Critical Review Form

Diagnostic Test

Operative versus Non-operative Management of Blunt Abdominal Trauma: Role of Ultrasound-measured Intraperitoneal Fluid Levels; *AJEM 2001;*19:4

Objective: To determine whether the quantity of free intraperitoneal fluid on the FAST examination, alone or in combination with unstable vital signs, is sensitive in predicting the need for exploratory laparotomy in patients with blunt abdominal trauma. (p. 284)
Methods: A prospective study carried out in 2 Level I trauma centers (which two Emergency Departments is not stated) in which patients presenting with "major blunt abdominal trauma" on a non-consecutive basis (convenience sampling) over a 2 year period were enrolled. The authors enrolled 270 patients during this timeframe, but fail to provide demographics or patients excluded or lost to enrollment. Exclusion criteria included age under 18 years or FAST exam contraindicated because delay to operating room would adversely impact outcome. (p. 284)

The FAST exam was performed & interpreted by emergency physicians who had some experience with the ultrasound exam (p 284) which focused exclusively on the presence and amount of free fluid rather than evidence of solid organ or parenchymal injury. Pericardial and intrathoracic fluid analyses were excluded. FAST exams were done as part of the primary/secondary survey and were compared to either exploratory laparotomy or abdominal CT was the gold standard. The FAST scan was compromised of 5 viewable areas and any free fluid (FF) was measured. The largest quantity of free intraperitoneal fluid (anechoic stripe) of the 5 abdominal views was used as the positive measurement for the FAST exam and the results recorded as small (<1 cm), medium (1-3 cm) or large (>3 cm) amounts of FF. Unstable vital signs were defined as initial pulse >100 bmp or systolic blood pressure < 90 mm Hg.

Guide		Comments
I.	**Are the results valid?**	
A.	**Did clinicians face diagnostic uncertainty?**	Yes. This was a prospective evaluation to determine whether major blunt abdominal trauma patients could undergo a FAST exam to rapidly delineate which patients required operative repair based on the amount of free fluid present.
B.	**Was there a blind comparison with an independent gold standard applied similarly to the treatment group and to the control group?**	Of the 270 patients enrolled, 33 (12%) had positive FAST findings all of which were compared either to CT or ex lap. So although the article does not specify which patients had which study or how that was determined, at least the gold standard (1 of 2 modalities) was applied to all positive FAST scans. Subjects with negative FAST scans did not necessarily have further imaging performed (verification bias).

C.	**Did the results of the test being evaluated influence the decision to perform the gold standard?**	Although the article mentions specifically that "all of the FAST examinations were performed immediately after the primary clinical survey in the ED emergency department and with patient supine. Trauma team members continued with routine trauma evaluation and procedures, and were instructed not to allow the FAST examinations to interfere with patient management", (p 284) it is possible that a trauma leader may not have been blinded to the results of the FAST exam since it was being done immediately in front of them. Such a research design flaw opens the possibility of *selection bias* and *verification bias.* In addition, the surgeons performing the exploratory lapartomies were the also those who determined whether the procedure was therapeutic or not. Not surprisingly, the authors contend that all lapatomies were therapeutic. Since no objective definition for a therapeutic laparotomy is established before the study's inception, it sounds a bit like the "fox guarding the chicken coop".
II.	**What are the results?**	
A.	**What likelihood ratios were associated with the range of possible test results?**	33/270 had a positive FAST, but the numbers necessary to calculate Likelihood Ratios are not provided. 18/33 → large amount of free fluid 16/18 underwent laparotomy → Sensitivity = 89% 10/33 → moderate amount of free fluid 6/10 underwent laparotomy → Sensitivity = 60% 5/33 → small amount of free fluid 5/5 → non operative management and discharged in good condition, although the length-of-stay is not reported, nor is any subject follow-up interval.
III.	**How can I apply the results to patient care?**	
A.	**Will the reproducibility of the test result and its interpretation be satisfactory in my clinical setting?**	No. First, these authors used a modified FAST exam excluding the subxiphoid cardiac view and including multiple liver parenchymal views and 2 paracolic gutter views which are not used at BJH. Our FAST scan is limited to 4 views including the subxiphoid cardiac view. Second, this study used a dedicated EM physician FAST sonographer trained in sonography. Our institution has residents who are trained in sonography with varying degrees of US skill and the FAST exam.
B.	**Are the results applicable to the patients in my practice?**	Uncertain but probably very likely. The article offers little on patient demographics(average age, mechanism, co-morbidities) or which hospitals recruited the patients (Kansas City, Milwaukee, Chapel Hill, Chicago).

C.	**Will the results change my management strategy?**	Probably not. At BJH we already do a mid-resuscitation FAST exam evaluation with a dedicated resident MD sonographer-in-training. The current study may be more of a practice modifier to someone practicing in a Level II ED in deciding if & when to transfer a patient to a Level I hospital or alternatively to notify the on-call Surgeon.
D.	**Will patients be better off as a result of the test?**	Potentially. If better designed studies show cost and time benefit from utilizing this diagnostic modality, one would expect improvement in patient important outcomes: time to definitive treatment, hospital length-of-stay, and mortality.

Limitations:

1. **The authors failed to define "major trauma" a priori and included trauma patients based on ISS scores (1-75). Without clearly stating how many patients were not enrolled or if they differed from those who were enrolled, a *selection bias* is possible.**
2. **No patient demographics are provided leaving uncertain the study's external validity.**
3. **Both CT and lapartomy were used as gold standards, but the authors fail to discuss what criteria were used to determine who obtained which gold standard or how the findings differed between those who had CT versus those who had laparotomy. Finally, those who had negative FAST scans often received no subsequent study to verify a "true-negative".**
4. **No length-of-stay or follow-up was reported. If every patient labeled as "negative" FAST exam returned to an ED with continued complaints and a subsequent "positive" confirmatory study, the authors' conclusions would be vastly different. The reader (and presumably the authors) have no way of knowing the outcome of "negative" FAST exam subjects, however, because no attempt at follow-up is reported.**
5. **The large-medium-small amount of fluid designation of the FAST exam was ultimately determined after the initial resuscitation. The article does not mention if this was simple or reproducible calculation. In the trauma setting, a very sensitive free fluid measurement that takes 30 minutes to calculate would have a somewhat limited role as part of a modality that is designed to give real-time indications of blunt trauma severity and need for further studies.**

Bottom Line

This prospective US study is one of many articles attempting to quantify the amount of free fluid predictive of need for operative repair. Although this study suffered from a lack of preset definitions (major trauma) and potential biases (selection, verification), it verify what many physicians using ultrasound already believe: US is sensitive (60-89%) in detecting free fluid, essentially eliminating the need for DPL. Subject with unstable vitals and a "large amount" of free fluid, all require operative evaluation. For other patients, however, the sensitivity and accuracy are less impressive and FAST scanning becomes less reliable as operative predictor. Although limited in applicability in a Level I trauma center where CT evaluation and trauma services are present continuously, the current study certainly has applications in smaller ED's where CT technicians or Trauma Surgeons may need to be called in from home. Before widespread investments in US-technology and training ensue, however, future research into the utility of US in BAT should utilize a priori definitions, blinded observers, reproducibility assessments, and uniformly applied gold standards to further delineate the utility of sonography in ED trauma patients.