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Assessment of Severity of Acute Pancreatitis Comparison of Haematocrit and Glasgow Criteria with CT Abdomen

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ABSTRACT

Acute Pancreatitis (AP) is a complex clinical condition that poses significant challenges in surgical management. Approximately 20% of patients with AP fail to respond to supportive therapy and develop complications. Accurate early prediction of the severity of AP is crucial for timely intervention and to consider aggressive treatment options. In recent years, various markers have been studied for their ability to stratify the severity of AP, including measures of systemic inflammatory response and direct assessment of pancreatic tissue damage. An ideal marker for AP should appear early, provide reliable and accurate severity staging, and be cost-effective and easy to measure. The study aimed to evaluate the effectiveness of Haematocrit and Glasgow scoring as early markers for determining the severity of acute pancreatitis. It also sought to compare these markers with CT imaging in evaluating the severity of AP. The study was conducted with in-patients at the General Surgery Department of Mahatma Gandhi Medical College and Research Institute, Puducherry, from August 2011 to July 2013. Out of 59 patients initially diagnosed with AP, 9 were excluded after normal findings. The remaining patients were assessed using Haematocrit and Glasgow scores, which were then compared with CT grading to evaluate their effectiveness in assessing AP severity. The study found a higher incidence of AP in males (98%), with the most common age group affected being 31-40 years (32%). Alcoholism was identified as the primary cause in 60% of the patients. The study demonstrated that while serum amylase levels had a significant correlation with CT findings ($p = 0.033$), Haematocrit showed a stronger correlation ($p = 0.007$) compared to the Glasgow score. The study concluded that Haematocrit is a more effective marker than the Glasgow score for assessing the severity of acute pancreatitis. It is an easily accessible, low-cost and reusable test. Despite the value of biochemical markers and scoring systems in evaluating AP, CT scanning remains the definitive tool for diagnosing AP and its complications. Prompt estimation of Serum Amylase and Haematocrit, along with Contrast Enhanced CT, can significantly aid in diagnosing and determining the severity of acute pancreatitis.

INTRODUCTION

Acute pancreatitis, characterized by inflammation of the pancreas and surrounding tissues or distant organ systems, typically presents as a mild, self-limiting condition. However, approximately 25% of cases evolve into a severe form with a high mortality rate (30%), significantly exceeding the general mortality rate (2-16%). The severity is often linked to complications like organ failure and sepsis, frequently accompanied by necrotizing pancreatitis, which occurs in 20-30% of these cases. Efforts to identify prognostic factors for high-risk patients have been ongoing, aiming to enhance monitoring and provide more intensive medical care, including early admission to intensive care units[1].

The effectiveness of various clinical and laboratory tests in predicting the severity of acute pancreatitis has been extensively studied. Biochemical markers such as C-reactive protein, interleukin-6, polymorphonuclear elastase and trypsinogen activation peptide are commonly utilized to gauge the severity of acute pancreatitis. Haematocrit is another marker routinely checked at admission for every acute pancreatitis case due to its accessibility and low cost. Despite some studies suggesting haematocrit as a reliable severity marker for acute pancreatitis, its correlation with organ failure, pancreatic necrosis, or mortality remains inconsistent. Over the last fifty years, numerous classifications have been developed, with various criteria like Glasgow, Ranson's criteria and APACHE II being widely used[2].

Among pancreatitis-specific scoring systems, the modified Glasgow score has shown superior performance. The modified Glasgow (Imrie) score, a straightforward prognostic system, relies on data from the initial 48 hours post-hospitalization. For imaging, contrast-enhanced CT scans are the preferred method to assess inflammation severity, detect pancreatic necrosis and identify local complications. CT scans have demonstrated an early detection rate of around 90% and nearly 100% sensitivity, with the CT severity index closely correlating with the development and complications of acute pancreatitis[3]. The objective of this study is, to evaluate the prediction of severity in acute pancreatitis employing Haematocrit, the Modified Glasgow Scoring System comparing with CT scoring system.

Aims and Objectives: To evaluate Haematocrit and Glasgow scoring as early markers in severity of acute pancreatitis. To compare Haematocrit and Glasgow scoring with CT in evaluation of severity of acute pancreatitis

MATERIALS AND METHODS

The study was carried out after obtaining the clearance from Institutional Human Ethical Committee (IHEC). The Study was conducted in the In-Patients of General Surgery Department in Mahatma Gandhi Medical College and Research Institute, Puducherry from August 2011 to July 2013. Patients admitted with clinical diagnosis of Acute Pancreatitis were included and those who had Chronic Kidney Disease were excluded from the study. Fifty nine patients were included in the study, with the clinical diagnosis of Acute Pancreatitis. These 59 patients were evaluated with blood investigations which included Amylase (>270), Haematocrit, total leucocyte count, serum calcium, serum albumin, blood glucose, blood urea, Lactate DeHydrogenase, PaO2. Then CECT Abdomen was done within 3 days of admission for confirmation of acute pancreatitis and the severity of pancreatitis was graded using CT findings based on Modified Balthazar Scoring. Of the 59 patients, Pancreas was found to be normal in CECT abdomen in the 9 patients who had Amylase <270. Those 9 patients were excluded from the study.

Glasgow Scoring System:

- Age of the patient: >55 yrs
- White cell count: >15 x 109/L (>15000 cells/mm3)
- PaO2: <60 mm Hg
- Serum Calcium: <2.0 mmol/L (<8 mg/dl)
- Serum Albumin: <3.2 gL
- Blood Glucose: >10 mmol/L (>180 mg/dl)
- Blood Urea: >16 mmol/L (>45 mg/dl)
- Serum LDH: >600 IU/L

If the total score is 3 or more, it is considered as acute severe pancreatitis. Finally Haematocrit value and Glasgow score were compared with CT grading and role of Haematocrit and Glasgow score in assessing the severity of acute pancreatitis was estimated using Sensitivity, Specificity, Positive Predictive Value and Negative Predictive Value. Outcome of the disease was also assessed using the Length of stay in ICU, Duration of Hospital stay, surgical procedure and Mortality.

RESULTS AND DISCUSSIONS

Of the 50 patients studied the youngest patient was 13 years old and the oldest patient was 67 years old. ranges The mean age was 32years. In our study, 30 patients (60%) had AP due to alcoholism, 4 patients (8%) had both alcoholism and biliary obstruction and 16 patients had other causes. Aetiology did not correlate with severity of AP. Correlation of Haematocrit values with CT was done. 18(56.3%) patients with a haematocrit of less than 42 fell between 0 to < 4 in the CT index score, 14(43.8%) with haematocrit less than 42 fell 4 in the CT index score and 3(17.6%) with haematocrit more than 42 fell between 0 to <4 in the CT index score, 14(82.3%) with haematocrit more than 42 fell 4 in the CT index score.

Modified Balthazar Scoring Prognostic Indicator Points	
Pancreatic Inflammation	
Normal pancreas	0
Intrinsic pancreatic abnormality with or without inflammatory changes in peripancreatic fat	2
Pancreatic or peripancreatic fluid collection or peripancreatic fat necrosis pancreatic necrosis	4
Necrosis	
None	0
<30%	2
>30%	4
Extra pancreatic complications	2

Table 1: Patient Demographics and Causes of Acute Pancreatitis in the Study

Description	Details
Total Number of Patients Studied	50
Age Range of Patients	Youngest: 13 years Oldest: 67 years
Mean Age of Patients	32 years
Cause	
Alcoholism	30 patients (60%)
Alcoholism and Biliary Obstruction	4 patients (8%)
Other Reasons	16 patients
Percentage with AP due to Alcoholism	60% (30 patients)
Percentage with Both Alcoholism and Biliary Obstruction	8% (4 patients)
Patients with Other Causes	16 patients
Correlation Between Aetiology and Severity of AP	None

Table 2: Comparative Analysis of Haematocrit and Glasgow Scores with CT in Acute Pancreatitis

Parameter	Haematocrit vsCT	Glasgow Score vs CT
True Positive Cases	14	4
False Positive Cases	3	24
False Negative Cases	14	2
True Negative Cases	19	20
Sensitivity	50%	66.87%
Specificity	86.38%	45.45%
Positive Predictive Value (PPV)	82.35%	14.29%
Negative Predictive Value (NPV)	57.58%	90.91%
Accuracy	66%	48%
Kappa Coefficient	0.345	0.047
P-Value	0.007	0.683
Correlation with CT Index	-	Not statistically significant
CT Index Correlation (0 to <4, Glasgow <3)	-	20 (45.5%)
CT Index Correlation (4, Glasgow <3)	-	24 (54.5%)
CT Index Correlation (0 to <4, Glasgow ≥3)	-	2 (33.3%)
CT Index Correlation (4, Glasgow ≥3)	-	4 (66.7%)

The p value for 49 male was 0.009 and was significant. 1 female patient had her hematocrit less than 42 and fell between 0 to <4 in CT index score. Haematocrit values were compared with CT. 14 were true positive,3 were false positive, 14 were false negative, 19 were true negative. Haematocrit had a sensitivity of 50%, specificity of 86.38%, positive predictive value of 82.35, negative predictive value of 57.58, accuracy of 66%, kappa of 0.345. The P value for haematocrit was 0.007. Correlation of Glasgow score with CT was done. 20 (45.5%) with a CT index between 0 to <4 had a Glasgow score of less than 3 and 24 (54.5%) with a CT index 4 had Glasgow score less than 3 and 2 (33.3%) with a CT index 0 to <4 had a Glasgow score more than or equal to 3, 4 (66.7%) with CT index 4 had a Glasgow score more than or equal to 3. CT Index is not statistically correlated with Glasgow index score with p = 0.683.

Glasgow scores were compared with CT. 4 were true positive, 24 false positive, 2 false negative, 20 true negative. Glasgow score had a sensitivity of 66.87%, specificity of 45.45%, positive predictive value of 14.29 negative predictive value of 90.91, accuracy of 48%, kappa of 0.047. The p value for Glasgow score was 0.683. The demographics and causes of acute pancreatitis vary across different studies, with factors like age, gender and etiology showing variations. In the study conducted at Assiut University Hospital, the mean age was approximately 50.96 years, with 60% of patients being male. The predominant etiology was gallstones (56%), followed by idiopathic pancreatitis (26%) Formanchuk *et al*[4]. This contrasts with other studies, like those by Vengadakrishnan and Koushik, which observed a lower mean age and a higher incidence in the age group of 21 to 40 years . Gender distribution in acute pancreatitis also varies, with some studies, like Nageb *et al*[5]. observing almost equal distribution between males and females .

Etiologically, alcoholism and biliary stones are major causes of acute pancreatitis. Baig *et al*. found alcoholism to be the most frequent cause, a finding echoed by Wang *et al*. who noted biliary stones and alcohol abuse as the top causes . Patel *et al*[6]. The prevalence of these etiologies differs globally. For instance, studies from Ireland and America show a balanced distribution between alcohol and gallstone pancreatitis, while in European studies, gallstones

predominate over alcohol in southern Europe, with similar frequencies observed in northern Europe. Acehan *et al*[7]. For (Table 2), These variations highlight the influence of regional, lifestyle and demographic factors on the presentation and causes of acute pancreatitis. The comparative analysis of Haematocrit and Glasgow Scores with CT in acute pancreatitis can be discussed in the context of other studies: Comparison of Scoring Systems in Acute Pancreatitis: A retrospective study evaluated the ability of four scoring systems (Ranson, BISAP, Glasgow and APACHE II) to predict outcomes of acute pancreatitis in elderly patients. The study concluded that BISAP and Glasgow can be used to evaluate all acute pancreatitis patients, with Ranson being more effective for younger patients in assessing severity . Faur *et al*[8].

Evaluation of Scoring Systems' Effectiveness. The study also found that all four scoring systems were similar in predicting pancreatic necrosis and death in both elderly and younger groups. However, BISAP was noted to perform very well in predicting severity, pancreatic necrosis and death in elderly acute pancreatitis patients, while APACHE II was more suitable for younger patients . Chan KS *et al*[9]. Study on the Accuracy of Scoring Systems: Another study, which included 1848 patients treated between January 2003 and August 2020, assessed several scoring systems, including the Ranson score (RS), Glasgow score (GS) and others. The study concluded that RS and GS predicted the severity of acute pancreatitis better than they predicted mortality and organ failure. In contrast, the Pancreatic Activity Scoring System (PASS) was more effective in predicting mortality and organ failure. Kui *et al*[10]. These studies indicate that while scoring systems like the Glasgow score are useful in predicting the severity of acute pancreatitis, their effectiveness can vary based on patient age and specific outcomes like mortality and organ failure. Moreover, the effectiveness of these scoring systems, including Haematocrit, can also depend on the patient population and the specific parameters of the study.

CONCLUSION

Haematocrit (Hct) can be routinely assessed in every Acute Pancreatitis case at admission. In our study, it was found that hemoconcentration was superior to Glasgow and it constitutes a good marker for assessment of severity of Acute Pancreatitis and it is an easily accessible, low-cost test and reusable. Serum amylase still has a valuable role in diagnosis and evaluation of Acute Pancreatitis. In spite of the biochemical markers and scoring system used in evaluation of acute pancreatitis, CT is the gold standard in the diagnosis and assessment of severity in acute pancreatitis including local complications. An urgent estimation of serum Amylase and Haematocrit combined with Contrast Enhanced CT in an acute abdomen will help in establishing not only the diagnosis but also the severity of acute pancreatitis.

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