ISSN: 2581 – 3633
PubMed - National Library of Medicine - ID: 101745081

International Journal of Medical Science and Advanced Clinical Research (IJMACR)

Available Online at:www.ijmacr.com

Volume – 6, Issue – 2, April - 2023, Page No. : 548 - 553

Evaluation of role of hepatic transaminases as predictors of severity of liver injury following blunt trauma abdomen.

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How to citation this article: Dr. Shirisha V, Dr. Kemparaj T, Dr. Dileep C, "Evaluation of role of hepatic transaminases as predictors of severity of liver injury following blunt trauma abdomen", IJMACR- April - 2023, Volume – 6, Issue - 2, P. No. 548 – 553.

Type of Publication: Original Research Article

Conflicts of Interest: Nil

Abstract

Introduction: Blunt Abdominal trauma (BAT) cases are commonly encountered in emergency with liver being second most commonly injured organ following spleen. It is associated with significant morbidity and mortality. CT scan is considered as gold standard for diagnosis but it is not easily accessible, expensive, challenging in hemodynamically unstable patients. Hence AST and ALT are easily available laboratory markers which helps surgeon to suspect liver injury and also it's severity.

Materials and methods: A prospective observational study of 90 patients was conducted in hospitals attached to BMCRI. All patients underwent blood investigations and CT scan except hemodynamically unstable patients who underwent laparotomy. After assessment patients are classified in two groups with or without liver injury.

Results: According to the ROC curve, the optimum cut-off values for AST and ALT are 63.50 and 59.50 respectively. ALT has highest value of area under the curve 0.978 than AST 0.961. Sensitivity and specificity of the AST is 91.18% & 92.86% and of ALT is 100% & 89.29% respectively.

Conclusion: Liver enzymes successfully predict liver injury and also its severity with ALT being more sensitive than AST. These markers may make extremely valuable tool in the work up of patients with BAT, especially in remote areas for early referral and timely management of patients.

Keywords: BAT- Blunt trauma abdomen, AST- Aspartate trans aminase, ALT- Alanine trans aminase, ROC curve-Receiver operating characteristic curve, CT- Computed tomography.

Introduction

Blunt Abdominal trauma (BAT) cases are commonly encountered in trauma care center. Liver is the second most commonly injured organ following spleen [3].

Among the mode of injury road traffic accidents dominates which can lead to injury to both solid organ and hollow viscus injuries. Other causes for BAT being fall from height, crush injury and physical assault [2]

Blunt liver injuries can be minor contusions or major lacerations or avulsions and is associated with signifi cant morbidity and mortality. The clinical diagnosis of liver injury in patients with BAT is major challenge for trauma surgeons. FAST is easily available and portable but has low sensitivity in diagnosing liver injury as it is user- dependent [4].

CT is considered as the gold standard as it also helps in assessing grades of liver injury and other associated organ injuries [5]. As CT scan is not easily accessible, expensive to be used as screening tool. It is challenging to maintain the hemodynamic stability of the patient in CT scan suite and transportation. Hepatic transaminases are easily available laboratory markers. Study of these can provide valuable guidance to emergency surgeon to suspect liver injury, and also its severity.

Materials and methods

A prospective observational study of 90 patients was conducted in hospitals attached to BMCRI from August 2021 to July 2022.

➢History, vitals at admission were recorded.

➢Blood samples taken for Hematocrit and LFT.

➢All patients underwent CT scan except hemo dynamically unstable patients who underwent Emer gency laparotomy

➢All patients with BAT are assessed for liver and other associated injuries based on imaging and intraoperative findings

➢Patients are divided into two groups -

group A: with liver injury

group B: without liver injury

Patients with liver injury grading is done by CT scan or intraoperative findings.

Inclusion Criteria

1. Age above 18 years
2. Patients willing to give informed consent.
3. Patients with history of blunt injury to abdomen received at emergency department in hospitals attached to BMCRI, Bangalore.

Exclusion Criteria

1. Age below 18 years
2. Patients not ready to give informed consent.
3. Patients with known liver diseases
4. Patients positive for hepatitis B and hepatitis C antigen
5. Patients whose blood investigations not done within 24hrs of admission.

Statistical analysis

The collected data was analysed using SPSS software, ver.20.

1) Since KMO test value is < 0.05, the data was not normally distributed.

2) KRUSKAL WALLIS TEST was used for comparing mean values of grading of liver injury.

3) Chi-square test was used to compare categorical variables.

4) ROC was performed to evaluate the performance of AST A& ALT tests, & to make decision about the cut off points.

Results

Out of 90 patients with blunt trauma abdomen 83% were males and 17% were females (table 2). 34 patients had liver injury and rest 56 patients had no liver injury (table 3).

Majority of the patients with liver injury belonged to grade I (15.6%) and grade II (12.2%). Grade IV (2.2) and V (1.1) injuries were rare in occurrence (table 4). AST levels in patients with liver injury range from 48(grade I) to 1633(grade V). AST elevation correlates with the severity of liver injury which is statistically significant (table 6).

ALT levels in patients with liver injury following BAT range from 62(grade I) to 1784(grade V). P value is <0.001, hence there is statistically significant difference between gradings of liver injury and mean ALT values (table 7). ROC curves are plotted to estimate the optimum cutoff values of AST and ALT (graph. The optimum cutoff values of AST and ALT are 63.50 &59.5 respectively. Based on these values the liver injury is cross tabulated. AST levels above 63.5 and ALT levels more than 59.5 is taken as positive.

ALT has highest value of AUC (area under curve-.978) than AST (0.961). Sensitivity and specificity of the ALT test was 100% and 82.29% respectively (table 10).

Discussion

Liver is the second most commonly injured organ following spleen in blunt trauma abdomen cases. Road traffic accidents are dominant mode of injury. Blunt liver injury spectrum includes minor contusions to major lacerations or avulsions.

FAST is portable and easily available but has low sensitivity and is user dependent. CT scan is considered as gold standard in diagnosing liver injuries but as it is expensive, not easily available in remote areas and challenging to carry out in hemodynamically unstable patients. Hepatic transaminases are easily available, cost-effective laboratory markers and can bev carried out even in remote areas. Study of these enzymes provide valuable guidance to treating surgeon to suspect liver injury and also predict its severity.

In our study, the significance of elevation of liver enzymes in patients encountering blunt trauma abdomen with or without liver injury. Our study concluded that raised liver enzymes successfully predict liver injury in stable patients. These laboratory markers can be used as a guide in working up of patients with BAT, especially in remote areas for early referral and timely management of patients. Sensitivity and specificity of the ALT test was 100% and 82.29% respectively.

Conclusion

The present study supports the hypothesis that raised liver enzymes successfully predict liver injury in stable pat. ALT has higher sensitivity when compared to AST. Higher levels of transaminases, following blunt trauma abdomen may also suggest a higher- grade of liver injury.

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Legend Tables

Table 1

Age distribution (Years)				
N (Frequency)	Minimum	Maximum	Mean	Std. Deviation
90	19	80	35.11	12.399

Table 2

Gender distribution			
		Frequency	Percent
Valid	Male	75	83.3
	Female	15	16.7
	Total	90	100.0

Table 3

Frequency of liver injury			
		Frequency	Percent
Liver injury	NO	56	62.2
	YES	34	37.8
	Total	90	100.0

Table 4

Grading of liver injury			
		Frequency	Percent
Grading	1	14	15.6
	2	11	12.2
	3	6	6.7
	4	2	2.2
	5	1	1.1
	Total	34	37.8

Table 5

Overall ast & alt levels		
	N (Frequency)	Median (IQR)
AST	90	53.33 (25.67 – 154.67)
ALT	90	50.67 (26.67 – 186)

*P < 0.001 which is < 0.05 hence there is statistically significant difference mean AST values within and between gradings of liver injury.

Table 6

AST elevation correlated with severity of liver injury						
Grading	N	Mean	Std. Deviation	Std. Error	Minimum	Maximum
No injury	56	41.23	41.585	5.557	-	-
1	14	110.07	59.731	15.964	48	254
2	11	226.18	69.659	21.003	118	336
3	6	431.67	164.674	67.228	286	708
4	2	1245.000	417.193	295.000	950	1540
5	1	1633.00	-	-	1633	1633

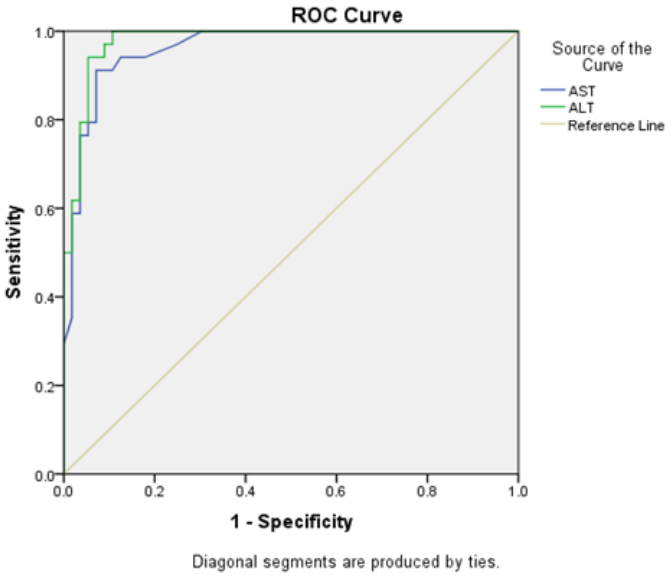
*P < 0.001 which is < 0.05 hence there is statistically significant difference mean ALT values within and between gradings of liver injury.

Table 7

ALT elevation correlated with severity of liver injury						
Grading	N	Mean	Std. Deviation	Std. Error	Minimum	Maximum
No injury	56	40.25	38.415	5.133	-	-
1	14	120.36	45.689	12.211	62	208
2	11	268.27	63.652	19.192	156	369
3	6	494.6	208.95	85.30	302	896

		7	3	5		
4	2	1565.00	445.477	315.000	1250	1880
5	1	1784.00	-	-	1784	1784

Graph 1



Parameters	AST	ALT
	% (95% CI)	% (95% CI)
Sensitivity	91.18% (76.32% - 98.14%)	100% (89.72%-100.00%)
Specificity	92.86% (82.71% - 98.02%)	89.29% (78.12% - 95.97%)
Positive Predictive Value	88.57% (74.98% to 95.25%)	85% (72.68% - 92.35%)
Negative Predictive Value	94.55% (85.44% to 98.08%)	100%

Table 8

AST * LIVER INJURY Crosstabulation				
		Liver injury		
		NO	YES	Total
AST	Negative	52	3	55
	Positive	4	31	35
Total		56	34	90

Table 9

ALT * liver injury Crosstabulation				
		Liver injury		
		NO	YES	Total
ALT	Negative	50	0	55
	Positive	6	34	35
Total		56	34	90

Table 10