

**How to Cite:**

Bhardava, V., Panchal, A., Jain, P., & Shah, S. (2022). Prospective study on role of E-FAST in evaluation of abdominal trauma. *International Journal of Health Sciences*, 6(S3), 7070–7078. <https://doi.org/10.53730/ijhs.v6nS3.7657>

## **Prospective study on role of E-FAST in evaluation of abdominal trauma**

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**Abstract**--Introduction: Diagnosis of abdominal trauma is a real challenge that helps the treating doctor in optimum management of abdominal trauma which include Diagnostic peritoneal lavage (DPL), Extended-Focused Assessment with Sonography for Trauma (FAST) and CT scan. Objectives: The aim of this study is to define the recent role of E-FAST in the diagnosis of abdominal trauma. Material and methods: Aim of the study is to evaluate patients coming to the department of Radiodiagnosis of Dhiraj General hospital with USG. Total number of patients are 50. Results: Out of 50 patients of abdominal trauma, 9 patients (22%) were in age group 21-30 years the commonest mode of trauma was road accident according for 54% of total cases. In this study, more commonly injured organs are liver, spleen and kidney. USG showed overall sensitivity 57.48% and specificity 97.77%. Conclusion: E-FAST is useful as the initial diagnostic tool for abdominal trauma. With proper training and understanding limitations of ultrasound, the results of E-FAST can be optimized.

**Keywords**--E-FAST, hematoma, tear, injury, collection, trauma, hemoperitoneum.

## **Introduction**

Diagnosis of abdominal trauma is a real challenge. The clinical findings are usually not reliable. Abdominal examination is compounded by different factors like fractures of lower chest ribs, contusion and abrasions of the abdominal wall, presence of fractured lumbar vertebrae with retroperitoneal hematoma, and reduced level of consciousness. Diagnostic tools that help the treating doctor to take critical decisions like the need for laparotomy or conservative treatment are mandatory if we aim for a favourable outcome. Diagnostic peritoneal lavage (DPL) had been the gold standard to detect intra-peritoneal fluid since the sixties. Use of Focused Assessment with Sonography for Trauma (FAST) and helical CT scan have dramatically changed our methods of diagnosing blunt abdominal trauma, refined our decisions, and enabled us to select patients for conservative treatment.

E-FAST additionally surveys the anterior and posterior pleural spaces to evaluate for pneumothorax or pleural effusion, usually taken as haemothorax in the patients with history of trauma. Preference of a specific investigation depends on the hemodynamic stability of the patient, availability of the modality and severity of the injuries associated. The aim of this communication is to define the recent role of E-FAST of the abdomen in the diagnosis of abdominal trauma.(1). Following steps are taken for the the evaluation of the patient with abdominal trauma.

- E-FAST Extended Focused assessment with sonography in trauma.
- E-FAST is a rapid screen for intra-abdominal injury and can be performed in less than 5 minutes. E-FAST is non-invasive, may be easily performed and can be done concurrently with resuscitation.

Also the advantage of E-FAST is that it can be repeated if necessary as it is portable. Like DPL, it can determine the presence of hemoperitoneum but can make no determination as to the aetiology of the hemoperitoneum [3]. E-FAST is clearly operator-dependent and requires true expertise for reliable use. In general, several hundred cubic centimetres of fluid/blood are necessary to be clearly visible using E-FAST, but E-FAST cannot tell whether fluid is blood, bile or clear fluid [2]. E-FAST examination cannot be used to reliably grade solid organ injuries. FAST is generally performed in four areas: The ultrasound probes are placed in four locations.

- Right upper quadrant-Morison's pouch.
- Epigastric area (pericardial).
- Left upper quadrant (peri splenic).
- Suprapubic area (pouch of Douglas).

E-FAST includes two more scans for better assessment.

### **Anterior and lateral pleural recess**

The E-FAST increases the sensitivity by evaluating dependant positions in the peritoneal cavity where fluid accumulates preferably in trauma patients.(1)

The most dependant area of abdomen, blood pools in the morison's pouch. Pericardial tamponade is very rare after trauma, yet pericardial views can be helpful if present. In the hemodynamically stable patients, a follow up CT scan should be obtained if non-operative management is contemplated. (5) Clearly, E-FAST has limitations. In addition, a single E-FAST cannot absolutely exclude intra-abdominal injury. A recent international consensus conference concluded that prudent evaluation would involve two E-FAST exams performed at least 6 hours apart supplemented with serial physical exams to avoid missing an injury.(2)

### **Materials and Methods**

Aim of the study is to evaluate patients coming to the department of Radiodiagnosis of Dhiraj General hospital with USG. Total number of patients are 50.

#### **Inclusion criteria**

- Only patients who were willing to participate in the study were included.
- Patients who were referred to department of radiology for X-ray, USG and CT scan for other disease and accidental finding present in abdomen due to trauma, were included in the study.
- Already diagnosed case of abdominal trauma, which needed follow up radiological imaging who were referred to radiology department of Dhiraj hospital were included in the study.
- Total sample size was 50 patients.

#### **Exclusion criteria**

- Patients who gave negative consent for the study.
- Uncooperative patients for the procedure.
- Patients who were referred to department of radiology having abdominal lesions due to trauma and were completely recovered from it.

#### **Description of tools**

- GQ LOGIQ P9 USG MACHINE

### **Results**

Of these 50 patients of abdominal trauma, 9 patients (22%) were in age group 21-30 years, followed by 10 patients(24%) in 31-40 year age group and 9 patients(20%) in 41- 50 years. In the present study abdominal trauma was most common among males, 42 out of 50 patients (84%) with male:female ratio of approximately 5.2: 1. (Table – 1). The commonest mode of trauma was road traffic accident according for 54% % of total cases. (Table – 2). In this study, more commonly injured organs are liver, spleen and kidney. Out of 13 Patients with splenic injury 5 patients showed peri splenic collection without identifiable injury in 2 patients and in 3 patients only free fluid in abdomen was identified.(Table-3)

Of 14 patients with liver injury, 5 patients were having free fluid in abdomen, 4 patients had liver lacerations and 5 patients showed parenchymal contusions with or without intraparenchymal hematoma.

There were 3 cases of bowel perforation, out of which 2 patients showed comet tail artifact in free fluid on USG which gave us a suspicion about bowel perforation. USG showed free fluid in 42 patients. Out of 5 patients having organ injury, not associated with hemoperitoneum were splenic injury in which subcapsular hematoma was present, renal injury in which renal contusion and perinephric hematoma were present, ureteric injury in which urinoma was present, bladder injury in which vesico-cutaneous fistula was present, and testicular injury in which intra-parenchymal rupture of the testis was seen along with haematocele was present. (Table-3). There were total 8 patients out of 50 patients with pleural injury in the form of pleural effusion, haemothorax, and pneumothorax seen.

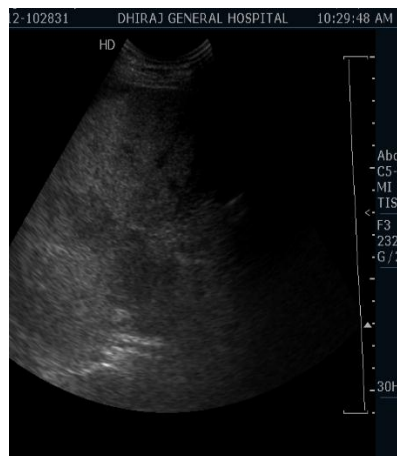


Figure 1. hypoechoic lesion reaching up to the surface of liver, s/o laceration.



Figure 2. Hemoperitoneum



Figure 3. USG image showing heterogenous lesion predominantly hyper echoic in 6<sup>th</sup> and 7<sup>th</sup> segment of right lobe of liver with pleural effusion



Figure 4. Hemoperitoneum



Figure 5. There is break in continuity of renal outline with fluid collection around it , s/o urinoma



Figure 6. Splenic contusion

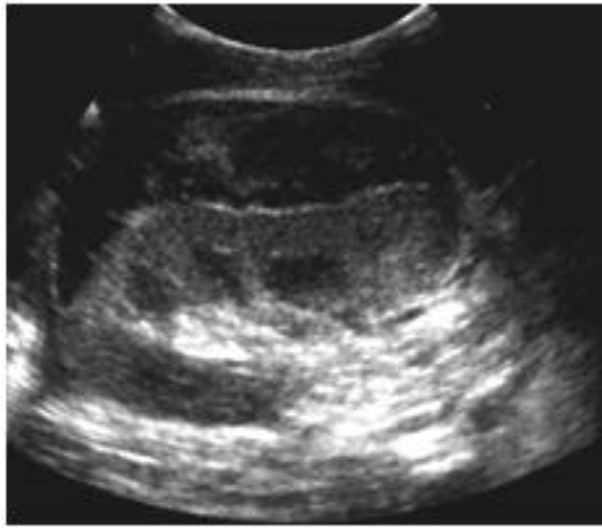


Figure 7. Subcapsular hematoma

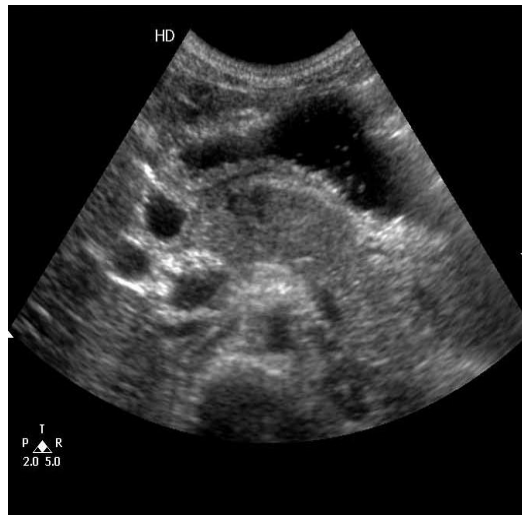


Figure 8. Pancreatic transection

Table 1  
Age and sex distribution (n=50)

Age group (years)	Male	Female	Total	Total (%)
0-10	6	1	7	14
11-20	5	1	6	12
21-30	9	2	11	22
31-40	10	2	12	24
41-50	9	1	10	20
51-60	1	0	1	2
61+	2	1	3	6
total	42	8	50	100

Table 2  
Patient distribution as per the injury mechanism (n=50)

Mode of trauma	No. of patients	Total (%)
RTA	27	54%
Fall from height	20	40%
Penetrating abdominal trauma	3	6%
Total	50	100%

Table 3  
Distribution of patients according to organ injury on USG. (n=50)

Organs	Cases
Spleen	13
Liver	14
Pancreas	2
Kidney	12
Urinary bladder	1
Retroperitoneal hematoma	1
Bowel	3
Mesentery	4

## Discussion

The imaging of abdominal trauma is challenging. It has to be identified accurately the injury that requires immediate exploration and to avoid unnecessary operative intervention in cases that can be managed conservatively. In recent years, CT and USG have extensively replaced all other modalities of investigation. But both have their limitations. This prospective study of 50 cases of blunt abdominal trauma was carried out by USG (real time ultrasound). In this study, more commonly injured organs are liver, spleen and kidney. For diagnosis of liver injuries, ultrasound is efficient in detecting liver injuries with sensitivity of 64.7% and specificity of 100%, USG showed sensitivity of 64.7% and specificity of 97% in diagnosing splenic injury. CT plays important role in detecting organ injury, characterize its type, location and extent of injury, which influences treatment plan. For patient treated conservatively, ultrasound is valuable in follow up studies.(4). For detection of free intra-peritoneal fluid, USG showed sensitivity of 93.3% and specificity of 100%%, USG was not able to find the aetiology of free fluid though. E-FAST has high sensitivity and specificity, can be done quickly, noninvasively and without radiation exposure and also can be done repeatedly. Due to these benefits, ultrasound has essentially replaced diagnostic peritoneal lavage (DPL) in evaluation of trauma patients.(3)

## Conclusions

E-FAST is useful as the initial diagnostic tool for abdominal trauma to detect intra-abdominal fluid. E-FAST can direct further diagnostic testing in hemodynamically stable patients. E-FAST may indicate immediate intervention in a hemodynamically unstable patient. E-FAST can be repeated so many times



without interfering the patient treatment in critical patients. USG can be done in pregnant women. In hemodynamically stable patients, indications for diagnostic peritoneal lavage are becoming more restricted. In hemodynamically stable patients, the diagnostic modality of choice is CT scanning. These three modalities are complementary and not competitive. With proper application within the defined clinical setting, values of these modalities are increased when they are applied properly within defined clinical algorithms.

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