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Original Research Article

Evaluate of acute pancreatitis using CT severity index and modified CT severity index

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Abstract: ***Background:*** Diseases of pancreas have a very variable presentation and imaging plays an important role in the diagnosis and management of pancreatic diseases. Modalities for imaging pancreas range from plain x-ray to Ultrasonography (USG), endoscopic ultrasound, Endoscopic Retrograde Cholangiopancreaticography (ERCP), Computed Tomography (CT), Magnetic Resonance Imaging (MRI), Magnetic Resonance Cholangiopancreaticography (MRCP). ***Material and Methods:*** This is a prospective study This is a prospective study conducted in the Department of Radiology, Shadan Institute of Medical Sciences, Teaching Hospital & Research Centre, Hyderabad. A total of 70 patients referred from the Department of Medicine and Department of Surgery, presented with the chief complaint of epigastric pain, nausea and vomiting and CECT abdomen were suggestive of acute pancreatitis were included in this study. ***Assessment of Severity:*** Assessment of severity of acute pancreatitis was done in all cases by Balthazar CTSI scoring and Mortele Modified CTSI scoring. ***Results:*** Cholelithiasis was found to be most common aetiological factor for acute pancreatitis in 46% cases followed by alcoholic pancreatitis was seen in 28.5% of cases. Together cholelithiasis and alcoholism accounted for 76% of cases. Least Aetiological factor such as Trauma and drug induced. In our study, pleural effusion was the most common extra-pancreatic complication, 30 patients (47.6%). Left pleural effusion was more common than the right, and in none of the cases, isolated right sided pleural effusion was found. Ascites was the second most common complication seen in 16 patients (25.3%). Among vascular complications, venous thrombosis was the most common (2 in portal vein and 1 in splenic vein). One case of pseudoaneurysm were found, both in splenic artery. More than one complication was present in few cases. ***Conclusion:*** The Modified CT Severity Index is a simpler scoring tool and more accurate than the Balthazar CT Severity Index. In this study, it had a stronger statistical correlation with the clinical outcome, be it the length of hospital stay, development of infection and occurrence of organ failure. It could also predict the need for interventional procedures.
Key words: Balthazar CTSI, Acute pancreatitis and Mortele Modified CTSI scoring.

INTRODUCTION

Diseases of pancreas have a very variable presentation and imaging plays an important role in the diagnosis and management of pancreatic diseases. Modalities for imaging pancreas range from plain x-ray to Ultrasonography (USG), endoscopic ultrasound, Endoscopic Retrograde Cholangiopancreaticography (ERCP), Computed Tomography (CT), Magnetic Resonance Imaging (MRI), Magnetic Resonance Cholangiopancreaticography (MRCP). Computed Tomography (CT) is highly accurate, and sensitive than USG in both diagnosing as well as demonstrating the extent [1]. CT is a key diagnostic tool in understanding the cause of endocrine and exocrine pancreatic insufficiency in most patients. Pancreatitis is one of most complex and clinically challenging of all abdominal disorders [2].

As early treatment of patients with severe acute pancreatitis can reduce morbidity and mortality. Balthazar in 1990, created the CT Severity Index (CTSI) by combining the original grading system with the presence and extent of pancreatic necrosis. The combined score of CTSI proved to have a better prognostic accuracy than the Balthazar score but it, too, had some drawbacks. The score obtained with the index did not significantly correlate with the subsequent development of organ failure, extra pancreatic parenchymal complications or peripancreatic vascular complications [3,4].

In view of these limitations, a modified and CT scoring system was hypothesized in 2004 by Mortele and colleagues so as to determine if the scores obtained with this could be used to predict the clinical outcome more accurately. The modified Mortele CTSI was easier

to calculate and was found to correlate more closely with patient outcome measures like the length of the hospital stay, the need for surgery/intervention, and the occurrences of infection, organ failure and death than the currently accepted Balthazar CT severity index, with similar interobserver variability [5]. The revised Atlanta classification system, introduced in 2012, better defined the clinical diagnosis, Computed Tomographic (CT) manifestations and disease course of acute pancreatitis into two morphologic subtypes [6]: Interstitial oedematous pancreatitis and Necrotizing pancreatitis

MATERIALS AND METHODS

This is a prospective study conducted in the Department of Radiology, Shadan Institute of Medical Sciences, Teaching Hospital & Research Centre, Hyderabad. A total of 70 patients referred from the Department of Medicine and Department of Surgery, presented with the chief complaint of epigastric pain, nausea and vomiting and CECT abdomen were suggestive of acute pancreatitis were included in this study.

Assessment of Severity

Assessment of severity of acute pancreatitis was done in all cases by Balthazar CTSI scoring [3] and Mortele Modified [7] CTSI scoring.

Outcome Parameters

Clinical follow-up of the patients was done in terms of the following parameters:

- Need for surgery or percutaneous intervention.
- Length of hospital stay.
- Existence of organ failure-respiratory, cardiovascular, kidney, liver, haematological system.
- Evidence of infection in any organ system.
- Discharged/death.

The clinical outcome was compared with the currently accepted Balthazar's CTSI and Modified Mortele's CTSI in all the cases.

Method of data collection clinical diagnosis was based on the symptoms like upper abdominal pain, nausea, vomiting, fever and/or elevation of serum amylase three times the upper limit of normal (normal serum amylase 20-110 U/L).

Inclusion Criteria

Clinically suspected case of acute pancreatitis of all ages.

Exclusion Criteria

1. Patients with chronic pancreatitis suggested by intra-ductal calculi, ductal stricture and parenchymal calcification.
2. Any previous pancreatic surgery.
3. Other pancreatic pathology like pancreatic malignancy, cyst.
4. Contraindicated cases for contrast study.
5. Pregnant females.
6. Postoperative cases.

Equipment used in the study – Siemens Somatom Sensation mdct 40 slice and Mederton Inkjeterton CT2 (pressure injector).

Statistical Analysis

Data analysis was done using SPSS version 25th Data transformation by recoding, counting and cross tabulation was performed and obtained information was processed using Pearson chi-square and Fisher's-exact test.

RESULTS

Total 70 cases of acute pancreatitis cases were included in the study. These patients underwent CT abdomen and pelvis, later images were reviewed by radiologist.

Table 1: Age distribution of patients with acute pancreatitis

Age in years	No. of patients	Percent
< 20	7	10.0
21-40	32	45.7
41-60	19	27.1
> 60	12	17.1

In table 1: The maximum patients were in the age group of 21 to 40 years [n=32 (45.7%)], followed by 41 to 60 years group [n= 19 (27.1%)]. The minimum age of patients was 18 years and maximum age was 64 years with a minimum number of patients seen below the age of 20 years.

Table 2: Gender wise distribution of patients with acute pancreatitis

Gender	No. of patients	Percent
Male	49	70
Female	21	30
Total	70	100

In table 2, out of 70 cases, 49 (74.6%) were male and 21 (30%) were females. We found that acute pancreatitis was found three times more common in males than in females.

Table 3: Aetiological Distribution of Acute Pancreatitis

Cause	No. of patients	Percent
Alcohol	21	30.0
Cholelithiasis	34	48.5
Trauma	1	1.42
Drug Induced	1	1.42
Post ERCP	3	4.28
Idiopathic	10	10.0

Cholelithiasis was found to be most common aetiological factor for acute pancreatitis in 46% cases followed by alcoholic pancreatitis was seen in 28.5% of cases. Together cholelithiasis and alcoholism accounted for 76% of cases. Least Aetiological factor such as Trauma and drug induced.

Table 4: Extra-pancreatic Complications

Findings	No. of patients	Percent
Pleural fluid		
• Bilateral pleural effusion	17	26.98
• Left pleural effusion	13	20.63
Extra pancreatic complications		
• Infarction		
• Sub capsular collection	0	0
• Haemorrhage	4	6.3
	0	0
Ascites	16	25.3
Vascular complications		
• Venous thrombosis	3	4.7
• Arterial haemorrhage	0	0
• Pseudo aneurysm formation	1	1.58
Inflammation of GIT		
• Thickening of wall	11	17.4
• Intramural fluid collection	0	0

Extra-Pancreatic Complications

In table 4, in our study, pleural effusion was the most common extra-pancreatic complication, 30 patients (47.6%). Left pleural effusion was more common than the right, and in none of the cases, isolated right sided pleural effusion was found. Ascites was the second most common complication seen in 16 patients (25.3%). Among vascular complications, venous thrombosis was the most common (2 in portal vein and 1 in splenic vein). One case of pseudoaneurysm were found, both in splenic artery. More than one complication was present in few cases.

Table 5: Patient outcome using currently accepted Balthazar CTSI.

Outcome Parameter	Mild (n=29)		Moderate (n=19)		Severe (n=22)	
	No.	%	No.	%	No.	%
Mean duration of hospitalization (in days)	14		22		19	
Intervention/drainage	3	10.3	5	26.3	3	13.6
Surgical debridement	0	0	0	0	1	4.5
Infection	1	3.4	0	0	4	18.1
End organ failure	1	3.4	1	5.2	3	13.6

In table 5, intervention and length of stay was significantly more (p-value = 0.02 and 0.01 respectively) associated with moderate grade. Infection, organ system failure and death were significantly associated with severe grade.

DISCUSSION

The introduction of the CT severity index in 1994 was a significant advance in the assessment of patients with acute pancreatitis [6]. This internationally accepted severity index, which is based on scoring the presence and degree of pancreatic inflammation and

pancreatic necrosis, not only allows accurate differentiation of mild from severe pancreatitis but also numerically correlates with the patient's prognosis. However, despite the fact that the CT severity index has been successfully used to predict overall morbidity and mortality in patients with acute pancreatitis, recent literature has revealed the limitations of this currently accepted CT severity index [7]. First, the presence of organ failure [8], extrapancreatic parenchymal complications [9], and peripancreatic vascular complications [10] does not significantly correlate with the score obtained with this index. Second, as reported in two independent studies [11], the interobserver agreement for scoring CT scans using the current CT severity index is only moderate, with a reported percentage of agreement approximating 75%. Finally, as acknowledged by Balthazar et al. [12] and confirmed by others [13], no significant difference in morbidity and mortality is seen, when using the CT severity index, between patients who have 30-50% necrosis and patients who have more than 50% necrosis. Therefore, it is questionable whether these specific categorizations of the degree of pancreatic necrosis are necessary.

Previous studies[13] showed that both CTSI and MCTSI were significantly associated with all clinical outcome parameters, including length of hospital stay, admission to and length of ICU stay, persistent OF, pancreatic infection, need for intervention, mortality, and clinical severity of AP. The present study also produced similar results, except that we did not find significant association of these scores with the length of ICU stay. This may be partly due to the relatively small number of our patients (19/60) who had a stay in the ICU (the rest of the patients were managed in the ward). Furthermore, in the present study, both CTSI and MCTSI showed good concordance with severity grading as per the RAC, with MCTSI performing a little better (although this difference was not statistically significant). This is similar to the results of a recent study by Raghuwanshi *et al*.[14] Compared with the study by Bollen *et al*., a greater proportion of our cases had OF. This is likely because a higher percentage of our cases belonged to the severe and moderately severe categories of AP.

We assessed the sensitivity and specificity of CTSI and MCTSI in the categorization of cases as “mild” or “not mild” (i.e., moderately severe or severe). MCTSI had a sensitivity of 100%, where as a specificity was 92.3%. CTSI had 100% specificity, where as its sensitivity was 97.1%. In other words, MCTSI correctly categorized all severe cases, though it slightly overestimated some mild and moderate cases. CTSI correctly categorized all mild cases. However, in moderate cases, it both underestimated and overestimated a few cases; among severe cases, it underestimated almost half the cases as moderate grade. MCTSI (and not CTSI) correctly categorized all cases that had evidence of infection or needed intervention and also all cases that developed persistent OF. In the clinical setting, this increased sensitivity of MCTSI gives it an edge over CTSI assessment – it is imperative to identify all patients of AP who may have a potentially complicated clinical course to institute appropriate management strategies in a timely manner.

CONCLUSION

Contrast enhanced Computed Tomography is excellent diagnostic modality to stage the severity of inflammatory process, detect the pancreatic necrosis and depict local complications and grading of severity of acute pancreatitis. The scores obtained with the modified Mortele index, showed a stronger correlation for all outcome parameters in all the patients better than the Balthazar index. Revised Atlanta classification is more accurate than modified Mortele index and Balthazar severity index for assessing patient mortality and organ failure.

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