Original Article

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Surgery Section

Role of Amylase and Lipase Levels in Diagnosis of Blunt Trauma Abdomen

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ABSTRACT

Introduction: Blunt Trauma Abdomen (BTA) is the leading cause of morbidity and mortality amongst all age groups. Spectrum of injury may vary from simple to life threatening multi organ involvement and therefore proper assessment and diagnosis becomes very important.

Aim: To evaluate the role of serum amylase and lipase in diagnosis of blunt trauma abdomen.

Materials and Methods: This study was done on 50 patients with diagnosis of BTA admitted in Dayanand Medical College and Hospital, Ludhiana. Serum amylase and lipase levels were estimated on days 1, 3 and 5 of admission.

Results: Road side accident was the most common aetiology accounting for 40 patients. Thirty one patients were less than 35 years of age and 42 patients were males. Abdominal tenderness was the most common per abdomen finding, found in 31 patients, followed by distension, found in 21 patients. The most common organ injured was liver, seen in 27 patients. Fifteen patients underwent laparotomy while 35 patients were managed conservatively. There was statistically significant rise in serum amylase levels on days 1, 3 and 5 in patients with small and large intestinal injury. There was statistically significant rise in serum lipase levels on days 1, 3 and 5 in patients with stomach injury. Raised levels of serum amylase and lipase had a statistically significant prediction for the need of surgery in these patients.

Conclusion: Serum amylase and lipase levels, when coupled with other laboratory tests and imaging modalities, may have significant role in predicting the site of injury as well as the surgical outcome in patients of BTA.

Keywords: Investigations in trauma, Liver injury, Surgery for trauma

INTRODUCTION

Blunt Trauma Abdominal (BTA) is one of the most common cause of morbidity and mortality in road side accidents. Identification of serious intra-abdominal pathology is often challenging as many injuries may not manifest during the initial assessment and treatment period.

The manifestations may vary from being simple to life threatening injuries, hence accurate diagnosis becomes very crucial in the management. The diagnostic problem is complicated in most cases due to unavailability of accurate information about the nature of trauma.

The role of ultrasonography (USG), Computed Tomography (CT) and Focused Abdominal Sonography for Trauma (FAST) in management of BTA is well established [1-3]. But the role of laboratory tests in the evaluation of these patients is controversial.

In cases of BTA, many causes have been found to cause raised value of serum amylase and lipase levels. Some of these causes can be pancreatic, hollow viscus, bowel, facial and brain injury [4]. The usefulness of serum amylase in cases of management of pancreatic injuries has been studied in detail in the past [5,6]. However, many studies have found these parameters to be neither sensitive nor specific for the diagnosis and management of BTA patients.

AIM

This study was designed to determine the efficacy of amylase and lipase levels in the diagnosis and management of BTA patients.

MATERIALS AND METHODS

A hospital based prospective study was carried out on patients admitted in Dayanand Medical College and Hospital, Ludhiana with clinical diagnosis of Blunt Trauma Abdomen. This study included all the patients admitted in the casuality of the year 2013. Fifty consenting patients with BTA were included in the study. All of these patients were subjected to detailed history, physical examination, routine investigations (haemogram, renal function tests, liver function tests, coagulation profile), serum amylase and lipase levels, ultrasound and CT scan abdomen (wherever clinically indicated). Serum amylase and lipase was evaluated on days 1, 3 and 5 of admission.

We included patients who had a clinical diagnosis of BTA, were haemodynamically stable, who signed the consent form and who did not have any history of trauma in the past 6 months of admission.

Patients with co-morbid conditions such as intestinal obstruction, diabetic ketoacidosis, mesenteric ischemia, acute or chronic cholecystitis or strangulated hernia were excluded from the study. Patients who expired within 24 hours of hospital stay, had a known history of malignancy or who had history of ectopic pregnancy and patients with macroamylesaemia were also excluded from the study. On the basis of physical examination and requisite investigations, patients were either managed conservatively or taken up for surgery. All the findings (peroperative, intra-op and post-op) were recorded. All the data thus collected was compiled and was stastically analysed using chi-square test.

RESULTS

This study was done on 50 consecutive patients of BTA who were admitted through emergency department of Dayanand Medical College and Hospital, Ludhiana, India.

Following observations were made

1) Aetiology: The most common cause of BTA was road side accident followed by fall from height and assault.

2) Age and Sex: Majority of the patients were males in the age group of 25 to 45 years.

3) General Physical findings: Pallor was the most common finding on general examination.

4) Abdominal Findings: Abdominal distention and tenderness were the most common abdominal findings [Table/Fig-1].

5) Serum Amylase level: In this study, raised serum amylase levels were seen in 29 patients on Day 1; in 26 patients on Day 3 and in 18 patients on day 5 [Table/Fig-2].

6) Serum lipase Levels: Serum lipase levels were maximally raised on day 1, seen in 29 patients. The number of patients with abnormally raised levels came down to 27 on day 3 and further down to 23 on day 5 [Table/Fig-3].

7) Intra abdominal organ injured: The most common organ injured was liver (27/50), followed by splenic injury (9/50), gut in (5/50), stomach (3/50) and kidneys (2/50). One patient had dual injury to both liver and pancreas [Table/Fig-4].

8) Type of management: Fifteen patients underwent laparotomy while 35 patients were managed conservatively.

9) Injury grade and serum amylase/ lipase levels: The p-values for injury grade in correlation to serum amylase and lipase levels on day 1, 3 and 5 were more than 0.05, thereby making it statistically insignificant.

Per abdomen findings	No. of patients	Percent
Distention		
Absent	29	58.0
Present	21	42.0
Bruising		
Absent	39	78.0
Present	11	22.0
Rigidity		
Absent	36	72.0
Present	14	28.0
Guarding		
Absent	31	62.0
Present	19	38.0
Tenderness		
Absent	19	38.0
Present	31	62.0
Ascites		
Absent	50	100.0
Present	-	-
Bowel sounds		
Absent	9	18.0
Present	41	82.0

[Table/Fig-1]: Distribution of subjects on the basis of per abdomen findings.

	No. of patients	Percent
Amylase Day 1		
Abnormal	29	58.0
Normal	21	42.0
Total	50	100.0
Amylase Day 3		
Abnormal	26	52.0
Normal	24	48.0
Total	50	100.0
Amylase Day 5		
Abnormal	18	36.0
Normal	32	64.0
Total	50	100.0

[Table/Fig-2]: Serum amylase levels.

	No. of patients	Percent
Lipase Day 1		
Abnormal	29	58.0
Normal	21	42.0
Total	50	100.0
Lipase Day 3		
Abnormal	27	54.0
Normal	23	46.0
Total	50	100.0
Lipase Day 5		
Abnormal	23	46.0
Normal	27	54.0
Total	50	100.0

[Table/Fig-3]: Serum Lipase Levels.

Organ	No. of patients	Percent
Bladder	1	2.0
Diaphragm	2	4.0
Gut	5	10.0
Liver	27	54.0
Liver and Pancreatic	1	2.0
Mesentry	1	2.0
Omentum	1	2.0
Renal	2	4.0
Spleen	9	18.0
Stomach	1	2.0
Total	50	100.0

[Table/Fig-4]: Intra Abdominal Organ Injured.

10) Organ specific amylase level: In this study there was statistically significant rise in serum amylase levels on days 1, 3 and 5 in patients with intestinal injury. For all other intra-abdominal organ injuries there was no statistically significant rise in amylase levels. In case of injury to the omentum, the value of amylase was found to be abnormal only on day 1 and 3 of examination. However, on day 5, the value of amylase came down to normal. Out of the 9 cases of splenic injury, abnormal values of serum amylase and lipase were found in 4 patients on day 1 and 3 of examination. However, on day 5, the abnormal value was found only in 3 of these 9 patients [Table/Fig-5a].

11) Organ specific lipase level: In this study there was statistically significant rise in serum lipase levels on days 1, 3 and 5 in patients with stomach injury. For all other intra-abdominal organ injuries there was no statistically significant rise in lipase levels. Serum lipase was found to be abnormal in cases of injury to pancreas, mesentry and omentum on all the days of examination. In cases of splenic injury, the raised value of lipase was found in 6 out of the 9 patients on day 1 and 3 of examination. On day 5 of examination, the raised values were seen in only 4 patients [Table/Fig-5b].

12) Role of amylase and lipase in predicting surgical outcomes: Of the 50 patients enrolled in this study, 15 patients underwent surgery. Of these 15 patients, 13 patients had raised amylase levels on day 1 and 13 and 11 patients had raised levels on day 5. The p-value was <0.05 on all these three days of estimation [Table/Fig-6a]. Of the 15 patients, 12 had abnormal lipase levels on day 1 and 5 and 11 had abnormal lipase levels on day 3. The p-value was <0.05 on all these 3 days of estimation, thus making it stastically significant [Table/Fig-6b].

DISCUSSION

The rise in the incidence of Blunt Trauma Abdomen has led to the search for newer modalities that would help in early diagnosis

Injury Organ	Amylase Day 1					Amylase Day 3					Amylase Day 5				
	Abnormal		Normal		P-value	Abnormal		Normal		P-value	Abnormal		Normal		P-value
	No.	%age	No.	%age		No.	%age	No.	%age		No.	%age	No.	%age	
Bladder	1	3.45	0	0.00	0.061	0	0.00	1	4.17	0.039	0	0.00	1	3.13	0.075
Gut	5	17.24	0	0.00	< 0.001	5	19.23	0	0.00	< 0.001	4	22.22	1	3.13	<0.001
Liver	13	44.83	14	66.67	0.002	12	46.15	15	62.50	0.020	7	38.89	20	62.50	0.001
Liver, Pancreatic	1	3.45	0	0.00	0.061	1	3.85	0	0.00	0.048	1	5.56	0	0.00	0.017
Mesentric	1	3.45	0	0.00	0.061	1	3.85	0	0.00	0.048	1	5.56	0	0.00	0.017
Omental	1	3.45	0	0.00	0.061	1	3.85	0	0.00	0.048	0	0.00	1	3.13	0.075
Renal	1	3.45	1	4.76	0.641	0	0.00	2	8.33	0.003	0	0.00	2	6.25	0.011
Spleen	4	13.79	5	23.81	0.070	4	15.38	5	20.83	0.317	3	16.67	6	18.75	0.700
Stomach	2	6.90	1	4.80	0.527	2	7.70	1	4.20	0.295	3	10.30	0	0.00	0.001

[Table/Fig-5a]: Injury organ -Amylase levels.

Injury Organ	Lipase Day 1					Lipase Day 3					Lipase Day 5				
	Abnormal		Normal		P-value	Abnormal		Normal		P-value	Abnormal		Normal		P-value
	No.	%age	No.	%age		No.	%age	No.	%age		No.	%age	No.	%age	
Bladder	0	0.00	1	4.76	0.027	0	0.00	1	4.35	0.035	0	0.00	1	3.70	0.052
Gut	4	13.79	1	4.76	0.028	3	11.11	2	8.70	0.568	4	17.39	1	3.70	<0.002
Liver	11	37.93	16	76.19	<0.001	11	40.74	16	69.57	<0.001	9	39.13	18	66.67	<0.001
Liver, Pancreatic	1	3.45	0	0.00	0.061	1	3.70	0	0.00	0.052	1	4.35	0	0.00	0.035
Mesentric	1	3.45	0	0.00	0.061	1	3.70	0	0.00	0.052	1	4.35	0	0.00	0.035
Omental	1	3.45	0	0.00	0.061	1	3.70	0	0.00	0.052	1	4.35	0	0.00	0.035
Renal	2	6.90	0	0.00	0.008	1	3.70	1	4.35	0.815	0	0.00	2	7.41	0.006
Spleen	6	20.69	3	14.29	0.236	6	22.22	3	13.04	0.103	4	17.39	5	18.52	0.835
Stomach	3	10.30	0	0.00	0.001	3	11.50	0	0.00	<0.001	3	13.00	0	0.00	<0.001

[Table/Fig-5b]: Injury organ -Lipase.

Injury Organ	Amylase Day 1				Amylase Day 3				Amylase Day 5				Total	
	Abnormal		Normal		Abnormal		Normal		Abnormal		Normal			
	No.	%age	No.	%age	No.	%age	No.	%age	No.	%age	No.	%age	No.	%age
Conservative	16	55.17	19	90.48	13	50.00	22	91.67	7	38.89	28	87.50	35	70.00
Surgery	13	44.83	2	9.52	13	50.00	2	8.33	11	61.11	4	12.50	15	30.00
Total	29	100.00	21	100.00	26	100.00	24	100.00	18	100.00	32	100.00	50	100.00
p-value	0.007				0.001				0.000					

[Table/Fig-6a]: Surgery Vs Conservative - Amylase level.

Injury Organ	Lipase Day 1				Lipase Day 3				Lipase Day 5				Total	
	Abnormal		Normal		Abnormal		Normal		Abnormal		Normal			
	No.	%age	No.	%age	No.	%age	No.	%age	No.	%age	No.	%age	No.	%age
Conservative	17	58.62	18	85.71	15	57.7	20	83.30	11	47.83	24	88.89	35	70.00
Surgery	12	41.38	3	14.29	11	42.3	4	16.7	12	52.17	3	11.11	15	30.00
Total	29	100.00	21	100.00	26	100.00	24	100.00	23	100.00	27	100.00	50	100.00
p-value	0.039				0.048				0.002					

[Table/Fig-6b]: Surgery vs conservative - Lipase levels.

and management of these patients. The role of isoenzymes, as a biochemical marker for establishing the diagnosis of BTA and in further establishing the intra abdominal injuries has always been a topic of discussion. The results have been equivocal.

In this study, serial examination of serum amylase and lipase was done on days 1, 3 and 5 of admission on patients who presented with blunt trauma abdomen. The data obtained was evaluated and following observations were made.

In this study, roadside accident was the most common mode of injury. Studies by Isenhour JL Marx J, also reported motor vehicle collisions to be the most common cause (75% cases) of BTA [7].

A 62% patient was in the age group of 15-35 years and 84% of the patients were males. Lone et al., in their series also reported a male preponderance with a ratio of 4.4:1 [8]. Baradaran H et al., have also reported young males, most of all those aged 20-30 years, to be the most frequent victims [9].

Earlier studies have proved the role of amylase/lipase as a screening diagnostic tool for diagnosis of acute pancreatitis. However, sparse literature is available on the role of amylase level in serum to help predict specific intra abdominal extra pancreatic injuries after BTA [10]. Takishima T et al., and Mayer et al., have advocated the significance of serum amylase in pancreatic injury specifically [6,11]. In this study, serum amylase was raised in 58% of patients on day 1, 52% on day 3 and 36% of the patients on day 5. Serum lipase was raised in 58% of patients on day 1, 54% on day 3 and 46% on day 5. Our results were consistent with the results of Farkouh E et al., who found that in 101 patients with abdominal

trauma, 25 patients had hyperamylesaemia [12]. Similarly, Lott et al., also suggested elevation of both serum amylase and lipase to be indicators of intra abdominal injury [13]. Buechter KJ et al., in their study on 85 consecutive blunt abdominal trauma patients also found elevated amylase and lipase levels, though; they did not find it to be clinically useful tool [14].

In this study there was statistically significant rise in serum amylase levels on days 1, 3 and 5 with regards to involvement of small and large intestine. There was significant rise in serum lipase levels on day 1, 3 and 5 with regards to involvement of stomach. Mahajan A et al., found statistically significant elevated serum amylase levels in cases of bowel injuries [15]. Boulanger et al., reported, in their analysis of 4316 patients with blunt trauma, that hyperamylesaemia was significantly associated with a greater injury, severity score and death rate, as well as with increased incidence of brain injury, pancreatic and hollow viscus injuries, and hypotension [16]. Cynthia Blank Reid, RN et al., in their study on abdominal trauma found that serum lipase levels, when persistently elevated, might indicate injury to the bowel [17].

In this study there were statistically significant correlation in the patients who had raised serum amylase and lipase levels and those undergoing surgery. Studies have been done on correlation between serum amylase/lipase and intra abdominal injury, but raised levels as predictors of laparotomy is a new and significant finding of this study.

CONCLUSION

We conclude that serum amylase and lipase levels, when coupled with other laboratory tests and imaging modalities, may have significant role in predicting the site of injury as well as the surgical outcome in patients. The raised levels of serum amylase and lipase levels may be indicator for the need of surgery in this subset of patients and hence the need for more intensive and thorough investigations. However, a study with greater sample size is required to further ascertain the role of amylase and lipase in the diagnosis of BTA patients.

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