

## COMPARATIVE ANALYSIS OF FOCUSED ASSESSMENT WITH SONOGRAPHY FOR TRAUMA (FAST) AND COMPUTED TOMOGRAPHY (CT) FOR RENAL INJURY DETECTION IN TRAUMA

### PATIENTS: A CROSS-SECTIONAL STUDY

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#### **ABSTRACT**

##### **OBJECTIVES**

*This study aimed to evaluate the diagnostic accuracy of Focused Assessment with Sonography for Trauma (FAST) in detecting renal injuries compared to computed tomography (CT) as the gold standard.*

##### **METHODOLOGY**

*This cross-sectional study was conducted from 2022 to 2023 at the Department of Radiology, Khyber Teaching Hospital, Peshawar. The sample size was 139. The sonographic examination and computed tomography were performed.*

##### **RESULTS**

*The mean age was 38 years ± 13.81. 100(72%) patients were male while 39(28%) were female. FAST had a sensitivity of 85%, specificity of 57.14%, positive predictive value of 97.42%, negative predictive value of 16.66%, and diagnostic accuracy of 83.61%.*

##### **CONCLUSION**

*FAST has reasonable sensitivity, specificity, and accuracy for detecting free fluid in traumatic renal injury patients.*

**KEYWORDS:** Diagnostic Accuracy, Focused Assessment with Sonography, Renal Injuries, Computed Tomography

## INTRODUCTION

Traumatic renal injury is a significant global health issue and remains the primary cause of death and disability among individuals aged 1 to 44 years old.<sup>1,2,3</sup> Renal injuries affect 3% of hospitalized trauma patients and 8 to 10% of those with abdominal trauma.<sup>2</sup> The blunt force causes the majority (70-80%) of renal trauma cases.<sup>2,4</sup> Trauma can result in injury to the renal parenchyma or to the renal vasculature, which can cause bleeding or injury to the collecting system with possible leakage of urine. Diagnostic accuracy was measured regarding sensitivity, specificity, and positive and negative predictive values. Focused Assessment with Sonography of Trauma (FAST) is a rapid bedside ultrasound examination performed as a screening test for blood around the heart (pericardial effusion) or abdominal organs (hemoperitoneum) after trauma. Computed tomography (CT) is a diagnostic imaging test that creates detailed images of internal organs, bones, soft tissue, and blood vessels. The utilization of FAST for the initial assessment of blunt abdominal trauma has witnessed a rise in recent years. This is primarily attributed to its non-invasive and non-ionizing

techniques, broad accessibility, and ability to provide rapid diagnostic outcomes for most patients.<sup>5,6</sup> Despite the high precision of sonography in identifying abdominal free fluid in trauma patients, there is substantial debate surrounding its reliability in diagnosing trauma-induced renal injury.<sup>6</sup> The kidney ultrasound typically appears normal in cases of grade I acute renal injury, but it is more likely to be abnormal with severe (grade II or more significant) renal injuries.<sup>7</sup> FAST may be used in the triage of patients with blunt abdominal trauma and possible renal injury. However, a negative ultrasound does not rule out renal injury, so a CT scan is recommended as the preferred method to evaluate patients with blunt abdominal trauma, as it is considered the most accurate diagnostic tool.<sup>1,7,8,9,10,11,12</sup> One of the studies showed that FAST's sensitivity, specificity and NPV in detecting free fluid in trauma were 92.1%, 98.7%, 90.7%, 98.8% and 88%, respectively.<sup>13</sup> Previous research demonstrated that sonography's sensitivity in detecting free fluid ranged from 63% to 99%. However, some studies reported a lower sensitivity rate in detecting solid organ injuries using FAST.<sup>14</sup> The rationale of this study was to get local data, which would help make future

recommendations and suggestions and decide on a cost-effective FAST diagnostic modality for patients with kidney injury.

## METHODOLOGY

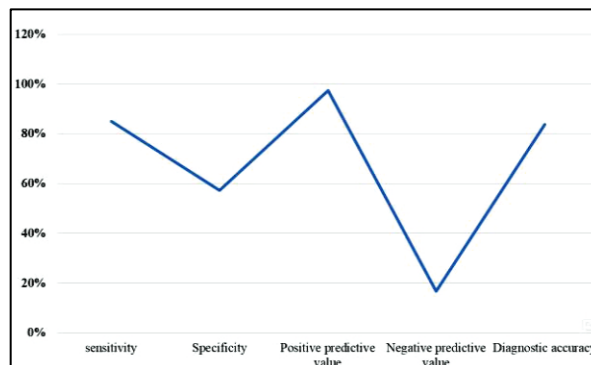
The study was conducted at the Radiology Department of KTH, Peshawar, from 2022-2023. This was a cross-sectional study. A consecutive non-probability sampling technique was used. The sample size was 139, taking the sensitivity and specificity of FAST as 83.3% and 92%, respectively, with a 10%2 prevalence of renal injury, 95% confidence level, and a 5% margin of error. All hemodynamically stable blunt trauma patients between 2 and 60 years of age of both genders were enrolled in this research. Patients with blood in the urethral meatus associated with pelvic fractures and markedly obese patients with BMI >35 were excluded. Approval from the hospital's ethical committee was sought. Informed written consent was taken from the patients. The demographic information was recorded. The ultrasound machine used was Xario 100 Toshiba, 7-10Hz probe. CT Toshiba Aquillion Prime 160 slice scanner was used. Sonographic examination and computed tomography were performed and interpreted by an expert radiologist with at least five years of experience. Data was entered and analyzed using SPSS version 21.0. Mean and standard deviation were computed for continuous variables like age and BMI. Frequencies and percentages were computed for categorical variables like gender, FAST findings, and CT scan Findings. Sensitivity, specificity, positive predictive value (PPV), negative predictive value (NPV) and diagnostic accuracy were computed using a 2x2 table. Ethical No. 430 / DME / KMC , dated: 21-06-2022

## RESULTS

In this study, age distribution among 139 patients was analyzed as 11(8%) patients were in the age range <18 years, 74(53%) patients were in the age range 19-30 years, 54(39%) patients were in the age range 31-60 years. The mean age was 38 years  $\pm$  13.81. 100(72%) patients were males while 39(28%) were female. BMI distribution among 139 patients was analyzed as 65(47%) patients had BMI  $\leq$ 27 kg/m<sup>2</sup> while 74(53%) patients had BMI 27 kg/m<sup>2</sup>. FAST findings among 139 patients were analyzed as FAST findings were positive in 115(83%) patients and were negative in 24 (17%) patients. Among 139 patients, CT scan findings were positive in 132(95%) and negative in 7(5%). FAST had a sensitivity of 85%, specificity of 57.14%, PPV of 97.42%, NPV of 16.66%, and diagnostic accuracy of 83.61% (table no 1).

**Table 1: Diagnostic Accuracy of Fast for Trauma Findings Taking CT Findings as Gold Standard (n=139)**

		CT Findings	
		Positive	Negative
FAST Findings	Positive	112 True positive	03 False positive
	Negative	20 False negative	04 True positive



**Figure 1: Fast Accuracy in Detecting Renal Injuries**

## DISCUSSION

Traumatic renal injury is a significant global health issue and remains the primary cause of death and disability among individuals aged 1 to 44 years old.<sup>1,2,3</sup> Renal injuries affect 3% of hospitalized trauma patients and 8 to 10% of those with abdominal trauma.<sup>2</sup> The blunt force causes the majority (70-80%) of renal trauma cases.<sup>2,4</sup> Our study showed that among 139 patients, the mean age was 38 years  $\pm$  13.81. 100(72%) patients were male while 39(28%) were female. 65(47%) patients had BMI  $\leq$ 27 kg/m<sup>2</sup> while 74(53%) patients had BMI 27 kg/m<sup>2</sup>. FAST was positive in 115(83%) patients and negative in 24(17%). CT scan was positive in 132(95%) patients and negative in 7(5%). FAST had a sensitivity of 85%, specificity of 57.14%, PPV of 97.42%, NPV of 16.66%, and diagnostic accuracy of 83.61%. The validity and precision of FAST scanning in trauma cases have been studied in many kinds of research. Some of the results of the previous studies are comparable to those of our study, as discussed below. A study by Waheed KB et al. reported the sensitivity of FAST in detecting intraperitoneal free fluid as 76.1%, specificity 84.2% and accuracy 79%.<sup>15</sup> One study showed that FAST's sensitivity in detecting free fluid was 87.5%, specificity 75%, and NPV 80%.<sup>16</sup> Another research showed that FAST had a sensitivity of 91.9%, specificity of 84.6%, PPV of 94.4%, NPV of 78.6% and accuracy of 90% in detecting free fluid in blunt trauma.<sup>17</sup> In a previous study, the sensitivity of the FAST in identifying free fluid was reported at 87.5%, with a specificity of 75%

and NPV of 80%.<sup>18</sup> Another study carried out by Divya Y et al. reported that in comparison with the CECT scan, FAST had a sensitivity, specificity, and accuracy of 98%, 60%, and 91% in the detection of free fluid.<sup>19</sup> Ultrasonography may be employed as the primary imaging modality in blunt abdominal trauma because it is an effective, safe, and conveniently accessible imaging modality with high diagnostic value for evaluating patients with trauma.

## LIMITATIONS

The limitation of this study sample size was small and single center study.

## CONCLUSIONS

FAST is a quick, safe and accurate investigation used in patients with traumatic abdominal injuries. It had reasonable sensitivity, specificity, and accuracy for detecting free fluid in traumatic renal injury patients.

**CONFLICT OF INTEREST:** None

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2. **Humaira Anjum** - Critical Revision; Supervision; Final Approval
3. **Samia Iftikhar** - Data Analysis/Interpretation; Drafting Manuscript



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