DELAYED CARDIAC RUPTURE AFTER A TRAUMATIC CHEST WALL INJURY - A CASE REPORT

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Abstract

Traumatic chest wall injury may cause delayed cardiac rupture up to half a month later. The diagnosis of patients with such a rupture is challenging. We describe a 27-year-old female who tried with a knife to commit suicide by stabbing her anterior chest wall and cutting her left wrist. Pneumomediastinum and pneumopericardium without pneumothorax were the initial diagnosis. After conservative treatment for almost one month, a sudden onset of left chest pain radiating to back was noted. A chest CT showed a moderate amount of pericardial effusion and drainage was planned. An ECG showed right bundle branch block with left anterior hemiblock. However, a preoperative physical examination and transthoracic echocardiography revealed cardiac rupture and a ventricle septal defect was highly suspected. After surgical repairing, the patient was discharge without any further problems. The importance to anesthesiologists and emergency physicians of using focused transthoracic echocardiography is apparent from this case study.

Key Words: bundle branch block, focused echocardiography, delayed cardiac rupture

Introduction

Cardiac rupture, an unusual consequence of chest wall injury, is a major challenge to anesthesiologists. When this condition occurs, an emergency cardiac operation is necessary to save the patient's life. However, it is rare that cardiac rupture happens as late as two weeks after traumatic injury. In this case, there was no obvious fracturing of the ribs and no foreign body or bodies were present, any of which are known to cause delayed cardiac rupture. The evaluation and preparation carried out when treating this kind of patient thus become much more challenging.

Case report

A 27-year-old generally healthy female had attempted suicide with a knife and she then visited our emergency room in the early morning. At the ER, she complained of chest pain and dyspnea. A physical examination revealed a single stab wound to her anterior chest wall and some cuts to her left wrist. A chest X ray showed no pneumothorax. A complete blood cell count showed leukocytosis up to 14800/uL. The toxicological screening analysis showed the patient to be positive for benzodiazepines. An arterial blood gas analysis showed her HbCO level to be elevated at 7.1%.

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A cardiac enzyme analysis showed elevated troponin-I (4.51 ng/ml) and CKMB (34.5 ng/ml), with a CKMB mass/Total CK ratio of 10.0%. The level of CK was within the normal limits (344 IU/L). A complete ECG revealed sinus tachycardia with left anterior hemiblock and right bundle branch block. Chest CT without enhancement showed soft tissue injury with the presence of air within the anterior chest wall left of the sternum; this was associated with pneumomediastinum and pneumopericardium. Neither pneumothorax nor any obvious pericardium effusion were noted (Figure 1). A tentative diagnosis of pneumomediastinum and pneumopericardium was reached and she was admitted to intensive care unit for further observation and management.

At ICU, cardiac enzyme level was found to have decreased slightly (CKMB: 27.5ng/ml; CKMB mass/Total CK: 8.8%) during the evening after admission. The symptoms of dyspnea and chest discomfort gradually subsided over the following two days. A further chest X ray showed no pneumothorax but did detect the presence of borderline cardiomegaly. Two days later, she was transferred to the regular ward with stable vital signs. At this point she requested a transfer to China Medical University Hospital and she discharged herself against advice. One week later she visited our outpatient chest surgery department. She had no discomfort except wound pain at this time and a chest X ray showed no abnormality. Again, two weeks later, at her second follow up, she still denied the presence of any discomfort.

However, on the 18th day after injury, she returned to our ER complaining of a sudden onset of left chest pain that radiated to back. An ECG still showed the presence of left anterior hemiblock and right bundle branch block (Figure 2). A chest CT with enhancement showed lot of fluid accumulation in the mediastinum and the pericardial cavity, which indicated hemomediastinum and hemopericardium. (Figure 1. Chest CT without enhancement reveals pneumomediastinum and pneumopericardium. Figure 2. Left anterior hemiblock and right bundle branch block.)
3) Under the impression of chronic hemorrhage with an unknown source, the chest surgeon suggested surgical intervention and a sternotomy was planned with the aim of stopping the bleeding.

In the operation room, the patient's vital signs were acceptable with a blood pressure of 110/60 mmHg, a heart rate 92/min, and a room air oxygen saturation of 97%. A physical examination revealed a pansystolic murmur with grade 5 thrill. Invasive monitoring via an arterial line and a central venous catheter were set up. In order to rule out the possibility of cardiac tamponade, we strongly suggested that a further evaluation of the patient be carried out via a consultation with a cardiovascular surgeon. Transthoracic echocardiography was performed at the bedside and severe pulmonary regurgitation and a suspected ventricular septal defect (VSD) were noted. (Figure 4) Under an impression of pulmonary valve damage and cardiac rupture, an emergency operation involving cardiopulmonary bypass was performed. Intraoperative transesophageal echocardiography showed the presence of turbulent flow affecting the right ventricular outflow tract (RVOT) with a moderate amount pericardial effusion. (Figure 5) During the procedure, a single ventricular septal rupture (2 x 1 cm) affecting the RVOT (one cm away from pulmonary annulus) was identified. (Figure 6) The mitral valve and the pulmonary valve were intact. A small atrial septal defect (ASD) was also found incidentally. No other abnormalities were found during the operation, during which the septal defect was repaired. The surgical procedure went smoothly, and the endotracheal tube was removed the next day. Transthoracic echocardiography

Figure 3. High-density fluid within the pericardial cavity.

Figure 4. Transthoracic echocardiography, parasternal short axis view: VSD over RVOT.

Figure 5. Turbulent flow over the RVOT was noted after transesophageal echocardiography.

Figure 6. Traumatic VSD (2 x 1 cm) at the RVOT, 1cm away from the pulmonary annulus.
was carried out during following up and the repaired VSD, with pulmonary trunk dilation, was identified. The patient was discharged six days after the operation and follow-up has detected no further morbidities.

**Discussion**

Delayed cardiac rupture is uncommon, but, nevertheless, it remains life-threatening and when it occurs there is likely to be a sudden deterioration of the patient. Some patients with delayed cardiac rupture have even been diagnosed postmortem.\(^1\) Delayed cardiac rupture often occurs after blunt chest trauma, but some reports have identified it after penetrating injury.\(^2\) The possible causes of delayed cardiac rupture include ischemic change after cardiac contusion\(^1,3\) and fracture of the ribs.\(^4\) Cardiac contusion may induce myocardial muscle necrosis, which in turn can lead to cardiac rupture. A diagnosis of delayed cardiac rupture should be considered if patients have a history of chest trauma. The clinical presentation includes chest pain similar to angina with progressive dyspnea. A precordial thrill, a murmur, or complex arrhythmias might also be present during the physical examination. Systemic hypotension and an elevated pulmonary pressure may be related to cardiogenic shock. Cardiac enzyme levels may be elevated. Arrhythmias and conduction defects are the most common complications of cardiac contusion. Myocardial contusion is usually associated with a transient right bundle branch block. Left bundle branch block, however, has also been reported rarely.\(^2,5-8\) Cardiac contusions mostly affect the right atrium and ventricle, which is found on the anterior aspect of the heart. However, ventricular septal defects have been reported with some cases after blunt or penetrating chest trauma and these can be highly complicated due to conduction block.\(^7,9\) The latent interval previous to delayed cardiac rupture can be as long as two months after trauma,\(^4\) thus long-term follow-up after chest trauma is very necessary. Imaging studies, such as chest X rays or chest CT scans, are of limited use when pinpointing this diagnosis. Transthoracic echocardiography and CT angiography are suggested as having better functionality and seem to provide a more detailed structural presentation. Transthoracic echocardiography has even been suggested as useful when treating all chest traumatic injury patients.\(^10\)

During the first admission of the present case, only chest X rays and a CT scan without enhancement were carried out. These imaging studies provided only a limited amount of information. Nonetheless, the elevated levels of cardiac enzymes and the presence of a right bundle branch block did raise the possibility of cardiac contusion when the patient is so young. Transthoracic echocardiography should have been performed during the initial examination.

At her next admission, the patient complained of chest pain that had got worse and was radiating from the back. Emergency echocardiography needed to be performed right away to allow a differential diagnosis. On the other hand transthoracic echocardiography, which would have helped the anesthesiologist to gather information within a limited time during the preoperative evaluation has been suggested to be useful in such a situation. In fact, focused transthoracic echocardiography has become very popular in recent years. Focused transthoracic echocardiography is a focused examination of the cardiovascular system that is carried out by physician using ultrasound and acts as an adjunct to the physical examination. It is able to recognize specific ultrasonic signs and thus is able to help narrow down the field during differential diagnosis.\(^11\) A traditional physical examination, however, still is able to give us a hint as to the presence of this severe condition without the image studies that are mentioned above. We conclude that adequate preoperative evaluation should be able to help prevent the disastrous consequences that can be associated with delayed cardiac rupture.

**References**

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病例報告 - 胸腔外傷造成之遲發性心臓破裂

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摘要
胸腔創傷可造成遲發性心臓破裂，這也成為診斷時的挑戰。在這個案例中，將介紹以身體檢查和心臓超音波，發現刺傷胸口近一個月後發生的遲發性心臓破裂，並討論相關臨床表現及心臓超音波在此類狀況下的重要性。

關鍵詞：束支傳導阻滯，焦點導向心臓超音波，遲發性心臓破裂

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