

Tension pneumopericardium: case report

Tansiyon pnömoperikardiyum: Olgu sunumu

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Pneumopericardium is defined as the presence of air within the pericardial space. It is an uncommon complication of blunt or penetrating chest trauma and may also occur iatrogenically. 'Simple' pneumopericardium produces no discernible circulatory compromise; however, simple pneumopericardium may progress rapidly to produce cardiovascular compromise or circulatory collapse, when it is termed 'tension' pneumopericardium. Tension pneumopericardium requires emergent drainage of the pericardial sac. Failure to achieve rapid effective drainage may result in cardiac arrest. Drainage of the pericardial sac may be achieved by either percutaneous or open drainage technique. Formation of a sub-xiphoid pericardial window has been advocated as a rapid and effective means of achieving open drainage. This may be carried out at the bedside with minimal equipment, and the authors advocate this technique as the preferred option for achieving drainage. This case demonstrates the rapid and dramatic deterioration to cardiac arrest of a multiply injured trauma patient with radiologically confirmed pneumopericardium. The effectiveness of open drainage via a sub-xiphoid pericardial window at the bedside with resultant return of spontaneous circulation is also shown. In addition, the pathogenesis and natural history of this uncommon condition are reviewed and the options for management are discussed.

Key Words: Pneumopericardium; sub-xiphoid window; trauma.

Pnömoperikardiyum perikardiyal boşluk içinde hava varlığı olarak tanımlanır. Bu künt veya penetran göğüs travmasının iyatrojenik olarak da gelişebilen nadir bir komplikasyonudur. 'Basit' pnömoperikardiyum fark edilebilir hiçbir dolaşım sorun oluşturmaz; bununla birlikte, basit pnömoperikardiyum, hızla kardiyovasküler bozukluğa veya dolaşım iflasına ilerleyebilir ve bu durum tansiyon pnömoperikardiyum olarak adlandırılır. Tansiyon pnömoperikardiyum, perikart boşluğunun acil drenajını gerektirir. Hızlı efektif drenaj gerçekleştirilmede başarısız olunması, kalp durmasıyla sonuçlanabilir. Perikart boşluğunun drenajı, gerek perkütan gerekse açık drenaj tekniği ile gerçekleştirilebilir. Hızlı ve efektif bir açık drenaj için, subsifoid bir perikardiyal pencere oluşturulması önerilmiştir. Bu işlem, yatak başında ve minimal ekipman ile uygulanabilir ve yazarlar bu tekniği drenaj için tercih edilecek yöntem olarak önermektedir. Bu olgu, radyolojik olarak doğrulanmış pnömoperikardiyumu bulunan çoklu yaralanması olan bir travma hastasının, hızlı ve dramatik bir şekilde kalp durmasına doğru kötüleşmesini ortaya koymaktadır. Yatak başında subsifoid bir perikardiyal pencere yoluyla uygulanan ve spontan dolaşımın geriye dönmesi ile sonuçlanan açık drenajın etkinliği de gösterilmektedir. Ek olarak, bu seyrek durumun patogenezi ve doğal seyri de gözden geçirilmekte ve tedaviye yönelik seçenekler tartışılmaktadır.

Anahtar Sözcükler: Pnömoperikardiyum; subsifoid pencere; travma.

CASE REPORT

A 47-year-old female patient was involved in a high-impact pedestrian vehicular accident. The primary survey revealed a patent airway, central trachea and symmetrical bilateral air entry. She was shocked on arrival with an unrecordable blood pressure. The abdomen was soft and nondistended, the pelvis was

stable, and there were no long bone fractures. There was no evidence of external blood loss. Her Glasgow Coma Scale (GCS) on arrival was 7/15 (E1 V1 M5) and she was normoglycemic.

She was intubated, ventilated and resuscitated according to standard Advanced Trauma Life Support (ATLS) principles with good hemodynamic response



Fig. 1. A left-sided tension pneumothorax with associated extensive pneumopericardium.

to initial fluid resuscitation. Chest and pelvic X-rays were performed and showed no evidence of chest or pelvic pathology. Abdominal sonography revealed a trace of free fluid in Morrison's pouch. She remained hemodynamically stable 30 minutes after initial fluid bolus and was thus transferred to the computerized tomography (CT) scanner for further imaging of the brain, cervical spine and abdomen.

On the 'scout view' at CT, an extensive left-sided pneumothorax was evident, which prompted the radiologist to scan the chest. This confirmed a left-sided tension pneumothorax with associated extensive pneumopericardium (Fig. 1). The patient was cardiovascularly stable at this point but underwent immediate needle decompression followed by insertion of a thoracostomy tube.

Cranial CT revealed multiple cerebral hemorrhagic contusions without CT evidence of raised intracranial pressure (ICP). CT of the abdomen revealed a small amount of free fluid without evidence of solid organ injury.

The patient was returned to the resuscitation area and the on-call cardiologist was contacted. An echocardiogram was performed to assess cardiac function. On commencement of the echocardiographic examination, the patient suddenly deteriorated (systolic blood pressure fell to 70 mmHg). A single attempt at aspirating the pneumopericardium was performed under ECHO guidance. At this point, only feeble ventricular contractions were visible on ECHO and the patient deteriorated to pulseless electrical activity (PEA). Cardiopulmonary resuscitation was commenced and an emergency sub-xiphoid pericardial window was performed in the resuscitation room. This resulted in an immediate return of spontaneous circulation. A pericardial drain was placed and the patient remained

hemodynamically stable. She subsequently underwent a mini-laparotomy in view of her CT findings, which revealed a small hemoperitoneum and grade 1 liver laceration (not visualized on CT) but no other injuries. She had an uneventful course in the intensive care unit from a cardio-respiratory standpoint but had significant neurological deficits in keeping with her concomitant head injury.

DISCUSSION

Pneumopericardium is defined as the presence of air in the pericardial space. It is an uncommon condition that may arise spontaneously or secondary to blunt, penetrating or iatrogenic injury. Air may enter the pericardial space by a number of mechanisms. In the absence of a direct communication, it has been proposed that pulmonary interstitial air may track along the pulmonary perivascular sheaths from ruptured alveoli (the Macklin effect) or via a congenital pleuropericardial connection.

Pneumopericardium of sufficient magnitude to produce cardiovascular instability is termed 'tension pneumopericardium' and is a rare cause of hemodynamic instability.^[1] This may result from a 'one-way valve' mechanism within a pleuropericardial fistula, allowing the increased pleural pressures associated with positive pressure ventilation to be transmitted into the pericardial sac (despite effective pleural drainage with thoracostomy tubes).^[2] Management of non-tension pneumopericardium may be conservative, but tension pneumopericardium mandates decompression by percutaneous or open drainage.

Simple pneumopericardium may progress to tension pneumopericardium. This has been reported to occur in up to 37% of cases and is strongly associated with positive pressure ventilation.^[3,4] If conversion to 'tension' occurs at such a high rate then prophylactic drainage of the pericardial sac, particularly in ventilated patients, would seem prudent. However, this high reported rate of tension is described from a series, with more than 70% comprised of neonates undergoing mechanical ventilation, and does not tally with the authors' clinical experience of pneumopericardium in trauma patients. We have encountered many cases of simple pneumopericardium that never progressed to produce hemodynamic compromise; these cases were not published previously. It is likely that the true incidence of simple pneumopericardium is significantly underreported in the literature and that the reported rate of conversion to tension pneumopericardium is overestimated.

It has been suggested that consideration be given to prophylactic pericardial decompression of simple pneumopericardium before commencing mechanical ventilation.^[2] By contrast, others advocate that the

patient simply be monitored.^[1] We agree with the latter approach. Both percutaneous and open drainage of the pericardial sac are invasive procedures with significant risk of morbidity and mortality. They should be reserved for patients with evidence of hemodynamic compromise attributable to cardiac tamponade. A higher index of suspicion should be maintained in ventilated patients.

Tension pneumopericardium mandates drainage of the pericardial sac. This may be achieved via percutaneous or open technique. This case demonstrates that

rapid and effective drainage may be achieved using the sub-xiphoid approach.

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