Thi-Qar Medical Journal (TQMJ):Vol.(23),No.(1),2022
Web Site: https://jmed.utq.edu.iq Email: utjmed@utq.edu.iq
ISSN (Print):1992-9218, ISSN (Online):1992-9218

Penetrating Cardiac Injury by a Nail-Gun: A Case Report

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Keywords: Nail-gun, penetrating cardiac injury

Abbreviation: Computed tomography = CT.

Abstract
Nail-gun injuries are rare types of penetrating cardiac injuries with the right ventricle being the most common site for injury. However, occurrence of these injuries continuously rises due to the frequent utilization at the daily life setting with surgical intervention being the standard way of management, but there are patients with such type of injury who had been treated conservatively especially when the patient is hemodynamically stable and associated with mild hemopericardium. These types of injuries can occur either accidentally or self-inflicted as a suicidal attempt. We present a case of a young aged male patient who had been accidentally injured by an assumed unloaded nail gun to the anterior aspect of the chest to the left of sternum near the nipple.

Introduction

Cardiac injuries can be divided into blunt and penetrating injury according to the mechanism of trauma with a wide range of outcomes from instinctively resolving to fatal injuries . Penetrating cardiac injuries are generally caused by stab wounds, gunshots, or least common with nail-gun. It is worth mentioning the right ventricle is the most common chamber to be injured in penetrating cardiac injuries owing to its anatomical position. However, injuries to the left ventricle and atria are possible (1).

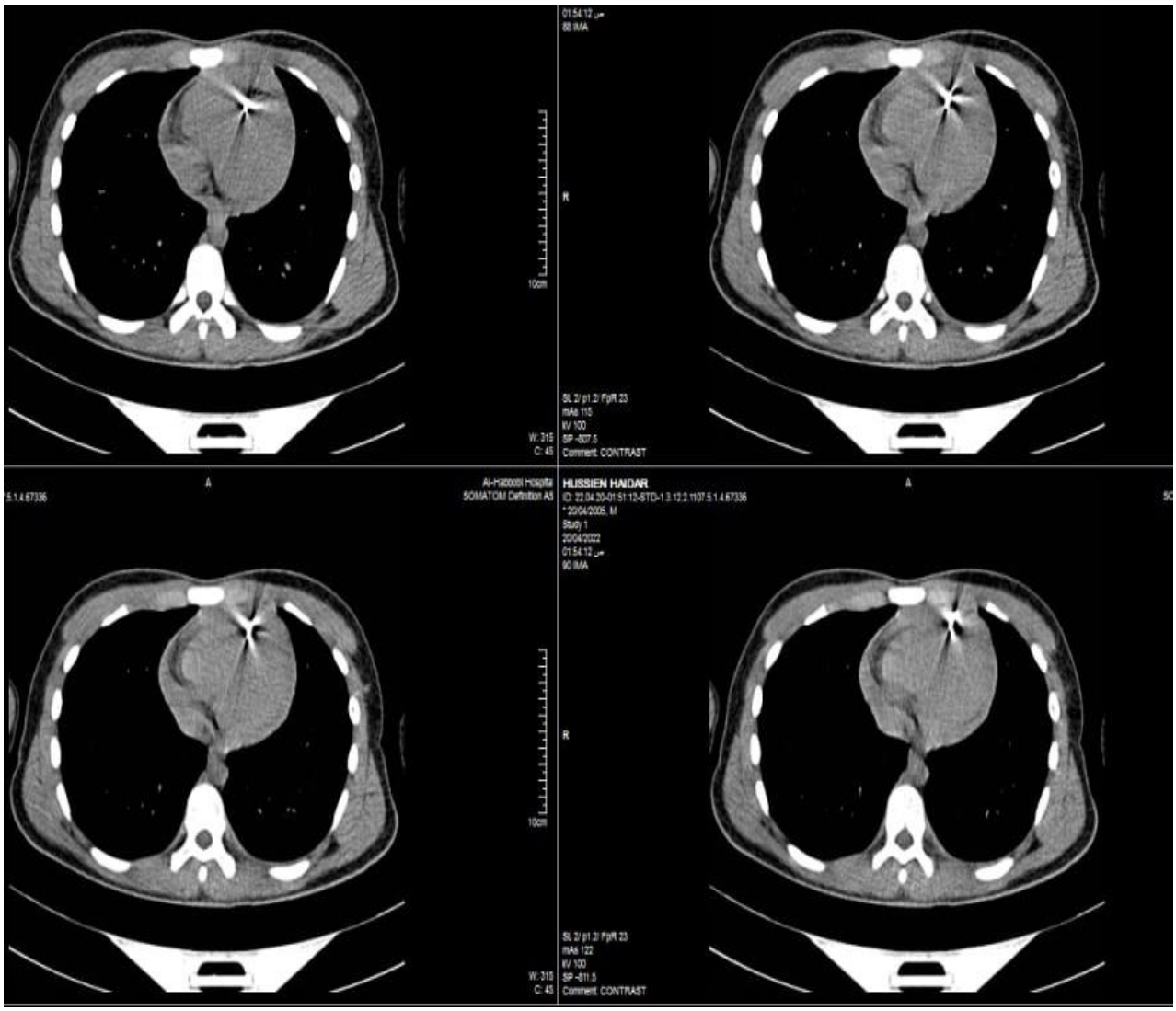
The rate of occurrence of nail-gun injury to the heart has risen due to their availability and frequent utilization in industrial and daily life settings. These injuries can occur either accidentally or self-inflicted due to suicidal attempt and may require surgical management in the form of emergency sternotomy or thoracotomy (2).

We describe a case of an accidental nail-gun injury to the chest. Consent was obtained from the patient for this study.

Case report

A 17 years old male patient presented with chest pain after accidental shooting of the chest by an assumed unloaded nail-gun. Chest computed tomography (CT) revealed a nail settled in the thorax as shown in (Figure 1 & Figure 2). On admission, the patient was conscious with tachycardia (heart rate of 130 beats per minute) and normal blood pressure (110/70 mmHg) and there was mild shortness of breath. A small puncture wound was noted about 2 centimeter to the left of the sternum in the third intercostal space. After few hours he developed signs of cardiac tamponade with weak distal pulses (obstructive shock). The jugular veins became distended and the heart

sounds became muffled . As a result, an urgent left anterior thoracotomy in supine position was done. During the operation, the nail was removed, the right ventricle was sealed using mediastinal fat and the hemopericardium of about (50-100) ml was drained with the placement of two drains one in the left pleural cavity and the second one in the pericardial space as explained in (Figure 3 & Figure 4). The Post-operative course was uneventful and the patient was discharged after 3 days of surgery. New investigations were done on outpatient follow up with excellent results.



Figure(1) shows a foreign body (nail) settled in the right ventricle of the heart and anterior chest wall (chest CT-scan, multiple transverse sections).

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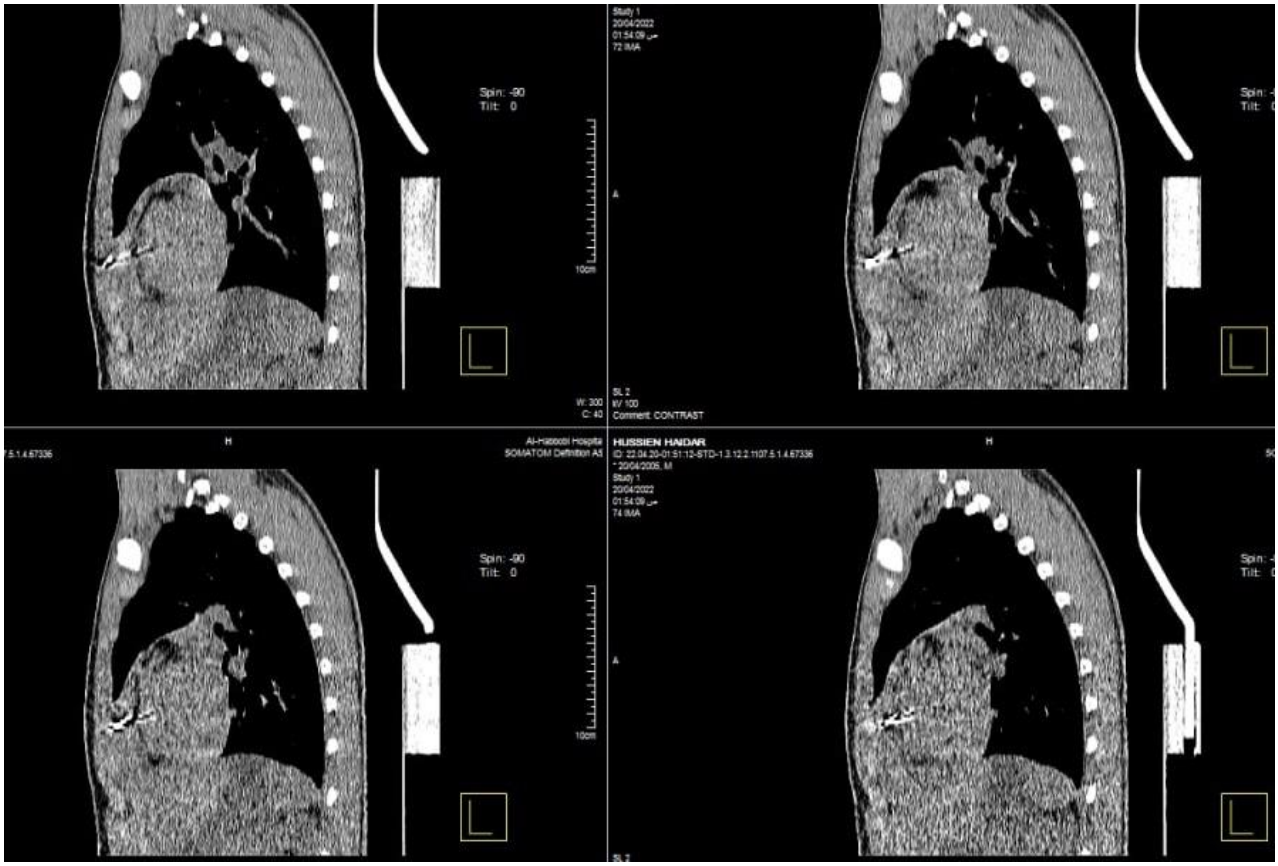

Figure(2) shows a foreign body (nail) settled in the right ventricle of the heart and anterior chest wall (chest CT-scan, multiple sagittal sections).

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Figure(3) shows the preoperative drowsy patient with penetrating cardiac injury immediately before surgery. The purple arrows refer to the site of entrance of gun nail in the anterior aspect of the chest.

Figure(4) shows the preoperative drowsy patient with penetrating cardiac injury immediately before surgery. The yellow arrows refer to the distended neck veins due to obstructive shock and elevated jugular venous pressure.

Figure(5) shows the patient with penetrating cardiac injury immediately after surgery. A sutured left anterior thoracotomy incision can be seen in the left anterior aspect of the chest below the site of the left nipple. The pericardial drain was located below the medial end of the left anterior thoracotomy incision while the left pleural drain was located below the lateral end of left anterior thoracotomy incision.

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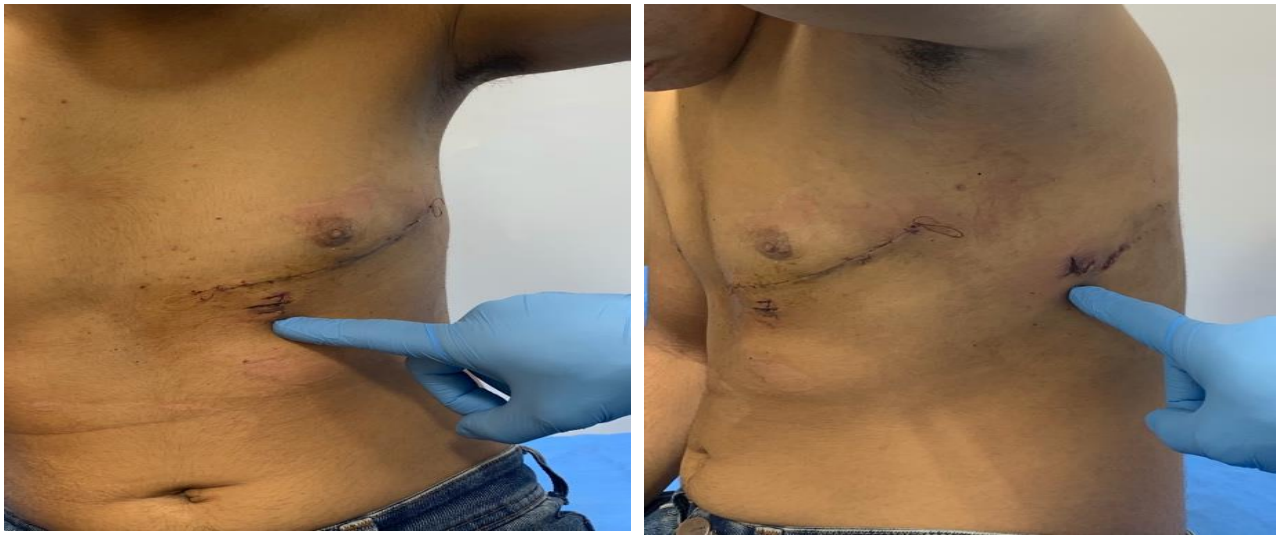

Figure(6) shows the patient with penetrating cardiac injury about 14 days after surgery. A scar of a left anterior thoracotomy incision over the left anterior aspect of the chest below the site of the left nipple can be seen.
On the left, the index finger refers to the site of scar of the previously removed pericardial drain below the medial end of the scarred left anterior thoracotomy incision while on the right, the index finger refers to the site of the previously removed left pleural drain below the lateral end of scarred left anterior thoracotomy incision.

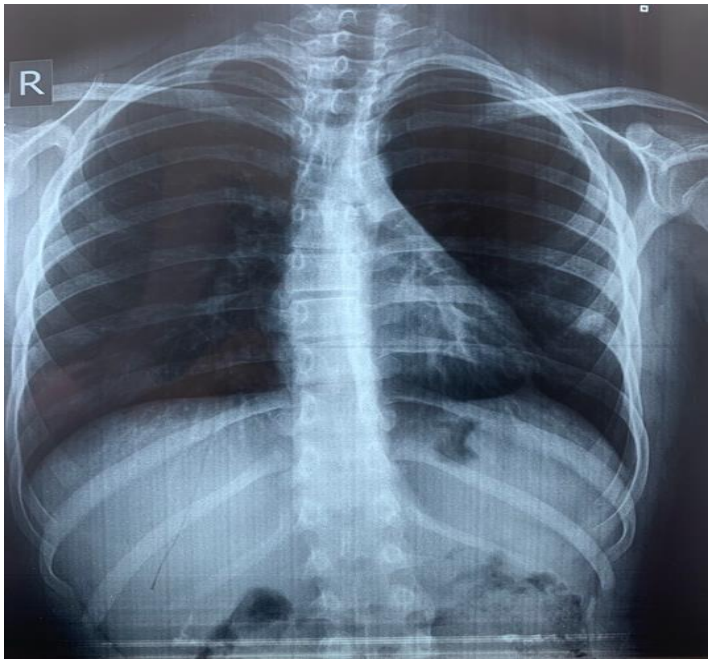

Figure (7) shows chest x-ray of the patient with penetrating cardiac injury after 14 days of surgery.

Figure (7) shows the surgeon on the left and the patient on the right after about one month of surgery

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Figure (8) shows the the patient after about one month of surgery.

Discussion

Even though nail-gun injuries to the heart are rare, these injuries could be fatal and must be treated urgently. Wound punctures on the skin is small and gives no indication about the degree of damage to internal organs, however, penetrating cardiac injuries rarely can be missed in history.

CT scan consider useful imaging in penetrating cardiac injuries to detect position, an extension of the injury, and the presence of pericardial effusion. Obtaining a preparative CT scan depends on the presentation of the patient. If the patient presented with cardiac tamponade or was unstable then transfer to the theatre with no further delay is the management of choice. If the patient was hemodynamically stable then CT imaging is indicated (2). Vosswinkel and Bilfinger reported that approximately 75% of the nail-gun injuries were hemodynamicly unstable with the leading cause for that was cardiac tamponade and this agrees with the findings as in our case (3).

Approximately patients with nail-gun injuries have a 25% mortality rate. However, these injuries are considered survivable with proper and rapid management (4).

Prevention strategies must be developed and applied to professional workers and the general public. Thus education and courses about the safety measures for proper use of nail gun may help reduce the number of injuries that could develop from nail-gun and raise awareness about the risk and potential of these injuries

Conclusion & Recommendation

Nail gun injuries are not common but may occur with a high survival rate with proper management and early identification of nail location and repair of the injury. Despite the high survival rate, additional efforts must be done to reduce mortality rate of these fatal injuries.

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