



RANSON SCORE VS SERUM PROCALCITONIN FOR PREDICTING THE SEVERITY OF ACUTE PANCREATITIS

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Abstract

Objectives: To predict the severity of acute pancreatitis. **Study Design:** Descriptive Cross sectional study. **Place and Duration:** From January, 2017 to July, 2017. Surgical Unit II, Holy Family Hospital, Rawalpindi. **Patients and Methods:** 100 consecutive patients meeting the inclusion and exclusion criteria were offered to enroll in the study after taking informed consent. The diagnosis of acute pancreatitis was based on acute upper abdominal pain associated with a serum amylase level greater than three times the normal value or an elevated serum lipase level and radiological evidence of AP. Patients with history of trauma, any active cardiac or renal issue were excluded from the study. **Results:** Hundred patients were enrolled in the study: 68 males and 32 females. The median patient age was 49 years. According to the Atlanta criteria, 56 patients were classified as mild AP and 44 as severe AP. There were no significant differences according to age ($p= 0.24$) and sex ($p= 0.65$). The causes of AP were biliary stone, idiopathic or miscellaneous; differences were not significant ($p= 0.40$). Twenty patients died: sixteen of multiple organ failure and four of severe necrotizing pancreatitis; all twenty had severe AP. Sensitivity, specificity and diagnostic accuracy of Ranson score is 43% , 86% and 67% as compared to serum Procalcitonin which is 29% and 90% and 47%. **Conclusions:** In patients with acute pancreatitis, serum procalcitonin level at admission does not accurately predict the progression to severe acute pancreatitis. Ranson score correlated better than serum procalcitonin in predicting the progression to severe pancreatitis.

Keywords: acute pancreatitis, ranson score, serum procalcitonin

Introduction:

Acute pancreatitis is an acute inflammatory process ranging from mild abdominal discomfort to severe disease involving multiple organ systems. Diagnosis is based on the presence of at least two of the following three features: abdominal pain, increased pancreatic amylase and /or lipase levels to > times the upper limit of normal and imaging tests showing characteristic findings of acute pancreatitis. The incidence of acute pancreatitis is known to differ geographically due to differences in alcohol consumption or in the incidence of gallstones disease in different parts of the world. Cholelithiasis is the leading cause of acute pancreatitis in our set up.¹

Several inflammatory markers are being used routinely in various hospitals in Pakistan to assess the prognosis of patients with acute pancreatitis. These include total and differential leukocyte counts, erythrocyte sedimentation rate, and CRP amongst others. Several scoring systems have been developed for severity stratification in acute pancreatitis. These include Ranson score, Glasgow score, BISAP score and CT severity index. Some of these scores require at least 48 hours to obtain a complete score (Glasgow and Ranson scores) whilst others are way too complex (APACHE II).² Procalcitonin is a calcitonin propeptide reported to increase early in severe infection and inflammation.³ It can be a relatively accurate and convenient method for predicting the severity in acute pancreatitis and is easily measured.^{4,5} It is important to be able to recognize and stratify the severity of the condition early on as early diagnosis and stratification of severity with aggressive treatment can prevent lethal complications like multiple organ failure, pancreatic necrosis and fluid collections and decrease mortality. Gallstone pancreatitis is on the rise in Pakistan.

Procalcitonin offers a good enough alternative and can be done immediately at the time of admission. Previous studies have maintained the supremacy of Ranson score over procalcitonin level for grading the severity of pancreatitis^{2,5} however considering the lack of local evidence coupled with the fact of an easier alternative we felt prompted to carry out this study.

Materials and Methods

This descriptive cross-sectional study was carried out at the department of surgery, Holy Family Hospital from January 2017 to June 2017. Ethical approval was taken from institutional review forum before starting the study. 100 consecutive patients meeting the

inclusion and exclusion criteria were offered to enroll in the study after taking informed consent. The diagnosis of acute pancreatitis was based on acute upper abdominal pain associated with a serum amylase level greater than three times the normal value or an elevated serum lipase level and radiological evidence of acute pancreatitis. Patients with history of trauma, any active cardiac or renal issue were excluded from the study. Data collection involved documentation of medical history, age, sex, vital signs, abdominal signs, and drug history. Serum procalcitonin level determination was performed on the same serum sample drawn for other biochemical tests. Plasma procalcitonin was estimated using semi quantitative strip test immunoassay. All patients were classified as mild or severe AP according to the Atlanta criteria. Descriptive and inferential statistical analysis was carried out on the data collected using SPSS 21.0. Groups were compared using the Mann-Whitney U test for non-categorical data; Fisher's exact test was used to examine differences in the sex ratio, etiology, and death ratio. The cutoff values of Ranson, serum PCT, and other parameters were determined using receiver operating characteristic (ROC) curves. Sensitivity, specificity, positive, and negative predictive values, accuracy, and likelihood ratios were also calculated.

Results

Hundred patients were enrolled in the study: 68 males and 32 females. The median patient age was 49 years. According to the Atlanta criteria, 56 patients were classified as mild AP and 44 as severe AP. There were no significant differences according to age ($p= 0.24$) and sex ($p= 0.65$). The causes of AP were biliary stone, idiopathic or miscellaneous; differences were not significant ($p= 0.40$) (Table 1). Twenty patients died: sixteen of multiple organ failure and four of severe necrotizing pancreatitis; all twenty had severe AP. The parameters according to the Atlanta criteria are described in Table 1. Sensitivity, specificity, Positive predictive value and Negative predictive value for patients calculated using procalcitonin level at 0.5 ng/ml, Ranson's score at 3 were 43%,86%,75%,49% and 29%,90%,82%,47% respectively using ROC curve.

Table 1a: Patient characteristics

Characteristic	Mild Pancreatitis (n =	Severe Pancreatitis (n=	Total (n=	p value
Male/Female	36/20	32/12	68/32	0.65
Age	43(25-72)	57(41-71)	49(25-72)	0.24
Deaths	0	20	20	<0.001
Duration of admission	8(6-18)	25(16-46)	17(6-46)	0.04

Table 1b: Etiology of Pancreatitis

Etiology	No. of cases
Biliary	58
Idiopathic	10
Post ERCP	16
Alcoholic	2
Traumatic	7
Hypertriglyceridemia	7

Table 2: Area under curve (AUC) for variables predicting severe pancreatitis.

Test Result Variable(s)	Area	p	Asymptotic 95% Confidence Interval	
			Lower Bound	Upper Bound
Serum Procalcitonin	0.688	0.077	0.492	0.867
RANSON Score	0.973	0.001	0.625	0.978

Table 3: Sensitivity, specificity, predictive values and diagnostic accuracy of RANSON score ≥ 3 for discrimination of severe pancreatitis

Parameter	Estimate	Lower - Upper 95% CI
Sensitivity (%)	42.83	(24.56-61.56)
Specificity(%)	85.61	(60.26-91.52)
Positive predictive value	74.56	(50.12-81.67)
Negative predictive value	48.65	(37.64-67.79)
Diagnostic Accuracy(%)	67.1	(50.3-74.5)

Table 4: Sensitivity, specificity, predictive values and diagnostic accuracy of PCT level $>0.5\text{ng/ml}$ for discrimination of severe pancreatitis

Parameter	Estimate	Lower - Upper 95% CI
Sensitivity (%)	29.41	(9.76-39.87)
Specificity(%)	90.21	(72.56-96.12)
Positive predictive value	82.22	(52.65-93.33)
Negative predictive value	47.26	(36.36-65.25)
Diagnostic Accuracy(%)	44.6	(31.2-56.9)

Discussion

It is very important to be able to distinguish between mild and severe acute pancreatitis. Contrast enhanced CT is considered as the gold standard to check for evidence of necrosis. Scoring systems have been developed to assess the severity of pancreatitis as early as possible and allows for the all-important decision to be made i.e whether intensive care is needed or not. Unfortunately, the scoring systems used at present are often inadequate in patients with severe AP, which is characterized by rapidly progressive multiple system organ dysfunction.⁶ Ranson score has been used successfully to grade the severity of pancreatitis over past several years however its use is limited by the fact that at least 48 hours are required to obtain a valid score. Thus there is a recognized need for a method for determining the severity of acute pancreatitis which can be applied daily, can easily be evaluated, which is practical and has a high rate of specificity and accuracy.

The overall mortality in our cohort was 20% and 44% of patients had severe acute pancreatitis. As expected the proportion of patients with severe disease and mortality in our cohort was higher as compared to previous studies^{2,4}; this is probably because of a more number of referred cases admitted in our hospital. Gallstones was the leading cause of pancreatitis (58%) in line with the Indian study by Khanna et al.

Many studies in the past have shown serum procalcitonin level to be a useful tool in predicting the severity of inflammation seen in acute pancreatitis.^{7,8} A previous study by Madhu et al⁹ reported Ranson score and serum PCT levels to have a diagnostic accuracy of 60% and 52.5% respectively consistent with the findings of our study which maintained the superiority of Ranson score over serum PCT level in terms of diagnostic accuracy as it was found out to be 67.1% compared to 44.6% for Ranson score and serum PCT respectively. This has also been reflected by other studies in the past.^{2,4}

There were certain limitations to our study which included the fact that a semi quantitative strip test was used to measure the serum procalcitonin level which is not as accurate as radioimmunoassay. Moreover we did not evaluate other important parameters such as BISAP score and CT severity index.

Conclusion

In patients with acute pancreatitis, serum procalcitonin level at admission does not accurately predict the progression to severe acute pancreatitis. Ranson score correlated better than serum procalcitonin in predicting the progression to severe pancreatitis.

References

1. Iqbal M, Malik M, Perveen S. Morbidity and Mortality in Acute Pancreatitis. *Journal of Surgery Pakistan (International)*. 2015 Oct;20:4.
2. Khanna AK, Meher S, Prakash S, Tiwary SK, Singh U, Srivastava A, Dixit VK. Comparison of Ranson, Glasgow, MOSS, SIRS, BISAP, APACHE-II, CTSI scores, IL-6, CRP, and procalcitonin in predicting severity, organ failure, pancreatic necrosis, and mortality in acute pancreatitis. *Hpb Surgery*. 2013 Sep 24;2013.
3. Taylor R, Jones A, Kelly S, Simpson M, Mabey J. A Review of the Value of Procalcitonin as a Marker of Infection. *Cureus*. 2017 Apr;9(4).
4. Kim BG, Noh MH, Ryu CH, Nam HS, Woo SM, Ryu SH, Jang JS, Lee JH, Choi SR, Park BH. A comparison of the BISAP score and serum procalcitonin for

- predicting the severity of acute pancreatitis. The Korean journal of internal medicine. 2013 May;28(3):322.
5. Woo SM, Noh MH, Kim BG, Hsing CT, Han JS, Ryu SH, Seo JM, Yoon HA, Jang JS, Choi SR, Cho JH. Comparison of serum procalcitonin with Ranson, APACHE-II, Glasgow and Balthazar CT severity index scores in predicting severity of acute pancreatitis. The Korean Journal of Gastroenterology. 2011 Jul 1;58(1):31-7.
 6. Lempinen M, Puolakkainen P, Kemppainen E. Clinical value of severity markers in acute pancreatitis. Scand J Surg 2005;94:118-123.
 7. Mofidi R, Suttie SA, Patil PV, Ogston S, Parks RW (2009) The value of procalcitonin at predicting the Severity of acute pancreatitis and development of infected pancreatic necrosis: systematic review. Surgery 146(1):72–81
 8. Riché FC, Cholley BP, Laisné MJ, Vicaut E, Panis YH, Lajeunie EJ, Boudiaf M, Valleur PD. Inflammatory cytokines, C reactive protein, and procalcitonin as early predictors of necrosis infection in acute necrotizing pancreatitis. Surgery. 2003 Mar 31;133(3):257-62.
 9. Madhu C P, Reddy V.A Comparison of the Ranson Score and Serum Procalcitonin for Predicting the Severity of Acute Pancreatitis.IJSR 2016 Nov; 5 (11)