



Case report

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Cardiac Tamponade from Displaced Rib Fracture and Intercostal Artery injury Via Pleural-Pericardial communication without Heart Chamber or Great Vessel Involvement

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Abstract

Cardiac tamponade occurs when a pericardial effusion leads to shock physiology. The fluid in the pericardium can be exudative, transudative, or sanguineous arising from multiple different etiologies. Furthermore, the faster the effusion develops, the less volume needed for the development of tamponade physiology. This makes prompt diagnosis and treatment of paramount importance, especially in trauma settings where multiple injuries need to be triaged appropriately. This patient was a 91-year-old female who underwent a motor vehicle collision versus tree as a restrained driver. She was stable on arrival but quickly decompensated in the emergency department requiring placement of a chest tube and infusion of blood products. Patient was taken to the operating room for pericardial window after a CT scan identified a moderate sized pericardial effusion. Intraoperatively, large volume bloody pericardial effusion was encountered requiring median sternotomy to control bleeding. The source of the bleed was an intercostal artery bleeding into the Left pleural space that was communicating with the pericardium via a disrupted parietal pericardium violated by a displaced rib fracture.

After obtaining hemostasis, the patient went into ventricular fibrillation and ultimately arrested after extensive resuscitation and cardiac massage. The patient in this situation was treated according to the advanced trauma life support guidelines. Despite placement of a thoracostomy tube to decompress a known hemothorax, the patient decompensated requiring emergent operative intervention. The source of the hemodynamic collapse was cardiac tamponade related to a rare instance of rib fractures from a blunt injury causing a tear of the pericardium without any damage to the chambers of the heart or great vessels. This case emphasizes the need for operative intervention of traumatic cardiac tamponade because appropriate patient care would have been significantly delayed had a bedside/percutaneous approach been attempted first.

Keywords: Cardiac tamponade; blunt cardiac injury; trauma; hemothorax; pericardial effusion

Abbreviations:

FAST: Focused Assessment with Sonography in Trauma

CT: Computerized Tomography

MVC: Motor Vehicle Collision

EMS: Emergency Medical Services

ED: Emergency Department

GCS: Glasgow Coma Scale

PEA: Pulseless Electrical Activity

ROSC: Return of Spontaneous Circulation

ATLS: Advanced Trauma Life Support

Introduction

Cardiac tamponade is defined as the accumulation of pericardial fluid leading to decreased cardiac output and shock physiology. The fluid can be exudative, transudative, or sanguineous due to a multitude of etiologies that include trauma, infection, malignancy and autoimmune disease. Additionally, the rate of fluid accumulation in the pericardium impacts the total volume needed for cardiovascular compromise, explaining how in traumatic pericardial effusions, less volume in the pericardium is needed for hemodynamic instability [1-5]. Prompt evaluation of all critical injuries is paramount in each trauma evaluation via systematic primary and secondary survey. To assist with this, Focused Assessment with Sonography in Trauma (FAST) exam is an important adjunct to the trauma evaluation with a very high sensitivity pertaining to thoracic trauma that allows for quick determination of injury requiring intervention [6]. Furthermore, the computerized tomography (CT) scan in trauma patients allows for time-saving detection of masked injuries that could alter medical decision making and subsequently improve patient morbidity and mortality [7].

Penetrating cardiac injury is more common than blunt trauma and carries significant mortality with both high rates of prehospital and in-hospital death. Furthermore, penetrating cardiac injury from blunt trauma, related to rib or sternal fracture is rare. Pericardial effusion from blunt trauma is found in approximately 0.5% of trauma admissions. But the presence of pericardial effusion in blunt trauma suggests injury to the heart or great vessels which portends significant mortality. In this case report, we aim to highlight a patient with cardiac tamponade after a motor vehicle collision (MVC) with a tree secondary to a rib fracture that violated the pericardium and allowed bleeding from an intercostal artery to track from the pleura to the pericardium.

Case Presentation

Patient was a 91-year-old female who underwent a MVC versus tree as a restrained driver. The patient was alert and oriented on EMS arrival and was promptly taken to the emergency department (ED). She was initially normotensive with a Glasgow Coma Scale (GCS) of 14 on presentation but quickly became hypotensive. On primary survey, the patient was noted to have a flail chest with absent left sided breath sounds thus a left sided chest tube was placed and the patient was given blood products (2 units of packed red blood cells) with subsequent resolution of the hypotension. FAST was negative for pericardial effusion and the patient was taken to CT scan. CT scan identified fracture of the sternum, right 3-10 and left 1-4 and 9 rib fractures, large left hemothorax and a moderate sized pericardial effusion. Cardiac surgery was consulted, and she was taken emergently to the operating room for evacuation and exploration. A pericardial window was performed via the subxiphoid approach, and a large volume dark blood was evacuated from the pericardial space. It was at this point that the decision was made to convert to median sternotomy.

The pericardium was fully opened to expose the heart and great vessels. There was no residual pericardial effusion present.

Upon evaluation of the pericardium, a large defect was present in the left posterolateral pericardium which appeared associated with a dislocated rib fracture that was adjacent to the pericardial injury. Complete examination of the heart and great vessels did not identify any injury with excellent hemostasis. The left pleural space was opened and a large volume hemothorax was evacuated. The left-sided chest tube was noted to be clotted off. After evacuation of the left hemothorax, the patient went into ventricular fibrillation and was defibrillated into a junctional rhythm. Ventricular pacing wires were placed, and the patient shortly thereafter developed pulseless electrical activity (PEA) arrest. Despite resuscitative efforts including cardiac massage, return of spontaneous circulation (ROSC) was not obtained and time of death was pronounced.

Discussion

This case highlights a rare instance where blunt trauma led to a penetrating injury to the pericardium but not the heart or great vessels. Furthermore, an accumulation of blood traveling from the pleural space to the pericardium led to delayed cardiac tamponade in the setting of a clotted thoracostomy tube drain. This is likely why the initial FAST examination did not identify a pericardial effusion with subsequent CT and intraoperative findings indicative of a significant pericardial effusion. It is important to emphasize the advanced trauma life support (ATLS) algorithm and early involvement of cardiac surgery by the trauma team in instances of potential cardiothoracic injury because swift intervention could have made the difference between life and death in a patient with higher physiologic reserve.

Acknowledgement

None.

Conflict of interests

No conflict of interest.

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