

Penetrating cardiac injury by stab wound: A case report

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Abstract

Introduction: Penetrating cardiac injuries are very rare, an approximate incidence of 0.16% has been described. They have a high mortality rate, most of them die at the site of the accident. PCI should be suspected in any penetrating wound over Ziedler's area.

Case report: An 18-year-old male with no known history was taken by paramedics to the emergency department for having suffered a stab wound to the left hemithorax 45 minutes before. On arrival he was in shock (hypotensive, tachycardic, tachypnea, hypoxemic) and Beck's triad. Due to the suspicion of cardiac injury, he was admitted to the operating room, where a left anterolateral thoracotomy was performed, identifying a 1 cm wound in the right ventricle, corresponding to AAST grade IV. Vascular control and suture with monofilament was performed, and an endopleural probe was placed at the end. With an adequate postoperative period, the patient was discharged on the fourth day without eventualities.

Conclusion: It is important to keep in mind this type of lesion due to its high mortality rate, and immediate action should be taken upon suspicion. This case is an example, where if approached in a timely manner, the prognosis is good despite the high mortality.

Keywords: Penetrating cardiac injury; Thoracic trauma; thoracotomy; Heart injury.

Abbreviations

AAST: American Association for the Surgery Of Trauma; ATLS: Advanced Trauma Life Support; PCI: Penetrating cardiac injuries.

Introduction

Penetrating cardiac injuries (PCI) are very rare, with an estimated incidence of 0.16% in the United States. It has been described that most of those affected die at the scene and that those who survive arrive very seriously to the emergency room [1]. Therefore, immediate surgical intervention is required [2]. PCI should be suspected when penetrating wounds are found in the anterior wall of the thorax, especially if they occur within the Ziedler area or cardiac box, delimited by the clavicles, medioclavicular lines and costal margins [3, 4]. High suspicion should be based on physical examination findings, trauma kinematics and if possible, FAST ultrasound with sub-xiphoid window should be performed [5] the approach should be performed based on the guidelines of the Advanced Trauma

Life Support (ATLS) [6].

Case Presentation

An 18-year-old male was admitted to the emergency department for having suffered a stab wound in the anterior face of the thorax, specifically in the precordial area 45 minutes earlier (**Figure 1**).

On admission he was alert, oriented and cooperative, with evident pallor, diaphoresis, dehydration and precordial pain. Examination revealed hypovolemic shock, hypotension (60/40 mmHg), tachycardia (130 beats per minute), tachypnea (25 breaths per minute), saturating 85% on room air. Neck with central trachea, subtle jugular ingurgitation. In the thorax there were 2 wounds of approximately 1.5 cm, the first at mid-clavicular level at the level of the third intercostal space and the second of 1.5 cm below the left nipple, on auscultation there were barely audible heart sounds and hypoventilation in the left hemithorax. Abdomen flat, soft, depressible, not painful to palpation. Extremities were intact. Resuscita-

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tion was performed according to ATLS protocol and due to the suspicion of cardiac injury, the patient was admitted to the operating room urgently. In the operating room, left anterior thoracotomy was performed at the level of the 5th intercostal space, finding bleeding in the pleural cavity, then pericardiectomy was performed and a lesion of approximately 1 cm in the right ventricle was identified, corresponding to a grade IV of the American Association for the Surgery of Trauma (AAST). Vascular control was performed with the index finger, then a 16 fr caliber foley probe was placed through the orifice (**Figure 2**) and with 2-0 prolene a U-stitch was made in the wound, which controlled bleeding (**Figure 3**). Hemostasis was verified and the pericardium was partially closed. Finally, the thoracic cavity was washed and a left anterior chest tube was placed (**Figure 4**), the thoracic cavity was closed by planes up to the skin.

The patient evolved favorably in his postoperative period, on his third day the chest tube was removed without any eventuality, he was kept under surveillance and the following day he was discharged with follow-up in the consultation room. The control echocardiogram showed LVEF of 59% with no evidence of cardiac compromise.



Figure 1: Clinical image of the patient on arrival at the emergency department, showing two stab wounds in the precordial area.

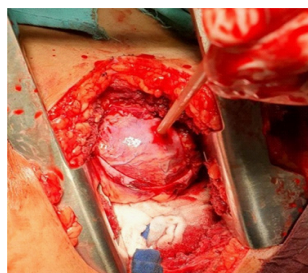


Figure 2: Clinical image showing vascular control by placement of a foley catheter.

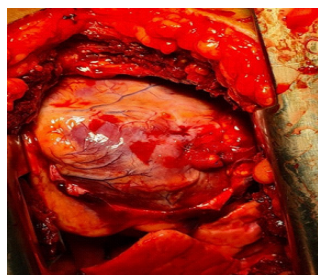


Figure 3: Image showing the repair of the wound, with U-stitches using prolene 2-0.



Figure 4: Postoperative chest x-ray showing correct placement of the left chest tube.

Discussion / Conclusion

Based on version 3.0 of the National Trauma Data Bank, we know that 60% of patients who suffer PCI are young men with a mean age of 38 years and that stab wounds account for up to 36% [1]. About 86% of cases die at the scene, with an estimated time of 50 min between accident and death. The variables that determine whether a patient arrives alive at the emergency department are rapid transport, the mechanism of the trauma, firearm injury, multiple cardiac injuries and associated injuries [6, 7]. In the case described, evolution was estimated at 45 min, and no associated lesions were found. In general, PCI caused by stab wounds show a more favorable evolution when compared to firearm wounds. The latter are associated with a higher mortality rate, due to their destructive power and the kinetic energy transmitted to the myocardium, in addition to the possibility of injuring adjacent structures and causing greater hemorrhage [4, 7]. Due to the instability of the patient, the high suspicion of PCI, based on the fact that the wound was in the precordial area, the mechanism of the trauma and the presence of Beck's triad, it was decided to take the patient urgently to the operating room [3, 6]. It is suggested to perform a left anterior-lateral thoracotomy when the lesions are lateral to the midclavicular line, which also provides faster access to the cavity [6]. Cardiac tamponade has been reported to have a temporary protective effect by restricting massive blood loss, which helps to buy a little more time [7]. Early recognition of cardiac tamponade, decompression of the pericardium and control of cardiac hemorrhage are key steps for the resolution of the pathology [8]. The most frequent site of involvement is the right ventricle, since it represents most of the anterior aspect of the heart, followed by the left ventricle, right atrium and left atrium [1, 3, 5, 9]. In our case, the right ventricle was affected.

The American Association for the Surgery of Trauma (AAST) has described a classification for cardiac injuries [10], in the case described, the injury corresponds to a grade IV. As described in the literature, we used finger pressure maneuvers and a foley catheter to control bleeding, and the cardiac lesion was repaired with 2-0 prolene U-stitches [3, 5, 6]. Complications such as cardiac dysfunction, arrhythmias, surgical site infection, wound dehiscence and mediastinitis have been reported [3], in our case, such complications did not occur. PCIs are rare, they should be kept in mind when a patient suffers stab wounds in the Ziedler area. Our patient is a clear example that if they go to the emergency department as soon as pos-

sible, they can have a good evolution despite their high mortality rate.

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