

## Pellet Embolus in Ulnar artery - A rare vascular Injury

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### ABSTRACT

Intravascular embolization of bullets and other foreign bodies is a rare complication of penetrating trauma. It can represent a diagnostic challenge because it may present in various and unexpected ways. We report the case of a 65-year-old male who sustained shotgun pellet emboli to left ulnar artery following a right and left upper extremity gunshot injury.

**Key words:** Shotgun injury; Pellet embolization; Extremity trauma

## INTRODUCTION

Pellet embolization although rare, should be considered in evaluating patients with gunshot wounds, particularly if there are anomalous symptoms or the projectile is not found in the original, or expected, location. Arterial and venous pellet emboli produce contrasting clinical effects. Close attention to the location of the foreign bodies on serial radiographs may reveal the diagnosis of intravascular embolization.

## CASE REPORT

A 65-year-old man was brought in as an emergency following an history of shotgun injury at close range to the lateral aspect of the both right and left forearm. He was hemodynamically stable on admission. On examination patient was conscious, oriented, Pulse 100/min regular blood pressure 140/80 mm of Hg. Gr

III compound fracture right & Left forearm with segmental loss of right radius. Right radial artery was ligated. No sensation in the distribution of both radial nerve. Decreased sensation in distribution of right median nerve. large (5x7x8 cm) wound lateral aspect extend to dorsomedial aspect of right forearm with extensive musculotendinous injury and another wound over left forearm about (3x5x7 cm) with musculotendinous injury. Capillary refill seen SpO<sub>2</sub> Right-92%, Left-90%. A hand-held Doppler probe detected triphasic signals over the brachial artery at the elbow and monophasic signals over the arteries at the left wrist. A plain radiograph demonstrated a comminuted left and right radius fracture with multiple shotgun pellets projected over the right and left upper arm and forearm (Figure-1). CT angiography demonstrated Multiple tiny metallic



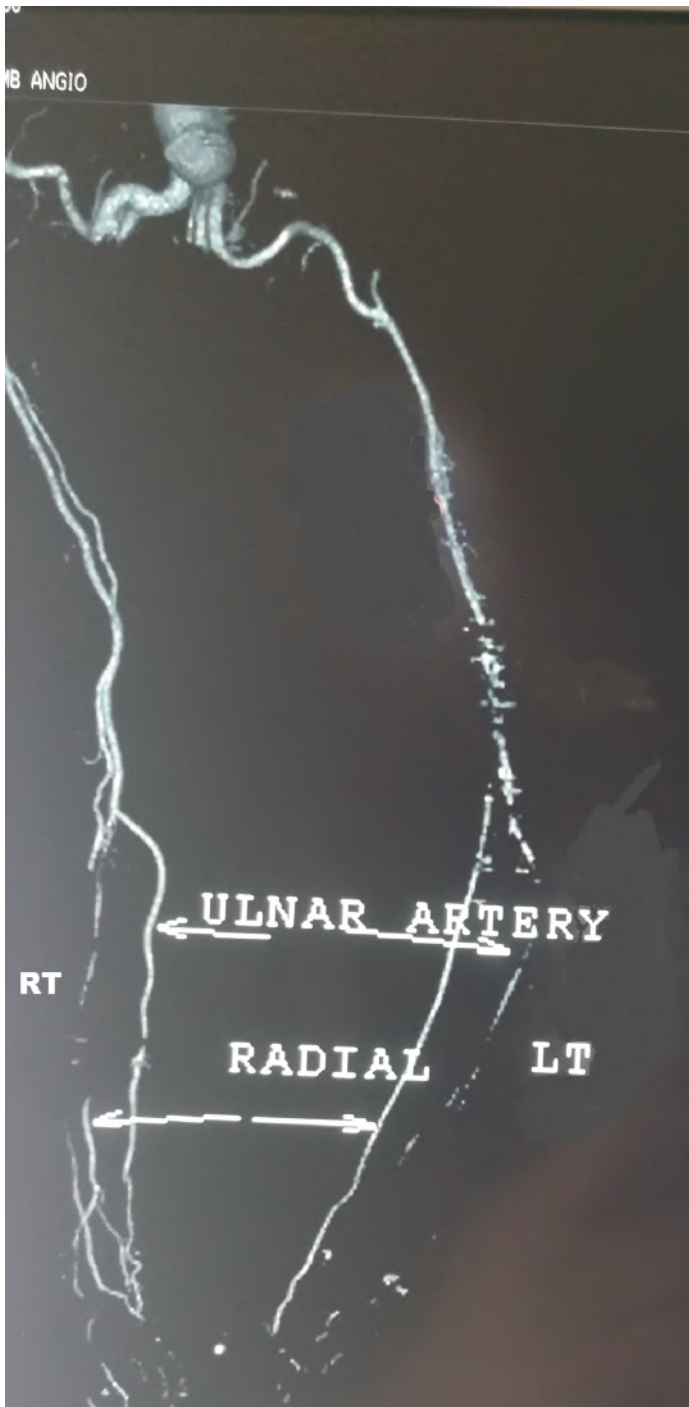
**Figure. 1:** X-ray Left forearm AP & Lateral view showing numerous Pellets within the soft tissue of forearm.

foreign bodies-suggestive of pellets are seen in the soft tissues of left arm and forearm and right forearm causing Beam Hardening artifacts. Oblique fracture of upper shaft of left radius is seen. Approximately 3 cm length of mid shaft of right radius is not visualized with suggestion of large soft tissue and skin loss (Figure-2). Right subclavian, axillary, brachial and ulnar arteries do not show any vascular injury. The right radial artery has high origin from brachial in arm. Mid part of the right radial artery in forearm is not visualized; however, no active contrast extravasation



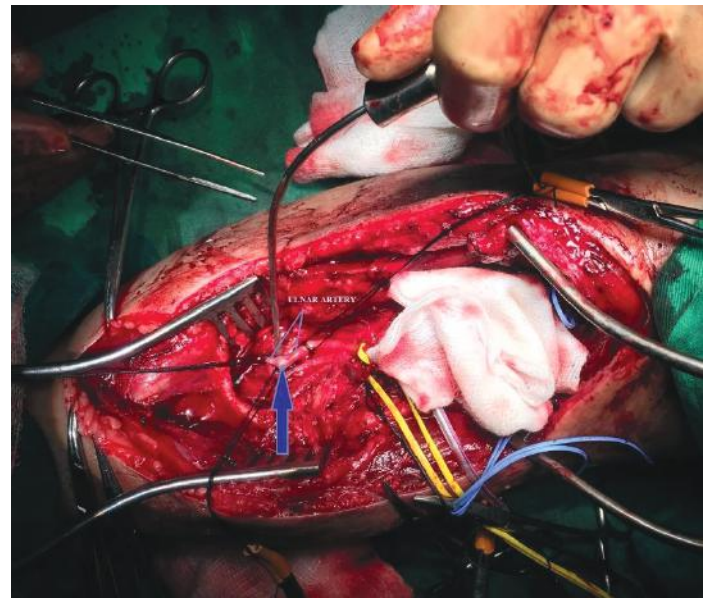
**Figure. 2:** Reconstructed radiographic image showing comminuted left and right radius fracture.

or major vascular injury identified. Distal right radial and ulnar arteries appear normal. Left subclavian, axillary, brachial and radial arteries are patent and do not show any vascular injury. No contrast seen in Left ulnar artery after proximal part (Figure-3).



**Figure. 3:** Reconstructed angiographic image of both upper limb showing absence of contrast in left ulnar artery distally

Left brachial artery exposed. Fogerty catheter passed both proximal and distally to Radial and Ulnar arteries. Ulnar artery could not be negotiated as catheter could not enter after 5 cm. A metallic hard object palpated in



**Figure. 4:** Per-operative picture of dissected left forearm showing Pellet (Blue arrow) embolus in Ulnar artery.

proximal Ulnar artery which was exposed and a pellet along with thrombus removed (Figure-4).

Ulnar artery repaired and good flow ensured. Post-operative recovery was uneventful. Subsequent follow-up at OPD demonstrated a fully functional hand with normal pulses and no evidence of further embolism.

#### DISCUSSION

Vascular trauma following shotgun injuries may involve laceration of the vessel wall, pseudoaneurysm, arteriovenous fistula or missile embolism. Missile embolization can represent a diagnostic challenge as it may present in a variety of ways, with manifestations that are unexpected based on the entrance site and presumed trajectory of the bullet. There are several historical reports of bullet embolization in the literature<sup>1,2,3</sup>. In 1920 Fry, a British pathologist, reported the case of a soldier shot below the left anterior superior iliac spine by a German bullet, which entered the left internal iliac vein and embolized to a left lower lobe pulmonary artery branch where it caused infarction<sup>1</sup>. More recent examples of bullet embolization to the pulmonary artery have also been reported. Agarwal et al. report the case of a bullet that entered from the right internal jugular vein emigrated to the left pulmonary artery<sup>4</sup>. Nehme reports the case

of a bullet migrating from the superior sagittal sinus to the left pulmonary artery<sup>5</sup>. Goldman and Carmody report two cases of pulmonary embolism secondary to gunshot wounds to the head, in which the foreign body emboli originated from the cranial venous sinuses<sup>6</sup>. Chen et al. report the case of a gunshot wound to the left flank resulting in bullet fragment embolization to the heart and left pulmonary artery via the inferior vena cava<sup>7</sup>. Most previous reported cases of missile embolization to the pulmonary artery describes a single embolus. Goldman and Carmody report a case in which multiple bullet fragments embolized to a single lobe of one lung, the left upper lobe (lingula)<sup>6</sup>. Foreign body emboli may be classified as arterial, venous, or paradoxical. Arterial emboli often result in ischemia, are symptomatic, and are discovered early. In contrast to arterial emboli, venous emboli are often asymptomatic and may not be recognized until later, if and when they result in vascular injury or obstruction<sup>8</sup>. Missiles may embolize antegrade within the vascular system, such as from peripheral veins to the heart and pulmonary arteries or from the aorta to peripheral arteries. Alternatively, they may embolize retrograde against the flow of blood due to gravity, such as from the right heart down the inferior vena cava. Paradoxical embolization is rare, and occurs when the missile embolizes from the venous system to the arterial system through a right to left shunt such as a cardiac septal defect<sup>9</sup>. Overall, missile embolization in the setting of vascular injury is quite rare. Rich et al report missile embolization occurred in 22 of approximately 7,500 (0.3%) of patients in the Vietnam Vascular Registry who sustained vascular trauma in United States military activity in Southeast Asia. Among this group, whole bullet embolization occurred in 14% and fragment embolization occurred in 86%. Arterial embolization was more common, occurring in 82% compared to venous embolization in 18%. 18% of emboli were located in the heart, 18% were located in the pulmonary artery, and 64% were located in systemic arteries<sup>10</sup>. Mattox et al report 28 cases of intravascular bullet emboli. Of these, 36% were from the thoracic or abdominal aorta to a peripheral artery, 25% were from peripheral veins to the pulmonary artery, 18% were from peripheral veins to the heart, 11% were from the heart to a peripheral artery, and 7%

were from the heart to the hepatic or renal vein via the inferior vena cava. One case (4%) was paradoxical from the inferior vena cava to the right atrium, then to the left atrium and thereafter into the abdominal aorta. The gender ratio in the series was 3:1 male to female<sup>9</sup>. The clinical presentation is often confusing, with signs and symptoms that do not correspond to those expected based on the missile's apparent course<sup>9</sup>. If the number of entry wounds does not match the number of exit wounds and the missile is not found in the expected location radiographically or surgically, embolization should be considered. If a missile is discovered in an unexpected location based on an observed entry site and expected trajectory, this too should raise suspicion, assuming there has not been a prior history of ballistic injury to account for the finding. Close attention should be given to the location of the foreign bodies on serial radiographs, as this may enable the detection of intravascular embolization. CT can be useful to confirm that the foreign bodies are in fact within the vascular system and determine their exact location. Risk factors for missile embolization include a history of gunshot wound, other penetrating missile trauma, and vascular injury associated with the trauma. The presence of a right to-left shunt, such as a cardiac septal defect, is a risk factor for paradoxical embolization. The management of intravascular missile emboli depends on the clinical situation. If the missile embolus is symptomatic, removal via an endovascular approach may be attempted. In situations where the symptomatic embolus is large or not easily accessible via an endovascular approach, operative removal may be necessary.

## CONCLUSION

Shotgun injury to the extremities may cause vascular trauma but intravascular missile embolism is relatively rare. A high index of suspicion and close attention to the location of bullets and other missile projectiles on serial radiographic examinations can enable the radiologist to detect intravascular embolization of the objects. Thorough assessment aided by appropriate radiographic imaging is the key to successful management.

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