Original Research Paper

Volume - 14 | Issue - 10 | October - 2024 | PRINT ISSN No. 2249 - 555X | DOI : 10.36106/ijar

Anaesthesiology

SURGICAL AND ANESTHETIC MANAGEMENT OF A CERVICAL PENETRATING WOUND: A CASE REPORT WITH LITERATURE REVIEW

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ABSTRACT Cervical penetrating injuries have the potential to negatively impact the essential and practical outlook for the injured person. The difficulties of handling emergencies and subsequent corrective procedures call for a comprehensive understanding of the seriousness of the situation, life-saving measures, and surgical reconstruction techniques. We report the case of a 24-year-old male who presented with a penetrating neck injury. It was a postero-lateral stab wound near the cervical spine. CT angiography confirmed the knife's path through muscles without vascular injury or contrast leakage. The patient underwent successful surgical exploration with thorough preoperative preparation and advanced anesthetic management. Management of penetrating neck injuries has evolved from routine exploration to a selective approach utilizing cervico-thoracic CT angiography, which reduces unnecessary procedures and improves outcomes. The neck is divided into three zones for assessment: Zone I (supraclavicular to cricoid), Zone II (cricoid to mandible), and Zone III (mandible to skull base).

KEYWORDS : Cervical Penetrating Wound, Anesthetic Management, Surgical

INTRODUCTION

Penetrating neck injuries are traumatic breaches of the neck's platysma and/or superficial cervical fascia. Despite becoming less common, they still account for 5-10% of trauma cases with a high mortality rate of 10%. These urgent medical situations pose life-threatening risks due to airway blockage and uncontrollable bleeding. Managing these cases requires immediate emergency care and subsequent reconstructive procedures.

Having a comprehensive understanding of the characteristics of these injuries is crucial in order to prevent potential mishaps. It is also imperative to possess a deep knowledge of the anatomy of the injury and the fundamental principles of its management in order to effectively address these traumas. In non-military environments, injuries to the cervical area are most commonly caused by sharp objects, followed by ballistic trauma. Incidents such as road accidents or injuries in the workplace comprise only a small percentage of these cases. [1]

In comparison, suicidal attempts are the primary reason for ballistic trauma to the face and neck in France, while they make up only 8% of such causes in the United States, where these injuries are mainly a result of assaults.3 Penetrating injuries to the neck commonly impact young males, who are at a higher risk for violent trauma and physical assaults. [2] The utilization of firearms is also a prevalent approach to suicide attempts among the male demographic. [2] Injuries to the cervical region result in an approximate mortality rate ranging from 3% to 6%, largely attributed to significant bleeding. [1]

We discuss a rare case of a postero-lateral penetrating neck injury caused by a knife. The proximity of the blade tip to the cervical spine posed a significant risk of neurological injuries. In this unique case, the postero-lateral penetrating neck injury was caused by a sharp knife with a menacing blade. The blade, with its keen edge and piercing point, tore through the flesh and punctured the protective layer of the platysma, breaching the once sacred barrier of the neck. While the occurrence of such injuries is becoming rarer in our medical practice, they still hold a significant presence, accounting for approximately 5-10% of all trauma cases that grace our doors. It is vital to acknowledge the gravity of such injuries, for they carry a mortality rate as high as 10%, reminding us of the fragility of life. [3] The complex nature of the neck requires caution and attention, as it contains essential structures. Thorough examination is crucial for managing penetrating neck injuries. "Hard signs," along with hemorrhagic shock, require immediate action. Swift measures must be taken for prompt treatment in the operating room. [4] In the pursuit of accurate diagnosis and proper treatment, cervico-thoracic CT angiography emerges as the preferred diagnostic tool for stable patients grappling with the aftermath of penetrating neck injuries. By harnessing the power of advanced imaging technology, we can unravel the intricate tapestry of damage, unveiling the extent of trauma and guiding our therapeutic approach. This invaluable test offers a panoramic view of the affected area, empowering us with the knowledge required to make informed decisions and chart a path to recovery. [5] A rare case of a neck injury caused by a knife blade close to the cervical spine posed a serious threat to the delicate nerves that control movement. The proximity to the spinal cord served as a reminder of the potential for devastating neurological injuries. Despite the adversity, our dedication to patient care and pursuing excellence remains strong as we strive to protect our patients. [5]

Case Presentation

A 24-year-old male was referred from Youssoufia District Hospital to the emergency department at Marrakech University Hospital Center Mohammed VI, presenting with a penetrating neck injury sustained 4 hours prior to arrival. The injury resulted from a stabbing attack, with the knife lodged in his neck. No additional injuries were reported (Figures 1,2). The patient had not been provided with any care prior to arrival at the hospital. The patient vehemently denied experiencing any form of persistent bleeding, breathing or speaking difficulties, voice changes, or dysphagia. He openly admitted to occasionally engaging in smoking and alcohol consumption, but reassured the medical personnel that he had no significant medical history, allergies, previous surgeries, or notable family medical background. It is important to note that he encountered only a mere fraction of blood loss immediately following the attack, which the medical team successfully managed. Upon being admitted, the patient was stable in terms of their hemodynamics and respiratory system, and they remained alert and oriented. Their vital signs were as follows: a heart rate of 105 beats per minute, a blood pressure of 120/75 mmHg, a respiratory rate of 19 breaths per minute, and an oxygen saturation of 96% while breathing room air. The patient did not exhibit any signs of cyanosis. The knife blade was situated in the left rear-lateral part of the neck at the level of

the cricoid, behind the sternocleidomastoid muscle, and angled diagonally from left to right and from top to bottom. The comprehensive physical examination, which included a detailed assessment of the injury site, did not exhibit any notable indications of bleeding or bubbling. Furthermore, it yielded no evidence of an expanding or pulsatile hematoma, dysphonia (difficulty in speaking), dysphagia (difficulty in swallowing), or any signs of bleeding from the oral or nasal cavities. Notably, there were no discernible neurologic abnormalities, and the carotid pulse remained intact and palpable. It is worth mentioning that subcutaneous emphysema was not observed during the examination. Importantly, all other systemic examinations conducted were found to be well within the parameters of normalcy. A Cervico-thoracic CT angiography was carried out, which resulted in the discovery of (Figures 3,4,5,6); A metallic object (knife) is situated in the left back and side of the neck, passing through the trapezius and paravertebral muscles on the same side, and ending between the spinal processes of D1 and D2, outside the openings in the spine. Emphysema is present in the soft tissues of the neck. There is no leaking of contrast media. The subclavian arteries are of normal size, regular, and open. The primary and internal carotid arteries are also normal, regular, and open. The right and left vertebral arteries are normal. The thyroid gland and larynx are normal. There are no signs of fractures, and the thoracic level is normal. The patient was brought to the operating room for surgical exploration of the neck under general anesthesia. Standard monitoring, including ECG (Electrocardiogram), SpO2 (Oxygen Saturation), NIBP (Non-Invasive Blood Pressure), and capnography was performed. A second large intravenous access was established to ensure adequate fluid administration and medication delivery. In preparation for the procedure, the patient received prophylactic antibiotics (2g/250mg of amoxicillin/clavulanic acid) to prevent potential infection. Tetanus prophylaxis was also administered. Additionally, 1g of tranexamic acid was given to minimize an unexpected bleeding during the surgery, for promoting better surgical outcomes. To ensure the availability of blood for potential transfusion, two units of blood cells were prepared before the start of the surgical intervention. Before the procedure commenced, the patient was adequately preoxygenated in a semi-sitting position for 5 minutes with 100% of oxygen to optimize oxygen reserves. The patient then underwent nasotracheal intubation with the aid of a nasofiberscope following nebulization with 2% xylocaine for 5 minutes and nasal packing with xylocaine-naphazoline-soaked tampons for 10 minutes while in a semi-sitting position. Additionally, the patient was repositioned to a dorsal decubitus position with a 30° head-up tilt. Conscious sedation was administered intravenously with AIVOC and 50 micrograms of fentanyl. A bilateral superior laryngeal nerve block was performed using ultrasound guidance, combined with a transtracheal block via the injection of 3 ml of 2% xylocaine into the cricothyroid membrane. Nasofiberscope-assisted in-line stabilization techniques were used to avoid any cervical extension and maintain the pharyngolaryngeal axis, thereby minimizing the risk of displacing the knife, which could lead to worsening neurological conditions or injury to nearby vascular structures. Anesthesia induction was performed with propofol, fentanyl, and rocuronium after verifying the correct positioning of the nasotracheal intubation tube by visualizing the progression of the tube on the fiberscope through the vocal cords, the visualization of the carina, and 3 capnograph readings on the scope, with careful monitoring of the patient's vital signs. The knife was extracted directly and gently with careful monitoring of bleeding. The absence of significant bleeding after the removal of the penetrating object did not necessitate either a focal or extrafocal approach to the lesion pathway. A sterile compressive dressing was applied, and the patient was monitored in the neurosurgery unit. Postoperative progress was favorable; the patient did not experience postoperative bleeding or neurological deficits. Antibiotic therapy was continued for one week. The surgical wound was clean, and the patient was discharged from the hospital on postoperative day 3.

Fig 1. Front view of the victim showing the knife blade situated in the left posterior-lateral part of the neck at the level of the cricoid, behind the sternocleidomastoid muscle, angled diagonally from left to right and from top to bottom, with no active hemorrhage.

Fig 2. Profile view of the victim showing the knife blade located in the left posterior-lateral part of the neck, traversing the sternocleidomastoid muscle, angled from left to right and from top to bottom, with no active bleeding or local hematoma.

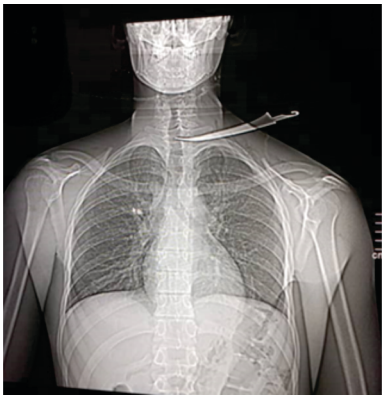

Fig 3. Digital standard frontal chest X-ray showing the entire trajectory of the weapon in the mid-cervical region (Zone II)

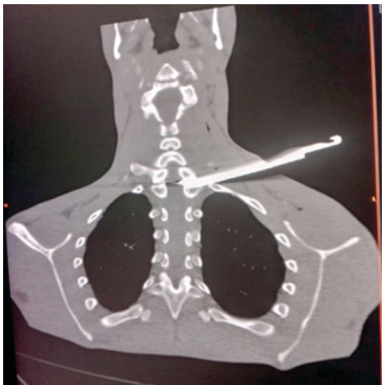

Fig 4. Bone window of a cervico-thoracic angioscan in coronal section showing the entire trajectory of the sharp weapon with the distal end arriving at the left flank of the D1-D2 stage with a subtle subcutaneous emphysema, and no visible fracture lines.

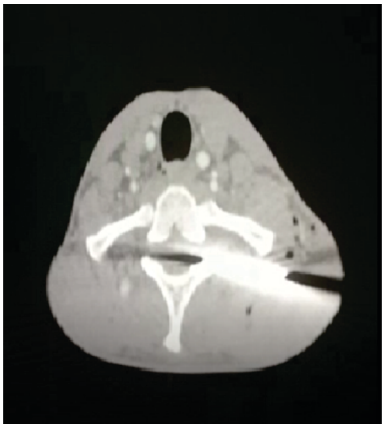

Fig 5. Cervico-thoracic angioscan in axial slice showing the path of a

metal-dense object (knife) in the left posterolateral cervico-thoracic region through the trapezius and prevertebral muscles, with the distal end arriving at the left flank of the D1-D2 stage with subcutaneous soft-tissue emphysema. No extravasation of contrast medium at any stage of the examination.

Fig 6. Photo showing the shape and type of the bladed weapon after its extraction in the operating room.

DISCUSSION

In the last 30 years, there have been significant and impressive developments in the assessment and treatment of penetrating neck wounds. There has been a considerable shift from the traditional method of requiring surgical exploration of the neck, even in stable patients, to a more selective approach that emphasizes surgical treatments and recognizes the importance of cervico-thoracic CT angiography. [6] These modifications have unquestionably assisted in enhancing the results for patients and refining medical treatments within this specific area. [7] Injuries to the neck encompass damages ranging from the clavicles to the skull base.

The neck is the anatomical region limited at the top and rear by the base of the skull, at the top and front by the basilar edge of the mandible, and at the bottom by the sternal notch, extending laterally by the clavicles.

The cervical region is traditionally divided into three anatomo-functional zones according to the classification by Monson et al; Zone I is defined as the area between the sternal notch and the two clavicles at its lower boundary, and the cricoid cartilage at its upper boundary. Zone II is situated between the cricoid cartilage and the mandibular angles. Lastly, Zone III encompasses the area from the mandibular angles to the base of the skull at the upper lateral sides of the neck. (Figure.7).

Zone I encompass all structures, notably blood vessels, in close proximity to the chest. Injuries in this area frequently result in a hemothorax or hemomediastinum, which are linked to a notably high fatality rate (10%), despite possibly showing no symptoms initially. Although exploring this region is challenging due to the presence of bony structures and entry into the thorax. Zone II is the largest area. Injuries in this zone can impact blood vessels, airway, and digestive structures, as well as the thyroid gland. It is the most vulnerable area but is also the most straightforward for surgical exploration. Therefore, injuries in Zone II have a lower fatality rate than those in Zones I or III. Surgical exploration of injuries in Zone III is complex due to the mandibular angle and the entry of structures into the base of the skull, and may require multidisciplinary management, including interventional radiology.[8]

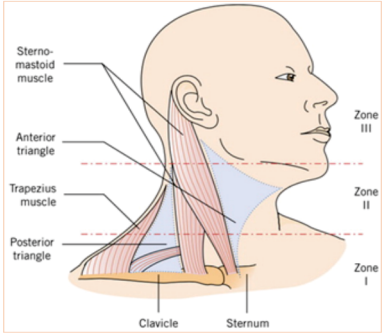

Fig 7. The anatomical classification of the neck zones (Monson 1969)

The initial response at the scene follows standard protocol for emergencies: ensuring open airway and controlling bleeding. This is crucial for short-term prognosis. After cervical injury, indicators of active bleeding include expanding or pulsatile blood clot, difficult-to-control bleeding, and unresponsive shock. Before admission, external compression of the neck is necessary. Establishing an IV line allows fluid resuscitation. If unsuccessful, tamponade can be performed with a Foley catheter. Immediate surgical management of bleeding is critical upon reaching the hospital. [9]

Airway management is the second fundamental aspect of immediate care for cervical injuries.It is crucial to handle this with care to prevent worsening spinal and medullary damage, while considering the craniovertebral junction. Examination and clearing of foreign objects from the oral cavity should be done before hospitalization, along with addressing other causes of cervical airway blockage. [10] The approach to controlling the upper airway depends on the patient's condition. Balancing the need for on-site techniques like orotracheal intubation with the risk of airway obstruction is important. The technique should be selected based on the case, with a rescue technique in mind. In cases of acute respiratory distress, safeguarding the airway is crucial. If no injuries are present, rapid sequence intubation is usually done. [11] If unsuccessful, cricothyrotomy is recommended. In special cases, like pharyngolaryngotracheal injuries, avoid blind intubation. Severe pharyngolaryngeal injuries often require prompt tracheostomy with a vertical incision towards the trachea. Injuries to the trachea may cause additional ruptures, with the lower part retracting into the chest. To prevent this, identify and secure the lower part of the trachea with a clamp and suture to enable ventilation. If respiratory distress continues, consider a compressive hemothorax. Needle decompression may be necessary. Less severe injuries are managed in the hospital. The severity of the injury determines the necessary procedure. Orotracheal intubation may be performed, with preparation for tracheostomy if needed. Local anesthesia may be used for a primary tracheostomy in the operating room. [12]

The use of fiberoptic guidance for OTI may be limited by the patient's ability to cooperate. The dramatic presentation of penetrating cervical trauma should not overshadow the possibility of associated injuries to the trunk, limbs, or brain. A comprehensive assessment is necessary to rule out urgent extracervical trauma. There is ongoing debate about certain practices, such as the need for cervical spinal immobilization with a cervical collar after a penetrating cervical injury. [13] Our patient was transported without a collar as there was no evidence of peripheral or central neurological deficit. A retrospective study by Rhee et al. found that this measure was only useful in 0.15% of cases in sharp weapon trauma (11 out of 7,483 patients). [14] While spinal cord injuries from direct sharp weapon trauma are rare, they are more common in cases of ballistic trauma. In any scenario where simultaneous bleeding can be managed, the presence of a localized neurological impairment caused by a penetrating injury to the neck or a high likelihood of nerve damage in an unconscious individual should lead to the immobilization of the cervical spine using a cervical collar. It is imperative that any patient with a penetrating cervical wound be promptly transported via medical transport to a specialized center equipped with appropriate technical resources and a specialized surgical team (consisting of a maxillofacial surgeon, vascular surgeon, and otorhinolaryngologist). Specific clinical indicators of severity necessitate immediate surgical investigation (prior to any paraclinical examination), including: Initial presentation with one of the two life-threatening emergencies (respiratory distress and massive hemorrhage); Hemodynamic instability. Severe visible or strongly suspected laryngotracheal injury (subcutaneous emphysema, air bubbles externalizing through the wound); Uncontrolled hemorrhage (active bleeding, compressive and/or rapidly evolving hematoma); Neurological signs suggestive of a stroke. evertheless, our patient remained stable in terms of both their hemodynamics and respiration at the site of the event. Upon evaluation by Emergency Medical Assistance Service (EMAS), it was determined that there were no indications of hemodynamic or respiratory problems, and there was no ongoing bleeding from the wound, with the exception of a small, detectable subcutaneous emphysema.

A clinical examination is needed to assess signs of vascular, nerve, respiratory, and digestive involvement. Wound location and nature, as well as points of entry and exit, are crucial in determining affected structures. Vascular injuries are present in around 20% of cervical wounds. Neurological examination is recommended, with attention to motor and sensory function in all four limbs. Phrenic nerve injury can

be confirmed through imaging. Upper limb deficits may indicate brachial plexus injury, while Horner's syndrome suggests sympathetic chain injuries. Laryngeal and tracheal injuries occur in 5% of cervical wounds. Pharyngoesophageal injuries are found in less than 7% of cases, requiring careful examination. Cervical esophageal injuries can lead to complications like mediastinitis. Suspicion of esophageal injury may arise with symptoms like dysphagia and subcutaneous emphysema. Our patient did not exhibit these symptoms, so management focused on monitoring. The knife's trajectory was far from the tracheoesophageal axis according to the angioscanner. [1]

Clinical evaluation is only taken into account if there are no indications of severe symptoms in a patient who is stable. The preferred and primary examination is CT angiography of the supra-aortic trunks (SAT) Vessels and Thorax, which is considered the best efficient, method, readily available, and enables evaluation of both the vascular and aerodigestive systems. It is capable of detecting cervical emphysema, related hemothorax or hemopneumomediastinum, and examining skeletal structures, soft tissues, incidental clues, and extraneous objects (such as projectiles, blades, etc.). Some experts have created decision trees for deciding if this examination is necessary. Nevertheless, due to its advantageous features, quick performance, minimally invasive character, and availability in facilities with minimal technical capabilities, it is advised to conduct systematic CT angiography of the subclavian artery and thorax for stable patients lacking indications of severity. This strategy is endorsed by numerous researchers who have examined the effectiveness of CT angiography in assessing penetrating cervical injuries. Having a sensitivity of 100% in detecting substantial vascular and aerodigestive injuries in 91 asymptomatic patients, and also a specificity of 94%. CT angiography was also the first examination performed on our patient upon admission to the emergency department, which provided valuable information about the relationship of the penetrating object to vital structures such as the vessels, nerves, and the pharyngolaryngeal-tracheal axis. Additional tests are conducted depending on the findings of the clinical assessment and CT angiography. CT Angiography of the Supra-Aortic Vessels and Thorax: The use of angiography has been significantly restricted due to the benefits of CT angiography. Moreover, angiography is a procedure that is invasive, requires a significant amount of time, has limited accessibility, and involves non-trivial iatrogenic risks (even up to 2% post-procedure embolic events). Angiography is consequently considered a secondary exam, generally conducted only in infrequent instances substantiated by clinical and/or angiographic evidence. It delivers an accurate diagnosis of vascular injuries and allows for endovascular intervention techniques like embolization. The main purpose of Endoscopic Examination is to diagnose injuries to the esophageal and pharyngolaryngeal digestive tract. It is also used in suspected cases and based on CT angiography results. Nasofibroscopy guides evaluation and prevents exacerbation of injuries. Rigid endoscopies are performed under anesthesia in the operating room, and hemostatic procedures may be carried out. Pharyngoesophageal Transit is a secondary examination that confirms suspicion of digestive injury, but it is not done in emergencies. Doppler Ultrasound is reliable for assessing cervical vessels, but is not often used in practice due to overlap with CT angiography and reliance on the operator. [1]

A comprehensive surgical investigation of all penetrating injuries to the neck was previously advised. Research has shown that routine cervical exploration in hemodynamically stable patients can lead to a high rate of non-therapeutic interventions, overlooked injuries, longer hospital stays, and increased complications. This method has now been replaced by a management plan based on an anatomical-functional zone approach [1] . Historically, surgical exploration was necessary for any wound in Zone II because of the high concentration of vascular, neural, and visceral structures in this area. [15] Exploration of penetrating wounds in Zones I and III was not systematic but guided by complementary examinations (CT angiography and others). More and more, writers are expressing disapproval of the "anatomical-functional zone" method in favor of what is known as the "no-zone" method. (Figure 8) [16]

It is true that anatomical-functional zone methods can result in incomplete cervicotomies and may fail to identify certain injuries even after exploration in the operating room: the seriousness of internal injuries (vascular or aerodigestive) does not always correspond to the extent of the surface wound. In addition, improvements in imaging methods (such as CT angiography of the supra-aortic trunks) now enable accurate evaluation of injuries. Finally, numerous teams have announced positive outcomes using cautious methods when deemed suitable. Initial findings regarding the selective management of peripheral nerve injuries (PNIs) have primarily been derived from the application of "zone-based" algorithms. These algorithms provide recommendations for the mandatory exploration of stable symptomatic zone II injury patients, as well as regular vascular radiographic studies for stable zone I and III injury patients. (figure 9) [17] Consequently, there is a growing need to develop more refined strategies for managing peripheral nerve injuries (PNIs) to minimize unnecessary interventions and improve patient outcomes. Future research and advancements in this area will help enhance our understanding of PNI management and potentially lead to more effective treatment approaches.[18]

Therefore, we suggest, as do other writers, a treatment approach involving a comprehensive clinical evaluation and CT angiography of the arteries in the upper chest, which can determine whether surgical investigation with specific information is necessary or if a conservative approach with careful monitoring is warranted. [1] Initial emergency management is not necessary for nerve injuries. Diagnosis can be quite difficult in patients who are unstable or unconscious. When it comes to nerve injuries, direct suturing is the preferred method. An epineurial microsurgical suture using a monofilament thread of the right size is performed while using a binocular loupe or microscope. It is important that this suture is done without tension and is also reinforced with tissue glue. If there is a loss of nerve tissue that hinders the ability to suture directly without tension, then it is advisable to perform the suture as soon as possible using a nerve graft. In the area of the neck, the superficial cervical plexus can serve as a viable donor site due to its accessibility and location within the same surgical field. On the other hand, the sural nerve is generally not suitable for cervical injuries. In this particular case, the patient sustained an extraordinarily rare and atypical postero-lateral neck injury. This injury was specifically classified as Zone II, according to the standard zonal distribution method. It is important to note that the blade responsible for this injury was deeply and firmly embedded in the left postero-lateral region of the patient's neck. Additionally, it was positioned just above the cricoid level, obliquely crossing from the upper to the lower part of the ipsilateral trapezius and paravertebral muscles. Remarkably, the blade's trajectory ended between the spinous processes of the first and second thoracic vertebrae. This final location is outside the confines of the vertebral foramen. The significant role played by the combined muscle layers of the posterior neck, along with the sturdy cervical vertebrae and spinal ligaments, in effectively containing the potentially harmful tip of the blade should not be underestimated. Their collective strength successfully limited the extent of the injury suffered by the patient. Comparatively, this distinctive injury highlights a notable advantage over anterior penetrating neck traumas. The vulnerability of the soft tissues in the anterior region, coupled with its anatomical susceptibility, makes these types of traumas far more likely to cause life-threatening injuries. The contrast is evident when considering the patient's situation. The inherent robustness of the posterior neck, particularly the muscle layers, played a crucial role in mitigating the severity of the injury. Our case supports the effectiveness of the no-zone approach, [18] (Figure 8), and underscores the importance of clinical examination, particularly those based on the presence or absence of hard signs [19] (Figure 10), as well as the use of CT angiography (CTA) to assess the severity of penetrating neck injuries (PNIs). CTA is valuable for determining the wound trajectory and identifying structures at risk of injury. However, it is worth noting that the presence of retained metallic fragments in the neck can limit the interpretation of CT angiographic images. [20] In this case, the CTA imaging proved to be effective.

Vascular trauma is common in penetrating cervical injuries, particularly venous injuries. The internal jugular vein is often affected, while injuries to the external jugular vein can cause significant bleeding. Carotid injuries, whether symptomatic or not, should be repaired promptly to reduce mortality and neurological complications. Treatment options include surgical repair, stent placement, or arterial embolization. Covered stents may be used for internal carotid injuries, but their long-term outcomes are uncertain. Isolated internal jugular vein injuries can be managed conservatively, with surgical repair if necessary. Preserving at least one internal jugular vein is recommended for bilateral injuries. Endovascular repair is typically required for subclavian and vertebral artery injuries due to limited surgical access. [1]

Clinical assessment and imaging are used to diagnose laryngeal and

tracheal injuries. Once confirmed or suspected, exploration is necessary. Airway management choice depends on the circumstances. Nasofibroscopy is useful for stable patients. Direct laryngoscopy with esophagoscopy is needed for initial respiratory distress or severe injury under general anesthesia. [1] Timely treatment of these injuries is essential to reduce speech-related complications or additional narrowing of the airway. The severity of laryngeal injuries is determined using the modified Schaefer-Fuhrman classification.

- Stages I and II: Handled prudently with corticosteroids, antibiotics, aerosols, and surveillance.
- Stages III, IV, and V: Require a tailored surgical intervention to treat the observed injuries.

✓ The main method of closure through a surgical incision in the thyroid cartilage for severe injuries, occasionally accompanied by a secondary tracheostomy to protect the damaged area.

✓ Surgical realignment and internal placement of securing devices for fractures of the thyroid and/or cricoid cartilage.

✓ Laryngeal stenting is utilized for cases involving extensive mucosal loss, comminuted fractures, and interruptions of the anterior commissure.

Injuries to the pharyngoesophageal region may cause symptoms like vomiting blood, painful swallowing, or neck air. Delayed diagnosis increases the risk of serious illness. CT scans detect neck air and determine injury severity. Treatment depends on findings: close monitoring for asymptomatic patients without neck air, endoscopy for symptomatic patients or those with neck air. For suspected or confirmed aerodigestive tract injuries, panendoscopy and bronchoscopy under anesthesia are recommended. Surgical options range from sutures to muscle flaps, gastrostomy, and jejunostomy. [1]

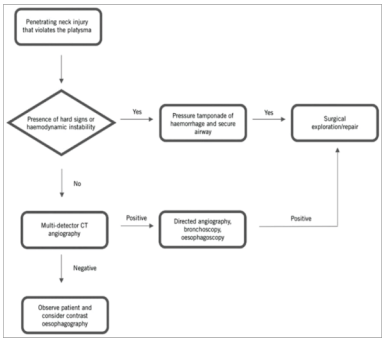

Fig 8. Western Trauma Association management algorithm for a penetrating cervical wound according to the no-zone approach model.

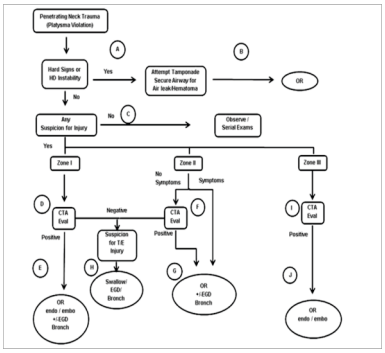

Fig 9. Western Trauma Association management algorithm for penetrating neck trauma (Sperry 2013). HD: hemodynamic; CTA EVAL: CT-Angiographie Evaluation; endo / embo: endoscopy / embolization; EGD: Eoesophagogastroduodenoscopy; Bronch: Bronchoscopy ; T/E : supra-aortic trunk/esophagus

> Shock
> Pulsatile bleeding or expanding haematoma
> Audible bruit or palpable thrill
> Airway compromise
> Wound bubbling
> Subcutaneous emphysema
> Stridor
> Hoarseness
> Difficulty or pain when swallowing secretions
> Neurological deficits

Fig 10. Hard signs' indicating immediate explorative surgery in penetrating neck injury.

CONCLUSION

In the current discussion about the best way to handle neck trauma, there is a compelling case being presented for the selective conservative method. This innovative approach to assessing and treating penetrating neck injuries is known as the no-zonal approach, which offers a fresh perspective that departs from the traditional anatomical zone-based methods that have been relied upon by medical professionals for the last half-century. By embracing advanced radiological tests, such as the highly effective helical CT angiography, medical practitioners are able to significantly minimize the need for unnecessary surgeries and ultimately enhance patient outcomes by tailoring treatment plans according to individual needs and circumstances. It is through the utilization of such state-of-the-art techniques that patients can benefit from a personalized and optimized approach to the management of neck trauma, ushering in a new era of medical excellence and patient-centric care.

Conflits d'Intérêts

Les auteurs ne déclarent aucun conflit intérêts.

Contributions des Auteurs

Tous les auteurs ont contribué à toutes les étapes de l'élaboration de ce travail. Les auteurs déclarent avoir lu et approuvé la version finale du manuscrit.

REFERENCES

1. Burgess CA, Dale OT, Almeyda R, Corbridge RJ. An evidence-based review of the assessment and management of penetrating neck trauma. Clin Otolaryngol 2012; 37:44–52.
2. J.-B. Caruhel, J. Bouaoud, N. Tabchouri, T. Schouman, P. Goudot, Plaies cervicales pénétrantes, Volume, Issue, /2019, Pages, ISSN 1241-8234, http://dx.doi.org/10.1016/S1241-8234(19)43063-0_(http://www.sciencedirect.com/ science/article/pii/S1241-8234(19)43063-0)
3. A. Isaza-Restrepo, J.A. Quintero-Contreras, et al., "Value of clinical examination in the assessment of penetrating neck injuries: a retrospective study of diagnostic accuracy test," BMC Emergency Medicine, vol. 2020, Springer, 2020. springer.com
4. M. Rehan, S. Anwar, H. Wali, A. Noor, O. Ehsan, et al., "Shrapnel in carotid sheath: A rare penetrating neck injury," Chinese Journal of Traumatology, Elsevier, 2023. sciencedirect.com
5. A. Ajiya, I. Y. Shuaibu, and H. M. Anka, "An audit of surgical neck explorations for penetrating neck injuries in northwestern Nigeria: experience from a teaching hospital," Nigerian Journal of Surgery, 2021. ajol.info
6. K. Inaba, B.C. Branco, J. Menaker, et al., Evaluation of multidetector computed tomography for penetrating neck injury: a prospective multicenter study, J Trauma Acute Care Surg 72 (2012) 576–583, discussion 583-4; quiz 803-4.
7. L. Duan, ""Political Power Grows Out of the Barrel of a Gun": Communist Policies on Mobilizing Armed Masses in Wartime China," War and Communism, 2022. [HTML]
8. Demetriades D, Asensio JA, Velmahos G, Thal E. Complex problems in penetrating neck trauma. Surg Clin North Am 1996; 76:661–83.
9. Franke A, Bieler D, Friemert B, Schwab R, Kollig E, Güsgen C. The first aid and hospital treatment of gunshot and blast injuries. Dtsch Arztebl Int 2017; 114:237–43.
10. Shuker ST. Expanding hematoma's life-threatening neck and face emergency management of ballistic injuries. J Craniofac Surg 2016; 27:1282–5.
11. Mandavia DP, Qualls S, Rokos I. Emergency airway management in penetrating neck injury. Ann Emerg Med 2000; 35:221–5.
12. Pons Y, Kossowski M. Chirurgie des plaies et traumatismes du larynx et de la trachée cervicale. EMC - Oto-rhino-laryngologie, Volume 2, Issue 1, February 2005. p. 107–18.
13. Schubl SD, Robitsek RJ, Sommerhalder C, Wilkins KJ, Klein TR, Trepeta S, et al. Cervical spine immobilization may be of value following firearm injury to the head and neck. Am J Emerg Med 2016; 34:726–9.
14. Rhee P, Kuncir EJ, Johnson L, Brown C, Velmahos G, Martin M, et al. Cervical spine injury is highly dependent on the mechanism of injury following blunt and penetrating assault. J Trauma 2006; 61:1166–70.
15. Roon AJ, Christensen N. Evaluation and treatment of penetrating cervical injuries. J Trauma 1979;19:391–7.
16. Nowicki, JL;Stew, B;Ooi, E. Penetrating neck injuries: a guide to evaluation and management. Annals of the Royal College of Surgeons of England, 01 Jan 2018, Vol. 100, Issue 1, pages 6 – 11. DOI: 10.1308/rcsann.2017.0191 https://publishing.rcseng.ac.uk/doi/10.1308/rcsann.2017.0191
17. M. Charlick, "Anatomy, head and neck, internal carotid arteries," 2020. europepmc.org
18. ML Chandrananth, JD Lee, D Read, "No zone' approach in the management of penetrating neck injuries–an Australian Tertiary Trauma Centre experience," ANZ Journal of Surgery, vol. 2024, Wiley Online Library.
19. J. Kotek, I. Žvák, T. Dušek, J. Růžička. "Prelaryngeal soft tissue injury of the neck caused by an accidental crossbow shot," April 2024. Formosan Journal of Surgery 57(4). DOI:10.1097/FS9.0000000000000124
20. C Böhmer, J Prevoteau, O Duriez, "Gulper, ripper and scrapper: anatomy of the neck in three species of vultures," Journal of …, Wiley Online Library, 2020. wiley.com. https://doi.org/10.1111/joa.13129