CT EVALUATION IS MUST FOR PROGNOSIS PREDICTION IN ACUTE PANCREATITIS; RESULTS OF A TWO YEAR PROSPECTIVE STUDY

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ABSTRACT

BACKGROUND

This study emphasizes the importance of computed tomography (CT) imaging in acute pancreatitis to grade clinical severity and predict outcome. The clinical and radiological findings in acute pancreatitis were correlated to predict the severity of the disease and its prognosis.

MATERIALS AND METHODS

Selected patients with clinical diagnosis of acute pancreatitis were evaluated clinically using Ranson's criteria and then by CT scan for Balthazar grading and CT severity index (CTSI).

RESULTS

In our prospective study of 91 patients of acute pancreatitis, the male:female ratio was approximately 2:1 and the aetiological agents were mainly alcoholism (41) seen predominantly in males and cholelithiasis (32) which was more in females. The Ranson's score of acute pancreatitis was calculated based on appropriate laboratory data and divided into two groups - mild in 51 and severe in 40 patients. The findings on CT scan were taken as standard for classifying acute pancreatitis into mild (57) and severe (34) forms based on Balthazar CTSI. 5 patients with severe form had prolonged hospital stay (>20 days). Also 5 patients had expired during the study duration (5.5 %) and they had severe form. The sensitivity and specificity of Ranson's criteria to correctly prognosticate the severity of acute pancreatitis were 86% and 68% respectively on correlation with Balthazar's CTSI. The discrepancy between Ranson's and Balthazar's CTSI in assessing the severity of acute pancreatitis existed in approximately 22% of the cases.

CONCLUSION

The Balthazar's CTSI based classification is superior to Ranson's scoring system in prediction and prognostication of severity of acute pancreatitis as computed tomography study provides direct visualization of anatomical distortion and pathological extension of disease process in acute pancreatitis, with particular emphasis on pancreatic necrosis.

KEYWORDS

Acute pancreatitis, computed tomography, necrosis, severity index, prognosis.

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BACKGROUND

Acute pancreatitis is inflammatory process of the pancreas with involvement of pancreatic parenchyma and regional or remote organ systems. Early assessment of cause and severity of acute pancreatitis is of utmost clinical importance in instituting treatment with close monitoring of the patients, preferably in intensive care units.[1] Diagnosis of acute pancreatitis is made by combination of clinical presentation, laboratory investigations and imaging. Serum amylase, lipase, liver function test, serum electrolytes with blood gas analysis are the commonly performed laboratory investigations which help to grade the severity and prognosis of acute pancreatitis based on several clinical criteria including Ranson's.[2]

Computed tomography is the most important imaging modality for diagnosis and staging acute pancreatitis. Based on CT findings of pancreatic enlargement along with pancreatic necrosis and adjacent collection helps in classify acute pancreatitis into mild and severe form and thereby predict the morbidity and mortality of the disease. Detection of necrosis and quantification of severity of acute pancreatitis is necessary to improve medical care and lower mortality rates.

Aims and Objectives

Correlation between Ranson's and Balthazar CT Severity Index of acute pancreatitis to grade clinical severity and predict outcome.

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MATERIALS AND METHODS

Patients

This was a prospective study conducted at our hospital comprising patients with clinical diagnosis of acute pancreatitis. A total of 91 patients were evaluated over a period of two years. Our patients included both sexes varying from the age group of 12 to 84 years referred from surgical department.

Inclusion Criteria

Each patient with suspicion of acute pancreatitis was clinically examined with detailed history and further evaluated by specific lab investigations and correlated with CT scan for confirmation and grading of acute pancreatitis.

Exclusion Criteria

Cases of recurrent and chronic pancreatitis were excluded from the study.

Laboratory Investigations

Laboratory investigations were send at the time of admission including the investigations required according to Ranson criteria for clinical assessment of severity of acute pancreatitis.

Repeat investigations were done as per the patients' clinical requirement giving due considerations to laboratory parameters needed after 48 hours of hospital admission according to Ranson criteria (Table -1).

Parameters	Values
At Admission	
Age	> 55 Years
Leukocytes count	> 16000 / microL
Serum Glucose	> 200 mg / dL
Serum LDH	> 350 IU / L
SGOT (AST)	> 250 IU / L
During initial 48 hours	
Haematocrit fall	>10 %
Blood Urea Nitrogen rise	> 5 mg / dL
Serum Calcium	< 8 mg / dL
PaO2	< 60 mmHg
Base deficit	> 4 meq / dL
Estimated fluid sequestration	> 600 ml

Table 1. Ranson's Criteria of Severity in Acute Pancreatitis

Acute pancreatitis is mild when there are two are fewer positive prognostic signs and severe form when three or more signs.

All patients were subjected to CT scan examination on 2nd or 3rd day of their hospital stay. CT scan was performed on Lightspeed GE scanner using contiguous sections of 8-10 mm thickness with interslice gap of 10mm, from dome of diaphragms to pelvis. Thin section of 5 mm and decubitus views of pancreatic regions were taken whenever required for optimal visualization of extent of pancreatic inflammation and necrosis. CT findings were used to evaluate the Balthazar's CT grade (Table -2) and CT Severity index (Table 3).

Grade	CT Findings
A	Normal
B	Focal (<20%), diffuse enlargement of the gland, irregular contour, inhomogeneous density
C	Grade B + inflammation in peripancreatic fat
D	Small, mostly occasionally fluid collections or phlegmon
E	Two or more fluid collection, gas within the pancreas or retroperitoneum

Table 2. Balthazar's Grading of Acute Pancreatitis with CT

Grade	Points	Necrosis		Severity Index
		Percentage	Additional points	
A	0	0	0	0
B	1	0	0	1
C	2	<30	2	4
D	3	30-50	4	7
E	4	>50	6	10

Table 3. CT Severity Index (CTSI)

A CT Severity index (CTSI) of less than 5 was considered as mild form of acute pancreatitis and with values of 5 or more were labelled as severe form of acute pancreatitis. Comparison between Ranson's method and Balthazar's CT severity indices was undertaken.

RESULTS

In our prospective study, total of 91 patients were examined during a period of two years. The group comprised of both male and female patients. The study had 61 male and 30 female patients. The male:female ratio was approximately 2:1. The youngest patient was 12 years old and the oldest was 84 years old. Majority of the patients were between the ages of 21 to 40 years. However maximum number of female patients were in age group of 41 to 60 years. In our study the etiological agents for acute pancreatitis were mainly attributed to alcoholism and cholelithiasis. The predominant cause of acute pancreatitis in male patients was alcoholism (66%) while that in female patients was cholelithiasis (53%).

The appropriate laboratory data at the time of admission and within 48 hours of hospital stay were used to calculate the Ranson's score of acute pancreatitis and there by divided into mild (51) and severe (40) groups.

The findings on CT scan were taken as standard for classifying acute pancreatitis into mild (57) and severe (34) forms based on Balthazar CTSI (Table 4). Overall, the mild form of acute pancreatitis predominated. The severe form was found to be commoner in males than females. Balthazar's CT grading showed that Grade C was most common (44.0%) followed by grade D (24%), Grade B

(18%) and Grade E (13%). Grade A being normal pancreas was not included in the study. However, on correlation with CT severity index, severe form of acute pancreatitis was confined to grade D and E.

Balthazar's CT Grade	CTSI		Grand Total
	Mild	Severe	
B	17	0	17
C	37	3	40
D	3	19	22
E	0	12	12
Grand Total	**57**	**34**	**91**

Table 4. Balthazar's CT Grading and CTSI Correlation

All cases which were categorized as mild had short duration of hospital stay. Of the severe cases, 5 (20%) had prolonged stay (20 or more than 20 days) in the hospital. 5 patients had expired during the study duration (5.5%). All these patients had severe form of pancreatitis.

Out of the 57 cases of mild form of acute pancreatitis according to Balthazar CTSI.

- 44 cases (77%) showed similar results of mild form of acute pancreatitis on correlating with Ranson's criteria.
- 13 cases (23%) were graded as severe according to Ranson's criteria but were found to be mild according to Balthazar CTSI. These patients had short duration of hospital stay with no complications.

Out of 34 cases which were labelled as severe based on Balthazar CTSI.

- 27 cases (79%) also had severe form based on Ranson's criteria.
- 7 cases (21%) which were labelled as mild by Ranson's criteria were found to be severe on Ranson's CTSI for acute pancreatitis.

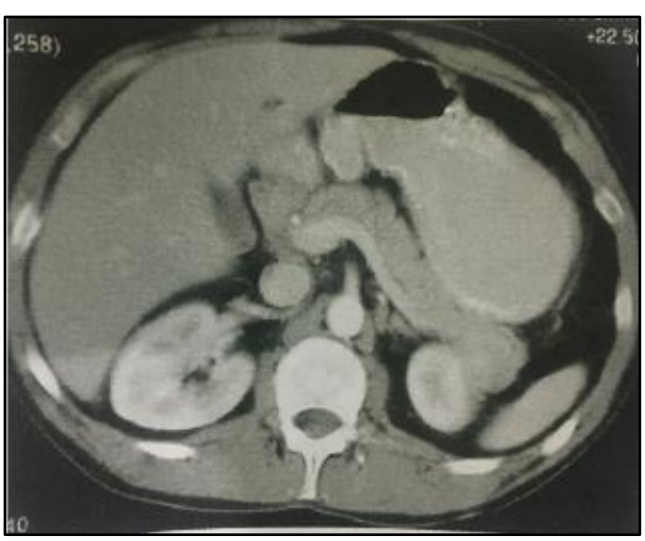

Figure 1. Normal Pancreas (Balthazar Grade-A)

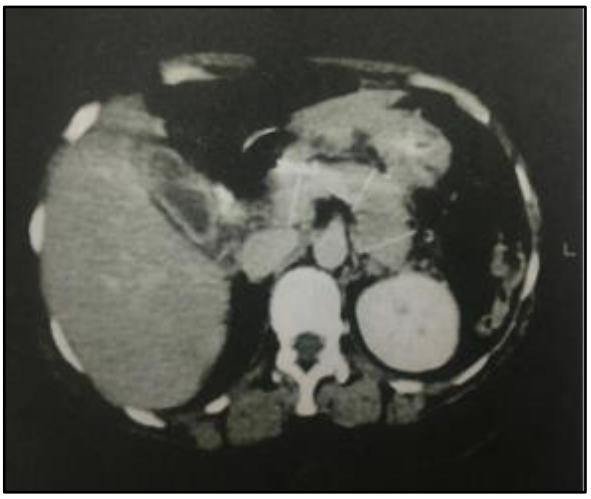

Figure 2. Inflamed Oedematous Enlarged Pancreas with Blurring of Pancreatic Margins Balthazar Grade-B, CTSI – 1/10 (Mild Form); Ranson's Score – 1 (Mild Form)

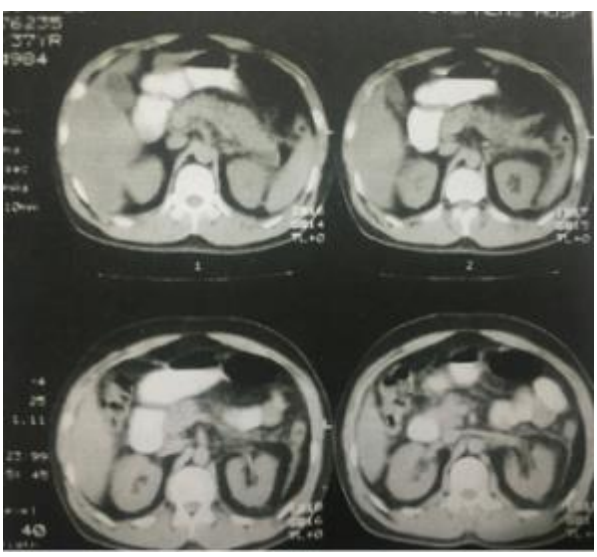

Figure 3. Enlarged Oedematous Pancreas with Peripancreatic Fat Inflammation and Thickened Retroperitoneal (Gerota's) Fascia Balthazar Grade-C, CTSI – 2/10 (Mild Form); Ranson's Score – 1 (Mild Form)

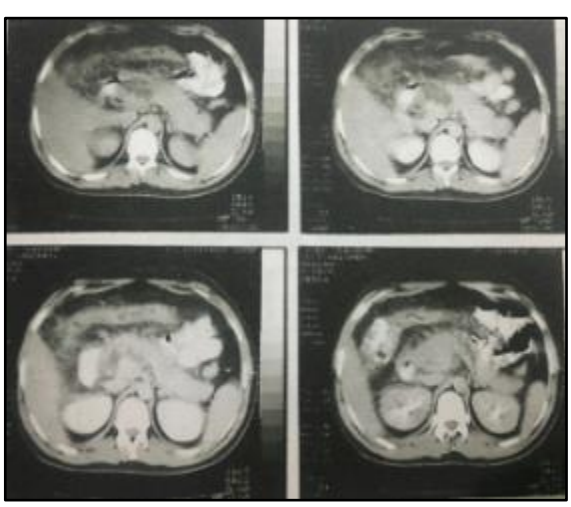

Figure 4. Enlarged Inflamed Pancreas with Hypodense Necrosis in Head Region, Minimal Collection in Subhepatic Region. Peripancreatic Fat and Mesenteric Inflammation. Balthazar Grade-D, CTSI – 5/10 (Severe Form); Ranson's Score – 2 (Mild Form)

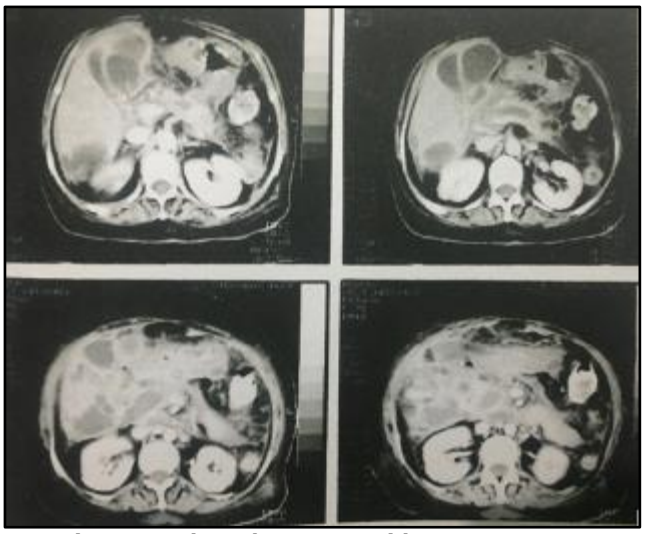

Figure 5. Enlarged Pancreas with Heterogeneous Enhancement and Necrotic Areas in Pancreatic Head and Body Region. Peripancreatic Collection in subhepatic and Lesser Sac Region. Adjacent Bowel Wall Thickening and Fat Inflammation. Balthazar Grade – E; CTSI – 8/10 (Severe Form); Ranson's Score – 5 (Severe Form)

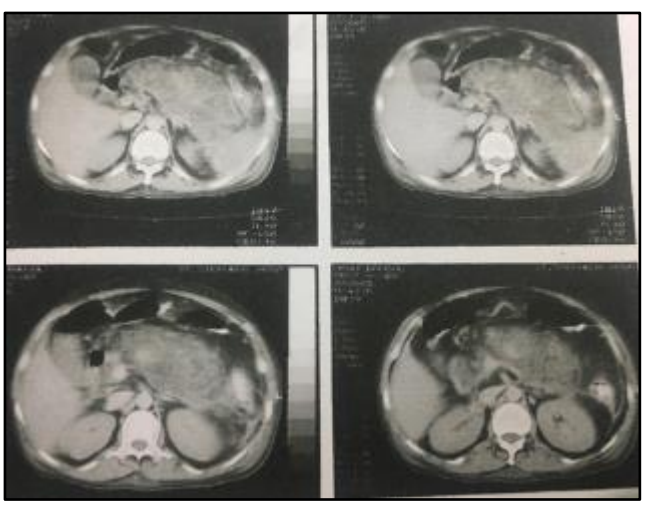

Figure 6. Replacement of Pancreatic Parenchyma with Necrosis and Peripancreatic Collection. Balthazar Grade – E, CTSI – 10/10 (Severe Form); Ranson's Score – 3 (Severe Form)

DISCUSSION

Predicting the severity and prognosis of Acute pancreatitis (AP) still represent a major challenge to clinicians. Early assessment of severity of Acute Pancreatitis is of utmost importance in patients' management. There have been several scoring systems for assessing the severity of acute pancreatitis since the work of Ranson in 1974. In our study we confirm the diagnosis of acute pancreatitis based on the findings of CT scan. Balthazar's CT grading and severity index were calculated. The Ranson's score was compared with the Balthazar's grading and severity index.

Alcohol abuse was the most common etiological agent for acute pancreatitis (45%) in our study and not the biliary tree pathology as compared with the study of Maes B et al, 1999[3] and Frey CF et al, 2006[4] which showed biliary tree pathology as the predominant etiological agent for acute pancreatitis. Although cholelithiasis was the most common aetiological agent for acute pancreatitis in female patients (53%) which show similar trends on comparison with the study of Yadav D et al, 2006[5] on acute pancreatitis. The Computed Tomography was taken as diagnostic modality for confirmation of acute pancreatitis and further classified based on CT severity index into mild and severe forms. As stated by Lankisch et al, 2001[6] a contrast enhanced CT scan in acute pancreatitis correlates significantly with severity of the disease. CT severity index can reliably predict length of hospital stay, morbidity and mortality. (Simhuk EJ et al, 2000).[7]

Among the various CT findings in acute pancreatitis (Table 5), Pancreatic enlargement with thickening of the retroperitoneal fascial planes (predominantly left lateral chonal and Gerota's fascia) was the most commonly observed findings on contrast enhanced CT scan in our study on acute pancreatitis and which fall into Balthazar's Grade C. Pancreatic necrosis was observed in 56 % of the total cases of acute pancreatitis. In our study, pancreatic necrosis was seen in majority of the patients having severe form of acute pancreatitis (67%) and only in 33% cases of the mild form of acute pancreatitis thereby stating that necrosis is a reliable predictor of mortality and morbidity in acute pancreatitis. Similar findings were also observed by Casas JD et al, 2004[8] and Kuo Dc et al, 2015[9] in their study. Extrapancreatic fluid collections were observed in only 13 % of the total cases of acute pancreatitis and were more prominent in severe form of acute pancreatitis.

Balthazar's CTSI of Acute Pancreatitis	Adjacent Fluid Collection		Pancreatic Necrosis		Thickened Fascia		Ascites		Pleural Effusion	
Mild	4	13%	17	33%	41	55%	4	25%	16	49%
Severe	26	87%	34	67%	34	45%	12	75%	17	51%
Total	**30**		**51**		**75**		**16**		**33**	

Table 5. Spectrum of CT findings in Acute Pancreatitis

Prolonged hospital stay (20 or >20 days) was observed exclusively in severe form of acute pancreatitis (CTSI >5). This finding correlates with the studies of Simchuk EJ et al, 2000[7] and Balthazar EJ et al[10,11] on acute pancreatitis.

Ranson's criteria were used to classify the patients in mild and severe forms of acute pancreatitis.[12] In our study, according to Ranson's criteria, we had 51 patients in mild category (56%) and 40 patients in severe category (44%).

Then these results were compared with the Balthazar's CT severity index based classification of acute pancreatitis.[13] There was a mismatch between the Ranson's and Balthazar's CTSI based classification of acute pancreatitis. 21% of cases labeled as mild by Ranson's criteria were categorized as severe based on Balthazar's CT severity index and 23% of cases diagnosed as severe by Ranson's criteria were mild according to the Balthazar's CT severity index.

The sensitivity and specificity of Ranson's criteria to correctly prognosticate the severity of acute pancreatitis were 86% and 68% respectively on correlation with Balthazar's CT severity index. The discrepancy / mismatch between Ranson's and Balthazar's CTSI in assessing the severity of acute pancreatitis existed in approximately 22% of the cases. This discrepancy between Ranson's and Balthazar's CT severity scoring system may be contributed to direct visualization of anatomical distortion and pathological extension of disease process in acute pancreatitis, with particular emphasis on pancreatic necrosis, on CT scan imaging and thereby suggesting the superiority of the Balthazar's severity scoring system. Our study supports the findings of Leung TK et al, 2005[14] and Chatzicostas et al, 2003[15] studies in stating that the Balthazar score is superior and reliable for prognosticating the severity of acute pancreatitis in comparison to Ranson's scoring system. Our study findings are contradictory to Thomas L Bollen et al, 2012[16] who concluded that the predictive accuracy of CT scoring systems for severity of AP is similar to clinical scoring systems and a CT on admission solely for severity assessment in AP is not recommended. However, the positive findings in our study are basically because we performed the CT scan on second or third day of the admission.

CONCLUSION

Based on the data found in our study, alcoholism is the most common cause of the acute pancreatitis followed by cholelithiasis. Findings like pancreatic necrosis, adjacent fluid collections and retroperitoneal fascial thickening have good correlation with severe form of acute pancreatitis based on Balthazar's CT severity index. There is discrepancy between the Ranson's clinical criteria and Balthazar's CT severity index based classification of acute pancreatitis into mild and severe forms and with Balthazar's CTSI being superior to Ranson's scoring system in prediction and prognostication of severity of acute pancreatitis.

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