



## Role of Serum Amylase and Lipase Levels in the Classification of Acute Pancreatitis According to Revised Atlanta Classification

Authors

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### ABSTRACT

**Introduction:** Revised Atlanta classification proposed the use of morphologic CECT criteria to diagnose the specific type of acute pancreatitis into acute interstitial oedematous pancreatitis (IEP) or acute necrotizing pancreatitis. The total serum amylase test is most frequently ordered to diagnose acute pancreatitis, because it can be measured quickly and cheaply. In acute pancreatitis, the serum amylase concentration is usually more than 2 to 3 times the upper limit of normal. Lipase is considered as the most sensitive and specific marker for acute pancreatitis currently used in clinical practice. The aim of this study was to evaluate for any correlation of radiological imaging features in acute pancreatitis with pancreatic enzyme levels.

**Materials and Methods:** This was a descriptive study involving 67 study subjects suspected to have acute pancreatitis who underwent CECT Abdomen in the department from January 2015 to June 2016. Imaging findings were defined as per Revised Atlanta classification in addition to obtaining serum amylase and lipase values. Data collected were analysed using statistical tools.

**Results:** Mean values for serum amylase for IEP was 1127.39 and 1572.74 for necrotising pancreatitis. Mean values for serum lipase for IEP was 1390.39 and 2401.03 for necrotising pancreatitis. Independent sample t test was done to compare mean values of serum pancreatic enzyme levels in specific type of pancreatitis. Though the mean values were found to be higher for necrotising pancreatitis, no significant association ( $p$  value  $< 0.05$ ) was found between the enzyme level and the type of pancreatitis.

**Conclusion:** Pancreatic enzyme evaluation was observed to aid in diagnosing acute pancreatitis; however their levels were not significant to predict the type of pancreatitis as defined by Revised Atlanta classification.

**Keywords-**acute pancreatitis, amylase, lipase, Revised Atlanta classification, computed tomography.

### Introduction

Acute pancreatitis (AP) is an acute inflammatory state involving the pancreas. Majority of patients with acute pancreatitis, approximately 80% to 85% of patients, will have the mild form, with a clinical course which has no complications. On the other hand, 15% to 20% will develop a complicated

clinical course characterized by organ failure and/or local complications<sup>1</sup>. The incidence of acute pancreatitis in the United States of America varies from 4.9 to 73.4 per 100,000 patients<sup>2</sup>. In the year 2000, in the United States there were 2834 deaths from acute pancreatitis, making it the 14th most common cause of death due to gastrointestinal

diseases<sup>3</sup>. Acute pancreatitis is the second most common inpatient GI diagnosis in the United States following cholelithiasis and acute cholecystitis<sup>3</sup>. The incidence of acute pancreatitis appears to be increasing worldwide<sup>4</sup>. Revised Atlanta classification<sup>5</sup> was put forth in 2012 which was a classification system that facilitated standardized reporting of clinical and imaging data, as well as increased the objective assessment of treatment, which can be used as an effective means of communication among the medical team. It also facilitates the comparison of results among different institutions.

The total serum amylase test is most frequently ordered to diagnose acute pancreatitis, because it can be measured quickly and cheaply. It rises within 6 to 12 hours of onset and is cleared fairly rapidly from the blood since its half-life is 10 hours. Probably less than 25% of serum amylase is excreted by the kidneys. What other processes clear amylase from the circulation is not known for sure. The serum amylase is usually raised on the first day of symptoms. It remains raised for 3 to 5 days in uncomplicated attacks. The sensitivity of the serum amylase level for detecting acute pancreatitis is difficult to assess because an elevated amylase is often used to make the diagnosis of acute pancreatitis. In mild attacks, other tests to confirm pancreatic inflammation are either not sensitive enough or not necessary. The limitation of serum amylase is that it is neither highly sensitive nor specific. Sensitivity is thought to be above 85%. Serum amylase may be normal or minimally elevated in fatal pancreatitis, during a mild attack or an attack superimposed on chronic pancreatitis since the pancreas has little remaining acinar tissue, or during recovery from acute pancreatitis. Another limitation to the sensitivity of serum amylase is that the level may return to normal quickly, in just a few days<sup>6</sup>. One half of all patients with an elevated serum amylase level may not have pancreatic disease<sup>7</sup>. In acute pancreatitis, the serum amylase concentration is usually more than 2 to 3 times the upper limit of normal; it is usually less than this with other causes of hyperamylasemia. An increased serum amylase level supports rather than

confirms the diagnosis of acute pancreatitis. There are some individuals who have persistent hyperamylasemia without clinical symptoms. This has been reported to be due to macroamylasemia or pancreatic hyperamylasemia on a familial basis. Non pancreatic diseases that cause hyperamylasemia include pathologic processes in other organs that normally produce amylase (e.g., salivary glands, fallopian tubes). Furthermore, mass lesions such as papillary cystadenocarcinoma of the ovary, benign ovarian cyst, and carcinoma of the lung can cause hyperamylasemia because they produce and secrete salivary (S-type) isoamylase. Elevated levels are also seen in intestinal infarction and in perforated viscus. Renal failure increases serum amylase up to 4 to 5 times the upper limit of normal because of decreased renal clearance of this enzyme<sup>8</sup>. Patients on haemodialysis tend to have higher serum amylase levels than those on peritoneal dialysis.

The sensitivity of serum lipase for the diagnosis of acute pancreatitis is above 85%<sup>9</sup>. Lipase is considered to have greater specificity for pancreatitis than amylase. Serum lipase is normal when serum amylase is elevated, as in salivary gland dysfunction, tumours, gynaecologic conditions, and macroamylasemia. Serum lipase is always elevated on the 1st day of illness and remains elevated longer than does the serum amylase, thus having a higher sensitivity<sup>10</sup>. Specificity of lipase can suffer from some of the same problems as those of amylase. In the absence of pancreatitis, serum lipase may increase less than 2-fold above normal in renal insufficiency. Some believe that serum lipase measurement is preferable to that of serum amylase because it is as sensitive as amylase measurement and more specific.

There has been paucity of studies which has applied the revised Atlanta classification in the Indian population. The aim of this study was to evaluate for any correlation of radiological imaging features in acute pancreatitis with pancreatic enzyme levels (Amylase and lipase).

### Materials and Methods

The present study was descriptive and done from January 2015- June 2016. All patients with clinical suspicion of acute pancreatitis who came for CECT study in the department were included after obtaining informed consent. Only patients above 18 years of age were included. Patients who were unwilling to be part of the study were excluded. Data regarding the serum amylase and lipase levels done within 24 hours prior of the imaging were collected in addition to imaging details as per the Revised Atlanta Classification of acute pancreatitis<sup>5</sup>. Patients were subjected to computed tomography with IV contrast. Contrast was given by bolus injection at the rate of 2-3ml/sec typically of 100 ml of Iopromide/Ultravist™. CT sections were taken from the level of diaphragm to pubic symphysis with reconstruction of data at 3mm intervals. Data collected was entered into Microsoft Excel 2007 worksheet. Independent sample t test was done to compare mean values of S. amylase and S. lipase values in specific types of acute pancreatitis.

### Results

Most number of study population belonged to the 4th decade, accounting for 32.8% of the study population. Male to female ratio of study population with acute pancreatitis was approximately 5:1. Of the total 67 patients included in the study, 33 patients were diagnosed to have acute interstitial oedematous pancreatitis and 34 had acute necrotising pancreatitis.

In our study, mean values of amylase and lipase was assessed for both the groups of acute pancreatitis. Mean values for serum amylase for IEP was 1127.39 and 1572.74 for necrotising pancreatitis. Mean values for serum lipase for IEP was 1390.39 and 2401.03 for necrotising pancreatitis.

Independent sample t test was done to compare mean values of serum pancreatic enzyme levels in specific type of pancreatitis. Though the mean values were found to be higher for necrotising pancreatitis, no significant association (p value < 0.05) was found between the enzyme level and the type of pancreatitis.

**Table No 1:** Comparison of mean values of serum pancreatic enzyme levels in the specific types of pancreatitis.

Pancreatic enzyme	Type of pancreatitis	Total cases	Mean	Std. Deviation	p value
S.Amylase	Interstitial Oedematous Pancreatitis	33	1127.39	1615.486	0.242
	Necrotising Pancreatitis	34	1572.74	1468.515	
S.Lipase	Interstitial Oedematous Pancreatitis	33	1390.39	1031.466	0.054
	Necrotising Pancreatitis	34	2401.03	2776.567	

### Discussion

There are many studies regarding the role of pancreatic enzymes in diagnosing pancreatitis. Lipase is considered as the most sensitive and specific marker for acute pancreatitis currently used in clinical practice<sup>11</sup>. Other causes of an elevated lipase include conditions causing prolonged pancreatic ischemia. Hyperlipasemia is frequently

encountered in patients in the intensive care unit. The degree to which clinicians should balance an elevated lipase in making the diagnosis of acute pancreatitis in the critically ill patient is uncertain. 159 of 417 patients with an elevated lipase and ICU admission had evidence of acute pancreatitis, yielding a positive predictive value (PPV) of 38%. The mean peak lipase in patients with acute pancreatitis was 2209 +233 IU/L compared with

596  $\pm$  37 IU/L in patients without acute pancreatitis ( $p = 0.001$ ). Mean lipase showed significant difference between patients with alcoholic pancreatitis (1731  $\pm$  291 IU/L) and biliary pancreatitis (2565  $\pm$  352 IU/L) ( $p = 0.001$ ). Degree of lipase elevation did not correlate with severity as measured by BISAP score or with mortality<sup>11</sup>. Many normal persons have elevations of serum amylase and/or lipase of little clinical significance. Diabetics appear to have higher median lipase compared to non diabetic patients for unclear reasons<sup>12</sup>. In this prospective study, it was shown that 20% of type 2 diabetics had an elevated lipase, and 2% had a serum lipase of more than 3-fold elevation despite the absence of symptoms. However, when evaluating serum amylase, only 5% of type 2 diabetics were found to have an elevated level and no patient had more than 3-fold elevation. While the ramifications of these findings are unclear, there is one recent study that suggested that these low-level elevations in pancreatic enzymes may signify a risk of developing ductal changes in the pancreas consistent with chronic pancreatitis. In a study by Keim, V et al<sup>13</sup> the clinical value of amylase and lipase measurement for the diagnosis of acute pancreatitis was evaluated in 253 patients presenting with acute abdominal pain. Acute pancreatitis was detected in 32 patients by computed tomography or ultrasound. In the serum samples collected on days 1 after the onset of symptoms, lipase was elevated in 100% and amylase in 95%. A 95% sensitivity/specificity was reached at a lipase cut off near two fold above normal. The receiver operating characteristics (ROC) showed similar curves for both enzymes, lipase being slightly superior to amylase. The ROC curves from days 23 demonstrated a much lower sensitivity/specificity of both enzymes. Lipase, however, was notably superior to amylase: at a sensitivity of 85% the specificity of lipase (amylase) was 82% (68%). In samples from days 45 the accuracy of the enzyme assays was even worse; at a sensitivity of 60% the specificity did not increase above 70%. Combination of both parameters mainly improved the specificity of the assay (from 91 to 98%

on days 23 and from 93 to 97% on day 45). It was concluded that the simultaneous determination of serum lipase and amylase marginally improved the diagnosis of acute pancreatitis in patients with acute abdominal pain; however, the sensitivity of the assay with samples collected 45 days after onset of the disease remained low.

In our study, mean values of amylase and lipase was assessed for both the groups of acute pancreatitis. Mean values for serum amylase for IEP was 1127.39 and 1572.74 for necrotising pancreatitis. Mean values for serum lipase for IEP was 1390.39 and 2401.03 for necrotising pancreatitis.

Independent sample t test was done for comparison which showed no significant association ( $p > 0.05$ ) with specific type of pancreatitis, even though the values were higher for necrotising pancreatitis. Thus the role of these serum enzymes may still be limited to only diagnosing acute pancreatitis, and not for diagnosing a specific type of acute pancreatitis. This is in concordance with study by Kristin L, in which it was concluded that degree of enzyme elevation did not correlate with severity<sup>11</sup>. However, further assessment of S.lipase values with more samples may be needed in order to establish clearly any association since its p value of 0.054 was nearer to the cut off in our study.

## Conclusion

Pancreatic enzyme evaluation was observed to aid in diagnosing acute pancreatitis; however their levels were not significant to predict the type of pancreatitis as defined by Revised Atlanta classification.

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**Permission of IRB:** Yes

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