

Early and Focused Ultrasonography in Physical Trauma

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Summary and conclusions

Focused Assessment with Sonography for Trauma (FAST) is an ultrasound examination used in the early management of patients subjected to physical trauma. The aim is to detect the presence of free blood in the abdomen or pericardium. FAST cannot be used to confirm or rule out injuries in the internal organs.

Most of the studies on this topic present results from abdominal examinations. Within the framework of this assessment we found only a single study that presented results from examining the pericardium.

SBU's appraisal of the evidence

- The accuracy of the method in detecting free abdominal blood is good, assuming that the practitioner has the appropriate education and training. Between 69% and 100% of these hemorrhages are detected, depending on the practitioner's skill. Hence, education and training are a prerequisite for achieving high sensitivity and subsequently a high level of patient safety. Specificity, however, is consistently high – between 96% and 100%.
- FAST can be beneficial for patients with unstable blood circulation (systolic blood pressure ≤ 90 mmHg) in whom bleeding is detected, since they can be transferred directly to surgery. The advantages, in comparison to computed tomography (CT), are that the processing time is shorter and patients are not subjected to radiation.
- In the studies, the FAST method was used by emergency physicians or surgeons that had received some form of special education and training. There are too few studies to determine the extent of the education and training required for optimum results.
- The scientific evidence is insufficient to determine the method's diagnostic accuracy in identifying blood in the pericardium. Additional studies are required to determine the benefits and risks in patients subjected to chest trauma.

- The scientific evidence is insufficient to draw any conclusions on the cost-effectiveness of the method. However, if the practitioner has sufficient education and training to assure high diagnostic accuracy, FAST can be cost-effective since the additional costs of the method are low.

Technology and target group

Quick and adequate management of acute, severely injured patients has a major impact on reducing mortality and permanent disability in this patient group. As a diagnostic tool, FAST can show free blood in the abdominal cavity and pericardium and thereby contribute to quicker and safer care of these patients. FAST cannot be used to confirm or rule out organ damage in patients.

The intent is that any surgeon or emergency physician with adequate education, training, and experience could conduct the examination. This would save time in transporting the patient or waiting for an ultrasound specialist to reach the emergency department.

The method is noninvasive and thereby gentle for patients since they do not need to be subjected to injection of contrast agents, surgical incisions, or ionizing radiation.

Primary questions

- What is the diagnostic accuracy of FAST in terms of identifying free blood in the abdomen and pericardium?
- Does the method lead to faster and safer management of the patient?
- Can the method be used by physicians other than radiologists (eg, surgeons or emergency physicians)?
- What educational and training requirements should be placed on practitioners to assure optimum management of patients?
- What does the method cost? Is it cost-effective?

Patient benefit

- The reviewed studies report that the sensitivity of FAST is between 69% and 100%, depending on the practitioner's skill. However, specificity is consistently high – between 96% and 100%. The method is found to be beneficial in managing patients with unstable blood circulation (systolic blood pressure ≤ 90 mmHg) and findings of free blood in the abdomen. These patients could be transferred rapidly to surgery (Evidence grade 3)* and consequently avoid radiation from computed tomography.
- The scientific evidence is insufficient* to determine whether FAST would lead to quicker processing of patients with stable blood circulation (systolic blood pressure >90 mmHg).

According to the studies, patients need further investigation via computed tomography if FAST shows free blood in the abdomen. However, the patient can be followed up clinically if FAST does not show free blood in the abdomen. Thereafter, the patient's general condition determines whether or not the examination needs to be complemented with computed tomography.

- The scientific evidence is insufficient* to define how practitioner education should be designed and the level of training and experience required to assure that the examination results are as reliable as possible.
- Studies have not directly compared findings from FAST examinations conducted by surgeons, emergency physicians, and radiologists (ultrasound specialists). In each of the included studies, the examination is conducted by either emergency physicians or surgeons/trauma physicians with special education and various levels of training.
- Although the method is intended for use in diagnosing blood in the pericardium, only one of the included studies presented results from examinations of the pericardium. Further studies are needed in patients exposed to chest trauma to determine the benefits of FAST in relation to detecting blood in the pericardium.

This assessment includes 21 controlled observational studies. Five of these studies are retrospective and the remaining 16 are prospective, with consecutive inclusion of subjects. One of the studies was found to have high

quality, 6 had medium quality, and the remaining 14 had low quality. Only the 7 studies of high or medium quality provided evidence for the conclusions of this report. These 7 studies had been published between 1998 and 2007, whereof 4 had been published prior to 2000. Five of the studies were conducted in the United States, 1 in Turkey, and 1 in Australia.

The practitioners in all of these studies received some type of theoretical education and practical training in the FAST method before the study commenced. All studies reported on the sensitivity and specificity of the method. Some studies also reported separately on the respective practitioner groups, based on their degree of practical experience.

Economic aspects

- The scientific evidence is insufficient* to draw any reliable conclusions on the cost-effectiveness of the method.

The cost per FAST examination is approximately 200 to 250 Swedish kronor (SEK), which is substantially less than the cost for a computed tomography examination.

The scientific evidence is insufficient to draw any conclusions about the cost-effectiveness of the method. However, since the additional costs for the method are low, FAST can be cost-effective if the practitioner has sufficient education and training to assure high diagnostic accuracy.

* Criteria for evidence grading SBU's conclusions

Evidence grade 1 – Strong scientific evidence. The conclusion is corroborated by at least two independent studies with high quality, or a good systematic overview.

Evidence grade 2 – Moderately strong scientific evidence. The conclusion is corroborated by one study with high quality, and at least two studies with medium quality.

Evidence grade 3 – Limited scientific evidence. The conclusion is corroborated by at least two studies with medium quality.

Insufficient scientific evidence – No conclusions can be drawn when there are not any studies that meet the criteria for quality.

Contradictory scientific evidence – No conclusions can be drawn when there are studies with the same quality whose findings contradict each other.

The GRADE system is primarily intended for treatment studies rather than diagnostic studies. Hence, this report does not use the GRADE system to grade the evidence presented in the scientific literature. However, efforts are under way to develop guidelines for grading the evidence generated by diagnostic studies (www.gradeworkinggroup.org).

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SBU evaluates healthcare technology

The Swedish Council on Health Technology Assessment (SBU) is a national governmental agency that assesses healthcare technologies. SBU analyzes the benefits, risks, and costs of different methods and compares the scientific facts to prevailing practices in Sweden. SBU's goal is to provide stronger evidence for everyone engaged in shaping the delivery of health services.

The SBU Alert reports are produced in collaboration with experts from the respective subject areas, the National Board of Health and Welfare, the Medical Products Agency, the Swedish Association of Local Authorities and Regions, and a special advisory panel (the Alert Advisory Board).

This assessment was published in 2010. Findings based on strong scientific evidence usually continue to apply well into the future. However, findings based on insufficient, limited, or contradictory evidence might have already been replaced by more recent findings.

The complete report is available in Swedish.

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