ST open

RESEARCH ARTICLE

Blast injury to the common carotid artery in a soldier wounded in the war in Ukraine: a case report

Vitelii Lukiianchuk, Dmytro Mialkovskyi, Serhii Palka

Department of Surgery, Zaporizhzhia Military Hospital, Zaporizhzhia, Ukraine

Aim: Penetrating blast injuries to the neck carry a high risk of mortality due to the presence of vital structures. Common carotid artery (CCA) injuries require urgent management to prevent exsanguination or ischemic complications. Temporary shunting is often preferred in ROLE 2 (NATO medical role system) military settings, as it reduces stroke and mortality rates. However, in cases where vascular expertise is limited, CCA ligation may be a safer and faster alternative, as it minimizes the risk of distal embolization. This case report presents a combat-related CCA injury and the rationale for ligation over shunting in a ROLE 2 environment.

Methods: A 35-year-old soldier sustained a blast injury to the neck and was evacuated to a front surgical team with signs of major vascular damage. Surgery identified injuries to the right CCA and vertebral artery. Due to the risk of embolization and limited vascular expertise, CCA ligation was performed instead of temporary shunting. The patient was stabilized and transferred to ROLE 3 for definitive repair, where autologous vein grafting was successfully performed.

Results: Temporary shunting is the preferred approach for maintaining cerebral perfusion but requires vascular expertise and carries the risk of embolization. In resource-limited combat settings, ligation provides rapid hemorrhage control and facilitates faster evacuation. This case demonstrates that CCA ligation can be an effective damage control strategy when shunting is not feasible. The patient recovered well, with minimal postoperative complications.

Conclusions: Combat-related CCA injuries require rapid decision-making based on available resources and expertise. While temporary shunting is ideal, ligation is a practical alternative in ROLE 2 settings where vascular specialists are unavailable. This case highlights the need for adaptive surgical strategies in military trauma care.

Keywords: neck injuries; wounds, penetrating; wounds, gunshot; carotid artery, common; blood vessel injuries; shunts (surgical)

Correspondence to:
Dmytro Mialkovskyi
Department of Surgery, Zaporizhzhia Military Hospital, 32-B Sobornyi Avenue, Zaporizhzhia, Ukraine
mialkovskyidmytro@gmail.com

Cite as:
Lukiianchuk V, Mialkovskyi D, Palka S. Blast injury to the common carotid artery in a soldier wounded in the war in Ukraine: a case report. ST-OPEN. 2025;6:e2025.2519.22.

DOI:
https://doi.org/10.48188/so.6.6

Introduction

Penetrating blast injuries to the neck carry a significant mortality rate of up to 10% primarily due to the high concentration of vital structures in this anatomically compact region. These structures, including major blood vessels, the airway, the cervical and brachial plexuses, the phrenic nerve, the cervical ganglia of the autonomic nervous system, and the esophagus, are embedded in soft tissue and lack the protective shielding of bone, making them highly vulnerable to trauma (*1*). If they are damaged, patients often suffer from life-threatening complications and long-term disabilities. Vascular injuries can lead to exsanguination or ischemia, obstruction of the airway may result in respiratory failure, and neurological damage can cause permanent deficits. Given the complexity of these injuries and their potential for rapid deterioration, a multidisciplinary approach is essential for optimal management. Coordination between trauma surgeons, vascular and neurosurgical specialists, otolaryngologists, and critical care teams is crucial to ensuring timely and effective intervention, improving both survival rates and functional outcomes (*2*).

We present a case of a soldier who suffered a blast injury to the neck involving the common carotid artery (CCA), which was managed through temporary ligation in a forward ROLE 2 military surgical setting, followed by definitive repair. This case highlights the surgical decision-making process in combat trauma, where resource limitations may impact treatment choices.

Methods

A 35-year-old male soldier sustained a blast injury from an explosive device deployed by a drone during combat operations on the southern front of the war in Ukraine. We evacuated him to the forward ROLE 2 surgical unit, where he presented with a penetrating wound to the right side of the neck, signs of major vascular injury, active bleeding from the wound, tracheal deviation to the left, and impaired respiration.

We initiated resuscitation and performed an emergency surgical intervention, as we identified injuries to the right CCA and right vertebral artery. The patient was intubated and placed on mechanical ventilation. Surgical management included neck wound debridement, hemostasis of the damaged cervical vessels, and ligation of the CCA. We controlled the bleeding from the injured vertebral artery by using topical hemostatic agents.

After stabilizing the patient, we evacuated him to a ROLE 3 (NATO medical role system) medical facility providing an advanced level of care within the echelons of military medical support (*3*), under the supervision of a specialized team. He remained on mechanical ventilation under analgosedation.

The patient's medical history was unremarkable. His general condition was severe, but stable, with normal vital signs. On further physical examination, we noted a 20 cm longitudinal wound on the right side of the neck, extending along the anterior surface, that had been packed and secured with temporary sutures. Hemostasis was preserved, and the left carotid artery was pulsatile.

Laboratory tests, including a complete blood count, were within normal limits. A contrast-enhanced computed tomography (CT) scan revealed an injury to the right CCA (post-ligation status), a large soft tissue defect on the right side of the neck, and a metal fragment at the level of the right transverse process of C7. We also identified a metal foreign body measuring 5×5×5 mm and damage to the V1 segment of the right vertebral artery, though we observed no signs of active bleeding (**Figure 1**, Panels A and B). We inspected the wound, after which we planned and immediately commenced an operation to repair the right CCA. We removed the skin sutures and swabs from the neck wound, after which we carefully extracted the polymer-based hemostatic material (SanaSeal Putty and SanaSeal Gauze; SanaHeal Inc., Cambridge, MA, USA) which was firmly attached to the tissues at the wound's base by the front surgical team doctors.

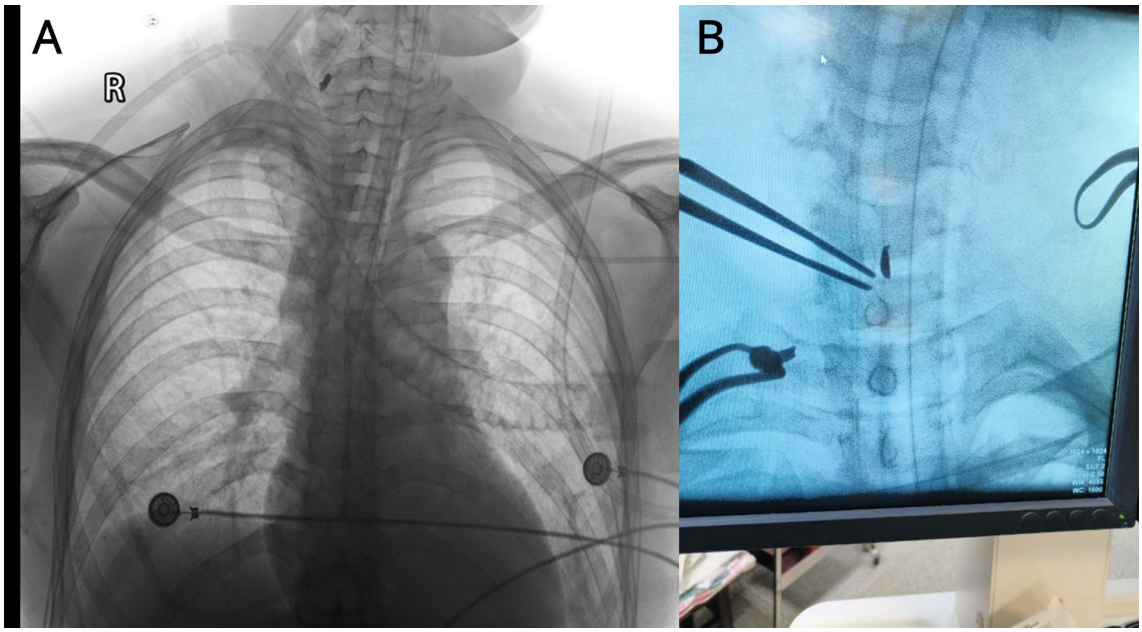

Figure 1. Panel A. An X-ray showing a metallic fragment projected over the right transverse process of C7. Panel B. Removal of the foreign body under fluoroscopic guidance.

On inspection, we found the CCA to be torn and ligated 4 cm distal to the bifurcation. Signs of contusion were present, and the vagus nerve was traumatically interrupted. We also noted injuries in the branches of the thyrocervical trunk and the right vertebral artery. We excised the damaged segment of the CCA and flushed the artery with a heparin solution. Afterwards, we removed the thrombus and restored central and retrograde blood flow. We performed autologous grafting of the CCA using a segment of the reversed great saphenous vein. After clamp removal, we observed no leakage from the anastomoses.

Results

The patient developed mild neuropathy of the right brachial plexus during the postoperative period, diagnosed through neurological examination and electromyography, which confirmed a peripheral neuropathy with decreased voltage at the level of the brachial

plexus. After two days, we transferred him from the intensive care unit to the vascular surgery department in stable condition, with stable vital signs, clear consciousness (Glasgow Coma Scale 15/15), and fully oriented, responsive, and mobile in bed. We discharged the patient on postoperative day 15. Signs of right brachial plexus neuropathy resolved after two weeks. During follow-up, we confirmed the patency of the vein graft and observed no late complications.

Discussion

The immediate and long-term consequences of neck injuries can be significant due to the close proximity of critical anatomical structures within a confined space. Delayed recognition of major injuries and inadequate treatment result in high morbidity and mortality (*4*). If major neck vessels are injured, rapid and massive bleeding can occur, potentially leading to death at the scene, unless it is controlled either by hematoma formation or timely medical intervention. In our case, significant bleeding resulted in hypovolemic shock.

Injury to the airway can lead to immediate or delayed asphyxia (*5*). Damage to the spinal cord, neural roots, and vertebrae is often associated with severe neurological deficits. Esophageal perforation, if left untreated, can lead to the development of neck abscess, mediastinitis, and, ultimately, fatal complications.

Previously, CT angiography of the neck has been demonstrated to be a sensitive, specific, and safe technique for screening vascular injuries (*1*). In our case, it was instrumental in clarifying the extent and type of injury. The management of gunshot wounds to the neck requires a thorough understanding of neck anatomy. Radiologists play a crucial role in patient care by assessing the missile trajectory in emergencies using plain film and CT (*6*).

A multidisciplinary approach is essential for surgical intervention, as it helps minimize intraoperative complications (*2*). In cases of major vessel injury, restoring vascular integrity is crucial to prevent uncontrolled hemorrhage and maintain cerebral perfusion. Temporary shunting or ligation of the CCA may be employed as damage control measures in ROLE 1 or ROLE 2 settings. When hard signs of CCA injury are present, emergency surgery is indicated. Reconstruction of the common or internal carotid artery is preferred over ligation, provided the patient's physiological condition allows and the procedure is technically feasible. This is especially recommended in penetrating carotid artery injuries classified as Grade 2 or 3 by the European Society for Vascular Surgery. However, in hemodynamically unstable patients, in the absence of a vascular-trained surgeon, or during mass casualty events, CCA ligation may be the more practical option. If a vascular surgeon is available but the patient remains unstable or resource constraints persist, temporary shunting may be considered. Literature suggests that temporary shunting is preferable to ligation, as it improves the likelihood of avoiding ischemic stroke and enhances survival by preserving cerebral perfusion (*7*). Nevertheless, shunting requires basic vascular surgical skills and carries significant risks, including intimal dislodgement, embolism, and stroke. Furthermore, if the shunt obstructs the external carotid artery, it may block a vital collateral pathway, worsening cerebral ischemia. In such scenarios, ligation may be safer and more time-efficient, as it shortens operative time, facilitates rapid evacuation to high-

er-level care and reduces the risk of iatrogenic embolization. This approach can improve patient survival and decrease the incidence of stroke. In our case, ligation was deemed the most appropriate course of action, and the outcome was favorable.

This type of injury is typically accompanied by nerve damage (*8*). Postoperative neurological deficits are common, but often resolve over time. Posttraumatic neuropathy is generally considered a minor complication and is usually reversible.

Conclusion

Neck injuries, particularly penetrating and blast-related trauma, carry a high mortality risk due to the presence of numerous vital anatomical structures and the absence of musculoskeletal protection. The treatment of such injuries is highly complex. X-ray and CT scans are essential emergency imaging modalities for assessing the wound trajectory and identifying associated damage. A multidisciplinary approach is crucial for optimal management. In cases of major vascular injury, emergency surgical intervention is life-saving. Effective hemorrhage control using all available techniques significantly improves survival rates. Restoring vascular integrity is essential to prevent uncontrolled bleeding and to maintain cerebral perfusion. While temporary vessel ligation can be a feasible and safe option in a damage control strategy, it carries the risk of cerebral ischemia and permanent neurological deficits. Postoperative neurological deficits are a common complication; however, they often improve over time, as does neuropathy.

Provenance: Submitted. This work is part of the Translational Research in Biomedicine (TRIBE) doctoral program project “Giving voice” aimed at helping Ukrainians to publish their war-related experiences.

Received: 28 February 2025 / **Accepted:** 6 May 2025 / **Published online:** 24 July 2025.

Peer review: Externally peer reviewed.

Acknowledgements: We are grateful to the TRIBE director, Damir Sapunar, for his help in preparing the article.

Ethical approval: This study was approved by the Ethics Committee at the Zaporizhzhia Military Hospital. The authors declare that written informed consent was obtained from the patient for the publication of this case report, including the use of any accompanying images and medical data. The patient has been informed that their identity will remain confidential, and all efforts have been made to ensure anonymity. The patient understands that while every attempt has been made to maintain confidentiality, absolute anonymity cannot be guaranteed. This case report has been prepared in accordance with ethical guidelines and with respect for the patient’s privacy and rights.

Funding: No financial support was received for this study.

Data availability statement: The data are available from the authors upon reasonable request.

Authorship declaration: The patient was under the care of VL, MD, and PS. MD drafted the initial version of the manuscript. VL and SP contributed to revising, editing, and finalizing the manuscript. MD prepared figures. All authors read and approved the final manuscript.

Disclosure of interest: The corresponding authors completed the ICMJE Disclosure of Interest Form and disclose no relevant interests.

ORCID

Vitelii Lukiianchuk https://orcid.org/0000-0003-2415-0428

Dmytro Mialkovsky https://orcid.org/0000-0001-5565-0850

Serhii Palka https://orcid.org/0009-0006-9296-9709

References

1. Doctor VS, Farwell DG. Gunshot wounds to the head and neck. Curr Opin Otolaryngol Head Neck Surg. 2007 August;15(4):213–8. doi: 10.1097/MOO.0b013e3281fbd3ef
2. Chung TR, Mishler M, Aukerman W, Nannapaneni S, Urias D, Shayesteh K. A Multidisciplinary Approach to Penetrating Neck Trauma in a Patient with Self-Inflicted Gunshot Injuries to Zones 1–3 of the Neck. Am Surg. 2022 March;88(3):538–41. doi: 10.1177/0003134820973357
3. NATO. NATO Logistics Handbook. Brussels (Belgium): NATO; 1997.
4. Khan AM, Fleming JC, Jeannon JP. Penetrating neck injuries. Br J Hosp Med (Lond). 2018 February 2;79(2):72–8. doi: 10.12968/hmed.2018.79.2.72
5. Dayal S, Dugom P, Kharazi A, Iannettoni M, Anciano C, Oliver A, et al. Tracheal Transection From Gunshot Wound to the Neck. Ann Thorac Surg. 2022 July;114(1):e39–41. doi: 10.1016/j.athoracsur.2021.08.076
6. Pinto A, Brunese L, Scaglione M, Scuderi MG, Romano L. Gunshot injuries in the neck area: ballistics elements and forensic issues. Semin Ultrasound CT MR. 2009 June;30(3):215–20. doi: 10.1053/j.sult.2009.02.006
7. Asensio JA, Kessler JJ 2nd, Kotaru TR, Kalamchi LD, Miljkovic SS, Dabestani PJ. Penetrating Internal and Common Carotid Artery Injuries Shunts versus no shunts during repair effect on neurological outcomes. Injury. 2021 February;52(2):266–73. doi: 10.1016/j.injury.2020.11.032
8. Yevich SM, Lee SR, Scott BG, Shaltoni HM, Mawad ME, Benndorf G. Emergency endovascular management of penetrating gunshot injuries to the arteries in the face and neck: a case series and review of the literature. J Neurointerv Surg. 2014;6(1):42–6. doi: 10.1136/neurintsurg-2012-010574