

# Shot to the Heart and Weak in the Legs

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## Background

- Intravascular ballistic embolization is a rare complication of missile injury.
- The true incidence of bullet embolism in the civilian population is unknown. Most of the incidence literature describe this phenomenon in war time. During the Iraq and Afiganistan War, bullet embolism was estimated at 1.1 %
- Missile embolism occurs when the bullet has enough kinetic energy to penetrate a vessel but not enough energy to exit through the opposing wall and once the projectile reaches a distal site where the diameter of the missile is greater than the housing vessel, it can cause occlusion.

## Objective

To elucidate the diagnosis and management of arterial bullet emboli from penetrating trauma and literature review of the same.

## Case Presentation

17yo Male presents as level one trauma with penetrating injury to the left chest adjacent to the sternum.

GCS15, HR150's, BP 90/50, RR 20, Temp 98.5F

Ancillary imaging after primary survey reveals pericardial fluid on FAST exam along with a widened mediastinum (Figure 1) and foreign projectile between L2/L3 region on KUB (Figure 2).

Sentinel operation was trauma laparotomy and midline sternotomy. Findings included through and through innominate vein and ascending aorta penetrating injury.

A return to the OR for an aortoiliac exploration and retrieval of foreign body was performed after CT demonstrated retained intravascular projectile (Figure 3).

Fogarty embolectomy, and bovine patch aortoplasty was performed.

Patient required RLE fasciotomy for compartment syndrome during hospital stay

Patient was discharged home with follow up in clinic.

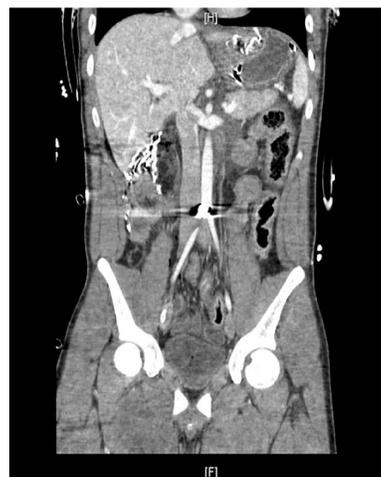
## Images



•Figure 1: Index CXR with wide mediastinum



•Figure 2: KUB with retained projectile



•Figure 3: CT demonstrating intravascular projectile

## Discussion

- Most arterial bullet emboli exhibit anterograde migration, following the direction of the blood flow in the affected vessel
- The physics of the bullet embolism was clearly described in a paper published in 1989 by Patel et al.
- The projectile must be able to travel to the subject with a kinetic energy exceeds the force necessary to penetrate clothing, skin, soft tissue, organs, and a single vessel wall. The missile must also lose its kinetic energy at the very moment it enters the lumen of the vessel in order to embolize and travel into a vessel with an overall diameter smaller than the diameter of the vessel.
- When the projectile reaches a vessel of smaller diameter, it occludes it causing critical limb ischemia, sepsis, thromboembolism, vessel wall erosion
- The emboli have also been seen to migrate to the coronary circulation and even the pulmonary circulation causing other potential lethal.

## Conclusion

- Bullet embolisms are more frequent in the venous circulation when compared to the arterial embolisms and direct cardiac injury. The missile embolisms in the arterial circulation are more likely to become symptomatic causing critical distal ischemia while venous emboli are more likely to end up in the cardiac or pulmonary circulation.
- The majority of the bullet embolisms are of smaller caliber weapons. Perhaps more common are missile emboli of bullet fragments or shotgun shot rather than single high caliber and high velocity weapons.

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