

# Ballistic injury to the neck in a soldier injured in the war in Ukraine: a case report

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**Introduction and relevance:** Penetrating neck trauma results in a 10% mortality rate for patients and management can be challenging, often requiring a multidisciplinary approach.

**Methods:** This is a case report of a 33-year-old male patient who received a neck gunshot through the oral cavity during close combat on the south front of the Ukrainian-Russian war in January 2023.

**Clinical discussion:** A CT scan revealed a foreign body in the neck on the right side, between the mastoid process and the right jaw angle. A CT scan with contrast revealed a foreign body in the neck – a bullet – and helped with observing relations to surrounding tissues and following the bullet's trajectory. The multidisciplinary team performed surgery for foreign body removal. As a first step, carotid arteries and the internal jugular vein were dissected and looped to control potential bleeding. The bullet was 7.62 caliber. The patient recovered well with minimal postoperative complications, including hypoglossal and facial nerve neuropathy, which resolved in two weeks.

**Conclusion:** The proximity gunshot resulted in unexpectedly moderate tissue injury, but regardless of the relatively low destruction of palate tissue, the location of the foreign body near carotid arteries made the surgery approach challenging.

**Keywords:** gunshot wound; penetrating neck trauma; ballistic injury to the neck; War in Ukraine

## Introduction

Penetrating neck injuries (gunshots in particular) are associated with high mortality (up to 10%) and morbidity due to numerous adjacent vital structures located in the neck, without adequate musculoskeletal protection [1]. Gunshot wounds to the head and neck result in significant bone and soft tissue loss [1]. Injuries of major vessels, airways, spinal cord, major nerves, and esophagus lead to dramatic sequela; such cases require a multidisciplinary approach [2]. Here we present a case of a soldier shot into the oral cavity that resulted in

unexpectedly moderate tissue injury and that required a multidisciplinary surgical approach because of the proximity of the foreign body to the neck vascular and nerve structures.

### Case presentation

A 33-year-old male patient was shot in the mouth by AKM Kalashnikov's Automatic Rifle Modernized (AKM) assault rifle during close contact combat while defending his position on the south front of the Ukrainian-Russian war. The incident happened on January 3, 2023. A 7.62 caliber bullet, shot into the oral cavity, destroyed the first and second premolars of the left upper jaw, traversed the palate (**Figure 1**), and got lodged in soft tissues of the neck in zone III on the right side close to the internal jugular vein, and both internal and external right carotid arteries.



**Figure 1.** Photograph of the injured soldier shot in the oral cavity showing the destroyed 1<sup>st</sup> and 2<sup>nd</sup> left premolar (black arrow) and wound of the palate (white arrow).

## Patient information

The patient's general condition on admission was stable. His medical history, vital signs, and general physical examination were normal. The patient complained of neck and jaw pain on the right.

## Clinical findings

On focused examination, we noted mild bleeding from the oral cavity. The 1<sup>st</sup> and 2<sup>nd</sup> left premolar of the upper jaw were destroyed and extracted. We detected mild edema of the gingival. The neck was slightly tender on the right side, just below the angle of the jaw. We detected no edema on the neck. Carotid pulsation was satisfactory. Neither bruit nor thrill was auscultated over the carotid vessels on the affected side. We did not detect a neurological deficit.

## Diagnostic assessment

Basic blood tests were normal. A CT scan revealed a foreign body in the neck on the right side, between the mastoid process and the right jaw angle (**Figure 2**, panels A and B).

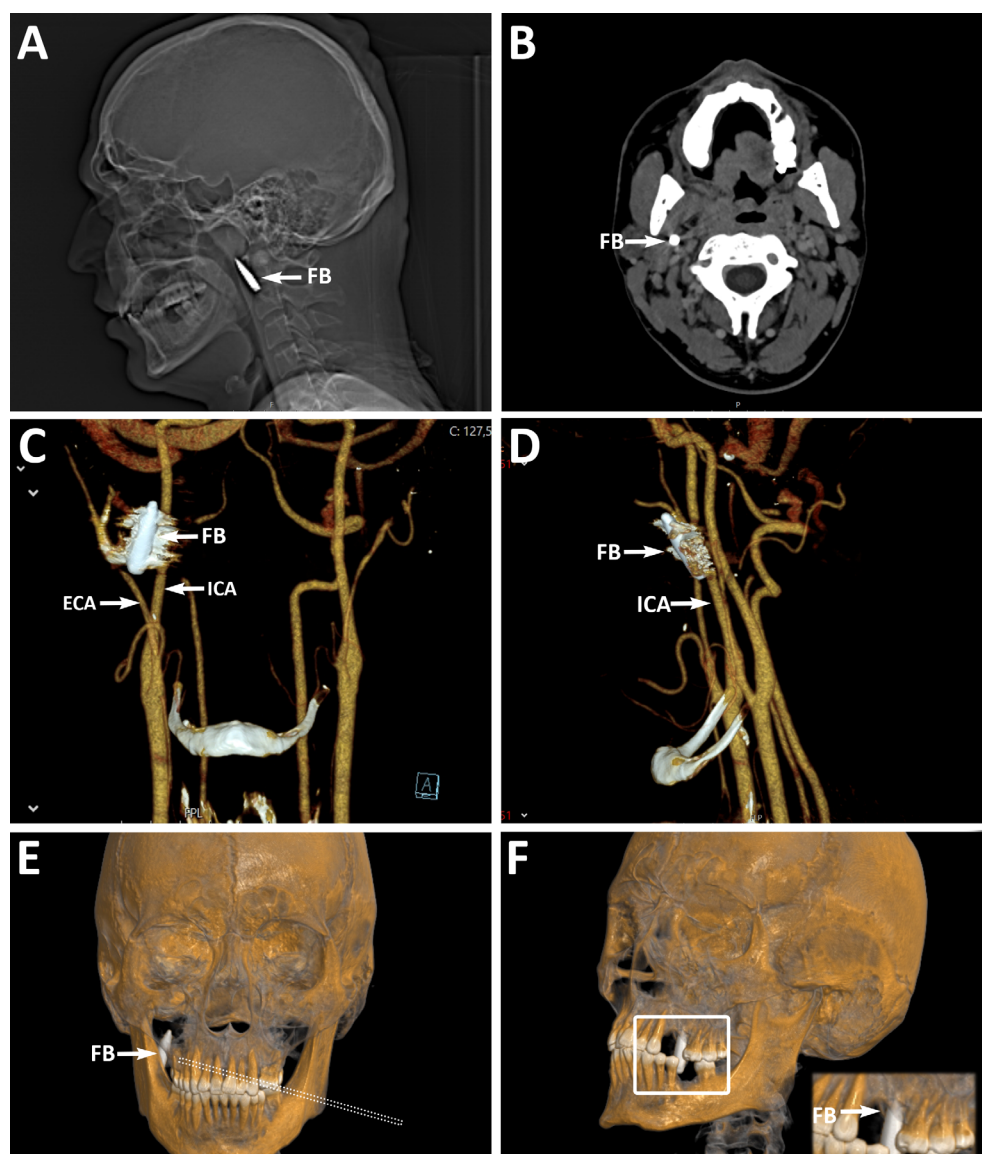
Retraction of damaged teeth was performed under local anesthesia. CT scan with contrast revealed a 27.5 by 6.9 mm metal foreign body above the bifurcation of the common carotid artery 2 mm away from the right internal jugular vein (**Figure 2**, panels C and D).

## Therapeutic intervention

Initial management included pain control with dexketoprofen 50 mg IM TDS, mouthwash with chlorhexidine, and Ceftriaxone 1 gr IV BID. We analyzed the missile's path in detail and planned the foreign body removal surgery. We obtained the patient's informed consent for the procedure.

Due to the proximity to the internal carotid artery and suspected injury to the vessel wall, during preoperative planning, we decided to reveal and display the common carotid artery, external carotid artery, and internal carotid artery prior to attempting to remove the foreign body. The potential necessity to operate on the distal portion of the internal carotid artery in the narrowed space (between the jaw and cervical vertebrae) and anticipated challenges required the involvement of a maxillo-facial surgeon to perform subluxation of the right temporomandibular joint. Also, the anticipated difficulties in tissue dissection close to the neural roots of the cervical spine required the expertise of the neurosurgeon.

Three days-post admissions, the patient was taken to the operative theater and placed in a supine position with a bolster under the shoulders. The head was turned right. Under general anesthesia, a longitudinal skin incision over the anterior border of the sternocleidomastoid muscle was made. The common carotid artery, internal and external carotid arteries, and internal jugular vein were dissected and looped. The hypoglossal nerve was

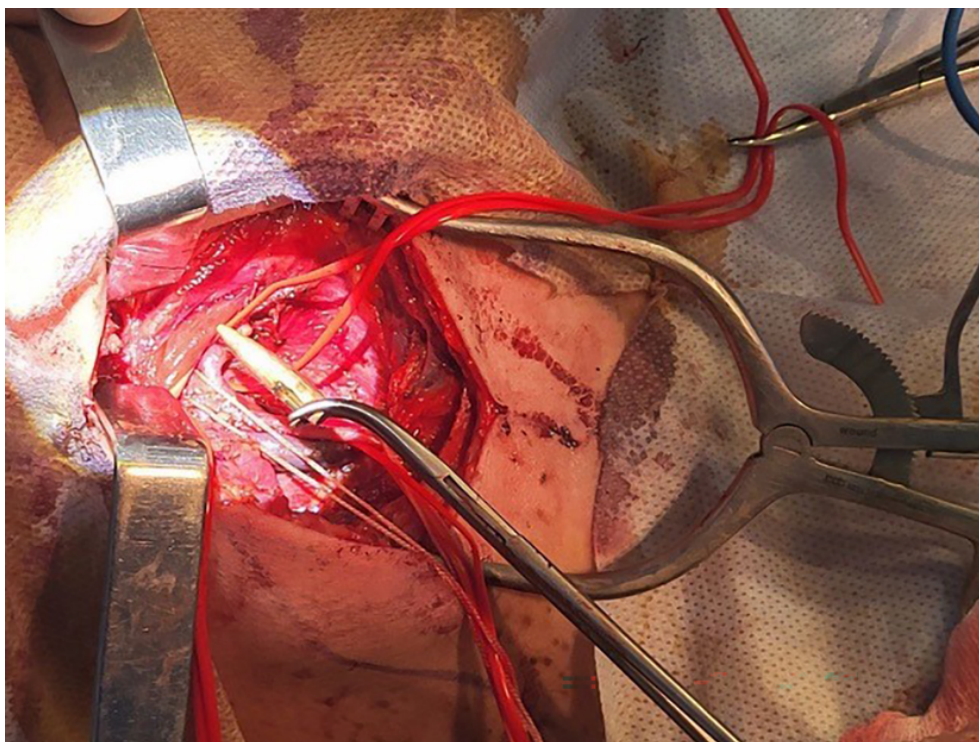


**Figure 2.** (A) The head CT scout view (topogram) showing the location of the foreign body (FB). (B) Axial view of CT scan of the cranial base showing the position of the foreign body (arrow). (C) Anteroposterior and (D) lateral view of the 3D reconstruction of a CT angiography image showing the position of the foreign body and its relation to the right internal carotid artery (ICA) and external carotid artery (ECA). Due to the metal composition of the foreign body, the artifact surrounding the foreign body is visible. The (E) axial and (F) sagittal view of 3D skull reconstruction showing the position of the bullet (arrows) and an assumed bullet trajectory (dotted lines) (E). FB – foreign body, ECA – external carotid artery, ICA – internal carotid artery.

exposed and gently retracted. Further, cephalad dissection revealed a cavity. The cavity was opened and 2 ccs of pus were drained. On inspection, the metal piece (7.62 caliber bullet) was detected and gently retrieved (**Figure 3**). No hemorrhage was observed. The cavity was washed with saline and povidone-iodine, and a corrugated drain was placed. No other abnormalities were detected. The wound was sutured and covered with sterile gauze.

### Follow-up and outcomes

Postoperatively, the patient developed deviation of the tongue to the right and mild asymmetry of the face as a consequence of hypoglossal and fascial nerve neuropathy. There



**Figure 3.** Intraoperative photograph of operation field showing removal of a bullet. Dissected right internal carotid artery is visible on the left of the bullet.

were no postoperative wound complications. The drain was removed after two days. The patient was discharged on the third postoperative day. Face asymmetry and tongue deviation resolved within two weeks.

## Discussion

The immediate and long-term consequences of injury to the neck can be significant because of the close relationship of important anatomical structures in a confined space. Delayed recognition of major injury and inadequate treatment results in high morbidity and mortality [3, 4]. Major neck vessels, if injured, may lead to fast, massive bleeding and death at the scene if not arrested, either by forming hematoma or medical assistance. Injury to the airways may cause immediate or delayed asphyxia [5]. Injuries to the spinal cord, neural roots, and vertebrae are associated with significant neurological deficits. Perforation of the esophagus, if left untreated, leads to neck abscess, and mediastinitis and eventually may become lethal. Computed tomography angiography of the neck has been shown to be a sensitive, specific, and safe technique in screening for vascular injuries [1].

Management of gunshot neck injuries depends on a clear understanding of the anatomy of the neck. The radiologist can contribute substantially to the successful treatment of a patient with a gunshot wound. The important analysis includes the assessment of the missile path in emergency conditions by using plain film and computed tomography [6, 7]. Surgical dissection can cause iatrogenic injuries to the nerves with serious adverse outcomes. The multidisciplinary approach is essential for repairing all injured organs and covering all possible intraoperative scenarios [2]. If injury to carotid arteries and internal

jugular vein is suspected, vascular control is mandatory before approaching foreign body removal to avoid uncontrolled bleeding. As compared with other similar cases [8, 9], we first dissected major vessels of the neck from our patient first to provide anticipated hemorrhage control before attempting to remove the foreign body. The endovascular technique for the treatment of penetrating gunshot injuries is feasible and safe for selected patients [6]. Postoperative complications, such as neuropathy, are common but usually resolve over time [10].

## Conclusion

Penetrating neck injuries, gunshots in particular, are associated with high mortality and morbidity due to numerous vital structures residing in the neck, close to each other, and the lack of adequate musculoskeletal protection. Treatment of such injury is complex. It is important to analyze the missile path using CT. The multidisciplinary approach is essential. Vascular control is required to prevent uncontrolled bleeding during retrieval of the foreign body. Postoperative complications, such as neuropathy, are common but in most cases resolve over time.

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**Competing interests:** The authors completed the ICMJE Unified Competing Interest form (available upon request from the corresponding author), and declare no conflicts of interest.

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