

Penetrating Cardiac Injuries: Role of Emergency Thoracotomy

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Abstract

Background: Due to the increase in violence in recent years due to the wars and the increasing use of weapons and sharp machines such as knives and others, the number of victims of cardiac injuries, especially gunshot wounds, stabbing injuries and other acute machines has increased due to the seriousness of these injuries and complications resulting therefrom.

Objective: To show the importance of urgent diagnosis and surgical approach of cardiac traumatic patients.

Patients and Methods: Between January 2016 and January 2017, 5 penetrating cardiac traumatic patients were admitted to the emergency unit in Imam Hussein medical city in Karbala, 3 of them were stab wounds and 2 cases were shell injuries. All of them males in age range from 14-44 years old ,the 5 patients were operated without using cardiopulmonary bypass machine and all of them passed without any complications except one patient who complain from some neurological deficits postoperatively.

Results: In this study we have 5 patients with penetrating cardiac injuries, 2 have gunshot (40%) and 3 have stab injuries (60%). Emergency thoracotomies were done in all patients and the wounded were sutured with 4/0 proline after good resuscitation in ER.

Conclusion: Traumatic injuries of the heart are one of the major cause of mortality and morbidity in our society due to violence. Rapid action and good resuscitation with right decision of good skill hands cardiac surgeon will improve the outcome of the results.

Keywords: Cardiac Injuries ,Emergency Thoracotomy.

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Introduction

As violence is increase in our society, the cardiac injuries mainly the penetrating type continue to increase. The ways of cardiac injuries either by sharp objects (knives and

icepicks) or hand guns[1]. With aggressive resuscitation and rapid intervention ,the survival rate may reach 80%.[2].

Cardiac traumas are divided into blunt or penetrating. Increasing the violence in our society leads to increase the number of penetrating cardiac patients and this make the cardiac surgeons to search more and more to know how to deal with this type of trauma rapidly and correctly .Most of victims were young males. The most common types of these injuries are stab wounds or gunshot wounds. When the injury occurred to the heart the result either tamponade or exsanguination[3].

Most victims die before they reach to emergency room, but if they still alive until reaching the hospital, they could be reach in shock state. The management of cardiac injuries is based on accurate diagnosis and rapid intervention. Detection the site of trauma, physical findings, immediate resuscitation and the right surgical approach decrease the percent of mortality significantly[4]. The right ventricle is most frequently chamber involved, due to its anterior position, followed by the left ventricle. Cardiac injuries usually fatal and if the patients survive may complain from some complications like neurological or organic failure. So it is important to know how to deal with this injury quickly and accurately and use the right procedure to prevent such complications from occur and to preserve the life of the patient .

Patients and Methods

Five injured patients were operated on in Immam Hussein medical city Hospital in a period between January 2016 and January

2017. All patients were transferred to hospital by ambulance.

Most of them arriving the emergency room within less than thirty minutes. The patients ranged in age from 14 to 44 years old. All of them male .Two had gunshot wounds and three with stab wounds.Emergency resuscitation including endotracheal intubation, circulatory resuscitation , and chest tubes insertion ,then they transferred to the operating room for thoracotomy and repairing the the cardiac injuries and other injuries.

In our study 5 cases of cardiac injuries were presented, 2 patients with gunshots and 3 with stab wounds in the heart. 1st case was a 14years old male with 7cm stab wound under his left nipple. Admits to emergency room with self-ventilating, palpable carotid pulse, but without measurable blood pressure. Left chest tube drain was inserted and drain 1000cc blood. The condition of patient rapidly deteriorated and the patient developed cardiac tamponade then he lost his consciousness, and developed apnea and cardiac arrests before the surgery. After intubation, the ECG showed ST elevation and anterior chest incision was rapidly performed. The pericardium was opened and the clot ventral to the heart was removed . Internal cardiac massage was done to treated the arrested heart. There was 6cm cut in lateral pericardium corresponding to the stab wound. Almost transmural wound in left ventricle, parallel to a diagonal branch of LAD, the wound was not bleeding with clot inside it.The ventricular wound was repaired

with single continuous sutured using 4/0proline ,pericardium sutured with interrupted 4/0 proline leaving small opening to prevent cardiac tamponade. Post operatively, the patient transferred to the intensive care unit with endotracheal tube. In the next day, he was awake and self ventilating. He stayed in ICU for 3days, then he was transferred to thoracic ward.

Echocardiogram and all other investigations were normal, so he discharge to home after 7day. The 2nd case was 32years old man came to emergency unit with stab wound to the heart to RV near the origin of pulmonary artery. The patient refer to our hospital from periphery with chest tube inserted to left side of the chest, drain more than 700cc blood. The patient developed dyspnea with hypotension and cardiac tamponade so the patient entered to theater room immediately after replacement blood loss with blood and fluids. Left thoracotomy done, small wound to RV sutured with continuous 4/0 proline, pericardium sutured with interrupted 4/0 proline leaving small opening to prevent cardiac tamponade. Post operatively, the patient transferred to intensive care unit with endotracheal tube. In the next day, he was awake and self ventilating. He stay in ICU about 1 day, then he was transferred to thoracic ward. Echocardiogram and all other investigations were normal apart from mild diastolic dysfunction, so he was discharged to home after 5days. The 3rd case was 20years old with stab to epigastric region with injury to internal mammary artery , pericardium and RV wall with sever

hemorrhagic shock and hemothorax in right pleural cavity with right lung collapse. Right anterior thoracotomy done with ligation of right internal mammary artery at two ends with RV repair ,removal of large hematoma, inflating the lung, suturing right dome of diaphragm and putting a-drain, then transfer to ICU and stay for 3days then discharged to the thoracic ward and after 5days the patient was discharged to home.

The 4th case was 17years old young male came to emergency unit with penetrating shell to the heart. Patient arrived shocked unconscious, no heart beat, no pulse, undetected BP, so CPR done rapidly at theatre room, rapid anterior thoracotomy done with direct massage and direct adrenaline to the heart intubation made. When heart beats return, surgery done with repair the injury to LV and the other injury to base of the heart near the origin of aorta with repairing the injury of the lung. The patient transfer to ICU and stay there 1week and weaning from ventilator at day 3 from the surgery. In a second week he transfer to thoracic ward and remain for 2weeks after improvement of his general condition. He was discharged to home after 1month from time of injury with good health apart from visual weakness, due to hypoxic ischemic encephalopathy, which improve after few months.

The last case was 23 years old refer from periphery region to our hospital with shell pass from pericardium and settled in RV and other shell in the chest wall. operation was done with left anterior thoracotomy and

removal of the shell on beating heart after evacuation of hemo-pericardium which cause tamponade without need for by pass machine. Dissection of pericardial fat under fluoroscope and removal of shell from from pericardium and RV wall and remove of adhesion with meticulous dissection, then suturing the RV wall and insertion of drain in pericardial and pleural cavity.

Most patients were entered the theatre room immediately after insertion of chest tube with good resuscitation. Left anterior thoracotomy was done except in one patient where right anterior thoracotomy done. Direct suturing of the heart with 4/0proline and repair the

associated injury in the lung, chest wall, and abdomen if present then the patients were transferred to ICU and after stabilization of their general condition they discharge to the ward and then discharge to home.

Results

In this study the 5cases of cardiac injuries were males, presented to cardio thoracic department. The agr in current study were divided into three groups as shown in Table (1). The first group (10-19) years the N. of patients in these group was [1] patient (20%). The second group (20-29) years the N. of patien was [3] (60%) and the last group (30-39)years the N. of patient [1] (20%).

Table (1): Number of patients according to age

Age	N. of patients	Percentage
10-19	1	20%
20-29	3	60%
30-39	1	20%

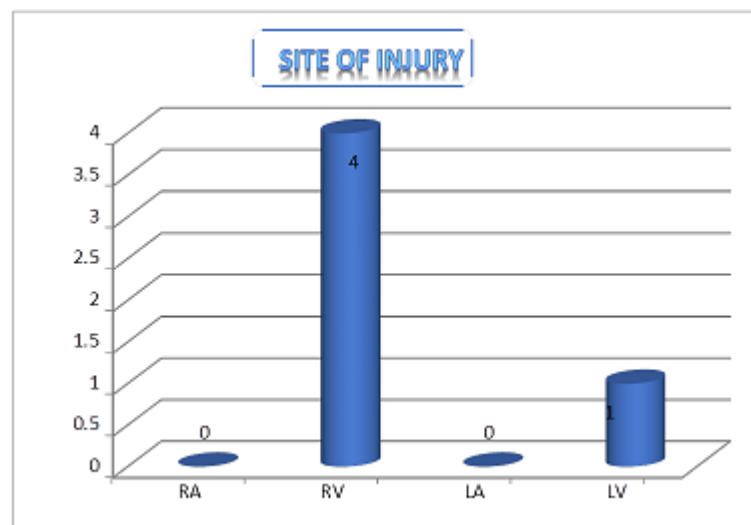


Figure (2): Number of patients according to site of injury

Type of injury in current study were shown in Table (3) that revealed the number of patients had stab wound was [3] (60%) and number of patients had shell wounds was [2] (40%).

Table (2): Number of patients according to type of surgery

Type of surgery	No. of patients	Percentage
Left anterior thoracotomy	4	80%
Right anterior thoracotomy	1	20%
Median sternotomy	0	0%

Types of surgery were shown in Table (2) that revealed the no. of patients in left anterior thoracotomy was [4] (80%), while the no. of patients in right anterior thoracotomy [1] (20%), and the no. of patients in median sternotomy was [0] (0%).

Table (3): Number of patients according to type of injury

Percentage	N. of patients	Type of injury
60%	3	Stab wounds
40%	2	Shells wounds

Case	Gender	Age	Site Of Injury	Type Of Surgery	Tamponade	Prognosis
1 st	male	14 y	LV	Lt.ant.thoracotomy	Yes	Good
2 nd	male	32 y	RV	Lt.ant.thoracotomy	Yes	Good
3 rd	male	20 y	RV	Rt.ant.thoracotomy	No	Good
4 th	male	17 y	LV	Lt.ant.thoracotomy	No	Visual weakness
5 th	male	23 y	RV	Lt.ant.thoracotomy	Yes	Good

All patients in our study were managed with thoracotomy without need for sternotomy, and working on beating heart without use of cardiopulmonary bypass machine as show in Table (2). Postoperative follow up by ECG, echocardiograms and CXR were done .And all patients were discharged to home without any complications, except one patient who had neurological deficits due to prolong time of CPR as the patient developed apnea and stand still.

Discussion

In a review in 1968, found that about 80% of patients with penetrating cardiac injuries arrived dead to emergency room, but with

improving the methods of transfer the patients safely and rapidly increase the numbers of patients who reach to emergency room alive[5].

Cardiac injuries increase progressively over the last few decades, due to increase a violence in our society after the war on Iraq ,and increase the use of weapons and harmful sharp objects like knives and gunshots. The gunshots and knives are the most penetrating cardiac injuries in our study. The stab cardiac injuries carry better prognosis if compared with the gun shot, because the gunshot leave larger defects in the pericardium and myocardial tissues than

the stab, which produce a small defect and lead to cardiac tamponade[6].

Our study represents the retrospective study in 5 patients with penetrating injuries to heart. All of these patients managed under the close supervision of the single cardiac surgeons in the Imam Hussein medical city in Karbala. Penetrating wound to the heart should be suspected in any patient with penetrating wounds to the chest wall specially in the anterior aspect of the chest mostly in the left side, upper abdomen and neck[7]. Agitation, cold extremity, distended neck veins, paradoxical pulses with muffled heart sounds in patients with penetrating wounds to the chest, upper abdomen and neck suggested a cardiac injury with tamponade. Early transport of patient and good resuscitation play important role in the outcome of surgery[8].

The surgical team must take a rapid action in saving the life of the patient by rapid insertion of intravenous line, fluids and blood replacement, endotracheal tube, chest tubes, if needed, with urgent thoracotomy done. Lefty, the pericardium should be opened for treatment of tamponade, repair the cardiac injury, using pledged proline interrupting sutures, but in few cases we did suturing by proline 3 or 4 zero without pledging, because of shortage of the distance and stop bleeding. And better to leave a window in pericardium to avoid reaccumulation of fluids and blood or put a drain. If the heart is found arrested, direct cardiac massage is done. In our study, All cases are managed without using cardiopulmonary bypass machine as in

others, open and working on beating heart that lead to decrease the post operative complications of using cardiopulmonary bypass machine like renal, pulmonary, neurological complications, due to long time of clamping of aorta. So all patients pass smoothly without any complications after surgery. Also we not use of pericardiocentesis in ER, to prevent time lost in preparing the equipment for procedure and early transfer of patients to theatre room and manage the tamponade by open and evacuation. Chest X-R had no role in diagnosis of cardiac injuries[9], so we never used it in our study. Echo study and CT scan of the chest may help in diagnosis, if the patient not in shocked and hemodynamically stable. The mortality rate in patients with penetrating cardiac injuries is depending on, the type of injury, site of it, if there is associated other injuries, and the duration to transfers the patient to emergency room and starting resuscitation and management. We believe that rapid transfer of injured patient and early ER thoracotomy will decrease the mortality rate from cardiac injuries.

Conclusions

As the violence increase in the last few decades, the numbers of penetrating cardiac patients also increase, So this make the cardio thoracic surgeons to learn more about how to deal with this injuries in a right way, as delay may lead to bad results. The mortality rate in patients with penetrating cardiac injuries depend on the type of injury, site of it, if there is other associated injuries, and the duration of transfer the patient to

emergency room and starting resuscitation and management. As the cardiac injury regarding the most common cause of mortality and morbidity among the body trauma ,so it need rapid action and good management to save the the life of the patient.

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