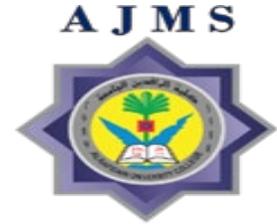


Al-Rafidain J Med Sci. 2025;9(2):203-205.
DOI: <https://doi.org/10.54133/ajms.v9i2.1107>



Online ISSN (2789-3219)

Case Report

Penetrating Cardiac Injury in a Child Following Nail Gun Accident: Clinical Implications and Public Health Concerns

Munaf Jarallah Yaseen¹ , Nabeeha Najatee Akram*² , Mohanad Kudhair Shukur Al-Ghanimi³ ,
 Mustafa Abadi Jasim⁴ 

¹Department of Pediatrics, College of Medicine, University of Baghdad, Baghdad, Iraq; ²Department of Pediatrics, College of Medicine, Mustansiriya University, Baghdad, Iraq; ³Department of Pediatrics, College of Medicine, University of Babylon, Babylon, Iraq; ⁴The Iraqi Center of Cardiac Diseases, Baghdad, Iraq

Received: 2 September 2025; Revised: 20 October 2025; Accepted: 25 October 2025

Abstract

Penetrating cardiac injuries caused by nail guns are exceedingly rare but often life-threatening, with reports showing an increasing trend. We described the case of an adolescent male who sustained accidental cardiac penetration by an iron nail while performing carpentry work. Rapid referral to a specialized cardiac center enabled timely surgical intervention, illustrating the pivotal role of early recognition, expedited transfer, and expert management in optimizing outcomes. This case also highlights the grave risks associated with the employment of minors in hazardous occupational settings, where exposure to unsafe environments may lead to catastrophic consequences.

Keywords: Cardiac injury, Children, Nail gun accident.

إصابات أَلقَلب النافذة لدى طفل الناتجة عن مسدسات المسامير: الآثار السريرية ومخاوف الصحة العامة

الخلاصة

إصابات القلب النافذة الناتجة عن مسدسات المسامير نادرة للغاية، ولكنها غالبًا ما تُهدد الحياة، مع وجود تقارير تُشير إلى تزايد هذه الظاهرة. وصفنا حالة مراهق تعرض لاختراق عرضي في القلب بمسمار حديدي أثناء قيامه بأعمال النجارة. مكنت الإحالة السريعة إلى مركز متخصص في أمراض القلب من التدخل الجراحي في الوقت المناسب، مما يُبرز الدور المحوري للتشخيص المبكر، والنقل السريع، والإدارة المتخصصة في تحسين النتائج. تُسلط هذه الحالة الضوء أيضًا على المخاطر الجسيمة المرتبطة بتوظيف القاصرين في بيئات عمل خطيرة، حيث قد يؤدي التعرض لبيئات غير آمنة إلى عواقب وخيمة.

* **Corresponding author:** Nabeeha N. Akram, Department of Pediatrics, College of Medicine, Mustansiriya University, Baghdad, Iraq; Email: nabiha@uomustansiriya.edu.iq

Article citation: Yaseen MJ, Akram NN, Al-Ghanimi MKS, Jasim MA. Penetrating Cardiac Injury in a Child Following Nail Gun Accident: Clinical Implications and Public Health Concerns. *Al-Rafidain J Med Sci.* 2025;9(2):203-205. doi: <https://doi.org/10.54133/ajms.v9i2.1107>

© 2025 The Author(s). Published by Al-Rafidain University College. This is an open access journal issued under the CC BY-NC-SA 4.0 license (<https://creativecommons.org/licenses/by-nc-sa/4.0/>).



INTRODUCTION

Penetrating injury from nail guns is rare but potentially lethal. The hand of the non-dominant side is the most injured site; however, other body parts, including the head, neck, abdomen, lower extremity, and most seriously the heart, have been reported [1]. An iron nail penetrating the heart presents along a spectrum of clinical presentations—from silent, delayed findings to acute tamponade and circulatory collapse [2]. Although the exact incidence is unknown, the mortality rate in adults is well documented at approximately 25%. However, this depends on the cardiac site involved and the extent of the resultant heart damage [3]. Survival can be improved by rapid recognition of critical symptoms, controlled temporizing measures in the prehospital setting, such as airway management and circulatory

support, immediate transfer to definitive care with a cardiothoracic team, and meticulous postoperative management, all of which contribute to improved outcomes [4,5]. Much of our knowledge of penetrating cardiac nail gun injury comes from adult case series, and reports with reported pediatric cases are extremely rare. We report a successful management of a pediatric patient with an accidental nail gun injury to the heart. This case highlights the vital role of early recognition of penetrating cardiac injury and expert management in specialized settings in optimizing the outcomes. In addition, express the critical risks associated with the engagement of minors in hazardous occupations, where exposure to unsafe environments can lead to catastrophic consequences.

Case Presentation

A 14-year-old boy who works as a carpenter in a woodworking shop equipped with nail guns. During break time, his adolescent work partner teased him using a pneumatic nail gun and accidentally fired a nail on his chest (Figure 1).

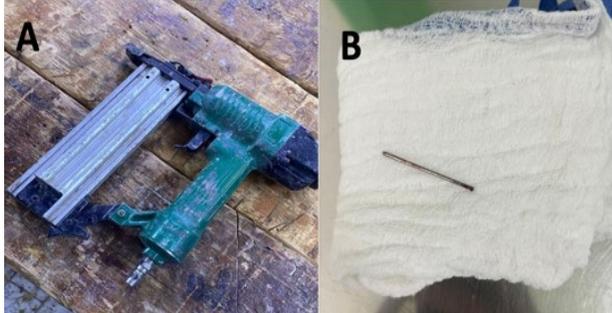


Figure 1: A) Pneumatic nail gun; B) The iron nail that is extracted from the current reported case.

The patient was transferred to the emergency department of a general hospital, at which the examination revealed a conscious, oriented adolescent, but looking pale and irritable with blood pressure 85/35 mmHg and a regular low-volume pulse at a rate of 165 bpm and a 2 mm puncture wound visible at the left sternal border at the 5th intercostal space with no other obvious injuries. The patient was immediately referred to a specialized cardiac center (Iraqi Center of Cardiac Diseases) for further evaluation and management. A transthoracic echocardiograph showed moderate pericardial effusion. An urgent cardiac CT scan revealed an iron nail penetrating the left chest wall, lateral to the sternum at the 5th intercostal space, with the nail penetrating the anterior wall of the right ventricle and reaching to the right ventricular cavity (Figure 2). Laboratory investigations, including a complete blood count, revealed a blood hemoglobin level of 8 g/L. As a result, the patient received 2 pints of blood before surgery. Emergency surgery is done under general anesthesia, which involves midline sternotomy with supine position, central line insertion, and a cell saver machine. With the aid of transesophageal Echo guided procedure, the pericardium opened where a large blood clot together with a fresh blood collection has been identified. By inspection, the injury was identified in intraventricular groove just lateral to the left anterior

descending coronary artery. Two pledgets 5/0 Polypropylene sutures were placed, and transesophageal echo shows no injury to the intraventricular septum and confirmed hemostasis.

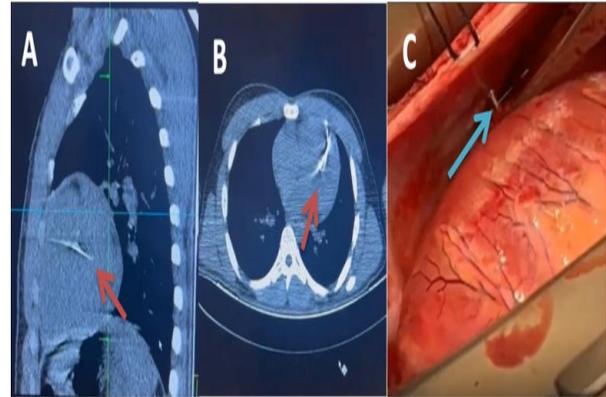


Figure 2: (A, B) CT scan of the chest; A) sagittal view; B) axial view, demonstrating a metallic foreign body (red arrow) penetrating the anterior chest wall and extending into the right ventricle/interventricular septum; C) Intraoperative view showing the iron nail (blue arrow) penetrating the anterior wall of the right ventricle.

Two mediastinal drains were inserted, and the patient was discharged from ICU after one day. Postoperative transthoracic echo showed no complications, and subsequently the patient was discharged home after 4 days.

DISCUSSION

The use of nail guns causes more and more injuries, with cardiac injuries being a rare but potentially fatal type [4]. Most of these injuries are accidental; however, intended self-inflicted injuries are reported in psychologically disturbed drug abusers, and one case is regarded as an act of terrorism [6,7]. The anterior wall of the right ventricle is the predominant portal of entry reported in nail gun injury. This comes from the anterior position of the right ventricle, which makes it vulnerable to traumatic injury [6]. However, other cardiac chambers, the interventricular septum, coronary arteries, and various degrees of valvular involvement had been reported in adult cases [7]. Nail gun injuries in the pediatric population are uncommon, with only six previously reported cases in this age group, one of which also occurred in Iraq (Table 1).

Table 1: Summary of pediatric cases reported with penetrating cardiac nail gun injuries

Authors	Sex,	Age	Cardiac Site	Mechanism of injury	Survival
Kulaylat <i>et al.</i> [10]	Female	29 months	Anterior right ventricle	Accidental self-inflicted	yes
Michalsen <i>et al.</i> [7]	Male	3 years	Right ventricle, right interventricular septum	Accidental self-inflicted	yes
Zhang <i>et al.</i> [11]	Female	4 years	Anterior right ventricle	Accidental self-inflicted	Yes
Daffer and Ibrahim [8]	Male	17 years	Anterior right ventricle	Accidental self-inflicted	yes
Madani <i>et al.</i> [12]	Male	17 years	Pulmonary artery	Accidental	Yes
Wang <i>et al.</i> [13]	Male	17 years	left ventricle and descending aorta	NA	Yes

Unlike adults, all pediatric cases were accidental and not self-inflicted. There is a male predominance in pediatric

cases, consistent with the current case. The increasing engagement of minors in hazardous working

environments in industrialized countries is blamed for the increasing incidence of these types of penetrating cardiac injuries in children. The current case aligns with a report by Daffer and Ibrahim [8], as both patients are Iraqi adolescents engaged in carpentry who sustained accidental penetrating nail gun injuries to the heart, which draws attention to the public health and ethical concerns surrounding child work in hazardous occupations in Iraq. Although both cases survived the event, the residual scar in the heart might act as a focus of arrhythmia in the near future [9]. The operation of high-powered tools such as nail guns demands technical proficiency, adequate safety training, and mature judgment—capacities not fully developed in younger individuals. When minors are exposed to such occupational risks, the likelihood of severe and potentially fatal injuries is markedly increased. Thus, beyond its clinical contribution to the limited body of literature on penetrating cardiac trauma caused by nail guns in children, this case underscores the imperative of enforcing regulations that safeguard children from premature entry into high-risk labor sectors.

Conclusion

Accidental cardiac penetrating injury by nail guns is life-threatening. Retrieval of intracardiac foreign bodies should only be attempted in a facility where open-heart surgery is available.

Conflict of interests

The authors declared no conflict of interest.

Funding source

The authors did not receive any source of funds.

Data sharing statement

Supplementary data can be shared with the corresponding author upon reasonable request.

REFERENCES

- Hussey K, Knox D, Lambah A, Curnier AP, Holmes JD, Davies M. Nail gun injuries to the hand. *J Trauma*. 2008;64(1):170-173. doi: 10.1097/TA.0b013e3180d09996.
- Ho S, Liu B, Feranec N. Self-inflicted cardiac injury with nail gun without hemodynamic compromise: A case report. *Cureus*. 2017;9(1):e971. doi: 10.7759/cureus.971.
- Wang SH, Chen MY, Yan JL, Huang TY, Chang CC, Chien CY. Survival after multiple nail gun injuries to the brain, lung, and heart: a case report and a review of the literature. *J Int Med Res*. 2021;49(10):3000605211049923. doi: 10.1177/03000605211049923.
- Eranki A, Wilson-Smith A, Villanueva C, Seah P. Penetrating cardiac trauma caused by a nail-gun: A case report and narrative review. *Trauma Case Rep*. 2022;39:100649. doi: 10.1016/j.tcr.2022.100649.
- Yaseen M, Akram N, Nori W. Intravascular foreign bodies retrieval: Navigating differences from childhood to adulthood. *Scripta Medica*. 2025;56(1):69–76. doi: 10.5937/scriptamed56-53482.
- Asai Y, Yoshida M, Kurimoto Y, Arnold JL. Case report: penetrating cardiac injury secondary to a terrorism-related nail bomb explosion. *Prehosp Disaster Med*. 2003;18(3):249-252. doi: 10.1017/s1049023x00001126.
- Michalsen KL, Iguidbashian JP, Kyser JP, Long WB. Low-velocity nail-gun injuries to the interventricular septum: Report of two cases, one in a child. *Tex Heart Inst J*. 2015;42(4):393-396. doi: 10.14503/THIJ-13-4023.
- Daffar AA, Ibrahim ZA. Penetrating cardiac injury by a nail-gun: A case report. *Thi-Qar Med J*. 2022;23(1):60-68.
- Jhunjhunwala R, Dente CJ, Keeling WB, Prest PJ, Dougherty SD, Gelbard RB, et al. Injury to the conduction system: management of life-threatening arrhythmias after penetrating cardiac trauma. *Am J Surg*. 2016;212(2):352-353. doi: 10.1016/j.amjsurg.2015.07.034.
- Kulaylat AN, Chesnut CH, Patel S, Rocourt DV, Clark JB. Penetrating cardiac nail gun injury in a child. *Pediatr Emerg Care*. 2016;32(8):536-537. doi: 10.1097/PEC.0000000000000449.
- Zhang W, Cao L, Hu S, Huang X, Yang Y. Nail gun penetrating cardiac injury in a young child. *Lancet*. 2014;384(9945):828. doi: 10.1016/S0140-6736(14)61370-2.
- Madani M, Drissi M, Ajaja MR, Rifai M, Moutaouakkil el M, Cheikhaoui Y, et al. Nail gun may cause heart injury: a young adult's misadventure. *Int Emerg Nurs*. 2012;20(2):98-101. doi: 10.1016/j.ienj.2011.06.006.
- Wang MJ, Chen IS, Tsai SK. Nail gun penetrating injury of the left ventricle and descending aorta. *Circulation*. 1999;100(3):e18-19. doi: 10.1161/01.cir.100.3.e18.