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Case Report

Right-Sided Luxation of the Heart Caused by Blunt Traumatic Pericardial Rupture

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Abstract

Cardiac luxation is a rare condition in cases of blunt thoracic trauma, yet it is quite fatal. We present a case of a 28-year-old man, admitted to the emergency room after a motorcycle accident in a hemodynamically unstable condition and radiographic presentation of multiple rib fractures, bilateral pneumothorax, pneumomediastinum, and significant dislocation of the heart to the right. After performing emergency bilateral tube thoracostomy and achieving hemodynamic stability, a CT scan was performed and the patient was diagnosed with pericardial rupture with right-sided luxation of the heart. An emergency sternotomy was performed with repositioning of the heart and pericardial reconstruction. In the postoperative period, suspicion of myocardial infarction was ruled out and the patient was discharged with persistent traumatic monoplegia of the left upper limb and Claude Bernard-Horner syndrome. An analysis of this very rare type of chest trauma has been made and the probable mechanism for its occurrence has been discussed.

Keywords

blunt thoracic trauma, cardiac herniation, heart luxation, pericardial rupture

INTRODUCTION

The heart is injured in an estimated 15% of cases of major blunt thoracic trauma.[1] Pericardial rupture with luxation of the heart is a rare diagnosis and it has been associated with a very high mortality rate of 30–64%.[2] Heart dislocation is frequently associated with other severe traumatic injuries such as valve ruptures, pelvic fractures or internal abdominal injuries, which can mask clinical signs and symptoms.[3] In patients admitted to the hospital with blunt chest trauma and multiple rib fractures, a high index of suspicion is required to formulate an early diagnosis and reduce mortality.[4]

CASE REPORT

We present a case of a 28-year-old male with heart luxation due to an isolated right pericardium tear with a specific clinical presentation. The patient was brought to the emergency department after being hit by a car while driving a motorcycle. He was admitted to the ER in a state of shock with blood pressure measured to 90/59 mmHg and heart rate up to 130 beats per minute. On examination, breath sounds were absent on the left hemithorax, dramatically decreased in the right and subcutaneous emphysema was present around the chest. Glasgow Coma Scale score at admission was 12 points. Abdomen and limbs were found with no changes on physical examination and focused assessment with sonography in trauma (FAST) exam showed no free fluid in the abdomen but suspicious signs of pericardial air were found. Therefore, a chest radiograph was done and showed tension left-sided

pneumothorax with significant dislocation of the heart in the right, partial right-sided pneumothorax and multiple bilateral rib fractures ***(Fig. 1)****. An emergency bilateral tube thoracostomy was performed and the patient was intubated. After achieving hemodynamic stability, a whole-body computed tomography was performed and showed the following images: pericardial rupture with herniation and right-sided luxation of the heart, persistent left-sided pneumothorax, pneumomediastinum with the presence of air collections along the descending part of the aorta* ***(Figs 2A, 2B)****.*

Additional paraclinical studies showed depression of the ST segment from the ECG, with elevated laboratory values of cardiac enzymes.

The neurological clinical study diagnosed a post-traumatic lesion of the left brachial plexus with plegia of the left arm based on intramedullary traumatic changes in the neck area and Claude Bernard-Horner syndrome. A secondary larger thoracostomy tube (34 Ch) was inserted in the left pleural space because of the persistent pneumothorax and after initial resuscitation, preparations were made for major cardiothoracic intervention.

An approach via midline sternotomy was used and the following traumatic injuries were identified: large pericardial rupture located from the level of the diaphragm to the hilum of the right lung with a length of 8.5–9 cm ***(Fig. 3)****, luxated heart located entirely in the right thoracic half with intact major vessels, while right phrenic nerve was found retracted posteromedially at 2-3 mm from the ruptured line of the pericardium along its entire length.*

Manual repositioning of the heart was performed and subsequently, the pericardial defect was repaired with its tissues and closure of the right pleural tears. A total of 4 silk (size 0) stitches were applied, the first being X-shaped ***(Fig. 4)****, and the remaining 3 were made in a simple fashion with distance from each other 2 cm. A drain was left in the pericardial space. Rapid recovery of hemodynamic stability was observed following the procedure and the treatment continued in the ICU. The postoperative chest radiograph was normal* ***(Fig. 5)****.*

After cardiac repositioning, ECG changes suspicious for myocardial infarction were no longer recorded and cardiac enzymes were in normal ranges from laboratory studies. Areas of pulmonary contusion were identified in both lungs on postoperative CT ***(Figs 6A, 6B)****. The patient was discharged on the 42nd postoperative day with persistent plegic left upper limb and Claude Bernard-Horner syndrome and was referred to a rehabilitation center.*

DISCUSSION

Isolated pericardial ruptures without damage to the myocardium or valvular apparatus are very rare in clinical practice.[5] Patients who have suffered an accident or other severe blunt trauma to the heart and chest die on site, during transport, or in the first hours in a non-specialized medical establishment.[6] Another severe chest injury resulting

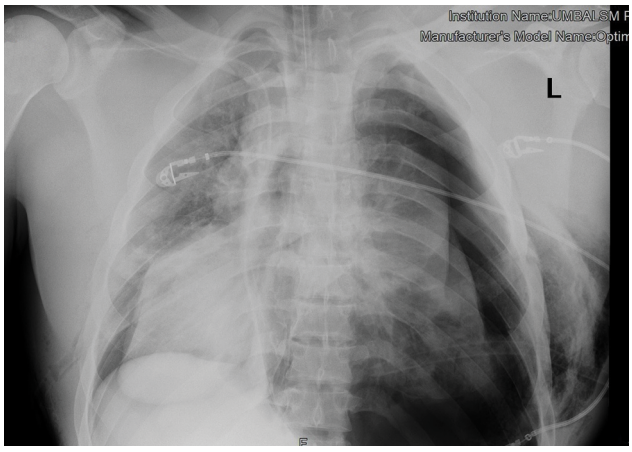

Figure 1. Chest radiograph showing tension pneumothorax on the left with a complete collapse of the lung, partial pneumothorax on the right. Significant dislocation of the heart to the right.

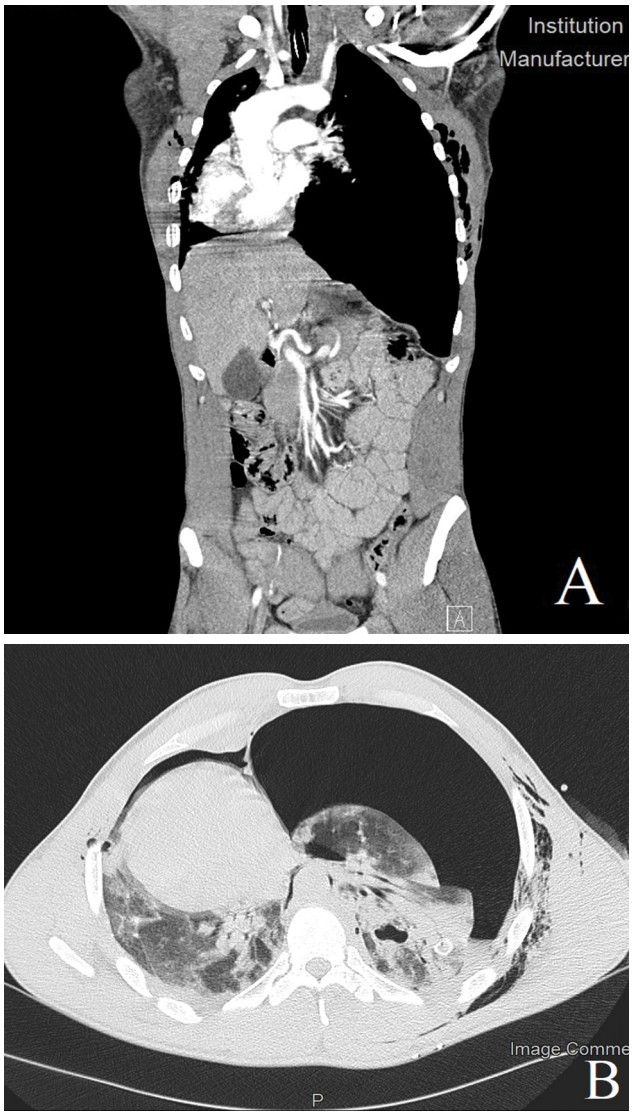

Figure 2. A. CT of the thorax. Heart, aortic arch and main vessels positioned in the right thoracic half. **B.** Pneumomediastinum along the course of the descending part of the aorta. Subcutaneous emphysema on the left axillary area. Minimal pleural effusions bilaterally.

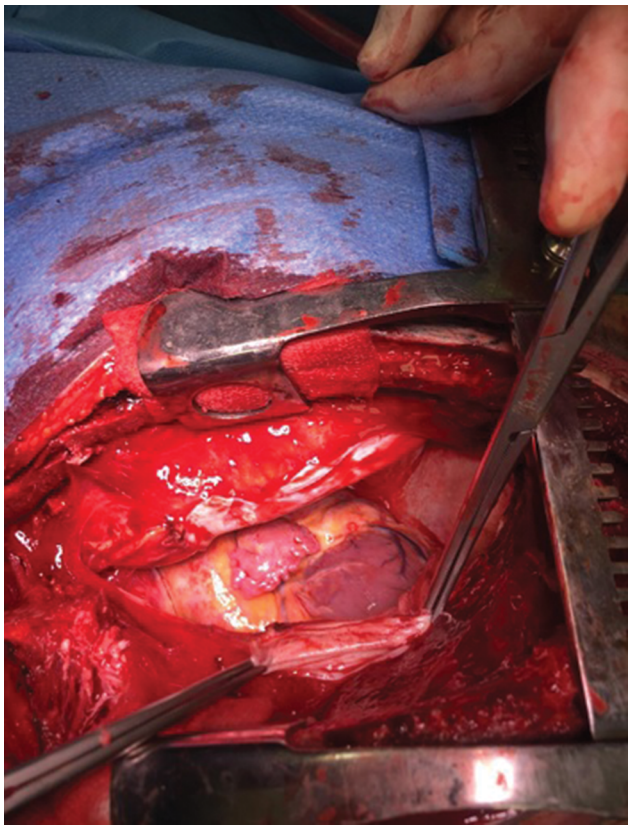

Figure 3. Ruptured pericardium grasped with instruments.

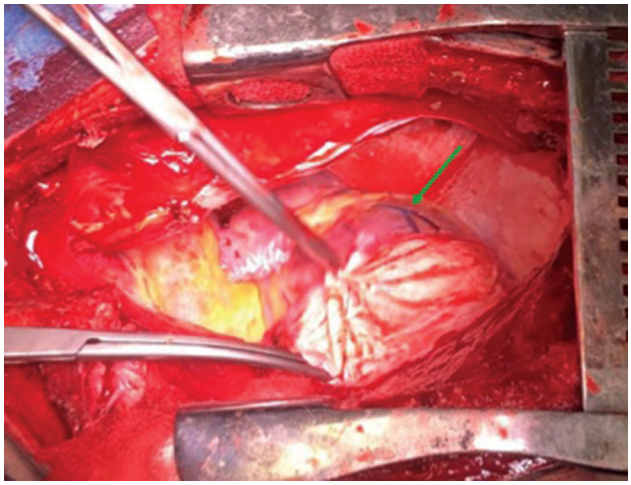

Figure 4. The first (X-shaped) pericardial suture.

from a similar mechanism of action with rapid deceleration and associated with high mortality is the blunt aortic injury (BAI). It is also observed with hemodynamic instability in the absence of intraperitoneal, pleural or pericardial bleeding and refractory to fluid resuscitation. The main key point in differentiating both conditions is the widening of mediastinum on chest X-ray in BAI and sometimes loss of aortic knob, apical capping from blood in the apex, displacement of left mainstem bronchus, nasogastric tube to the right, deviation of the trachea or right mainstem bronchus and widening of the paravertebral stripe.[7]

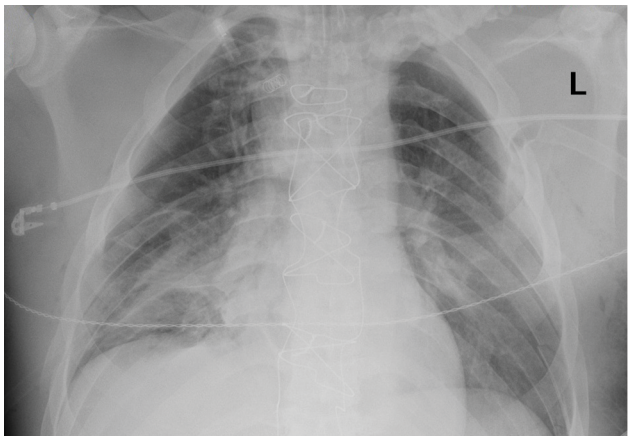

Figure 5. Chest radiograph: normal positioning of heart and major vessels, post-traumatic pulmonary contusion areas in both lungs.

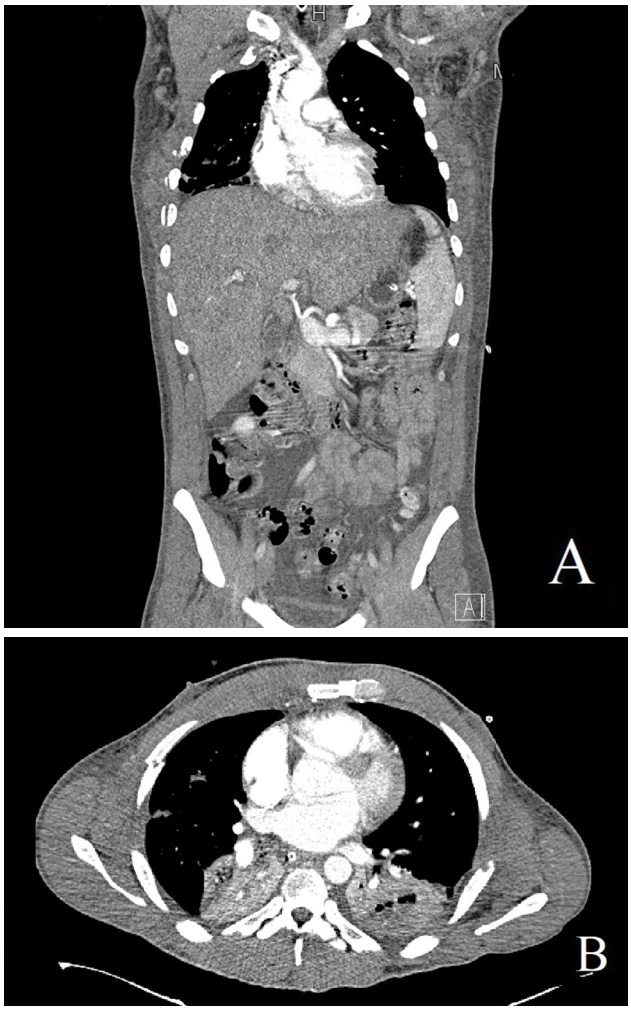

Figure 6. A. Chest CT: normal positioning of heart and major vessels postoperative. **B.** Areas of contusion in dorsal segments of both lungs.

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In cases of pneumothorax, after lung expansion by tube thoracostomy, pericardial rupture with heart dislocation to the left or, less frequently, to the right may go undetected in the initial hours of arrival.[8] Laboratory and ECG changes with catecholamine therapy suggest myocardial infarction, but without being definitive. In some cases of severe chest trauma, the FAST exam and particularly examination of the pericardial area with this method may be difficult to perform due to cardiac dislocation, presence of tension pneumothorax and massive subcutaneous emphysema. When a CT image of a ruptured pericardium is suspected, the diagnosis and the specific surgical approach are greatly facilitated. The choice of operative method (thoracoscopy, wide thoracotomy) and access (sternotomy, lateral thoracotomy) is based on a clear diagnosis and readiness to restore organ and vascular lesions of direct and indirect nature.[9]

Lindenmann et al. and Wang et al., reported similar cases but compared to our technique they used left thoracotomy as an operative approach and prosthetic material was used to repair the pericardial rupture.[10,11]

The intimate mechanism of pericardial rupture in blunt thoracic trauma is not sufficiently clarified. Factors such as the moment of inertia, hydrodynamic impact, elasticity, and resistance of different tissues are discussed.[12] It is noticeable that an isolated pericardial rupture is more common with two (or more) momentary energy effects than with a single impact to the thorax. In our opinion, this is a prerequisite for (positive) wave interference in a fluid-containing organ (heart) and the closed space around it, which increases the power of the hydrodynamic shock and results in an underlying tissue with less elasticity (pericardium).

CONCLUSION

Pericardial rupture with cardiac herniation is a rare injury seen after blunt thoracic trauma. A high index of suspicion is required in cases of rapid deceleration mechanisms in trauma that present with hypotension and signs of heart dislocation with hemodynamic instability. If the injury is recognized in time, treatment is simple and effective. The shortened time for surgical intervention with manual repositioning of the heart is a major factor for a favorable outcome.

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Правосторонняя дислокация сердца, вызванная тупым травматическим разрывом перикарда

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Резюме

Дислокация сердца – редкое состояние при тупой травме грудной клетки, однако оно приводит к летальному исходу. Мы представляем случай 28-летнего мужчины, доставленного в отделение неотложной помощи после мотоциклетной аварии в гемодинамически нестабильном состоянии и рентгенологически с множественными переломами рёбер, двусторонним пневмотораксом, пневмомедиастинумом и значительным смещением сердца вправо. После выполнения экстренной двусторонней трубчатой торакостомии и достижения гемодинамической стабильности выполнена компьютерная томография и у больного диагностирован разрыв перикарда с правосторонней дислокацией сердца. Выполнена экстренная стернотомия с репозицией сердца и реконструкцией перикарда. В послеоперационном периоде было исключено подозрение на инфаркт миокарда и больной выписан с сохраняющейся травматической моноплегией левой верхней конечности и синдромом Клода Бернара-Горнера. Проведён анализ этого очень редкого вида травмы грудной клетки и обсуждён вероятный механизм его возникновения.

Ключевые слова

тупая травма грудной клетки, грыжа сердца, дислокация сердца, разрыв перикарда