



# Successful Management of Penetrating Cardiac Injury with Tamponade in a Low Resource Setting: Case Report from Yekatit 12 Hospital Medical College

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**Abstract:** Penetrating cardiac injury refers to traumatic injury to the heart secondary to penetrating action. This includes injury such as stab, gunshot, and accidental impalements. Hemorrhage, cardiac tamponade, and cardiac failure are the three major disorders associated with penetrating cardiac injury. Patients with cardiac injury have varying clinical conditions from hemodynamically stable to cardiac arrest. Due to this presentation the detection and management of cardiac injury is a great challenge. When this injury occurred in a setting where there is no diagnostic imaging, equipment, or cardiac surgeon, it is a nightmare for the emergency physician. Here we will present a 27 year old male who sustained stab injury to his left chest around the pericardial area which resulted in cardiac tamponade. He was managed with emergency thoracotomy with cardiorrhaphy and discharged improved. Although cardiac trauma accounts about only 1% of chest trauma, it is still has increased mortality and morbidity. Emergency thoracotomy, preferable anterolateral approach, should be done once cardiac injury with tamponade is diagnosed if experienced surgeon is available. But in the setting experienced surgeon is not available one should go for pericardiocentesis as stabilization and for possible transportation of the patient to center capable of doing emergency thoracotomy. In conclusion, having high index of suspicion for cardiac injury, timely transportation, and early operative intervention will have good outcome in patient who sustained penetrating cardiac injury with tamponade. And the result of this case report shows the successful management of cardiac injury with tamponade in resource limited settings.

**Keywords:** Penetrating Cardiac Injury, Cardiac Tamponade, Resuscitative Thoracotomy

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## 1. Introduction

Penetrating cardiac injury is a rare but life threatening clinical condition in trauma patients. The mortality rate ranges from 3% to 84 %. [1] There are three major disorders associated with PCI, these being hemorrhage, cardiac tamponade and cardiac failure, being cardiac tamponade an early opportunity for survival; however, also contributing very rapidly to mortality associated with cardiac wounds. [2] In cases of CT following PCI, progressive accumulation of blood within the pericardial sac causes reduction in size of cardiac chambers and their diastolic compliance limits cardiac output. [3] The pericardium normally accumulates 100 to 250 ml above which tamponade will occur. [4] Blood

accumulated within the pericardium gets clotted and it becomes more difficult for pericardiocentesis resulting in incomplete drainage. Definitive surgical procedure to manage CT is surgical drainage of pericardial blood and repair of underlying cardiac injury. [3]

Due to the low frequency of these cases and thus the difficulty in acquiring sufficient experience in their management, it can be easy to miss a diagnosis of cardiac injury. Penetrating cardiac injuries represent around 0.1% of all trauma admissions, representing less than 10 cases per year for the majority of hospitals in many regions of the world. [5] Survival rate for patients admitted to emergency departments in a shock state after PCI is about 35%. [6] Initial clinical examination together with analysis of the mechanism

of trauma will provide vital information on potential and severity of the injury. If the extent of the injury remains undetermined and the condition of the patient permits, imaging can provide further information. [7]

The right ventricle is involved more often than the left ventricle because it is positioned anteriorly in the chest and occupies the largest part of the anterior surface of the heart. Right ventricle is the most affected chamber (43%), followed by left ventricle (34%) and right atrium (18%). [1, 8]

Cardiac tamponade after penetrating trauma may initially be managed by intermittent drainage and transfusions until a thoracotomy and cardiorrhaphy can be performed. [9]

Resuscitative thoracotomy is an immediate thoracotomy carried out on patients who are in a 'peri-arrest' state or in established cardiac arrest, usually after trauma. The survival rate after thoracotomy is 35% for penetrating cardiac injury patients'. [10] The objectives of resuscitative thoracotomy are: To control bleeding in the thorax, relief of cardiac tamponade, repair of cardiac injury, open cardiac massage, control of abdominal bleeding by cross clamping of the descending aorta, and internal defibrillation in patients with ventricular fibrillation cardiac arrest. The incision of choice in patients with cardiac arrest is the left anterolateral thoracotomy in the fifth intercostal space as originally described by Spangaro. This incision may be extended to the right chest utilizing a clamshell incision if hemorrhage in the right chest cavity is suspected. [11]

## 2. Case Summary

A 27 year old male patient presented to ED of Yekatit 12 hospital after he sustained stab injury over his precordial area of the left chest of 30 minutes duration. He was injured by unknown offenders. He was complaining shortness of breath and bleeding from the stab site.

Physical examination at presentation to the emergency revealed: he was communicative with GCS of 15/15. His peripheral pulses were not palpable, and blood pressure was un-recordable. He had pink conjunctivae and clear chest with good air entry bilaterally. There was about 0.5cm by 0.5cm stab wound at the left 3<sup>rd</sup> intercostal space along midclavicular line. And There were also two superficial lacerations over the upper part of the sternum. Heart sounds were muffled and neck veins were distended. Other than the mentioned pertinent positive findings there was no finding in other systems. FAST was done and it showed a significant pericardial collection. With the assessment of penetrating cardiac injury with tamponade, large bore double IV line was secured. CBC, BG and cross match were sent and the patient was started on crystalloids until blood products arrived. The patient was also catheterized to follow urine output.

Transfusion was started at ED and the patient was immediately taken to Major OR for resuscitative thoracotomy. During anesthesia induction and intubation, he had cardiac arrest. Left pleural cavity was urgently entered through left anterolateral incision. There was no cardiac activity and upon opening the pericardium, there was gush of

around 300ml of clot mixed blood. Blood was sucked out and laceration site of about 0.81cm by 0.5cm was identified at the outlet of the right ventricle. Laceration was finger plugged and two figure of eight stitches were applied using prolene 4.0 sutures. Bleeding subsequently stopped and the patient's vital signs stabilized. Hemostasis was secured, two chest drains were left in the pericardium and the left pleural cavity, and intercostal nerve block (using bupivacaine) was given, and the chest wall was closed in layers. Intraoperative Estimated blood loss was about 1.5 liters and the patient was transfused with two units of PRBC and, one unit of FFP. The patient produced about 1 liter of urine intra-operatively. He was extubated on table and transferred to the ICU for monitoring.

He was subsequently started on potent analgesics, transfused with another unit of PRBC, three units of FFP, and 4 units of platelets. The next day, he was started on sips and tolerated. On his 2<sup>nd</sup> post-operative day the patient was transferred to surgical ward after PA CXR was done (see figure 1), the pericardial drain was removed and the patient was encouraged to perform chest physiotherapy with adequate pain management. On the next day, the left pleural cavity chest drain was removed and the patient was continued on chest physiotherapy with adequate pain management. The patient was discharged home on the 6<sup>th</sup> post-operative day.



Figure 1. PA chest X ray on 2nd post-operative day.

## 3. Discussion

The major and life threatening chest injuries that require identification and treatment during the primary survey includes: airway obstruction, tension pneumothorax, cardiac tamponade, open pneumothorax, massive hemothorax and flail chest. These conditions are highly lethal unless identified and managed thoroughly. [12]

Patients may present to the emergency department with either penetrating or blunt cardiac trauma. Though, many patients die during transportation or at the trauma scene.

Cardiac tamponade is known for a protective for massive volume loss as it has a restricting effect which helps for time during transportation. In patient with stable hemodynamic the surgeon should have high index of suspicion for cardiac tamponade. There are reports that showed patient sustaining penetrating cardiac injuries from different causes have stable to hemodynamic instability in presentations. [8, 13]

According to literatures, the leading causes of penetrating cardiac trauma are stab wound and gunshot followed by accidental impalement of sharp objects. Our patient came after he sustained stab to left chest which make us to have high index of suspicions for cardiac injury. The clinical manifestations of cardiac trauma are varying. Beck's triad (hypotension, muffled heart sound and distended jugular veins) may present. These manifestations were present in our case. There is case report in which late discovery of cardiac tamponade after the initial injury, i.e. after forty five days of the primary trauma. [7, 14]

Cardiac injuries still have increased rate of morbidity and mortality. Chest trauma accounts about 10.4% of trauma cases seen at the emergency operations. Cardiac trauma accounts only about 1% of chest trauma. Although the incidence is lower compared to other traumas, cardiac injuries are highly associated with mortality. Time of transportation is one of important factor that affect mortality rate. [3, 15] Due to the anatomic location, the right ventricle is the most injured chamber of the heart. This is true throughout history of cardiac injury. In our patient it was the right ventricle injured which is consistent with the findings in literature. [1, 8, 16].

The management of patient with penetrating cardiac injury can be operative intervention or pericardiocentesis. In hemodynamically unstable with available of experienced surgeon capable of performing emergency thoracotomy can be done. But if experienced surgeon is unavailable one can do pericardiocentesis for temporarily stabilization of the patient for transportation. In our case as there was surgeon capable of emergency thoracotomy we immediately took the patient to the operation theater. The options of the surgical approach depends on the by the mechanisms of injury, site of injury and anticipated injuries. One can approach through median sternotomy or anterolateral thoracotomy. The former is technically more challenging and associated with higher rates of wound complications but gives good access to the anterior mediastinum. The latter is easy to perform and provide urgent access to the thoracic cavity. In Our case as we anticipated the cardiac injury and to have urgent access to the thoracic cavity we performed anterolateral thoracotomy. [11, 17]

Following, penetrating cardiac injury it is rare to have impaired cardiac function unless there is injury to the conduction bundle. There is case report of patient who was stable at presentation after penetrating cardiac injury with sudden development of cardiac arrest. Therefore one has to evaluate the patient in terms of cardiac function impairment following cardiac injury. In our case we have done proper electrocardiography during follow up and there was no

abnormality detected till this report was written. [18]

## 4. Conclusion

Penetrating cardiac injuries with cardiac tamponade are very fatal. For this reason, physician treating patient with left chest stab should have high index of suspicious for the possible cardiac injury and should examine according.

Early transportation of the patient to the center where experienced surgeon available is mandatory for timely intervention to have good outcome.

## Consent

A verbal informed consent was obtained from the patient for publication of this case report and any accompanying radiologic images.

## Competing Interest

We, the authors, declare there is no competing interest.

## Abbreviations

CT: Cardiac Tamponade  
 PCI: Penetrating Cardiac Injury  
 ED: Emergency Department  
 FAST: Focused Abdominal Sonography for Trauma  
 IV: Intravenous  
 CBC: Complete Blood Count  
 PA CXR: Postero-anterior Chest X-ray  
 PRBC: Packed Red Blood Cells  
 FFP: Fresh Frozen Plasma

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