Case Report

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A cardiac injury and pericardial tamponade following a stab wound to the chest: a case report

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Introduction and importance: A stab wound in the heart is associated with high mortality rates. Rapid patient transfer to the closest hospital, maximal speed in establishing a diagnosis, and highly trained prompt surgical intervention are all crucial to achieving a positive result in the treatment of these critical patients.

Case presentation: This report presents a 28-year-old man with a stab wound to the chest, causing pericardial tamponade and a myocardial injury that presented with shock. The patient was diagnosed by chest ultrasonography and operated on successfully after 45 min of the stab without complications.

Clinical discussion and conclusion: Cardiac repair should be attempted as soon as possible if the patient with the stab wound to the heart is not dead upon arrival. The time from the stabbing to the start of the operation is vital, and any delay in the operation may lose the patient. Glasgow Coma Scale could be considered as predicting variable for complications or mortality in patients with stab heart wounds.

Keywords: cardiac injury, case report, heart, penetrating chest injury, stab wound, tamponade

Introduction

A stab wound in the heart is associated with high mortality rates, up to more than 60% of the patients in some reports[1,2]. Right ventricular tears, cardiac tamponade, and related extra-cardiac injuries are all different causes of death in penetrating chest injuries[3]. Most fatalities from penetrating cardiac wounds are caused by coronary artery damage, cardiac tamponade, or exsanguination[4]. Rapid patient transfer to the closest hospital, maximal speed in establishing a diagnosis, and highly trained prompt surgical intervention are all crucial to achieving a positive result in the treatment of these critical patients[5–7]. The fastest and most accurate approach to noninvasive diagnosis for penetrating heart damage is ultrasonography[8].

We present a case of a stabbed heart who was operated on after 45 min of being stabbed and who was operated on successfully and is fortunately still alive. This case report has been reported according to the Surgical CAse REport (SCARE) guidelines[9], Supplemental Digital Content 1, http://links.lww.com/MS9/A74, Supplemental Digital Content 2, http://links.lww.com/MS9/A75.

HIGHLIGHTS

- This report presents a 28-year-old man with a stab wound to the chest, causing pericardial tamponade and myocardial injury presented with shock. The patient was diagnosed by chest ultrasonography and operated on successfully after 45 min of the stab without complications.
- Cardiac repair should be attempted as soon as possible if the patient with the stab wound to the heart is not dead upon arrival. The time from the stabbing to the start of the operation is vital, and any delay in the operation may lose the patient.

Case presentation

A 28-year-old man with free past medical, drug, family, and psychological histories was presented to the emergency room after 20 min of fighting with someone who stabbed him with a stab wound to the anterior left chest in the fourth intercostal space at the mid-clavicular line just below the nipple. On arrival, the patient was partially unconscious, disoriented, and vitally unstable with severe dyspnea, congested nonpulsating neck veins, dropped blood pressure (70/40), and an O2 saturation of 60%.

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At the admission, the patient had a Glasgow Coma Scale (GCS) 13 and was actively bleeding from the anterior part of the left chest.

Once we received the patient, we assessed his airway, breathing, and circulation, applied proper hemostasis, and did an urgent chest ultrasound to confirm the exact amount of blood in his chest. The chest ultrasound revealed that his chest was full of blood with a substantial pericardial tamponade *video 1*, Supplemental Digital Content 3,http://links.lww.com/MS9/A76. So, immediately, we transfer the patient to the operation theater. At this point, the patient was entirely unconscious with GCS 10.

Under the complete aseptic condition and after general anesthesia, we did a left anteromedial thoracotomy. Examination of the heart revealed pericardial membrane and pericardial vessel injury, and the pericardial fat was well seen. We opened the pericardial membrane to examine the cardiac muscle, and we saw myocardial injury in the left ventricle; however, the myocardium was not completely perforated, *video 2*, Supplemental Digital Content 4,http://links.lww.com/MS9/A77. No other intrathoracic injuries were observed.

After securing the hemostasis, we stitched the injured myocardium, pericardial vessels, and pericardial membrane with a proline 1 suture. However, we left a small part of the pericardium without suturing to prevent the reoccurrence of pericardial tamponade. Two chest tubes were inserted, one with the pericardium and one behind the left lung. The intercostal muscles were stitched layer by layer using Proline 3.0. The chest was approximated by the 'figure of 8' using Vicryl 1.0. During the surgery, we drained about 800 CC of blood from the chest cavity and about 160 CC from the pericardial cavity, and the patient needed 3 l of blood transfusion. Figure 1 shows the heart after repairing the injury.

After the surgery, we do a chest radiography to confirm the patient's status and transfer him to the postoperative ICU with good observation of vital signs. We did not allow anything by mouth and gave him total parenteral nutrition with 3 l of IV fluids (1.5 l normal saline and 1.5 l ringer lactate) in addition to an antibiotic, Ceftriaxone 1 g IV/12 h and good pain control with paracetamol IV 1 g/8 h and tramadol IV 100 mg/24 h and fraxiparine 0.3 IU SC/24 h as an anticoagulant. The surgery was done by O.R.N., M.G.A., and H.A.S.

A chest radiography after surgery showed a slight, insignificant pneumothorax, and no need for any intervention, Fig. 2A. At this time, the patient had GCS 13. On the following day of surgery, the patient was vitally stable and fully conscious, with an O2 saturation of 100% and a GCS of 15. The patient was extubated and started orally. The chest radiography showed that the lung was fully expanded, and the minimal pneumothorax was resolved, Fig. 2B. We investigated the patient with an ECG, and it was normal. The wound was clean, and we did daily wound care. As a follow-up, we did a control chest radiography every morning from the next day until the discharge.

Before the discharge, we removed the two chest tubes. All vital signs were within normal with 100% O2 saturation in room air, and no complications were observed. Two weeks follow-up after discharge, the patient was completely normal with a clean, healed wound. The status of the patient from presentation till the last day of follow-up is presented in Fig. 3. Written informed consent was obtained from the patient for the publication of this case report and accompanying images. A copy of the written consent is available for review by the Editor-in-Chief of this journal on request.

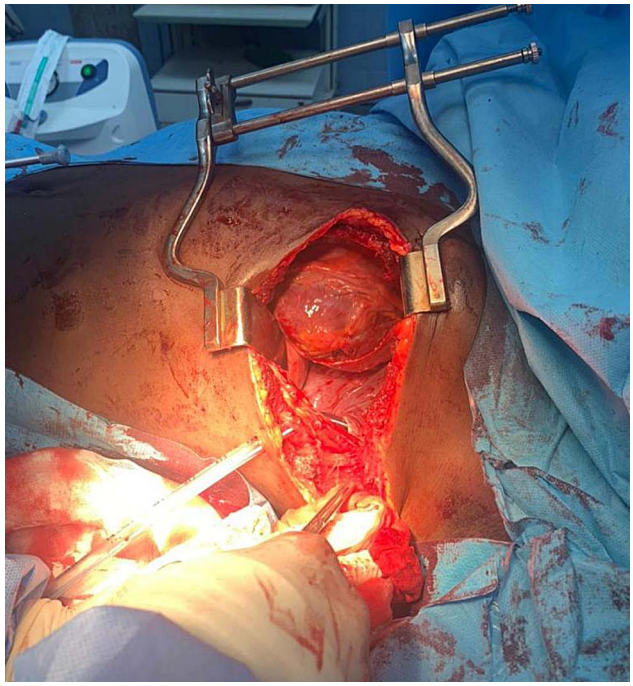

Figure 1. Shows the heart after repairing the injury.

Discussion

The presented case report describes the successful management of a 28-year-old man who was presented to the emergency department with a stab wound to the anterior left chest that resulted in severe dyspnea and hemodynamic instability.

The first successful management of the cardiac injury is credited to Dr Ludwig Rehn, the German surgeon who stitched the right ventricle's incision in 1896 using an anterolateral thoracotomy method[10]. Penetrating heart injury may manifest by shock, which is marked by hemorrhage in the chest and other hemothorax-related symptoms or pericardial tamponade[11]. Most fatalities from piercing cardiac wounds are caused by coronary artery damage, massive pericardial effusion, or profuse bleeding causing hemorrhagic shock[4]. Moreover, Bamous[3] reported the pericardial tamponade, right ventricular tears, and related extra-cardiac lesions as independent risk factors of mortality in penetrating stab wounds to the heart. Our patient had a pericardial tamponade, which is an independent risk factor of mortality, and is fortunately still alive despite the limited facilities in our hospital. All types of shock can be associated with penetrating heart injury. First, the hypovolemic shock due to the extensive blood loss[12]; second, the obstructive shock, which occurs as a result of the pericardial effusion[12]; third, the neurogenic shock due to the pain and the disruption of the sympathetic nervous system[12,13], and last, the cardiogenic shock due to the affection of the cardiac muscle[14]. Our patient was suffering from pericardial tamponade, and also, he lost a significant amount of his blood, so the hemorrhagic and obstructive shock may explain his critical condition.

In patients with hemodynamic instability, the diagnosis of pericardial tamponade is often made solely based on clinical symptoms and ultrasound imaging[7,8,11]. In our patient, we used

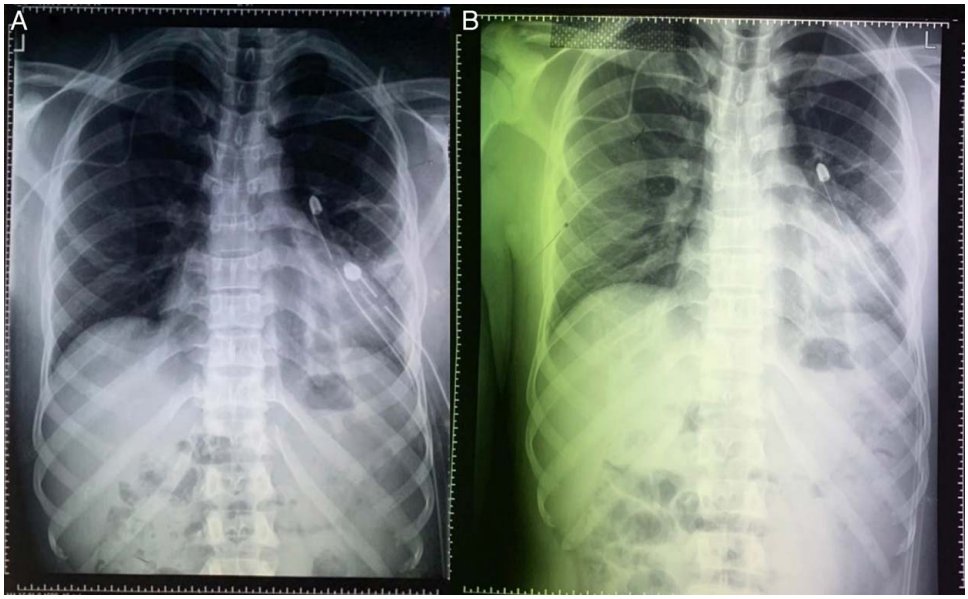

Figure 2. (A) shows chest radiography just after the surgery showing minimal pneumothorax; (B) shows chest radiography before discharge showing fully expanded lung with no pneumothorax.

chest ultrasound imaging for the urgent diagnosis of pericardial tamponade, along with his clinical presentation suggesting the presence of shock. The patient's hemodynamic condition and urgent surgical intervention are crucial for their prognosis[5]. Thoracic drainage alone may treat about 90% of penetrating thoracic injuries, and surgery must be used to manage the remaining injuries[7,11,15]. In this patient, we needed to do urgent surgery due to the rapid deterioration of his clinical condition, along with significant pericardial tamponade, which was suggested clinically by Beck's triad of acute pericardial tamponade[16] of hypotension, muffled heart sounds, and congested jugular veins and confirmed urgently by chest ultrasonography, which was an indication for urgent surgery even without any investigations[17], as cardiac tamponade should be suspected in any chest injuries associated with hypotension. However, chest ultrasonography confirmed our case diagnosis of pericardial tamponade.

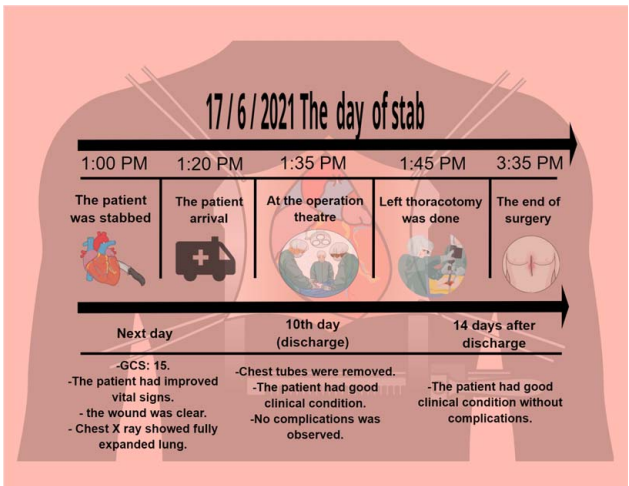

Figure 3. Shows a summary of our case from the presentation till the last day of follow-up.

The time from the site of injury to the start of the operation is a vital issue for the outcomes of the surgery, as the prognosis is often worse when there is a delay between trauma and operation[18]. In our case, the time from the injury to the operation was about 45 min. This delay was attributed to the delay in delivering the patient to the hospital, and also we took about 10–15 min to confirm the diagnosis and prepare the operation room and about 5–10 min to perform the anesthesia and start the operation. However, fortunately, we got favorable outcomes without complications.

Patients with lower GCS had less favorable results[19–21]. Moreover, GCS at admission could be considered a predictor of mortality and complications in these patients[21]. A study found that a GCS of less than eight raises the risk of mortality by 6.22 times[21]. The initial GCS of our patient at admission was acceptable; however, it started deteriorating and became 10 just before the surgery. The GCS started improving from the end of surgery and became 15 on the day following the surgery. The GCS of greater than or equal to 10 in our patient and the good outcomes support considering GCS as a predicting factor for complications or mortality.

In most cases of cardiac injury, Prolene 3.0 or Sylk 2.0 are used to close the defect[22]. In our cases, we started with Vicryl 3.0; however, it was very weak and destroyed by the power of the heartbeats. So, we had to use prolene 1.0.

Conclusion

In this report, we presented a case of a stab wound to the heart presented with pericardial tamponade and shock who underwent

surgery after 45 min of being stabbed. The patient was managed successfully without apparent complications.

In conclusion, cardiac repair should be attempted as soon as possible if the patient with the stab wound to the heart is not clearly dead upon arrival. The time from the stabbing to the start of the operation is vital, and any delay in the operation may lose the patient. GCS could be considered as predicting variable for complications or mortality in patients with stab heart wounds.

Ethical approval

NA.

Consent of Patient

Written informed consent for writing and publishing this report has been taken from the patient.

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None.

Author contribution

O.R.N.: preparation of the first draft; M.B. R., E.E., A.G., and M. G.A.: writing-reviewing and editing; H.S.: data collection and writing; K.S.T.: supervision. All authors were involved in the surgery and revised and approved the final draft.

Conflicts of interest disclosure

The authors declare that they have no financial conflict of interest with regard to the content of this report.

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