

Penetrating Cardiac Trauma

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Penetrating cardiac injuries remain a difficult challenge to most surgeons. They are one of the leading causes of death. We report a case of a 25-year-old male who sustained a penetrating injury to the heart. He was brought in unconscious state with severe shock. Prompt aggressive resuscitation was initiated and an emergency thoracotomy performed. The patient had uneventful recovery and he was discharged from the hospital seven days later without untoward sequelae. The relevant literature has been reviewed. This is the first case reported in the Salmaniya Medical Center since the establishment of medical records in 1987.

Penetrating cardiac injuries can present a diagnostic challenge to the accident and emergency physicians. Patients with these injuries may present in a stable condition or in shock. The clinical signs, chest roentgenogram, pericardiocentesis results and electrocardiographic changes are inconclusive in establishing the diagnosis and may presents as a diagnostic dilemma^{1,2}. However, cardiac catheterization can accurately diagnose penetrating trauma to the heart. This procedure will provide information about the specific area of the heart involved, whether the cardiac valves or coronary vessels have been damaged and if any intracardiac shunts have been created. But this approach is considered to be time consuming and is not appropriate for the initial evaluation of the trauma patient^{3,4}. One effective technique is the use of subxiphoid pericardial windows, which represents a rapid method for the accurate diagnosis of such injuries and should be considered as the gold standard for the evaluation of penetrating cardiac trauma⁵. An alternative approach is to utilize serial echocardiography. In a recent series of patients with cardiac penetrating chest wounds and stable vital signs, two dimensional echocardiography was found to be 90% sensitive and 97% specific for the diagnosis of cardiac penetration^{5,6}.

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Significant findings were a precordial stab wound, central venous pressure of more than 15 cm of water, pericardial tamponade which classically results in the acute cardiac

compression-“Triad of Beck”, which consists of decreased arterial pressure, increased central venous pressure and distant heart sounds^{5,6}. Also, the patient will present with initial shock with tachycardia, decreased systolic and mean arterial blood pressures^{1,7}.

Efficient fluid resuscitation and emergency thoracotomy should decrease mortality^{1,8,9,10}. The main complications are anoxic brain damage and postpericardiotomy syndrome, which occurs in 10-40% of cardiac surgery patients. It is characterized by pleuropericardial pain, pericardial friction rub and fever with malaise, appearing and recurring two weeks to several months after the surgery. These patients have a rapid response to corticosteroids⁷.

The authors emphasize the importance of rapid transport, efficient resuscitation including maintenance of airway, restoration of blood volume, establishing a central venous pressure line and emergency thoracotomy in penetrating cardiac injuries. We report the first case of penetrating cardiac trauma at the Salmaniya Medical Center.

The Case

A 25 year old Bangladeshi male was brought to the Salmaniya Medical Center immediately after sustaining a stab wound to the left side of his chest. On arrival to the Accident and Emergency, the patient was unconscious and in severe shock with an unrecordable pulse and blood pressure. A three centimeter stab wound was found just above his left nipple with lung tissue protruding through the wound without any visible active bleeding externally.

Prompt aggressive resuscitation was initiated on arrival by oxygen supplementation and a bolus of three liters of Ringer lactate solution along with two units of packed red cells which each contained 450ml of blood group O negative. Intercostal drainage tube was inserted in the left side because of the absence of air entry. It yielded a half liter of frank blood. At this time, his heart sounds could be auscultated and there were no signs of cardiac tamponade, air entry began to improve and femoral and carotid pulses could be felt. His blood pressure was 50/30 mmHg. The patient was taken to the operating room within fifteen minutes of arrival and emergency thoracotomy was performed.

Left anterior thoracotomy was performed through fourth intercostal space, the chest cavity was exposed. It was full of blood, which was gushing from a two centimeter wound in the right ventricle adjacent to the left descending coronary artery. Bleeding was controlled by inserting two fingers in the wound and placing a purse-string suture using Prolene 2/0 suture and a few interrupted stitches. After controlling the bleeding, his blood pressure reached 120/70 mmHg.

The patient received two liters of packed red cells intra-operatively, two and half liters of ringer lactate solution and three hundred milliliters of fresh frozen plasma. A pericardial window was done and the wound was closed in layers. Postoperatively the patient was kept in the coronary care unit with constant vigilant medical care and monitoring.

The patient did well and he was transferred to a general ward on the fourth postoperative day with vital signs within normal limits. The intercostal drainage was removed on the seventh postoperative day and the patient was discharged in good health.

DISCUSSION

Rehn in 1897 described the first successful cardiorrhaphy¹¹. Since then the management of penetrating trauma to the heart has become commonplace with application of cardiovascular techniques, advances in emergency medical service transportation and use of emergency thoractomy^{8,12,13}. A common presentation of intracardiac injuries is asymptomatic and usually is delayed^{14,15}. Acute cardiopulmonary bypass has classically been reserved for proximal coronary artery injuries with intractable cardiac failure¹⁶. The most significant artery associated with severe cardiac dysfunction is the left anterior descending coronary artery. Other small vessels injury which are less than one millimeter produce small infarcts which do not lead to cardiac failure. Therefore, they can be ligated without serious risk to the cardiac function¹⁶.

Delay in surgical intervention affects mortality rates¹⁷. Those who had surgery within 30 minutes of arrival to the Accident and Emergency department had a higher survival rate than those who had delayed intervention, which indicates it is probably the single most important factor affecting survival¹⁷.

The indicators of a good outcome are right ventricular injury, which is three times more common than left ventricular injury, single chamber injury, absence of plural breach, stab injury, cardiac tamponade, single injury, early operative intervention, and aggressive resuscitation^{17,18}.

When reviewing the medical records of the Salmaniya Medical Center which dates back to 1987, we found that this is the only case of cardiac injury seen in this hospital. In this case, the patient was brought from his residence, which was in close proximity to the hospital. If he was brought by the ambulatory services, the amount of fluid and blood needed to resuscitate him would have been less since they would have initiated the process of resuscitation during transportation to the hospital. The predictors of a good outcome in favor of this patient was the mechanism of stab injury, which was a single injury to the right ventricle and emergency thoracotomy performed in less than half hour after the injury.

CONCLUSION

In management of a sole penetrating cardiac injury, it is essential to have rapid transport of the patient to a tertiary medical facility. Then, aggressive resuscitation should be initiated to stabilize the patient condition and perform an emergency thoracotomy, so as to have a favorable outcome for the patient and increase the survival rate.

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