

COMPUTED TOMOGRAPHY SEVERITY INDEX AS AN EARLY PROGNOSTIC TOOL FOR ACUTE PANCREATITIS

Mushtaq Ahmed, Muhammad Attaullah Khan, Mahmud Aurangzeb, Muhammad Muslim, Muhammad Zarin, Nisar Ahmed, Saqib Saleem Afridi, Hazrat Amin

Department of Surgery, Khyber Teaching Hospital, Peshawar - Pakistan

ABSTRACT

Objective: To study the prognostic value of Computed Tomography Severity Index (CTSI) in acute pancreatitis.

Material and Methods: A prospective observational study was conducted in surgical A unit of Khyber Teaching Hospital from September 2011 to July 2014. All patients with diagnosis of acute pancreatitis underwent CT abdomen with pancreatic protocol after 48 hours of admission to define CTSI. Ranson score was established for comparison with CTSI. Patients with moderate and severe acute pancreatitis were managed in ICU and complications and mortality were recorded in a systematic manner.

Results: Eighty three patients were admitted with acute pancreatitis. Overall complication rate was 49 % and mortality rate was 5%. Complications rate and mortality were 35% and 0% for CTSI of 0 to 3, 75% and 16% for CTSI of 4 to 6, and 100% and 35% for CTSI of 7 to 10, respectively. Early CTSI on admission correlated well with complications, outcome and necessity for ICU care and was found superior to Ranson score.

Conclusion: Establishment of early CTSI is a valuable tool in planning management and predicting outcome of patient with acute pancreatitis.

Key Words: Acute Pancreatitis, Computed, Tomography, Severity Index, Ranson's score, ICU.

INTRODUCTION

Acute Pancreatitis (AP) is an inflammatory disease of the pancreas that ranges from mild edema of the pancreas to severe pancreatic necrosis and even death due to multi organs failure.¹ It's clinical course is quite unpredictable but the outcome mainly depends on the early recognition of its severity.²

Various scoring systems such as Ranson Criteria⁴ and Acute Physiology and Chronic Health Evaluation (APACHE) II are helpful in predicting the severity but not the outcome of acute pancreatitis.³⁻⁵ These scoring systems needs time to establish and are impractical for routine clinical use therefore radiologic investigations is a subject of interest to establish early the severity of AP.

Balthazar and colleagues defined CT severity Index in 1990, to quantify pancreatic inflammation and necrosis in a well-defined scoring system that can help to predict the outcome of patients with AP.^{6,7} The

clinical outcome of patients with acute pancreatitis can be improved if the severity of the disease can be predicted early and the patient with severe AP has to be nursed in ICU care setting with maximum conservative approach.^{8,9,10,11}

The full extent of necrosis may develop in up to 96 hours, or even after that, our study was based on performing a CT scan of the abdomen with IV and oral contrast on 48 hours of admission. CTSI was defined for each patient and based on CTSI score and clinical findings patients were nursed in general surgical ward or shifted to ICU.

MATERIAL AND METHODS

This prospective observational study included all patients diagnosed with acute pancreatitis who were admitted to the surgical unit of Khyber Teaching Hospital in the period from September 2011 to July 2014. Inclusion criteria were clinical presentation with pain epigastrium radiating to back and high serum amylase level. Spiral CT of the abdomen was performed after 48 hours of admission with IV and oral contrast to establish CTSI as described in Table 1. Ranson criteria were evaluated at the time of admission and after 48 hours (Table 2) for comparison with CTSI in predicting morbidity and mortality.

Address for Correspondence:

Dr. Mushtaq Ahmed

Associate Prof

Department of Surgery, Khyber Teaching Hospital, Peshawar - Pakistan

Cell: 0321-3001416

Email: drmahmad68@hotmail.com

Clinical course of the disease was monitored and all the complications and length of stay in the ICU and hospital, and in-hospital deaths were recorded. Patients with hemodynamic instability, sepsis, old age with other co morbidities and CTSI > 6 on initial CT scan obtained on 48 hours of admission were admitted to ICU and the rest were managed at ward.

A maximum conservative approach was adapted and surgical interventions were only carried out when the patients had persistent hemodynamic instability and infected pancreatic necrosis causing sepsis. Patients were shifted from ward to ICU if they were deteriorating and those in ICU were shifted to ward when seems clinically satisfactory. All complications and deaths were recorded and evaluated in monthly morbidity and mortality meetings. Based on CTSI and Ranson score, patients were grouped and compared using a two-tailed Student's t-test with unequal variance. Correlation between CTSI and complications, sepsis, and mortality were established by calculating R2. Correlation for Ranson score was also established by the same way.

RESULTS

From September 2011 to July 2014, 83 patients were admitted with acute pancreatitis, with average age of 42 years (range 15 to 82 years), 39 were men and 44 women. The average duration of stay in the ICU was 2 days (range 1 to 15 days). The average stay in the hospital was 7 days (range 2 to 32 days). Cholelithiasis was the cause of pancreatitis in 73 patients (61% males and 78% females), drugs in 5 patients, trauma in 2 patients, alcohol in 2 patients and other miscellaneous causes in the rest of patients.

Complications occurred in 53% patients. Urinary tract infection was the most frequent complication, i.e. in 21% patients, followed by sepsis in 18% patients, respiratory system complications in 13%, pancreatic pseudo cyst in 13%, infected pancreatic necrosis in 7% and other miscellaneous complications developed in 17% patients. Sixteen patients developed sepsis and 4 of them died despite intensive supportive care and surgical debridement and drainage of pancreatic necrosis in two of them. The average CTSI in these four patients was 7 and all of them died in ICU.

The average CTSI on 48 hours of admission was 3.7 and the average Ranson score was 2.5. Patients were divided into three groups according to the initial CTSI, i.e. CTSI 0 to 3 (n = 49; 59%), CTSI 4 to 6 (n = 27; 33%), and CTSI 7 to 10 (n = 7; 8%). Ranson 0 to 3 (n = 61; 73%), Ranson 4 to 6 (n = 16; 19%) and Ranson 7 to 10 (n = 6; 7%). Correlation of CTSI and Ranson score with complications, sepsis and mortality is given in Table 3 and Table 4 respectively.

Table 1: Calculation of the CT Severity Index*

Inflammatory process	Score	Necrosis	Score
Normal Pancreas	0	No necrosis of the pancreas	0
Focal or diffused enlargement	1	<30% necrosis	2
Peripancreatic inflammation	2	30-50% necrosis	4
Single fluid collection	3	>50% necrosis	6
Multiple fluid collections/ gas	4		

*CT Severity Index= Inflammatory process + Pancreatic Necrosis

Table 2: *Ranson Criteria

Parameters on admission		After 48 hours	
Age	>55	Increase in BUN	>1.8mmol/L
Glucose	>11mmol/L	Base deficit	>4
TLC	>16000 / μ L	Hct drops	>10 %
AST	>250 IU/L	PO2	<60 mmHg
LDH	>350 IU/L	Serum Calcium	<1.9mmol/L
		Fluids sequestration	>6L

Each parameter has one point. *Ranson score is equal to the sum of positive parameters. TLC; Total Leucocytes Count, AST; Aspartate aminotransferase, LDH; Lactate dehydrogenase, BUN; Blood Urea Nitrogen,- PO2 is partial pressure of oxygen

Table 3: Overall Complications, Sepsis, and Mortality According to CT Severity Index

CT Severity Index	0-3	4-6	7-10	R2
Complications %	35	75	100	0.97
Sepsis %	12	33	50	0.98
Mortality %	2	12	35	0.97

Correlation indicated as r2 values.

Table 4: Overall Complications, Sepsis, and Mortality According to Ranson Criteria

Ranson score	0-3	4-6	7-10	R2
Complications %	42	72	71	0.68
Sepsis %	17	25	55	0.89
Mortality %	4	13	78	0.85

Correlation indicated as R2 values

DISCUSSION

Initial clinical presentation and laboratory findings have low sensitivity and low predictive value in assessing the severity and predicting the outcome of acute pancreatitis on admission.¹² Patients with mild edema of the pancreas and patients with pancreatic necrosis may present the same way with pain epigastrium and on initial presentation it is often not possible to differentiate between them. However patients with pancreatic necrosis will have a complicated clinical course with high morbidity and mortality, hence it is important to assess early the severity of AP and predict the outcome.¹³ Contrast enhanced CT scan is the best modality available, to assess the severity of AP early and to show if pancreatic necrosis is present. CTSI is calculated based on CT findings that gives a good prediction of pancreatitis severity and has a great implication in patient care and outcome.¹⁴ In our study CTSI also correlates highly with the presence of complications ($r^2=0.97$), occurring of sepsis ($r^2=0.98$) and deaths ($r^2=0.97$) in patients with AP, therefore we think it is justified to establish CTSI on 48 hours of admission of patients with severe AP.¹⁵

Our study showed good correlation between CTSI and Ranson's score, ($r^2=0.94$). We found CTSI to be superior to Ranson criteria in early recognition of complications and predicting the outcome of patient with AP. Moreover CTSI was more practical, easily reproducible with little inter-observers variability and a great value in cost effectiveness for health care in patients of AP, as patients with CTSI <6 on initial presentation were managed in ward. Only 5 patients with CTSI <6 were shifted to ICU who developed sepsis, and four of them were successfully managed there except one 62 years old patient with previous history of coronary artery disease and hypertension, who died of myocardial infarction despite vigorous resuscitation and intensive care. Follow up CT scan was considered in selected patients who were having a high CTSI and were suspected for developing local complications of AP.¹³ A routine follow up CT was avoided in patients with initial CTSI of 0-3.

Antibiotics were used in selected patients, to minimize the chances of pancreatic necrosis infection due to translocation of bacteria across the gut wall.^{16,17} We discourage a nil by mouth practice in all patient with acute pancreatitis to stimulate normal bowel function and maintain an anabolic state,^{18,19} however a nil by mouth approach and nasogastric tube was used only in selected patients with intractable vomiting, not relieved with anti-emetics.

CONCLUSION

In well equipped hospitals Computed Tomography Severity Index should be included as a prognostic tool for acute pancreatitis.

REFERENCES

1. Werner J, Waldernar UHL, Buchler MW. Acute pancreatitis In: Cameron JL, ed. Current Surgical Therapy, 8th ed. Philadelphia: Elsevier Mosby; 2004: 459-64.
2. Vriens CT Severity Index for Acute Pancreatitis J Am Coll Surg. 201; 4; 2005: 497-502.
3. Yousaf M. McCallion. K. Diamond T. Management of severe acute pancreatitis British J Surg 2004; 85: 209-19.
4. Gates LK Jr. Severity scoring for acute pancreatitis: where do we stand in 1999? Curr Gastroenterol Rep 1999; 1: 134-38.
5. Khanna KA, Meher S, Prakash S, Tiwary K S, Singh U, Srivastava A et al. Comparison of Ranson, Glasgow, MOSS, SIRS, BISAP, APACHE-II, CTSI Scores, IL-6, CRP, and Procalcitonin in Predicting Severity, Organ Failure, Pancreatic Necrosis, and Mortality in Acute Pancreatitis, HPB Surg 2013; 1-10.
6. Papachristou G. I, Muddana V, Yadav D. "Comparison of BISAP, Ranson's, APACHE-II, and CTSI scores in predicting organ failure, complications, and mortality in acute pancreatitis," American J of Gastro 2010, 105; 2: 435-41.
7. AlMofleh A, "Severe acute pancreatitis: pathogenetic aspects and prognostic factors," World Journal of Gastroenterology, 2008. 14; 5: 675-84.
8. Kalfarentzos FE, Kehagias J, Kakkos SK. Treatment of patients with severe acute necrotizing pancreatitis based on prospective evaluation. Hepatogastroenterology 1999; 46: 3249-56.
9. Tenner S, Banks PA. Acute pancreatitis: nonsurgical management. World J Surg 1997; 21: 143-48.
10. Hartwig W, Maksan SM, Foitzik T. Reduction in mortality with delayed surgical therapy of severe pancreatitis. J Gastrointest Surg 2002; 6: 481-87.
11. Bank S, Singh P, Pooran N, Stark B. Evaluation of factors that have reduced mortality from acute pancreatitis over the past 20 years. J Clin Gastroenterol 2002; 35: 50-60.
12. Gravante G, Garcea G, Ong LS, Metcalfe SM, Berry DP, Lloyd MD, et al. Prediction of Mortality in Acute Pancreatitis: A Systematic Review of the Published Evidence, Pancreatology 2009; 9: 601-14.
13. Toouli J, Brooke-Smith M, Bassi C. Guidelines for the management of acute pancreatitis. J Gastroenterol Hepatol 2002; (Suppl 17): 15-39.
14. Uhl W, Roggo A, Kirschstein T. Influence of contrast enhanced computed tomography on course and outcome in patients with acute pancreatitis. Pancreas 2002; 24: 191-97.

15. Lankisch PG, Struckmann K, Assmus C. Do we need a computed tomography examination in all patients with acute pancreatitis within 72 h after admission to hospital for the detection of pancreatic necrosis? *Scand J Gastroenterol* 2001; 36: 432-36.
16. Mazaki T, Ishil Y, Takayama T. Meta-analysis of prophylactic antibiotic use in acute necrotizing pancreatitis. *British J Surg* 2006; 93; 674-84.
17. Samel S, Lanig S, Lux A. The gut origin of bacterial pancreatic infection during acute experimental pancreatitis in rats *Pancreatology* 2002; 2: 449-55.
18. Kalfarentzos F, Kehagias J, Mead N. Enteral nutrition is superior to parenteral nutrition in severe acute pancreatitis: results of a randomized prospective trial. *Br J Surg* 1997; 84: 1665-69.
19. Olah A, Pardavi G, Belagyi T. Early nasojejunal feeding in acute pancreatitis is associated with a lower complication rate. *Nutrition* 2002; 18: 259-62.

AUTHOR'S CONTRIBUTION

Following authors have made substantial contributions to the manuscript as under:

Ahmed M:	Study conception and design.
Khan MA:	Acquisition of data.
Aurangzeb M:	Overall Supervision.
Muslim M:	Drafting of manuscript.
Zarin M:	Critical revision.
Ahmad N:	Statistical expertise.
Afridi SS:	Follow up.
Amin H:	Analysis and interpretation of data.

Authors agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

CONFLICT OF INTEREST: Authors declare no conflict of interest

GRANT SUPPORT AND FINANCIAL DISCLOSURE NIL

ONLINE SUBMISSION OF MANUSCRIPT

It is mandatory to submit the manuscripts at the following website of JMS. It is quick, convenient, cheap, requirement of HEC and paperless.

Website: **www.jmedsci.com**

The intending writers are expected to first register themselves and then attach/submit the manuscript. If processing fee is not submitted before should be deposited with Managing Editor in cash or can submit in the form of bank draft in the name of editor JMS. Also follow the format and check list of the Journal. Author agreement can be easily downloaded from our website. A duly signed author agreement must accompany initial submission of the manuscript.