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Research Paper

Evaluation of Patients with Acute Pancreatitis by Using the Modified Computed Tomography Severity Index

Raya Talib Ghazal[1], Raad Hefdhi Abed Alkhayat[2]

ABSTRACT:

BACKGROUND:

Pancreatitis is inflammation of the pancreas. Pancreatitis can appear in its acute form, that is, it appears suddenly and lasts a few days. Some people may develop chronic pancreatitis, which lasts for many years. Mild cases of pancreatitis get better with treatment, but severe cases can cause life-threatening complications.

OBJECTIVE:

To assess the modified Baltazar score Computed tomography severity index of acute pancreatitis

PATIENTS AND METHODS:

A cross sectional analytic study was performed at Al-Yarmouk Teaching Hospital in Department of Radiology in the period from 1st of January 2021 to the end of November 2021. The current study involved 50 patients (male and female), age ranging (18-70 years) referred from emergency and outpatients.

RESULTS:

Significantly found that survival rate decreased with severity, indicated higher mortality rates in severe cases and that Computed tomography severity index significantly correlated with outcome of patients, Computed tomography severity index score was good predictor for longer duration of hospitalization with high sensitivity, specificity and accuracy of 85.7%, 93.1% and 89.4%, respectively with high positive predictive value of 92.5% and negative predictive value of 86.7%.

CONCLUSION:

Modified CTSI is an excellent predictor of outcome of acute pancreatitis with high sensitivity, specificity and accuracy rates with high PPV and NPV

KEYWORD: Acute pancreatitis, Modified Baltazar score, severity index.

[1] *Al Yarmook Teaching Hospital, Baghdad, Iraq*

[2] *M.R.D-F.I.B.M.S., Diagnostic Radiology. The Iraqi Board for Medical Specializations*

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INTRODUCTION:

Acute pancreatitis (AP) is one of the most common gastrointestinal causes for hospitalization in the United States. In 2015, AP accounted for 390940 hospitalizations making it one of the most frequent causes of gastrointestinal hospitalizations in the nation with the annual incidence only expected to increase over time. Despite recent advances in gastroenterology, AP continues to be associated with substantial mortality, morbidity and healthcare resource utilization [1]. A patient complaining of sudden onset of epigastric pain radiating to the back, associated with nausea and vomiting, requires rapid exclusion of a wide range of life-threatening conditions involving the cardiovascular (myocardial infarction, ruptured and/or dissecting aortic aneurysm) and gastrointestinal (peptic ulcer with perforation or bleeding or acute pancreatitis) [2].

Contrast-enhanced CT examination that is considered as the gold standard in the evaluation of the patients with acute pancreatitis not only establishes the diagnosis of acute pancreatitis, but also allows to stage the severity of the disease. In the cases with acute pancreatitis, CT examination should be performed if the clinical diagnosis is uncertain. The ideal time for assessing these complications with CT is after 72 hours from onset of symptoms. Follow-up CT is not recommended for those CT severity index (CTSI) score < 3. However, if the patient shows change in clinical status that suggests a developing complication, CT scan should be performed [3].

CT is also useful to guide catheter placement for drainage and to assess success of treatment in patients who underwent percutaneous drainage or other interventions. Moreover, in patients with

their first episode of acute pancreatitis who are over 40 years of age and have no identifiable cause for pancreatitis, contrast-enhanced CT should be used to exclude a possible neoplasm. A thin-slice (≤3mm) contrast-enhanced CT at the portal venous phase, obtained 60-70s after the intravenous contrast agent administration, allows to identify pancreatic necrosis as well as evaluating the extra-pancreatic complications [4,5].

CT findings of acute pancreatitis depend on the severity and extend of the inflammatory process. A CT scan which is performed within the first 48 hours of the onset of symptoms may be completely normal. CT findings of acute pancreatitis include enlargement of the pancreas (localized or diffuse), ill-defined parenchymal contours, decreased of density and inhomogeneity of the pancreatic parenchyma and fluid collections in the peripancreatic region [6].

PATIENTS AND METHODS:

The current prospective study was done at the department of radiology in Al-Yarmouk teaching hospital during the period from January to November 2021. The study included (50) patients with acute pancreatitis (28 males and 22 females) with their ages ranging between (18-70) years. The patients were referred from emergency, inpatient and outpatient clinics with clinical, laboratory and ultrasonography findings suggestive of acute pancreatitis. All patients were examined with CT native and IV contrast injection and were followed up for about one month.

All referred patients with sudden onset of severe epigastric pain with increase more than three folds normal levels serum lipase ± amylase were included in the study, while those with negative lab test of serum Amylase, high renal indices that preclude contrast, and patients with known history of allergy to iodinated contrast agents were excluded from the study.

All patients were informed about the purpose of the study and a written consent was taken from them. All patients underwent Ct examination native and IV contrast then assessed for the severity of pancreatitis scored using modified CT-severity index of acute pancreatitis, and all of them were followed up (prognosis and hospitalization) for about one month.

The patients were subjected to CT examination in supine position native and with intra venous non–ionic iodinated contrast media 1ml/1kg BW arterial phase (30 seconds after injection) and portal venous phase (60-70) seconds after the IV contrast agent administration) with 1mm slice thickness in 3D reconstruction by Siemens 64 slice CT scanners, and all images were interpreted by two radiologists.

Approval of the scientific council of the Iraqi board of health specializations was obtained. Also a written consent from each participant was obtained prior to data collection after explaining the aim of study.

Statistical analysis

The statistical package for social sciences version 26 was utilized in statistical procedures and testing. Chi square test and Fisher's exact test were used to compare frequencies and assess the association. Analysis of variances and student's t tests were used to compare means accordingly among subgroups. Level of significance, P. value of 0.05 was set as cutoff point for significant difference or correlations.

RESULTS:

A total of 50 adult patients were recruited in this study, with a mean age of 43.6±13.1 (range: 18-70) years. On the other hand, 18% of patients aged ≤30 years, 28% at (31-40) years of age, 28% at (41-50) years of age and 26% were >50 years. Males were relatively dominant constituting 56% of the studied group with a 1.27:1 male to female ratio, as seen in table (1).

Table 1: Demographic characteristics of the studied group.

Variable		No.	%
Age (year)	≤ 30	9	18.0
	31 – 40	14	28.0
	41 – 50	14	28.0
	> 50	13	26.0
Mean age (SD)	43.6 (13.1)	-	-
Age range	18 – 70		
Gender	Male	28	56.0
	Female	22	44.0
Total		50	100.0
SD: standard deviation of mean			

As shown in table (2), CT revealed pancreatic inflammatory changes in 35 (70%) patients, peri-pancreatic fat stranding in 39 (78%), peri-pancreatic fluid collection in 13 (26%) and only 1 (2%) patient had pancreatic edema. Some patients had more than one finding simultaneously (overlapping) while 10 (20%) patients had normal CT findings.

Table 2: Pancreatic CT findings of the studied group (N=50)*.

Finding	No.	%
Pancreatic inflammatory changes	35	70.0
Peri-pancreatic fat stranding	39	78.0
Peri-pancreatic fluid collection	13	26.0
Pancreatic edema	1	2.0
Normal	10	20.0
**Overlapping is present some cases had more than one finding*		

Distribution of the studied group according to CT-pancreatic necrosis showed that 28 (56%) patients had no pancreatic necrosis, 16 (32%) had ≤ 30% and 6 (12%) of patients had pancreatic necrosis of >30-50% as shown in table (3).

Table 3: Distribution of CT-pancreatic necrosis of patients (N=50)*

Findings	No.	%
None	28	56.0
≤ 30%	16	32.0
> 30-50%	6	12.0
Total	50	100.0

Severity of pancreatitis according to modified CTSI score indicated that 25 (50%) of the patients had mild pancreatitis, 16 (32%) moderate and 9 (18%) had severe pancreatitis, as observed in table (4).

Table 4: Distribution of patients according to modified CTSI score (N=50).

Findings	No.	%
Mild pancreatitis (0-2 CTSI score)	25	50.0
Moderate pancreatitis (4-6 CTSI score)	16	32.0
Severe pancreatitis (8-10 CTSI score)	9	18.0
Total	50	100.0

The comparison of mean duration of hospitalization across the CTSI grade revealed that patients with mild pancreatitis had the shorter duration of hospital stay, (mean: 7.2±1.5 days), the mean duration of hospitalization in moderate pancreatitis cases was 12.7±2.5 days while the longer duration (mean: 14±6 days) reported in cases with severe pancreatitis, the difference was statistically significant, (P. value=0.001). This reflected a direct (positive) correlation between CTSI score and duration of hospitalization, as seen in table (5).

Table 5: Comparison of duration of hospitalization according to modified CTSI score.

Severity	No. of patients	Duration (mean ± SD)	P. value
Mild pancreatitis (0-2 CTSI score)	25	7.2 ± 1.5	0.001 significant
Moderate pancreatitis (4-6 CTSI score)	16	12.7 ± 2.5	
Severe pancreatitis (8-10 CTSI score)	3	14.0 ± 6.0	
Total*	44	10.4 ± 5.1	

SD: standard deviation of mean
**died patients were 6, not entered in the comparison*

When CTSI grade of pancreatitis cross-tabulated against outcome of the patients, it had been significantly found that survival rate decreased with severity, i.e. patients with higher CTSI score more likely to have poor prognosis and died. All patients with mild or moderate pancreatitis were survived while 66.7% of severe cases died, indicated higher mortality rates in severe cases and that CTSI significantly correlated with outcome of patients, where comparison of mean total CTSI score between survived and died patients showed a significant higher mean total CTSI score in died patients (mean: 9.3 ± 0.9) than survived group (mean score: 3.2 ± 2.1), (P. value = 0.001), as shown in table (6).

Table 6: Patients' outcome according to modified Balthazar score.

	Survived		Died		Total
	No.	%	No.	%	
Mild pancreatitis (0-2 CTSI)	25	100.0	0	0.0	25
Moderate pancreatitis (4-6 CTSI)	16	100.0	0	0.0	16
Severe pancreatitis (8-10 CTSI)	3	33.3	6	66.7	9
Total	44	100.0	6	100.0	50

Fisher's exact test, P. value < 0.001

DISCUSSION:

Since the emergence of original Balthazar grading system, different investigators tried to modify and find an accurate and more precise CT severity index by combining different scoring systems. The modified scoring system was found to be more accurate with better prognostic value than earlier systems, nonetheless, it still having some limitations [7].

The role of computed tomography in early prediction of the course disease, staging and assessment of modified CTSI in acute pancreatitis have not been fully studied in our country, which was the prerequisite for this work.

The current study included 50 patients, and it was observed that only 18% of the patients aged 30 years or younger, while the majority of patients were older than 30 years, on the other hand, relative gender variation was reported with a male to female ratio of 1.27:1. Epidemiological studies investigating the risk factors of acute pancreatitis documented that incidence of AP and high hospital admission and readmission rates increased with advancing age [8,9]. Furthermore, in a large scale Indian national survey conducted by Garg et al. [9], males were relatively dominant while females appeared less likely to be admitted or readmitted for AP among the studied group. Another study conducted by Banday et al. [7] found 66% of patients were males.

In the current study, CT examination revealed that peri-pancreatic fat stranding and pancreatic and peri-pancreatic inflammatory changes were the more frequent findings among the studied group, contributing to 78% and 70% of the studied group, respectively.

The next frequent finding was peri-pancreatic fluid collection in 26%. These findings were consistent with previous studies with relative variation in the frequencies of the reported findings among different studies; an earlier study conducted in 2016 by Raghuwanshi et al. [10] found that the most common CT finding was peripancreatic inflammatory changes in 88% of their patients followed by irregular pancreatic contour in 80% of cases. In 166 mild AP cases, Reynolds et al. found less proportion of peripancreatic inflammatory changes as 52.9% of these cases had focal or diffuse pancreatic enlargement and / or inflammatory changes [11].

However, CT findings in patients with AP mainly associated with the severity of disease and extent of inflammation, therefore, some variation found among different studies due to variation in the time of performing the CT study, for instance, CT scan within 48 hours of the onset of attack of symptoms could reveal normal findings, while later CT revealed ill defined parenchyma, low density and non-homogenous pancreatic paranchyma, fluid collection, pancreatic inflammation and peripancreatic fat stranding. Usually, the inflammation is diffused involving the whole pancreas, but in almost 18% of cases the inflammatory process usually restricted to the head of pancreas [12].

Distribution of the studied group according to CT-pancreatic necrosis showed that (56%) patients had no pancreatic necrosis, (32%) had ≤ 30% and (12%) of patients had pancreatic necrosis of >30-50%. The rate of pancreatic necrosis reported In different studies are varied and depend mainly on the time of examination and hospitalization of patients [13,14].

Lautz et al. [14] found that CT is very beneficial for detection of complications of AP. However, Lautz et al. used similar goading to ours in grading of necrosis among children and found almost similar results [14]. On the other hand, Bonday et al. found no significant association between severity score and degree of necrosis, this could be attributed to the difficulty in differentiation between extent of necrosis at border lines of 30-50% or >50% [10]. According to CTSI, 50% of our patients had mild pancreatitis grade, (32%) moderate (18%) had severe pancreatitis. When the CTSI grading cross tabulated against duration of hospitalization and outcomes of the patients we found a significant association between the CTSI score and duration of hospitalization where the mean duration of hospitalization was significantly higher with higher CTSI score, patients with severe CTSI grade had the longer duration of hospitalization.

Mortele et al. found that the range of hospital stay was 0-34 days, which is close to our finding (0-30 days), and that higher CTSI was significantly associated with longer hospital stay [15]. Our findings also supported that of Chishty et al [16] who documented that CTSI was higher in patients with longer hospital stay and complicated cases and concluded a significant relationship between CTSI and outcome including hospitalization and complications.

Nonetheless there still some variation among studies and it was expected, because this subject still needed further evaluation and assessment and some scoring systems might gathered to get a new one, however, the source of this variation could be subjective and possibly attributed to the variability in the categorization of pancreatic necrosis and inflammation, the time of inclusion of patients, inter-observer variation, sample size and studied population [7].

CONCLUSION:

Modified CTSI is an excellent predictor of outcome of acute pancreatitis with high sensitivity, specificity and accuracy rates with high PPV and NPV

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