**Settled Nail Injury in the Corpus of the Seventh Cervical Vertebra**

---Case Report---

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**Abstract**

A 26-year-old construction worker presented with a nail settled in the C-7 corpus. He had no neurological or physical abnormalities. Preoperative evaluation of the vascular, neural, and aerodigestive structures with cervical radiography, computed tomography (CT), CT angiography, and contrast esophagography found no damage. The nail was completely exposed surgically and removed. The patient recovered with no deficits. Penetrating neck injury may be associated with significant morbidity and mortality due to vascular, neural, and aerodigestive tract injury. Patients in stable clinical condition should be evaluated by CT angiography, esophagography, and chest and cervical radiography.

Key words: cervical vertebra, neck, penetrating injury

**Introduction**

Penetrating neck injury affects a complex area of anatomy, and evaluation of the injury should include the respiratory, cardiovascular, nervous, digestive, and endocrine systems. Arterial injuries pose the greatest threat to the patient early after the injury, whereas penetrating neck trauma and esophageal injuries cause the greatest delayed threat. Digestive tract injuries often remain clinically silent but contribute significantly to morbidity and mortality, and early evaluation of the esophagus is vital. The recommendations for diagnostic work-up and surgical management range from mandatory operative intervention to selective management with evaluation of the vascular system (especially the carotid and vertebral arteries, jugular veins, and subclavian vessels), the respiratory system including the trachea and larynx, and the digestive tract including the esophagus and pharynx. Penetrating neck injuries often present difficulties in surgical exposure which hinder the prevention of early and late complications.

We describe an unusual case of accidental nail injury occurring in a man who sustained a penetrating neck injury, with the nail settling in the seventh cervical (C-7) vertebra.

**Case Report**

A 26-year-old construction worker tried to pull a nail out from a piece of wood by forcefully stretching a rope, about 25 meters long, attached to the top of the nail. The nail was pulled free, but gained momentum and struck the man, sinking into the anterior right side of the neck (Fig. 1A). He stated that he felt a sharp pain in the neck, and he then immobilized his neck. Both he and his coworkers tried to pull out the settled nail, but could not. The patient was admitted to our hospital 7 hours after the accident. On admission to the emergency unit, the patient was fully conscious and cooperative. Neurological examination revealed no abnormalities. The nail was embedded in the right side of the neck behind the sternocleidomastoid muscle at the C-7 level. The wound was not bleeding. There were no signs of hematoma, crepitation, or bruit. Physical examination revealed blood pressure of 120/70 mmHg, pulse of 80 bpm, and full and symmetric breath sounds. Electrocardiography showed sinus rhythm at 85 beats/min. He complained of pain in the anterior region of the neck in the supine position, and so preferred to remain sitting in an anteflexion position.

Cervical radiography showed the nail settled in the C-7 corpus (Fig. 2). Cervical computed tomography (CT) showed that the spinal canal and trachea were intact (Fig. 3A). CT angiography of the
Fig. 1 Photographs showing (A) the nail in the anterior zone of the neck with the end of the rope, and (B) the nail surgically extracted from the C-7 vertebra.

Fig. 2 Posteroanterior (A) and lateral (B) cervical radiographs showing the nail in the C-7 corpus.

Fig. 3 A: Cervical computed tomography scans of the neck showing the position of the nail at the C-7 level and the intact spinal canal and trachea. B: Contrast esophagography showing no leakage from the esophagus.

Fig. 4 Computed tomography angiogram showing no damage to the common carotid artery or vertebral artery (arrow, intact common carotid artery; arrowhead, intact hypoplastic right vertebral artery).

e common carotid and vertebral arteries showed the relationship of the nail to the vascular structures. There was no sign of vascular injury or pseudoaneurysm (Fig. 4). Contrast esophagography showed no leakage from the esophagus (Fig. 3B).

The patient received broad-spectrum antibiotic therapy and was prepared for surgery. An oblique skin incision was made in front of the sternocleidomastoid muscle and the settled nail, which lay between C-5 and C-7. All structures from the skin to the vertebra were dissected, and the settled nail was isolated from the tissues. The common carotid artery and esophagus were gently dissected, and the C-7 corpus and the unsettled portion of the nail were completely exposed. The nail was grasped with surgical pliers and gentle rotational movements were performed to loosen the settled portion of the nail, then the nail was pulled out (Fig. 1B). The patient's
recovery was uneventful, and he was discharged in good clinical condition on the 2nd postoperative day.

Discussion

The present case of accidental penetrating neck injury resulted in the nail settling in the anterior side of the C-7 corpus.

Penetrating neck injuries are classified into three zones according to location. Zone 1 extends from the inferior border of the cricoid cartilage to the clavicles. Injury in this region carries a high risk of mortality because of the potential involvement of the thoracic structures, major vessels, upper mediastinum, lungs, trachea, esophagus, and thoracic duct, and because surgical exposure is difficult. Zone 2 extends between the cricoid cartilage and the angle of the mandible. This is the most frequently injured region of the neck, but the mortality rate is relatively low because of the better surgical exposure compared with the other zones. Underlying structures include the major arteries and veins of the neck, the air and alimentary passages, the cervical spine, and the thyroid gland. Zone 3 comprises the area between the angle of the mandible and the base of the skull. Vascular and pharyngeal injuries are most common in this region. Surgical exposure is difficult.

Clinicians should recognize that wounds in the anterior and lateral aspects of the neck compromise the airway more often than wounds in the posterior region (behind the sternocleidomastoid muscle) because of the proximity to the larynx, trachea, laryngeal nerves, and cervical vessels. The primary concern in managing such injuries is control of bleeding and airway management. Serious injuries resulting from penetrating neck trauma may be asymptomatic or masked by coma and other life-threatening injuries. The leading cause of death in penetrating neck trauma is vascular injury. Patients with active bleeding, expanding hematoma, or neurological abnormalities should undergo prompt surgery. Most investigators suggest integrated clinical and radiographic work-up, including bronchoscopy, contrast esophagography, esophagoscopy, cervical spine and chest radiography, and routine angiography to exclude vascular injury in patients in stable condition. Spiral CT angiography is comparable to conventional angiography for demonstrating nontraumatic carotid pathology. Comparison of CT angiography and conventional angiography for detecting penetrating trauma to the arteries of the neck has demonstrated that CT angiography has 90% sensitivity, 100% specificity, 100% positive predictive value, and 98% negative predictive value.

The anterior location of the larynx and trachea makes them exposed to injury in blunt and penetrating trauma of the neck. Rapidly expanding subcutaneous emphysema of the neck and voice tone changes are obvious indications. Clinically, airway and vascular injury are easier to identify than esophageal injury, and an esophageal tear may be overlooked due to the low index of suspicion. The cervical esophagus is surrounded by major vessels, and the surgeon may pay much closer attention to them than to the esophagus. Missed esophageal tears may rapidly lead to mediastinitis progression, septic multiple organ failure, and ultimately death. Published reports of nail injuries to the neck are rare and all are associated with the use of pneumatic and explosive cartridge-activated nail gun. Although extremity injuries are the most common, life-threatening injuries to the neck and the other vital parts of the body may occur due to the use of a nail gun.

This case illustrates an uncommon nature and mechanism of injury. The nail caused no damage to anatomical structures throughout its trajectory despite the close arrangement of several vital structures in the neck. Penetrating wounds in this region should be evaluated by neck CT angiography, neck CT, and esophagography. Surgery in Zone 1 requires an experienced and skillful surgeon to treat tracheal, esophageal, and vascular trauma. A settled nail in the C-7 corpus, as in our patient, may cause more serious and life-threatening injuries to vessels, trachea, and/or esophagus during removal, and should never be pulled out before careful anatomic dissection. This case illustrates that penetrating traumas in the neck require proper preoperative diagnostic evaluation and a sound surgical plan.

References

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