is one of the most common gastro-interological diseases. The annual incidence may range from 5-50/100000 populations worldwide. The disease may occur at any age, with peak in young man and older women.*
Objective:*To determine the best prognostic indicator in acute pancreatitis comparing Ranson, Glasgow and Multiple organ system failure (MOSF) systems.To assess the prognostic accuracy of Ranson, Glasgow and Multiple Organ System Failure scoring systems in predicting the severity of acute pancreatitis.*
Materials and Methods:*Hospital based prospective study carried out in Fishtail Hospital and Research Center Pvt. Ltd. in the period of 2 years of time (January 2016-December 2017).*
All patients presented to surgical out patients department (OPD) or emergency department who are diagnosed for acute pancreatitis were included. In this period total of 71 patients of acute pancreatitis were included in this study. All patients were examined and sent for laboratory investigations and radiological investigations required for the diagnosis. All statistical analysis was done using SPSS 11.5 software.
Result:*The mean age of thepatients was 52 years. There were female pre-dominant. Alcohol was the most common causative agent. MOSF had maximum specificity of 100% followed by Glasgow 88% and Ranson 72%. Ranson had maximum sensitivity of 46 % followed by Glasgow 36% and MOSF 23%. MOSF had maximum positive predictable value 100% followed by Glasgow 78% and Ranson 67%.*
Conclusion:*The present study show that MOSF score can determine the prognosis of acute pancreatitis early and it has highest specificity compared to Ranson and Glasgow.*
Keywords:*Acute pancreatitis, Ranson, Glasgow, Multiple organ system failure.*

I   Introduction

Acute pancreatitis is an inflammation of the pancreatic parenchyma. It's an acute condition presenting with abdominal pain, a three-fold or greater rise in the serum levels of the pancreatic enzymes, amylase or lipase and/or characteristics findings of pancreatic inflammation on contrast enhanced CT-Scan. Acute pancreatitis may recur. The majority will have a mild attack of pancreatitis. The mortality from which is around 1%. Severe acute pancreatitis is seen in 5-10% of patients,. The mortality varies from 20-50%.

A revision in 2013 of the Atlanta classification of acute pancreatitis (1992) recommends three groups: A: mild acute pancreatitis; no organ failure, no local or systemic complications, B: moderately severe acute pancreatitis; organ failure that resolves within 48 hours (transient organ failure) and/or local or systemic complications without persistent organ failure, C: severe acute pancreatitis; persistent organ failure more than 48 hours, single organ failure; multiple organ failure[1].

The most common cause of acute pancreatitis is the presence of gall stone and chronic heavy alcohol use. The other cause of acute pancreatitis includes abdominal trauma, drugs, infections, tumors and genetic abnormality of pancreas[2]. There are several approaches that have been used in an attempt to predict the severity and prognosis of acute pancreatitis. These include clinical, biochemical and imaging assessments. Amongst these assessment tools multiple factors scoring systems are the most often used[3]. The Ranson and Glasgow scoring system are specifically designed to predict the severity of acute pancreatitis and have been the most widely used indices in clinical practices since 1980s[4]. However, the major drawback of the Ranson or Glasgow system is that they need 48 hours before a reliable assessment of the severity can be achieved. Subsequently, other severity scoring system such as the multiple organ system failure score, was introduced for such assessment to be made at times earlier than 48 hours[5,6,7]. The purpose of this study was to assess the prognostic

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accuracy of Ranson, Glasgow and multiple organ system failure scoring systems in predicting the severity of acute pancreatitis. During the past 20 years, a considerable reduction in mortality associated with acute pancreatitis has been recorded because of adequate medical treatment, intensive care treatment, frequent clinical assessments repeated laboratory studies and then use of advanced imaging technique[8].

Scoring system used in this study:

1.   Ranson Score:
Ranson criteria is a clinical prediction rule for predicting the severity of acute pancreatitis. It was introduced in 1974.

At admission; age in years more than 55 years, white blood cell (WBC) count, more than 16,000 cells/mm^3, blood glucose more than 10 mmol/l (more than 200 mg/dl), serum AST more than 250 IU/L and serum LDH more than 350 IU/L.

At 48 hours, calcium-serum calcium <2 mmol/L (<8 mg/l), hematocrit fall more than 10%, oxygen-hypoximia pO2<60 mmhg, BUN increased by 1.8 or more mmol/L (5 or more mg/dl). After IV fluid hydration, basedeficiet (negative base exceed) more than 4 meq/L and sequestration of fluids more than 6 litres.

Intrepretation of the score: if the score is ≥3, severe pancreatitis likely. If the score ≤3, severe pancreatitis is unlikely or score 0-2-2% mortality, score 3-4-15% mortality, score 5 to 6-40% mortality and if the score is 7 to 8-100% mortality.

2.   Glasgow Score:
Age more than 55 years pO2 < 60mmhg, WBC >15×10^9/liter, Ca^{2+} (uncorrected) <2mmol/litre, LDH >600 IU/L, glucose >10 mmol/L, urea >16 mmol/L, albumin <3.2 g/L and AST/ALT >200 units. Minimum score: 0, Maximum score: 8. If the score is <3, severe pancreatitis unlikely but if the score is ≥3, severe pancreatitis is likely.

3.   Multiple Organ System Failure Score:
Cardiovascular: Mean arterial pressure <=50 mm Hg, need for volume loading and/or vasoactive drug to maintain systolic blood pressure above 100 mm Hg, heart rate <=50 beats/min, ventricular trachycardia/fibrillation, cardiac arrest and acute myocardial infraction.

Pulmonary: respiratory rate ≤5/min or ≥50/min, mechanical ventilation for 3 or more days or Fio$_2$>0.4 and/or positive in expiratory pressure >5 mm Hg.

Renal: serum creatinine ≥3.5 mg/dl (280 mmol/L), dialysis/ultrafiltration needed.

Neurologic: Glasgow Coma Scale ≤6 (in the absence of sedation)

Hematologic: Hematocrit ≤20%, leucocyte count <= 300 mm^3 (0.3×10^9/L), platelet count <= 50×10^3/ml (50×10^9/L) and disseminated intravascular coagulation.

Hepatic: Total Billirubin level ≥3.5 mg/dl (51 mmol/L) in the absence of hemolysis. ALT >100 unit/L.

Gastrointestinal: Stress ulcer necessitating transfusion of moe than 2 units of blood in 24 hours, Acalculuscholecystitis, necrotisingenterocolitis and bowel perforation.

Scoring: The sum of the failing organ system during a day, score varies from 0-7.

II   Materials And Methods

Hospital based prospective study carried out in Fishtail Hospital and Research Center Pvt. Ltd. in the period of 2 years of time (January 2016-December 2017). Informed written consent is taken from the patients and his/her relatives. Ethical clearance taken from the institute. All patients suspicious for acute pancreatitis presenting to surgical OPD or emergency department were examined and sent for required investigations for the diagnosis of acute pancreatitis. Data collected in performa containing detail information on each patient. We collected data for Ranson, Glasgow and MOSF and compared with each other and assessed the severity of patients. We divided the patients as those having length of stay ≥ 5 days as severe and those patients having < 5 days as mild. Comparison was made between these prognostic group for detecting the outcome of the patients and severity. In this study, 71 patients were included. Data were entered and comparison was made between the various scoring systems. All statistical analysis was done using SPSS 11.5 software. Patients were not included are clinically doubtful cases, chronic pancreatitis cases, inability to receive informed consent due to mental disability, patients died within 48 hours of hospital stay and patients with pregnancy.

III   Results

In this study, 71 patients were included. Patients were of age 14-86 with mean age of 52 years. 39 (54.9%) were female and 32 (45.1%) were male. There were female predominant with female to male ratio with 1.2:1. Alcohol (28 patients) was the most causative agent followed by unknown etiology (27 patients) and gall stone (13 patients). Three patients had both etiology of alcohol consumption and cholelithiasis. Ranson, Glasgow and MOSF scoring was done. In Ranson, there were 44 patients who were classified as mild (score <3) and 27 as severe (score ≥3). In Glasgow, there were 53 patients who were classified as mild (score <3) and 18 as severe (score ≥3). In MOSF, there were 61 patients who were classified as mild (score <3) and 10 as severe

(score ≥3).Comparison of Ranson score with the length of stay was done with Spearman's rho and was found significant (Sig.2-tailed as 0.050). Comparison of Glasgow with the length of stay was done with Spearman's rho and was found significant (Sig.2-tailed as 0.051). Comparison of MOSF with the length of stay was done with Spearman's rho and was found significant (Sig.2-tailed as 0.000). Receiver Operating Characteristic (ROC) curve was made and the area under curve was found to be 0.590, 0.617, 0.628 for Ranson, Glasgow and MOSF respectively. Ranson severity column were taken as severity, Glasgow as severity A and MOSF as severity B. MOSF had maximum specificity of 100% followed by Glasgow (88%) and Ranson (72%). Ranson had maximum sensitivity of 46% followed by Glasgow (36%) and MOSF (23%). MOSF had maximum positive predictable value of 100% followed by Glasgow (78%) and Ranson (67%).

Table No. 1: Frequency table of Mild and Severe cases of acute pancreatitis

RANSON

	Frequency	Percent	Valid percent	Cumulative percent
MILD	41	62.0	62.0	62.0
SEVERE	27	38.0	38.0	100.0
Total	71	100.0	100.0	

GLASGOW

	Frequency	Percent	Valid percent	Cumulative percent
MILD	53	74.6	74.6	74.6
SEVERE	18	25.4	25.4	100.0
Total	71	100.0	100.0	

MULTIPLE ORGAN SYSTEM FAILURE SCORE (MOSF)

	Frequency	Percent	Valid percent	Cumulative percent
MILD	61	85.9	85.9	85.9
SEVERE	10	14.1	14.1	100.0
Total	71	100.0	100.0	

Table No. 2: Comparing Ranson, Glasgow and MOSF with Length of Stay (LOS).

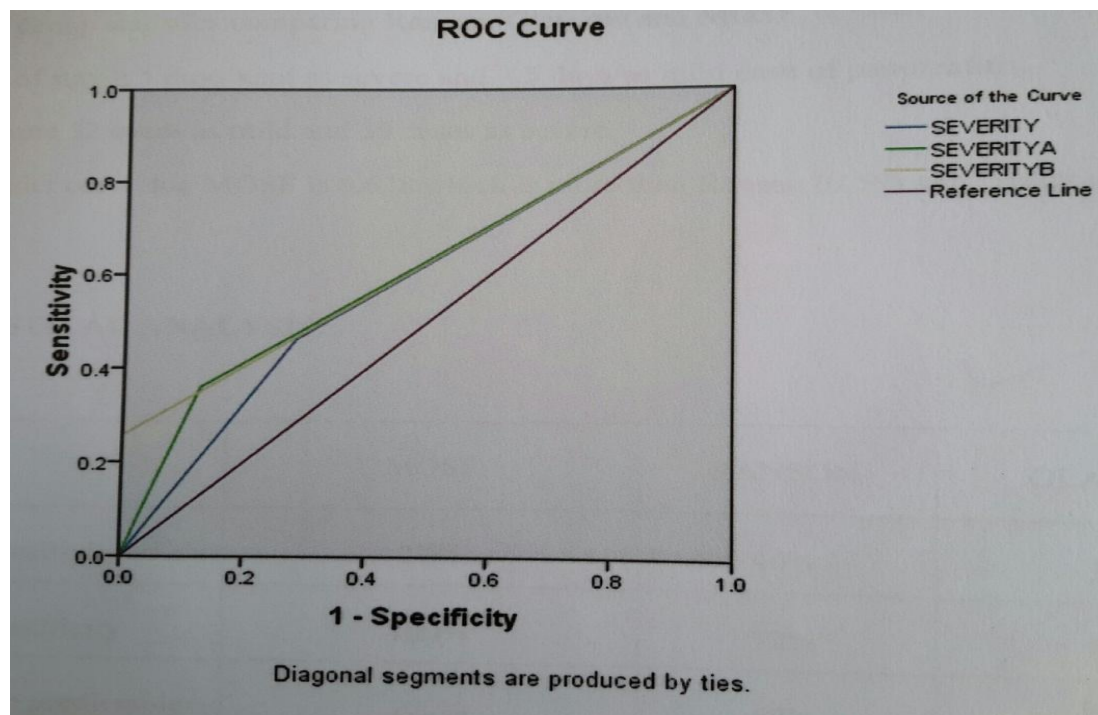| Variables	Spearman's rho	P Value
LOS and MOSF	0.48	0.000
LOS and Glasgow	0.23	0.051
LOS and Ranson	0.23	0.050

Table No. 3: Area under cover of ROC Curve

Variable(s)	Area	Std. Error	Asymptomatic Sig.	Asymptomatic 95% confidence interval	
				Lower Bound	Upper Bound
Ranson (Severity)	.590	.068	.194	.457	.723
Glasgow (Severity A)	.617	.067	.092	.487	.747
MOSF (Severity B)	.628	.066	.064	.499	.757

IV Statistical Analysis:

Table No. 4: Comparison of Ranson, Glasgow and MOSF.

	MOSF	RANSON	GLASGOW
Sensitivity	27%	46%	36%
Specificity	100%	72%	88%
Positive predictable value	100%	67%	78%
Negative predictable value	53%	52%	53%
ROC	0.628	0.590	0.617

Table No. 5: Comparison of Ranson, Glasgow and MOSF with Length of Stay.

	Mild (n=32)	Severe (n=39)	t-value	P value	95% CI
RANSON	1.8 (1.1)	2.5 (1.4)	-2.02	0.047*	-1.216 to -0.008
GLASGOW	1.5 (0.9)	2.0 (1.3)	-1.8	0.07	-1.045 to 0.49
MOSF	0.2 (0.5)	1.0 (1.2)	-3.46	0.001*	-1.281 to -3.44

V   Discussion

In our study, we have compared the Ranson, Glasgow and Multiple Organ System Failure (MOSF). We have kept as mild disease those who lived in hospital for less than 5 days and severe those who had Length of Stay (LOS) more than 5 days.

When we compared Ranson score, Glasgowscore and Multiple Organ System Failure (MOSF) with Length of Stay (LOS) by using Spearman ranked correlation we found that there was correlation between both. Correlation coefficient of 0.233 (P=.05) and 0.232 (P=.05) and 0.481 (P=<.005). This shows that there is correlation between the score of the prognostic indicator used and the length of stay. With all three indicators used, MOSF has maximum significance comparing with length of stay.The result was comparable to with study done by Stephine L. et al and they found that correlation coefficient was 0.39 (P=.005) and 0.43 (P=.005) for modified Glasgow and Multiple Organ System Failure (MOSF). Total of 71 patients met the inclusion criteria for the study with female to male ratio of 1.2:1. Age averaged 52 ± 18 years (range 14 – 86 years). Alcohol was most common etiological factor for acute pancreatitis (40%) and gallstone was (18%). Unknown etiology was seen in 38%. Three patients (4%) had both cholelithiasis and consumption of alcohol.

In the study done by Diep D. Tran et al found similar results. Age averaged 51 ± 18 (range 4 to 98 years). Alcohol (44%) was most common cause for acute pancreatitis.

Four patients with diagnosis of acute pancreatitis died within 48 hours of presentation and they were excluded from the study. All were diagnosed as severe acute pancreatitis. Ranson score of 48 hours couldn't be taken so were excluded from this study.

We also compared with severity in all 3 groups. Mild cases were those who had shorter hospital stay (less than 5 days) and severe were those who had longer hospital stay (more than or equal to 5 days). Ranson and Glasgow were the most sensitive systems at detecting LOS of 5 or more days at 46% and 36%, respectively. MOSF had highest specificity of 100% and sensitivity of 27%. Ranson and Glasgow had the PPV at 67% and 78% respectively. MOSF had highest PPV 100%. Statistical significance between sensitivity/specificity characteristics was calculated by comparing area under receiver operating characteristic (ROC) curves, with area 0.5 having a 50% chance of predicting correctly and one being a "perfect test". MOSF had the highest area at 0.628, and Ranson the lowest at 0.590. This was comparable to study by Stephine L. et al where MOSF and Glasgow were the most sensitive systems at detecting LOS of 5 or more days at 86% and 64%, respectively. In ROC curve Ranson and Glasgow had the highest PPV at 73% and 67%. MOSF had the highest area at 0.71, and Ranson the lowest at 0.54.

Sensitivity and Specificity both is higher in Ranson (46 and 72) but MOSF has highest specificity and PPV with higher AUC in ROC curve. This study signifies that all prognostic indicators has role in detecting severity of acute pancreatitis. For confirmation one need radiological study like ultrasound abdomen and contrast enhanced CT scan to detect the severity with its complications. Ranson has significant correlation with severity so has role in determining prognosis in acute pancreatitis. MOSF helps to detect severity more than other prognostic indicator used in this study.

Conclusion

The result of our present study shows that Multiple Organ System Failure (MOSF) score can determine the prognosis of acute pancreatitis early and it has highest specificity compared to Ranson and Glasgow. Ranson and Glasgow has role in determining prognosis in acute pancreatitis.

Comparison shows that all the prognostic indicators has role in determining the prognosis of acute pancreatitis.

Perhaps a larger sample size and comparison with the Ranson, Glasgow and Multiple Organ System Failure score (MOSF) with the radiological investigation can be done to determine the better prognostic value in acute pancreatitis.

In the case of acute pancreatitis, MOSF must be determined routinely for the prognosis and to determine the severe form of acute pancreatitis.

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