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Original article

A Retrospective Analysis of *FAST*-Sonography Reliability for Blunt Abdominal Trauma Management at *Abo-Slim Trauma Hospital*: Surgical Outcomes and CT Comparisons

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Blunt abdominal trauma (BAT) represents a significant cause of morbidity and mortality in emergency medicine. Accurate and timely diagnosis, along with appropriate intervention, is crucial in the effective management of trauma patients with BAT. Failure to identify occult injuries may result in preventable adverse outcomes. Focused Assessment with Sonography for Trauma (FAST) and computed tomography (CT-Scans) are essential diagnostic tools that aid clinicians in accurately diagnose and manage patients with BAT. This study aimed to evaluate the clinical utility of FAST-Scans performed by emergency surgeons at a regional trauma center (Abo-Slim Trauma Hospital) in the assessment of BAT patients. Additionally, it examines the limitations of FAST and explores potential strategies to enhance its diagnostic efficacy. A hundred of consecutive BAT patients at a Level I trauma center from 2009-2012 were studied, retrospectively. FAST-Scan performance was evaluated against laparotomy/CT-Scan findings, with statistical analysis using Fisher's exact test and multivariate regression. FAST-Scan demonstrated excellent sensitivity (98.3%) and reliable accuracy (89.5%) for detecting hemoperitoneum, though with limited specificity (14.3%). While CT showed superior anatomical characterization (100% accuracy). FAST-Scan remains an indispensable first-line tool for rapid triage in blunt abdominal trauma when interpreted by trained clinicians.

Introduction

Blunt abdominal trauma (*BAT*) remains a leading cause of morbidity and mortality in emergency and trauma settings worldwide [1]. The timely and accurate diagnosis of intra-abdominal injuries is critical, as missed or delayed detection can lead to life-threatening complications, including hemorrhagic shock [2, 3], peritonitis, and sepsis [4, 5]. Unlike penetrating trauma, where external wounds often guide management, BAT presents diagnostic challenges due to its frequently occult nature, especially in poly trauma patients with altered mental status or distracting injuries [2, 6].

Historically, diagnostic peritoneal lavage (DPL) was the gold standard for detecting hemoperitoneum [7]. However, its invasive nature, risk of complications, and inability to localize injuries led to its gradual replacement by imaging modalities. The advent of Focused Assessment with Sonography for Trauma (*FAST*) revolutionized trauma care by providing a rapid, non-invasive, and repeatable bedside tool to identify free intraperitoneal fluid—a surrogate marker for significant injury [8, 9]. *FAST* gained rapid adoption in the 1990s, endorsed by the American College of Surgeons and integrated into Advanced Trauma Life Support (ATLS) protocols due to its high specificity for hemoperitoneum and utility in triaging unstable patients [10,11].

Despite its advantages, *FAST* has well-documented limitations. Its sensitivity varies widely (60–98%) depending on operator skill, patient body habitus, and injury type. While excellent for detecting free fluid, *FAST* cannot reliably identify solid organ injuries, retroperitoneal hematomas, or hollow viscus perforations [12, 13]. Moreover, false negatives occur in cases with minimal bleeding or delayed fluid accumulation [14-16]. These shortcomings have led to debates about its role in modern trauma algorithms, particularly with the increasing availability of computed tomography (CT), which offers superior anatomical detail and injury characterization [16, 17].

CT-Scan, particularly contrast-enhanced multi-detector CT (*MDCT*), is now considered the gold standard for stable *BAT* patients, with near-perfect sensitivity and specificity for solid organ injuries, vascular lesions, and active bleeding. However, CT is resource-intensive, exposes patients to ionizing radiation, and requires hemodynamic stability—making it impractical for immediate decision-making in unstable trauma scenarios [18]. Thus, *FAST* retains its role as a screening tool in the primary survey, particularly in resource-limited settings where CT may not be readily available [13, 17].

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While numerous studies have evaluated *FAST* performance, discrepancies persist regarding its real-world accuracy, particularly when performed by surgeons rather than radiologists**.** Additionally, the false-positive and false-negative rates in clinical practice, and their impact on unnecessary laparotomies or missed injuries, require further scrutiny. At *Abo-Slim Trauma Hospital*, where *FAST* is routinely performed by emergency and general surgeons, understanding its diagnostic reliability is essential for optimizing trauma workflows. This study aimed to evaluate the diagnostic accuracy of Focused Assessment with Sonography for Trauma (*FAST*) in blunt abdominal trauma (*BAT*) patients by analysing its sensitivity, specificity, positive predictive value (*PPV*), and negative predictive value (*NPV*) using laparotomy findings and abdominal CT scans as reference standards. Additionally, the study seeks to identify common pitfalls associated with *FAST* interpretation, including operator dependency, challenges in detecting minimal fluid volumes, and confounding pathologies that may lead to false-positive or false-negative results.

Methods

Study design

This retrospective study at *Abo-slim Trauma Hospital* aimed to evaluate the diagnostic performance of *FAST* in blunt abdominal trauma (*BAT*) patients managed by emergency surgeons. First, we analyzed the primary etiologies of *BAT* to identify common injury mechanisms in this population. Second, we assessed the correlation between positive *FAST* exams and therapeutic laparotomy findings to determine *FAST's* clinical utility in guiding surgical intervention. Finally, we examined whether *CT-Scan* results correlated with laparotomy outcomes, comparing its diagnostic accuracy with *FAST*. The study also explores the limitations of *FAST* and proposes strategies for improvement, with the goal of optimizing trauma workflows in resource-limited settings.

We conducted a retrospective descriptive study of 100 consecutive trauma patients aged 37±2.74 (Mean±SD) years admitted to our Level I trauma center following emergency department evaluation between 2009 and 2012.

Date collection and validation

Trained research assistants, blinded to study objectives, retrospectively abstracted all data through a comprehensive medical record review. No formal inter-rater reliability assessments or ongoing monitoring of research assistants was conducted during data collection. Data were obtained from the institutional trauma registry, with variables including age, sex, mechanisms of injury, arrival timestamp, presenting complaint, initial systolic blood pressure, *Glasgow Coma Scale (GCS) score*, *FAST* examination results, and abdominal *CT-Scan* findings. *FAST-Scan* results were specifically extracted from documentation by both emergency department surgeons and surgical consultants.

FAST Examination Protocol

All *FAST- Scans* were performed following primary survey with patients in the supine position. Each examination included four standard views: (1) right upper quadrant (Morrison's pouch), (2) left upper quadrant (splenorenal recess), (3) transverse pelvic, and (4) longitudinal pelvic (cul-de-sac) views. In select cases, a subxiphoid view was obtained as well. The primary objective of FAST was to identify free intraperitoneal fluid indicative of abdominal organ injury [8]. A scan was considered positive if free fluid was detected, irrespective of volume or location, while the absence of fluid constituted a negative result. Given our focus on abdominal evaluation, cardiac views were excluded from the analysis.

CT-Scan Criteria

Abdominal CT findings were classified as positive based on trauma registry criteria, including hemoperitoneum, retroperitoneal/pelvic hematoma, or significant visceral/bowel injury. Isolated injuries to bony structures were excluded from positive CT findings.

Statistical Analysis

Data analysis was performed using *StateView software*. Continuous variables with normal distribution were analyzed using Student's t-test, while non-normally distributed variables were assessed with the Mann-Whitney U test. Categorical variables were evaluated using Pearson's chi-square test. Multivariate logistic regression adjusted for temporal variations in clinical and demographic factors when analyzing trends in *FAST* and *CT-Scan* utilization.

Results

A retrospective analysis was conducted on 100 blunt abdominal trauma patients presenting to the emergency department at *Abo-Slim Trauma Hospital* between *January* 2009 and *January* 2012. The cohort

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comprised 70% male patients, with a mean age of 37±2.74 (Mean±SD; range: 9–83). Road traffic accidents (52%) were the predominant injury mechanism, followed by falls (23%), assaults (14%), and motorcycle crashes (11%).

FAST Performance Findings

The study identified 65 patients (65%) with positive *FAST-Scans* showing intraperitoneal fluid, all of whom underwent surgical exploration. Among these cases, 59 patients (90.7%) had their injuries confirmed during laparotomy, while 6 cases (9.3%) revealed no significant pathology upon exploration, representing false positive results (Table 1). Of the 35 patients with negative *FAST-Scans*, the majority (33 patients, 94.3%) were successfully managed non-operatively. However, two *FAST*-negative cases (5.7%) required subsequent laparotomy due to clinical deterioration, with one case demonstrating mesenteric injury and the other showing no apparent injury upon surgical exploration.

These findings demonstrate *FAST's* strong predictive value for detecting significant intra-abdominal injuries requiring surgical intervention, while also highlighting its limitations. The 9.3% false positive rate indicates some unnecessary surgical explorations, whereas the 5.7% false negative rate underscores the importance of ongoing clinical assessment even in patients with initially negative *FAST* results. The high confirmation rate of positive *FAST-S*cans (90.7%) supports its utility as a rapid screening tool in the trauma setting, though clinicians should remain vigilant for the possibility of missed injuries in *FAST*-negative cases.

Diagnostic Performance Characteristics

The analysis revealed *FAST* to have a sensitivity of 98.3% (95% CI: 0.75-0.99) and specificity of 14.3% (95% CI: 0.33-0.60) in this patient population. The *Positive Predictive Value* (*PPV*) reached 90.7%, while the *Negative Predictive Value* (*NPV*) was 50%. Statistical analysis using *Fisher's exact test* confirmed a highly significant association between positive *FAST* results and the presence of intra-abdominal pathology (p=0.001). These performance metrics demonstrate *FAST's* effectiveness as a screening examination, particularly its ability to reliably identify patients requiring surgical intervention, though the relatively low specificity suggests limitations in its ability to definitively rule out injuries without additional imaging modalities.

CT-Scan Performance Findings

Among the study cohort, 16 patients underwent preoperative CT imaging prior to surgical intervention. The *CT-scans* demonstrated perfect accuracy (100%) in identifying injuries that ultimately required operative management. However, the sensitivity of CT varied significantly depending on the specific type of injury being evaluated. The modality showed 64% sensitivity for detecting hemoperitoneum, 82.8% for retroperitoneal injuries, and 71.4% and 75% for liver and spleen injuries respectively, as detailed in Table 2.

These results highlight the complementary roles of *FAST* and *CT-Scans* in trauma evaluation. While CT provided definitive anatomical localization of injuries with complete accuracy in surgical cases, its variable sensitivity for different injury patterns suggests that certain pathologies may still be challenging to identify. The 100% accuracy in predicting surgical needs reinforces CT's value as a definitive diagnostic tool, particularly for treatment planning. However, the *organ-specific* sensitivity variations indicate that clinical correlation remains essential, especially for certain injury types like hemoperitoneum where the detection rate was notably lower.

Comparative Diagnostic Observations

The study revealed important contrasts between the two imaging modalities. *FAST* maintained excellent sensitivity (98.3%) for detecting free fluid but showed limited specificity (14.3%), resulting in a 9.3% false positive rate. In comparison, *CT-Scans* achieved perfect accuracy in determining surgical needs but demonstrated variable sensitivity across different injury types. The clinical course of two *FAST*-negative patients who later required laparotomy further emphasizes that neither modality alone is infallible, and serial clinical assessments remain crucial in trauma management. These findings collectively support the current practice of using FAST for rapid initial screening while reserving CT-Scan for definitive diagnosis and surgical planning in BAT cases.

Table 1 compares FAST-scan results with operative findings in 67 patients who underwent laparotomy. The data demonstrate *FAST's* high sensitivity (98.3%) for detecting surgically significant injuries, with 59 true-positive cases identified. Six false-positive *FAST*-scans (8.9% of laparotomies) and one false-negative case (1.5%) were observed, highlighting *FAST's* limitations in specificity. The single true-negative case represents a patient with negative *FAST* who nonetheless required non-therapeutic exploration. The correlation between *FAST* results and laparotomy findings revealed *FAST's* effectiveness in triaging blunt abdominal trauma. Key observations include 59 of 65 *FAST*-positive patients (90.8%) had confirmed injuries (high *PPV*), 6 false-positive cases led to non-therapeutic laparotomies (9.2%), and only 1 of 2 FAST-negative cases required therapeutic surgery (low false-negative rate). These outcomes demonstrate *FAST's* strong sensitivity but

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highlight the need for clinical correlation to optimize surgical decisions. Complete performance metrics are detailed in the Results section.

Table 1. Correlation between FAST and therapeutic Laparotomy in BAT patients

	Therapeutic laparotomy		
	Positive	Negative	Total
Positive FAST-Scan	59	6	65
Negative FAST-Scan	1	1	2
Total scans	60	7	67

Table 2 compares preoperative CT findings with operative outcomes across nine injury patterns in 16 blunt abdominal trauma patients undergoing laparotomy. The data reveal distinct diagnostic trends: CT demonstrated strong concordance with laparotomy for hemoperitoneum (7 true-positive cases) and retroperitoneal injuries (9 true positives), though it missed 2 occult retroperitoneal injuries. Solid organ assessment showed moderate accuracy, correctly identifying 5 liver and 6 splenic injuries but failing to detect 2 liver and 2 splenic injuries found during surgery. CT performed poorly for hollow viscus and mesenteric injuries, missing all 7 bowel injuries (4 large bowel, 3 small bowel) and 7 of 8 mesenteric injuries. Notably, diaphragmatic injuries (n=2) were all correctly identified, while pneumoperitoneum findings included 2 false positives. These results highlight CT's variable sensitivity depending on injury type, with particular weaknesses in detecting bowel and mesenteric trauma despite its overall anatomical precision.

Table 2: Correlation Between CT-Scan Findings and Laparotomy results in 16 BAT Patients

Injury Type	CT(+) Only	Lap(+) Only	Both(+)	Both(-)	Notable Findings
Hemoperitoneum	2	4	7	3	High concordance (7/16)
Retroperitoneum	2	2	9	3	CT missed 2 retroperitoneal injuries
Liver	4	2	5	5	2 liver injuries CT-negative
Spleen	3	2	6	5	Similar to liver injury pattern
Diaphragmatic	0	0	2	14	100% CT detection when present
Mesenteric	1	7	0	8	CT missed 7/8 mesenteric injuries
Large Bowel	0	4	0	12	CT missed all 4 bowel injuries
Small Bowel	0	3	0	13	All 3 injuries CT-negative
Air Under Diaphragm	2	0	0	14	2 false-positive CT readings
Renal injury	0	6	0	10	CT missed 6 renal readings

Discussion

The findings of our study contribute to the ongoing evaluation of Focused Assessment with Sonography for Trauma (*FAST*) as a critical diagnostic tool in blunt abdominal trauma [8, 9, 13, 19, 20]. Historical data from the 1990s established *FAST* as a reliable alternative to diagnostic peritoneal lavage, leading to its incorporation into the Advanced Trauma Life Support protocol and surgical training programs internationally [20, 21]. Our results demonstrate that *FAST* maintains its clinical relevance, showing 89% overall accuracy and exceptional sensitivity of 98.3% in detecting intraperitoneal hemorrhage. These figures align with international studies reporting sensitivity ranges of 83-100%, confirming *FAST*'s value as an initial screening modality [22, 23].

The specificity of *FAST* in our study presents a more complex picture. While the initial calculation showed 14.3% specificity, this value increases to 85% when considering conservatively managed patients as true negatives. This discrepancy highlights an important limitation in FAST interpretation - the challenge of distinguishing clinically significant hemoperitoneum from incidental fluid findings [24]. Our experience with six false-positive cases underscores the need for clinical correlation, particularly in patients with potential sources of non-traumatic intraperitoneal fluid such as pre-existing ascites or gynecological pathology [25-27].

The comparison between FAST and computed tomography reveals complementary strengths of each modality. While CT-Scan demonstrated perfect accuracy in surgical planning and superior anatomical detail, its variable sensitivity for specific injuries (64% for hemoperitoneum, 82.8% for retroperitoneal injuries) and logistical constraints limit its use as a universal screening tool [28, 29]. FAST's portability and rapid results make it indispensable in the initial trauma assessment, particularly for hemodynamically unstable patients where time is critical. The two false-negative FAST cases in our series, both requiring delayed laparotomy, reinforce the importance of serial clinical assessments regardless of initial imaging results [26, 30-32].

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Technical considerations significantly impact FAST reliability. The operator-dependent nature of ultrasound imaging means results vary with examiner experience. While our surgical team achieved excellent correlation with operative findings, the learning curve for accurate FAST interpretation should not be underestimated [33]. Challenges include detecting small fluid volumes, distinguishing blood from other fluid collections, and obtaining adequate views in patients with body habitus limitations. These factors support the need for structured training programs, quality assurance measures, and artificial intelligence in trauma centers implementing FAST protocols [34-38].

The management of specific injury patterns warrants special attention. Our experience with 26 intestinal injuries showed that while FAST detected free fluid in 25 cases, the injuries themselves required CT-Scan for definitive diagnosis. This observation, consistent with Lee's findings regarding bowel and mesenteric injuries, suggests that FAST should be viewed as part of a comprehensive diagnostic approach rather than a standalone test [39, 40]. The dynamic nature of traumatic injuries further complicates imaging timing - scanning too early may miss developing pathology, while delayed imaging may encounter clotted blood that is more difficult to recognize sonographically [41].

From a clinical implementation perspective, our results support an algorithmic approach to blunt abdominal trauma. Hemodynamically unstable patients with positive FAST should proceed directly to laparotomy in most cases. Stable patients with positive FAST benefit from CT characterization of injuries, while FAST-negative patients require careful observation with low threshold for repeat imaging or CT based on clinical evolution [42, 43]. This stratified approach balances the speed of FAST with the precision of CT, optimizing outcomes while conserving resources.

The limitations of our study include its retrospective design and the potential variability in examiner experience over the study period. Additionally, advances in CT technology since the study's completion may affect contemporary comparisons between modalities. However, the fundamental strengths and limitations of FAST that we identified remain clinically relevant, particularly in resource-limited settings where CT availability may be restricted.

Conclusion

FAST examination maintains its essential role in the initial assessment of blunt abdominal trauma due to its high sensitivity, rapid availability, and non-invasive nature. Our findings validate its strong correlation with surgical findings when performed by trained clinicians, with 98.3% of positive scans confirming significant intra-abdominal pathology. However, clinicians must remain aware of its limitations, particularly regarding specificity and the detection of specific injury patterns. The integration of FAST into a comprehensive diagnostic strategy that includes careful clinical assessment and selective CT use represents the optimal approach to blunt abdominal trauma management. Future research should focus on standardizing training protocols, exploring the role of contrast-enhanced ultrasound, and developing clear guidelines for repeat imaging in high-risk patients.

Conflict of interest. Nil

References

1. Mirzamohamadi S, et al. Patterns and outcomes of patients with abdominal injury: a multicenter study from Iran. BMC Emerg Med. 2024;24(1):91.
2. Ming Z, et al. Abdominal bleeding secondary to isolated mesenteric injury following blunt abdominal trauma: a case report. Medicine (Baltimore). 2025;104(12):e41920.
3. Latif RK, et al. Traumatic hemorrhage and chain of survival. Scand J Trauma Resusc Emerg Med. 2023;31(1):25.
4. Haddar K, et al. Isolated gastric perforation following blunt abdominal trauma: a case report. Radiol Case Rep. 2025;20(7):3367-3371.
5. Clements TW, et al. Secondary peritonitis and intra-abdominal sepsis: an increasingly global disease in search of better systemic therapies. Scand J Surg. 2021;110(2):139-149.
6. Devendra A, et al. Current updates in management of extremity injuries in polytrauma. J Clin Orthop Trauma. 2021;12(1):113-122.
7. Rafaqat W, et al. Diagnostic peritoneal lavage is dead: long live diagnostic peritoneal aspiration. J Trauma Acute Care Surg. 2024;96(3):e24.
8. Savoia P, Jayanthi SK, Chammas MC. Focused Assessment with Sonography for Trauma (FAST). J Med Ultrasound. 2023;31(2):101-106.
9. Bella FM, et al. Extended Focused Assessment with Sonography for Trauma in the Emergency Department: a comprehensive review. J Clin Med. 2025;14(10).
10. Kumar S, et al. Evaluating the impact of Advanced Trauma Life Support (ATLS) training in reducing preventable and potentially preventable deaths: a mixed-methods cohort study. Cureus. 2025;17(4):e81681.

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11. Rossaint R, et al. The European guideline on management of major bleeding and coagulopathy following trauma: sixth edition. Crit Care. 2023;27(1):80.
12. Kumar P, et al. Limitations of Focused Assessment with Sonography for Trauma in pelvic trauma: a retrospective review of false-positive results and non-therapeutic laparotomies. J Orthop Case Rep. 2025;15(4):245-251.
13. Sutarjono B, et al. Is it time to re-think FAST? A systematic review and meta-analysis of Contrast-Enhanced Ultrasound (CEUS) and conventional ultrasound for initial assessment of abdominal trauma. BMC Emerg Med. 2023;23(1):8.
14. Ijuin S, et al. False negative of pericardial effusion using focused assessment with sonography for trauma and enhanced CT following traumatic cardiac rupture: a case report. Trauma Case Rep. 2020;28:100327.
15. Quan GE, et al. Predictors of false-negative Focused Assessment With Sonography for Trauma examination in pediatric blunt abdominal trauma. Pediatr Emerg Care. 2020;36(5):e274-e279.
16. Jensen LR, et al. Accuracy of FAST in detecting intraabdominal bleeding in major trauma with pelvic and/or acetabular fractures: a retrospective cohort study. Eur J Orthop Surg Traumatol. 2024;34(3):1479-1486.
17. Granieri S, et al. Contrast-enhanced CT scan (CECT) for the detection of hollow viscus and mesenteric injuries in blunt trauma—an updated systematic review of the literature and meta-analysis of diagnostic test accuracy. Eur J Trauma Emerg Surg. 2024;50(6):2709-2719.
18. White A, et al. Computed tomography in initially unstable thoracoabdominal trauma can safely enhance triage. Surg Pract Sci. 2025;20:100274.
19. StatPearls. 2025.
20. Galvagno SM, Nahmias JT, Young DA. Advanced Trauma Life Support. Anesthesiol Clin. 2019;37(1):13-32.
21. Bustraan J, et al. MCQ tests in Advanced Trauma Life Support (ATLS©): development and revision. Injury. 2016;47(3):665-8.
22. Sargent W, Bull AMJ, Gibb I. Focused Assessment with Sonography in Trauma (FAST) performance in paediatric conflict injury. Clin Radiol. 2022;77(7):529-534.
23. Kim TA, Kwon J, Kang BH. Accuracy of Focused Assessment with Sonography for Trauma (FAST) in Blunt Abdominal Trauma. Emerg Med Int. 2022;2022:8290339.
24. Kornblith AE, et al. The utility of Focused Assessment With Sonography for Trauma Enhanced Physical Examination in children with blunt torso trauma. Acad Emerg Med. 2020;27(9):866-875.
25. Tomasińska A, et al. Accuracy of pretreatment ultrasonography assessment of intra-abdominal spread in epithelial ovarian cancer: a prospective study. Diagnostics (Basel). 2021;11(9).
26. Alramdan MHA, et al. Predictive value of a false-negative focused abdominal sonography for trauma (FAST) result in patients with confirmed traumatic abdominal injury. Insights Imaging. 2020;11(1):102.
27. Walcher F, et al. Accuracy of prehospital focused abdominal sonography for trauma after a 1-day hands-on training course. Emerg Med J. 2010;27(5):345-9.
28. Al Nufaiei ZF, Alshamrani KM. Comparing ultrasound, chest X-ray, and CT scan for pneumonia detection. Med Devices (Auckl). 2025;18:149-159.
29. Caraiani C, et al. Indications for abdominal imaging: when and what to choose? J Ultrason. 2020;20(80):e43-e54.
30. Nasr Isfahani M, et al. Enhancing clinical risk assessment in pediatric blunt abdominal trauma: a novel scoring system using ultrasound and laboratory data. BMC Emerg Med. 2025;25(1):34.
31. Greco PS, Day LJ, Pearlman MD. Guidance for evaluation and management of blunt abdominal trauma in pregnancy. Obstet Gynecol. 2019;134(6):1343-1357.
32. Rowell SE, et al. The focused assessment with sonography in trauma (FAST) in hypotensive injured patients frequently fails to identify the need for laparotomy: a multi-institutional pragmatic study. Trauma Surg Acute Care Open. 2019;4(1):e000207.
33. Tolsgaard MG, et al. Reliable and valid assessment of ultrasound operator competence in obstetrics and gynecology. Ultrasound Obstet Gynecol. 2014;43(4):437-43.
34. Kim YH. Artificial intelligence in medical ultrasonography: driving on an unpaved road. Ultrasonography. 2021;40(3):313-317.
35. Bektaş M, et al. Artificial intelligence-aided ultrasound imaging in hepatopancreatobiliary surgery: where are we now? Surg Endosc. 2024;38(9):4869-4879.
36. Reis NC, et al. FAST and Furious About Quality: impact of continuous review and feedback on point-of-care ultrasound examinations. Am Surg. 2024;90(11):2857-2861.
37. Kumar A, Kugler J, Jensen T. Evaluation of trainee competency with point-of-care ultrasonography (POCUS): a conceptual framework and review of existing assessments. J Gen Intern Med. 2019;34(6):1025-1031.
38. Cull J, et al. A quality assessment tool for focused abdominal sonography for trauma examinations using artificial intelligence. J Trauma Acute Care Surg. 2025;98(1):111-116.
39. Hodler J, Kubik-Huch RA, von Schulthess GK. *Diseases of the Abdomen and Pelvis 2018-2021: Diagnostic Imaging - IDKD Book*. 2018.
40. Diagnostic accuracy of FAST scan in patient with blunt abdominal trauma keeping CECT abdomen as gold standard. J Med Health Sci Rev. 2025;2(1).

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41. Desai N, Harris T. Extended focused assessment with sonography in trauma. BJA Educ. 2018;18(2):57-62.
42. Yazıcı MM, et al. The role of repeated extended FAST in patients with stable blunt thoracoabdominal trauma. Ulus Travma Acil Cerrahi Derg. 2023;29(5):553-559.
43. Elbaih AH, Abu-Elela ST. Predictive value of focused assessment with sonography for trauma (FAST) for laparotomy in unstable polytrauma Egyptians patients. Chin J Traumatol. 2017;20(6):323-328.

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