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• 증 례 •

둔상에 의한 외상성 좌심실 파열환자를 성공적으로 치료한 예

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— Abstract —

Successful Treatment of Blunt Traumatic Rupture of the Left Atrial Appendage and Pericardium: A Case Report

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Blunt cardiac rupture is uncommon and is associated with significant mortality. Patients with blunt cardiac rupture usually have combined injury and do not always show signs of cardiac tamponade, which delays the diagnosis of cardiac rupture and increases mortality. We report a case of cardiac rupture diagnosed and treated by using only thoracic exploration based on clinical impression, with radiologic studies, including even echocardiography, showing negative results. (J Korean Soc Traumatol 2011;24:168-170)

Key Words: Cardiac rupture, Blunt trauma, Thoracic injury

I. Introduction

Blunt or non-penetrating chest trauma is common in accidents and although blunt cardiac rupture is rare, it is usually lethal. Though Desforges et al.(1) reported the first successful surgical repair of a blunt traumatic cardiac rupture in 1955, it is still associated with a high mortality rate ranging from 50% to 81%.(2,3) Brathwaite et al.(2) reported that no patients survived who were without vital signs on their arrival. All authors insist that the key to patient survival is rapid transport, early diagnosis, and prompt operation. However, it is not easy to diagnose cardiac rupture and to perform surgery promptly. The ruptured site of heart varies according to the patient's anatomy, and the left heart has a lower incidence of rupture than right. We present a case of a survivor of blunt cardiac rupture in the left atrial appendage and cardiac arrest before surgery.

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II. Case presentation

A 53-year man fell down from a crane from approximately 15 m high and underwent loss of conciousness for a few seconds. On admission, his mental status had recovered, although his systolic blood pressure was 69 mmHg and his low blood pressure below a systolic pressure of 90 mmHg persisted despite massive fluid resuscitation. On physical examination, the patient had some combined injuries including right shoulder dislocation, left calcaneal open fracture, and left forearm fracture. there was no cyanosis or bleeding focus causing unstable vital signs, moreover, his initial hematocrit was 38%. Thirty minutes after the initial assessment, as his hematocrit had fallen to 27%, Computed tomography (CT) scanning showed two, right rib fractures and a small amount of right pneumothorax, a moderate amount of hemopericardium without extravasation of radiocontrast, and no head, spine or abdominal organ injury. When he was moved to the Emergency room (ER) after CT scanning, he began complaining of chest pain. Ten minutes after returning to the ER, cardiac arrest developed with pulseless electrical activity (PEA), although he recovered after external cardiac compression for one minute. Ten minutes later, PEA recurred, and the patient recovered after two minutes of external cardiac compression once again. We consulted a cardiologist, who concluded that the volume of hemopericardium was insufficient to cause a cardiac tamponade and that it was not necessary to perform pericardiocentesis following echocardiography. However, we decided to perform chest exploration. The patient was moved to the operating room 4.5 hours after the accident.

When we open the patient's chest we found a massive, left hemothorax not shown on both the chest CT and echocardiography as well as a transverse fracture with dislocation of the sternal manubrium and body joint. We aspirated approximately four liters of blood and then found a 6-cm-long, pericardial laceration as well as mediastinal bleeding. The bleeding focus was the tip of the left atrial appendage which had a 1.5-cm laceration which we repaired with prolene 4-0 interrupted without a cardiopulmonary bypass. There was no any other focus of bleeding. The patient recovered so well. He required mechanical ventilation for three days and remained in the intensive care unit for seven days. After becoming stabilized, surgery was performed for a left calcaneal fracture and a right humerus fracture. As echocardiography showed normal left ventricular function on postoperative day 7, the patient was discharged on hospital day 26 without cardiac dysfunction or any other neurophysiologic sequellae.

III. Discussion

Blunt cardiac rupture is a lethal injury with very low survival rates, and its incidence ranges from 0.5% to 2% among all hospitalized trauma patients.(3,5) This fact demonstrates the importance of a prompt response for treating this injury in that there were no survivors in prehospital cardiac arrest patients or in 0% and 57% of the survivors in hospital cardiac arrest patients.(2,4) However, it is not easy to immediately recognize cardiac injury. Cardiac rupture should be suspected in patients with cardiac tamponade signs including tachycardia, hypotension, and elevated central venous pressure. However, cardiac rupture does not always show the signs listed above. Brathwaite et al.(2) and Perchynsky et al.(6) reported that 58.3% of their patients had vital signs on arrival and that 85% of patients did not exhibit these characteristic signs. As cardiac rupture accompanies pericardial disruption in approximately 10% of patients, patients without cardiac tamponade showed a poor prognosis.(7,8)

CT scan with radio-contrast and echocardiography are useful diagnostic tools, although they do not always provide accuracy. May et al.(9) suggested that if a patient with sustained, unstable vital signs shows normal echocardiographic findings in significant high-energy trauma, cardiac rupture should be ruled out by pericardial lavage and pericardial window operation. Another problem which makes diagnosis of cardiac rupture difficult, is that it is usually occurs together with other injuries. The mean injury severity score is 27.9 to 54.(2,10,11) This suggests that associated injuries increase the mortality and morbidity rates in blunt cardiac trauma.

Blunt cardiac injury can be explained by several mechanisms. One possible mechanism is direct compression of the chest wall between the sternum and vertebra, thus leading to cardiac entrapment.(3) Increased intrathoracic pressure is exerted on the cardiac chamber and it can be more common in the end-systolic phase because the atria are filled maximally and the valves are closed.(2,12) On second, a sudden deceleration creates traction between the fixed and mobile portions, thus causing tearing of the junction.(12,13)

Compression of a lower extremity and abdomen forces venous upward flow displacement and rapidly increases the hydraulic pressure of the cardiac chamber. Myocardial contusion progresses to necrosis and may thus cause cardiac rupture.(12) And bone fragments of the sternum and ribs may directly penetrate the heart.

Each anatomical site shows a different incidence of blunt cardiac trauma. The right atrium is 36～65%, right ventricle 17～32%, left atrium 20～31%, left ventricle 11～15%, and more than one chamber 6～10%.(13) Many authors have reported the same sequence which shows a two times higher survival rate in right heart rupture than in left heart rupture.(2,7,14)

In our patient, the initial assessment was difficult as his vital signs were unstable and he did not show obvious signs of cardiac tamponade. Moreover, as the initial laboratory and radiologic findings did not suggest the possibility of cardiac rupture. It can be easily understood why massive bleeding progressed rapidly in our patient, we assume that the cardiac rupture was minimal and that blood flowed slowly into the thoracic cavity through the tear of the pericardium. Then CPR aggravated the cardiac rupture by producing massive bleeding. Fortunately, our patient was currently recovered, it emphasizes the importance of both a prompt diagnosis and surgery in cardiac rupture patients. Cardiac rupture is uncommon but fatal injury. Moreover, combined injuries make diagnosis of cardiac injury difficult. Only rapid diagnosis and prompt treatment can save patients. If injury mechanism suggests cardiac injury and there is unexplained hemodynamic instability, cardiac injury should be evaluated with first priority.

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