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Original Research Article

Role of Focused Assessment with Sonography for Trauma (FAST) and CT scan in abdominal trauma: Radiologist's perspective

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Abstract

Background: Diagnosis of abdominal trauma is a real. Diagnostic tools that help the treating doctor in optimum management of abdominal trauma include; Focused Assessment with Sonography for Trauma (FAST), Diagnostic peritoneal lavage (DPL) and CT scan.

Objectives: The aim of this communication was to define the recent role of FAST and CT scan of the abdomen in the diagnosis of abdominal trauma.

Material and methods: This study aimed at evaluating patients who came to the Radiology Department of Dhiraj General Hospital, by using USG and CT scan. This study comprised of 50 patients.

Results: Out of 50 patients of abdominal trauma, 12 patients (24%) were in age group 21-30 years with male to female ratio of approximately 5.2: 1. The commonest mode of trauma was road traffic accident according for 54% of total cases. Spleen and liver were the most common organs injured, followed by kidney. USG showed overall sensitivity 57.48%, specificity 97.77%, positive predictive value 88.9125, negative predictive value 97.185 and accuracy of 90.75%. CT scan showed highest sensitivity of 95.35%, specificity of 100%, positive predictive value of 100%, negative predictive value 77.78% and accuracy 96%.

Conclusion: 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

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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 intra peritoneal fluid, delineate the extent of solid organ injury, detect retroperitoneal injuries, and help in the decision for conservative treatment. Helical CT is done rapidly which reduces the time the patient stays in the CT scan room. Furthermore, this improves sagittal and coronal reconstruction images which are useful for detecting ruptured diaphragm.

Key words

FAST, CT, 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 favorable 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 for diagnosing blunt abdominal trauma, refined our decisions, and enabled us to select patients for conservative treatment. The choice of a particular modality depends on the hemodynamic stability of the patient, the reliability of physical examination, the severity of associated injuries, and the availability of a particular diagnostic modality. The aim of this communication is to define the recent role of FAST and CT scan of the abdomen in the diagnosis of blunt abdominal trauma.

The evaluation of the patient with abdominal trauma is done by following steps.

FAST - Focused abdominal sonography for trauma

FAST is a rapid screen for intra-abdominal injury and can be performed in less than 3 minutes. FAST is non-invasive, may be easily performed and can be done concurrently with resuscitation. In addition, the technology is portable and may be easily repeated if necessary. Like DPL, it can determine the presence of hemoperitoneum but can make no determination as to the etiology of the hemoperitoneum [1]. FAST is clearly operator-dependent and requires true expertise for reliable use. Like DPL, FAST is ineffective for imaging the retroperitoneum. The amount of fluid necessary for a positive FAST remains unclear. In general, several hundred cubic centimeters of fluid/blood are necessary to be clearly visible using FAST, but FAST cannot tell whether fluid is blood, bile or clear fluid [2]. 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 (perisplenic)
- Suprapubic area—pouch of Douglas

No matter which organ is injured, the perihepatic view is most commonly positive. Blood pools in Morison pouch, the most dependent portion of the abdomen. The

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pericardial views can be extremely helpful, although pericardial tamponade is rare after blunt abdominal injury. The ability of FAST to determine the need for laparotomy is questionable. McKinney, et al. had encouraging data that suggest that their scoring system can predict the need for laparotomy [3]. In the hemodynamically stable patient, a follow-up CT scan should be obtained if non-operative management is contemplated. Clearly, FAST has limitations. Its ability to detect small amounts of fluid is questionable, even in skilled hands. In addition, a single FAST cannot absolutely exclude intra-abdominal injury. A recent international consensus conference concluded that prudent evaluation would involve two FAST exams performed at least 6 hour apart supplemented with serial physical exams to avoid missing an injury.

E-FAST (Extended FAST) includes two more scans for better assessment.

- Right paracolic gutter.
- Left paracolic gutter.

CT scanning

With the marked decrease in the use of diagnostic peritoneal lavage [4, 5], diagnosis of abdominal injuries now relies almost exclusively on the accurate interpretation of findings from adequately performed CT examinations acquired in a timely fashion. In patients with multiple traumas, the "panscan" (CT of the head, neck, chest, abdomen, and pelvis) has become the necessary step to enable physicians to diagnose and ascertain the severity of the injuries and to determine the order in which these should be treated. CT is superior to clinical evaluation and diagnostic peritoneal lavage for diagnosing important abdominal injuries [6, 7].

Shortly after its introduction into clinical practice nearly 3 decades ago, CT scan redefined our understanding of the appearance and importance of abdominal organ injuries [8]. Subsequently, helical CT technology improved the accuracy and expanded the applications of CT imaging [9, 10]. Recent hardware and software developments, especially multi-detector technology [11, 12] have further potentiated the methods used to evaluate the poly trauma patient in multiple facets: diagnostic capability, speed, and patient safety.

CT scan often provides the most detailed images of traumatic pathology and may assist in determination of operative intervention [13]. Only CT scanning can make the diagnosis of organ-specific abdominal injury. CT scanning images both the abdomen and the retroperitoneum. CT scan quantitates the amount of blood in the abdomen [14]. Drawbacks of CT scanning relate to the need to transport the patient from the trauma resuscitation area, the additional time required to perform CT scanning compared to FAST or DPL and it is more expensive. The best CT scan imagery requires both oral and intravenous contrast. Some controversy has arisen over the use of oral contrast and whether the additional information it provides negates the drawbacks of increased time to administration and risk of aspiration [15]. The oral contrast material often produces nausea and vomiting and must be administered while the spine remains immobilized. The intravenous contrast material has a small incidence of allergic reactions. Some advocate that oral contrast is unnecessary for abdominal CT during the initial assessment. This requires further study before it is likely to gain widespread acceptance. No definitive answer exists at this time to the value of oral contrast in diagnosing bowel injury.

There are some patients who require CT scanning despite a normal FAST. Chiu, et al. had shown that 28 percent of selected patients may have intra-abdominal solid visceral injury

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without hemoperitoneum. These include those with abrasions or tenderness in the lower chest, abdomen, or pelvis. Other findings mandating CT are pelvic fractures or thoraco-lumbar spine fractures.

DPL – Diagnostic Peritoneal Lavage

DPL was introduced by Root in 1965 as a rapid and accurate method to identify the presence of intra-abdominal hemorrhage following trauma. Subsequent studies have confirmed the efficacy of DPL in diagnosing abdominal hemorrhage as well as its superiority over physical examination alone. DPL is rapid, safe, and inexpensive. There is approximately a 1 percent incidence of major complication.

A positive DPL, based on microscopic analysis of lavage fluid, has been defined as $>10^5$ RBC/mm^3. A positive DPL does not necessarily mandate immediate laparotomy in the hemodynamically stable patient. Laparotomy based solely on a positive DPL for red cells results in a non-therapeutic procedure approximately 30 percent of the time. It has been recommended that patients with RBC counts in the equivocal range (i.e., 25,000–75,000 RBC/mm^3) undergo additional diagnostic testing, such as CT scanning. It is more accurate than CT for the early diagnosis of hollow visceral and mesenteric injuries, but it does not reliably exclude significant injuries to retroperitoneal structures. False positive results may occur in the presence of pelvis fractures. Hemodynamically stable patients with equivocal results are best managed by additional diagnostic testing to avoid unnecessary laparotomies. FAST's diagnostic accuracy generally is equal to that of diagnostic peritoneal lavage (DPL).

Materials and methods

This study aimed at evaluating patients who came to the Radiology Department of Dhiraj General Hospital, by using USG and CT scan. This study comprised of 50 patients.

Inclusion criteria

- Only those patients who wanted to participate in study were included.
- Patients referred to the Radiology Department for X-ray, USG and CT scan. Already diagnosed cases of abdominal trauma, which need follow up radiological investigations and were referred to Radiology Department, were included in study.
- Patients came for X-ray, USG and CT scan for other diseases, and were accidentally found to have abdominal lesion due to trauma, were included in this study.
- Sample size was total 50 patients.

Exclusion criteria

- Patients presented to Radiology Department having abdominal lesions due to trauma in the past and were cured completely were excluded from the study.
- Patients not consented for the investigation.
- Patients who were unable to cooperate for the procedure.

Description of tools:

- **X-Ray machine:** 600 mA Siemens, 500 mA Siemens, 300 mA Siemens
- **CR system:** Kodak/AGFA
- **USG:** Philips HD 7 and Philips HD 9
- **CT scan machine:** Siemens emotion 16 slice MDCT

Results

Of these 50 patients of abdominal trauma, 12 patients (24%) were in age group 21-30 years, followed by 31-40 year age group 22% and 41-

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50 years 20%. In the present study abdominal trauma was most common among males, 42 out of 50 patients (84%) with male to 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**) This was similar to findings by other studies [3].

In the present study, spleen and liver were the most common organs injured, followed by kidney. Of 17 Patients with splenic injury, USG correctly diagnosed splenic injury in 12 patients and missed in 5 patients. Of the 5 patients, USG showed perisplenic collection without identifiable injury in 2 patients and in the remaining 3 patients only free fluid in abdomen was identified. CT correctly diagnosed splenic injury in all 17 patients. (**Table – 3**)

Of 17 patients with liver injury, USG correctly diagnosed liver injury in 11 patients and missed in 6 patients. Of the 6 patients, 5 patients showed free fluid in abdomen on USG and 1 patient showed no signs of liver injury on USG. CT showed subcapsular hematoma in 2 patients which was missed on USG. Four patients had lacerations of liver which was missed on USG. 5 patients showed parenchymal contusion with or without intraparenchymal hematoma on USG, 2 patients also revealed associated laceration on CT. CT correctly diagnosed liver injury in all 17 patients.

Of 13 patients with renal injury, USG correctly diagnosed renal injury in 8 patients and no signs of renal injury in 3 patients. Of the 3 patients with no renal injury on USG, 3 showed only perirenal collection.

CT correctly diagnosed renal injury in all 11 patients.

Out of total 4 patients with bladder injury, only 1 was detected on USG, rest 3 was not been able to detect on USG.

Of 3 cases of pancreatic injury, USG diagnosed pancreatic injury in 2 cases and missed in 1 case. CT correctly diagnosed in all 3 cases. In 1 case which was missed on USG, findings showed free fluid around pancreas but could not identify pancreatic injury. On CT pancreatic fracture was found in the head. In 2 cases USG showed pancreatic contusion, of which CT showed laceration of pancreas in one patient and other only contusion was found.

In our study, there were no cases of bowel wall contusion. 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 , but CT scan diagnosed bowel perforation in all the 3 patients correctly.

Out of 3 total patients, USG just showed free fluid in abdomen and no specific signs of mesenteric injury, CT scan showed confirmed mesenteric injury in 1 patient and query mesenteric injury in 1 patient which was later confirmed by Exploratory laprotomy. In 1 patient with positive ileal perforation on CT scan, mesenteric injury was found on exploratory laprotomy. Of these 50 patients with blunt abdominal trauma, 42 patients showed free fluid in abdomen/ hemoperitoneum on USG. CT scan showed hemoperitoneum in 45 patients. 5 patients didn’t have hemoperitoneum out of 50 patients.

USG showed free fluid in 42 patients and had 3 false negative results. 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

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hematoma were present, urteric 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 hematocoele was present.

There were total 8 patients out of 50 patients with pleural injury in the form of pleural effusion, hemothorax, and pneumothorax seen.

Out of 8 patients, 7 patients were positive on USG, and CT scan detected all 8 cases. Hence USG showed 1 false negative value.

When p-value was found to be less than 0.05, then the result would be considered statistically significant. (**Photo – 1 to 13**)

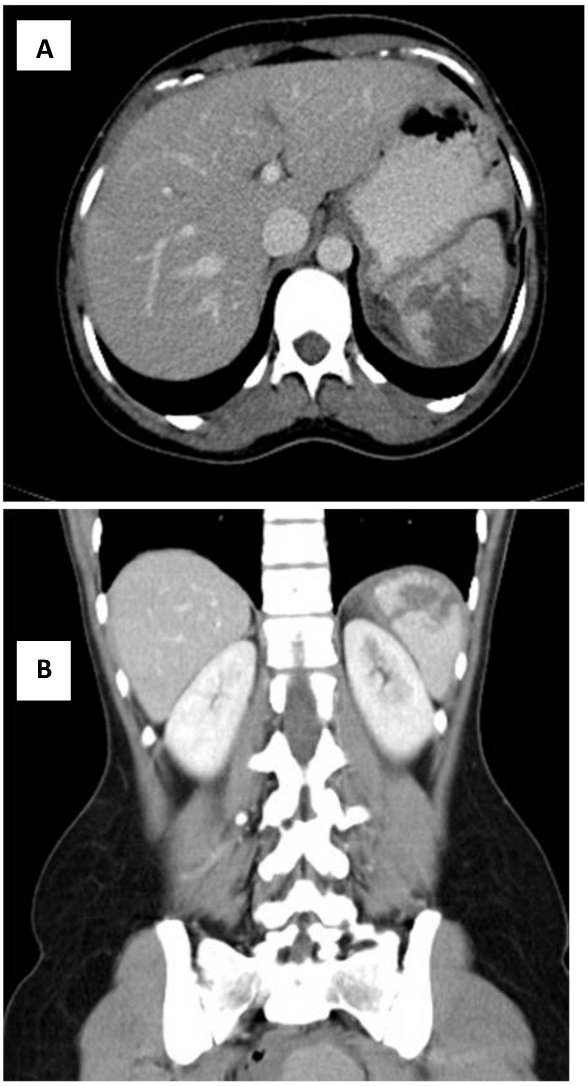
Photo - 1: USG of patient showing splenic contusion at the inferior pole of the spleen.

Discussion

The challenge in the imaging of abdominal trauma is to accurately identify injuries that require early exploration and at the same time avoid unnecessary operative intervention in cases that can be managed conservatively.

In recent years, CT and USG have to a great extent replaced all other modalities of investigation. But both have their limitations. In spite of diagnostic superiority, availability of CT is still limited and it also requires stable patients. On the other hand, inability to consistently detect pancreatic, bowel and mesenteric injuries and inability to functionally assess the kidneys and frequent interference by gaseous distension and associated bone or soft tissue injuries are major limitations of USG.

Photo – 2A, 2B: CT scan (axial and coronal) of showing grade III splenic injury.



This prospective study of fifty cases of blunt abdominal trauma was carried out by, USG (real time ultrasound) and CT (computed tomography).

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Photo – 3A: USG of the patient showing acute hematoma in the right lobe of the liver.

Photo – 3B: Doppler USG of patient showing hematoma extending to middle hepatic veins.

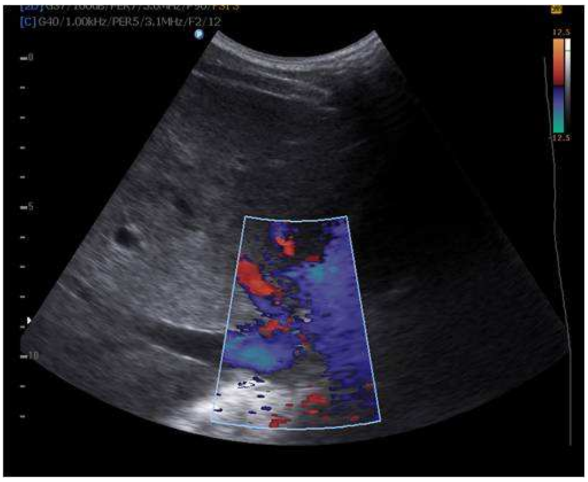


Photo – 4: CT scan of patient showing grade V liver injury and hemoperitoneum.

Forty six (46%) patient were in the age group of 21-40 years, which is the most active span of life. The incidence of trauma was much among and most common made of trauma was road traffic accident, followed by fall from height. Out of all the patients, 45 had abdominal organ injury and hemoperitoneum. The most common organ injured were spleen and liver followed by kidney.

Photo – 5: USG of this patient shows collection of fluid in the pancreatic head region.

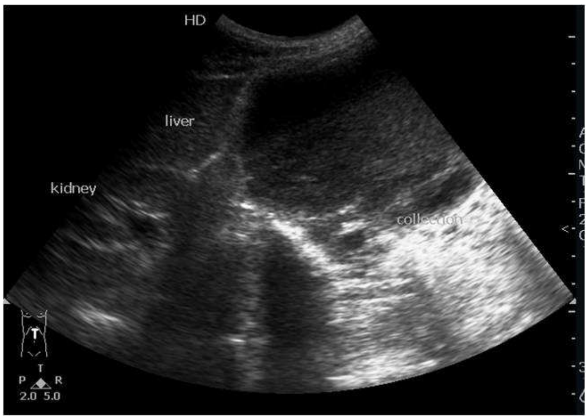
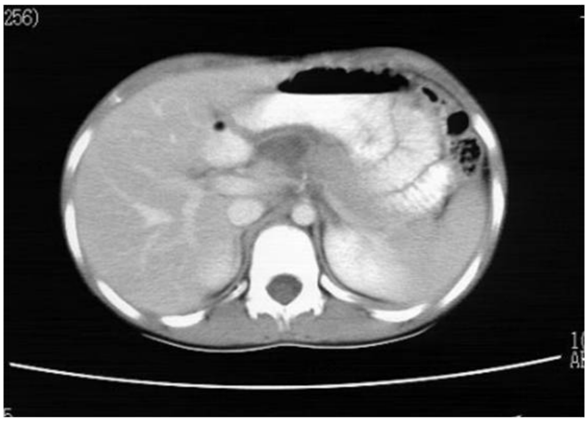


Photo – 6: CT scan of patient shows fracture of head of pancreas grade V pancreatic injury.



X-rays raised suspicion about left upper abdominal injury, probably spleen or left kidney, but were not accurate in diagnosing splenic injury. Splenic injuries can be detected on ultrasound, While CT remains an accurate method of identifying, classifying and quantifying it, but decision of laparotomy remains on hemodynamic stability of patients. USG showed sensitivity of 64.7% and specificity of 97% in diagnosing splenic injury. CT scan

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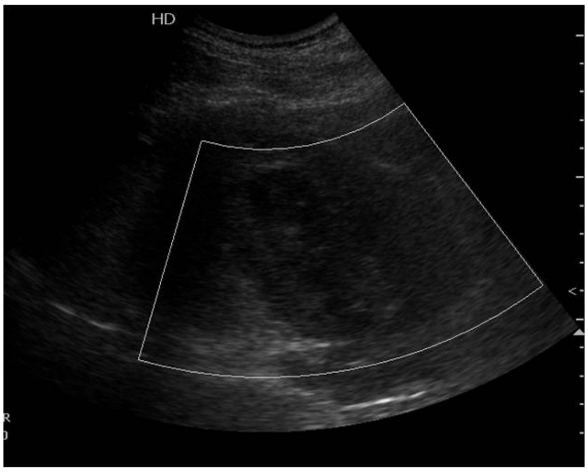
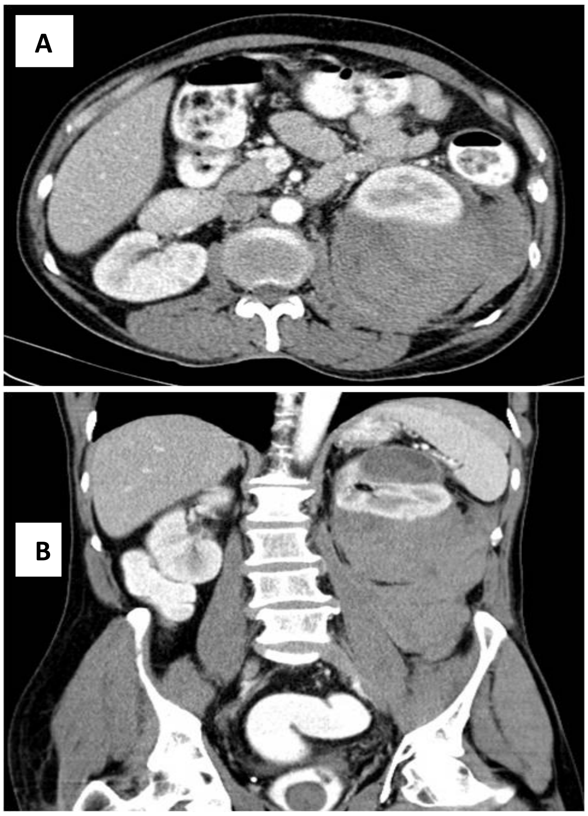
remained the gold standard modality for diagnosing the splenic injury.

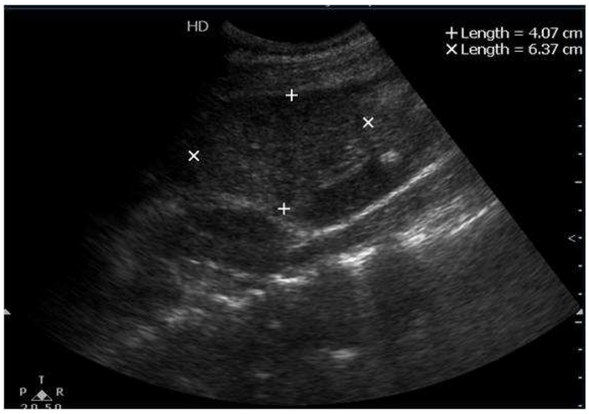
<u>Photo - 7</u>: USG of patient showing subcapsular collection, compressing the kidney causing page kidney.



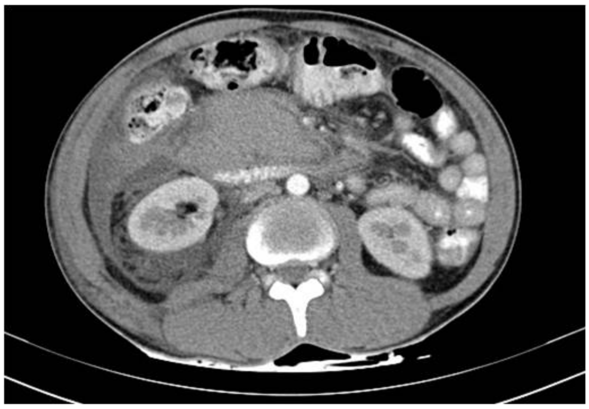
<u>Photo – 8A, 8B</u>: CT scan (axial and coronal) of patient showing grade II renal injury (extensive subcapsular and perirenal hematoma) extending to left psoas muscle and causing compression of the left kidney. X-rays of patient were under normal limits.



<u>Photo - 9</u>: USG showing retroperitoneal hematoma.



<u>Photo – 10</u>: CT scan (Axial cuts) of patient showing retroperitoneal hematoma and perinephric fat stranding.



<u>Photo - 11</u>: X-ray of pelvic with both hips shows multiple pelvic fractures and pelvic diastasis.

For diagnosis of liver injuries, ultrasound is efficient in detecting liver injuries with sensitivity of 64.7% and specificity of 100%, but

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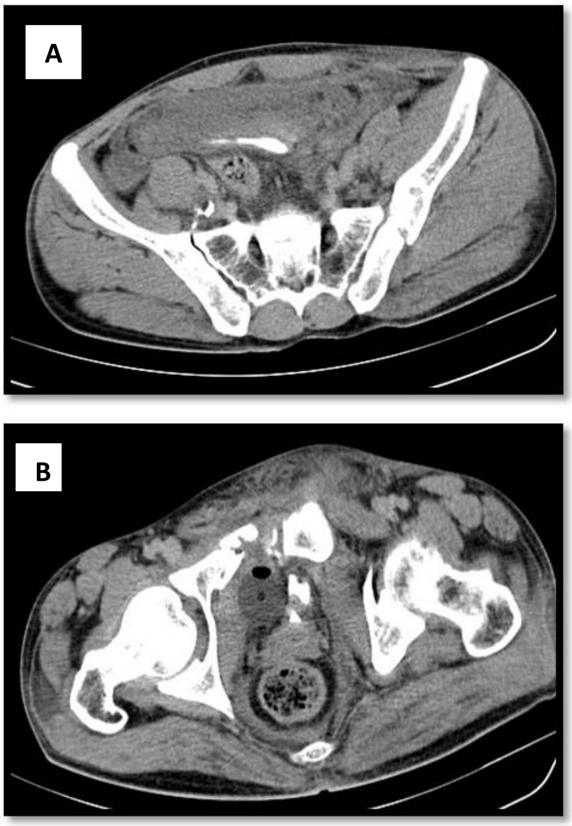
CT plays important role in detecting organ injury, characterize its type, location and extent of injury, which influences treatment plan. For patient treated conservatively, ultrasound is valuable in follow up studies.

Photo – 12: USG of patient showed free fluid in the pelvis.

Photo – 13A, 13B: CT scan of patient (Axial cuts) showed both intra-peritoneal as well as extra-peritoneal bladder rupture, that is grade V bladder injury.



For diagnosis of pancreatic injuries USG and CT scan play important role and compliments each other. USG showed sensitivity of 66.7% and specificity of 100%. CT will be better modality and characterization of injury and also for follow up studies.

Renal injuries can be efficiently diagnosed on USG but functional assessment cannot be done with it.USG had sensitivity and specificity of 45.5% and 92.3% respectively. On the other hand, CT detects renal injuries, its type, extent and also demonstrates renal functions with higher sensitivity and specificity. For follow up, Ultrasound is an efficient modality.

For detection of other abdominal and pelvic organ injuries such as ureter, CT is a better modality in sensitivity and specificity than USG.

For the detection of urinary bladder injury, USG showed 25% sensitivity and 100% specificity. CT scan was 100% sensitive and 100% specific. CT scan provides additional assessment of bony pelvic trauma.

For detection and characterization of bowel and mesenteric injuries, CT scan is moderately sensitive and specific but USG is much less sensitive and specific. The presence of free intra-peritoneal fluid on USG in the absence of solid organ injury should raise possibility of bowel and mesenteric injury.

CT has an upper hand over ultrasound for diagnosis of retroperitoneal hematoma and it also detects injuries to adjoining bony structures.

For detection of free intra-peritoneal fluid USG showed sensitivity of 93.3% and specificity of 100%%, USG was not been able to find the eitiology of free fluid though, while CT scan

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showed 100% sensitivity and 100% specificity in detecting intra-peritoneal free fluid.

For detection of pleural injury, CT scan showed 100% sensitivity and 100% specificity in diagnosing pleural injuries.

In this study, USG showed sensitivity of 100%, specificity of 62.5% and overall accuracy of 94% as compared to that of CT, which showed sensitivity of 100%, specificity of 100% and accuracy of 100% in detection of free intra-peritoneal fluid.

CT scan showed an upper hand in diagnosing retroperitoneal hematoma and psoas hematoma.

CT scan diagnosed all the solid organ injuries except in 1 patient of diaphragmatic injury, CT raised a suspicion of diaphragmatic injury in the form of detecting subphrenic collection and raised dome of the left diaphragm and in another patient CT scan missed mesenteric tear but had diagnosed ileal perforation in the same patients. CT scan also gave details about basal consolidation and lung window better than X-ray or USG.CT scan gave details about vertebral fractures which were missed on X-ray.

Hence, it was calculated from our study, USG showed overall sensitivity 57.48%, specificity 97.77%, positive predictive value 88.9125, negative predictive value 97.185 and accuracy of 90.75%. CT scan showed highest sensitivity of 95.35%, specificity of 100%, positive predictive value of 100%, negative predictive value 77.78% and accuracy 96%. (**Table – 4**)

We conclude that X-rays findings if negative do not suggest that there is no abdominal trauma and could be replaced by CT scanning of abdomen and lower thorax , but cost-effectiveness remains the main issue, USG gave us an fair information about most of the solid organ injuries and could be easily used in pregnant females and is cost-effective , but USG could not give the extent of the injury in lot of patients, USG also could not give any information about the bony injury cuts or lower lung injury and could not help classify the injury.

CT scan was the most sensitive and most specific modality in the patients with abdominal trauma patients. CT scan helped in classifying the injury and thus helped in management of these patients, prevented lot of unwanted laprotomies and saved lot of lives by giving a correct classification and thus timely laprotomies.

Conclusion

FAST is useful as the initial diagnostic tool for abdominal trauma to detect intra-abdominal fluid. 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. Their usefulness is maximized when they are applied properly within defined clinical algorithms.

References

1. Scalea TM, Rodriguez A, Chiu WC, Brenneman FD, Fallon WF, Kato K, et al. Focused assessment with sonography for trauma (FAST): Results from an international consensus conference. J Trauma, 1999; 46: 466-72.
2. Wherrett LJ, Boulanger BR, McLellan BA, Brenneman FD, Rizoli SB, Culhane J, et al. Hypotension after blunt abdominal trauma: The role of emergent abdominal sonography in surgical triage. J Trauma, 1996; 41: 815-20.
3. McKenney M, Lentz K, Nunez D, et al. Can ultrasound replace diagnostic

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ISSN: 2394-0034 (O)

peritoneal lavage in the assessment of blunt trauma? J Trauma, 1994; 37: 439–441.

4. Drost TF, Rosemurgy AS, Kearney RE, Roberts P. Diagnostic peritoneal lavage. Limited indications due to evolving concepts in trauma care. Am Surg, 1991; 57(2): 126–128.
5. Catre MG. Diagnostic peritoneal lavage versus abdominal computed tomography in blunt abdominal trauma: A review of prospective studies. Can J Surg, 1995; 38(2): 117–122.
6. Gonzalez RP, Ickler J, Gachassin P. Complementary roles of diagnostic peritoneal lavage and computed tomography in the evaluation of blunt abdominal trauma. J Trauma, 2001; 51(6): 1128–1134; discussion 1134–1136.
7. Federle MP. Computed tomography of blunt abdominal trauma. Radiol Clin North Am, 1983; 21(3): 461–475.
8. Fishman EK. Spiral CT. Applications in the emergency patient. Radio Graphics, 1996; 16(4): 943–948.
9. Novelline RA, Rhea JT, Rao PM, Stuk JL. Helical CT in emergency radiology. Radiology, 1999; 213(2): 321–339.
10. Fang JF, Wong YC, Lin BC, Hsu YP, Chen MF. Usefulness of multi-detector computed tomography for the initial assessment of blunt abdominal trauma patients. World J Surg, 2006; 30(2): 176–182.
11. Milia DJ, Brasel K. Current use of CT in the evaluation and management of injured patients. Surg Clin North Am, 2011; 91(1): 233–248.
12. Peitzman AB, Makaroun MS, Slasky BS, Ritter P. Prospective study of computed tomography in initial management of blunt abdominal trauma. J Trauma, 1986; 26: 585–592.
13. Rodriguez C, Barone JE, Wilbanks TO, Rha CK, Miller K. Isolated free fluid on computed tomographic scan in blunt abdominal trauma: A systematic review of incidence and management. J Trauma, 2002; 53: 79–85.
14. Federle MP, Peitzman A, Krugh J. Use of oral contrast material in abdominal trauma CT scans: Is it dangerous? J Trauma, 1995; 38: 51–53.
15. Chiu WC, Cushing BM, Rodriguez A, Ho SM, Mirvis SE, Shanmuganathan K, et al. Abdominal injuries without hemoperitoneum: A potential limitation of focused abdominal sonography for trauma (FAST). J Trauma, 1997; 42(4): 617-23.

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Table - 1: Age and Sex distribution (n=50).

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

Table - 2: Distribution of patients according to mechanism of injury (n=50).

Mode of trauma	No. of patients	Percentage of total (%)
RTA	27	54%
FH	18	36%
Penetrating abdominal trauma	1	2%
Fall of wall on abdomen.	2	4%
Iatrogenic trauma	1	2%
Injury to the groin by cricket ball.	1	2%
Total	50	100%

Table – 3: Distribution of patients according to organ injury on USG and CT scan and no. of cases confirmed (n=50).

Organ	USG	CT scan	No. of cases confirmed
Spleen	12	17	17
Liver	11	17	17
Pancreas	2	3	3
Kidney	8	11	11
Ureter	0	1	1
Urinary bladder	1	4	4
Bowel	2	3	3
Mesentery	0	2	3
Retroperitoneal hematoma	1	2	2
Testis	1	1	1
Diaphramatic injury	0	0	1
Psoas hematoma	0	2	2

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Table - 4: Organ wise sensitivity P-value and Z-value.

Organ	USG	CT	No. of confirmed cases	Z-value	p-value
Spleen	12 (24.0)	17 (34.0)	17	1.109	0.268
Liver	11 (22.0)	17 (34.0)	17	1.348	0.178
Pancreas	2 (4.0)	3 (6.0)	3	0.456	0.646
Kidney	8 (16.0)	11 (22.0)	11	0.767	0.443
Ureter	0 (0.0)	1 (2.0)	1	1.01	0.312
Urinary Bladder	1 (2)	4 (8)	4	1.389	0.165
Bowel	2 (4.0)	3 (6.0)	3	0.459	0.646
Mesentry	0 (0)	2 (4.0)	3	1.44	0.149
Retroperitoneal Hematoma	1 (2.0)	2 (4.0)	2	0.587	0.557
Testis	1 (2)	1 (2)	1	0	1.00
Diaphragmatic injury	0 (0)	0 (0)	1	-	-
Psoas Hematoma	0 (0)	2 (4)	2	1.44	0.149
PE	7 (14)	8 (16)	8	0.280	0.779
FF/HP	42 (84.0)	45 (90.0)	45	0.896	0.371