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ASSESSMENT OF THE RANSON SCORE IN ACUTE PANCREATITIS: ITS VALUE IN AN EMERGENCY SETTING UPON ADMISSION

AKUT PANKREATİTTE RANSON SKORUNUN DEĞERLENDİRİLMESİ: ACİL SERVİSE BAŞVURU ANINDA DEĞERİ

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ABSTRACT

Objective: Ranson criteria, introduced in 1974, was the first clinical prediction rule for acute pancreatitis in which five admission parameters and six (or five) late components collected within 48 hours were used to reach a clinical decision. This 48-hour follow-up requirement was not convenient for use in the emergency department setting. This study was undertaken to assess whether five admission Ranson parameters may have use in differentiating edematous pancreatitis from necrotizing pancreatitis in the emergency department setting.

Material and Method: Patient data for this retrospective cohort study was gathered from 205 patients treated for acute pancreatitis from January 2018 to December 2022 in a tertiary care center. The patient files were extracted from the archives for clinical data gathering. Laboratory admission data and radiology reports were extracted from the automated laboratory reporting system.

Result: The 205 acute pancreatitis patients were mostly female and in their sixth decade. The etiology was mostly biliary pancreatitis (76%). Patient history revealed that 80% was the first attack. The radiologic imaging study review revealed the majority of the patients had edematous pancreatitis (87%). Higher scores in admission Ranson score (aRS) weakly predicted increasingly higher probability (2.6% for aRS 0 to 28.6% for aRS 4-5) for the presence of necrosis without reaching statistical significance (p=0.055). When components of the score were analyzed, age, LDH levels, and glucose had no discriminating value, WBC parameter posi-

ÖZET

Amaç: 1974'te tanımlanan Ranson kriterleri, klinik bir karara varmak için 48 saat içinde toplanan 5 kabul parametresi ve 6 (veya 5) geç bileşenin kullanıldığı akut pankreatit için ilk klinik tahmin kuralıydı. Bu 48 saatlik takip gerekliliği, Acil Servis ortamında kullanım için uygun değildi. Bu çalışma, acil servis ortamında ödematöz pankreatitin nekrotizan pankreatitten ayırt edilmesinde 5 kabul Ranson parametresinin kullanılıp kullanılamayacağını değerlendirmek için yapılmıştır.

Gereç ve Yöntem: Bu retrospektif kohort çalışması için hasta verileri, üçüncü basamak bir bakım merkezinde Ocak 2018 ile Aralık 2022 arasında akut pankreatit nedeniyle tedavi edilen 205 hastadan toplandı. Hasta dosyaları, klinik veri toplamak için arşivlerden çıkarıldı. Laboratuvar kabul verileri ve radyoloji raporları otomatik laboratuvar raporlama sisteminden alınmıştır.

Bulgular: İki yüz beş akut pankreatit hastasının çoğu kadındı ve altıncı dekattaydı. Etiyoloji çoğunlukla biliyer pankreatit (%76) idi. Hasta öyküsü, %80'inin ilk atak olduğunu ortaya koydu. Radyolojik görüntüleme çalışması incelemesi, hastaların çoğunda (%87) ödematöz pankreatit olduğunu ortaya çıkardı. Başvurudaki daha yüksek Ranson skoru (aRS), istatistiksel anlamlılığa ulaşmadan (p=0.055) nekroz varlığı için daha yüksek bir olasılığı (aRS 0 için %2.6 ila aRS 4-5 için %28.6) zayıf şekilde öngördü. Skorun bileşenleri analiz edildiğinde, yaş, LDH düzeyleri ve glukozun ayırt edici bir değeri yoktu, WBC parametresinin pozitifliği nekrotizan pankreatit olasılığını önemli ölçüde artırırken, pozitif AST düzeyi nekrotizan pankreatit riskini önemli ölçüde azalttı.

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tivity significantly increased the odds of necrotizing pancreatitis, whereas positive AST level significantly decreased the risk of necrotizing pancreatitis.

Conclusion: In conclusion, aRS had little utility in predicting pancreatic necrosis.

Keywords: Ranson score, acute pancreatitis, necrotizing pancreatitis, edematous pancreatitis

Sonuç: Sonuç olarak, aRS'nin pankreas nekrozunu tahmin etmede çok az faydası vardı.

Anahtar Kelimeler: Ranson skoru, akut pankreatit, nekrotizan pankreatit, ödematöz pankreatit

INTRODUCTION

Acute pancreatitis is an acute inflammatory disease of the pancreas. It typically manifests as excruciating abdominal discomfort, may influence several organ systems, and can result in organ dysfunction. According to the Atlanta classification, the two major subtypes are interstitial edematous and necrotizing acute pancreatitis (1). Although it has a one to five percent overall mortality rate, pancreatic necrosis can increase that number to 15% (2,3).

Ranson criteria were introduced by Dr. John Ranson in 1974 as a clinical prediction rule for forecasting the severity and the risk of mortality of an acute pancreatitis episode (4). As conceived, the criteria had two separate components: the early component or data collected on admission which may basically predict the risk of pancreatic necrosis, and the late component collected 48 hours later which deals with other complications that may arise from severe acute pancreatitis such as third space sequestration of volume, hemoconcentration, and pre-renal acute kidney injury, acidosis, hypocalcemia, and hypoxemia due to respiratory distress.

As the score can only give meaningful prognostic information after all the 11 components are collected, 48 hours must elapse before any prognostic information can be gleaned. As this state of affairs was deemed unacceptable, different scoring systems have been proposed with varying success among which Acute Physiology and Chronic Health Evaluation II (APACHE II) (5) and Bedside Index of Severity In Acute Pancreatitis (BISAP) (6) whose scores can be calculated at any time point were the most useful. But these scoring systems are cumbersome to use in an emergency department setting and are a statement about the critical state of the patient not whether the patient had necrotizing or edematous pancreatitis (7, 8). Therefore, the question was asked whether five easily obtained early Ranson score components can be used to predict the presence of pancreatic necrosis hence giving an idea of the disease severity.

This study was undertaken to assess whether the admission Ranson score may have use in differentiating edematous pancreatitis from necrotizing pancreatitis in the emergency department setting.

MATERIAL and METHODS

Study population

Patient data for this retrospective cohort study was gathered from 205 patients treated for acute pancreatitis from January 2018 to December 2022 in a tertiary care center; Istanbul University, Istanbul Faculty of Medicine, Emergency Internal Medicine Division. Patients who meet two of the following three criteria were included in the study: Acute onset of back-radiating epigastric pain, a threefold or higher increase in serum lipase or amylase above the upper limit of normal, and detection of pancreatitis on imaging. Patients with suspected diagnoses and missing data were excluded from the study. Ranson scoring was done separately according to biliary and non-biliary pancreatitis classification. Age: + if >70 years for biliary, >55 years for other causes of pancreatitis, WBC: White blood cells + if >18000 cells/mm^3 for biliary, >16000 cells/mm^3 for other causes of pancreatitis, LDH: + if >250 IU/l for biliary, >350 IU/l for other causes of pancreatitis, AST: + if >250 IU/l for biliary, >250 IU/l for other causes of pancreatitis, Glucose: + if >220 mg/dl for biliary, >200 mg/dl for other causes of pancreatitis (Table5).

Study protocol

The patient files were extracted from the archives for clinical data. Laboratory admission data was extracted from an automated laboratory reporting system and imaging data were reviewed from digital images stored in the same system. The study was conducted in accordance with the Declaration of Helsinki. The study was found ethically appropriate by the Ethics Committee of Istanbul University, Istanbul Medical Faculty (Date: 17.02.2023, No: 04).

Statistical analysis

Patient data were analyzed using SPSS for Windows version 28.0 (IBM Corp., Armonk, NY, U.S.A.). Numerical data were given as mean±standard deviation and categorical data as frequency and percent. Two group comparisons of numerical data with normal distribution were carried out using independent samples Student's t-test. If the numerical data had non-normal distribution, the Mann-Whitney U test was used. Categorical data comparison was carried out using the χ^2 test. If expected frequencies in cells were lower than five, groups were joined where appropriate un-

Table 1: Demographic data of the acute pancreatitis patients (n=205)

Variable	Value
Age (years)	56±17 (18–99)
Gender (n/%)	
Male	93 (45%)
Female	112 (55%)
Etiology (n/%)	
Biliary	155 (76%)
Alcohol	20 (10%)
Post ERCP	13 (6%)
Hypertriglyceridemia	9 (4%)
Autoimmune	4 (2%)
Other	4 (2%)
Admission Ranson Score* (n/%)	
0	38 (18%)
1	79 (39%)
2	57 (28%)
3	21 (12%)
≥4	6 (3%)
Type (n/%)	
Edematous	179 (87%)
Necrotizing	26 (13%)
Chronicity (n/%)	
Acute	164 (80%)
Acute on chronic (recurrent)	41 (20%)

ERCP, Endoscopic retrograde cholangiopancreatography: Other, Malignancy (2), Medication (1), Genetic (1): * These are admission data of Ranson score, age, glucose level, AST level, LDH level, and WBC count.

Table 2: Admission hematologic and biochemical parameters of acute pancreatitis patients (n=205)

	Mean±SD[€] (minimum-maximum)
Hematologic variables	
Hemoglobin (g/dl)	12.8±2.0 (7.5-17.9)
Hematocrit (%)	38±6 (24 -54)
MCV (fl)	85±7 (59-100)
RDW	15±2 (12-24)
WBC (10^3/ml)	11.3±5.3 (3.8-35)
Neutrophil count (10^3/ml)	9.0±5.2 (2-33)
Lymphocyte count (10^3/ml)	1.5±1.0 (0.3-11.5)
Platelet count (10^3/ml)	262±132 (10.5-1646)
Biochemical variables	
Glucose (mg/dl)	141±64 (64-651)
Creatinin (mg/dl)	1.0±0.7 (0.2-6.5)
Amylase (IU/l)	1305±1533 (23-7782)
Lipase (IU/l)	2784±3727 (13-21324)
AST (IU/l)	169±203 (9-1048)
LDH (IU/l)	356±172 (119-1415)
Total bilirubin (mg/dl)	2.1±2.5 (0.1-17.9)
Calcium (mg/dl) (n=165)	9.3±0.7 (6.4-12.3)
Albumin (g/dl)	4.0±0.6 (2.2-5.1)
Triglyceride (mg/dl) (n=93)	384±773 (45-4028)
CRP mg/l	57±97 (1-600)
INR	1.0±0.3 (0.8-4.1)
Urine amylase (IU/l) (n=95)	10556±23615 (31-151460)
Blood gases variables (n=150)	
pH	7.39±0.05 (7.23-7.60)
Lactate (mmol/l)	1.9±1.0 (0.5-8.8)

[€]: Standard deviation, MCV: Mean corpuscular volume, RDW: Red cell distribution width, WBC: White blood cell

til expected cell counts exceeded five. For 2*2 contingency tables, Yates correction was done. If assumptions were violated for 2*2 tables, Fisher's exact test was used.

RESULTS

The demographic data of the 205 acute pancreatitis patients are given in Table 1. Patients were mostly in their sixth decade with female preponderance. The etiology was overwhelmingly biliary (76%), and alcohol, post-ERCP, and hypertriglyceridemia were the cause in another 20%. Patient history revealed that 80% was the first attack, the rest having recurrent acute pancreatitis or chronic pancreatic disease. The radiologic imaging study review revealed the majority of the patients had edematous pancreatitis (87%) and only 13% of the cohort had necrosis. When the admission Ranson score was calculated from the five parameters: age, glucose, AST, LDH, and WBC count, approximately two-thirds of the patients had a score of 1 or 2, and 18% had a score of 0. Females had slightly higher scores compared to males (1.5±1.1 vs 1.3±0.9) without reaching statistical significance (p=0.111). Necrotizing pancreatitis was more frequent in males (16%) compared to females (10%) without reaching statistical significance (p=0.167).

Admission biochemical parameters are given in Table 2. Serum amylase and lipase and urine amylase levels are high as expected. Most of the biochemical parameters gathered, i.e., glucose, AST, LDH, bilirubin, and CRP levels, were all high with non-normal distribution.

Biochemical parameters were compared in edematous versus necrotizing pancreatitis and the results are shown in Table 3. There was no statistically significant difference for hematologic parameters except a difference in red cell distribution width (RDW) (p=0.036) which was not deemed clinically significant. Amylase and lipase levels were significantly lower in necrotic pancreatitis. Likewise, AST and total bilirubin levels were lower in necrotic pancreatitis (p=0.002, p=0.02 respectively). However, serum albumin levels were significantly lower (p=0.003) and CRP levels were significantly higher in the necrotic pancreatitis group (p<0.001).

Admission Ranson scores were compared in edematous and necrotizing pancreatitis groups (Table 4). Higher

Table 3: The comparison of biochemical parameters in edematous versus necrotizing pancreatitis

Variables	Type of pancreatitis		P value
	Edematous (n=178)	Necrotizing(n=26)	
Age (Years)	56±18	54±14	0.544
Hemoglobin (g/dl)	12.9±1.9	12.5±2.2	0.345
Hematocrit (%)	38±6	37±6	0.246
MCV (fl)	85±7	83±8	0.211
RDW	15±2	15±2	**0.036**
Platelet count (10^3/ml)	252±78	332±303	0.453
WBC count (10^3/ml)	10.8±4.5	14.5±8.3	0.053
Neutrophil count (10^3/ml)	8.6±4.3	12.3±8.4	0.052
Lymphocyte count (10^3/ml)	1.5±1.1	1.4±0.7	0.969
Glucose (mg/dl)	137±52	168±115	0.137
Amylase (IU/l)	1400±1564	653±1167	**0.002***
Lipase (IU/l)	3000±3806	1385±2866	**0.001***
Creatinine (mg/dl)	0.9±0.6	1.0±0.7	0.924
AST (IU/l)	185±211	69±76	**0.002***
LDH (IU/l)	356±177	365±142	0.809
Total bilirubin (mg/dl)	2.2±2.5	1.2±2.1	**0.02***
Albumin (g/dl)	4.1±0.6	3.6±0.7	**0.003***
Calcium (mg/dl)	9.3±0.7	9.0±0.8	0.059
CRP (mg/l)	45±79	138±159	<**0.001***
Triglycerides (mg/dl)	375±805	433±664	0.780
pH	7.39±0.05	7.40±0.06	0.339
Lactate (mmol/l)	1.9±1.1	2.2±1.1	0.099
INR	1.0±0.3	1.0±0.1	0.983

MCV: Mean corpuscular volume, RDW: Red cell distribution width, WBC: White blood cell, *: Mann-Whitney U test 2-sided significance

Table 4: Admission Ranson score in edematous versus necrotizing pancreatitis (n=205)

Ranson Score*	Type of pancreatitis		Total
	Edematous (n=178)	Necrotizing (n=26)	
0	37	1	38
1	68	11	79
2	50	7	57
3	19	5	24
≥4	5	2	7

*: Fisher's Exact test two-sided p= 0.055 (Ranson score 0 versus 1 or higher)

scores in admission Ranson score weakly predicted an increasingly higher probability for the presence of necrosis without reaching statistical significance. Admission Ranson scores of 0, 1, 2, 3, and 4 and above are associated with 2.6%, 14.1%, 12.3%, 20.8%, and 28.6% possibility of necrotic pancreatitis respectively with the pre-test probability being 13% in necrotizing pancreatitis.

Components of the admission Ranson score were compared for edematous and necrotizing pancreatitis cases for their discrimination value (Table 5). Age, LDH levels, and glucose had no discriminating value. White blood cell count Ranson parameter positivity increased 5-fold the odds of necrotizing pancreatitis, whereas a positive AST level Ranson parameter significantly decreased the risk of necrotizing pancreatitis.

DISCUSSION

Foreknowledge about the course of a disease in a patient has preoccupied the medical profession from the times of Hippocrates (9). For acute pancreatitis, Ranson

Table 5: Significance of the elements of admission Ranson score for differentiating edematous from necrotic pancreatitis

Admission Ranson score parameters	Type of pancreatitis		Odds Ratio (95% CI)	P value
	Edematous	Necrotic		
Age (years)			1.99 (0.85-4.62)	0.107
-	130	15		
+	48	11		
WBC (10^3/ml)			5.36 (2.06-13.96)	**0.001**
-	162	17		
+	16	9		
LDH (IU/l)			0.77 (0.33-1.82)	0.550
-	59	10		
+	115	15		
AST (IU/l)			0.12 (0.02-0.89)	**0.014**
-	129	21		
+	46	1		
Glucose (mg/dl)			2.79 (0.91-8.53)	0.074
-	164	21		
+	14	5		

WBC: White blood cell, LDH: Lactate dehydrogenase AST: Aspartate aminotransferase. The classification is explained in the material and method

criteria were the first to be proposed (4). It was geared towards acute pancreatitis patients admitted to a surgical ward, and during the follow-up of 48 hours, the surgeon used this clinical decision rule to assess whether operative treatment was required (10). As this leisurely state of affairs does not address the concerns of an emergency department, at least 17 other clinical decision rules have been validated (11). However, the Holy Grail of emergency decision rules, one that is simple and easy to implement and straightforward to interpret is still to be validated (12).

Ranson criteria have several issues which make it less than ideal for evaluation in the Emergency department. First, it seems that an APACHE II score >7 or BISAP score >2 has higher sensitivity and specificity in predicting severe acute pancreatitis (13, 14). Second, the leisurely 48-hour observation period needed in Ranson criteria, a time that Emergency Departments do not have, makes the criteria ineffectual. However, this is not an issue for either APACHE II or BISAP scores which may be implemented repeatedly at any time after admission. The APACHE II score was developed for patients in Intensive Care Unit and may be difficult to use in an Emergency Department, but the BISAP score is a bedside scoring system and should be easier to implement, though the SIRS component requires four additional parameters (8). Third, Ranson Criteria validity for patients aged less than 30 years, or in patients living in higher altitudes is less than certain (15, 16). Fourth, the fact that there are 11 components in the Ranson criteria may make the assessment process cumbersome for clinicians.

It was tempting to use the admission Ranson criteria to predict pancreatic necrosis. The elements of the score were hypothesized to be directed towards showing pancreatic inflammation (WBC), specific (glucose), and nonspecific (AST, LDH) pancreatic cellular injury and were easy to gather. However, only increased WBC count was significantly related to pancreatic necrosis. Surprisingly, AST level increase was associated with edematous pancreatitis, not necrosis. A recent reassessment of the Ranson score in 938 acute pancreatitis patients, excluding AST from calculations, caused a better fit to the data in predicting severe pancreatitis, which puts the utility of AST in the prediction scheme in doubt (17).

In conclusion, there is no easy method for predicting the severity of acute pancreatitis or detecting pancreatic necrosis at the bedside, and admission Ranson criteria were of little utility.

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