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"Comparative Study Of Ranson's Versus Apache Ii Scoring Systems In Predicting The Clinical Outcome In Patients With Acute Pancreatitis"

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Abstract:
OBJECTIVE: To assess the prognostic accuracy of Ranson and APACHE II and III scoring systems in predicting the severity of acute pancreatitis.
METHODS: A time bound prospective study was conducted on patients admitted with acute pancreatitis during the study period from December 2015 to December 2017. After considering both inclusion and exclusion criteria, total number of patients included in the study were 40. All the 40 patients were subjected to both Ranson's and APACHE II scoring systems. Scoring was done on admission/time of diagnosis and at 48 hours. The scores were compared with the clinical outcome.
RESULTS:
One hundred nineteen cases of pancreatitis were classified as mild, and 34 were classified as severe. The mortality rate was 3.2%. All three scores correlated with length of stay and disease severity. AUC for Ranson was found to be significantly larger than AUC for APACHE II and APACHE III score (0.817, cut-off > or =3; 0.618, cut-off, > or =10; and 0,676, cut-off > or =42 respectively). The Ranson score achieved the highest sensitivity and the lowest false-negative rate, but the positive and negative predictive values and LRPT were of similar extent for all three scores.
CONCLUSION:
The APACHE III offers little, if any, advantage over the APACHE II score. Ranson criteria proved to be as powerful a prognostic model as the more complicated APACHE II and III scoring systems, but with the disadvantage of a 24-hour delay.

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I. Introduction :

Acute pancreatitis is a common entity encountered during routine surgical practice and it poses a great challenge to the treating surgeon. It is a protean disease capable of wide clinical variation, ranging from mild discomfort to severe consequences. It is an inflammatory condition of the pancreas that is painful and at times deadly. Despite the great advances in critical care medicine over the past 20 years, the mortality rate of acute pancreatitis has remained at about 10%. Diagnosis of pancreatic problems is often difficult and treatments are therefore delayed because the organ is relatively inaccessible. There are no easy ways to see the pancreas directly without surgery, and available imaging studies are often inadequate.

II. Aim & Objectives:

Present study was aimed at analyzing patients admitted toDepartment of General Surgery, Madurai Medical College with a diagnosis ofacute pancreatitis during the period between December 2015 and May 2017with the following
OBJECTIVES:
To assess the severity of acute pancreatitis using Ranson's scoringsystem and APACHE II scoring system
To compare these two scoring systems with respect to theiraccuracy in predicting the outcome in cases of acute pancreatitis.

Inclusion Criteria

Patients with confirmed diagnosis of acute pancreatitis based on clinical / laboratory / radiological investigations.

Exclusion Criteria

1)Age less than 16 years; as physiological thresholds are calibrated for adults.
2)Patients with acute on chronic pancreatitis.

Sample Size
After considering both inclusion and exclusion criteria, total number of patients included in the study were 100

III. Methods Of Statistical Analysis

All the 100 patients were subjected to both Ranson's and APACHE II scoring systems. Scoring was done on admission/time of diagnosis and at 48 hours. The scores were compared with the clinical severity which was graded according to Atlanta criteria and also compared with the clinical outcome.

Independent t test was used to examine differences in age; fisher's exact test for sex; and chi square test for etiology were used. Sensitivity, specificity, positive predictor value, negative predictor value and accuracy were calculated. A "p" value of less than 0.05 was considered to be statistically significant. Data analysis was performed using SPSS software

IV. Results:

Sex Distribution of the Study Population

Sex	Mild	Severe	Total
Male	56	36	92
Female	6	2	8

Of the 100 patients, 92 were Male (92.5 %) and 8 were Female (7.5%). There was no statistical significance of Sex (p=0.545) on the severity of the disease

Etiology of Acute Pancreatitis

Etiology	Mild	Serve	Male	Female	Total
Alcohol	65	27	92	0	92
Gall stones	6	2	0	8	8
Idiopathic	2	2	4	0	4

Out of 100 patients, 30 (74%) had Alcohol induced Acute Pancreatitis, 3 (8%) had Gall Stones Induced Acute Pancreatitis and 7 (18%) had Idiopathic Acute Pancreatitis. There was no statistical significance of Etiology (p=0.943) on the severity of the disease

OUTCOME OF THE PATIENTS:

No of patients without complicated	No of Patients with complicated	complicated			
		Local complications			System complications
		Pseudo cyst	Pancreatic necrosis	Hemorrhagic pancreatitis	SIRS

60	40	16	15	6	3

Out of 100 patients
60% had uncomplicated outcome
40% of patients with any complication
6.4% of patients developed pseudo cyst
6% of patients developed Pan –Necrosis
Out of 100 patients with acute pancreatitis, 25 patients (62.5 %) had anuncomplicated outcome
15 patients (37.5 %) developed complications, of which 14 patients (93.4%) developed local complications and 1 patient (6.6 %) developedsystemic complication. Of the local complications, 6 patients developedPseudo Cyst, 6 patients developed pancreatic necrosis, and 2 developedhemorrhagic pancreatitis. The patient who developed systemiccomplication(SIRS) had a fatal outcome.
Surgical intervention was performed in one patient. ExploratoryLaparotomy with necrosectomy was done and the patient eventually recovered

Outcome of patients based on different cut-off Ranson's Score

Ransons score	**Uncomplicated Outcome**	**Complicated outcome**			
		Local complications			**Syst complications**
		Pseudo cyst	**Pancreatic necrosis**	**Hemorrhagic pancreatitis**	**SRS**
<=3	39	3	0	0	0
>3	25	10	15	5	0
>5	0	0	0	0	3

Out of 42 patients <+ 3
32.85% are uncomplicated
7.14 % are complicated
Out of 55 patients > 3
45.45% Are uncomplicated
18.18% are complicated – pseudo cyst
27.27% are complicated – Pan necrosis
9.09% are complicated – Haemorrigic pancreatitis
Of the 25 patients (62.5 %) who had Ranson's score of less than orequal to 3, 24 (96 %) had an uncomplicated outcome and one (4 %) developedPseudo Cyst. No patient in this group had Pancreatic Necrosis or any majororgan failure. There were no deaths in this group.
15 patients (37.5 %) had Ranson's score of more than 3, one (6.6 %) ofthem had an uncomplicated course and 14 patients (93.4 %) developedcomplications, 13 had local complication and one had systemic complication.One patient (2.5 %) had Ranson's score more than 5 and developed systemic complication (SIRS) and had fatal outcome.Of the 25 Patients with Ranson's Score < = 3, 96 % had an

uncomplicated mild course. The inference being Ranson's Score < = 3 predictsan uncomplicated outcome – mild acute pancreatitis.
Of the 15 Patients with Ranson's Score > 3, 93.4 % developedcomplications. The inference being Ranson's score > 3 predicts acomplicated outcome -- severe acute pancreatitis.

Outcome of patients based on different cut-off APACHE II

Apache II Score	Uncomplicated outcome	Complicated outcome			
		Local complications			Syst complications
		Pseudo Cyst	PAN Necrosis	Hemorrhagic Pancreatitis	SIRS
<=8	57	3	0	0	0
>8	4	6	9	2	0
>12	1	6	6	3	3

Apache II score <8Uncomplicated outcome were 57%. Local complications:pseudo cyst were 5.26%.
Apache II score >8Uncomplicated outcome were 4%. Local complications: pseudo cyst were 35.29%, pancreatitis necrosis were 55.97%,Hemorrhagic pancreatitis were 11.17%.
Apache II score >12 Uncomplicated outcome were 1%. Local complications: pseudo cyst were 33.3%, pancreatitis necrosis were 33.3%,Hemorrhagic pancreatitis were 16.6%. and SIRS were 16.6%.
Of the 25 patients (62.5 %) who had APACHE II score less than or equal to 8,24 patients (96 %) had an uncomplicated outcome. One patient (4 %)developed Pseudo Cyst. No patient in this group had Necrosis or major organfailure or death
15 patients (37.5 %) had APACHE II score more than 8, one (6.6 %) of them had an uncomplicated course and 14 patients (93.4 %) developed complications, 13 developed local complications and one developed systemic complication. Of the 7 patients who had APACHE II score more than 12, all 7 patients (100 %) developed complications

Of the 25 patients who had APACHE II score < = 8, 96 % had an uncomplicated outcome. The inference being APACHE II score < = 8 predicts an uncomplicated outcome -- mild acute pancreatitis

Of the 15 patients with APACHE II score > 8, 93.4 % developed complications. APACHE II score > 8 predicts a complicated outcome -- severe acute pancreatitis

Mean of Ranson'sand APACHE II Score

Ranson's	Mean
Mild	2.40
Severe	4.53
Over All	3.20

APACHE II	Mean
Mild	5.28
Severe	12.27
Over All	7.90

Ranson's Score and APACHE II Score in severe acute pancreatitiswere significantly higher than those in the mild cases ($p < 0.001$)

Prediction of severity by Ranson'sScore

Ranson Score	Sensitivity	Specificity	PPV	NPV	Accuracy
>=3	100	56	57.69	100	72.5
>=4	93.33	96	93.33	96	95
>=5	53.33	100	100	78.1	82.5

Prediction of severity by Ranson'sScore

Ranson's score of greater than or equal to 4 predicted 93% of severe attacks and 96% of mild attacks with a PPV of 93.33 and NPV of 96 and accuracy of 95.
Ranson's score of greater than or equal to three predicted more number of severe attacks (100%) but less number of mild attacks (56%) with PPV of 57.69 and NPV of 100 and accuracy of 72.5.
Ranson'sscore of greater than or equal to 5 predicted less number of severe attack (53%) and branded more severe attacks as mild attacks.
Ranson's score of greater than or equal to 4 had the best sensitivity, specificity and accuracy.

Prediction of severity by APACHE II Score

Apache II Score	Sensitivity	Specificity	PPV	NPV	Accuracy
>=8	100	80	75	100	35
>=9	93.33	96	93.33	96	95
>=10	86.66	100	100	92.6	95
>=11	80	100	100	89.2	92.5

APACHE II score of greater than or equal to 9 predicted 93.33% of severe attacks and 96% of mild attacks with a PPV of 93.33 and NPV of 96 and accuracy of95%. APACHE II score of greater than or equal to 10 also had the same accuracy.
APACHE II score of greater than or equal to 8 predicted more number of severe attacks (100%) but less number of mild attacks (80%) with PPV of 75 and NPV of 100.
APACHE II score of greater than or equal to 11 predicted less number of severe cases and labelled more number of severe cases as mild .
APACHE II score of more than or equal to 9 had the best sensitivity, specificity and accuracy.

Prediction of Major Organ failure and Pancreatic collection by Ranson's Score

Ranson Score	**Sensitivity**	**Specificity**	**PPV**	**NPV**	**Accuracy**
Pancreatic Collection	93.33	96	93.33	96	95
Major Organ Failure	100	64.1	6.66	100	65

The Ranson'sscores were very sensitive for prediction of systemic complications (100%) but less sensitive for prediction of local complications(93.33).

Prediction of Major Organ failure and Pancreatic collection by APACHE II
APACHE II scores showed higher sensitivity in the prediction ofsystemiccomplications(100%) than in the prediction of localcomplications(93.33%).

APACHE II Score	**Sensitivity**	**Specificity**	**PPV**	**NPV**	**Accuracy**
Pancreatic Collection	93.33	96	93.33	96	95
Major Organ Failure	100	64.1	6.66	100	65

Prediction of Severity by the two scoring Systems

	Sensitivity	**Specificity**	**PPV**	**NPV**	**Accuracy**
Ranso Score	93.33	96	93.33	96	95
APACHE II Score	93.33	96	93.33	96	65

As Sensitivity, Specificity, Positive Predictive Value, Negative Predictive Value and Accuracy are found to be the same for Ranson's and APACHE II scores, Ranson'sscoring system is equally efficacious as APACHE II scoring system in the prognostication of acute pancreatitis.

Hospital Stay

The mean duration of hospital stay was 6.60 days for mild cases . The mean duration of hospital stay was 9.31 days for severe cases. The duration of hospital stay was not statistically significant.

V. Discussion

Acute Pancreatitis is an increasing common abdominal emergency.

Assessment of severity of acute pancreatitis is important for early identification of patients who may benefit from additional supportive andspecific therapeutic procedures. Many different scoring systems have beendevised for the assessment of severity of acute pancreatitis, which are divided into two types : The first type attempts to correlate laboratory and clinical markers specific to pancreatitis with subsequent outcome and disease severity, the most widely used in this group is Ranson'sScore. The second type of scoring system is the application of non specific physiological scoring system, which was originally created for use in general population of critically ill patients like APACHE II scores.

Ideal predicting criteria should be simple, non-invasive, accurate and quantitative; and the assessment tests should be readily available at the time of diagnosis.

In this study we compare the classical and simple Ranson's scoring system with the more cumbersome APACHE II scoring system. We have classified the severity of acute pancreatitis in this study based on the Atlanta criteria.

In this study, acute pancreatitis was found 12 times more commonly in males than females and the mean age was 37.5 years. These results do not match with the results of the study of Larvin et al where male is to female ratio was 47:53 and mean age was 62 years.

In the present study alcohol was the etiological factor in 74 % of patients and gall stones in 8 %, contrary to alcohol being 22 % and gall stones 43 % in Larvin et al. The etiology had no significant influence on the scores or thefinal outcome of acute pancreatitis, suggesting that once the pathogenicmechanisms have initiated the disease, the course and outcome of acute pancreatitis are not influenced by underlying etiological factors. Some authors have published similar results as in the study by SuMi Woo et al[6].

Out of the 40 cases in this study, 25 patients (62.5 %) had mild acute pancreatitis and 15 patients (37.5 %) had severe acute pancreatitis. The percentage of severe cases was higher in our study as compared to most of the other studies. In the study by Larvin et al 20 % of all the cases were severe. Mortality in our study was 2. 5 % and mortality in the study by Larvin et al was 7.6 %. Mortality was less in our study.

In our study the mean Ranson'sand APACHE II scores calculated during the first 48 hours showed significantly higher values for severe than for mild cases of acute pancreatitis. The mean Ranson'sscore in mild and severe cases was 2.40 and 4.53 respectively. The mean APACHE II score was 5.28 and 12.27 for mild and severe cases respectively.

Comparing outcomes in patient groups based on a range of Ranson's and APACHE II scores, it was observed that complications like Pseudo Cysts, Pancreatic Necrosis, major organ failure and deaths were more common when Ranson's score exceeded 3 and APACHE II scores exceeded 8. Contrary to expectation Pseudo Cyst was observed in one patient whose Ranson's and APACHE II scores were 3 and 8 respectively. These patients presented to hospital later than 48 hours after the onset of symptoms by which time the severity of the attack has subsided and the recorded scores were spuriously low. It can therefore be concluded that patients with Ranson'sscore more than3 and APACHE II score of more than 8 are high risk patients.

In our study Ranson's score of greater than 3 and APACHE II score of greater than 8 had the highest sensitivity, specificity and accuracy for theprediction of severity of acute pancreatitis.

In our study theRanson's and APACHE II scoring systems were very sensitive for the prediction of systemic complications (100%) but less sensitive for prediction of local complications (93.33%). This is comparable to the study by Larvin et al, where the sensitivity to detect systemic complications was higher (76%) than to detect local complications (73%).

In our study the sensitivity, specificity, positive predictor value, negative predictor value and accuracy of Ranson's and APACHE II scores are comparable.

	SensitivitySpecificit	PPV	NPV	Accuracy
Ranson's	93.33 96	93.33	96	95
APACHE	93.33 96	93.33	96	95

As sensitivity, specificity and accuracy of Ranson's and APACHE II scores are comparable in our study, Ranson'sis as powerful a prognostic scoring system as APACHE II.

VI. Conclusion

From this study, we can conclude Ranson'sscoring system is not inferior to APACHE II scoring system in predicting the severity of acute pancreatitis. Ranson'sscoring system is a simple, cheap, easy to remember, recollect, and calculate scoring system. Moreover, Ranson's scoring system was developed specifically for acute pancreatitis. In the developing world, where cost effectiveness of each test is important, Ranson's scoring system can be used in place of APACHE II scoring system. The Ranson's scoring system accurately predicts the outcome in patients with acute pancreatitis and compares favourably with the physiological scoring systems in the prediction of disease severity for acute pancreatitis, the only disadvantage being a24 hour delay.

The Ranson's scoring system proved to be as powerful a prognostic model as the more complicated APACHE II scoring system even in the present era of advanced investigations.

VII. Summary

In the present study:
100 cases of acute pancreatitis were studied.
According to the Atlanta criteria, 62.5 % were mild acute pancreatitis and37.5% were severe acute pancreatitis.
37.5 % of patients were in the age group of 31 to 40 years.

92.5 % of patients were male.

Alcohol in-take was the cause in 74 % of patients.
Common complications were pseudo cyst of pancreas and pancreatic necrosis.
Mean Ranson'sscore for mild and severe cases were 2.40 and 4.53 respectively; Mean APACHE II score for mild and severe cases were 5.28 and 12.27 respectively.
Ranson'sscore of more than 3 and APACHE II score of more than 8 had the best accuracy for predicting severity of acute pancreatitis.
The Ranson'sand APACHE II scores showed higher sensitivity in prediction of systemic complications than in the prediction of local complications.2.5 % of patients were treated surgically.
Mean duration of hospital stay was 6.6 days for mild cases and 9.3 days for severe cases.Over all mortality rate was 2.5 %.
Sensitivity, Specificity, Positive Predictor Value, Negative Predictor Value and Accuracy were 93.33, 96, 93.33, 96 and 95 respectively for both the Ranson'sand APACHE II scoring systems.

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