Case report

Isolated right atrial appendage rupture following blunt chest trauma

Rakesh Hegde⁎, Nathan Lafayette, Michael Sywak, Gregory Ricketts, Jorge Otero, Scott Kurtzman, Zhongqiu Zhang

Waterbury Hospital, CT, United States

ARTICLE INFO

Keywords:
EFAST
Isolated right atrial appendage rupture
Tamponade

ABSTRACT

Background: Right sided tears or rupture are the most common injury to the heart after blunt chest trauma. The majority of these injuries are to the thin walled atrium. Reports of localized right atrial appendage rupture are rare. The classical features of Beck’s triad are unreliable in the trauma bay. With the advent of EFAST (Focused assessment with sonography for trauma extended to thorax), Beck’s triad should be considered but not used as the primary clinical tool for diagnosis of cardiac tamponade [1]. EFAST aids in rapid diagnosis and definitive care [3].

Case presentation: Our patient was a 17 year old male who presented with hypotension after a rollover motor vehicle accident. He presented with a grossly negative physical exam and positive EFAST for pericardial effusion with tamponade physiology. We performed an emergency pericardiocentesis and expedited transportation for operative exploration. A Right atrial appendage injury was identified and repaired and patient recovered uneventfully.

Conclusion: EFAST examination aids in rapid diagnosis of cardiac tamponade in the trauma setting. Pericardiocentesis facilitates temporizing the hemodynamics in preparation for operative exploration.

Case report

The patient was a 17 year old male, restrained, rear seat passenger of a car involved in a rollover accident. He was agitated in trauma bay with GCS of 8, and tachycardic with a heart rate between 140 and 160 bpm. His blood pressure was 80 systolic, saturating at 96% on room air. His bilateral air entry was equal, and the remainder of his examination was normal without any obvious external injuries. It was felt that his agitation was secondary to hemorrhagic shock. He was urgently intubated for air way protection and sedated, two large bore IV lines were placed, and blood was drawn for labs, resuscitated with a liter of normal saline. It was felt that this patient was too hemodynamically unstable to be taken for CT scan. After intubation and sedation of the patient an EFAST was performed. This examination revealed a massive pericardial effusion causing cardiac tamponade (Fig. 1). Concurrently, his blood pressure further dropped to 60/30 and an emergent percutaneous needle sub-xiphoid pericardiocentesis was performed under ultrasound guidance draining 250CC gross blood (Fig. 2). Repeat EFAST revealed expansion of the right ventricle free wall and improvement of his blood pressure to 80/40 mm Hg giving enough time for the OR/bypass team to be mobilized and the massive transfusion protocol to be initiated (Fig. 3). A Right femoral vein Cordis was placed and another liter of normal saline was infused.

Once in the operating room, we started by excising the xiphoid process and entering the pericardium. A large amount of persistent...
Fig. 1. Parasternal short axis view with large effusion note RV collapse.

Fig. 2. Subcostal view with needle PE-Pericardial effusion, LV-Left ventricle, RV-Right ventricle, Red arrow-18 Gauge needle. (For interpretation of the references to colour in this figure legend, the reader is referred to the web version of this article.)
venous bleeding was encountered. A sternotomy was performed, the pericardium was incised longitudinally exposing the heart and an actively bleeding, 1 cm, right atrial appendage tear was noted. Digital compression and a clamp were applied at the tear which was then repaired. After placing two sub-xiphoid chest tubes the chest was closed (Fig. 4). Following surgery the patient was hemodynamically stable and underwent CT scan of head, neck, chest abdomen and pelvis that revealed no other injuries. He had uneventful postoperative course.

Discussion

About 6–10% of patients who endure significant blunt injury to the chest have cardiac rupture [9]. Blunt traumatic rupture of the heart is a frequent cause of traumatic death, most typically from cardiac tamponade. Cardiac injuries are rarely diagnosed early in the prehospital period with most patients dying at the scene of the accident [4]. A high degree of suspicion of tamponade with recognition of Jugular venous distention, muffled heart sound and hypotension (Becks triad), combined with the use of EFAST allows rapid evaluation and expeditious management and may increase the number of survivors.

An isolated rupture of the right atrial appendage following blunt chest trauma is extraordinarily rare and has few instances reported in the literature, however right chamber injuries seem to be reported more often [5,6,8]. The presence of bilateral lung contusions and liver injury indicate a major compression of the complete intrathoracic cavity. This can lead to a sudden inflow of a pool of blood into the right atrium. At the end of diastole or in late systole, when the tricuspid valve is closed, this sudden inflow causes a supernormal pressure and an isolated rupture at the weakest spot in this case, the right atrial appendage [8].

Once cardiac rupture is suspected or confirmed and no other traumatic injuries have been identified the patient should be expeditiously taken to the operating room. A median sternotomy offers the best cardiac exposure, and in our case was an extension of a previous subxiphoid incision. This incision can also be extended caudally over the midline of the abdomen for intra-abdominal procedures if required. Furthermore, the tenting of the pericardial margin facilitates direct cardiac massage, systemic inspection of the heart, and provides the setting for cardiopulmonary bypass and extracorporeal life support in more complex cases.

Blunt chest trauma is common after motor vehicle accidents. However, cardiac rupture due to blunt trauma is relatively uncommon, and survival following this type of injury is rare. Kutsukata et al. reported a probability of survival to be 14.7% with an actual survival rate of 16.7% in their series [8]. Among cases of blunt cardiac rupture, right atrial rupture may achieve hemostasis temporarily by the compression from an intrapericardial hematoma. This permits the possibility of maintaining a stable hemodynamic state with initial volume resuscitation. Therefore, the opportunity of salvage is considered greater than with other cardiac ruptures [9].
Conclusion

Patients with blunt cardiac rupture will continue to be a challenging injury to diagnose and treat. A high index of suspicion, expeditious diagnostic protocols and appropriate surgical management are essential to a better outcome. Training and expertise in bedside ultrasonography proves to be an initial effective diagnostic and therapeutic tool to help rapidly identify blunt cardiac injuries and will supplement clinical findings of Beck’s triad.

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