Case report:
E-FAST in Detecting Traumatic Pneumothorax. Do We Agree with The Article: Pneumothorax On E-Fast? Not So Fast

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Abstract: Blunt Thoracic trauma is one of the main causes of death in the world with mortality rates ranging from 15-77%. The most common case is pneumothorax where air collects in the pleural cavity due to trauma which causes partial or complete lung collapse. E-FAST examination has been accepted as a modality in diagnosing pneumothorax in trauma cases but there are many reports vary regarding the accuracy of using E-FAST, especially in diagnosing pneumothorax. This case presentation reports the case of a male patient with blunt thoracic trauma where E-FAST diagnosis provides an early diagnosis with more sensitive results compared to chest X-ray. Taking into account the operator's knowledge and the existing system, the authors still recommend using E-FAST in trauma patients to get a better diagnosis and early warning, especially in emergency conditions, the authors also suggest that in patients with stable conditions, the E-FAST examination combined with other examination modalities will obtain more accurate results.

Keywords: Blunt thoracic trauma, chest x-ray, E-FAST, pneumothorax.

Introduction

Trauma is an injury to an organ or body cavity that can cause injury. Based on the cause, trauma can be categorized as penetrating or blunt. Blunt thoracic trauma is one of the leading causes of death in the world, ranging from 15-77%. Blunt thoracic trauma comprises 10-15% of all trauma and represents 25% of all trauma deaths. Traumatic pneumothorax is presence of air in the pleural cavity due to trauma causing partial or complete collapse of the lung. The accumulation of air can increase the pressure on the lungs and cause them to collapse. The radiological diagnosis of pneumothorax is usually made by chest X-ray whereas clinically, pneumothorax can be further classified as simple, tension, or open. A simple pneumothorax does not displace the mediastinal structures, as the case with a tension pneumothorax, but if it is not treated promptly, a simple pneumothorax can develop into a tension pneumothorax which can be life-threatening. Therefore early, fast, precise and directed assessment is the main key to handling blunt thoracic

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trauma (Husain et al., 2012; Putra & Laksminingsih, 2021; Weiser, 2022).

In addition to using chest radiographs, Ultrasound (performed at the bedside during initial resuscitation, under the Extended Focused Assessment With Sonography in Trauma [E-FAST] protocol) and chest computerized tomography scan (as the gold standard) are more sensitive for diagnosing small pneumothorax. With the modality of ultrasound examination, pneumothorax can be recognized by the absence of "lung sliding", with the finding of the barcode sign, which occurs because the visceral and parietal pleural layers were separated. Apart from traumatic cases it has been agreed that "lung point" findings provide better diagnostic value. But in trauma conditions, the E-FAST examination only requires examination at 2 locations; findings of the absence of lung sliding with a barcode sign are the accepted sign of pneumothorax suspicion and the presence of lung points on examination will increase the sensitivity and specivicity of the examination (Agapian et al., 2020; Liu et al., 2018; Sauter et al., 2017).

The E-FAST examination is an accepted test in the initial assessment of trauma that can be used to identify pneumothorax (PTX), pericardial effusion (PCE), and free intra-abdominal fluid (FF). Various studies have validated the use of ultrasound in the early diagnosis of trauma patients, with varying reported sensitivity and specificity. Several studies reported higher sensitivity and specificity of E-FAST compared to chest X-rays in detecting pneumothorax in trauma patients but some studies yielded the opposite result (Abdulrahman et al., 2015; Maximus et al., 2018; Netherton et al., 2021 ; Sauter et al., 2017).

This case report will present the case of a male patient with blunt thoracic trauma where the diagnosis with E-FAST provides an early diagnosis and more sensitive than chest x-rays.

Case presentation

A 50-year-old man came to the emergency room (ER) with complaints of pain in the chest area and shortness of breath after falling from a coconut tree. On physical examination we found injury on the left side of the chest, fast and shallow breathing with respiratory rate (RR) of 36-40 breaths per minute with 98% oxygen saturation with nasal cannula.

Other physical examination was unremarkable; the patient was in a compos mentis condition without neurological deficits accompanied by a stable hemodynamic condition except for an increase in RR. Immediately after the initial assessment, an E-FAST examination was carried out by an emergency medicine

resident that obtained free fluid in the left interpleural area indicating a left hemothorax and also obtained a loss of lung sliding with a barcode sign description on the right hemithorax without any free fluid in the right interpleural area indicating a right pneumothorax. (figure 1).

With the patient's stable condition, a chest x-ray was immediately performed on the patient; only a left hemothorax was obtained and a chest tube was immediately placed on the left hemithorax. When a chest tube control x-ray was taken, 4 hours later from the E-FAST examination, incidentally a chest X-ray showed a pneumothorax in the right hemithorax (figure 2). In this patient, a second chest tube was immediately placed in the right hemithorax.

During observation in the ER, the patient vital signs are in a fairly stable condition. The patient was hospitalized for 5 days in high care unit (HCU) and allowed to go home afterwards.

Figure 1. Initial examination results: chest X-ray and E-FAST on the right and left hemithorax
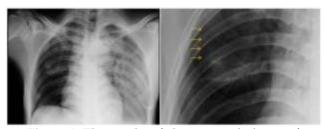

Figure 2. The results of chest control photos after inserting a chest tube (4 hours apart)

Discussion

E-FAST has been agreed upon as part of the initial assessment of trauma patients but there are variations in the results of studies where most studies show higher sensitivity and specificity of E-FAST than chest x-rays, but some studies provide the opposite result. One meta-analysis published in 2019 by taking 75 existing studies which involving 24.350 patients showed that although some studies had good sensitivity for diagnosing pneumothorax, the results of this meta-analysis was different; it gave only moderate sensitivity

with good specificity in diagnosing pneumothorax. The same result was also reported by a study published in the previous study that the E-FAST examination in diagnosing pneumothorax has a sensitivity of 65%, which is lower than a chest x-ray which is 78% (Agapian et al. al., 2020; Netherton et al., 2021; Santorelli et al., 2022; Sauter et al., 2017).

In this case report it was found that E-FAST can detect pneumothorax earlier than chest X-ray. Although one report cannot generalize the existing population, the authors argue that these varied results are one of the weaknesses of using USG in diagnostic enforcement, namely operator dependent. Errors in emergency ultrasonography are the most frequently encountered compared to other examination modalities because of environmental conditions, stress in emergency conditions and operator errors itself. This can be overcome by developing the system and the knowledge of the operators (Agapian et al., 2020; Netherton et al., 2021; Pinto et al., 2013).

The knowledge of operators can be increased with existing training based on a study showing that final year medical students can learn effectively the E-FAST examination. Five hours of E-FAST training and practice provides an acceptable skill level. The author believes that in the hands of a reliable operator, the results of the E-FAST examination will provide a better diagnostic value (Agapian et al., 2020; Alper et al., 2018; Netherton et al., 2021; Pinto et al., 2013).

For system development in the future, the authors recommend not using ultrasound as the only diagnostic modality if possible, especially if the patient is in a stable condition but ultrasound can be used as a screening tool for early detection, increased awareness and early management in increasing patient safety rates especially in emergency conditions (Agapian et al., 2020; Netherton et al., 2021; Pinto et al., 2013; Sauter et al., 2017).

Conclusion

Although there are many variations regarding the accuracy in the use of E-FAST compared to chest x-ray in trauma patients, the authors still recommend the use of E-FAST in trauma patients to get better early diagnosis and alertness especially in emergency conditions. The authors also suggest that in trauma patients with stable conditions, the E-FAST examination should combined with other examination modalities to obtain more accurate results.

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