

# Accuracy of Focused Assessment with Sonography for Trauma Performed by Emergency Medicine Residents Compared to Radiology Residents

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## ABSTRACT

**Aim:** To evaluate the accuracy of focused assessment with sonography for trauma (FAST) performed by emergency medicine residents to detect intra-peritoneal free fluid in blunt trauma patients.

**Design:** Randomized control trial.

**Place and duration of study:** Accident & Emergency Department, Mayo Hospital Lahore from 6<sup>th</sup> April 2022 to 5<sup>th</sup> November 2022.

**Methodology:** One hundred and twenty one patients were included. FAST scan was performed in each patient by emergency resident as well as radiology resident. FAST was performed under direct supervision of radiology consultant. Furthermore, FAST reports were confirmed by patient follow up in first 24 hours by checking final outcome of patient based on results of abdominal computed tomography (CT), exploratory laparotomy or conservative management by admitting in surgical ward for observation and hemodynamic status change.

**Results:** Focused assessment with sonography for trauma scan done by emergency residents showed free fluid in 20 patients (16.5%) while FAST done by radiology residents was positive in 21 (17.4%). Sensitivity of FAST performed by EM residents was 85.7% and specificity was 98%, while FAST done by radiology residents had sensitivity of 95.25 and specificity of 99%. Accuracy of FAST done by EM residents was 95.8% as final outcome.

**Conclusion:** After training, emergency residents can perform FAST with high accuracy, similar to radiology residents in blunt abdominal trauma patients.

**Keywords:** Focused assessment with sonography for trauma (FAST), Trauma, Blunt abdominal trauma

## INTRODUCTION

Focused assessment with sonography for trauma scan is part of primary resuscitation as it has become an invaluable adjunct that can be used in resuscitation rooms in blunt abdominal trauma patients to check the accuracy of FAST performed by radiology residents and emergency residents who first got training<sup>1</sup> and done practice under supervision of radiology consultant<sup>2</sup>.

According to most current information from the World Health Organization (WHO), road traffic accidents are the leading cause of death due to injury worldwide. These contribute 23% of the global injury mortality. Significantly, more than 90% of motor vehicle crashes occur in developing countries. Every year lives of approximately 1.3 million people are cut short by road traffic crash while 20 to 50 million more people suffer from non-fatal injuries, with many incurring a disability as a result of their injury.<sup>3</sup> According to latest WHO data published in 2020, road traffic accidents death in Pakistan reached 28,170 or 1.93% of total deaths. Pakistan rank at 95 in the world according to this death toll<sup>4</sup>. These accidents also cause considerable economic loss for injured, families and to nation as a whole.

Patients with traumatic injury presenting to hospital should be managed as per advanced trauma life support (ATLS) protocol using primary and secondary survey. Primary survey gives first and foremost priority to airway management with cervical spine immobilization. When the airway is secured, next is breathing and ventilation; third is circulation with hemorrhage control, followed by disability (assessment of neurological status) and exposure/environmental control. Here these steps are presented in order of importance but in practice, these steps are done simultaneously by trained trauma team. Radiographic studies are important adjuncts in the primary survey of trauma patients. These include X-ray, focused assessment with sonography in trauma (FAST) and

extended focused assessment with sonography in trauma (e-FAST). These can be used in resuscitation area, only if these will not interrupt the resuscitation process. Shock in trauma patients is classified in two categories, hemorrhagic and non-hemorrhagic. Hemorrhage is most common cause of shock in injured patients and virtually all trauma patients have some degree of hypovolemia. Non hemorrhagic shock includes cardiac tamponade, tension pneumothorax and neurogenic shock in trauma patients<sup>5</sup>.

Focused assessment with sonography in trauma is point-of-care ultrasound examination performed at the time of presentation of a trauma patient.<sup>6-8</sup> It scans four regions, first is hepatorenal interface, also known as Morrison pouch. Second is left flank view (perisplenic). Third is pericardial (subcostal or subxiphoid) view. Fourth is pelvic or suprapubic view. It is used to identify intra-peritoneal free fluid which indicates injury to abdominal organs.<sup>9</sup> This study was conducted in two different national institutes as well.<sup>10,11</sup> FAST has certain advantages like it can be done at bedside within 5 minutes especially useful in hemodynamically unstable patients<sup>9</sup>. It is non-invasive, can be repeated as many times as required, and has high sensitivity (73-92%) and specificity (84-99%). It can be performed equally in pediatric trauma patients<sup>13</sup>. It is also useful in disaster settings when number of patients exceed the hospital capacity as it is less time consuming<sup>14</sup>. It is better diagnostic modality in ruling in than ruling out a patient with blunt abdominal trauma<sup>15,16</sup>. Because it has certain limitations like it is operator dependent, cannot see retroperitoneal organs, difficult to interpret in obese patients and with increased intraluminal bowel gas.

## MATERIALS AND METHODS

This randomized control trial was conducted in Accident & Emergency Department, Mayo Hospital Lahore from 6<sup>th</sup> April 2022 to 5<sup>th</sup> November 2022 and 121 patients were enrolled. Emergency residents first had FAST training before participating in this study. As study compared the accuracy of FAST performed by

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emergency medicine and radiology residents, so, FAST scan was performed by both groups in each patient. ATLS guidelines were followed in patient initial resuscitation as primary and secondary survey was conducted and needed interventions were done. No patient treatment was delayed while doing FAST scan. This study included all the patients who presented with blunt abdominal trauma by any means like road traffic accident (RTA), road side accidents and fall from stairs or roof, crush injury, hit by animal. All blunt trauma patients whether hemodynamically stable or unstable were included with age group 14 or above, of both gender. In this double blind study, FAST was performed in each patient by both emergency and radiology residents under direct supervision of radiology consultant whose decision was considered gold standard. Abdominal CT was done in hemodynamically stable patients with positive FAST and in those who responded to initial resuscitation with negative FAST but carry high suspicion. Patients who were hemodynamically unstable and those who did not respond to initial resuscitation with positive FAST directly shifted to surgical floor for operative management. The data was entered and analyzed through SPSS-20.

## RESULTS

There were 94 (77.7%) males and 27 (22.3%) females. Eighty four (69.4%) patients between 14-40 years 32 (26.4%) patients between 41-60 years old and 5 (4.1%) patients more than 60 years. The mean age was 34.7 years. This showed that most patients involved in trauma were young and mechanism of injury in trauma patients were shown in Table 1. FAST scan performed by EM residents was positive in 20 patients (16%), while 21 patients (17%) showed positive result in FAST scan performed by radiology residents. In reality based on final outcome, 18 patients (85.7%) were true positive and 98 patients (98%) were true negative. CT scan was performed in 39 patients who were hemodynamically stable and had positive FAST or high suspicion of intra-abdominal injury with negative FAST. Only 9 out of 39 patients (7.4%) had positive result on CT scan. 10 out of 121 patients underwent laparotomy. Out of 98 patients with negative FAST, 39 patients were discharged after observation for 4-6 hour's period, remaining were shifted to surgical ward for conservative management and other specialties like orthopaedics, neurosurgery, maxillofacial according to their injuries. FAST scan performed by EM residents has sensitivity of 85.7% while specificity was 98%. Sensitivity of FAST performed by radiology residents was 95.2% and specificity was 99% (Tables 2-3).

Table 1: Frequency of mechanism of injury in trauma patients

Mechanism of injury	No.	%
RTA	99	81.8
Fall from stairs	6	5.0
Assault	4	3.3
Crush injury	2	1.7
Animal hit	1	0.8
Pedestrian struck	1	0.8

Table 2: Accuracy of FAST scan with emergency residents and radiology consultants

Emergency Resident	Radiology Consultant		Total
	Free Fluid	Normal	
Free Fluid	18	2	20
Normal	3	98	101
Total	21	100	121

Sensitivity=85.7% Specificity=98% Accuracy=95.8%

Table 3: Accuracy of FAST scan with radiology residents and radiology consultants

Radiology Resident	Radiology Consultant		Total
	Free Fluid	Normal	
Free Fluid	20	1	21
Normal	1	99	100
Total	21	100	121

Sensitivity=95.2% Specificity=99% Accuracy=98%

## DISCUSSION

The results of the present study showed that with training, emergency physicians can perform FAST scan with high accuracy and high sensitivity and specificity.<sup>17</sup> The accuracy of FAST in EM residents group was 95.8% as per final outcome. It can be further improved with emphasis on FAST practice. Previous studies showed sensitivity range from 60-99% and specificity of 86-100%.<sup>18,19</sup> As per these results, FAST is modality that should be made available in trauma resuscitation rooms, as it can help in deciding the patient disposal, as which patients need urgent surgical intervention, and which patients need further investigations. But positive FAST alone is not an absolute indicator for laparotomy, because some patients who respond to treatment can be kept under observation for conservative management, instead of immediately shifting to operation theatre. This study showed that only 10% patients with positive FAST immediately shifted to surgery for laparotomy because these were either transient responders to treatment or non-responders. Patients who responded to resuscitation, had CT scan done and further treatment was decided as per vitals and CT results. Some patients were kept under observation for 24 hour period.

Focused assessment with sonography in trauma is the modality used in blunt trauma patients to check free intraperitoneal fluid. It can be readily used bedside when patients are hemodynamically unstable to transport to radiology, and can be repeated if need arise, also safe in pregnancy and in children. FAST scan can be readily applied in military settings and in disasters, where disposition is done during or immediately after primary survey.<sup>20,21</sup> Modification of FAST is extended focused assessment with sonography for trauma (e-FAST) which includes chest cavity in blunt chest trauma patients to see pleura for pneumothorax or hemothorax<sup>22</sup>.

Focused assessment with sonography in trauma scan results are not absolute, because it can be false positive or false negative<sup>23</sup> depends upon the expertise of the doctor, so clinical judgment should be made as per patient respond to resuscitation.<sup>24</sup> In these cases, different radiological investigations can be done if patient is vitally stable to transfer to radiology suite for CT scan<sup>25</sup>.

Blunt trauma patients with positive FAST who were hemodynamically stable or showed good response to initial resuscitation and patients with high suspicion of abdominal injury with negative FAST had undergone CT scan.<sup>26</sup> Hemodynamically unstable patients with positive FAST and those who did not respond to initial resuscitation and also those who did respond but later deteriorated again, referred urgently to surgeons for exploratory laparotomy. Follow up was done to compare the results of FAST with laparotomy findings.

## CONCLUSION

Focused assessment with sonography in trauma scan training, emergency residents can perform FAST scan with high accuracy, similar to radiology residents, in blunt trauma patients. This modality can be used during resuscitation of unstable patients in emergency.

## REFERENCES

- Değirmenci S, Kara H, Kayış SA, Ak A. Role of ultrasound simulators in the training for Focused Assessment with Sonography for Trauma (FAST). *Ulus Travma Acil Cerrahi Derg* 2021;27(3):303-9.
- Heydari F, Ashrafi A, Kolahdouzan M. Diagnostic accuracy of focused assessment with sonography for blunt abdominal trauma in pediatric patients performed by emergency medicine residents versus radiology residents. *Adv J Emerg Med* 2018;2(3).
- WHO. Road traffic injuries. Geneva: World Health Organization, 2022.
- WHO. Road traffic accidents. Geneva: World Health Organization, 2020.
- Stewart RM. *Advanced trauma life support®*. Chicago: American College of Surgeons, 2018

6. Achatz G, Schwabe K, Brill S, Zischek C, Schmidt R, Friemert B, et al. Diagnostic options for blunt abdominal trauma. *Eur J Trauma Emerg Surg* 2022;48(5):3575-89.
7. Manson WC, Kirksey M, Boublik J, Wu CL, Haskins SC. Focused assessment with sonography in trauma (FAST) for the regional anesthesiologist and pain specialist. *Reg Anesth Pain Med* 2019;44(5):540-8.
8. Stengel D, Leisterer J, Ferrada P, Ekkernkamp A, Mutze S, Hoenning A. Point-of-care ultrasonography for diagnosing thoracoabdominal injuries in patients with blunt trauma. *Cochrane Database Syst Rev* 2018;12(12).
9. Nayak S, Yeola M, Nayak S, Kamath K, Raghuvanshi P. Role of focused assessment with sonography for trauma in the assessment of blunt abdominal trauma – a review. *J Evolution Med Dent Sci* 2021;10:45-50.
10. Ahmed U, Awan M, Ahmed G, Asad H. Focused Assessment with Sonography for Trauma (FAST) scan versus exploratory laparotomy in patients with blunt abdominal trauma. *Pak Armed Forces Med J* 2022; 72:576-9.
11. Mughal HH, Bibi T, Raja R, Malik S. Accuracy of FAST (Focused Abdominal Sonography in Trauma) scan in diagnosis of significant abdominal trauma using CT abdomen as gold standard. *Professional Med J* 2020;27:2067-71.
12. He NX, Yu JH, Zhao WY, Gu CF, Yin YF, Pan X, et al. Clinical value of bedside abdominal sonography performed by certified sonographer in emergency evaluation of blunt abdominal trauma. *Chinese J Traumatol* 2020.
13. Bahrami-Motlagh H, Hajjoo F, Mirghorbani M, Salevati-Pour B, Haghghimorad M. Test characteristics of focused assessment with sonography for trauma (FAST), repeated FAST, and clinical exam in prediction of intra-abdominal injury in children with blunt trauma. *Pediatr Surg Int* 2020;36(10):1227-34.
14. Lee C, Balk D, Schafer J, Welwarth J, Hardin J, Yarza S, et al. Accuracy of Focused Assessment with Sonography for Trauma (FAST) in Disaster Settings: A Meta-Analysis and Systematic Review. *Disaster Med Public Health Prep* 2019;13(5-6):1059-64.
15. Kim TA, Kwon J, Kang BH. Accuracy of Focused Assessment with Sonography for Trauma (FAST) in Blunt Abdominal Trauma. *Emerg Med Int* 2022.
16. Deepak T, Jitesh T. Surgical follow up after focused assessment with sonography for trauma exam in blunt abdominal trauma. *Indian J Forensic Med Toxicol* 2022;16(4):159-63.
17. Azeemuddin M, Waheed A, Alvi M, Khan N, Sayani R. Interobserver agreement on focused assessment with sonography for trauma in blunt abdominal injury. *Cureus* 2018;10.
18. Oliveira L, Tagliari D, Becker M, Adame T, Neto J, Spencer Netto F. Basic ultrasound training assessment in the initial abdominal trauma screening. *Revista do Colégio Brasileiro de Cirurgiões* 2018;45.
19. Hamed Elbaih A, Abu-Elela S. Predictive value of focused assessment with sonography for trauma (FAST) for laparotomy in unstable polytrauma Egyptians patients. *Chinese J Traumatol* 2017;20.
20. Qi X, Tian J, Sun R, Zhang H, Han J, Jin H, et al. Focused assessment with sonography in trauma for assessing the injury in the military settings: a meta-analysis. *Balkan Med J* 2019;37.
21. Carter N, Gay D. FAST in the deployed military setting. *J Royal Army Medical Corps* 2018;164.
22. Netherton S, Milenkovic V, Taylor M, Davis P. Diagnostic accuracy of eFAST in the trauma patient: a systematic review and meta-analysis. *CJEM* 2019;21:1-12.
23. Montmany Vioque S, Rebasa Cladera P, Campos Serra A, Gràcia Roman R, Luna Aufroy A, Navarro Soto S. Consequences of therapeutic decision-making based on FAST results in trauma patients with pelvic fracture. *Cirugía Española* 2021.
24. Aziz A, Mahmoud S, El-Sherif A, Kamal A, Mohamed A. Validity of the Fast Scan for Diagnosis of Intra-Abdominal Injury in Blunt Abdominal Trauma. *Indian J Public Health Res Develop* 2020;11:1173.
25. Shyu J, Khurana B, Soto J, Biffi W, Camacho M, Diercks D, et al. ACR Appropriateness Criteria® Major Blunt Trauma. *J Am Coll Radiol* 2020;17:S160-S74.
26. Janjua A, Hussain S, Iqtidar S, Manzoor A. Validity of the fast scan for diagnosis of intra-abdominal injury in blunt abdominal trauma. *Ann PIMS* 2017; 13(2):124-9.