Clinical Case Report

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Penetrating neck trauma caused by a rebar

A case report

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Abstract

Rationale: Penetrating neck trauma has a mortality of 3% to 6% and is associated with serious complications, mainly due to the high density of vital structures in this area and the lack of corresponding protection from bone.

Patient concerns: A 55-year-old man who suffered neck trauma involving the parotid gland, caused by a rebar, after suffering a fall from the second floor of a building.

Diagnoses: Penetrating neck trauma.

Interventions: The patient underwent a neck exploration under general anesthesia in the emergency operating room and tracheotomy was performed prophylactically.

Outcomes: The foreign object was ultimately removed successfully with no complications.

Lessons: We concluded that computed tomography (CT) and three-dimensional reconstruction of the CT images can be a viable method to exclude macrovascular injury for patients who are in an emergency condition and are not eligible for computed tomography angiography (CTA). A chest tube could be used as an option for the removal of foreign bodies in the case of sharp or rough objects (such as spiral foreign bodies), when fully exposing the foreign body and its track.

Abbreviations: ALTS = Advanced Trauma Life Support, CT = computed tomography, CTA = computed tomography angiography, mm Hg = millimeters mercury.

Keywords: foreign body, neck, penetrating trauma

1. Introduction

The neck is an area susceptible to injury, because of the high density of vital structures and the lack of corresponding protection from bone except for the cervical vertebrae. The morbidity and mortality of penetrating neck trauma are reported to be 5% to 10% and 3% to 6%,[1–3], respectively, the main cause of death being massive hemorrhage from damaged blood vessels.[3,4] The management of penetrating neck trauma has undergone a shift from mandatory exploration to selective management. Selective operative management of patients with penetrating neck trauma based on physical examination and selective diagnostic studies is widely supported by clinicians.[5–7]

For initial management of patients with penetrating neck trauma, the first priority is to ensure the stability of the airway and maintain circulation according to the Advanced Trauma Life Support (ALTS) guidelines. Selective management is safe and feasible in hemodynamically stable patients who have no signs of significant structural damage, based on physical examination and auxiliary examination.[7–9] The neck is generally divided into 3 zones: Zone I, between clavicle/sternum and cricoid cartilage, including the thoracic inlet. Zone III, extending from the angle of the mandible to the the base of the skull. Zone II, between zones I and III.[5,10] Stab wounds make a main contribution, approximately 70%,[7,8–11] to the penetrating neck trauma at present. Zone II injuries are the most common for both the child and the adult.[11–13] For patients who are hemodynamic and respiratory stable, diagnostic studies should be first performed. If the airway is unstable, oral endotracheal intubation or creation of an emergent surgical airway must be performed immediately.

Here, we report a case of a 55-year-old man who had suffered penetrating neck trauma, presenting with a rebar protruding from both sides of the neck. The bar had entered into the anterior border of the left sternocleidomastoid muscle at the level of the hyoid bone, headed diagonally across the oropharynx, causing a right wound located at the junction of the anterior border of the sternocleidomastoid muscle and the inferior margin of the digastric muscle, and exiting the below the right mastoid process (Fig. 1). The foreign object was ultimately removed successfully with no complications.

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Figure 1. A rebar protruding from both sides of the neck. (A) The rebar entered into the anterior border of the left sternocleidomastoid muscle at the level of the hyoid bone. (B) The rebar exited below the right mastoid process (arrow).

2. Case report

A 55-year-old building worker presented at our emergency department with a steel reinforcing bar with a diameter of 14 mm (commonly known as a rebar) protruding from both sides of his neck. The foreign body entered the left neck in zone II, crossing across the neck and exiting the right neck in zone III. The patient had fallen from the 2nd floor 3 hours previously and was brought in by paramedics. On admission, he was conscious and clinically stable, with a little bleeding from the wound, no bleeding from nose or mouth, and no evidence of respiratory distress. Subsequent examination revealed signs of odynophagia, but no evidence of abnormal neurological findings, expanding hematoma or dysphagia. His initial vital signs were temperature, 98.2°F; heart rate, 78 beats per minute; blood pressure, 95/60 mm Hg; respiratory rate, 20 breaths per minute; and O_2 saturation, 100%.

CT of the neck revealed a rod-shaped metallic foreign body inserted into the left neck, headed diagonally across the oropharynx, and exiting the right maxillofacial region (Fig. 2). There was a small amount of air in the tract, the bilateral root of the neck, the supraclavicular fossa, and the mediastinum. No obvious signs of hematocele were noted. A hyoid bone fracture was suspected. The local cortical bone in the anterior border of the right transverse process of the atlas was less coherent (postoperative CT showed the atlas was unremarkable). The remainder of the skull was unremarkable on CT.

The patient underwent a neck exploration under general anesthesia in the emergency operating room. The rebar was successfully removed and tracheotomy was performed prophylactically. We extended the wound during the operation to fully expose the foreign body and its track. Intraoperative findings: transverse penetrating neck trauma from left to right; wound on both sides, as stated above. The foreign body passed through the pharyngeal cavity, and there was injury to the left laminae of the thyroid cartilage, along with extensive laceration of bilateral pharyngeal mucosa and pharyngeal constrictors. There was laceration to the left carotid sheath, but no injury to the left cervical vasculature or nerve within the sheath. The right part of the foreign body penetrated the parotid gland, causing laceration to the parotid gland membrane, but no injuries to the salivary duct. There was no damage to the right carotid sheath. Careful examination found that the left side of the rebar punctured the retropharynx, and the superior laryngeal nerve was loose and edematous. We placed a chest tube over the rebar during the operation and the foreign body was successfully removed (Fig. 3). The wound was irrigated with hydrogen peroxide, povidone iodine and normal saline, the parotid gland membrane was sutured, then the wound edges were trimmed prior to being sutured in layers. We used 2 tubes for drainage and tube feeding was continued for 14 days. Some pus was noted in the right side of the neck on the 3rd postoperative day. Some sutures were removed and the wound was opened, an accumulation of pus was drained, the wound was irrigated with hydrogen peroxide, then with normal saline and drained prior to pressurized bandaging. When examined another 3 days later, no pus was evident and the wound healed gradually. The patient was taken to the operating room again at postoperative day 16 to close the tracheotomy fistula, and no dyspnea was apparent. The patient was discharged home at postoperative day 20. At the 12-month follow-up, the patient had no sequelae from his injury (Fig. 4).

3. Discussion

As a rapid, accurate, noninvasive, nonoperator-dependent and repeatable technology, CTA can provide information about blood vessels, bone structure, airway, and digestive tract to conduct a comprehensive assessment of penetrating neck

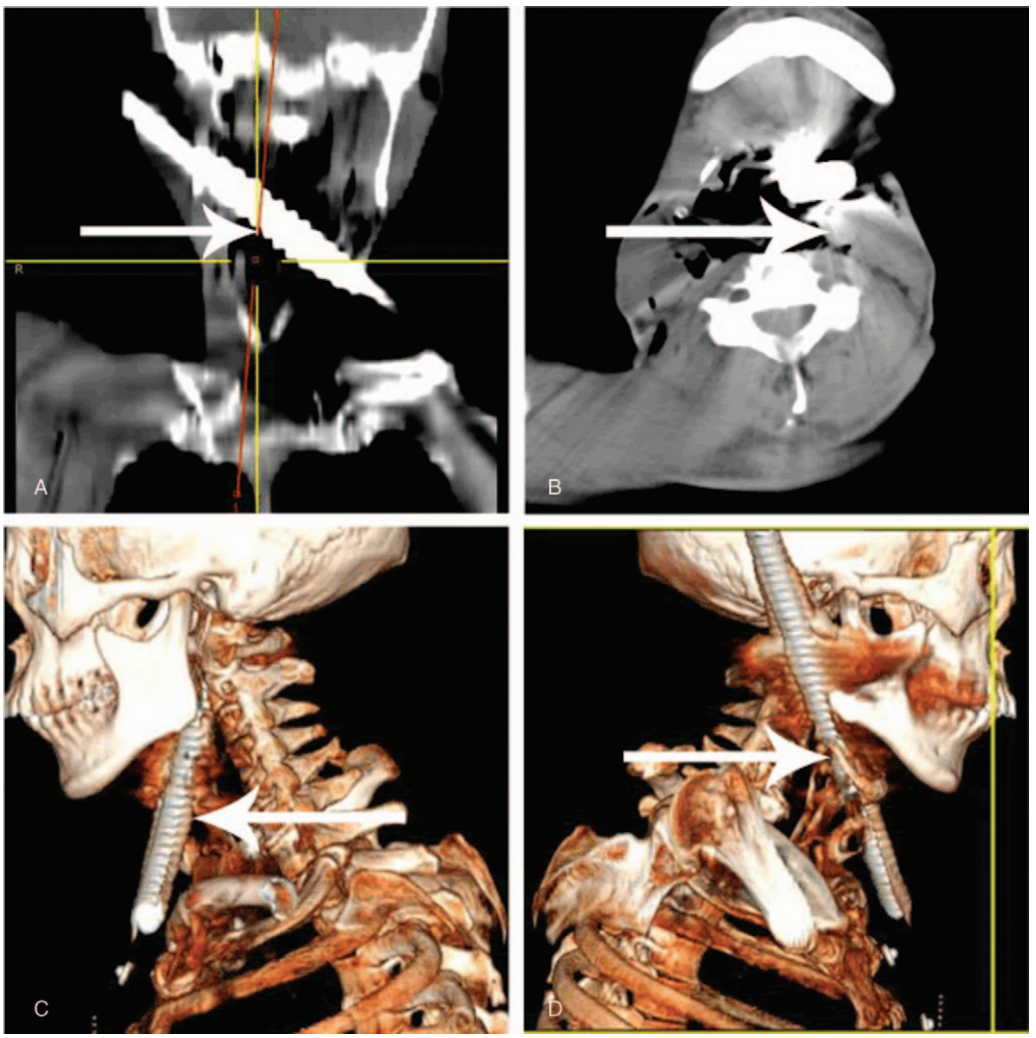

Figure 2. Computed tomography (CT) and three-dimensional reconstruction of the CT images of neck. (A) CT showed a rod-shaped metallic foreign body protruding from both sides of the neck and the foreign body headed diagonally across the oropharynx. (B) CT showed the relationship between major vessels (arrow) and the rebar. (C and D) Three-dimensional reconstruction of the CT images showed the track of metallic foreign body, and that it passed through the hyoid bone region (arrow). CT = computed tomography.

injuries.[14,15] In this case the patient, who was hemodynamically stable, without active bleeding or hematoma at admission, and with no obvious signs of hematocele in the neck on the CT image, was transferred to the emergency operating room because of concern that any movement of the rebar could injure the surrounding tissues. CT imaging could not completely rule out vascular injury, because hypotension, compression of a blood clot and surrounding soft tissue, or obstruction caused by the foreign body, could mask vascular injury. Vascular surgeons and an interventional radiologist were prepared to proceed to surgery in the event of bleeding upon removal of the foreign body. No blood vessel-related imaging was performed, and there was no hypotension, no obvious signs of hematocele according to the CT image in this case, and no massive bleeding at any stage of the procedure, but blind surgery should not be advocated as CT has limited ability to rule out vessel injuries. Before operating, a CTA scan is necessary for hemodynamically stable patients to provide information about the cervical vascular injury,[5] with the possibility of angiography in the case of interference caused by a metal artifact.[14] CT and three-dimensional reconstruction of the CT images can be a viable method to exclude macrovascular injury on the basis of careful physical examination for patients who are in emergency condition and are not eligible for CTA, magnetic resonance imaging (MRI) or radiography. CT can exclude direct vascular damage if the foreign body is far away from important blood vessels, while CT and three-dimensional reconstruction of the images can identify a large hematoma and clearly show the track of a metal foreign body if the foreign body is close to a blood vessel and thus, provide good guidance for the clinician.

In our case, the patient had a rebar protruding from both sides of his neck but no evidence of cervical spinal fracture or focal neurologic deficit, spinal immobilization was not warranted because it would be likely to mask any expanding hematoma, evolving airway compromise or other positive signs. The patient followed the doctor's advice not to shake his head in case of secondary damage caused by movement of the rebar.

We fitted a chest tube over the rebar after exposing the foreign body and its track to prevent secondary damage to the surrounding tissue, especially the blood vessels, during the operation. However a chest tube should be used with caution, as it may cause crush injury to the surrounding blood vessels and

Figure 3. The foreign object was ultimately removed successfully. A chest tube was fitted over the rebar (arrow).

nerves. We recommended that a chest tube could be used as an option for the removal of foreign bodies in the case of sharp or rough objects (such as spiral foreign bodies), when fully exposing the foreign body and its track.

Some pus was noted in the right side of the neck on the 3rd postoperative day, and this was considered to be related to the parotid membrane injury. After the subsequent management, as stated above, the wound healed gradually. Consequently, we recommend that the parotid gland duct should be sutured, a drainage tube should be placed, and pressurized bandaging should be applied for traumatic parotid injuries; if there is no injury to the salivary duct, draining this area would be a better option than place additional suture.

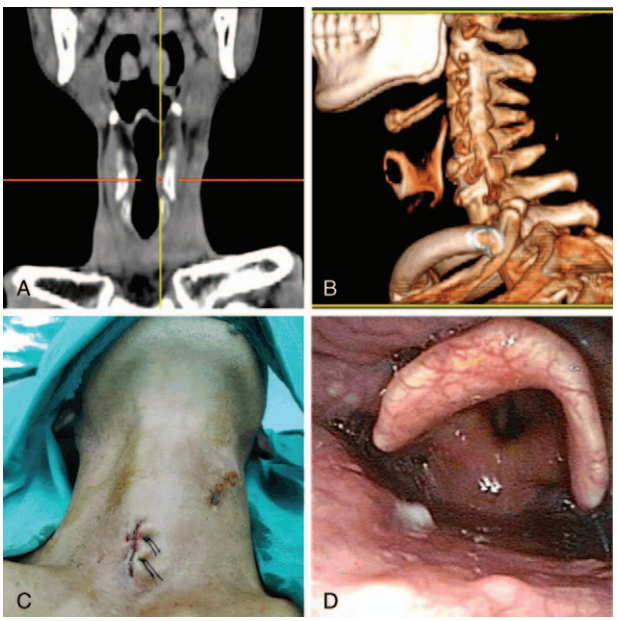

Figure 4. Postoperate images. (A) Postoperative CT showed the neck was unremarkable. (B) Three-dimensional reconstruction of the CT images showed the bone of neck was normal and that there was no foreign body residue remains. (C) The tracheotomy fistula was closed at postoperative day 16. (D) Electronic laryngoscope of pharyngeal cavity at postoperative day 20. CT = computed tomography.

4. Conclusions

Although penetrating neck trauma is relatively rare, as a clinician, it is necessary to have a thorough understanding of the anatomy of this region and to master initial steps in managing these cases. CTA is recommended as the preferred imaging method for examination of hemodynamically stable patients with penetrating neck trauma. CT and three-dimensional reconstruction of the images can also provide good guidance for the clinician to exclude macrovascular injury. Postoperative imaging should also be performed to confirm that no foreign body residue remains in the wound. A chest tube could be used as an option for the removal of foreign bodies in the case of sharp or rough objects (such as spiral foreign bodies). For traumatic parotid injuries the parotid gland duct should be sutured and a tube placed for drainage. Conventional packing of the sinus tract left after removal of foreign bodies is not recommended. Isolated pharyngeal injuries can be managed nonoperatively with antibiotics and nasogastric tube feeds for a period of 2 weeks in cases of pharyngeal fistula. All patients should be followed up for at least 3 months to prevent the occurrence of delayed presentation of a carotid pseudoaneurysm.

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