On-line Case Report

Intubation of the pericardial sac

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A 22-year-old male was admitted to casualty with a penetrating injury to his left ventricle following a stabbing to his chest. Penetrating injuries to major organs that originate or pass through the relatively narrow mediastinal corridor may have catastrophic consequences with little in the way of external signs to indicate the severity of the injury. Clinically, patients with penetrating cardiac injuries may present with cardiac shock due to either volume loss or pericardial tamponade. However, expeditious recognition, resuscitation and surgical treatment of these injuries are imperative if one wishes to reduce their inherently high mortality. Simple methods in trauma resuscitation, often being carried out in less than optimum conditions, are vital in order to save an injured patient's life. Decompression of the pericardial sac by intubation is described as a new and relatively simple method in the initial resuscitation of a patient with sharp cardiac injury, prior to definitive surgery.

Key words: Cardiac injury – Cardiothoracic trauma – Resuscitation methods – Pericardial tamponade

Penetrating injuries to major organs that originate or pass through the relatively narrow mediastinal corridor may have catastrophic consequences with little in the way of external signs to indicate the severity of the injury. Simple methods in trauma resuscitation, often carried out in less than optimum conditions, are vital in order to save an injured patient's life. Decompression of the pericardial sac by intubation is described as a new and relatively simple method of initial resuscitation in a patient with sharp cardiac injury, prior to definitive surgery.

Case history

A 22-year-old male was admitted to casualty following multiple stab injuries to thorax and abdomen. On arrival, he was agitated but verbalising with a pulse rate of 99/min and a blood pressure of 100/70 mmHg. He was noted to have two stab injuries to his thorax – one to his

left lateral chest wall, the other just lateral to his left lower sternum.

He had decreased breath sounds on auscultation of his left chest. Heart sounds were normal with no raised JVP. His ECG showed a sinus tachycardia.

Shortly after admission, he suffered pulseless electrical activity/electromechanical disassociation (PEA/EMD) cardiac arrest and he received external chest massage. An attempt at needle pericardiocentesis during resuscitation failed. A chest drain was inserted through his left lateral chest wall – a rush of air indicated an existing left pleural pneumothorax and a small volume of blood stained fluid was also noted. His clinical condition, however, failed to improve. It was possible to palpate the patient's heart at the tip of an examining finger (Fig. 1) when it was placed through the oblique tract of the left lower sternal wound. A trocarless drain was then run over the examining finger that acted as a guide and this was immediately followed by drainage of 900 ml of frank pericardial blood and a

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Figure 1 Heart palpation and insertion of a trocarless drain.

return of cardiac output. This was also accompanied by a significant improvement in the level of the patient's consciousness, shortly followed by an epileptic fit that was treated by the administration of rectal diazepam. The patient, however, continued to bleed significantly into his drain and was transferred to the operating room for an emergency thoracotomy. On transfer, he suffered a second PEA (EMD) arrest, which, in this instance, was felt to be due to hypovolemia. The patient continued to receive external cardiac massage and high volume transfusion during thoracotomy and, on opening his chest, his cardiac output once again returned.

At thoracotomy, a chest drain was found immediately adjacent to the heart lying in the pericardium and the rest of the pericardial sac was devoid of free blood but did contain a small amount of clot. A full-thickness 2-cm laceration was present at the apex of the left ventricle that was spurting and a further laceration to the left distal anterior descending artery was also actively bleeding. The operating surgeon dislocated the heart anteriorly and over sewed the distal portion of the left anterior descending coronary artery and the left ventricle was repaired with horizontal mattress sutures. Semi-elective abdominal laparotomy the following day failed to demonstrate any further significant injuries although a small intercostal bleed was found at thoracotomy. The patient made an

otherwise uneventful recovery and, on discharge, walked out of hospital 2 weeks following his original injury, remains well and has returned to full physical activity.

Discussion

Penetrating injuries to major organs that originate or pass through the relatively narrow mediastinal corridor may have catastrophic consequences with little in the way of external signs to indicate the severity of the injury. However, expeditious recognition, resuscitation and surgical treatment of these injuries is imperative if one wishes to reduce their inherently high mortality.^{1,2} Clinically, patients with penetrating cardiac injuries may present with cardiac shock either due to either volume loss or pericardial tamponade.² This patient appeared to have suffered both. Beck's triad—distended neck veins, muffled heart sounds and hypotension—are present in only 48% of patients with proven tamponade. Paradoxically, in patients with smaller pericardial and ventricular wounds, tamponade may initially prolong life by reducing the severity of blood loss eventually proving fatal as venous return is impeded further.^{1,3} In instances where the laceration to the pericardium and myocardium is large enough, the patient may have uncontrollable bleeding as the rise in pericardial pressure eventually widens the pericardial rent.

In an audit of penetrating cardiac injuries,³ 11 of the 12 patients without recordable blood pressure on admission had pericardial tamponade. Needle pericardiocentesis is probably ineffective is a failure to aspirate semi-solid pericardial coagulum.¹ Needle pericardiocentesis is still cited as standard treatment for pericardial decompression in Advanced Trauma Life Support (ATLS)⁴ as it is thought that even a small reduction in pericardial volume may have a beneficial effect. ATLS refers to pleural intubation by running a trocarless tube alongside an examining finger having previously palpated the parietal pleura of the inner chest wall.⁴ Here, the tamponade was successfully decompressed using a similar method, blindly tracing a tract through the chest wall and pericardial defect and running a drain into the pericardium alongside the examining finger acting as a guide. A subxiphoid pericardial window (mini-pericardiotomy) is a widely accepted method for the diagnosis and relief of cardiac tamponade and may equally have been of benefit in this instance.

Overall survival for admitted left-sided cardiac injuries is 23%. Only 2–13% of patients with unrecordable blood pressure survive following a stab injury to the

heart.^{2,3} In an audit of penetrating injuries of the heart, only 1 out of 14 patients with a left anterior descending coronary artery survived.¹

Conclusions

Given the likely chances of death and the actual survival of our patient, one can only attribute this successful outcome to the expeditious recognition and decompression of cardiac tamponade. An attempt at this method before consideration of pericardiotomy or thoracotomy is recommended.

References

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