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E-FAST: A propos of hemopericardium in the Emergency Department

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ABSTRACT

The extended-focused assessment with sonography in trauma is still recognized as a technique approach to patients whose trauma involves the chest and the abdomen, with the aim of ruling out conditions as pneumothorax, hemothorax, pericardial effusion/cardiac tamponade, and intraperitoneal free fluid. Although CT is the gold standard test, the inconvenience of moving unstable patients and the amount of time it takes to carry it out, makes it not always possible in the Emergency Department, which positions the ultrasound as an ideal tool in the evaluation of patients with trauma in the Emergency Department. In this case report, we presented the case of a patient who complains of multiple stab wounds, and the extended-focused assessment with sonography in trauma confirmed the diagnostic impressions.

1. Introduction

Trauma is one of the leading causes of mortality worldwide[1]. In emergency departments, it is usually caused by hypovolemic shock (hemothorax, hemoperitoneum) or by obstructive shock (pneumothorax, hemopericardium). Thus, forcing emergency services to actively look for these lesions in patients suffering trauma of the thorax and/or abdomen.

Bedside ultrasound performed in the Emergency Department is positioned as a tool of choice given the precision, speed and safety of its preparation, giving concise answers to specific questions: Is there a pneumothorax? hemothorax? hemopericardium? free intraperitoneal fluid[2,3]?

In this article, we reported the case of a patient with trauma whose injuries led to pneumothorax, hemothorax and hemopericardium, being suspected clinically, and confirmed by ultrasonography.

2. Case report

A 29-year-old male patient presented to the Emergency Department, no relevant past medical history, brought by prehospital personnel. He complained of being stabbed in the anterior thoracoabdominal area as a victim of an assault. In the physical exam, the patient was found conscious, alert but anxious. Vital signs: blood pressure: 63/48 mmHg, pulse: 81, respiratory rate: 26, SpO_2: 92%, positive findings: one right precordial wound, with air coming out of it and diminished breath sounds, strongly suggesting pneumothorax, and a left precordial chest wound with small active bleeding (Figure 1, with the authorization of the patient); cardiovascular: regular rate and rhythm, no murmur or click; lungs: unilateral right diminished breath sounds. No injuries in abdomen, soft, non-tender.

In the initial evaluation, we observed an ST segment depression, suggesting heart involvement (Figure 2).

After the primary assessment, our diagnostic impressions were: possible right pneumothorax, possible cardiac injury.

Later, and with the intention of accurate decision-making, extended-focused assessment with sonography in trauma (E-FAST) was performed with palm size ultrasound scanner (Welld 3100-Shenzhen China), using initially convex transducer (2.5–5.5 MHz) for the conventional FAST scan, which was negative for intraperitoneal free fluid, but with a confirmatory image of hemopericardium seen in the subcostal window (Figure 3). Subsequently with linear transducer 7.5–9.5 MHz we looked for pneumothorax, confirming the absence of pulmonary sliding in the right anterior chest (right pneumothorax). It was also found an anechoic image at right costodiaphragmatic recess, suggesting superimposed hemothorax.

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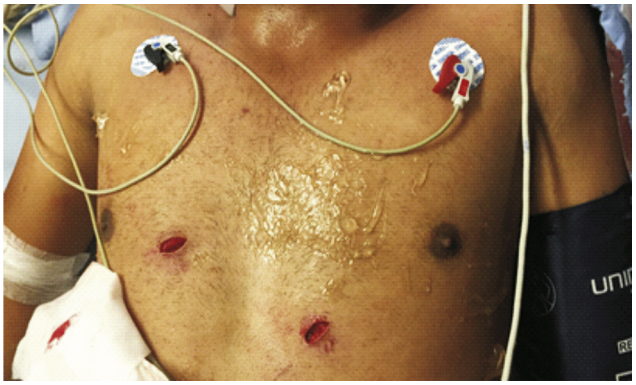

Figure 1. Right thoracic wound with air leakage (pneumothorax). Left: Precordial wound.

Figure 2. ST depression suggesting cardiac injury.

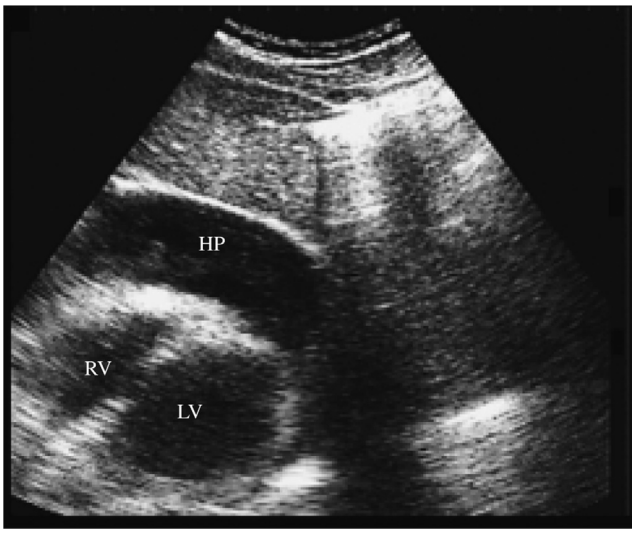

Figure 3. Hemopericardium. Note that the ventricles are not collapsed. LV: Left ventricle; RV: Right ventricle; HP: Hemopericardium.

After completing the E-FAST, and with the surgery team awaiting for the patient, we concluded that hypotension was not due to hypovolemia but to the combined effects of pneumothorax and hemopericardium, as hemothorax was not significant. We considered this a susceptible patient for low-volume resuscitation-or controlled hypotension given his preservation of the state of consciousness[4]. Also, given the absence of right cavities collapse, pericardiocentesis in the Emergency Department was not necessary, as the patient underwent surgery almost immediately after the confirmation of diagnostic impressions.

Finally, in the operating room right hemopneumothorax, one centimeter left ventricle injury, an associated hemopericardium were documented. After a short ICU admission, patient was discharged without complications.

3. Discussion

Early mortality in emergency departments by thoracoabdominal trauma usually occurs secondary to hypovolemic shock, and/or the mechanical complications of pneumothorax and/or hemopericardium, leading to tamponade and cardiac arrest. The initial approach of major lesions responsible for mortality can be performed ultrasonographically.

Hemopericardium is an accumulation of blood in the pericardium virtual space, between the visceral and parietal pericardium. In the context of trauma, when it leads to hemodynamic collapse called pericardial tamponade, due to a restrictive mechanism of ventricular filling, initially in the right cavities, significantly reducing preload (and therefore reducing cardiac output), and finally compromising left ventricle filling. It presents in only 2% of penetrating chest trauma, however, 60%–80% of precordial penetrating wounds, will have hemopericardium. Beck triad has been traditionally recognized as a classic triad of signs suggesting pericardial tamponade, which consisted of hypotension, distended jugular veins and diminished hearth sounds, but these are only present in 20% of the patients having pericardial tamponade[5,6]. The diagnosis requires a high clinical suspicion. Given that clinically, it can be easily confused with tension pneumothorax or massive hemothorax. The diagnosis should be determined rapidly by ultrasound, which shows a hypoechoic image that separates the visceral and parietal pericardium. It is usually significant when bleeding is greater than 1 cm in size between the pericardium sheets. Variants in minor bleeding can lead to instability, which should be taken into account[7].

Pericardial tamponade occurs when ultrasound B mode (brightness) is observed right cavities collapse associated with pericardial effusion and hemodynamic instability.

3.1. Pneumothorax definition and diagnosis

Pneumothorax is defined as the presence of air in the pleural cavity, which can lead to lung collapse, making it a medical emergency that requires immediate intervention after diagnosis[8]. The symptoms depend on the magnitude of the pneumothorax and the respiratory functional reserve of the patient[9].

Identification of pneumothorax starts with the clinical suspicion and physical examination. The diagnostic images confirm the suspicion, ideally chest X-ray, bedside chest ultrasound, and CT scan, which require the movement of the patient.

3.2. Chest X-ray

Since the patient presenting to the Emergency Department could have a disease that potentially risks his life, a portable chest X-ray should be performed at the bedside, given that the hemodynamic unstability, psychomotor agitation and severity of thoracic lesions contraindicate the transfer to radiology room.