

## Venous Embolization of a Lower Extremity Projectile

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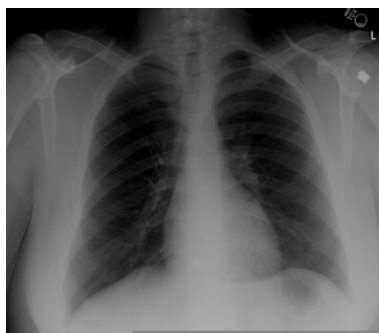
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### Introduction

Foreign body migration into the vasculature and subsequent embolization is a rare complication of both medical procedures and penetrating trauma. Endovascular filters, wires, and pins have been found to travel through the vasculature resulting in a variety of complications, including death [1]. In the case of penetrating trauma, the incidence of bullet migration into the vasculature is approximated at 0.3% [2]. While the morbidity associated with bullet emboli can be as high as 25% [3], the decision to retrieve bullets remains controversial.

### Case Report

A 20 year old male presented to the Emergency Department with gunshot wounds to both lower extremities and left upper arm. His Glasgow Coma Scale (GCS) on presentation was 15 and vital signs were within normal limits. Examination revealed three wounds in the proximal left upper extremity, two wounds in the proximal left lower extremity, and one wound in the proximal, medial right lower extremity. No metallic foreign bodies were identified radiographically in the bilateral lower extremities. A chest radiograph was obtained based on proximity of the wounds to the thoracic cavity and revealed two metallic foreign bodies. The first was near the left humeral head and the second was in the central mid-thoracic region (Figure 1).

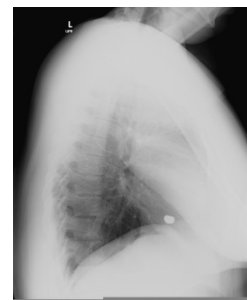


**Figure 1:** Chest radiograph based on proximity of the wounds to the thoracic cavity.

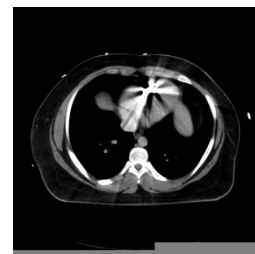
The patient was immediately re-examined and no additional wounds were identified. A lateral chest radiograph was obtained, showing the foreign body located within the right heart (Figure 2).

No foreign body was identified within the heart on bedside Emergency Department cardiac ultrasound. However, a Computed Tomography (CT) scan of the chest and abdomen revealed the foreign body in the right ventricle (Figure 3). The CT scan was extended

caudally, revealing a small amount of hemorrhage and multiple foci of air surrounding the right femoral vein and artery without evidence of major vascular injury.



**Figure 2:** Chest radiograph showing the foreign body located within the right heart.

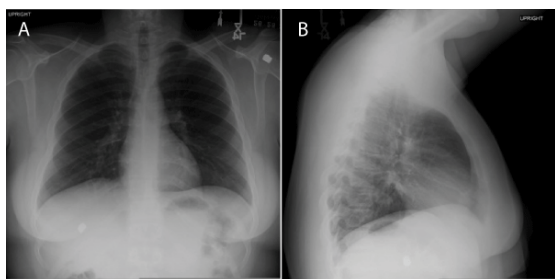


**Figure 3:** Computed Tomography (CT) scan of the chest and abdomen.

The patient remained hemodynamically stable and was admitted to the trauma service for serial exams and cardiovascular surgery consultation. A formal echocardiogram was performed and no intracardiac foreign body was found. Repeat chest X-ray the following day again showed the bullet within the right ventricle. The assumption was that the bullet did not lie within the ventricle and was possibly embedded in the diaphragm or had migrated to the liver. The patient remained stable and was asymptomatic. He was discharged home the following day, hemodynamically stable after deciding to forego attempts at retrieval.

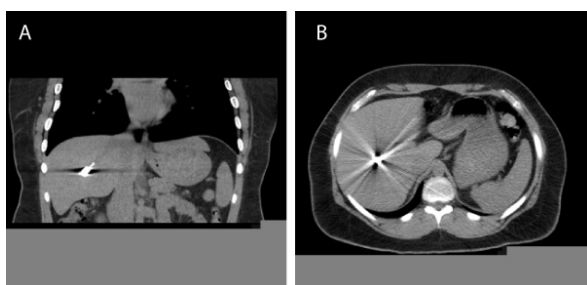
The patient returned to the Emergency Department four months later with left hand pain after trauma unrelated to his prior gunshot wounds. In addition to extremity radiographs for his current presenting complaint, a chest X-ray was obtained to evaluate the

current location of the bullet. The images showed the bullet now lying below the diaphragm (Figures 4a and 4b).



**Figure 4:** X-ray shows the current location of the bullet.

A CT scan was obtained and localized the bullet to the right hepatic vein (Figures 5a and 5b). The patient was asymptomatic from his bullet embolus. He was treated for his extremity injury and discharged in good condition.



**Figure 5:** CT scan localized the bullet to the right hepatic vein.

## Discussion

This case is instructive in several different areas pertaining to emergency medicine. First, the importance of a thorough physical exam is paramount in all cases of trauma. Inspecting the patient from head to toe and documenting all findings helps to assess the acuity of the patient, create a differential and prioritize the emergent problems. In penetrating trauma, pairing entry and exit wounds is essential, as it gives the provider an idea of the path the bullet travelled and the possible injuries associated as a result. Although not completely reliable, initial decision making can be influenced by localizing possible gunshot wound tracks. The odd number of wounds to the left upper extremity and right lower extremity in this case, prompted further evaluation. The resulting images found both retained bullets. The unexpected finding in the thorax dictated additional care including further imaging and surgical consultation.

Disposition to a trauma service or cardiothoracic surgeon is appropriate for further treatment, however management of bullet emboli is somewhat controversial. Given the rarity of occurrence and risks of retrieval, debate over operative versus conservative management in these patients still exists. However, a 2003 review of post-traumatic and iatrogenic foreign bodies in the heart recommends a three pronged approach: (1) Symptomatic patients should have the

foreign body removed; (2) Asymptomatic patients who present immediately after the injury, should undergo removal; and (3) Asymptomatic patients with delayed diagnosis or without risk factors can be treated conservatively [4]. Again, these are recommendations and ultimately the route chosen will be dictated by the treatment team.

With recent advances of interventional radiology, early consultation may drive management decisions. A 2011 article discusses the evolving role of endovascular retrieval of these foreign bodies [5]. Given the ability to move from one location in the vasculature to another, as evidenced by this case, real-time imaging may be more appropriate. Had the bullet been visualized in the heart during ultrasound, the cardiovascular surgeon may have been more aggressive. Yet, whether the bullet would have remained in the heart by the time the patient went to the operating room is unknown, and potentially creates a larger problem for the surgeon. An interventionalist may have more flexibility to adapt to a non-stationary object and may be a more appropriate consultant in these cases.

While the decision on retrieval will not ultimately be made by the emergency physician, it is possible that patients managed conservatively will return to the emergency department with sequelae. Chest pain, arrhythmias, hemoptysis and cardiac tamponade have all been reported secondary to foreign body migration to the heart [6-8]. This patient did return for what was likely an unrelated complaint, but possible migration of his retained bullet did play a role, although minimal, in his evaluation. This highlights the importance of a complete history and its incorporation into the differential.

## Conclusion

Bullet embolism is a rare occurrence associated with a significant degree of morbidity, both immediately and in the long-term. This case is a reminder to perform a thorough physical exam in all trauma patients, and to keep a broad differential in patients presenting with a history of retained foreign bodies. Recommendations on the management of these injuries do exist, but must be placed in the context of each individual case. The future involvement of interventional radiologists in these cases will likely continue to evolve.

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