

# Crossbow injury to the neck

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Crossbow injuries are uncommon among penetrating trauma. The tendency for a crossbow bolt to remain in situ appears to limit catastrophic haemorrhage despite the involvement of major vessels.<sup>1</sup> Here we report our experience with an injury to the left internal jugular vein by a crossbow bolt. The injury was successfully treated by emergency neck exploration

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## Case report

A 49-year-old man presented to our emergency department (ED) with a crossbow bolt impaled his left anterior neck. This was a close-range self-inflicted injury in an attempted suicide (Figure 1, upper part). Paramedics intubated the patient in the field and then transported him to our ED. Vital signs on arrival were as follows: pulse 82 beats/min; systolic blood pressure 134 mmHg (after administration of 1 L of normal saline); oxygen saturation 100% (FiO<sub>2</sub>, 0.4) and respiratory rate 28 breaths/min (under sedation). Anteroposterior and lateral X-ray revealed that the bolt was impacted in the left neck just lateral to the vertebral body of cervical spine 3 and 4 (Figure 1, lower part). The patient remained haemodynamically and neurologically stable during his evaluation in the ED. Computed tomography Angiography (CTA) was not performed because of a history of severe iodine allergy. Pre-contrast protocols would be time consuming and delay definitive management if vascular or aerodigestive injuries were present. In the absence of hard signs of arterial injury the decision was taken for operative management and exploration to remove the bolt.

With the projectile still in place, routine anterior sternocleidomastoid incision was made. On deep dissection, the projectile was found to have passed through left sternocleidomastoid muscle, both anterior and posterior walls of the internal jugular vein, and impacted into the

paravertebral fascia. The bolt travelled medial to the left common carotid, lateral to the left vertebral artery canal and was away from the oesophagus (Figure 2, upper part). Proximal and distal control of the carotid and jugular vessels was achieved. After removing the bolt (Figure 2, middle and lower part), primary venous repair was considered but due to the extent of the injury (greater than 50% of the vessel circumference) suture ligation was felt to be the safest option. The wound was closed in layers and a 6.4 mm closed suction tube drain was left in situ. The patient's postoperative course was uneventful, and he was discharged after psychology assessment on postoperative day 3.

## Discussion

There are two main types of arrow tips, a broad-head tip and a conical field tip. While the broad-head tip is designed to cause haemorrhage and is commonly used in hunting, the conical field tip is commonly used to practise shooting.<sup>2</sup> Most civilian crossbows are used only at shooting ranges by hobbyists and not hunters. In this case, the arrow had a conical field tip. If a broad-head tip had been used, extraction of the tip would have been much more difficult and usually requires large incision to open a tract to pull the bolt out along the trajectory of its entry. Crossbow injuries cause damage by direct tissue penetration of the arrowhead. Unlike gunshot wounds, cavitation does not occur because of the low kinetic energy in such injuries. Bleeding from the wound is also uncommon because the surrounding soft tissue is elastic and narrows or closes the wound track, thereby acting as an incomplete tamponade.<sup>2,3</sup>

In standard practice in the investigation of patients with impaled projectiles, good quality cross-sectional imaging with angiography is beneficial to assess the depth, delineate injured structures and the extent of injury. In this case, a contrasted



*Figure 1. upper part: Preoperative photograph of the injury  
lower part: Initial neck X-ray (A-P and Lateral)*

CTA of the neck was not performed due to the evidence of a significant iodine allergy; an un-contrasted CT may have indicated the trajectory of the projectile to suggest possible structures injured. In our setting, access to the CT suite is not always possible, hence the decision to explore rather than wait for any further special imaging. Magnetic resonance angiography (MRA) was not considered because of time constraints and the possibility that the bolt was composed of magnetic material.

Although veins can be repaired safely, their repair is tedious and time consuming. In the clinical scenario of an unstable bleeding patient, ligation of veins has stood the test of time. The decision to ligate or repair weighs the risk of thrombosis with ligation against the risk of prolonged surgery to repair. The risk of clot propagation with surgery and ligation of the internal jugular vein has been shown to carry a risk of only 2.7% of cerebral vein or dural sinus thrombosis.<sup>4</sup>



*Figure 2. upper part: Operative photograph (before removing the bolt) middle part: Operative photograph (after removing the bolt) lower part: The aluminium arrow was 14-inch long and 8 mm in diameter.*

## Conclusion

Penetrating injuries related to crossbow bolts are rare. Even rarer are self-inflicted injuries. The conical field tip is less likely to cause exsanguination as soft tissues are pushed aside as the projectile tip moves through and tamponades injured vessels. Cross-sectional imaging forms a vital part of pre-operative workup but in a select group of patients, like the case presented, surgical exploration without special imaging is required.

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