

## Role of Ultrasound in Outcome of Blunt Abdominal Trauma

KHALID MAHMOOD CHEEMA\*, MUHAMMAD TOUSEEF ASGHAR\*\*, SHAHID MAHMOOD\*\*, ABDUL BASIT SAEED\*\*

### ABSTRACT

**Objective:** The main objective of this study was to evaluate the accuracy of abdominal ultrasonography in blunt trauma victims and to determine its sensitivity and specificity in such patients.

**Place & duration of study:** Emergency Department, Services Hospital, Lahore from 1<sup>st</sup> January 2008 till 31<sup>st</sup> December 2008

**Study design:** Descriptive cross sectional study.

**Conclusion:** Following blunt trauma abdomen timely availability of ultrasonography can make the diagnosis and operative decision quicker in most of the cases. Haemodynamically unstable patients should be operated early to prevent morbidity and mortality. Ultrasound should be made available round the clock in surgical emergency to facilitate decision making regarding exploration.

**Keywords:** Blunt trauma abdomen, ultrasound, FAST (focused assessment with sonography in trauma)

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### INTRODUCTION

Trauma is a major cause of morbidity and mortality worldwide. Incidence of blunt trauma is increasing because of increased automobile and motorcycle accident rate<sup>1,2</sup>. There are different diagnostic modalities in blunt injuries of abdomen including plain abdominal X-rays, ultrasound, MRI and computerized axial tomography. Abdominal ultrasound during the past two decades has achieved a primary role in investigation of trauma<sup>3-6</sup>. This technique is portable, non-invasive, simple and cost effective<sup>7,8</sup>. Ultrasound can detect intraperitoneal fluid that requires further evaluation and possible laparotomy<sup>9,10,11</sup>.

With the introduction of second generation ultrasound contrast agents, contrast-enhanced ultrasound (CEUS) has become available as an adjunct to the conventional FAST (focused assessment with sonography in trauma). Results from several controlled studies indicate excellent diagnostic accuracy of CEUS for the exclusion of clinically relevant parenchymal injuries. Particularly in younger, hemodynamically stable patients this technique could contribute to a reliable exclusion of parenchymal injuries without the use of ionizing radiation<sup>12</sup>. As far as North America and Western Europe is concerned, lot of studies are emphasizing the role of contrast enhanced computerized Scan (CT). CT scanners have evolved to yield rapid, highly sensitive images, revolutionizing trauma

management protocols<sup>13</sup>. Another aspect blunt abdominal trauma is pancreatic injury. Physical examination as well as serum amylase is not diagnostic following blunt trauma. Computed tomography (CT) scan can delineate the injury or transaction of the pancreas more accurately as compared to other diagnostic modalities<sup>14</sup>.

### PATIENTS AND METHODS

This study was carried out on patients sustaining blunt trauma abdomen presenting in emergency department of surgical unit II of Services Hospital, Lahore from 1<sup>st</sup> January 2008 till 31<sup>st</sup> December 2008. After taking written consent from all the patients or their relatives, hundred patients were included in the study. Permission from the ethical committee of the hospital was taken. Data was subjected to statistical analysis. Mean time interval for a diagnostic ultrasound was recorded. In stable patients with inconclusive ultrasonography, computerized tomography was done. Clinical course, operative findings and examinations were recorded.

All patients presented with blunt abdominal trauma in the emergency department of surgical unit II of Services Hospital were included. Patients below the age of twelve years were excluded from the study. Similarly patients with penetrating abdominal trauma were also shifted to operation theatre without ultrasound.

### RESULTS

Total one hundred patients met the inclusion criteria for the study. Ninety patients were males and ten females. Eighty patients were below forty years of

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\*Assistant Professor Surgery, King Edward medical University, Lahore.

\*\*Department of Surgery, Shalimar Medical & Dental College Lahore.

Correspondence Dr. Khalid Mahmood Cheema, 03219443633. E mail. kayceesfh@yahoo.com

age. Seventy of the patients were laborers. Mode of injury was Road Traffic Accident in eighty patients. Investigations showed that forty four patients had hemoglobin below 10g/dl. Sixteen patients had radiographic evidence of pneumoperitoneum which were operated without ultrasound examination. Seventy five patients had free intraperitoneal fluid on abdominal ultrasound. Out of these sixty eight patients underwent exploratory laparotomy. All these patients who were operated on the basis of ultrasound findings had positive findings per operatively.

Table showing pattern of injury.

Total no. showing free fluid	75
Liver	60
Intestine	10
Spleen	5
Pancreas	2
Mesentery	26
More than one organ	12

Two patients with fluid in RHC and stable vitals were managed conservatively. In our study, Ultrasound Abdomen was found to have positive predictive value of 100%. Remaining thirty patients without free fluid on the ultrasound were managed conservatively. All of these remained stable and discharge after one to two days.

**DISCUSSION**

Trauma, a disease of young remains a challenge with significant morbidity and mortality. Incidence of blunt trauma is increasing because of more road traffic accidents<sup>2</sup>. Trauma effects more people at younger age group<sup>2,3,4</sup>. In our study 80% of patients were between 21-40 years. Worldwide, males consistently sustain higher death rates. Possible explanations of the greater burden seen among males may include higher levels of risk-taking behaviors and hazards within occupations. Our study shows that 90% of the patients involved in blunt injury abdomen were males<sup>15</sup>.

Our study shows that 80% of the patients presented with blunt injury abdomen had road traffic accident. There is variation in the results of international studies. One study shows that 60% of patients sustaining blunt injury abdomen were due to road traffic accidents<sup>16</sup>.

In our study ultrasonographic demonstration of free fluid shows 92.7% sensitivity, 100% specificity, 100% positive predictive value and 93.75% negative predictive values. Richards et al<sup>11</sup> reported 60% sensitivity, 98% specificity, 82% positive predictive value and 98% negative predictive value for diagnosing intra abdominal injury. In blunt trauma

early laparotomy has been recommended because the finding of more than trace amount of free fluid in absence of solid organ injury is associated with clinically significant visceral injury<sup>11</sup>. The value of ultrasound is limited by large percentage of organ injuries that are not associated with free fluid<sup>9</sup>. For splenic injuries sensitivity was 90% and specificity 100%. Another study proved the accuracy of ultrasonography was 94.2%, with 91.9% sensitivity, 96% specificity, and 94.9% predictive value<sup>17</sup>. 1% of our patients had free fluid without any evidence of visceral injury and managed conservatively. Other studies also confirmed the association of free fluid with blunt injury abdomen without any visceral damage in the range of 2 to 3%<sup>18,19</sup>.

FAST is useful as the initial diagnostic tool for abdominal trauma to detect intra abdominal fluid. With proper training and understanding the limitations of ultrasound, the results of FAST can be optimized. DPL is indicated to diagnose suspected internal abdominal injury when ultrasound machine is not available, there is no trained person to perform FAST, or the results of FAST are equivocal or difficult to interpret in a hemodynamically unstable patient. In contrast, in hemodynamically stable patients the diagnostic modality of choice is CT with intravenous contrast. It is useful to detect free air and intraperitoneal fluid, delineate the extent of solid organ injury, detect retroperitoneal injuries, and help in the decision for conservative treatment<sup>20</sup>.

**CONCLUSION**

Following blunt trauma abdomen timely availability of ultrasonography can make the diagnosis and operative decision quicker in most of the cases. Haemodynamically unstable patients should be operated early to prevent morbidity and mortality. Ultrasound should be made available round the clock in surgical emergency to facilitate decision making regarding exploration.

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