

## Introduction

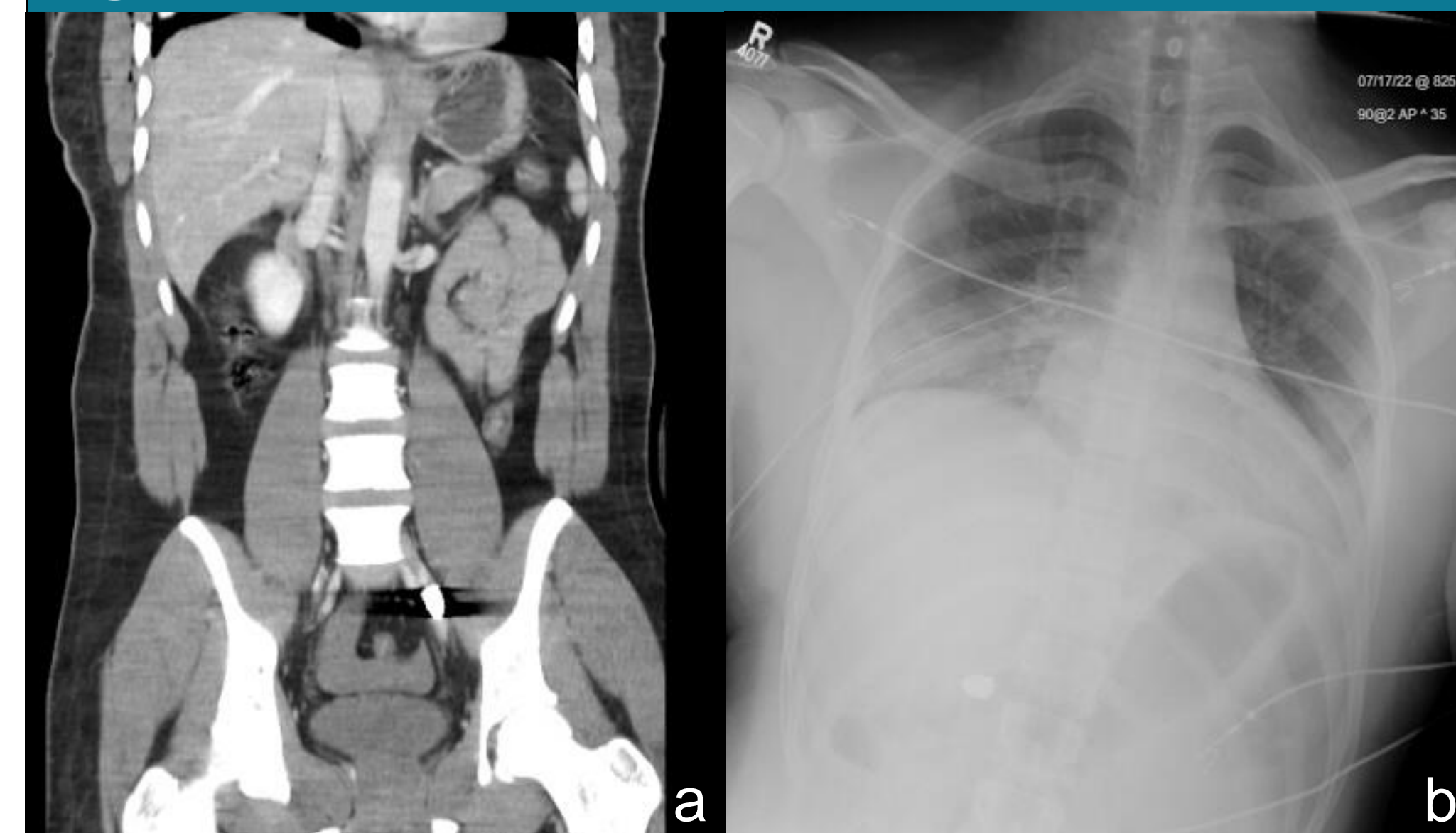
Gunshot wounds (GSW) account for significant morbidity and mortality in the United States. A rare and potentially fatal complication of GSW is a missile embolus (ME). The incidence of actual ME was reported as 0.04% during the Vietnam war and 0.3% during the Afghanistan war (1,2). ME can be subdivided into arterial, venous, and paradoxical (3). Arterial embolism can result in distal limb ischemia, coronary infarct, renal infarction and stroke. Venous embolism can result in pulmonary embolization, cardiac valvular injury, thrombophlebitis, and dysrhythmias (4,5). A thorough physical exam and appropriate imaging is vital as the repercussions of missed injuries can be devastating. The incidence of arterial ME was estimated to be four times venous ME but more recently seen to be more equal (1,5). We have one case of venous ME and one of arterial ME to report.

## Case Report

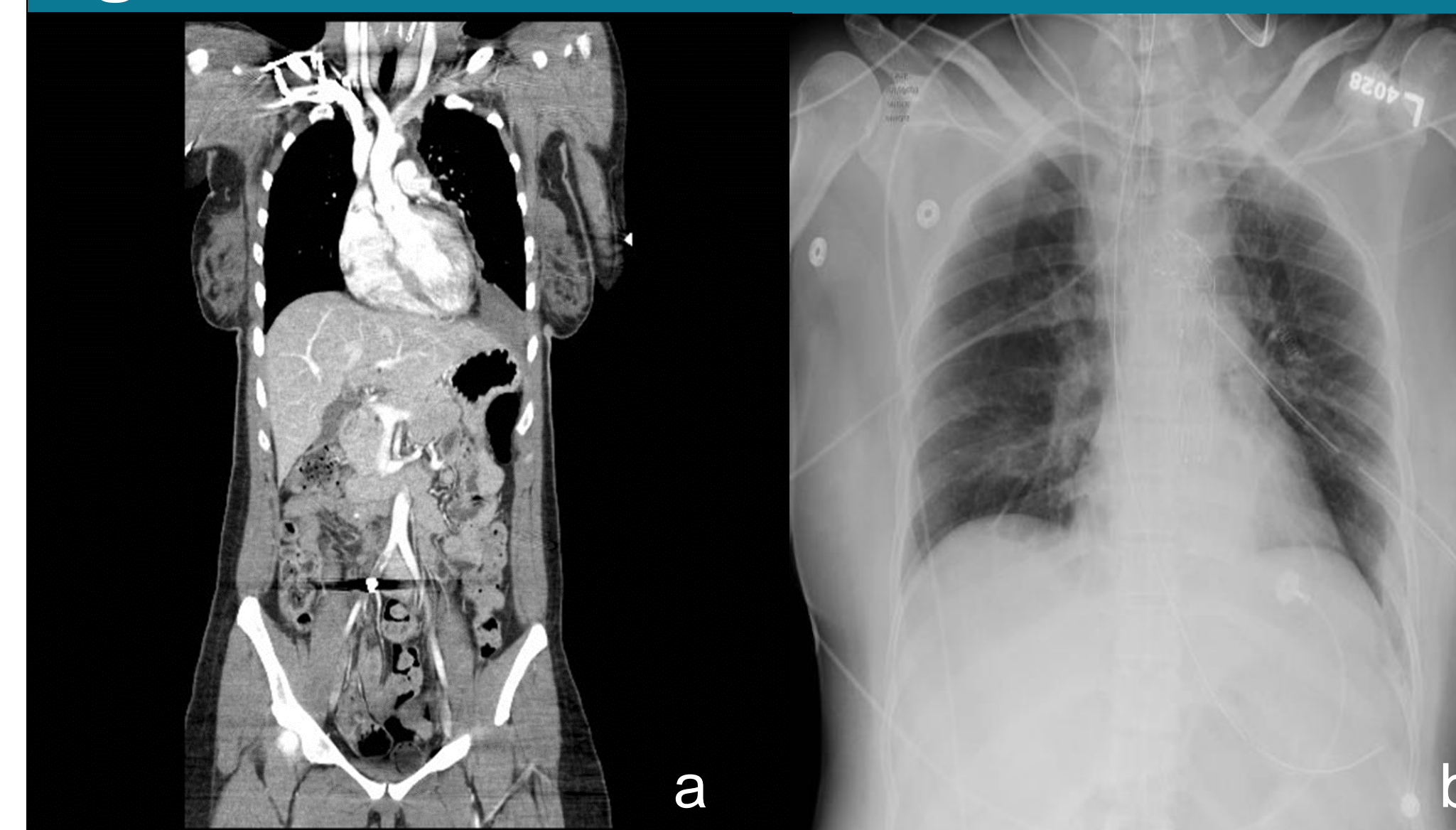
A 25-year-old male sustained a GSW to the anterior right chest. The patient required a right tube thoracostomy and blood transfusion with improved hemodynamics. His computed tomography (CT) demonstrated a right hemopneumothorax, a grade 5 liver injury with probable intrahepatic inferior vena cava injury, and a ballistic missile in the left external iliac vein (Figure 1a). A subsequent CXR revealed migration of the ballistic missile to the right upper quadrant of the abdomen (Figure 1b). The patient underwent successful percutaneous retrieval of the ballistic, which was found to be in the right renal vein. His chest tube was removed and he was discharged post-injury day 3 with aspirin in improved condition.

A 25-year-old female sustained a GSW to the left back. She was hemodynamically normal and CXR was unremarkable with no missile found. She was found to have no right femoral or pedal pulses. A CT revealed a left hemothorax and the missile in the right external iliac artery (Figure 2a). The patient underwent a left tube thoracostomy and the missile was removed percutaneously with a TEVAR placed over the aortotomy (Figure 2b). Her chest tube was removed and she was discharged post-injury day 5 with aspirin in improved condition.

### Figure 1 – Venous Missile Emboli



### Figure 2 – Arterial Missile Emboli



## Discussion

ME is a rare complication of GSWs, which can be associated with significant morbidity and mortality. It must therefore be recognized in a timely fashion. More recently, Kuo et al found that venous embolism was more common, 56%, than arterial embolism (5). As it was previously thought to be mainly arterial, 80% (3,4). It was found that there was a higher risk of symptomatic ME in the left circulation, 74%, versus the right circulation, 14%. Overall, the most common complication being ischemia (5). Surgical embolectomy and endovascular retrieval are the preferred treatment for any ME in the left circulation, right circulation in a symptomatic patient or right circulation in an asymptomatic patient found to have a right to left shunt. Overall, endovascular retrieval has been found to be successful in 63% of cases with 57% requiring vascular cutdown (5). For patients found to have a ME in the right circulation who are asymptomatic with no right to left shunt, observation is an option (4,5). We report a BE within the right sided and left sided circulations, both of which were successfully treated with endovascular retrieval.

## Conclusion

Missile embolus is a rare complication of gunshot wounds and requires prompt recognition. After ballistic injury all missiles should be accounted for with a thorough physical exam and appropriate imaging. Surgical embolectomy and endovascular retrieval are the preferred treatments. Asymptomatic right circulatory BE without a right to left shunt can be managed conservatively and should be discussed thoroughly with the patient.

## References

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