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Original Article

Accuracy of Focused Assessment with Sonography in Trauma for Laparotomy in Blunt Trauma Abdomen

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Abstract

Introduction: Focused assessment with sonography in trauma (FAST) is an important diagnostic modality for trauma management in the emergency department, in addition to clinical examination. FAST visualizes abdominal bleeding, hemoperitoneum, and soft-tissue injuries in the abdomen.

Aim: This study aimed to assess the contribution of FAST for abdominal blunt trauma and its application to enhance the management strategy for laparotomy.

Materials and Methods: Patients of either sex of the Business Technology Association undergoing FAST followed by laparotomy satisfying the study design and presenting during the study period were included in the study. A total of 60 patients were included in the study.

Results: In our study, FAST findings matched the laparotomy findings. Sensitivity of FAST was 100%, specificity was 98%, positive predictive value was 97%, and negative predictive value was 100%.

Conclusion: According to this study, FAST is useful to detect intra-abdominal fluid in the initial assessment of hemodynamically unstable patients with high accuracy.

Key words: Blunt trauma abdomen, FAST, Laparotomy

INTRODUCTION

Trauma is a leading cause of death and disability, particularly among the active population in developing countries, and the fourth leading cause of death in developed countries.[1] Abdominal trauma, both penetrating and blunt, accounts for about 25% of all trauma cases, with delays in diagnosis and treatment being the primary cause of death.[2] The most common causes of blunt abdominal trauma are traffic accidents, falls, and physical conflicts.[3]

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For patients with stable hemodynamics, the primary diagnostic methods are focused assessment with sonography in trauma (FAST) and computed tomography (CT) scans. In hemodynamically unstable patients where FAST and CT scans are not feasible, diagnostic peritoneal lavage (DPL) and exploratory laparotomy are considered the gold standards. Mortality from bleeding following blunt abdominal trauma is higher than that from penetrating trauma, making rapid diagnosis crucial.[4]

FAST has become a standard part of trauma resuscitation, detecting intraperitoneal fluid safely and quickly, especially beneficial for unstable patients who cannot be moved to a CT suite. FAST's high sensitivity for detecting intraperitoneal fluid is invaluable.[5] Abdominal CT scans, though comprehensive, are time-consuming, expensive, and not feasible for all patients.[6] FAST is quick, portable, and low-cost; it reduces radiation risk and can be repeated

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based on clinical condition, thus reducing the need for CT scans.[7,8] However, FAST has limitations, including the inability to accurately diagnose certain injuries, leading to unavoidable diagnostic errors.[9,10]

This study aims to assess the accuracy of FAST in determining the need for laparotomy and to enhance the management strategy for blunt abdominal trauma. It evaluates the feasibility of relying solely on FAST, without the need for CT scans, DPL, or exploratory laparotomy, to improve the efficiency and effectiveness of trauma care in emergency settings.

Aims and Objectives

This study aimed to assess the accuracy of FAST for considering laparotomy and to enhance the management strategy for abdominal blunt trauma.

The objective of the study was to evaluate the results of FAST in blunt trauma to the abdomen patients, to study the relationship between FAST and laparotomy findings, and to study the outcomes of blunt trauma to the abdomen patients.

MATERIALS AND METHODS

This hospital-based diagnostic efficacy study was conducted in the Surgery Department at AIMSR Bathinda over 18 months, following Ethics Committee approval. The study aimed to assess the accuracy of FAST in determining the need for laparotomy in blunt abdominal trauma cases. Patients presenting to the emergency and surgery departments were included after applying the inclusion and exclusion criteria and obtaining informed consent. The sample size, calculated based on a previous study's sensitivity of FAST at 92.6%, was 60 patients.

The methodology involved a detailed history, physical examination, and sonography within 20–30 min of arrival, followed by laparotomy if indicated. FAST was performed using a Toshiba Xario ultrasound machine with specific probes and four standard views: hepatorenal recess, splenorenal recess, pelvic, and subxiphoid views. Outcome measures included physical, sonographic, and laparotomy findings, alongside patient outcomes. Statistical analysis was calculated to determine sensitivity, specificity, positive predictive value (PPV), and negative predictive value (NPV), with associations tested using the Chi-square test. Inclusion criteria encompassed patients of either sex with blunt abdominal trauma who consented and underwent FAST followed by laparotomy; exclusions included those refusing enrolment, pregnant females, and pediatric patients.

Table 1: Distribution of patients according to USG findings

USG FAST findings	No. (*n*=60)	Percentage
Gross Ascites	1	1.7
Fluid in perisplenic area	30	51.8
Free fluid in hepatorenal area	2	3.3
Free fluid in Morrison	12	20.0
Free fluid in pelvic view	14	23.3
Free fluid with echoes/hemoperitoneum	1	1.7

USG: Ultrasonography, FAST: Focused assessment with sonography in trauma

Table 2: Distribution of patients according to surgical management

Surgical management	No. (*n*=60)	Percentage
Ascites drained	1	1.7
Bladder repair	1	1.7
Hemoperitoneum drained	8	13.3
Hepatic repair	12	20.0
Small bowel perforation 1° closure	5	8.3
Nephrectomy	3	5.0
Resection and anastomosis	1	1.7
Renal repair	2	3.3
Colostomy	1	1.7
Splenectomy	17	28.3
Splenic repair	9	15.0

RESULTS AND OBSERVATIONS

In our study, the sensitivity of FAST was 100%. Specificity was 98%, positive predictive value was 97%, and negative predictive value was 100% [Figure 1].

In our study, the most commonly damaged viscera due to abdominal trauma were the spleen, 43%. The second most commonly damaged organ was the liver, 21.7%. The intestine was injured in 15% of cases, the kidney 10%, and other organs in 6.7% [Figure 2].

In our study, the most common ultrasonography FAST finding was fluid in the perisplenic area, 51.8%. Free fluid in pelvic view was found in 23.3%. Free fluid in Morrison was seen in 20%. Free fluid with echoes and gross ascites were seen in 1.7% and 1.7%, respectively.

In our study, the most common laparotomy finding was splenic injury, 43%. Hepatic injury was seen in 20%. Hemoperitoneum was seen in 13.3%. Ileal perforation and renal injury were seen in 8.3% cases. Ascites, bladder injury, jejunal perforation, and sigmoid perforation were present in 1.7% of cases each [Table 1]. Ascites was drained in 1.7% of cases. [Table 2 and Figure 3].

In our study, splenectomy was done in 28.3% cases. Hepatic repair was done in 20% cases. Splenic repair was done in 15% cases. Hemoperitoneum was drained in 13% of cases. Small bowel perforation 1° closure was done in 8.3% of cases.

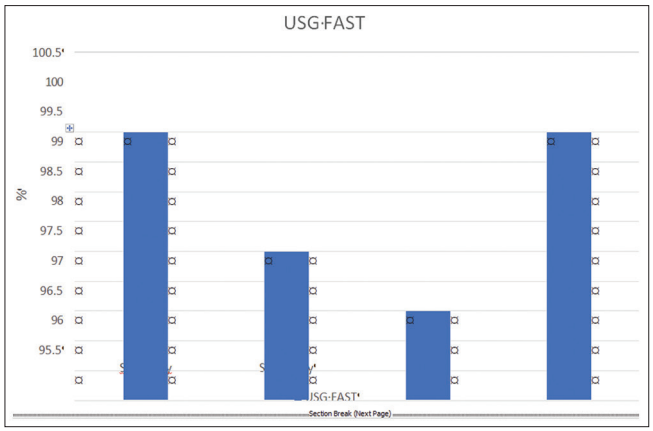

Figure 1: Distribution of various variables of Focused assessment with sonography in trauma

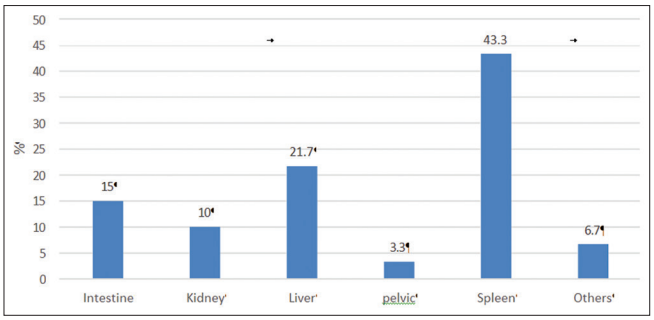

Figure 2: Distribution of patients according to damaged viscera due to blunt abdominal trauma

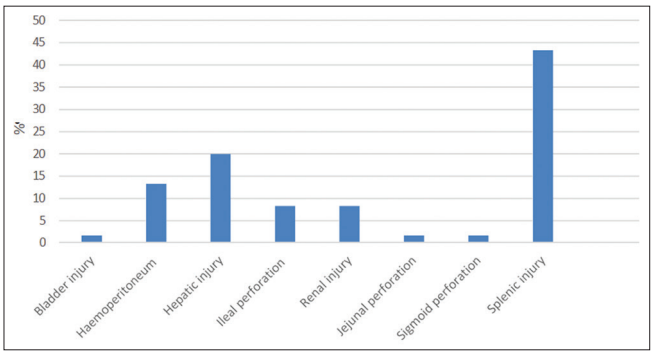

Figure 3: Distribution of patients according to laparotomy findings

Nephrectomy was done in 5% cases whereas renal repair was done in 3.3% case. Resection and anastomosis were done in 1.7% of cases. Bladder repair was done for 1.7% cases. Colostomy was made in 1.7% of cases. Ascites was drained in 1.7% of cases.

DISCUSSION

This study aimed to evaluate the accuracy of FAST in predicting the need for laparotomy in cases of blunt trauma to the abdomen. The findings highlight the utility of FAST as a diagnostic tool in trauma settings, guiding surgical decisions in patients with blunt abdominal injuries. The study was male predominant, with a mean age of 53.12 ± 10.44 years. The most common cause of injury was vehicle crashes, followed by falls from heights. The spleen was the most commonly injured organ, with fluid in the perisplenic area being the most frequent FAST finding. The most common surgical procedure was splenectomy. The mean hospital stay was 7.93 ± 2.93 days, with a survival rate of 93.3%. FAST showed a sensitivity of 100%, specificity of 98%, PPV of 97%, and NPV of 100%. These results affirm FAST as a crucial method for detecting intra-abdominal fluid in hemodynamically unstable patients with high accuracy.

Key findings include the high sensitivity and specificity of FAST in detecting intra-abdominal injuries requiring surgical intervention. The positive and negative predictive values suggest its reliability in ruling in and out the need for laparotomy. The timely information provided by FAST significantly impacts patient management, allowing for prompt surgical intervention or conservative management, thus reducing unnecessary laparotomies and associated risks.

Comparison with previous studies indicates consistent findings regarding the gender predisposition, the most common cause of trauma, and the diagnostic accuracy of FAST. Studies by Bagheri-Hariri *et al.*,[11] and Mohamad Karimi *et al.* [12] support the high sensitivity and specificity of FAST, though variations in sample demographics and injury types exist.

Clinical implications highlight FAST's role in decision-making, resource optimization, and the need for adequate training and standardization to ensure optimal performance.[12] Limitations include operator dependency and patient selection bias, suggesting future research should focus on the impact of training and evaluating a larger, more diverse patient population to enhance generalizability.

CONCLUSION

FAST is crucial for detecting intra-abdominal fluid in hemodynamically unstable patients, offering high accuracy and rapid bedside evaluation. This study demonstrated the feasibility and significant impact of FAST on decision-making in a resource-constrained setting, enabling immediate triage for laparotomy. Combining FAST with clinical parameters enhances precision in assessing polytrauma patients. Future studies should include larger sample sizes and consider repeat FAST at 6 and 24 h to identify missed cases, as this study did not include FAST-

negative cases. This would increase the study's credibility and improve patient outcomes.

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