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ORIGINAL ARTICLE

Value of AST/ALT Ratio in Pediatric Liver Trauma

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ABSTRACT

This study was aimed to determine the utility of aspartate aminotransferase and alanine aminotransferase ratio (AST/ALT ratio) in first 48 hours of injury, in children with liver trauma.

The study was conducted in a prospective observational series of children younger than 15 years who had sustained blunt abdominal trauma. Children who were at risk of intra-abdominal trauma, were examined by physicians at Emergency Department of the Hospital and underwent standardized laboratory testing. From January 2004 to January 2008, 104 children presenting to the Emergency Department of General Hospital "Georgios Gennimatas" of Thessaloniki, for suspected physical abuse were prospectively entered in the study. All the children underwent complete history taking, physical examination and various laboratory investigations like white blood cell/hematocrit/platelets, aspartate aminotransferase, alanine aminotransferase, amylase and urinalysis.

104 children suffered intra-abdominal injuries and 20 had liver trauma. Transaminasemia correlated with liver injury when $AST > 200$, $ALT > 150$ and AST/ALT ratio > 1 .

AST/ALT ratio can be used as a predictor for diagnosis of liver trauma and as a marker for response in nonoperative treatment-resuscitation.

Key Words

AST/ALT Ratio, Liver Trauma, Children

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Introduction

Blunt abdominal trauma is a common cause of multiple injuries in children and approximately 80% have internal injuries without any physical findings[1]. In blunt abdominal trauma, the organs most frequently involved are spleen, liver and kidney.

To assess the utility of serum aspartate aminotransferase/alanine aminotransferase (AST/ALT) ratio in a group of children with blunt abdominal trauma; we analyzed charts of 104 haemodynamically stable children with blunt abdominal trauma.

Patients and Methods

We analyzed the charts of 104 haemodynamically stable children with blunt abdominal trauma, who had been referred to the Emergency department between January 2004 and January 2008. The study population included 20 children with liver trauma, 18 children with blunt abdominal trauma and radiological evidence of abdominal organ injury; and 66 children with blunt abdominal trauma but without radiological evidence of organ injury.

All patients underwent complete history taking, physical examination and laboratory tests including white blood cell/hematocrit/platelets, aspartate aminotransferase, alanine aminotransferase, amylase and urinalysis.

AST and ALT activity concentrations were measured simultaneously in serum of each patient at the time of initial presentation and at 12 hours, 24 hours and 48 hours after admission (normal values of AST < 48 U/I and ALT < 37 U/I).

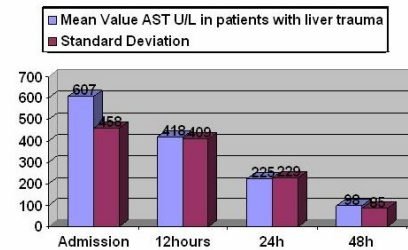
All children were evaluated ultrasonographically and CT scan was applied to children with ultrasound pathology.

Statistical analyses were performed by Systat statistical software. All data were presented as the mean \pm S.D.

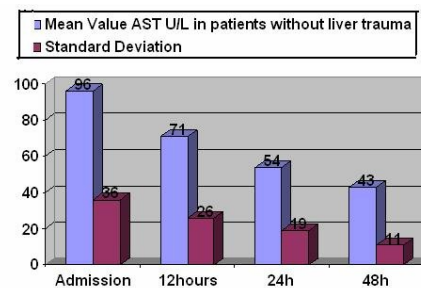
Results

104 haemodynamically stable children were investigated in the study, 68 children were males (65, 3%) and 36 were females (34, 7%). There ages averaged from 10 months to 14 years (mean age 7.08 years). In all the patients included in the study, physical findings of abdominal trauma were present. AST and ALT levels in patients with liver trauma (n=20) on admission were 607 \pm 458 (221-2206) and 387 \pm 210 (166-985) respectively, whereas AST (>48 U/I) levels in children without liver trauma (n=26) on admission were 96 \pm 36 (51-190) and ALT (>37 U/L) levels (n=24) were 78 \pm 34 (38-177). There was a significant difference between AST and

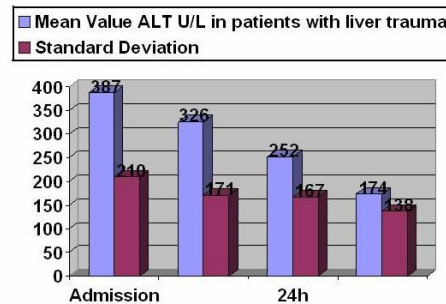
ALT levels taken on admission, at 12 h, 24 h and 48 h after admission in children with liver trauma [Table/Fig 1], [Table/Fig 3] and without liver trauma [Table/Fig 2], [Table/Fig 4].



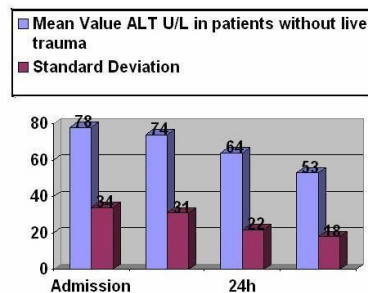
(Table/Fig 1) Mean Value AST U/L In Patients With Liver Trauma.



(Table/Fig 2) Mean Value AST U/L (AST > 48 U/L) In Patients Without Liver Trauma.

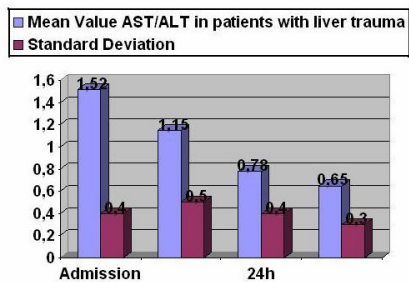


(Table/Fig 3) Mean Value ALT U/L In Patients With Liver Trauma.



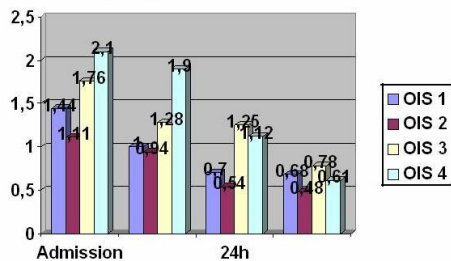
(Table/Fig 4) Mean Value ALT > 37 U/L In Patients Without Liver Trauma.

AST/ALT ratio in patients with liver trauma (n=20) was >1 on admission, except in one child (AST/ALT=0.8) where the admission took place 4 hours after injury. The AST/ALT ratio was more frequently <1 at 12 h, 24 h and 48 h after admission, [Table/Fig 5] with a significant correlation between Organ Injury Score and AST/ALT ratio [Table/Fig.6].



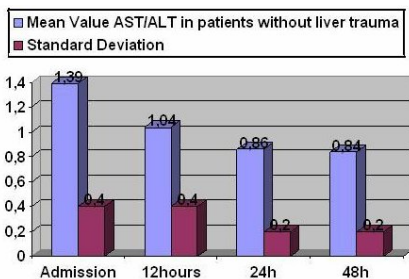
(Table/Fig 5) Mean Value AST/ALT Ratio In Patients With Liver Trauma.

Correlation between Organ Injury Score (OIS) and AST/ALT ratio



(Table/Fig 6) Correlation Between Organ Injury Score (Liver Injury Scale Classification According To The American Association For The Surgery Of Trauma) And AST/ALT Ratio.

AST/ALT ratio (AST >48 U/L and ALT >37 U/L) in children with abdominal trauma but without liver trauma was observed to be less than 1.5 on admission [Table/Fig 7].



(Table/Fig 7) Mean Value AST/ALT Ratio In Patients Without Liver Trauma.

Discussion

Blunt abdominal trauma is a life-threatening event that is common in children. After such a trauma in child, the physical examination is not reliable enough to determine whether the patient suffers from an intra-abdominal organ lesion or not[2],[3],[4]. Abdominal CT scan has been proven as a valuable diagnostic tool for evaluating intra-abdominal injury but is irradiating, expensive and may require general anesthesia to avoid movements by the patient [1], [2]. However biochemical tests are relatively rapid, cost effective and radiation free means of excluding abdominal injury[1].

The present study demonstrates the utility of calculating and following serially not only the serum AST, ALT but also the serum AST/ALT ratio, in children with liver trauma.

Some authors have suggested that liver function tests (LFTs) on admission, could per se discriminate between presence and absence of significant liver lesions. No one has yet reported AST/ALT ratio and the time from injury to admission. Oldham et al in their study, detected liver injury in 19 of 100 consecutive children with suspected major blunt trauma and they suggest that AST above 200U/I and ALT above 100U/I would reflect severe liver injury [5]. Hennes et al reported that liver injury is uncommon when AST is below 450U/I and ALT is below 250U/I [6]. Similar studies have also described cut-off values of 400 U/I for AST and 250U/I for ALT [1],[7],[8],[9]. Karam et al in the most recent study have reported two patients with liver trauma and AST as low as 95 and 92 and ALT 80 and 86 U/I [2]. We can easily observe here that the two patients have AST/ALT ratio >1.

Conclusion

We believe that the use of a ratio bypasses the problems related to interpretation of different aminotransferase cut-off values but only in haemodynamically stable children.

The ratio between AST and ALT has also been found to be a useful indicator of hepatic disease in adults and infants with chronic liver disorders [10],[11],[12],[13]. We suggest that children at risk for these injuries could be identified prospectively with accuracy within minutes of arrival by simple determination of standard serum liver function tests like AST, ALT and AST/ALT ratio less as a diagnostic marker and more as a prognostic factor in liver trauma. The AST/ALT ratio appears to be an easy and early prognostic indicator for children with liver trauma.

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