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Shot through the heart: survivorship of gunshot wound

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ABSTRACT

Introduction: While penetrating cardiac injuries are rare in incidence, its poor management carries grave prognosis. Prompt prehospital care and timely intervention are vital to ensure the victim's survival. This report explores a case of an air rifle injury through the heart with satisfactory outcomes through meticulous preoperative planning and surgical intervention.

Case: A 21-year-old man suffered an air rifle gunshot wound due to an occupational accident. The patient presented with stable hemodynamics. Chest X-ray revealed a right hemothorax with a bullet-like material in the mediastinum. Consecutive transthoracic echo workup suggested a foreign body material at the right ventricular septal wall with mild pericardial effusion. A thoracic CT scan revealed an intracardiac metallic material. The patient underwent an urgent open-heart surgery to evacuate the bullet with the use of a cardiopulmonary bypass machine, found at the posterior right ventricular wall on exploration. No lung laceration from the trajectory track through the right side was found. The patient was hospitalized for a total of 10 days before discharged under good condition. A median sternotomy was initiated with aortic, superior vena cava (SVC), and inferior vena cava (IVC) cannulation. Upon exploration, the bullet track originates from the right mediastinal pleura through the right atrium (RA), nestled in the right ventricle (RV). Approach via the RA through the tricuspid valve (TV) revealed a 3 x 3 x 5 mm airgun pellet at the posterior wall of the RV. No lung laceration was identified. A chest drain was inserted, and the patient was discharged under good condition.

Conclusion: Although rare, surviving a cardiac gunshot wound is possible with rapid response, immediate intervention, and comprehensive postoperative care. This case exemplifies the critical role of trauma response team and the need for ongoing research to refine treatment protocols.

Keywords: Penetrating cardiac injury; gunshot wound; intracardiac bullet extraction.

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INTRODUCTION

Penetrating cardiac trauma is historically lethal. With current advancements in diagnostic and interventional therapy, the victims have better chance of survival. However, due to its rare incidence and varied course of injury, there are limited reports regarding its management. This case exhibits a hemodynamically stable patient with intracardiac air rifle pellet with successful extraction. Appropriate diagnostic workup, when possible, and strategic intervention is critical in managing such critical injury.^{1,2}

CASE PRESENTATION

A 21-year-old male presented to the emergency department following accidental air rifle gunshot to the right lateral hemithorax. The patient was hemodynamically stable with a systolic

blood pressure of 130 mmHg, a heart rate of 93 bpm, and respiratory rate of 22 bpm. There was no active bleeding at the site of wound, and no exit wound was apparent. Chest X-ray indicated right hemothorax and a single air pellet at the mediastinum (**Figure 1**). A 28Fr right chest tube was inserted with 500 ml initial hemorrhagic drainage. Transthoracic echocardiography (TTE) revealed a foreign body at the right ventricular (RV) septal wall with mild pericardial effusion (**Figure 2**). However, exact localization with Computed Tomography (CT) Scan was obscured by beam-hardening artifacts (**Figure 3**).

The patient underwent urgent foreign body extraction via median sternotomy. Cannulation on the aorta, superior vena cava (SVC), and inferior vena cava (IVC) was done as the usual fashion. Cardiopulmonary bypass was initiated. Visualization of the pellet through the

RA incision was difficult, and aortic cross-clamping was done. Antegrade cardioplegia was administered. Upon exploration through the tricuspid valve (TV), the airgun pellet was lodged at the posterior RV wall. The material was successfully extracted, and the RV wall and RA were sutured with pledgeted 4-0 polypropylene (**Figure 4**). No right lung laceration was apparent. A right chest tube and intrapericardial drain were placed.

The postoperative hemodynamic was stable, and the patient progressed favorably. The chest drain was removed at the 7th postoperative day, and the patient was discharged at the 8th postoperative day under good condition.

DISCUSSION

Cardiac injuries may pose as a fatal blow, its clinical presentation ranging

from mild contusion to cardiac rupture with unstable hemodynamic. Due to its uncommon incidence, the literature holds limited reports in this field. However, the assessment for cardiac injury parallels standard trauma evaluation, and requires a high index of suspicion. Airway, breathing, and circulation should be stabilized before continuing with further assessment modality.

Patients with penetrating cardiac injury are prone to cardiac tamponade, which, in most cases prevents the victims from reaching the hospital alive due to rapid hemodynamic collapse. Therefore, insertion of intravenous lines should not delay transport—this should be achieved during transport instead.¹

The survival of patients with penetrating cardiac injury is primarily determined by its anatomical nature. Another critical aspect is prompt initiation of transport to an appropriate medical facility. Gervin and Fischer. (1982) described a single-center comparison of two groups with similar age and type of cardiac injury, with distinct in-field treatment. One group was treated with ‘scoop and run’ technique with approximate ambulance arrival to definitive treatment of 9 minutes. The other group received extensive in-field stabilization with approximate ambulance arrival to definitive treatment of 25 minutes. The first group delivered 83% (5 out of 6 patients) survival rate with 67% (4 out of 6) successfully discharged, while the latter group yielded 0% survival.²

In rare instances, such as this case, the victim may present with stable hemodynamics. This spares the physician more windows for observation and more detailed diagnostic workup.³ After intravenous access with large-bore catheters is achieved, a focused assessment with sonography for trauma (FAST) may help identify abnormal pericardial fluid collection. Transthoracic (TTE) and transesophageal (TEE) echocardiography, in a stable setting, aids in assessment of abnormal cardiac wall and valvular physiology in a trauma case. CT may provide visualization of other surrounding soft tissue injuries.^{4,5}

The mainstays of treatment are relief of cardiac tamponade and control of hemorrhage 3). A rapid surgical exposure

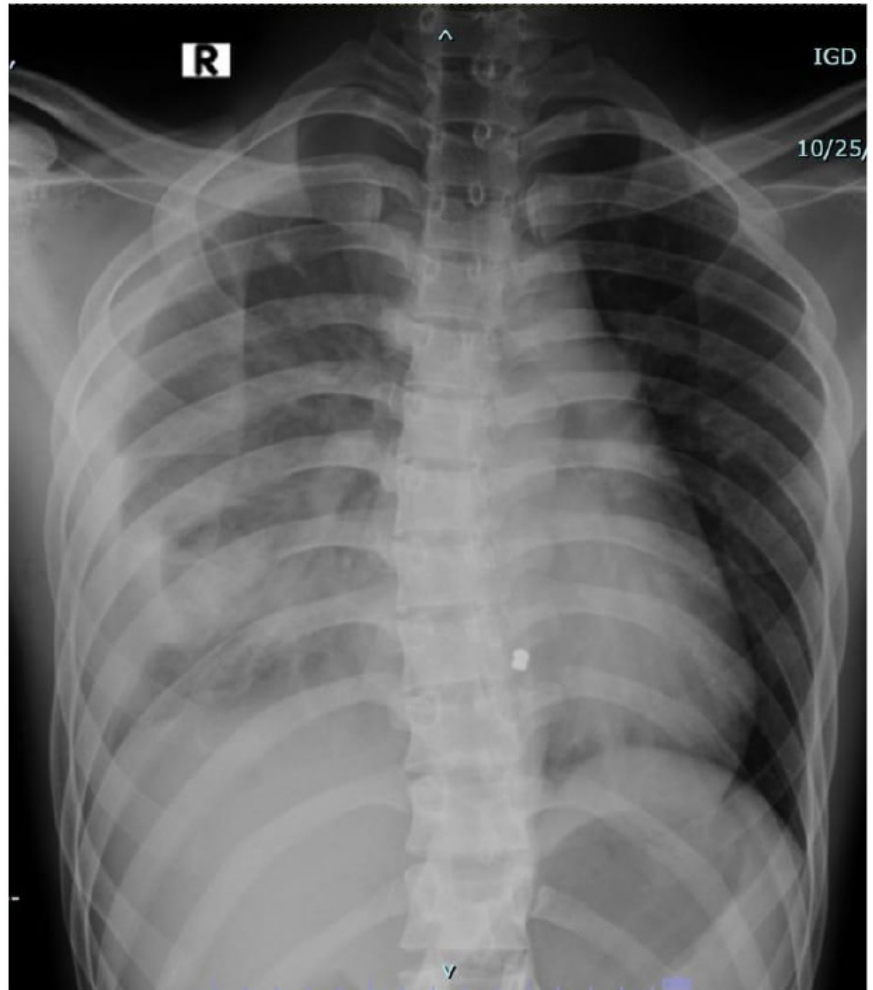


Figure 1. Chest X-ray indicated a right haemothorax and a foreign body material at the mediastinum

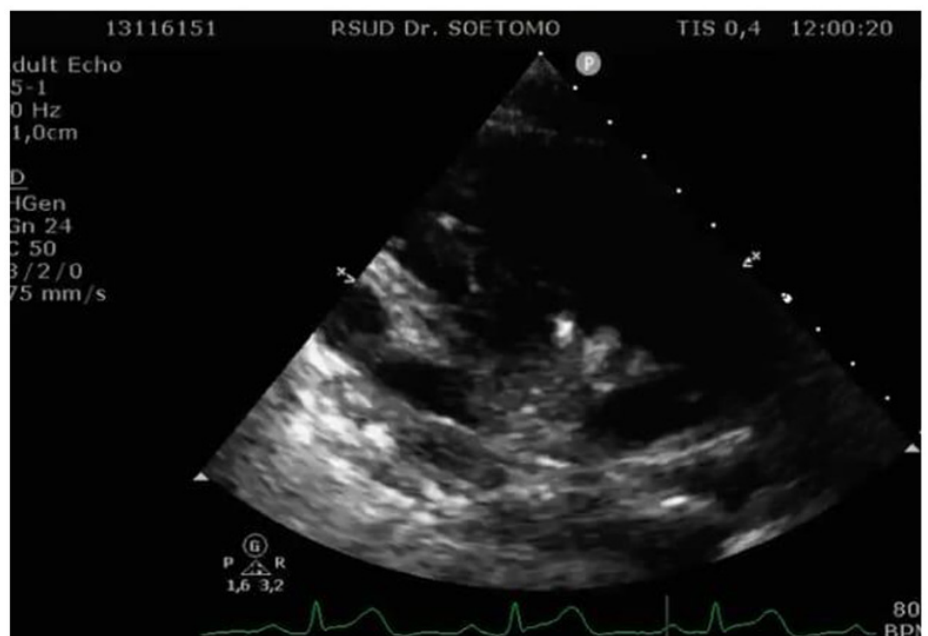


Figure 2. On TTE, the foreign body is found at the RV septal wall

can be achieved through a left anterior thoracotomy to allow access to the heart and aorta, if cross-clamping is deemed necessary. Median sternotomy can be done in selected stable cases to expose the anterior structures of the heart and both cavities of the thorax.

CONCLUSION

This report presents a rare case of survival following a penetrating cardiac injury. Prompt and coordinated interventions are of paramount importance, particularly in unstable patients. In a more stable condition, more detailed diagnostic workup may be considered to approximate the anatomical nature of the wound better and, if any, intracardiac foreign body. This contributes an insight to the management strategies of penetrating cardiac injury, and highlights the need for ongoing research to refine treatment protocols.

AUTHOR CONTRIBUTION

All authors had contributed to manuscript writing and agreed for the final version of manuscript for publication.

CONFLICT OF INTEREST

All author declares there is no conflict of interest.

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ETHICAL CONSIDERATION

The patient had received signed written informed consent regarding publication of medical data in scientific medical journal with confidentiality to personal information.

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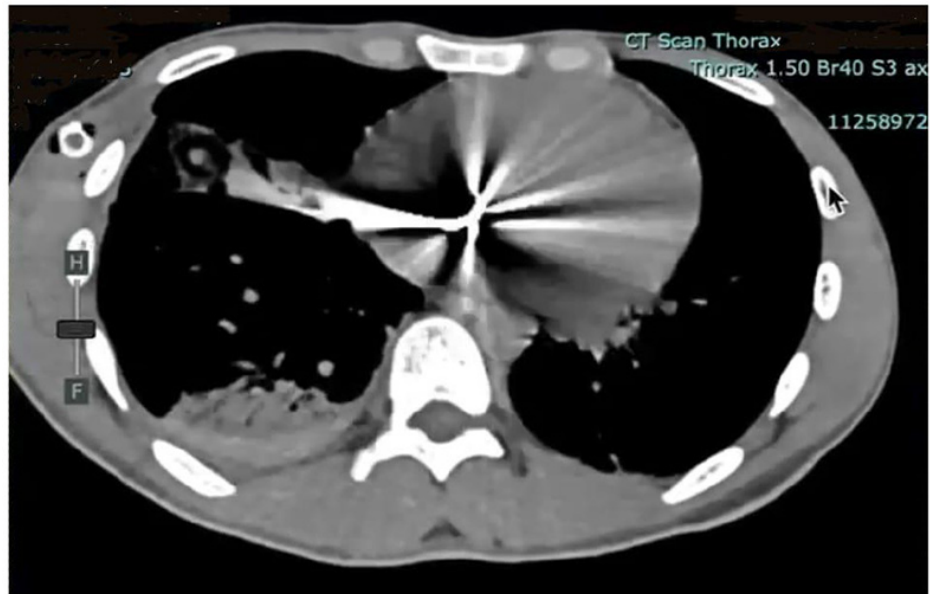


Figure 3. CT scan revealed the bullet trajectory through the right pleura through the heart

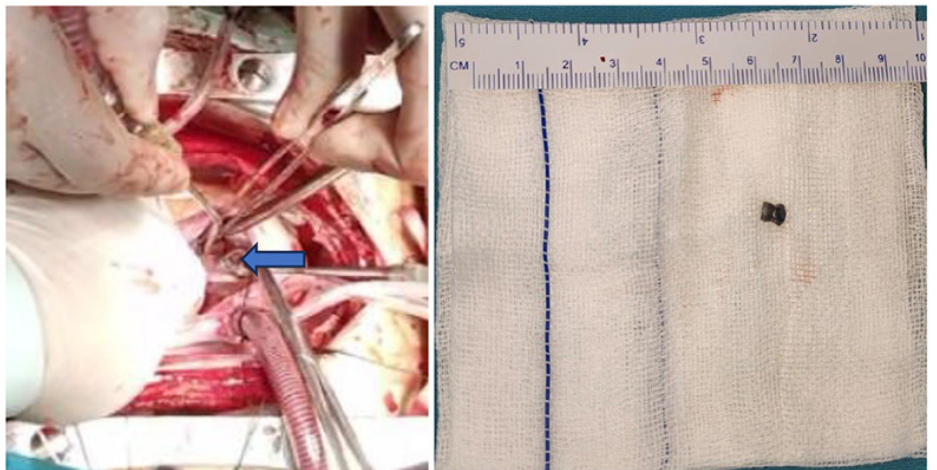


Figure 4. A 3 x 3 x 5 mm airgun pellet (blue arrow) was successfully extracted from the posterior RV wall through the TV

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