Original Research Paper

Volume - 7 | Issue - 6 | June - 2017 | ISSN - 2249-555X | IF : 4.894 | IC Value : 79.96

General Surgery

# SIGNIFICANCE OF S.AMYLASE IN GASTROINTESTINAL PERFORATION

| | |
|---|---|
| **Dr Gyan Prakash Rastogi** | Teerthanker Mahaveer Medical College And Research Center Moradabad U.P. |
| **Dr. S. C. Sharma** | Teerthanker Mahaveer Medical College And Research Center Moradabad U.P. |
| **Dr. S. P. Sinha** | Teerthanker Mahaveer Medical College And Research Center Moradabad U.P. |

**ABSTRACT**

**Background**: The fact that a certain number of patients with perforation have significantly elevated serum and peritoneal fluid amylase is widely known. Elevated serum amylase is a frequent concomitant of perforated gastrointestinal perforation. A study was made of the clinical records of 100 patients with gastrointestinal perforation to determine if there might be significant correlation between increased serum amylase and site of perforation.This rise in serum amylase comes about in cases of perforated peptic ulcer as a result of peritoneal lymphatic absorption of fluid containing pancreatic enzyme which is spilled through the perforation.The factors of amount of fluid spill, duration of the perforation, size of perforation, site of perforation were also studied for possible relationship with elevated serum amylase. Other aspect of study was where to give incision as it takes more time because it is very difficult to decide exact site of perforation (gastroduodenal or intestinal) higher level were recorded in former not in later .

**Material and Methods**: A prospective study was done of all the patients admitted with diagnosis of gastrointestinal perforation and treated at TMU from 12 March 2014 to 10 June 2015.100 cases were studied with perforation presented in casualty in TMMC&RC. Blood and fluid was taken at the time of admission and were analyzed for amylase estimation by modified somgyi method. This includes 83 male and 17 female patients. Out of these 100 patients 62 patients were gastric perforation and 38 patients were intestinal perforation.

**Results**: Out of these 100 patients 62 patients belongs to gastroduodenal perforation and 38 patients belongs to enteric perforation. Approximately 93% patients with gastroduodenal perforation having increased serum amylase levels, on the other hand approx. 13% patients with enteric perforation have increased serum amylase level. Result also shows the relation of size of perforation to serum amylase level.

**Conclusion**: Study shows that the l serum amylase level depends on factors like site of perforation, size of perforation. Significant elevation of serum amylase level is found in patients with gastroduodenal perforation and with lareger size perforation.

**KEYWORDS :** Gastrointestinal Perforation, Serum Amylase Level, Pancreatitis.

## INTRODUCTION

Blood serum includes a variety of enzymes in different concentration vary with modification in patients physiological condition. The augmentation in the serum enzyme activity depends upon the level of the enzyme in the body tissue as well as the brutality of sickness.A lot of diverse pathology took place in abdomen. The clinical appearance in a case of acute abdomen may be so confusing that a doctor becomes puzzled at times to reach at a perfect diagnosis.

Elman and McCaughan [1] reported increase of amylase level in cases acute pancreatitis and recommended its applicationas a diagnostic tool. Lewison [2] notice that in variety of cases like Mumps, Gastrointestinal ulcer, Uraemia,Gall stones disease, Ectopic pregnancy and Haemo-peritoneum serum amylase level was increased. Wapshaw[3] [in] a study found that out of 30 patients of perforated peptic ulcer 6 patients have raised serum amylase level and the maximum level was 640 units.

Although an abnormal rise in blood amylase is accepted clinically as usually indicative of an acute pancreatitis, it is well known that such a rise can occur in gastrointestinal perforation and with certain other disorders as well.

A review and classification of mechanisms through which abnormal level of serum amylase may appear in the blood is integrated. Interpretation made on the association of elevated serum amylase levels to the quantity of fluid spilled in the abdominal cavity; the time, size, site and duration of the perforation among 100 perforated ulcer patients have been summarized.

Amylase

Normal range of s. amylase is 40-150 somogyi units based on amount of glucose liberated from starch during incubation with the serum.Since the introduction of the serum amylase test in clinical medicine as a diagnostic test for acute pancreatitis many additional disorders where elevated amylase levels may exist have subsequently been cited.

A number of these are listed. They can be classified generally as:

1. Primary disease of the pancreas itself;
2. Diseases which emerge to cause a secondary pancreatitis by producing interference at the level of ampulla.
3. Diseases completely dissimilar to the pancreas which result in increase in peripheral enzyme chiefly by gastro-intestinal exudation or leak;
4. State of Renal insufficiency.

**Table : Cause of Elevated Serum Amylase**

| | | |
|---|---|---|
| A. | Primary Pancreatic | Acute and chronic pancreatitis, Pseudo-cyst of pancreas, Penetrating peptic ulcer |
| B. | Condition which probably produce their effect at the ampullary level | Carcinoma ampulla of vater Carcinoma, head of pancreas, common duct exploration, Acute cholecystitis Common duct stone |
| C. | Abnormal renal excretion of enzyme | Chronic renal insufficiency, Acute reversible renal failure, Shock |
| D. | Diseases which produce a gastro-intestinal leak or exudates | Perforated peptic ulcer, Mesenteric vascular occlusion, Small bowel obscuration |

This rise in serum amylase comes about in cases of gastrointestinal perforation as a result of peritoneal lymphatic absorption of fluid containing pancreatic enzyme which is spilled through the perforation. Among patients with perforated ulcers and elevated serum amylase levels, the higher the amylase level, the higher the mortality rate.

Amount of abdominal fluid spill depends on the duration of the perforation before surgical closure, the size of the perforation, shock and recent ingestion of food.

**Mechanisms for Elevated Serum Amylase:**

A lot of experimental study done to explain the different causes for abnormally increased serum amylase levels. The accurate mechanism of the rise in enzyme level in acute pancreatitis has been calculated quite accurately as pancreatitis can be fashioned in the laboratory in an strength from mild edema to severe necrotizing pancreatits.4, 5,6

After the beginning of the laboratory test of serum amylase as a diagnostic test for pancreatitis in clinical practice [7,8,9] A lot of additional disease where abnormally increased serum amylase levels may exist have afterward been identified.

**Elevated Serum Amylase level in Pancreatic Disease.** There is clinical and experimental proof to explain the pathogenesis of abnormally increased serum amylase level in case of acute pancreatitis. With the beginning of an attack of acute pancreatitis it seems that absorption of fluid rich in enzyme into the lymphatic system as well as the portal venous circulation through the peritoneal cavity and sub-capsular space.[4,6]

Egdahl has been concludes that theelevation in serum amylase level is due to the absorption of amylase into the venous blood. His study illustrated that the subsequent maintenance or…. sustained increase in the amylase and lipase titer in the blood with experimental pancreatitis was due to absorption of sero-sanguinous peritoneal fluid through lymphatics. The transudate peritoneal fluid in pancreatitis has been well-known to be tremendously high in amylase level. The concentration of enzymes here are several times elevated than the peripheral blood levels of enzyme and the level of enzyme activity is extensively maintained.[10] This finding has been used to advocate peritoneal tap in order to confirm a diagnosis of pancreatitis.

Posterior penetrating duodenal ulcers more commonly create a localized pancreatitis and consequent rise in enzyme level, thus this experience in this hospital indicates that this to be a comparatively unusual cause.[11]

Parotitis and inflammatory disease of other salivary glands may be known to produce mildly increased in serum amylase levels.[12]

**Serum Amylase Elevations in Renal Insufficiency:** In pre-renal or renalazotemia the blood amylase level will rise. This appears most definitely to be withholding of normal amylase. In reflecting the abnormal renal output in patients of renal insufficiency the amylase level is hardly ever high. It generally parallels the rising level of blood urea nitrogen but will rarely reach levels seen in acute pancreatitis.

**Elevations Serum Amylase level Associated with Gastro-intestinal Leak:** The increased serum amylase level that may follow loss of integrity in the gastro-intestinal wall is almost certainly due to absorption through peritoneal surfaces.

Pemberton and associates done a study on duodenal perforations in dogs and concluded that amylase was absorbed from the peritoneal cavity in sufficient quantities to produce a abnormal rise in serum level of enzyme.[13]

Amerson and associates more recently done a experiment in dogs by injecting dilute hydrochloric acid into the abdominal cavity but he failed to produce increase serum amylase levels above the normal levels of enzyme .[14]

## AIMS AND OBJECTIVES

**Primary**:

To establish, correlation between serum amylase level and probable site of gastrointestinal perforation.

**Secondary**:

- To plan the site of incision.
- To minimize intraoperative duration and postoperative complication.

## Material and methods

A prospective study was done of all the patients admitted with diagnosis of gastrointestinal perforation and treated at TMU from 12 March 2014 to 10 June 2015.

100 cases were studied with perforation presented in casualty in TMMC&RC. Blood and fluid was taken at the time of admission and were analyzed for amylase estimation by modified somgyi method.

Out of these 100 patients 62 patients were gastric perforation and 38 patients were intestinal perforation. In this study we have not included 20 % of those patients with G.I. perforation who presented with other medical illnesses with very poor general condition, severe hypertension, un recordable B.P., pulse or renal failure and in spite of best resuscitation efforts their B.P. could not be achieved to its normal range and they could not be brought to the level of safe anesthesia.

Some of these patients with very short history of perforation and who could not be operated is a matter of another study as why these patients went in un manageable septicemia or shock. In these patients also serum amylase was done and we found that all most in all the patients it was significantly on higher side.

INCLUSION CRITERIA –
-Conscious patient with satisfactory vitals
-X- ray abdomen erect with free gas under diaphragm.

EXCLUSION CRITERIA-
-Patientswith co-morbid condition viz. severe hypotension, renal failure, shock and unconscious patients.

## OBSERVATION

**1- Sex Ratio**

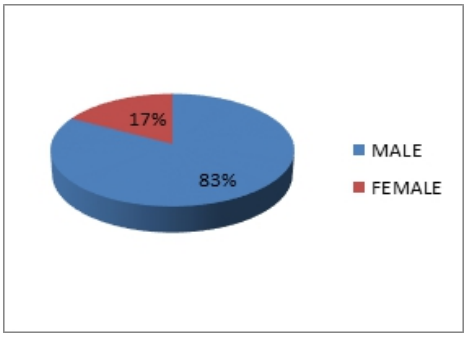



**Figure 1**
In this study 83 patients are male and 17 patients are female.

Age Incidence-

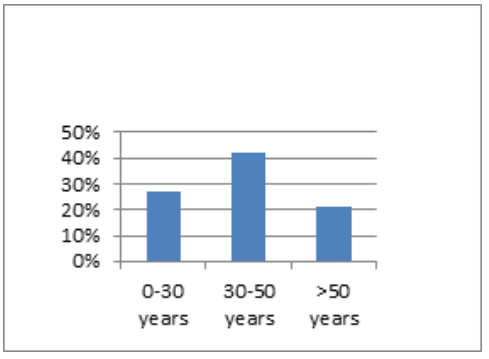



**Figure2**
In this study maximum patients falls in age group of 30-50 years.

**According to complaints- Pain abdomen**

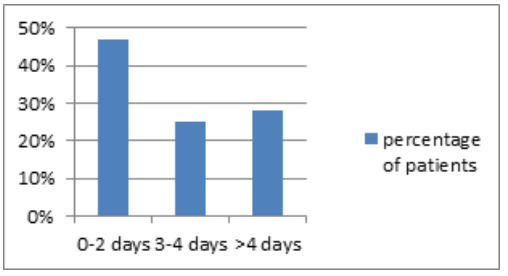
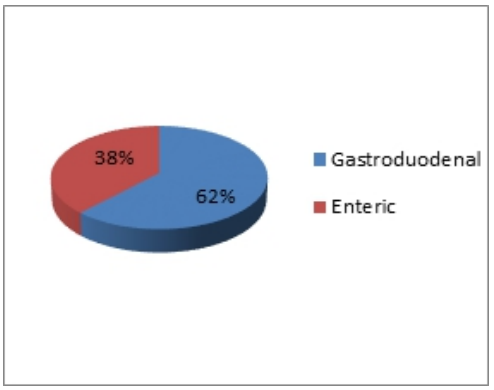



**Figure 3**

| History of the pain | No. of the patients |
|---|---|
| 0 – 2 Days | 47% |
| 2 – 4 Days | 25% |
| > 4 days | 28% |

**Site of perforation-**




Out of 100 patients of Gastrointestinal perforation 62 patients belongs to Gastroduodenal perforation and rest belongs to enteric perforation

**According to size of perforation-**

On the basis of size of perforation patients are divided in to 3 groups as follows.

| Size of perforation | Percentage of the patients |
|---|---|
| 0.5 – 1 cm | 67% |
| 1 – 1.5 cm | 21% |
| > 1.5 cm | 12% |

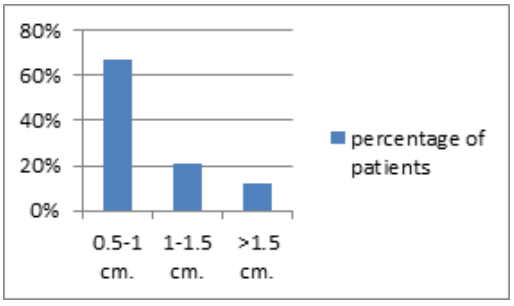
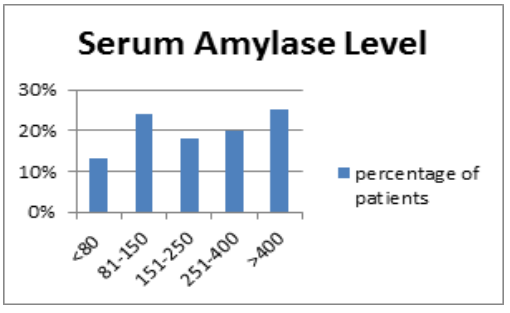



**Figure4**

The size of ulcer perforation has prognostic significance, as the size of perforation increases chance of mortality also increases.

**Serum Amylase value in perforation**

| Amylase | % of the patients |
|---|---|
| <80 | 13% |
| 80 - 150 | 24% |
| 150 - 250 | 18% |
| 250 - 400 | 20% |
| >400 | 25% |



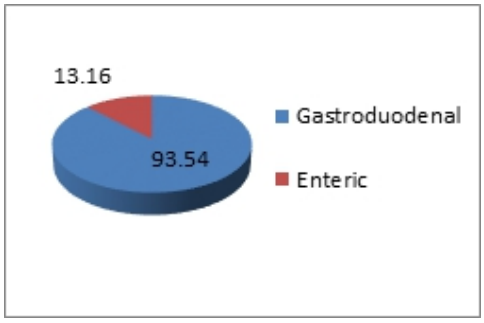

**Amylase value as per size of perforation**

| Size of perforation | Total no of cases | Normal Amylase level | Elevated Amylase level | % Elevated |
|---|---|---|---|---|
| 0.5-1.0 cm. | 67 | 30 | 37 | 55% |
| 1.0-1.5 cm. | 21 | 5 | 16 | 76% |
| >1.5 cm. | 12 | 2 | 10 | 83% |

This table indicates the increased number of patients with elevated blood amylase found in group with larger perforation. In the group with smaller perforation 55% patients had elevated serum amylase levels. This percentage increased to 83% in group with larger perforations.

**Raised Amylase value as per site**

| Site | Amylase |
|---|---|
| Enteric perforation | 13.16% |
| Gastrioduodenal perforation | 93.54% |




This table depicts those approx. 93% patients with gastroduodenal perforation having increased serum amylase levels

**Level of amylase in perforation as per site over days**

IN CASE OF GASTRIC PERFORATION

| Days | Amylase level | Remarks |
|---|---|---|
| 0 – 2 days | 92.68% | Increased |
| | 7.31% | Normal |
| 3 – 4 days | 90.9% | Increased |
| | 9.09% | Increased |
| >4 days | 100% | Increased |
| | 0% | Normal |

IN CASE OF INTESTINAL PERFORATION

| Days | Amylase level | Remarks |
|---|---|---|
| 0 – 2 days | 77.77% | Normal |
| | 22.22% | Increased |
| 3 – 4 days | 66.66% | Normal |
| | 33.33% | Increased |
| >4 days | 72.72% | Normal |
| | 27.27% | Increased |

**Discussion**

The present study was done to assess the diagnostic significance of serum amylase in gastrointestinal perforation.

The fact that a certain number of patients with gastroduodenal perforation willhave significantly elevated serum amylase reading is widely known. In this study gastroduodenal

An elevated serum amylase level in gastro-intestinal perforation is of significance primarily because it confuses a picture which otherwise might be typical of perforation. In this present group there were a higher percentage of patients with gastro-duodenal perforation who exhibit abnormal amylase laves than with enteric perforation. This finding does, conversely correlate with gastroduodenal perforation closer to the enzyme source and larger size of perforation, so usually larger amount of fluid spills. This was most likely because more enzymes leaked through perforation site and was absorbed with passage of time. Burnett and Neis also reported that levels as high as 1000 units/100ml can be reached in perforated gastroduodenal ulcer thereby causing confusion in diagnosis.[21]

In perforated gastroduodena ulcer out of 62 cases 58 had elevated serum amylase level while 4 cases had normal serum amylase level. In enteric perforation out of 38 cases 5 had elevated serum amylase level. .But the levels increased upto 3 days in contrast to acute pancreatitis where successive assessment showed declining levels.

Other factors which tend to produce an increase in blood amylase is

size of perforation, duration of perforation, site of perforation ,all seems to be factors which affects this rise and are interrelated as well.

If patients in whom perforation is suspected have no free subphrenic air, but do have serum amylase values in abnormal range, the doctor should seek to rule out perforation by other methods. One method peritoneal aspiration, characteristically the fluid from perforated ulcer is cloudy, may be bile stained depending upon site of perforation and may show organism. While the fluid in pancreatitis is somewhat clear and usually slightly sero-sanguinous.

This study disclose that more percentage of patients with gastroduodenal perforation having increased serum amylase level, on the other side very few patient of enteric perforation has significant rise in serum amylase level.

Rise in serum amylase in case of acute intestinal obstruction can occur due to duodenal hypertension provoked by vomiting leading to back pressure in pancreatic ducts and interstitial pancreatitis and intestinal mucosal denudation.[22]

In acute appendicitis, mild to moderate elevation of serum amylase. The rise in levels could be because of starch splitting organisms from infected appendix. Burnet and Ness also reported similar findings.

It is apparent in the present study that marked elevation of serum amylase levels between 400-600 were detected in perforated gastroduodenal ulcer, while in case of enteric perforation there is mild to moderate elevation of serum amylase level occurs in few cases only. So if the level is more than 1000 units/1OOml it is diagnostic of acute pancreatitis but in levels 600-1000 units/1OOml clinical examination and other investigation like X-ray abdomen, USG, CT abdomen are essential to differentiate perforated peptic ulcer from pancreatitis. Mild elevation in serum amylase can occur in other acute abdomen cases.

## REFERENCES:


1. Elman, R. and McCaughan J.M. The quantitative estimation of blood amylase with the viscosimeter. Arch. Int. Med. 1927; 40: 59-64.
2. Lewison, E.F. Clinical value of serum amylase test. Surg. Gyn. and Obst. 1941: 72: 202-12
3. Wapshaw, H. Serum enzyme changes in perforated peptic ulcer. Lancet 1949; 2: 414-15
4. Egdahl, R. H.: Mechanism of Blood Enzyme Changes Following the Production of Experimental Pancreatitis. Ann. Surg., 148:389, 1958.
5. Elliott, D. WV., R. D. Williams and R. M. Zollinger. The Role of Trypsin and of Bile Salts in the Pathogenesis of Acute Pancreatitis. Surgical Forum, 9:533, 1958.
6. Howard, J. M., A. K. Smith and J. J. Peters: Acute Pancreatitis: Pathways of Enzymes into the Blood Stream. Surgery, 26:161, 1949.
7. Elman, R., A. N. Arneson and E. A. Graham: The Value of Blood Amylase in the Diagnosis of Pancreatic Disease. Arch. Surg., 19:943, 1929.
8. Hiatt, N.: Observations of the Blood Amylase Level in the Dog with Experimentally Produced Simple and Strangulated Obstructions of the Small Intestine. Ann. Surg., 149:77, 1959.
9. Keith, L. M., Jr., R. M. Zollinger and R. S. McCleery: Peritoneal Fluid Amylase Determinations as an Aid in the Diagnosis of Acute Pancreatitis. Arch. Surg., 61:930, 1950.
10. 24. Popper, H. L.: Enzyme Studies in Edema of the Pancreas and Acute Pancreatitis. Surgery, 7:566, 1940.
11. Probstein, J. G., P. A. Wheeler and S. H. Gray: Perforated Peptic Ulcer: Its Differentiation from Acute Pancreatitis by Blood Diastase Determination. J. Lab. Clin. Med., 24:449, 1939.
12. Applebaum, I. L.: Serum Amylase in Mumps. Ann. Int. Med., 21:35, 1944.
13. Pemberton, A. H., J. H. Grindley and J. L. Bollman: Serum Amylase Levels After Acute Perforations of the Duodenum. A Preliminary Report. Proc. Staff Meet. Mayo Clin., 25:5, 1950.
14. Amerson, J. R., J. M. Howard and K. D. J. Vowles: The Amylase Concentration in Serum and Peritoneal Fluid Following Acute Perforation of Gastroduodenal Ulcers. Ann. Surg., 147:245, 1958.
15. Burnett, XV. and T. D. Ness: Serum Amylase and Acute Abdominal Disease. Brit. Med. J., 2:770, 1955.
16. Edmondson, A. A., C. J. Berne, R. E. Homann, Jr. and M. Wertman: Calcium, Potassium, Mlagnesium and Amylase Disturbances in Acute Pancreatitis. Am. J. Med., 12:34, 1952.
17. Polowe, D.: Blood Amylase Activity in Pancreatitis and Other Diseases. A Simple Diagnostic Aid. Surg. Gynec. & Obst., 82: 115, 1946.
18. Wapshaw, H.: Serum Enzyme Changes in Perforated Peptic Ulcer. Lancet, 2:414, 1949.
19. Musgrove, J. E.: Elevated Serum Amylase Levels Associated with Perforated Gastroduodenal Lesions. Proc. Staff. Meet., Mayo Clinic, 25:8, 1950.
20. Mahaffrey, J. H., H. L. Brockman, G. L. Jordan and J. M. Howard: A Study of the Serum Amylase Concentration in Patients with Acute Perforation of Gastroduodenal Ulcers. Surg. Gynec. & Obst., 101:129, 1955.
21. Burnett and Ness, T.D. Serum amylase and acute abdominal diseases. Brit. Med. 1955; 52: 770-72.
22. Hinshaw, D.B. and Murray, G.L. Splenic haemorrhage simulating acute pancreatitis. Surgery 1957; 42: 357- 78.