



## ACCURACY OF FAST (FOCUSED ABDOMINAL SONOGRAPHY IN TRAUMA) SCAN IN DIAGNOSIS OF SIGNIFICANT ABDOMINAL TRAUMA USING CT ABDOMEN AS GOLD STANDARD.

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**ABSTRACT... Objectives:** The aim of this research work is to find out the precision of FAST scan in detection of the significant abdominal trauma with the utilization of the CT abdomen considering it as a gold standard. **Study Design:** Cross Sectional study. **Setting:** Department of Radiology and Department of Emergency in Holy Family Hospital, Rawalpindi. **Period:** Six months from March, 2019 to September 2019. **Material & Methods:** Total 120 patients of both genders having age from 16 to 65 years who were presented in the Department of Trauma emergency. Both were the participants of this research work. We carried out CT of abdomen and FAST scan for every patient. We also calculated the sensitivity, PPV, NPV, specificity and overall accuracy rate of the FAST scan. **Results:** There were 80.80% (n: 97) male patients and 19.20% (n: 23) patients were females. We found 28.30% (n: 34) patients as positive in FAST scan and 22.50% (n: 27) patients as positive on CT of abdomen. FAST scan's accuracy, NPV, PPV, sensitivity and specificity were present as 84.20%, 93%, 61.80%, 77.8% and 86% respectively. **Conclusion:** FAST scan permits the identification of the free fluid gathered in various regions of the abdomen cavity because of the BAT with high rate of sensitivity, PPV, NPV and specificity.

**Key words:** Abdomen, Correspondingly, FAST Scan, Gold Standard, Radiology, Sensitivity, Transverse.

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## INTRODUCTION

One of the most important reason of death in the whole world is trauma. It is the most important reason of mortality as well as it is the root cause behind the morbidity of forty-five million populations every year.<sup>1</sup> Harm to the organs of abdominal cavity. Most frequently injured organs in this trauma are kidneys, spleen and liver.<sup>1</sup> According to reports, incidence of abdominal trauma is up to 31%.<sup>1</sup> Management of abdominal trauma is difficult due to low diagnostic accuracy of physical findings and presence of other serious injuries especially head injuries that lead to altered consciousness and delay in diagnosis of significant abdominal injury may be life threatening, therefore a quick and easily available diagnostic test may make a big difference. Diagnostic tools for evaluation of abdominal trauma are FAST (Focused Assessment with Sonography for Trauma) scan, diagnostic peritoneal lavage, CT scan whereby laparotomy

finally uncovers all significant injuries. These investigations actually supplement rather than substituting one another. The overall accuracy of DPL is 92% with sensitivity and specificity of 96.6% and 88.5.

Jensen JO<sup>2</sup> stated that CT scan as the gold standard for diagnosis. The sensitivity of CT is 97.6% and specificity is 98.7%. Method of FAST identifies the free fluid gathered in dependent regions of abdomen because of damage to organs. Most important injured regions are Morison's pouch, renal space, suprapubic region and region of spleen.<sup>1</sup> Tsui discovered in his research work that FAST is cheap, portable, non-invasive and a procedure which is very easy to perform.<sup>2</sup> Different research works have studied reliability of this method of FAST in various countries like Japan, US and Greece displaying its sensitivity of 86% and specificity of 88% for the identification of the free fluid.<sup>3,4,5</sup> A local

research work studied the efficiency of FAST but comparison with the CT scan was missed which is much important.

### material & methods

The design of this study was cross sectional study and the duration of this research work was from March, 2019 to September 2019 in Department of Radiology and Department of Emergency, Holy Family hospital on one hundred and twenty patients. We applied the non-probability sampling method for the selection of the patients. Patients with a past history of the abdomen disease or suffering from any other serious complication of kidneys or liver were not the part of this research work. A radiologist performed the FAST scan on all the patients who appeared in the Department of emergency with suspected AT after examined by a surgeon. In accordance with the FAST procedure, radiologist took the views of right upper-quadrant, left upper-quadrant, pelvic and pericardial region. We recorded the availability or non-availability of the free fluid as negative and positive scan correspondingly. A radiologist consultant did the CT scan and provided reports. We recorded all the examined results. SPSS V.20 was in use for the statistical analysis of the collected information. We used the frequencies for the representation of the categorical variables. We used the equations for the calculations of overall accuracy, sensitivity, specificity, PPV and NPV.

The calculation of the following parameters was in use for the assessment of the diagnostic value of findings of FAST scan.

- Sensitivity (Using Equation-1)
- Specificity (Using Equation-2)
- Positive predictive value (Using Equation-3)
- Negative predictive value (Using Equation-4)
- Overall Accuracy (Using Equation-5) = 84.2%

#### Equation-1 = Sensitivity's Formula

$$\text{Sensitivity} = \frac{\text{True - Positive}}{\text{True - Positive (+) False - Negatives}} \times 100$$

#### Equation-2 = Specificity's Formula

$$\text{Specificity} = \frac{\text{True - Positive}}{\text{True - Positive (+) False - Negatives}} \times 100$$

#### Equation-3 = Positive Predictive Values Formula

$$\text{PPV} = \frac{\text{True - Positive}}{\text{True - Positive (+) False - Negatives}} \times 100$$

#### Equation-4 = Negative Predictive Values Formula

$$\text{NPV} = \frac{\text{True - Positive}}{\text{True - Positive (+) False - Negatives}} \times 100$$

#### Equation-5 = Diagnostic Accuracy's Formula

$$\text{Accuracy} = \frac{\text{True - Positive (+) True - Negatives}}{\text{True - Positive (+) True - Negatives (+) False - Positives (+) False - Negatives}} \times 100$$

## RESULTS

There were total 80.8% (n: 97) male patients with an average age of  $42.9 \pm 9.1$  years and 19.2% (n: 23) patients were females with an average age of  $41.6 \pm 12.8$  years. The cumulative average age of the patients was  $42.9 \pm 9.8$  years. The results of demography are present in Table-I.

Gender	Frequency / Percentage	Mean Age $\pm$ SD (Years)
Male	97 (80.8%)	$42.90 \pm 9.1$
Females	23 (19.2%)	$41.60 \pm 12.8$
Total	120 (100%)	$42.90 \pm 9.8$

**Table-I. Demographic profile of the study population**

The findings of FAST scanning displayed that there were 28.3% (n: 34) positive patients and 71.7% (n: 86) were negative according to the operational definition as presented in Table-II.

FAST Results	Frequency	Percentage	Cumulative %
Positive	34	28.3	28.3
Negative	86	71.7	100.0
Total	120	100.0	-

**Table-II. FAST Results**

The results of CT displayed that 22.5% (n: 27) patients were positive and 77.5% (n: 93) patients were negatives according to the standard prescribed in operational definition as presented in Table-III.

CT Results	Frequency	Percentage	Cumulative %
Positive	27	22.5	22.5
Negative	93	77.5	100.0
Total	120	100.0	-

**Table-III. Abdominal CT- results**

The results of this research work concluded that

in complete population, 17.5% (n: 21) patients were true positives, 66.7% (n: 80) patients were true negatives, 10.8% (n: 13) patients were false-positives and 5% (n: 6) patients were false-negatives as presented in Table-IV. This research work discovered that sensitivity, specificity, PPV (Positive Predictive Value), NPV (Negative Predictive Value) and accuracy were 77.8%, 86.0%, 61.8%, 93.0% and 84.2% respectively. Results are presented in Table-IV.

- Sensitivity (Using Equation-1) = 77.8%,
- Specificity (Using Equation-2) = 86.0%
- Positive predictive value (Using Equation-3) = 61.8%
- Negative predictive value (Using Equation-4) = 93.0%
- Overall Accuracy (Using Equation-5) = 84.2%

FAST Scan Results	Abdominal CT Scan		
	Positive	Negative	Total
Positive	21 (True Positive)	13 (False Positive)	34
Negative	6 (False Negative)	80 (True Negative)	86
Total	27	93	120
TP: True Positive, FP: False Positive TN: True Negative, FN: False Negative			
<b>Table-IV. Cross-tabulation of FAST scan and abdominal CT results</b>			

## DISCUSSION

BAT (Blunt Abdominal Trauma) is responsible for high rate of morbidity as well as mortality. Seventy-five percent patients of BAT are associated with the motor vehicle collision.<sup>6,7</sup> Abdomen blows and falls are accountable for 15.0% and 6.0% to 9.0% patients respectively.<sup>8</sup> BAT due to occult BAT may happen in a result of child abuse and violence in domestic activities. Various pathophysiologic mechanisms can be present in the patients suffering from BAT.<sup>9</sup> The fast and early diagnosis for the treatment of BAT is much necessary according to the guidelines present in international literature. FAST is the primary diagnosis tool for the detection of injuries at early stage in the patients of BAT.<sup>10</sup>

The adaptation of FAST is worldwide and there

is access of ultrasound machines in main trauma centers.<sup>11</sup> The findings of this research work are similar to the results of the published data present on the same subject.<sup>12,13</sup> Thourani VH<sup>14</sup> tried to validate the preciseness of FAST scan performed by the surgeons in the duration of ED resuscitation of pediatric patients of trauma. In one other research work, McKenney MG<sup>15</sup> assessed the US in initial evaluation abdominal trauma in one thousand patients. He discovered that we can use emergency ultrasound as initial modality for diagnosis of the patients suffering from BAT. Fleming S<sup>16</sup> in his research work on one hundred patients present with abdominal trauma evaluated FAST scan in identification of the availability peritoneal free fluid compared to the CT scan of abdomen cavity within two hours of patient's admission.

Professionals discovered that patients present with the false-negative scans, in need of therapeutic laparotomy is a concerning matter.<sup>17</sup> In patients who are not stable, FAST scan can help in the identification of those which are in need of laparotomy. Soundappan SV<sup>18</sup> in his research work found the diagnostic precision and clinical effectiveness of the surgeon-performed FAST among pediatric patients of BAT.<sup>19</sup> Two other research works concluded that FAST performed by surgeon for blunt abdominal trauma was a secure and precise with high rate of specificity.<sup>20,21</sup>

## CONCLUSIONS

FAST scan is useful for the identification of the free fluid gathered in the dependent regions of the abdomen cavity because of BAT with accuracy, NPV, PPV, sensitivity and specificity of 84.20%, 93%, and 61.80%, 77.8% and 86.0% respectively. There is a need of more research works on a large sample size to consolidate the findings of this research work.

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
“

A wise man gets **more** from his **enemies**  
than a **fool** from his **friends**.

”

“Unknown”

### AUTHORSHIP AND CONTRIBUTION DECLARATION

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2	Tahira Bibi	Article writing, Data collection.	
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