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Case Report

Dual chamber cardiac rupture following blunt thoracic trauma

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ABSTRACT

Introduction: Cardiac rupture following blunt thoracic trauma is rare. When diagnosed, these injuries have a mortality rate approaching 90%. Although there are reports of dual chamber cardiac rupture, there are no documented survivors from this injury.

Case Report: A fifty-year-old man presents after high speed motor vehicle crash. On arrival, he was hypotensive with massive right hemothorax. He progressed to asystole but pulse was regained and he went to the operating room. Upon right thoracotomy we encountered a right pericardial laceration and his incision was converted to bilateral thoracotomy (clamshell). He was found to have both right and left atrial rupture. Both injuries were rapidly repaired. The patient survived to discharge neurologically intact.

Discussion: Cardiac chamber rupture is rare and often fatal. Survival can occur with dual chamber rupture if swift action is taken and all members of the team work together.

Introduction

Blunt cardiac rupture (BCR) is a rare event. Data from the National Trauma Data Bank (NTDB) reveals that of all blunt trauma patients presenting to the emergency department, only 0.045% sustained BCR [1]. While incidence of BCR in patients arriving to the hospital alive is low, in an autopsy study of 160 fatal cardiac wounds, Fedakar found that only 5% of patients suffering from BCR were admitted to a hospital [2]. This suggests that the vast majority of BCR patients die in the field prior to medical care. Of patients that arrive to the hospital alive, overall mortality of BCR is 89% [1]. Blunt cardiac rupture is not evenly distributed between chambers. In a 5-year review of blunt cardiac rupture Brathwaite and colleagues found right atrial rupture in 41%, right ventricular rupture in 31%, left atrial rupture in 25% and left ventricular rupture in 13% [3]. None of the patients with ventricular or dual chamber rupture survived.

Diagnosing BCR quickly can be challenging. Although the Focused Assessment with Sonography for Trauma (FAST) exam is a useful tool for the diagnosis of BCR when it presents with cardiac tamponade, the diagnosis is often masked when combined with pericardial laceration [4, 5]. While there have been many case reports, retrospective case series, and NTDB studies of BCR, to our knowledge there are no published cases of survival following a dual chamber cardiac rupture from blunt thoracic injury. This unique case was challenging in its presentation and management.

Case Report

A 50-year-old man presented to our Level 1 trauma center following a high-speed motor vehicle collision. There was major damage to his vehicle and his steering wheel had been sheared off the column. At the scene, he had a Glasgow Coma Scale (GCS) 3, shallow breathing and weak pulse. He had decreased breath sounds bilaterally with declining pulse and emergency medical personnel performed bilateral needle decompression. On arrival to the hospital he was apneic with GCS of 3 and faint pulse. He was intubated and bilateral chest tubes were placed. In this process his pulse was lost and cardiopulmonary resuscitation (CPR) was started. His FAST exam was negative and of note, he did not have evidence of tamponade and cardiac ultrasound did not reveal pericardial effusion. He had 1,000 mL of blood from his right chest tube and 300 mL from his left chest tube. Massive transfusion of packed red blood cells, plasma and platelets was rapidly started. After three rounds of CPR, he regained a pulse. Because he continued to have large volume

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of blood from his right chest tube after his pulse was regained, he was taken directly to the operating room.

In the operating room a right thoracotomy was performed. Given his mechanism and critical state, coupled with the presence of two board certified surgeons, a laparotomy was performed concomitantly. He was found to have a Grade II liver laceration and his abdomen was rapidly packed. His right thoracotomy revealed a massive hemothorax and a pericardial laceration. While his pericardium was being opened, the thoracotomy was extended to the left side with transverse sternotomy (clamshell) for optimal exposure. Upon opening the pericardium, a right atrial appendage rupture was encountered. It was clamped and repaired. He lost his pulse again and received intra-cardiac epinephrine with initiation of manual cardiac message. He regained a pulse and moments later a large volume of bright red blood began to appear from the retro-cardiac space. The posterior portion of the heart was evaluated, and a left atrial rupture was encountered. In a similar fashion, it was clamped and repaired. Hemostasis was achieved, his chest was closed, his abdomen was temporarily closed, and he was returned to the recovery room.

Throughout the surgery the anesthesia team continued with massive transfusion using rotational thromboelastometry (ROTEM) directed correction of coagulopathy. His estimated blood loss was 8 L. He received 30 units packed red blood cells, 30 units fresh frozen plasma, 3 packs of platelets, 6 units of cryoprecipitate and 1,250 mL of autologous blood Post operatively his course was complicated by atrial fibrillation that was reversed medically and controlled with medication. The patient made a full neurologic and physical recovery and was discharged home.

Discussion

Cases or blunt cardiac rupture are rare with exceptionally high mortality rate. There are no documented cases of survival with dual chamber rupture. There are two key components to survival. First, the patient must be rapidly assessed and transported to definitive care. In this case, time of arrival to incision in the operating room was 32 minutes, including CPR, chest tubes, intubation, resuscitation and transport. Secondly, aggressive balanced resuscitation facilitated the surgical team completing the operating, avoid coagulopathy and maintain perfusion to vital organs

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