

# The Curious Case of Retained Bullets - Asymptomatic Gunshot Wounds to the Heart with Delayed Presentation and Management Strategies

Aabha Divya<sup>1</sup>, Niti Dalal<sup>2</sup>, Mona Swain<sup>3</sup>, Juhi Baktavar<sup>4</sup>

<sup>1</sup>Department of Cardiothoracic and Vascular Surgery, Vardhman Mahavir Medical College and Safdarjung Hospital, New Delhi, India. <sup>2, 3, 4</sup>Department of Anaesthesia and Critical Care, Vardhman Mahavir Medical College and Safdarjung Hospital, New Delhi, India.

## INTRODUCTION

Penetrating trauma to the thorax involving the heart is usually fatal. Discovery and management of intrathoracic missiles especially in the close vicinity of the heart is a major challenge. Retained intracardiac missiles are exceptionally unusual, and there are 322 reported cases over 60 years, from 1940 to 2009.<sup>1</sup> We present two patients who presented with penetrating gunshot wounds to the chest with retained intracardiac bullets.

The management of hemodynamically stable patients with retained intrapericardial foreign body remains controversial. Management options of thoracic firearm injuries are based on patient stability, course and location of the missile. We report our experience of two patients with delayed presentation of a retained intrapericardial bullet from firearm injuries. In this paper, we discuss the management strategies of such injuries in light of the available literature and summarize our clinical experience.

## PRESENTATION OF CASE

### Patient 1

An 18-year-old man was shot with in the chest and was evaluated in the emergency department two days after the incidence. The patient was hemodynamically stable with normal sinus rhythm. He had a single penetrating wound close to the left border of the sternum in the fifth intercostal space (Figure 1). A chest roentgenogram revealed foreign body between the cardiac silhouette and diaphragm with mediastinal widening (Figure 2). Bilateral intercostal drainage tubes were present in situ. Focused assessment with sonography in trauma (FAST) was positive for pericardial effusion. The computed tomographic (CT) scan revealed a pellet on the under surface of the heart with a tract through the left lung; however, the artefact from the pellet made exact localization difficult (Figure 3).

Transoesophageal echocardiography revealed normal ventricular and valvular function but with moderate pericardial effusion. There was no wall motion abnormality and the foreign body was poorly visualized. Patient was taken to operating theatre for emergency sternotomy. There was hemopericardium with clots overlying the lateral and inferior surface of the heart. Suspecting possible cardiac injury, he was placed on cardiopulmonary bypass via central cannulation. On exposing the lateral surface of the left ventricle, an entry wound through the posterolateral pericardium was identified. There was a tear in the left ventricle approximately one centimetre from the interventricular groove close to the left anterior descending artery (Figure 4). The wound was repaired with felt-reinforced sutures. The pellet was identified in the pericardium after suctioning and it was removed. The left pleura was opened. It revealed contusion in the left lower lobe of the left lung. A small leak was identified and was repaired with interrupted sutures. The patient was taken off of cardiopulmonary bypass after repair without difficulty and was subsequently shifted to the ICU.

*Corresponding Author:*

*Dr. Niti Dalal,*

*Department of Anaesthesia and Critical Care, Vardhman Mahavir Medical College and Safdarjung Hospital, New Delhi, India.*

*E-mail: dalal.niti@gmail.com*

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**Figure 1.**  
*Photograph of the Patient before Draping, with Site of Pellet Entry*



**Figure 2.**  
*Antero-Posterior Chest X-Ray of the Patient. The Pellet is Visible as an Opaque Body on the Under surface of the Cardiac Silhouette, above the Diaphragm*



**Figure 3.**  
*Computed Tomographic Image of the Chest of the Patient. Metallic Object Visible on the under surface of the Heart, above the Diaphragm*



**Figure 4.**  
*Intraoperative Photograph of the Patient. After Putting the Patient on Cardiopulmonary Bypass, the Heart was Turned to Trace the Path of the Pellet and See the Site of Injury. It had entered through the Right Pleura and Entered the Pericardium. It Had Hit the Left Ventricle One-Centimetre Lateral to the Left Anterior Descending Artery*

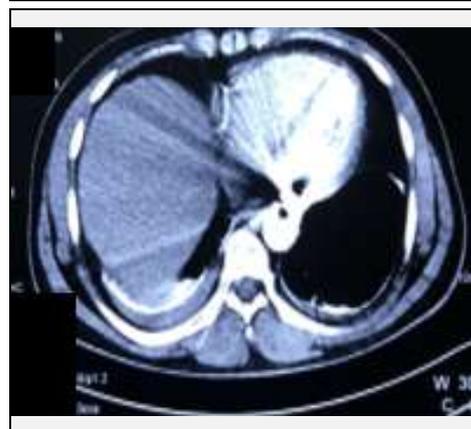
**Patient 2**

A 38-year-old man was caught in crossfire and got shot in the right upper chest. He was evaluated in the emergency department four days after the incidence. He was hemodynamically stable with heart rate of 67 / min, sinus rhythm with occasional ectopic beats and blood pressure of 100 / 78 mm Hg. He had a single penetrating wound 2 cm inferior to clavicle. His anteroposterior chest roentgenogram showed a bullet overlying the shadow of the heart (Figure 5). There was no evidence of rib injury or pneumothorax. FAST showed right sided pleural effusion. The computed tomographic scan revealed the presence of metallic body in the space between aorta and ventricle. (Figure 6). Transoesophageal echocardiography revealed the presence of a foreign body beneath the left ventricle in four-chambered view (Figure 7). There was no regional wall motion abnormality. The left ventricle was dilated with mild mitral regurgitation with central jet with normal ventricular function.

Patient was taken up for emergency sternotomy and exploration. Vertical pericardiotomy revealed mild serosanguineous pericardial effusion. An entry wound was found near the superior surface of the superior vena cava (Figure 8). Intraoperatively, no visible cardiac injury was found. The bullet was found lodged under the left atrium between the right and left inferior pulmonary veins and was removed (Figure 9). The right lung was examined. Dense adhesions were found in the upper lobe of the right lung. Temporary pacing wires were put, though post operatively, he did not require pacing.



**Figure 5.**  
*Antero-Posterior Chest X-Ray of the Patient Exhibiting the Bullet Overlying the Cardiac Silhouette*



**Figure 6.**  
*Chest Computed Tomographic Image of the Patient. Visible Metallic Object with Artifact Present in the Transverse Sinus. Exact Location not Delineated Due to the Metallic Shadow*



**Figure 7.**  
*Intraoperative Trans-Oesophageal Echo-Cardiography, Showed Bullet Moving Freely in the Pericardial Cavity. Over Here, It Appears to Be Abutting the Left Ventricle*



**Figure 8.**  
*Intraoperative Photograph. The Site of Rent in the Right Pleura, Revealing the Site Where the Bullet Entered the Pericardium*



**Figure 9.**  
*Intraoperative Photograph. The Bullet was Retrieved from Underneath the Heart, Wedged between the Lower Left and Right Pulmonary Veins*

Both the patients recovered without complications and were discharged after a few days. Both the patients came for follow-up at 3 months and 6 months with no further complaints. All medicines were stopped.

**DISCUSSION**

Patients presenting with retained cardiac missiles are unusual in the reported text. Those presenting without any symptoms are very rarely encountered. Stassen et al. has stated that though these patients presented with stable vital signs, they may have sustained contained vascular injuries or may have injuries to the oesophagus or tracheobronchial tree.<sup>2</sup> There is no test to indicate which patients presenting in a stable condition would go on to have a serious outcome.<sup>3</sup> Close monitoring and systematic investigations are needed.

Initial investigations depend on the hemodynamic stability of the patient; in an unstable patient, any imaging should be restricted to bedside chest x-ray and focused ultrasonography. For a patient with stable hemodynamic, a detailed evaluation is reasonable. Martin et al. has stated that computed tomography is instrumental in the assessment because of its ability to describe the trajectory of the bullet and to demonstrate organ injury.<sup>4</sup> Trans-thoracic echocardiography may be considered to confirm the presence or absence of pericardial effusion and localization of foreign projectile.

The management of retained missiles in the heart and pericardium remains controversial. Recommended guidelines for management suggest individualising treatment on the basis of timing of presentation, associated symptoms, and type and position of the foreign object. Since the management remains controversial, Marsico et al. has advocated removal of retained free intrapericardial bullets in all the patients,<sup>5</sup> while Akdemir et al. has managed them conservatively.<sup>6</sup> Localization of the retained missile in asymptomatic patients is vital in guiding treatment as bullets lodged near blood vessels may cause late aneurysms or embolism, especially in patients presenting with ischemic pain or with vessel wall indentation by the retained bullet on CT.

Hassett et al. mentioned that although 2-dimensional echocardiography has been reported to be an accurate method for localization of foreign body,<sup>7</sup> both cases highlight that even with intraoperative transoesophageal echocardiography, the exact location of a foreign body may still be difficult to ascertain. Presence of hemopericardium should raise suspicion of possible cardiac injury and a should be dealt with caution.

Carrick et al. commented that concomitant organ injuries (liver, lungs, stomach, and small intestines) complicate surgical management. Projectile trajectory must be followed up for determining injured tissues and its extent. We concluded that, timely surgical intervention may be the only diagnostic and therapeutic route, as controlling the bleeding operatively is the most effective resuscitation maneuver.<sup>8</sup>

Previous reports have also illustrated the ability of retained intrapericardial missiles to cause late complications like arrhythmias<sup>9</sup> and possible erosion or embolism into vessels leading to further morbidity and mortality.<sup>10</sup> Hence, consideration needs to be given to either emergent removal or careful follow-up with careful monitoring for potential complications.

**CONCLUSIONS**

There is no clear consensus on the management of patients presenting with stable haemodynamics with retained intrapericardial foreign body. Long term sequelae of pericarditis, recurrent pleural effusions, arrhythmias, lead poisoning, or even death due to erosion into blood vessels are possible. The management plan cannot be generalised, and the decision should be individualised according to the patient. Financial or other competing interests: None.

Disclosure forms provided by the authors are available with the full text of this article at jebmh.com.

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