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Ruptured right atrial appendage secondary to blunt chest trauma

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ABSTRACT

Rupture of one or more cardiac chambers following domestic blunt chest trauma is rare. A positive outcome depends on high level of suspicion and early surgical intervention. We report here an interesting case of a ruptured right atrial appendage in a four year old boy following a blunt crushing injury to the chest and abdomen by a heavy porcelain sink which was successfully repaired. Therefore, accurate diagnosis is very important for appropriate management.

Keywords: Blunt chest injury, cardiopulmonary bypass, cardiac chambers rupture, cardiac tamponade, median sternotomy, right atrial rupture, thoracic trauma

INTRODUCTION

Frequency of cardiac injuries following blunt chest trauma has been reported as high as 20 to 76% in some clinical series, most of which consist of myocardial contusion.[1, 2] Rupture of one or more cardiac chambers following blunt chest trauma however is rare, in the order of 0.3 to 0.9%.[2] However this incidence is on the rise and usually associated with significant forces such as those seen in a head-on road traffic collision.[2] Therefore to encounter a ruptured right atrial appendage following a domestic blunt crushing injury by a heavy object is extremely rare. We report he such a case here of a ruptured right atrial appendage in a four year old boy following a blunt crushing injury to the chest and abdomen by a heavy porcelain sink which was successfully repaired.

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CASE REPORT

A four year old boy was brought into the Accident and Emergency Department (AED) in May 2007 following a domestic accident three hours earlier. The child was climbing onto a large porcelain sink which was poorly secured to the wall. The whole sink subsequently toppled over with the child and landed onto his anterior chest wall and upper abdomen.

On arrival at the AED, he was unre-

sponsive with intravenous normal saline and his Glasgow coma scale improved to 13/15. Clinical examination only revealed bruising over the right upper quadrant of the abdomen with mild tenderness and guarding on deep palpation. There were no clinical signs of chest injury. Chest radiograph did not show any ribs or sternal fractures. An urgent ultrasound scan (focused assessment with sonography for trauma, FAST scan) of the abdomen showed minimal fluid collection in the abdomen with a small focal laceration within the left liver parenchyma. However, the degree of hypotension and tachycardia blood pressure 53/40 mmHg, pulse 160 beats per minute) did not correlate with the radiological findings which prompted the radiologist to scan the heart and discovered a large pericardial haematoma sitting on top of the right atrium. This was further confirmed on 2D echocardiography (Figure 1) and computed tomography of the chest and abdomen.

The child was taken to the operating room immediately but during induction became bradycardic and hypotensive. This was quickly resolved with a bolus of atropine. A median sternotomy was performed and the pericardium was blue, tense and bulging. A large amount of haematoma was evacuated from the pericardium with fresh blood pouring out of a 2 cm tear on the right atrial appendage bordering the atrio-ventricular groove (Figure 2). Finger pressure was applied over the appendage onto the atrio-ventricular groove to arrest the bleeding. The repair was performed by sewing the right atrial appendage onto the right ventricular epicardial fat using pericardium pledgetted 5/0 prolene sutures (Figure 2).

After the procedure, the child was transferred to paediatric intensive care unit for ventilation and observation. He was extubated early the next day and all drains were removed by the third post-operative day. He was well enough for discharge by the fourth post-operative day. He has been reviewed in clinic twice since and found to be well.

DISCUSSION

The favourable outcome of our case highlights

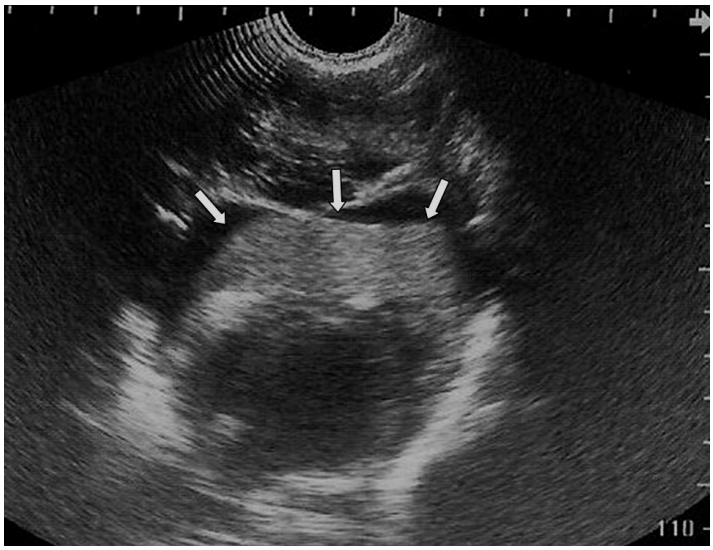

Fig 1: 2D echocardiography confirming the presence of a large clot sitting on top of the right atrium as indicated by the white arrows.

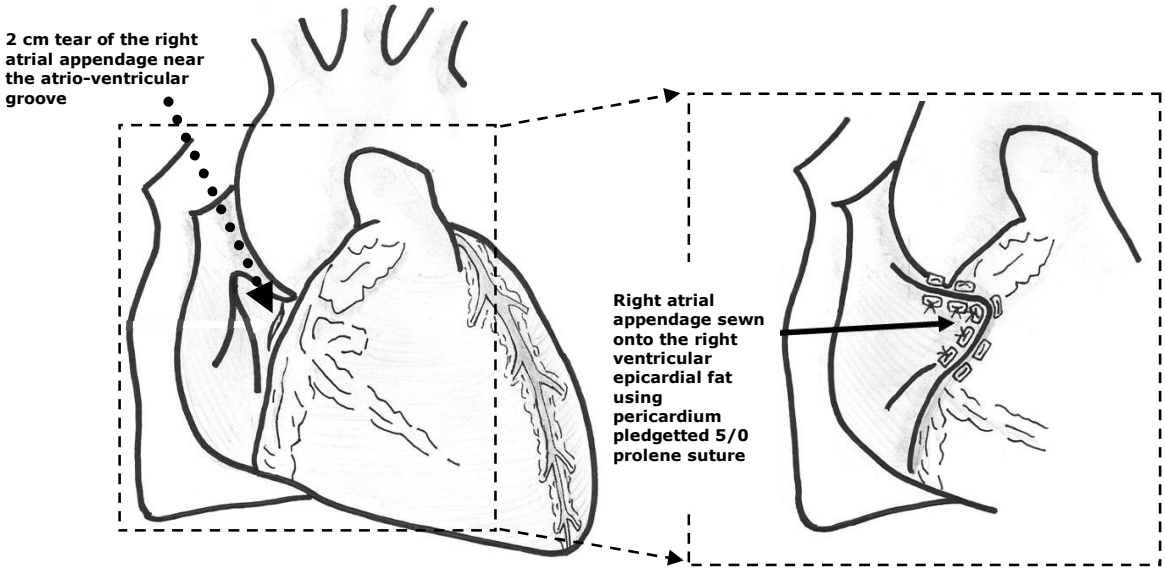

Fig 2: Schematic diagram showing a 2 cm right atrial appendage tear close to the atrio-ventricular groove (left); schematic diagram (right) showing the repair of the right atrial appendage tear by suturing the right atrial appendage to the right ventricular epicardial fat using pericardium pledgetted 5/0 prolene sutures, hence completely sealing the tear.

the importance of a high level of suspicion when dealing with such injuries. The lack of clinical and radiological signs of chest injury combined with radiological findings of minimal abdominal injury that did not correlate with the degree of clinical hypotension, tachycardia and drowsiness should arouse suspicion of cardiac injury.[2] As in this case, the discrepancies prompted the attentive radiologist to perform a FAST scan which picked up the pericardial tamponade. If it had not been for this high level of suspicion on the part of the radiologist, the child would have just been admitted to the ward for observation resulting in the most likely scenario of a cardio-respiratory arrest one to two hours later.

FAST scan has become a useful modality for the initial evaluation of patients with blunt abdominal trauma.[3] It can be performed either by a trained Emergency Physician, Surgeon or Radiologist subject to availability of an ultrasound machine. Clinical indications in this patient included hypotension and severe blunt trauma to the upper abdomen. Four standard focused areas of assessment, the hepatorenal recess, splenorenal recess, pelvis and pericardium are usually scanned in the said order to detect the presence of free fluid.[4] However, if cardiac tamponade is suspected, the first view should be the pericardium view. In a patient such as this, a positive finding would be one that identified free fluid as a black echo-free area around the heart in the pericardium (Figure 1). This finding of blood in the pericardium after trauma indicates the need for emergency thoracotomy, ideally in the operation theatre.

The lack of external signs of injury in young children could be explained by the flexibility and plasticity of the anterior chest wall to bend and take the crushing forces without causing any bony fractures. The compression force causes the sternum to approximate towards the dorsal spine, crushing the

heart in the process.[1] We speculate that the crushing force occurred at the time of atrial systole and the resulting right atrial contraction and compression of the right ventricle between the sternum and dorsal spine, forced the blood out through a weak point close to the atrio-ventricular groove.

Prompt and immediate surgical repair is mandatory once diagnosis is confirmed as mortality from this condition is extremely high.[5, 6] However, in patients with traumatic cardiac chamber injuries and cardiac tamponade if possible anaesthetic induction and intubation should be undertaken in the operating theatre where relief of tamponade can immediately follow as in this case.[7] It is advisable to avoid any agents such as propofol which can cause cardiovascular depression for anaesthetic induction to avoid severe cardiovascular collapse.[8] Use of induction agents such as etomidate is preferred instead. In the interim, patients with cardiac chamber injury should be resuscitated sufficiently with intravenous fluid (crystalloid or colloid or blood) but maintaining a systolic blood pressure in the range of 90-100 mmHg. Overzealous resuscitation to a higher systolic blood pressure may further aggravate the haemorrhage and cardiac tamponade. Direct repair of ruptured right heart chambers can be performed successfully without the aid of cardiopulmonary bypass as blood loss from the tear can be arrested using digital pressure. However, for left heart chamber injury, the use of cardiopulmonary bypass is mandatory in order to perform a successful repair. [3]

In conclusion, our case highlights the importance to clinicians, especially those in the front line to be vigilant in consider undetected potentially life-threatening injuries in patients with crush injuries to the chest and abdomen despite the lack of clinical signs and absence of any radiological bony injuries. This is especially true for young and healthy patients who may be able to compensate until the point that it is too late when progression can be rapid. Successful management demands a high level of suspicion of cardiac injury, prompt diagnosis and immediate surgical repair.

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