Pak J Med Res
Vol. 55, No. 2, 2016

Original Article

Efficacy & Accuracy of Focused Assessment Sonography for Trauma (FAST) in Management of Isolated Gastrointestinal Injury due to Blunt Abdominal Trauma

Akhtar Hussain Phul[1], Azhar Ali Shah[2], Nosheen[1], Imamuddin Baloch[2]
Department of Radiology[1], Department of Surgery[2], Shaheed Mohtarma Benazir Bhutto Medical University, Larkana.

Abstract

Objective: To determine the diagnostic accuracy of Focused Assessment Sonography for Trauma (FAST) in patients having isolated gastrointestinal injury due to blunt abdominal trauma.
Study design, settings and duration: Prospective, interventional study was done in department of General Surgery & Diagnostic Radiology, Shaheed Mohtarma Benazir Bhutto Medical University, Larkana from July 2012 to June 2014.
Materials and Methods: All patients who came with blunt abdominal trauma underwent emergency ultrasound with FAST technique to detect free fluid/ collection in abdominal cavity as an indicator of intra-abdominal organ injury. After ultrasound examination, most patients underwent surgical laparotomy to identify the gut and solid organ injury and were managed accordingly. The surgical findings were compared with ultrasound findings to see the correlation.
Results: A total of 317 patients with blunt abdominal trauma underwent emergency US with FAST technique. Out of these, 296 (93.37%) underwent exploratory laparotomy. During surgery, 52 (17.56%) patients had evidence of bowel injury with 38 (12.83%) having solid organ injury plus bowel injury and 14 (4.72%) having only bowel injury. Amongst them, FAST ultrasound showed free fluid/ collection in 28 (53.8%) patients (true positive) while it was negative in 24 (46.15%) patients (false negative). Among these, 24 patients with negative FAST, 15 (62.5%) had both solid organ injury plus bowel injury and 09 (37.5%) had only bowel injury (False negative).
Conclusion: FAST ultrasound missed 46% bowel injury with or without other solid organ injury and is therefore not reliable in diagnostic tool for assessing isolated bowel injury due to blunt abdominal trauma.
Key words: Blunt abdominal trauma, gastrointestinal injury, FAST.

Introduction

Trauma is the most common cause of mortality in 1-45 years age group.[1,2] Ultrasonography (US) especially Focused Assessment Sonography for Trauma (FAST) is mostly used as the first method of screening patients with blunt abdominal trauma.[2-5] Previously, it was believed that it was rare to see false-negative results when screening with US (1%),[6,7] but recently the utility of FAST in blunt abdominal trauma has been questioned.[8] Evaluation of blunt abdominal trauma with FAST usually leads to under diagnosis in some abdominal injuries such as gastrointestinal, vascular injuries, diaphragmatic rupture & retroperitoneal (pancreatic and adrenal) injuries that may have a negative impact on the patients outcome.[9] FAST therefore, has been reported to be of less value in detection of bowel and mesenteric injuries where patient invariably undergoes operative intervention.[10,11] Morbidity of gastrointestinal tract injury is mostly related to delayed diagnosis.[12] The purpose of this study was to compare surgical findings with FAST in patients suffering from blunt abdominal trauma and see if FAST can pick GI injury in patients suffering from blunt abdominal trauma.

Materials and Methods

The routine protocol in our center is that every patient with suspected abdominal trauma undergoes emergency ultrasound with FAST technique. Therefore, all patients over 13 years of age who had history of blunt abdominal trauma underwent FAST, to detect free fluid/ collection in abdominal cavity as an indicator of intra-abdominal organ injury. Ultrasound was performed using JustVision 200 ultrasound device (Toshiba, Japan) with 3.7-5 MHZ convex transducer in the emergency room by the radiologist and the data was recorded on a proforma. Six areas of the abdomen were examined to detect free fluid; left upper quadrant, Morrison's pouch, right upper quadrant, pelvis, right and left para-colic gutters (Figure-1a, 1b). Almost all patients underwent exploratory laparotomy and during surgery, trauma to bowel and other solid organs was noted. The results of FAST technique were compared with the surgical findings.

Patients having multiple trauma penetrating abdominal injuries to those who were operated without FAST & those patients who were operated on abdomen for any other pathology were excluded from the study.

Figure 1a: FAST scans

Figure 1b: FAST scans

The results were statistically analyzed and compiled on SPSS and two-tailed Fisher probability test (*p*-value) was used for significance.

The study was approved by Ethical Review Committee of Shaheed Mohtarma Benazir Bhutto Medical University, Larkana.

Results

A total of 317 patients with blunt abdominal trauma were seen during the study period out of which 296 patients (93.37%) underwent surgery. During surgery, 52 (17.5%) patients had bowel injury, males 41 (78.84%) females 11 (21.1%) with mean age 28.9 ± 16.5 years range: (13-80 years).

Out of 52 patients, who had bowel injury on surgery, 14 (26.9%) had isolated bowel injury and 38 (73%) bowel injury plus injury to the other solid organs like spleen (13), liver (08), pancreas (6), kidney (2) and diaphragm (1), while multiple organs were involved in 8 cases.

Corresponding Author:
Azhar Ali Shah
Department of Surgery
Shaheed Mohtarma Benazir Bhutto Medical University
Larkana.
Email: surgeonazhar@yahoo.com

Received: 10 January 2015, **Accepted:** 03 March 2016,
Published: 20 June 2016

Authors Contribution

AHP proposed the study and conceived the idea, collected and interpreted the data, AAS conceived the idea, supported in designing study, collected and interpreted the data and did final proof reading of manuscript. N and IB supported in data collection, literature review and in writing the manuscript.

Emergency ultrasound with FAST technique showed free fluid in 28 (53.8%) patients while there was no fluid level or collection in 24 (46.15%) patients who had evidence of bowel injury at surgery (Table-1). Out of 28 patients with positive FAST, 23 (82.1%) had solid organ injury along with bowel injury and 05 (17.8%) had only bowel injury (True positive). Among 24 patients with negative FAST, 15 (62.5%) had solid organ injury along with bowel injury and 09 (37.5%) had only bowel injury (False negative). The sensitivity of FAST in diagnosing bowel injury due to blunt abdominal trauma was 35.7% with specificity of 39.4%. Positive predictive value was 17.8%, Risk Ratio as 0.47, Odd Ratio as 0.36. *p*-value was calculated as 0.13 with Fisher two-tailed probability test. Statistically ultrasound using FAST did not have a significant yield in predicting bowel injury in blunt abdominal trauma cases when compared with surgery and therefore is not recommended as the screening test for bowel injury cases following blunt abdominal trauma.

Table: FAST data in 2x2 table.

FAST Result	Isolated GI injury	Concomitant GI injury	Total
Positive	05	23	28
Negative	09	15	24
Total	14	38	52

Discussion

In the present study, ultrasound using FAST technique missed 46% cases who had bowel injury following blunt abdominal trauma.[2] The reported incidence of bowel and mesenteric injuries after blunt abdominal trauma is 1.3% [1] which is much lower than 17.5% seen in the present study. Physical examination is often unreliable in diagnosing acute trauma.[13] Previous reports showed that emergency ultrasound is effective in diagnosing hemo-peritoneum.[2,14-16] FAST technique has been used by many workers for evaluation of patients with trauma, but some have reported its limited use.[2,12-17] In our study, the sensitivity of FAST in diagnosing isolated bowel injury was 35.7% which was similar to another study[9]. Many studies show that abdominal organ injury can be missed on ultrasonography.[1] In one study, 33% abdominal injuries which required operation were missed on ultrasound [18] while another worker reported 34% patients with blunt abdominal trauma had no free fluid seen on emergency ultrasound and concluded that the FAST technique may frequently miss patients with surgically correctable gut injuries.[15] There is a limited value for FAST in the diagnosis of certain injuries like diaphragmatic rupture,[19] pancreatic [17] and mesenteric injury.[20-22] MacGahan et al reported 44% sensitivity for diagnosis of isolated gastrointestinal injury by FAST [17] which is almost similar to our study. Two studies reported that ultrasound had a 22% sensitivity in clinically stable patients who are more prone to have gut injury than hemodynamically unstable patients and concluded that FAST has a very low sensitivity in detecting blunt abdominal trauma. [8,23] Some workers have suggested that serial physical abdominal examination and CT can help to diagnose intra-abdominal organ injuries while single FAST can often miss GI injuries so there is need to repeat FAST after 12 to 24 hours.[24]

Diagnosing gastrointestinal trauma in emergency rooms and physical examination is difficult [21,22,25] which necessitates using other imaging modality like CT scan [26,27] which has a sensitivity of 93-100.[26,27] It was therefore concluded that multi-detector CT which has high negative predictive value and can accurately show important bowel or mesenteric injuries should be used for diagnosing bowel and mesenteric injuries in blunt abdominal trauma cases.

Conflict of interest: None declared.

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