

# Traumatic thoracolumbar projectile with concomitant vertebral body and aortic injury

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## ABSTRACT

Penetrating subdiaphragmatic aortic trauma is associated with high morbidity and mortality with studies having reported a 50%-70% associated mortality. We describe a case of a patient with a subdiaphragmatic aortic injury caused by a 7.4-cm common nail that traversed through his L1 vertebral body into the aorta. His aortic injury was managed jointly with vascular surgery and neurosurgery teams. (*J Vasc Surg Cases and Innovative Techniques* 2020;6:490-2.)

**Keywords:** Penetrating aortic injury; Retroperitoneal; Aortic trauma

Penetrating subdiaphragmatic aortic trauma is associated with incredibly high morbidity and mortality with previous studies having reported approximately 50%-70% associated mortality.<sup>1-6</sup> Patients who are fortunate enough to arrive alive at the hospital with these injuries, can be diagnosed clinically with confirmatory radiologic studies such as computed tomography angiography. Prompt identification of the mechanism of injury, concomitant injuries, and, if indicated, surgical treatment are paramount to achieving a successful outcome. We report a patient who presented with a 7.4 cm common nail that penetrated his aorta posteriorly through his L1 vertebral body. Primary aortic repair via a retroperitoneal approach was performed in conjunction with neurosurgery with successful retrieval of the nail. The patient agreed, in writing, to publication of his case details and images.

## CASE REPORT

A 48-year-old man with no significant past medical history presented acutely after he had a mechanical fall 5 feet off a ladder onto a loaded nail gun. The projectile was discharged into his mid back. He did not lose consciousness or sustain any other injuries. On arrival, the patient was hemodynamically stable. His only pertinent physical examination finding was a posterior punctate puncture wound directly over his mid spinal column and

associated point tenderness. Neurologic examination revealed intact motor and sensory function of bilateral lower extremities. Owing to the mechanism and location of the injury, a computed tomography angiography of the chest, abdomen, and pelvis was performed. Imaging demonstrated a nail that traversed through the L1 vertebral body through the right L1 pedicle and tangentially through the spinal canal (Fig 1, A, B). The tip seemed to terminate within the aortic lumen directly posterior to the celiac artery. There were no signs of active extravasation.

Given the hemodynamic stability of the patient, a discussion between vascular surgery, neurosurgery, and trauma surgery determined the safest plan. Initially, both endovascular and open management were considered. The location of the nail, in zone 6, prohibited a straight forward thoracic graft placement owing to the celiac artery. Therefore, the decision was made to perform a retroperitoneal aortic exposure, to allow for optimal aortic control and repair, as well as foreign body removal.

The patient was positioned in the right lateral decubitus position enabling access to the entry site and allowing a retroperitoneal exposure. A retroperitoneal incision was made through the 9th rib space to expose the subdiaphragmatic aorta. No obvious bleeding was encountered and the celiac and superior mesenteric arteries were isolated and controlled. The aorta was retracted anteriorly and there was an obvious puncture of the aorta with provoked hemorrhage. This was controlled with DeBakey forceps and repaired primarily with 4-0 Prolene suture without the need for aortic clamping. The nail was visualized adjacent to the aortic puncture site (Fig 2). Under direct visualization, the nail was exposed posteriorly and extracted using a Leksell Rongeur clamp by the neurosurgery team (Fig 3). There was no obvious leakage of cerebrospinal fluid to suggest dural leak and no further neurosurgical intervention was needed.

His postoperative course was uneventful and the patient completed a 3-day course of vancomycin and cefepime for vertebral osteomyelitis prophylaxis and received the tetanus diphtheria and pertussis vaccine. On postoperative day 4, the patient was discharged. At his 1-month follow-up appointment, the patient demonstrated a well-healing surgical incision and was without any neurologic or vascular deficits.

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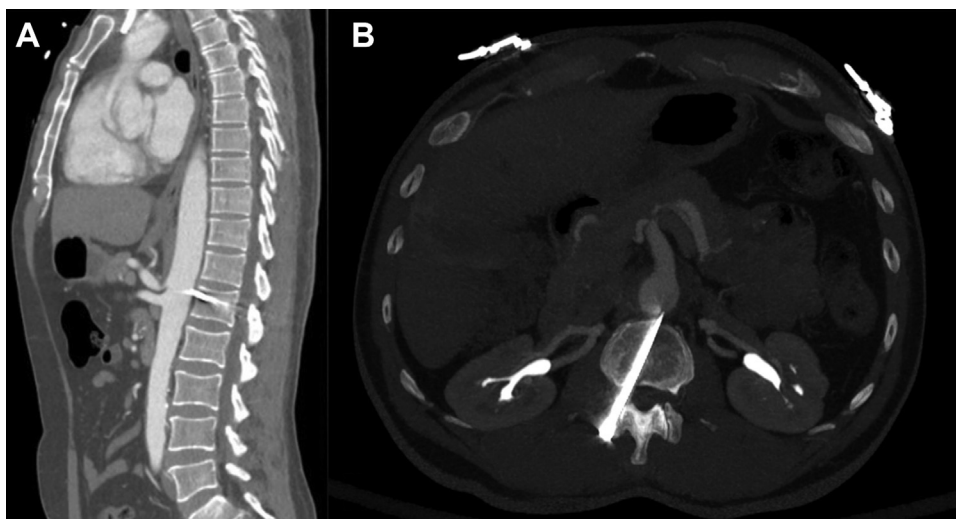
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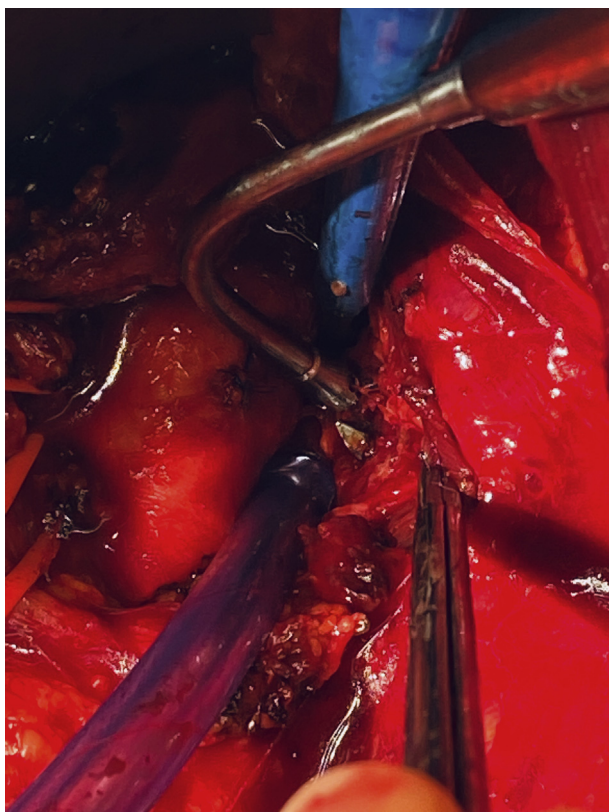
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**Fig 1.** A, Computed tomography angiography (CTA) of the chest, abdomen, and pelvis, sagittal view of projectile tip imbedded within the aorta at L1, at the level of the celiac artery. B, CTA axial view of projectile traversing through the spinal canal.



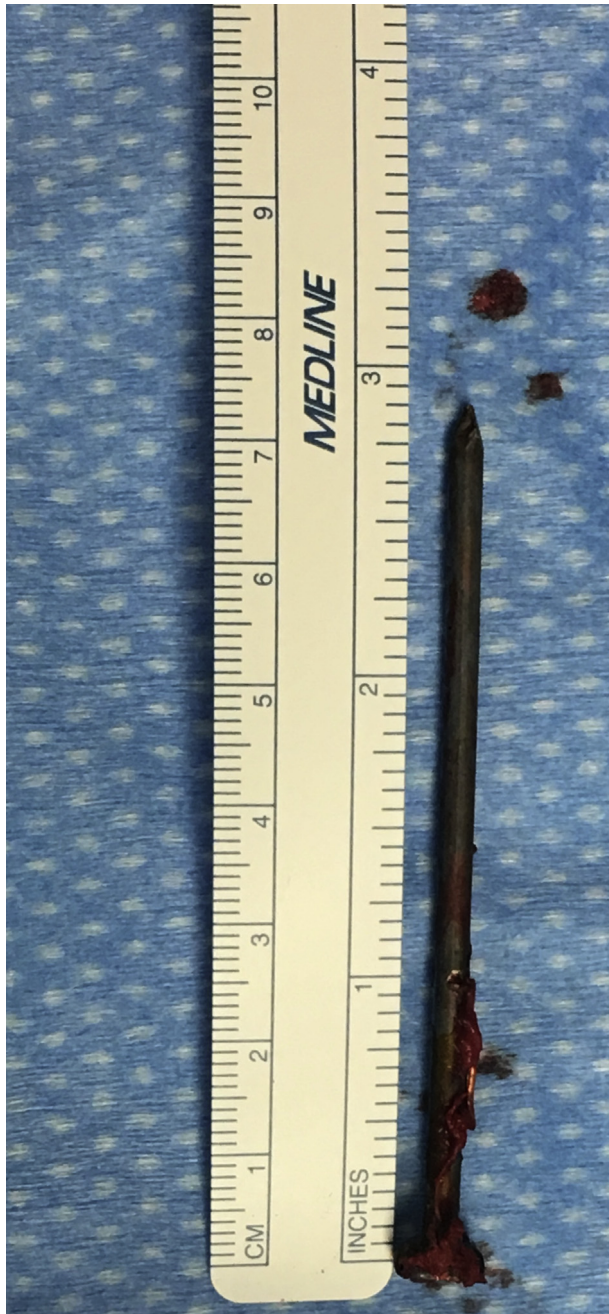
**Fig 2.** In situ, projectile tip with repaired aorta in view.

## DISCUSSION

Penetrating aortic injuries often present as surgical emergencies with associated hemodynamic instability secondary to hemorrhagic shock. A large retrospective review of 129 patients demonstrated significant survival benefit when a contained hematoma is present compared with free hemorrhage, 35% vs 90%.<sup>1</sup> Furthermore, the location of the aortic injury has demonstrated significantly different outcomes, with more proximal injuries corresponding with higher mortality.<sup>1</sup> Last, multiple vascular injuries were associated with further elevation of mortality as high as 79%, compared with just 46% with no other associated vascular injuries.<sup>1</sup>

Our patient's injury was at the level of L1, directly posterior to the celiac artery and was without frank hemorrhage on a computed tomography scan. This vascular injury was the only one identified. He was hemodynamically stable, with no vasoactive medications needed to support his blood pressure, allowing for a controlled plan by three different specialties. The precarious location of the nail did not allow for an endovascular solution prompting a multispecialty open surgical approach.

Once the extent of the patient's aortic injury was identified, proper anatomic exposure became critical. In the endovascular era, open aortic case volumes have decreased as much as 76% with concurrent decreases in resident trainee aortic case volumes as well.<sup>7,8</sup>



**Fig 3.** Extracted 7.4 cm common carpenter's nail.

Fortunately, the ability to perform the retroperitoneal exposure allowed for optimal patient positioning for both vascular and neurosurgical teams. Furthermore, it afforded the surgeon excellent aortic visualization for definitive repair.

### CONCLUSIONS

This case highlights the advantage of a multidisciplinary team approach to provide optimal patient care at a level one trauma center. Moreover, this case report demonstrates the continued need for excellent open aortic training for vascular residents as the number of open aortic cases continues to downtrend.<sup>7,8</sup> The ability to confidently expose the aorta via the retroperitoneal approach should be part of the vascular surgeons' armamentarium for both basic and precarious scenarios.

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