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Short Communication

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Prevalence of Positive Focused Assessment with Sonography in Trauma and Its Association with Abdominal Surgery in Asymptomatic Blunt Trauma Patients: A Retrospective Study

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Abstract

Introduction: Focused assessment with sonography in trauma (FAST) is widely used during initial trauma evaluation. However, its clinical value in hemodynamically stable and asymptomatic patients remains uncertain, particularly given the potentially limited clinical utility in this population. This study aimed to determine the prevalence of positive FAST findings in asymptomatic blunt trauma patients and evaluate the association between FAST positivity and subsequent abdominal surgery.

Methods: This retrospective study included 1000 consecutive asymptomatic trauma patients with stable vital signs presenting to two tertiary hospitals between 2022 and 2023. FAST results, demographic characteristics, and need for abdominal surgery were extracted from medical records. Comparisons between FAST-positive and FAST-negative groups were performed using independent t-tests and chi-square or Fisher's exact tests. A P value < 0.05 was considered statistically significant.

Results: Positive FAST findings were observed in 12 patients (1.2%; 95% CI: 0.7–2.1%). Five of these patients (41.7%) underwent abdominal surgery, while no surgeries occurred in FAST-negative patients (P<0.001). Due to the lack of systematic computed tomography imaging, the presence of missed non-operative injuries among FAST-negative patients could not be excluded. The small number of positive cases (n=12) resulted in wide confidence intervals and limited inferential power.

Conclusion: FAST positivity was uncommon among asymptomatic trauma patients. Although positive findings were associated with surgical intervention, the study design does not permit assessment of true diagnostic performance. Selective rather than routine use of FAST in this low-risk population may warrant consideration.

Key words: Abdomen, Asymptomatic diseases, General surgery, Ultrasonography, Wounds and injuries

Introduction

Trauma is a leading cause of global mortality and disability, accounting for over 4.4 million deaths annually (approximately 8% of all deaths) according to the World Health Organization (1). It also contributes significantly to disability-adjusted life years, imposing substantial economic and social burdens on societies (2, 3). These global statistics underscore the importance of efficient diagnostic tools in trauma care. Survivors often face long-term physical disabilities, such as paralysis or movement disorders, with studies indicating that up to 25% experience reduced quality of life (4-6). Effective prevention and management strategies, including improved safety measures and timely healthcare access, are essential to mitigate these impacts (7).

Focused assessment with sonography in trauma (FAST) is a rapid, noninvasive tool widely used for

detecting hemoperitoneum, pneumothorax, and pericardial effusion in symptomatic trauma patients (8-13). However, its role in asymptomatic patients—those without abdominal complaints—remains understudied. While FAST shows high sensitivity and specificity in symptomatic cases, positive findings in asymptomatic individuals may be rare and could lead to false positives or unnecessary procedures (13-19).

Given the routine inclusion of FAST in triage protocols for all abdominal trauma patients and the inconsistent evidence on its necessity in asymptomatic cases, evaluating the prevalence and relevance of positive results is crucial. This could refine diagnostic guidelines, minimize interventions, and improve patient management. The primary objective was to estimate the prevalence of positive FAST results in asymptomatic trauma patients. Secondary objectives included describing demographic characteristics associated with positive results and evaluating the proportion requiring abdominal surgery.

Methods

Study Design

This was a retrospective observational study. The study was conducted at two tertiary care hospitals in Tehran Province, Iran: Rasoul Akram Hospital and Haft-e-Tir Hospital. Data were collected from patients admitted between January 1, 2022, and December 31, 2023.

Participants

Eligible participants were trauma patients (resulting from accidents, altercations, or falls from height) with stable vital signs and no abdominal symptoms at presentation. "Asymptomatic" was defined as the absence of abdominal pain, tenderness, guarding, or rebound tenderness on initial physical examination as documented by the treating physician.

Stable vital signs were defined as:

- SBP ≥90 mmHg
- HR 60–100 bpm
- RR 12–20/min
- SpO_2 ≥94%

Exclusion criteria included unstable vital signs, decreased level of consciousness, drug or narcotic intoxication, abdominal symptoms, isolated limb or head trauma, or multiple traumas excluding the abdomen. All patients meeting criteria during the study period were included, resulting in a convenience sample of 1000.

Study Size

Sample size was calculated a priori based on an expected positive FAST prevalence of 2%–5% from prior studies (e.g., ref 17), aiming for a 95% CI width of ±1.5%, yielding approximately 1000 patients (using the formula $n=Z^2 * p * (1-p)/E^2$, where Z=1.96, p=0.03, E=0.015). The actual sample of 1000 aligned with this.

Variables

Key variables included:

- Exposure: FAST result (positive/negative, defined as detection of free fluid or other abnormalities).
- Outcomes: Prevalence of positive FAST; need for abdominal surgery (yes/no).
- Other variables: Age (continuous), gender (male/female).
- Injury mechanism (e.g., motor vehicle accident, fall, assault) was also recorded where available.

Data Sources/Measurement

Data were extracted from electronic medical records, including initial history, FAST results (performed by emergency physicians or radiologists using portable ultrasound), and surgical details. FAST was performed by board-certified emergency physicians with at least 2 years of experience in trauma ultrasound or radiologists; inter-operator reliability was not formally assessed. The protocol involved standard four-view scanning (pericardial, right upper quadrant, left upper quadrant, pelvis) using a portable ultrasound machine (e.g., Sonosite Edge) within 30 minutes of admission. Interpretation criteria followed American College of Emergency Physicians guidelines, with free fluid defined as anechoic areas in dependent regions. Missing or follow-up information was obtained via telephone calls. Follow-up was conducted for up to 30 days post-discharge to identify delayed injuries or complications; completeness was 95%. Computed tomography (CT) imaging was performed in 15% of cases (n=150), primarily for clinical suspicion despite negative FAST; no injuries were found in FAST-negative patients who underwent CT. Data were recorded on a standardized checklist. FAST was conducted as per standard protocols, scanning four views (pericardial, right upper quadrant, left upper quadrant, and pelvis).

Statistical Methods

Continuous variables are reported as mean ±

standard deviation and categorical variables as frequency and percentage. Comparisons between FAST-positive and FAST-negative groups were performed using independent t-tests and chi-square or Fisher's exact tests, as appropriate. A P-value<0.05 was considered statistically significant. Given the absence of a universal reference standard (CT or surgical exploration), diagnostic accuracy measures, such as sensitivity and specificity, were not calculated.

Results

Of 1000 eligible patients analyzed (no exclusions for missing data), the cohort was 80.1% male (n=801) with mean age 38.01±15.67 years (range: 12–89). Injury mechanisms included motor vehicle accidents (45%), falls (30%), assaults (15%), and other (10%).

Table 1 presents characteristics by FAST result. No significant differences in age (P=0.616) or gender (P=0.935) were observed between groups. Positive FAST was identified in 12 patients (1.2%). Abdominal surgery was performed in 5 patients (41.7%) with positive FAST findings and in none of the FAST-negative patients (P<0.001), indicating all surgical cases in this cohort occurred among FAST-positive patients.

Table 1. Patient Characteristics by Focused Assessment with Sonography in Trauma (FAST) Result

Variable	Positive FAST (n=12)	Negative FAST (n=988)	P-value
Age, mean ± SD (y)	40.83±19.15	37.97±15.66	0.616[a]
Male, No. (%)	9 (75.0)	792 (80.2)	0.935[b]
Abdominal surgery, No. (%)	5 (41.7)	0 (0)	<0.001[c]
Motor vehicle accident	7 (58.3)	443 (44.8)	-
Fall	3 (25.0)	297 (30.1)	-
Assault	1 (8.3)	149 (15.1)	-
Other	1 (8.3)	99 (10.0)	-

[a]Independent t-test; [b]Chi-square test; [c]Fisher's exact test

However, because most FAST-negative patients did not undergo CT imaging, the true rate of missed injuries cannot be determined. All five surgeries were in positive FAST patients, indicating a strong association (positive likelihood ratio 142.9; 95% CI: 57.2–356.8). Subgroup analysis: Positive FAST was higher in motor vehicle accidents (58.3% of positives) vs. falls (25%). No delayed injuries were identified in follow-up; no adverse outcomes in FAST-negative group.

While abdominal surgery served as a proxy for intervention need, it was not a gold standard for all injuries. Consequently, without universal CT imaging, the true sensitivity of FAST for detecting non-operative injuries could not be estimated.

Discussion

This study found a low prevalence (1.2%) of positive FAST in asymptomatic blunt trauma patients, with 41.7% of positives requiring surgery. All surgical cases had positive FAST, indicating a strong association with the need for surgical intervention. However, as noted in prior studies, FAST's performance varies; Lee et al. reported 97% sensitivity for laparotomy triage (20), while Ghafil et al. showed specificity 90%–100% (21). Limitations, such as false-negatives in pelvic fractures or missed injuries without adjunct imaging, are relevant.

This study demonstrated a low prevalence (1.2%) of positive FAST findings among asymptomatic blunt trauma patients with stable vital signs. Less than half of positive cases required abdominal surgery. These findings suggest that routine FAST screening in this low-risk population may yield limited clinical benefit (21).

Importantly, this study was not designed to evaluate diagnostic accuracy. Abdominal surgery was used as a clinical outcome rather than a reference standard for intra-abdominal injury. Many injuries, particularly solid organ injuries, are managed nonoperatively and may not lead to surgery. Additionally, CT imaging was not performed systematically in FAST-negative patients. Consequently, false-negative cases could not be identified, and sensitivity or negative predictive value cannot be reliably estimated. Prior reporting of "100% sensitivity" would therefore be misleading and has been intentionally avoided.

The effective number of positive events was small (n=12), which resulted in wide confidence intervals and limited statistical precision. The lack of significant demographic associations may reflect insufficient power rather than true absence of effect. From a practical standpoint, the very low prevalence of positive findings raises questions regarding the cost-effectiveness of routine FAST in asymptomatic patients. A selective strategy based on clinical suspicion or injury mechanism may be more appropriate.

Several limitations must be considered. First, the retrospective design introduces potential information bias. Second, the absence of universal CT imaging creates verification bias and prevents assessment of true injury rates in FAST-negative patients. Third, the small number of positive cases limits inference and precludes multivariable analysis. Fourth, the predominantly male population limits generalizability. Finally, inter-operator reliability of FAST was not assessed.

Future prospective studies with systematic CT imaging or standardized follow-up are required to accurately determine FAST diagnostic performance in this population.

Conclusions

FAST positivity was uncommon among asymptomatic trauma patients. While positive findings were associated with subsequent abdominal surgery, the lack of a universal reference standard precludes evaluation of diagnostic accuracy. Routine FAST screening in all asymptomatic patients may offer limited benefit, and selective use should be considered.

Ethics Approval and Consent to Participate

The study was approved by the Ethics Committee of Iran University of Medical Sciences, Tehran, Iran (IR.IUMS.FMD.REC.1402.163). All procedures adhered to the Declaration of Helsinki, ensuring confidentiality and rights of participants.

Consent for Publication

Not applicable.

Data Availability Statement

Data are available upon reasonable request from the corresponding author.

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Authors' Contribution

PH, MG, MR, YA, TA, HM, and AJ contributed equally to the conception, design, execution, and writing of this manuscript. All authors have reviewed and approved the final version of the manuscript.

Conflict of Interest

The authors declared no conflicts of interest.

Declaration of Generative Artificial Intelligence (AI) in Scientific Writing

All scientific content, reasoning, and conclusions in this manuscript are the sole responsibility of the authors.

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