Case Report

A rare late complication of traumatic diaphragmatic hernia repair

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Summary

We report a case of sudden cardiovascular collapse several weeks following surgical repair of a traumatic diaphragmatic hernia. The patient presented with features of circulatory shock without a clear diagnosis, therefore an urgent computed tomography scan of the chest and abdomen was undertaken, which revealed a pericardial effusion with evidence of cardiac tamponade. Ultrasound-guided needle pericardiocentesis with aspiration of blood from the pericardial sac in the Emergency Department provided an immediate response and her cardiac output improved. On review of the imaging, it is likely a surgically-placed permanent metallic fixation device, sitting near the pericardium, caused bleeding into the pericardial sac due to local trauma as a delayed postoperative complication.

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Introduction

Diaphragmatic injury in adults can occur following trauma, and is an occult injury which can be easily missed. Delayed recognition of the injury can lead to herniation and strangulation of abdominal contents and respiratory complications such as empyema. The gold standard for treatment is an emergency laparotomy or thoracotomy with repair of the diaphragmatic defect. Laparoscopic approaches can also be successful [1].

Complications are common following traumatic diaphragmatic hernia repair and recognised complications include suture-line and wound dehiscence, wound infections, iatrogenic nerve injury and empyema. Cardiac tamponade is a rare complication which has been previously described following similar operations, such as hiatal hernia repairs, due to the proximity of surgical tacks to the pericardium [2]. We present what we believe is the first case report describing a delayed presentation with cardiac tamponade following traumatic diaphragmatic hernia repair.

Report

A previously fit and well 69-year-old female patient was brought by ambulance to a district general hospital Emergency Department having developed sudden onset chest pain, shortness of breath, light-headedness and a witnessed collapse. Her only significant past medical history was a traumatic diaphragmatic hernia repair performed 5 weeks earlier. The initial injury had been sustained over 2 years before after falling while cycling. The surgery was performed via a laparoscopic approach and her early postoperative recovery had been uneventful.

On arrival in the resuscitation room, the patient was tachycardic, hypotensive and tachypnoeic. She was confused and agitated. An initial blood gas taken on arrival showed a metabolic acidosis and lactate concentration of 7.6 mmol.l⁻¹. The rest of

the examination was unremarkable. Given the diagnostic uncertainty in the context of a critically unwell patient and history of recent surgery, an urgent computed tomography (CT) scan of the abdomen and pelvis was requested and the critical care team were contacted for advice.

Although the CT scan showed no evidence of intra-abdominal organ ischaemia or perforation, it did reveal a large pericardial effusion with features that were consistent with blood. The imaging was also suggestive of a low cardiac output state, as there was reflux of contrast into the right renal and hepatic veins. The presence of a surgical fixation device in close proximity to the pericardium was also noted (Fig. 1). Following return from the CT scanner, the patient became more haemodynamically compromised with severe hypotension and reduced consciousness. The decision was made to proceed with needle pericardiocentesis under direct ultrasound guidance. Approximately 15 ml of blood was drained from the pericardial sac, with significant and rapid improvement in haemodynamics noted over the following minutes. The on-call cardiology consultant arrived and a decision was made transfer the patient to the cardiac catheterisation suite for consideration of a pericardial drain. A focussed cardiac ultrasound scan revealed a small amount of coagulated blood in the pericardial sac and good left ventricular function. A pericardial drain was not, therefore, inserted.

Following discussion with our tertiary cardiothoracic surgery service, the patient was admitted to critical care for invasive monitoring and observation, where her haemodynamic parameters remained normal. Review of her CT imaging with the consultant upper gastro-intestinal and cardiothoracic surgical input noted a surgical fixation device abutting the pericardium, and it was felt the delayed bleeding was likely due to local trauma from the foreign body. The patient was transferred from our hospital to a tertiary cardiothoracic critical care unit. She remained stable with good cardiac function and was discharged home 5 days following her initial presentation to await repeat outpatient CT imaging and local upper gastro-intestinal surgery follow-up.

Discussion

Cardiac tamponade is a life-threatening clinical syndrome caused by fluid accumulation in the pericardial sac, reduced ventricular filling and a resultant low cardiac output state. The stiffness of the pericardium produces a pressure–volume curve not unlike that seen in raised intracranial pressure, with an initial slow rise in pressure followed by a rapid increase with only minimal volume change. This makes tamponade a ‘last-drop’ phenomenon, where the last small increment in volume in the pericardial sac produces critical cardiac compromise, and conversely, a small volume drained initially can produce a significant clinical effect, as can be seen in our case. This effect is more pronounced in a rapidly accumulating pericardial effusion due to

Figure 1 A coronal abdominal CT scan demonstrating the presence of a large pericardial effusion and a surgical tack (green arrow) abutting the pericardium.

bleeding, as compared with a slower accumulation of pericardial fluid which may allow the pericardium to stretch and compensate to a degree [3, 4].

Intra-operatively and in the immediate postoperative period, tamponade following diaphragmatic surgery is a rare but well-recognised complication which carries a high mortality rate. A recent literature review found only 15 case reports of tamponade due to hiatal hernia or ventral hernia repair [5]. The majority of cases arose due to the use of surgical tacks in close proximity to the pericardium, and two-thirds of these resulted in death.

This rarity of this complication can lead to diagnostic challenges in the undifferentiated patient presenting to the Emergency Department, particularly if the classical signs, such as distended neck veins or muffled heart sounds, are not present or immediately looked for. Indeed, Beck's triad of muffled heart sounds, jugular venous distension and hypotension are only present in a minority of patients presenting with acute cardiac tamponade. In patients stable enough to undergo radiological imaging, a CT scan of the chest and abdomen can be diagnostic for cardiac tamponade and at the same time exclude other potential diagnoses. Signs include the presence of a (usually large) pericardial effusion, distension of the venae cavae, reflux of contrast into the azygos vein and compression or deformity of the cardiac chambers [6].

In the acute setting, bed-side focussed cardiac ultrasound is the single most useful diagnostic test to determine the presence and characteristics of any pericardial effusion present and estimate the severity of haemodynamic impact. Signs include diastolic collapse of the right ventricle, dilation of the inferior vena cava and exaggerated respiratory variability in blood flow through the heart [7]. In cases such as ours, with a patient presenting with undifferentiated circulatory shock, point-of-care ultrasound examinations such as the Rapid Ultrasound for Shock and Hypotension protocol, may be useful in making a timely and correct diagnosis [8]. Echocardiography can also be useful to help guide interventions such as pericardiocentesis in the emergent setting, and this practice is considered the standard of care [9]. The other consideration in this case is the risk of further tack erosion and a repeat event. There is no evidence to quantify this risk but we believe it to be very low.

In conclusion, cardiac tamponade is a rare complication of diaphragmatic surgery although it carries a high mortality and presents a diagnostic challenge. Bleeding may be related to the presence of surgical fixation devices, such as tacks. In the presence of severe haemodynamic compromise, bed-side needle pericardiocentesis with ultrasound guidance can be a life-saving procedure, with only small volumes of fluid or blood aspiration required to produce a pronounced haemodynamic improvement. In our case, following pericardiocentesis, no further surgical intervention was required and the patient made a complete recovery.

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References

1. Dwivedi S, Banode P, Gharde P, Bhatt M, Johrapurkar SR. Treating traumatic injuries of the diaphragm. *Journal of Emergencies, Trauma, and Shock* 2010; **3**: 173–6.
2. Penchev D, Kotashev G, Popivanov G, Mutaftchiyski V. Cardiac tamponade as a life-threatening complication after laparoscopic mesh hiatal hernia repair. *International Journal of Case Reports and Images* 2017; **8**: 528–32.
3. Shabetai R. Pericardial effusion: haemodynamic spectrum. *Heart* 2004; **90**: 255–6.
4. Spodick DH. Acute cardiac tamponade. *New England Journal of Medicine* 2003; **349**: 684–90.
5. Frantzides CT, Welle SN. Cardiac tamponade as a life-threatening complication in hernia repair. *Surgery* 2012; **152**: 133–5.
6. Santiago Restrepo C, Lemos DF, Lemos JA, et al. Imaging findings in cardiac tamponade with emphasis on CT. *Radiographics* 2007; **27**: 1595–610.
7. Adler Y, Charron P, Imazio M, et al. 2015 European Society of Cardiology (ESC) Guidelines for the diagnosis and management of pericardial diseases. *European Heart Journal* 2015; **36**: 2921–64.
8. Seif D, Perera P, Mailhot T, Riley D, Mandavia D. Bedside ultrasound in resuscitation and the rapid ultrasound in shock protocol. *Critical Care Research and Practice* 2012; **2012**: 503254.
9. Tsang TS, Freeman WK, Sinak LJ, Seward JB. Echocardiographically guided pericardiocentesis: evolution and state-of-the-art technique. *Mayo Clinic Proceedings* 1998; **73**: 647–52.