

Migratory Bullet: Bullet Embolism into the Common Iliac Artery

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Abstract Intravascular bullet embolism is a rare phenomenon encountered during autopsies of firearm fatalities. In cases where the victim has died due to firearm wounds, single entrance wounds without exits necessitate locating the bullet/projectile inside the body. This task gets tricky if the projectile enters a blood vessel and further embolises onwards with the flow of blood. We present a case of a firearm wound over the upper back with the projectile piercing the arch of aorta. Radiological investigations including CT–chest proved blank for locating any bullet inside the body. Emergency sternotomy was done but surgical exploration couldn't find the missing bullet and the patient later succumbed to internal blood loss. Pre-autopsy x-ray showed a hypo-dense metallic shadow in the lower middle abdomen slightly to the left. The missing bullet was located inside the lumen of the common iliac artery during autopsy after tracing the track from the wound in the arch of aorta downwards. A brief summation of diagnostic & treatment protocol and autopsy findings is presented.

Keywords: bullet wound, embolism, autopsy

Cite This Article: Luv Sharma, Tarun Dagar, and Vincent Merry, "Migratory Bullet: Bullet Embolism into the Common Iliac Artery." *American Journal of Medical Case Reports*, vol. 4, no. 6 (2016): 190-192. doi: 10.12691/ajmcr-4-6-2.

1. Introduction

The rarity of Bullet embolism and the potential lack of early symptoms lead to delays in diagnosis and often in inadequate early management that can potentially result in the loss of a limb or life. [1] Detection of the missile transported through the circulation requires very thorough autopsy examination, especially if X-ray equipment is not available. As in all other cases in which initial bullet trajectory is changed in the body, the very important part of the medico-legal autopsy in cases accompanied with missile embolism, is to determine direction of the first part of the bullet's trajectory, because this indicates the position of the axis of the weapon barrel in the moment of firing (if there was no external ricochet), taking into consideration the posture of the victim and the location of the shooting person in the same moment. [2]

2. Case Details

The patient's case details were as follows:

2.1. On Admission

The victim (a police officer) was shot at by unknown assailants from a truck during inspection at police check-post after information that some miscreants had used a truck to escape after robbing a bank at gunpoint. The patient was rushed to the Accident & Emergency

Department at our facility. On admission, he was conscious and oriented to person, time and place. A single punctured wound of size 0.75x0.75 cm with inverted margins present over posterior aspect of right shoulder was noted. Fresh bleeding was present. An impression of entry wound was provisionally made and surgical and orthopedics opinion was sought.

2.1.1. Treatment Records

A gunshot injury was noted over the right axilla, Chest x-ray& CECT chest were done and showed superior mediastinal hematoma with no evidence of any foreign body or pneumothorax, Bilateral lung fields were normal, there was no pleural effusion and the trachea & major vessels were reported as normal. Multi-detector computed tomography (MDCT) showed a large mediastinal hematoma with active contrast leak from arch of aorta (Figure 1). Cardiac surgeon's opinion was taken who reported that the patient was conscious, oriented with HR-120/min, BP- 96/60 with good air entry into the chest bilaterally; the ECG showed tachycardia. The patient was shifted to CTVS (Cardio-thoracic-vascular surgery) ICU (Intensive care unit)for monitoring. The Echocardiogram showed right ventricular compression by an external hematoma with significantly impaired diastolic filling and tamponade. Explorative sternotomy was planned however sudden hypertension with tachycardia and cardiac arrest occurred. CPR (cardio-pulmonary resuscitation) was done, the patient was intubated, cardiac massage done and the patient was taken on femoro-femoral cardio-pulmonary by-pass. Cardiac massage continued, the patient shifted

to OT where emergency sternotomy was done. A large hematoma was seen anterior to the heart, left pleural cavity was full of blood. Continuous bleeding was seen from the arch of aorta, which was controlled. The patient was taken on right atrial venous cannula, a cardioplegia needle was inserted into ascending aorta for delivery of cardioplegia. Cardioplegia was perfused to heart after applying aortic cross clamp. The aortic rupture site was identified and repaired with prolene sutures. The patient was transfused blood. After aortic repair, high ionotropic support was started, weak cardiac contractibility came and despite high ionotropic support, patient had very low BP. Surgical wound was closed and patient was shifted to ICU. High end ionotropic support was continued but low BP persisted. The patient developed cardiac arrest and was declared dead after about 15 hours of being admitted. No foreign body/projectile was reported in any radiological investigation or the surgical procedure undertaken.

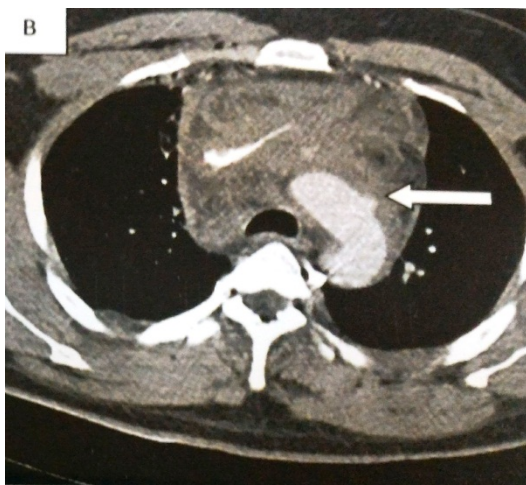


Figure 1. Multi-detector computed tomography (MDCT) showed a large mediastinal hematoma with active contrast leak from arch of aorta

2.1.2. Autopsy Findings:

Pre-autopsy X-ray chest, x-ray skull and x-ray abdomen were carried out in the mortuary. X-ray abdomen showed a hypodense metallic shadow in the lower middle abdomen slightly to the left.

A midline sternotomy incision was present with surgical staples present underneath, the right posterior shoulder region (entry wound as described later) was bandaged. Post-mortem staining was present over the back; Rigor mortis was in developing stage.

An entry wound of firearm over the postero-lateral aspect of right shoulder just abutting posterior axillary line of size 2 x 1.5 cm was present; it was slightly oblong in shape, 14 cm from right acromion process, 29 cm from mid line of the back and 152 cm from the right heel. Margins of the wound were irregular, contused, ragged with an abrasion collar over supero-lateral border (of width 0.5 cm). The inferior border of the wound showed tagged skin while lateral border showed an undermined, depressed and somewhat regular oval border. The wound track was directed medially, to the left and downwards fracturing supero-medial border of right sided 1st rib with fractured bony ends showing blood infiltration in exposed bone trabeculae. The track further entered right thoracic cavity to rupture and enter arch of aorta which was found to be surgically sutured at two places. The track then

travelled downwards through thoracic aorta to enter the abdominal cavity (no other wound was noted in thorax or diaphragm), it ruptured the first part of duodenum near pancreas and again in the second part of duodenum (in midline). It then ruptured the common iliac artery on right side and the bullet was found to be lodged in its lumen just short of the bifurcation into external and internal iliac arteries. (Figure 2, Figure 3 & Figure 4) The bullet was metallic and deformed with tip to base length 1.75 cm with straight/vertical secondary markings on the body of the bullet. (Figure 5) The abdominal cavity was full of dark red blood clots.

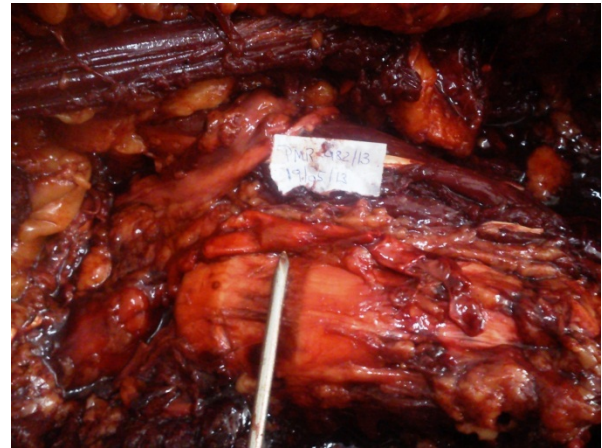


Figure 2. Bullet in the lumen of the common iliac artery in the abdominal cavity



Figure 3. Bullet in the lumen of the common iliac artery after dissecting it out



Figure 4. Bullet visualized in the lumen of the common iliac artery.



Figure 5. Bullet after removal from the body

3. Discussion:

The abdominal aorta begins at the aortic hiatus of the diaphragm, in front of the lower border of the body of the last thoracic vertebra (T-12), and, descending in front of the vertebral column, ends on the body of the fourth lumbar vertebra (L-4), commonly a little to the left of the middle line, by dividing into the two common iliac arteries. It diminishes rapidly in size, in consequence of the many large branches which it gives off. [3]

First described in 1834, foreign body embolisation is a rare complication of penetrating wounds with bullets being the commonest artifact with a quoted incidence of 0.3%. A bullet embolus should be suspected in any patient who has a gunshot wound without an exit wound, when the signs and symptoms do not correlate with those expected from the suspected course of the missile and when radiological investigations show that missile location deviates from the path of penetration. [4]

Slobodan et al comment that examination of such cases, especially if X-ray equipment is not available is a tedious and tricky job. As in all other cases in which initial bullet trajectory is changed in the body, the very important part of the medico-legal autopsy in cases accompanied with missile embolism, is to determine direction of the first part of the bullet's trajectory, because this indicates the position of the axis of the weapon barrel in the moment of firing (if there was no external ricochet), taking into consideration the posture of the victim and the location of the shooting person in the same moment. They have reported a case of popliteal artery embolization with interesting trajectory of projectile through the chest wall and right heart ventricle into the aortic lumen. [5]

The diagnosis and management of penetrating wounds of the great vessels continues to be a major surgical challenge. Their presentation varies from moribund patients to completely stable ones in whom the diagnosis is often missed unless subtle clues are noted. [6]

Cysne et al have reported two clinical cases of bullet embolism into the cardio-vascular system. The second case reports a projectile wound to the anterior right shoulder with eventual bullet embolism in the left iliac artery. [7]

Penetrating cardiac injury (PCI) frequently causes hemorrhage and cardiac tamponade. However peripheral

embolization is very rare. In this manuscript one of the rare case of bullet embolism in the right external iliac artery, which occurred after cardiac gunshot wound is reported under the light of literature. [8]

Engelgardt et al report that bullet embolism is an uncommon consequence of penetrating firearm injuries, rarely observed in everyday forensic practice. The present report presents two cases of gunshot bullet embolism. The first examined case is a contact gunshot wound with the entry wound situated at the back of the victim. The wound channel terminated in the thoracic aorta, where from, in keeping with the blood flow, the bullet was transported into the left common iliac artery. The second case pertains to a gunshot in the head, with the bullet shot from a point blank range. The wound channel had a downward course and terminated in the superior vena cava at the level of the pericardium, where from the bullet was transported down the inferior vena cava to the right femoral vein. [9]

Bullet penetration of the abdominal aorta or its major branches with peripheral embolization has previously been reported in 25 cases. Such penetration is not always fatal. If the bullet is not small enough, carries sufficiently small energy and the aorta is elastic enough, the wound of entry may close without exsanguinations. The vessel entrance has usually been located during laprotomy. The bullet has always been lodged in a lower extremity, when the entrance site is in the abdominal aorta. It has previously been stated that the majority of emboli locate to the left lower extremity as the left common iliac artery forms a more direct continuation of the abdominal aorta. [10] The same was noted in the instant case.

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