

## Use of Focused Assessment with Sonography in Trauma in Emergency Department Patients for Triage, Diagnosis and Disposition: A Series of Cases

Triyaj, Tanı ve Taburculukta Acil Serviste Travmada Odaklanmış Sonografik Değerlendirmenin Kullanımı: Bir Olgu Serisi

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### Abstract

**Objective:** The aim of this study was to determine the effectiveness of focused assessment with sonography in blunt trauma (FAST) patients as an initial diagnostic and observational tool.

**Material and Methods:** This descriptive prospective study was performed by collecting data from patients with blunt trauma who presented to our tertiary university hospital emergency department (ED) between October 2008 and December 2008 and who were evaluated with ultrasound by the treating emergency medicine physician (GE Proseries Logic 200 machine with a 3.5 MHz large curved array probe). Demographic, clinical, laboratory, and imaging data were collected prospectively and ISS, RTS, TRISS, and Glasgow scores were calculated.

**Results:** During the study period, 28 patients presented with blunt trauma and they were evaluated with a bedside ultrasound within 10 minutes. Only one patient had splenic trauma and two had pleural fluid on FAST exam. The FAST results correlated positively with the decrease in hematocrit (Htc) values, ISS, TRISS, and duration of admission ( $p=0.006, 0.01, 0.034, 0.009$ ). 96.4% ( $n=27$ ) of the patients were discharged, and 3.6% ( $n=1$ ) died.

**Conclusion:** FAST was the first and an observational clue for trauma before Htc, or even physical examination. (*JAEM 2011; 10: 119-22*)

**Key words:** FAST, blunt trauma

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### Özet

**Amaç:** Bu çalışmada amaç künt travma hastalarında başlangıç tanılma ve izlem aracı olarak odaklanmış sonografik değerlendirme (FAST) etkinliğini belirlemektir.

**Gereç ve Yöntemler:** Bu tanımlayıcı prospektif çalışma Ekim 2008 ve Aralık 2008 tarihleri arasında üçüncü basamak üniversite acil servisinde tedavi eden Acil Hekiminin ultrason ile değerlendirdiği künt travma hastalarından toplanan bilgiler ile gerçekleştirilmiştir (GE Proseries Logic 200 cihazı ile 3.5 MHz geniş eğri prob). Demografi, klinik, laboratuvar ve görüntü bilgileri prospektif olarak elde edildi ve ISS, RTS, TRISS ve Glaskov skorları hesaplandı.

**Bulgular:** Çalışma süresinde, 28 adet künt travma hastası başvurdu, bunlar 10 dk içinde hastabaşı ultrason ile değerlendirildi. FAST ile değerlendirmede yalnız bir hastada batında dalak yaralanması ve iki tanesinde plevral sıvı vardı. FAST sonuçları hematokrit (Htc) değerinde azalma, ISS, TRISS ve başvuru süresi ile doğru orantılı idi ( $p=0.006, 0.01, 0.034, 0.009$ ). Hastaların %96.4'ü ( $n=27$ ) taburcu edildi, %3.6'sı ( $n=1$ ) öldü.

**Sonuç:** FAST travmada ilk ve izlem ipucu olarak Htc'den, hatta fizik bakıdan bile daha etkindir. (*JAEM 2011; 10: 119-22*)

**Anahtar kelimeler:** FAST, Künt travma

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### Introduction

Focused assessment with sonography in trauma (FAST) is a useful diagnostic tool in the emergency department (ED), especially for managing hypotensive multitrauma patients (1). Bedside ultrasound not only increases the speed of the patient management but also lowers costs in ED. In order to detect pericardial, pleural with exam windows are used through which interior structures are imaged (2-6). In the setting of trauma, free intraabdominal or intrathoracic fluid indicates hemorrhage (1, 7, 8). When compared to physical exam and CT imaging,

bedside ultrasound is performed rapidly and assess accurate result in determining which patients needed emergency interventions (7, 9, 10). The aim of this study was to determine the usefulness of the FAST examination in first evaluation and observation of blunt trauma patients.

### Methods

The study design was approved by our university Ethics Committee. In this prospective study, all patients with blunt trauma

between October 1, 2008 and December 31, 2008 presenting to our tertiary care hospital ED in Adana were approached for participation in the study. Informed consent was obtained from every patient or the relative. Patients presenting more than one hour after the occurrence of trauma were excluded from study participation. Demographic information, type of trauma, duration from trauma occurrence to ED arrival were recorded. Injury Severity Score (ISS), Revised Trauma Score (RTS), Trauma Score-Injury Severity Score (TRISS), and Glasgow Coma Scale (GCS) scores were calculated and recorded. FAST was performed (and images printed) within a few minutes of presentation, and approximately 30 minutes, 2 hours, 8 hours and 24 hours later. The FAST exams were performed with a GE Proseries Logic 200<sup>®</sup> ultrasound machine with a 3,5 MHz large curved array probe by one of two Emergency physicians who had received ultrasound training throughout their residency training. At least three FAST examinations were performed on each patient. Hematocrit was measured within a few minutes of presentation, and after 2 and 8 hours of admission.

Data were analyzed using SPSS for Windows 12 software. Descriptive statistics were calculated and the Mann-Whitney U test was used for comparison of the two groups that were FAST positive and FAST negative patients. Fisher's exact test was used to test for dependency between the categorical variables. A p value of less than 0.05 was considered statistically significant.

**Results**

During the study period, 28 patients were presented with blunt trauma and evaluated in the first 10 minutes. Two patients were excluded. Of the remaining 28 patients or relatives, all gave consent for participation in the study. Of these, records for analysis were complete in 28 patients. The mean age of patients was 28±20 years (95% CI 20.5-27.96) and 64% (n=18) were male. The mechanism of trauma was motor vehicle accident (patient in the vehicle) in 50% (n=14), pedestrian hit by vehicle in 21% (n=6), fall from a height in 14% (n=4), driver in 7,1% (n=2), bicycle driver 3.6% (n=1) and fall from the horse in a race 3.6% (n=1). Mean duration of hospitalization was 4.7±6.9 days (95% CI 1.98-7.37). Of the 28 patients, 27 were discharged home, one patient died on the second day of admission. The final in management of blunt-trauma patient was mentioned in

Figure 1. All CT screenings were completed in 30 minutes at the latest. CT (serebral CT in 24, thorax and abdominal CT for 14, pelvis CT for 16, servical vertebra CT for 13 patients was performed) demonstrated head trauma in 29%, thorax trauma in 39% (hemothorax in 22%), abdominal trauma in 5.5%, pelvic trauma in 5%, and cervical trauma in 12%. Ten patients having normal trauma score ranges and/or without pathological physical findings did not undergo thoraco-abdominal CT imaging. When the relationships between finding the traumatic fluid in first FAST and age, ISS, RTS, TRISS, Glasgow Coma Scale scores, hematocrit values of patients and duration of hospitalization were evaluated; ISS, TRISS, hematocrit after 8 hours and hospitalization period (p=0.006, 0.01, 0.034, 0.009) were statistically significant. Age, RTS, GCS, and first and second hematocrits (after two hours) (p=0.970, 0.062, 0.166, 0.110, 0.100, respectively) were found to not correlate with FAST positivity. One patient with a positive initial FAST

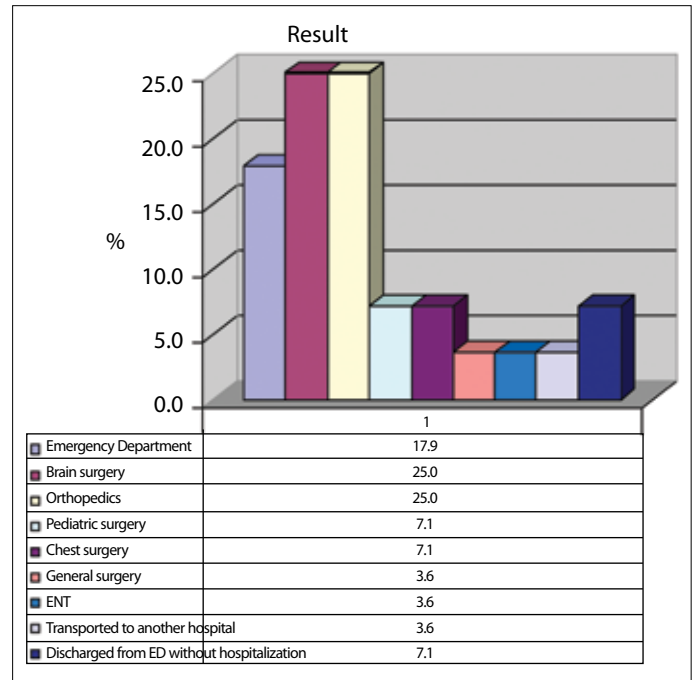


Figure 1. The final in management of blunt-trauma patient



Figure 2a-b. Positive FAST examination with splenorenal fluid



**Figure 3.** Subcapsular splenic fluid on FAST performed two hours after presentation

examination had splenorenal fluid (Figure 2a-b) while two of them had pleural fluid finding. Another patient had subcapsular splenic fluid on the FAST performed two hours after presentation (Figure 3). None of patients was operated upon.

## Discussion

FAST is a routine approach for the first management of a blunt-trauma patient (1). Its use has been increasing in trauma, although there is no consensus training in literature (11, 12). The ACEP policy statement described the essentials that was published in 2008 (13). It has been performed by experienced EPs with more than 5 years experience beginning in the residency programme. Hypotension in blunt trauma is attributed to abdominal and/or thoracic hemorrhage, spinal injury, tension pneumothorax, pericardial tamponade, and pelvic fracture (5, 6). It enables the detection of fluid-caused hypotension and concurrently evaluates the pleural and pericardial windows (1, 7). Besides, it could not be used as in CT. Although CT is the most commonly used diagnostic method identifying injuries in blunt trauma, there is a controversy about CT in these patients (13). There is concern in the literature about CT indications, radiation exposure, time spent and the CT costs (6, 13). Helling et al. performed FAST on all blunt trauma suspected patients and reported one dead due to intraabdominal hemorrhage in 92 patients who had undergone FAST as the only screening and 8 hemorrhagic cases on CT of 155 patients after having undergone FAST (1). Beckrazi et al. reported 15 true and 2 false FAST along with CTs as positive in 102 patients evaluated (3). Also, FAST must not be the last decision about whether there is abdominal hemorrhage or not (1). A negative first FAST and a physical examination finding cannot complete the management for a clear multi-trauma case without CT (7). Recent papers have reported that negative physical examination findings were not reliable and that the rate of significant abdominal injury with CT was 7.1% (9). Pal and Victorina demonstrated 6% hollow viscus injuries with CT in stable blunt trauma patients (10). Furthermore, a lack of hemoperitoneum in pelvic fractures with FAST in trauma (Sensitivity and specificity were 26% and 96%) were reported (5). Shackford reported hemoperitoneum with FAST with a sensitivity of 68%, and specificity of 98% (14). Npv was reported as 95-100%, while ppv was

reported as 61-100% (3, 15, 16). Smith mentioned the specificity and sensitivity of FAST as 100% and 71.4% in trauma patients (17). In the same paper, in the negative FAST group, there were 5/85 false negative cases (3). False negative and false positive FAST were the probabilities. There was one case founded on first FAST in our study. However, equivocal FAST evaluations have to be evaluated in CT (1). There was only one patient with positive FAST confirmed with CT having a splenic injury. The ppv, npv, sensitivity and specificity of abdominal fluid were 100%. However, it was related in a small number of our patients which included all trauma patients with all grades of trauma scores. Further studies may be planned to identify the values for high numbers of patients with only serious trauma scores. Our FAST results were correlated in CT without any other hemorrhage. Additionally, we used CT at a rate of 86% for the head, 64% for abdominal and thorax, 61% for the cervical region, and 71% for the pelvis screening in our patients. CT was used in patients with positive and/or equivocal FAST. It is used as the initial approach and recurrent without being invasive, difficult usage and harmful (6, 18). Brooks assigned the sensitivity of ultrasound was 92% and specificity 100% with a positive predictive value of 100% and negative predictive value 98% for identifying the haemothorax in trauma (19). The ppv, npv, sensitivity and specificity of pleural fluid 66.7%, 83.3%, 50%, 90.9%. We couldnt conclude half of patients with hemotorax by FAST. There was only one exitus patient found supradiaphragmatic fluid by FAST on arrive. However, we couldnt identify hemotorax in two of four patients by FAST that assigned with CT. The lying positioned patient and maybe, requirement of more fluid comparable than intraabdominal could be essential to detect free fluid in thorax. FAST was performed to patients, it was not eFAST. That was the another explanation of overlooked in %50 hemothorax patients. There was a surprised in one stabile patient found subcapsular fluid on the examination of 2<sup>nd</sup> hour control bedside ultrasonography. It was limited on persistent controls. In stabile with negative FAST in blunt trauma patients followed with, repeated physical examinations, FAST and Htc values. Physical examination with Htc were blind for observation in blunt-trauma patient. The first and 2<sup>nd</sup> hour taken Htc were not determinative in hemorrhagy in blunt trauma ( $p=0.110, 0.100$ ).

The limitations of our study were the number of the patients and most of them had non-life-threatening conditions. Even, FAST is a limited screen on trauma patient, it is still the fastest way for identification in hypotensive trauma patient (20). FAST is a screening evidence in trauma that should be performed with traditional marks (1, 7). It is an easy, non-invasive and golden clue for major pathologies due to trauma except hollow viscus and pelvic fracture (1, 5, 7). Even, one day course of FAST for emergency doctors and paramedics assess the accurate evaluation of free fluid in abdomen (21).

## Conclusion

ED and other wards are used for observation in most patients by the emergency physician and the surgeons where there has not been a trauma center, yet. FAST was found to be the first observational clue for trauma rather than Htc. It can be used for observation and discharge in probable blunt-trauma patients.

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## Conflict of Interest

No conflict of interest was declared by the authors.

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