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Diagnostic Accuracy of FAST, CT Scan and Diagnostic Peritoneal Lavage in the Evaluation of Blunt Abdominal Solid Organ Injuries.

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Abstract

Background: Blunt abdominal trauma (BAT) is a common surgical emergency in which rapid identification of solid organ injuries is essential for timely intervention and improved patient outcomes. Focused Assessment with Sonography for Trauma (FAST), contrast-enhanced computed tomography (CT), and diagnostic peritoneal lavage (DPL) are the principal diagnostic modalities used for evaluating patients with blunt abdominal trauma. ***Objectives:*** To evaluate the diagnostic utility of FAST, CT scan, and diagnostic peritoneal lavage in the assessment of blunt abdominal solid organ injuries and to determine their role in guiding clinical management. ***Materials and Methods:*** This prospective hospital-based observational study was conducted over 18 months (December 2017 to June 2019) at Basaveshwar Teaching and General Hospital, attached to M.R. Medical College, Kalaburagi. Fifty patients with blunt abdominal trauma involving solid organs were included. All patients underwent FAST and abdominal ultrasonography. Contrast-enhanced CT scan was performed in 38 hemodynamically stable patients, while diagnostic peritoneal lavage was carried out in 10 patients with equivocal clinical findings. Four-quadrant aspiration was performed in 33 patients when indicated. Diagnostic findings were correlated with clinical evaluation, operative findings, and subsequent management. ***Results:*** Of the 50 patients, 82% were males and 44% belonged to the 21–30-year age group. Road traffic accidents accounted for 58% of injuries. FAST/ultrasonography identified splenic injury in 40% and hepatic injury in 38% of patients. CT scan demonstrated splenic injuries in 24 patients, hepatic injuries in 22, renal injuries in 8, and pancreatic injuries in 3, providing more detailed assessment of organ involvement. Four-quadrant aspiration was positive in 25 of 33 patients (75.8%), while diagnostic peritoneal lavage was positive in 7 of 10 patients (70%), with all positive DPL findings confirmed at laparotomy. Conservative management was successful in 62% of patients, whereas 38% required operative intervention. Overall mortality was 12%. ***Conclusion:*** FAST is a valuable initial bedside screening tool for blunt abdominal trauma, particularly in emergency settings. CT scan remains the investigation of choice for comprehensive evaluation of hemodynamically stable patients because of its superior ability to define solid organ injuries. Diagnostic peritoneal lavage continues to be a useful adjunct in selected patients with equivocal findings or when CT is not feasible. The complementary use of these diagnostic modalities facilitates early diagnosis, appropriate management, and improved patient outcomes.

Keywords: Blunt abdominal trauma, FAST, computed tomography, diagnostic peritoneal lavage, ultrasonography, solid organ injury.

INTRODUCTION

Blunt abdominal trauma (BAT) is a major cause of trauma-related morbidity and mortality, particularly following road traffic accidents, falls, and assaults. Early identification of intra-abdominal injuries is essential to reduce preventable deaths and guide timely management. Ultrasonography has become an important bedside investigation because of its rapidity, portability, and non-invasive nature. Rozycki et al. first demonstrated that surgeon-performed ultrasonography was a reliable and effective tool for evaluating trauma patients, facilitating early detection of intra-abdominal injuries and reducing diagnostic delays.[1]

Subsequently, Boulanger et al. confirmed the value of emergency abdominal sonography in blunt trauma, reporting that focused abdominal ultrasound accurately detected hemoperitoneum and assisted in early clinical decision-making, particularly in hemodynamically unstable patients.[2] Recognizing the importance of systematic trauma evaluation, the Eastern Association for the Surgery of Trauma (EAST) published practice management guidelines recommending the

combined use of clinical assessment, FAST, computed tomography (CT), and diagnostic peritoneal lavage (DPL) according to the patient's hemodynamic status and injury profile.[3] Although FAST is highly effective for identifying free intraperitoneal fluid, Richards et al. demonstrated that its sensitivity for bowel and mesenteric injuries is relatively limited, emphasizing that additional imaging is often required when clinical suspicion persists despite negative ultrasound findings.[4] Contrast-enhanced computed tomography (CT) subsequently emerged as the imaging modality of choice for hemodynamically stable patients because of its superior ability to identify and grade solid organ injuries, thereby guiding operative and non-operative management.[5]

Recent studies continue to support the diagnostic value of FAST. Ghafouri et al. reported high diagnostic accuracy of emergency-performed FAST in blunt abdominal trauma, confirming its usefulness as an initial screening investigation in emergency departments.[6] Similarly, Ghaedamini et al. demonstrated good agreement between FAST and CT in detecting blunt abdominal injuries while emphasizing that CT remains the reference standard for comprehensive evaluation of stable patients.[7] Therefore, the present study was undertaken to evaluate the diagnostic accuracy and clinical utility of FAST, CT scan, and diagnostic peritoneal lavage in patients with blunt abdominal solid organ injuries.

MATERIALS AND METHODS

Study Design

The present study was conducted as a **prospective hospital-based observational study** to evaluate the diagnostic accuracy of FAST, CT scan, and diagnostic peritoneal lavage in patients with blunt abdominal solid organ injuries.

Study Setting

The study was carried out in the Department of General Surgery at **Basaveshwar Teaching and General Hospital**, attached to **M.R. Medical College, Kalaburagi**, a tertiary care referral center.

Study Duration

The study was conducted over **18 months**, from **December 2017 to June 2019**.

Study Population

The study included patients admitted with blunt abdominal trauma involving solid abdominal organs, including the spleen, liver, kidneys, and pancreas.

Sample Size

A total of **50 patients** meeting the eligibility criteria were included consecutively.

Inclusion Criteria

- Patients of any age and either sex with blunt abdominal trauma.
- Patients with suspected or confirmed solid organ injury involving the spleen, liver, kidneys, or pancreas.
- Patients who underwent diagnostic evaluation using FAST, ultrasonography, CT scan, or diagnostic peritoneal lavage.

Exclusion Criteria

- Penetrating abdominal injuries.
- Pregnant women with blunt abdominal trauma.
- Patients with associated severe head injuries or thoracic injuries.

Study Procedure

Following admission, all patients underwent initial resuscitation according to standard trauma protocols. A detailed history and clinical examination were performed after achieving hemodynamic stabilization.

Diagnostic evaluation included:

- **FAST examination** in all patients as the initial bedside assessment.
- **Ultrasonography of the abdomen** in all 50 patients.
- **Contrast-enhanced CT scan** in 38 hemodynamically stable patients for detailed evaluation of organ injuries.
- **Four-quadrant aspiration** in 33 patients when clinically indicated.
- **Diagnostic peritoneal lavage (DPL)** in 10 patients with equivocal abdominal findings using a semi-open infraumbilical technique with Ringer lactate lavage.

Patients who were hemodynamically unstable or had positive clinical findings suggestive of significant intra-abdominal injury underwent emergency exploratory laparotomy without delay.

Outcome Measures

The primary outcome was the diagnostic performance of FAST, CT scan, and DPL in detecting blunt abdominal solid organ injuries. Secondary outcomes included identification of injured organs, influence on treatment decisions, and correlation with operative findings.

Statistical Analysis

Data were entered into Microsoft Excel and analyzed using descriptive statistics. Continuous variables were summarized as mean or range, while categorical variables were expressed as frequencies and percentages. Diagnostic findings were correlated with operative findings and clinical outcomes.

Ethical Considerations

The study was conducted after obtaining approval from the Institutional Ethics Committee. Written informed consent was obtained from all participants or their legally authorized representatives before inclusion in the study, and confidentiality of patient information was maintained throughout the study.

RESULTS

A total of 50 patients with blunt abdominal solid organ injuries were evaluated during the study period. FAST/ultrasonography was performed in all patients, contrast-enhanced computed tomography was performed in 38 hemodynamically stable patients, and diagnostic peritoneal lavage was carried out in 10 selected patients with equivocal or obscured clinical findings. Four-quadrant aspiration was performed in 33 patients. The findings of these diagnostic modalities were assessed in relation to the final documented solid organ injuries and subsequent management.

Table 1. Diagnostic investigations performed and their observed findings

Diagnostic modality	Patients evaluated, n	Positive/abnormal findings, n (%)	Negative findings, n (%)	Not performed, n (%)	p value
FAST/abdominal ultrasonography	50	Solid organ injury detected in all included cases*	—	0 (0.0)	-
Contrast-enhanced CT scan	38	Solid organ injury demonstrated in 38 patients*	—	12 (24.0)	-
Four-quadrant aspiration	33	25 (75.8)	8 (24.2)	17 (34.0)	**0.005**
Diagnostic peritoneal lavage	10	7 (70.0)	3 (30.0)	40 (80.0)	0.344

FAST (abdominal ultrasonography) was performed in all 50 patients and served as the primary screening investigation. CT scan was performed in 38 (76%) hemodynamically stable patients, while 12 unstable patients underwent immediate surgery without CT. Four-quadrant aspiration was performed in 33 patients and was positive in 25 (75.8%) and negative in 8 (24.2%), with a statistically significant predominance of positive findings (**p=0.005**).

Diagnostic peritoneal lavage (DPL) was performed in 10 selected patients, yielding positive results in 7 (70%) and negative results in 3 (30%) (**p=0.344**). All positive DPL cases were confirmed to have significant intra-abdominal injuries at laparotomy, demonstrating complete operative concordance among positive cases. However, overall diagnostic accuracy could not be determined because complete operative correlation for negative and non-DPL cases was unavailable.

Table 2. Solid organ injuries detected by ultrasonography and CT scan

Solid organ	Detected by FAST/USG, n	Percentage of total sample (%)	Detected by CT scan, n	Percentage among CT-evaluated patients (%)	Final documented cases, n (%)
Spleen	20	40.0	24	63.2	24 (48.0)
Liver	19	38.0	22	57.9	22 (44.0)
Kidney	6	12.0	8	21.1	8 (16.0)
Pancreas	2	4.0	3	7.9	3 (6.0)

The spleen was the most commonly detected solid organ injury by both imaging modalities. FAST/ultrasonography identified splenic injuries in 20 patients (40%), whereas CT detected splenic injuries in 24 of 38 patients (63.2%). Hepatic injuries were identified in 19 patients (38%) by ultrasonography and 22 patients (57.9%) by CT. Renal injuries were

detected in six patients by ultrasonography and eight by CT, while pancreatic injuries were identified in two and three patients, respectively.

Overall, CT demonstrated more comprehensive detection of solid organ injuries than ultrasonography, particularly for renal and pancreatic trauma. Compared with the final documented injuries, ultrasonography identified **83.3% of splenic, 86.4% of hepatic, 75.0% of renal, and 66.7% of pancreatic injuries**, indicating good diagnostic performance for splenic and hepatic trauma but comparatively lower detection of renal and pancreatic injuries.

Table 3. Relationship of diagnostic evaluation with treatment selection

Treatment approach	Number of patients	Percentage (%)	Clinical basis
Conservative management	31	62.0	Hemodynamically stable, no signs of peritonitis, suitable imaging findings
Operative management	19	38.0	Hemodynamic instability or significant intra-abdominal injury requiring laparotomy
Total	**50**	**100.0**	
p value		**0.119**	

Conservative management was successful in **31 patients (62%)**, while **19 patients (38%)** required operative intervention (**p=0.119**). CT scan was primarily performed in hemodynamically stable patients to define the extent of injury and guide non-operative management, whereas unstable patients underwent immediate exploratory laparotomy based on clinical findings, FAST, four-quadrant aspiration, and DPL.

Among the operated patients, **splenectomy** was the most common procedure (**8 patients; 42.1%**), followed by **hepatorrhaphy** (**5 patients; 26.3%**), **splenorrhaphy** (**2 patients; 10.5%**), and **distal pancreatectomy** (**1 patient; 5.3%**). These operative findings correlated with the predominance of splenic and hepatic injuries identified on imaging.

Table 4. Complications and mortality according to treatment group

Outcome	Operative group (n=19), n (%)	Conservative group (n=31), n (%)	p value
Respiratory complication	6 (31.6)	3 (9.7)	0.067
Intra-abdominal abscess	2 (10.5)	3 (9.7)	1.000
Wound infection	4 (21.1)	Not applicable	—
Wound dehiscence	1 (5.3)	Not applicable	—
Mortality	4 (21.1)	2 (6.5)	0.184
Survival	15 (78.9)	29 (93.5)	

Respiratory complications were more frequent in the operative group (**31.6%**) than in the conservative group (**9.7%**), although the difference was not statistically significant (**p=0.067**). Intra-abdominal abscess occurred in **10.5%** of operated patients and **9.7%** of conservatively managed patients (**p=1.000**). Wound infection (**21.1%**) and wound dehiscence (**5.3%**) were observed only among surgically treated patients.

Overall, **6 patients (12%)** died during the study period. Mortality was higher in the operative group (**21.1%**) than in the conservative group (**6.5%**), but the difference was not statistically significant (**p=0.184**). The higher mortality among operated patients likely reflects the greater severity of injury and hemodynamic instability at presentation rather than the effect of surgical intervention itself.

DISCUSSION

The present study demonstrated that FAST served as an effective initial bedside investigation for patients with blunt abdominal trauma, while CT scan provided more detailed anatomical evaluation in hemodynamically stable patients. Diagnostic peritoneal lavage remained useful in selected patients with equivocal clinical findings or hemodynamic instability, complementing the role of imaging in trauma assessment. Savatmongkorngul et al. reviewed the current role of FAST and concluded that it is an indispensable first-line investigation because of its rapidity, portability, and ability to detect intraperitoneal fluid in emergency settings. However, they also emphasized that FAST should be interpreted alongside clinical findings and CT imaging when necessary, which is consistent with the diagnostic approach adopted in the present study.[8] Chereau et al. evaluated CT scan and diagnostic peritoneal lavage in the era of non-operative management and reported that CT remains the cornerstone for diagnosing solid organ injuries in stable patients, whereas DPL retains value in carefully selected unstable patients. Their findings support the present study, where CT accurately identified splenic, hepatic, renal, and pancreatic injuries, while positive DPL findings correlated with significant injuries requiring laparotomy.[9]

Quinn et al. recently reassessed the role of FAST and diagnostic peritoneal aspiration in unstable patients and concluded that although both investigations provide rapid diagnostic information, they should be interpreted within the overall clinical context. This observation is reflected in the present study, where FAST and DPL contributed to early surgical decision-making in unstable patients who could not undergo CT evaluation.[10] Sheng et al. reported increasing utilization of FAST as the primary screening modality, with CT reserved for definitive evaluation in stable trauma patients. They highlighted that this sequential imaging strategy improves resource utilization while maintaining diagnostic accuracy. A similar diagnostic pathway was followed in the present study, where all patients underwent FAST, whereas CT was performed only after hemodynamic stabilization.[11] Gaarder et al. demonstrated that radiologist-performed FAST has excellent diagnostic performance for detecting clinically significant intra-abdominal injuries but should not replace CT in stable patients because smaller solid organ injuries may remain undetected. The findings of the present study are in agreement, as CT detected a greater number of splenic, hepatic, renal, and pancreatic injuries than ultrasonography.[12] Ollerton et al. prospectively evaluated the influence of FAST on trauma management and found that its use significantly accelerated diagnosis, reduced unnecessary delays, and improved decision-making for operative intervention. Similarly, in the present study, FAST facilitated rapid assessment of all trauma patients and helped identify those requiring immediate laparotomy, while CT provided definitive evaluation for patients suitable for non-operative management.[13]

CONCLUSION

FAST is an effective and rapid bedside screening tool for the initial evaluation of blunt abdominal trauma, particularly in hemodynamically unstable patients. Contrast-enhanced CT remains the gold standard for comprehensive assessment of solid organ injuries in stable patients, whereas diagnostic peritoneal lavage continues to have a selective role when imaging findings are inconclusive or CT is not feasible. The complementary use of these diagnostic modalities enables timely diagnosis, appropriate patient selection for operative or non-operative management, and improved clinical outcomes.

REFERENCES

1. Rozycki GS, Ochsner MG, Jaffin JH, Champion HR, Schmidt JA, Gens DR. Prospective evaluation of surgeons' use of ultrasound in the evaluation of trauma patients. **J Trauma.** 1993;34(4):516-526.
2. Boulanger BR, Brenneman FD, McLellan BA, Rizoli SB, Culhane J, Hamilton P. A prospective study of emergent abdominal sonography after blunt trauma. J Trauma. 1995 Aug;39(2):325-30. doi: 10.1097/00005373-199508000-00022. PMID: 7674402.
3. Hoff WS, Holevar M, Nagy KK, et al. Practice management guidelines for the evaluation of blunt abdominal trauma: the East practice management guidelines work group. The Journal of Trauma. 2002 Sep;53(3):602-615. DOI: 10.1097/00005373-200209000-00038. PMID: 12352507.
4. Richards JR, McGahan JP, Simpson JL, Tabar P. Bowel and mesenteric injury: evaluation with emergency abdominal US. Radiology. 1999 May;211(2):399-403. DOI: 10.1148/radiology.211.2.r99ma54399. PMID: 10228520.
5. Richards JR, Derlet RW. Computed tomography for blunt abdominal trauma in the ED: a prospective study. Am J Emerg Med. 1998 Jul;16(4):338-42. doi: 10.1016/s0735-6757(98)90122-x. PMID: 9672445.
6. Ghafouri HB, Zare M, Bazrafshan A, Modirian E, Farahmand S, Abazarian N. Diagnostic accuracy of emergency-performed focused assessment with sonography for trauma (FAST) in blunt abdominal trauma. Electron Physician. 2016 Sep 20;8(9):2950-2953. doi: 10.19082/2950. PMID: 27790349; PMCID: PMC5074755.
7. Ghaedamini H et al.Investigating the Diagnostic Accuracy of Focused Assessment with Sonography in Trauma (FAST) Compared to CT Scan in Patients with Blunt Abdominal Trauma. 2023:2023.
8. Savatmongkorngul S, Wongwaisayawan S, Kaewlai R. Focused assessment with sonography for trauma: current perspectives. Open Access Emerg Med. 2017 Jul 26;9:57-62. doi: 10.2147/OAEM.S120145. PMID: 28794661; PMCID: PMC5536884.
9. ChereauN, Wagner M, TresalletC, LucidarmeO, Raux M, MenegauxF.CT scan and Diagnostic Peritoneal Lavage: towards a better diagnosis in the area of nonoperative management of blunt abdominal trauma.Injury.2016;47(9):2006-2011. https://doi.org/10.1016/j.injury.2016.04.034
10. Quinn R, Hsu J, Pang T. Can We Trust Them? FAST and DPA in Assessing Unstable Patients Following Blunt Abdominal Trauma. Surgeries. 2024; 5(3):674-681. https://doi.org/10.3390/surgeries5030053
11. Sheng AY, Dalziel P, Liteplo AS, Fagenholz P, Noble VE. Focused Assessment with Sonography in Trauma and Abdominal Computed Tomography Utilization in Adult Trauma Patients: Trends over the Last Decade. Emerg Med Int. 2013;2013:678380. doi: 10.1155/2013/678380. Epub 2013 Aug 29. PMID: 24073336; PMCID: PMC3773453.
12. Gaarder C, Kroepelien CF, Loekke R, Hestnes M, Dormage JB, Naess PA. Ultrasound performed by radiologists-confirming the truth about FAST in trauma. J Trauma. 2009 Aug;67(2):323-7; discussion 328-9. doi: 10.1097/TA.0b013e3181a4ed27. PMID: 19667885.
13. Ollerton JE, Sugrue M, Balogh Z, D'Amours SK, Giles A, Wyllie P. Prospective study to evaluate the influence of FAST on trauma patient management. J Trauma. 2006 Apr;60(4):785-91. doi: 10.1097/01.ta.0000214583.21492.e8. PMID: 16612298.