
CASE REPORT

Right Ventricle Injury by Stray Bullet

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SUMMARY

Penetrating cardiac injuries have high mortality rates even in patients with early surgical intervention. We report a patient with history of stray bullet injury of right ventricle and intrabdominal viscerae, successfully operated at our hospital.

Keywords: Stray bullet, penetrating cardiac injuries, right ventricle.

INTRODUCTION

It was not until late 19th century that cardiac surgery was accepted as the right approach for penetrating cardiac wounds¹. Penetrating cardiac injuries have high mortality rates even in patients with early surgical intervention. Survival rates between 3-84% have been reported in literature^{2,3,4,5,6},

The mechanism of injury and clinical presentation on hospital admission are the most important variables in determining the outcome in these patients, however, some studies indicate other variables like the presence of multiple lesions in the cardiac chambers^{3,4}. Intimately related to the increase of cardiac injuries due to firearms is the increase in urban violence and the greater access of civilian population to firearms^{3,4,5}.

CASE REPORT

A 10 year old boy was brought to the surgical emergency department of Services Hospital, Lahore having a single gunshot entry wound in the region of sternum at the level of 5th intercostals space with history of stray bullet injury. On clinical examination, his heart rate was 110, blood pressure 110/80 mmHg and respiratory rate 26 BPM. He had distended neck veins and muffled heart sounds and also there was peritonitis. Chest X-ray showed pneumopericardium and bilateral gas under diaphragm. As the patient was hemodynamically stable, a CT scan was done to diagnose cardiac injury. CT showed pericardial effusion, free fluid in abdomen.

Emergency laparotomy was performed through a midline incision which revealed a 2cm rent in segment 1 of liver, lesser curvature of the stomach and diaphragm in midline. Bullet was retrieved from stomach. Due to location of entry wound on the chest and the concern for any cardiac injury, the operating

surgeon proceeded with a subxiphoid window. Upon entrance into the pericardium, 200 ml of pulsatile venous blood was found indicating the presence of a cardiac injury. The cardiac damage resulting from the projectile was observed in the anterior wall (inlet hole) and the inferior wall (exit hole) of the right ventricle. Both the cardiac lesions were repaired with interrupted sutures using prolene suture line 3-0. Liver was repaired by horizontal mattress sutures using catgut 1. Stomach was sutured in two layers using vicryl 3/0 and diaphragm was repaired using prolene 2-0. After repairing all injuries and securing hemostasis, two drains were placed, one in pericardial cavity and other in abdomen. A chest tube was inserted on the left side of chest peroperatively. The abdomen was then closed in layers. The patient was transfused two pints of blood. He was shifted to ICU in stable condition. He remained there for two days and was then transferred to ward ICU. After an uneventful recovery, he was discharged on the 9th postoperative day. On follow up, there was no evidence of residual heart damage.



Fig.1 Chest X-ray showing pneumopericardium

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DISCUSSION

The firearm injuries by stray bullets cause a considerable quandary in developing countries like ours attributed to dispersal of the unlawful destructive and aggressive mobs, celebration of marriage ceremonies or the birth of a male child by aerial firing. Majority of the victims are not even aware that they have sustained gunshot injury⁷.

About 22% to 25% of patients with trauma succumb to chest injuries. Penetrating trauma accounts for 90% of cardiovascular lesions⁸. Gunshot cardiac wounds have higher mortality rate than stabbing cardiac injuries due to less destructive nature of the latter and overall less associated injury burden. Degiannis et al⁵ in a study comprising 117 patients with penetrating cardiac trauma caused by knives or firearm bullets, demonstrated that the mortality rate of cardiac injuries caused by firearms(81%) was higher than those due to knives(15.6%) .

76- 94% of victims with cardiac gunshot wounds die at the scene or on the way to hospital despite advances in rescue and prehospital transport achieved in the last four decades⁹ while overall mortality rates between 12% to 81% have been reported after cardiac gunshot wounds by previous studies^{4,5}. In 2006, a retrospective study of penetrating cardiac injury in South Africa found 81% mortality among the 21 patients who sustained gunshot wounds to the heart⁶.

The site of penetrating injuries on the front of thorax, the response of patient to the immediate fluid support, and the distension of the neck veins, hypotension, and muffled heart sounds (Beck's Triad) should be considered penetrating cardiac injury unless proved otherwise⁷. Although an occasional patient may be hemodynamically stable, majority of patients typically present with cardiac tamponade and/or hypovolemia. Although Beck's Triad may be present in up to 77% of patients⁹, it cannot be relied on to make a definitive diagnosis.

Chest radiographs are of limited value in the initial assessment of the patient with penetrating cardiac injury. The cardiac silhouette is not enlarged in about 80% of patients in acute cardiac tamponade, as the pericardium has not had sufficient time to stretch. At least 250ml of pericardial fluid must be present to detect heart enlargement radiographically. Occasionally pneumopericardium may be detected. For those hemodynamically stable patients with equivocal bedside cardiac ultrasound, further diagnostic options include surgical pericardial window, formal echocardiography or CT, although the latter studies are not routinely recommended in the traumatic patients as they are at increased risk of sudden decompensation from hemodynamically

significant pericardial tamponade or exsanguinations into hemithorax.

The prognosis of cardiac lesions depends on various factors, such as the mechanism of injury, presence of pericardial tamponade, place of thoracotomy, the injured heart chamber, the number of chambers involved, and other physiological parameters^{3,4,8}. However, prompt definitive surgical intervention is the single most important predictor of survival of these patients.

Cardiac tamponade may have a protective effect because it prevents exsanguination into the left hemithorax which may have been relevant to the better outcome of our patient. . Moreno et al also observed that tamponade existence in either right or left ventricle increased the survival rates in case of stabbing and shooting¹⁰. The survival rates of 73% with cardiac tamponade and 11% without tamponade have been reported by other studies^{1,10}.

Right ventricle is most commonly injured among the penetrating cardiac injuries^{4,8} also seen in our patient. This is due to the fact that the right ventricle covers the greatest part of the anterior chest wall contributing to 55% of the anterior cardiac surface. The authors explain that the ventricular penetrating injuries tend to bleed less intensely than the atrial ones, due to being stagnant during myocardial contractions, which may have saved the life of our patient. Also, the involvement of a single chamber contributed to the satisfactory outcome of our patient as reported by Lone et al⁴ who observed that patients 35(87.5%) with a single cardiac chamber injury had a higher survival rate 62.8% (22/35) than the 5(12.5%) patients with injury in multiple chambers (100% mortality).

Depending on the phase of respiration and diaphragmatic position when injury occurred, intraabdominal viscera may be also be injured which holds true for our patient also. Previous studies have shown that risk of mortality was not higher in patients with associated injuries⁵.

Our patient presented a unique scenario in that he presented with hemodynamic stability and deceptively benign investigations' results. There are multiple case reports in the literature on cardiac gunshot injuries with survival of the patients. However, this is the first report, to our knowledge, of a child surviving after bullet injury to the right ventricle in our country with limited health facilities especially in emergency situations.

In the recent years, provision of first aid before hospital care, rapid transport and early surgical intervention, the rates of survival of those patients with penetrating cardiac injuries have improved in developed countries^{1,5}. In developing countries like ours, the expedient diagnosis and treatment of

cardiac injury is largely predicated on the treating physician's "high index of suspicion" taking into account the patient's mechanism of injury, anatomical location of injury and the patient's physiology .

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