Traumatic Neck Injuries
Modern Evaluation and Treatment

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KEYWORDS

• Penetrating • Blunt • Neck • Trauma • Zone • Modern • Evaluation • Management

KEY POINTS

- Penetrating neck trauma accounts for 5% to 10% of all traumatic injuries, with a mortality rate ranging between 2% and 6%.
- The initial assessment of patients with neck traumatic injuries follows the Advance Trauma Life Support guidelines, and airway management is always the priority.
- Emergent surgical exploration is indicated for hemodynamically unstable patients with hard signs of vascular or aerodigestive tract injury.
- Multidetector computed tomographic angiography is the best initial diagnostic test for hemodynamically stable patients with no hard signs of vascular or aerodigestive tract injury.
- A nonzonal diagnostic approach for stable patients with penetrating neck trauma provides more accurate prediction of vascular or aerodigestive tract injury and reduces unnecessary surgery.

INTRODUCTION

Traumatic neck injuries occur in 5% to 10% of patients with severe trauma and are associated with a high mortality rate of up to 10%.[1,2] The evaluation and management of traumatic neck injuries have advanced over the last few decades, improving clinical outcomes.[3] However, challenges in management continue to exist, as injuries to important structures in the neck can be life-threatening and require immediate medical attention by a multidisciplinary team, including emergency medicine physicians, anesthesiologists, and trauma and otolaryngology surgeons.[4] Traumatic neck injury is typically classified into 2 categories: blunt and penetrating neck traumas.

Blunt neck trauma occurs when the neck is struck by a blunt force, with a reported incidence rate of 5%.[5,6] Etiologies include motor vehicle collision (MVC), sports injuries, falls, assault, crush injuries, hanging, and clothesline trauma. MVC is the most common cause of blunt neck trauma, often associated with other injuries from an unrestrained passenger striking the neck on a dashboard or steering wheel. Symptoms in patients with blunt neck trauma may present in a delayed manner, with damage to vital neck structures underdiagnosed, and therefore, close extended observation is recommended.[5,6]

Penetrating neck trauma is defined as an injury that violates the platysma muscle, carrying a high risk of damaging vital structures.[7] The most common mechanism of penetrating neck injury worldwide is a stab wound from a violent assault (40% to 75%), followed by gunshot wound (GSW, 25% to 45%), self-harm, and motor vehicle accidents.[8–10] The diagnostic and surgical management of penetrating neck trauma has progressed significantly over the last few decades with advances in radiographic studies and endoscopic techniques.

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Abbreviations

ATLS	Advanced Trauma Life Support
BCVI	blunt cerebrovascular injuries
CCA	common carotid artery
CTA	computed tomographic angiography
ECA	external carotid artery
EGD	esophagogastroduodenoscopy
GSW	gunshot wound
ICA	internal carotid artery
IJV	internal jugular vein
IR	interventional radiology for endovascular techniques, angiography embolization
MDCTA	multidetector computed tomographic angiography
MVC	motor vehicle collision
OR	operating room for neck exploration/repair
SCM	sternocleidomastoid muscle

Historically, penetrating neck trauma had a high mortality rate, reaching levels as high as 16% during World War I from nonoperative management of patients.[11] Military experiences during World War II led to the implementation of mandatory operative neck exploration as a diagnostic and treatment modality for all penetrating neck trauma, decreasing the mortality rate to 7%.[12,13] However, the primary limitation of operative exploration as a diagnostic modality was the high negative exploration rate of about 50%.[14,15] As a result, most trauma centers currently practice selective neck exploration to avoid unnecessary morbidity.[16,17]

This article reviews the modern evaluation and treatment of traumatic neck injuries, primarily focusing on penetrating neck injuries, as this is the more common, life-threatening type of neck trauma.

CLINICAL NECK ANATOMY

Understanding the neck anatomy is essential when evaluating a patient with neck trauma, as it contains important vascular, aerodigestive, and neurologic structures that are relatively unprotected.[18] To perform an accurate physical examination as a part of a primary and secondary survey of neck traumas, 4 types of vital structures in the neck must be taken into consideration:

1. Airway (pharynx, larynx, and cervical trachea)
2. Major vascular structures (carotid arteries, innominate arteries, subclavian arteries and veins, and jugular veins)
3. Nerves (spinal cord, brachial plexus, and cranial nerves)
4. Digestive tract (pharynx and esophagus)

The skeletal anatomy forms the neck boundaries. The inferior limit of the neck is delineated by the sternal notch anteriorly, the clavicles laterally, and the seventh cervical vertebra posteriorly. The superior limit of the neck is formed by the inferior border of the mandible antero-laterally and occipital bone in the posterior area. Based on the neck muscle landmarks, the neck is typically divided into anterior and posterior triangles by the sternocleidomastoid muscle (SCM).[19] The posterior neck triangle boundaries are the trapezius muscle posteriorly, the SCM anteriorly, and the clavicle inferiorly. The anterior neck triangle boundaries are the SCM laterally, the anterior midline medially, and the inferior border of the mandible superiorly (**Fig. 1**).

NECK ANATOMIC ZONES

The evaluation and management of penetrating neck trauma has historically divided the neck into 3 distinct anatomic zones, based on the classification first described by Monson and colleagues[20] in 1969 (**Figs. 2** and **3**). While the location of a deep vascular or aerodigestive tract injury does not necessarily correlate to its surface anatomy, it is worthwhile to remember the structures within each neck anatomic zone (**Table 1**).

Arterial injury in the neck confers a life-threatening risk of severe hemorrhage, as well as brain ischemia, and is found in 15% to 25% of penetrating neck trauma.[21,22] The rate of vascular injuries is higher in zone 1 and zone 3. This occurs because vessels are fixed to bony structures, larger blood vessels, and muscles at the thoracic inlet and the skull base. Vascular injury management can be challenging in zone 1, with high mortality rates due to the density of vascular structures and proximity to the thoracic cavity.

Patients with aerodigestive tract injuries are at high risk for airway compromise and sepsis, with incidence rates of up to 18%.[23] In zone 1, the esophagus is at risk for injury, and 25% of penetrating esophageal injuries are occult and asymptomatic. Missed esophageal injuries may be devastating, increasing the mortality rates by 25% due to progression to mediastinitis.[24] Therefore, for traumas in zones 1 and 2, esophageal injuries must be ruled out with endoscopic examination and/or other imaging modalities such as esophagrams.

Surgical access to zone 1 may require sternotomy or thoracotomy for hemorrhage control. Zone 2 is the largest and the most injured zone in the neck, and it also has the easiest access

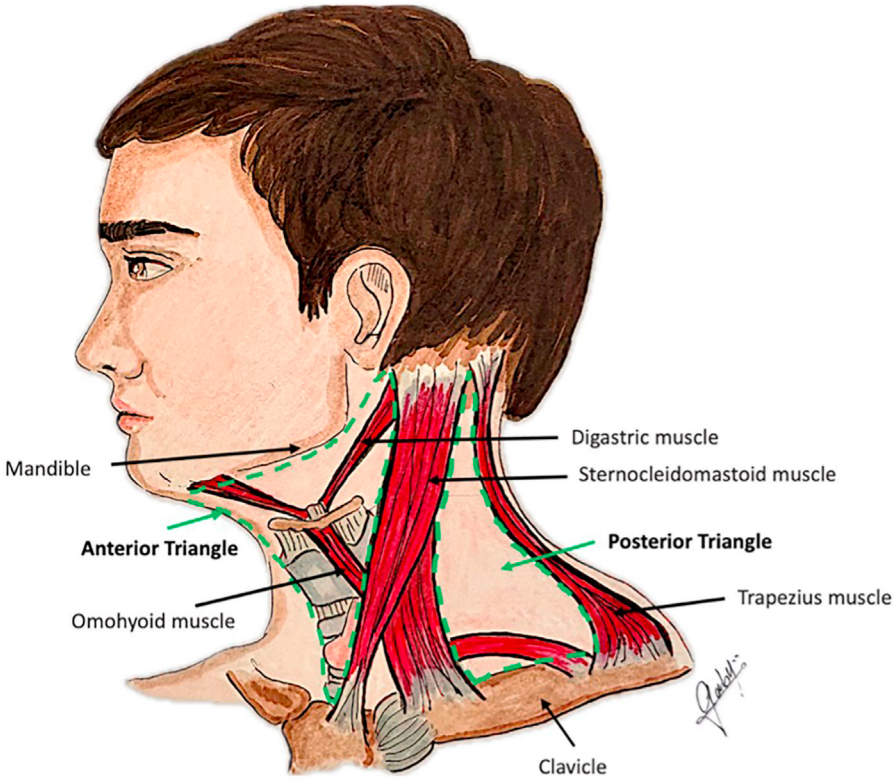

Fig. 1. Anterior and posterior neck triangles. (*Courtesy of* Gabriela Alejandra Pinero-Ortega.)

for surgical exploration (**Fig. 4**). In zone 2, the vessels are not fixed, and trauma forces can easily displace them, so vascular injury is much lower compared to other zones. Surgical access to zone 3 is difficult due to proximity to the craniofacial skeleton making surgical management of vascular injuries here challenging, with high associated mortality at the skull base. Surgical access may require craniotomy, mandibulotomy, or other maneuvers to displace the mandible anteriorly.

The zone-based algorithm approach has been used to guide management of penetrating neck traumas, including mandatory neck exploration.[25]

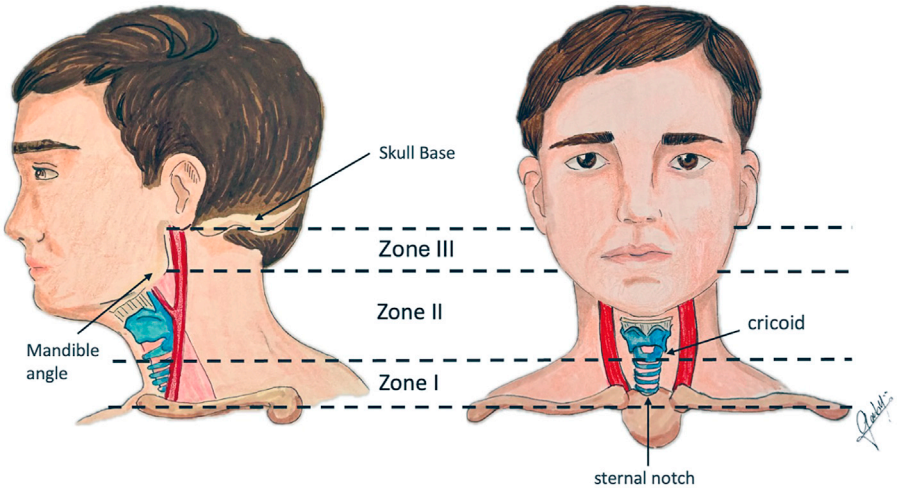

Fig. 2. Neck zones. (*Courtesy of* Gabriela Alejandra Pinero-Ortega.)

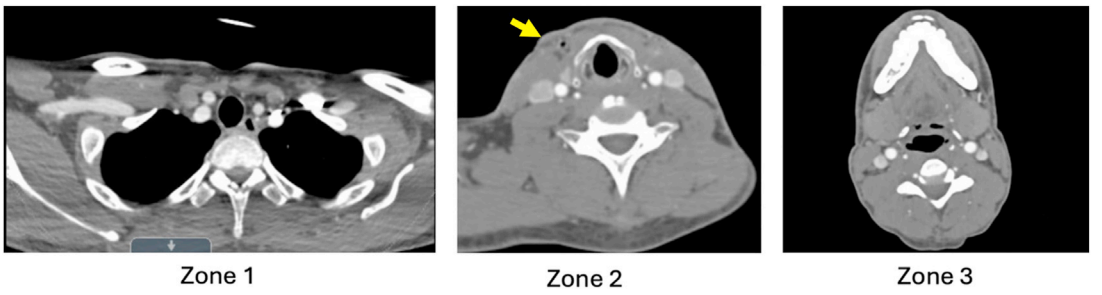

Fig. 3. Neck zones on CTA: The axial computed tomographic angiography (CTA) images correspond to zone 1, zone 2, and zone 3 from a patient with a right zone 2 neck stab wound (notice the small volume of emphysema at the level of the thyroid cartilage: yellow *arrow,* but no vascular or aerodigestive injury noted).

However, routine neck exploration in hemodynamically stable patients is associated with poor clinical outcomes, leading to a high negative exploration rate (around 50%), prolonged hospital stays, and an increased rate of complications.[26] In the zonal approach, asymptomatic patients with zone 1 and 3 neck injuries undergo diagnostic evaluation, including computed tomographic angiography (CTA), esophagram with contrast (**Fig. 5**), and endoscopy procedures to rule out vascular and aerodigestive injuries, decreasing the morbidity related to complex negative surgical neck explorations.[27,28] Symptomatic patients with zone 2 injuries should undergo immediate operative exploration due to the surgical accessibility of this area.[29]

Recently, however, as imaging studies have advanced, there has been movement to adopt a nonzonal approach, treating the neck as a single entity, and basing management on the hemodynamic stability of the patient. Moreover, in 2014, Low and colleagues[30] described poor correlation between the location of the external wound and the injuries to internal structures. As a result, the management of penetrating neck traumas over the last 2 decades has evolved, moving from a mandatory neck exploration of all neck wounds that penetrate the platysma (particularly zone 2 injuries). These advances in imaging and management algorithms will be discussed in the next sections.

INITIAL EVALUATION

The initial assessment of a patient with neck trauma centers on recognizing life-threatening vascular and aerodigestive tract injuries requiring prompt surgical intervention by following the

Table 1
Zones of the neck

Neck Zones	Anatomic Boundaries	Anatomic Structures
Zone 1	From the sternal notch inferiorly to the cricoid cartilage superiorly	• Major vessels of the upper mediastinum (proximal common carotid arteries, vertebral and subclavian arteries, subclavian, innominate, and jugular veins) • Lung apices, lower cervical esophagus, and trachea • Thyroid gland and the thoracic duct • Recurrent laryngeal and vagus nerves
Zone 2	From the cricoid cartilage to the angle of the mandible	• Carotid, vertebral, and internal jugular vessel • Pharynx, esophagus, larynx, and proximal trachea • Recurrent laryngeal and vagus nerves • Spinal cord
Zone 3	From the angle of the mandible to the base of the skull	• Extracranial carotid and vertebral arteries and distal internal jugular veins • Cranial nerves IX–XII • Sympathetic trunk • Spinal cord

Fig. 4. Right level 2 neck stab wound (6 cm): Platysma was violated superiorly. The wound was tracked 2 cm in depth laterally to the right.

Advanced Trauma Life Support (ATLS) primary and secondary surveys.[26,31] This protocol includes rapid assessment of the "A, B, Cs" of trauma, wherein airway management is always the first priority, followed by breathing and circulation (**Table 2**).

Clinical signs of airway injury include hoarseness, stridor, dyspnea, subcutaneous emphysema (without pneumothorax), air bubbling from the wound, and large-volume hemoptysis.[10,25] If endotracheal intubation is clinically indicated

Fig. 5. Normal contrasted esophagram from a right level 2 neck stab wound.

Table 2
Primary survey (The ABCDE)

A	Airway and cervical spine stabilization
B	Breathing and ventilation
C	Circulation with hemorrhage control
D	Disability: Neurologic status
E	Environment and exposure

and the patient is found to have a difficult airway secondary to distorted anatomy, awake fiberoptic intubation is the first option recommended. This technique allows for the assessment of the integrity of the supraglottic and subglottic airway while the patient keeps breathing spontaneously (**Fig. 6**).[32] In the event of a significant anterior tracheal injury, with the airway filled with blood or other sources of obstruction (causing poor direct scope visualization), a direct transcervical tracheal intubation (cricothyrotomy or tracheostomy depending on the location of injury) is recommended as it is safer than oral or nasal fiberoptic intubation.[33]

Once the airway is secured, the next step is the temporary external control of bleeding by applying direct pressure or placing packing materials into the wound. If bleeding cannot be controlled by pressure only, a Foley balloon catheter tamponade technique in the wound tract may be used,

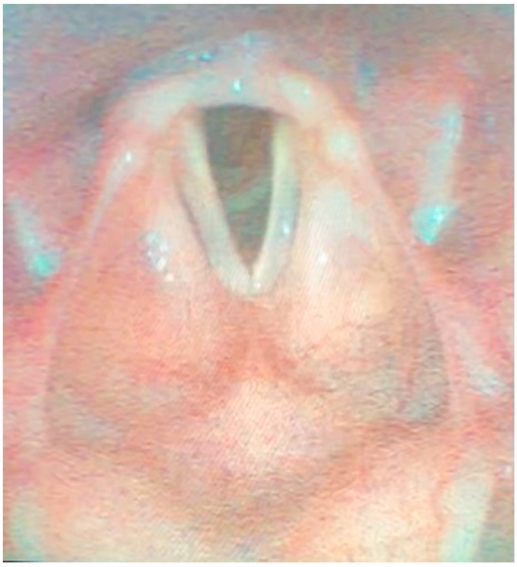

Fig. 6. Normal airway view from a flexible nasal laryngoscope examination. (*Data from* Mandavia DP, Qualls S, Rokos I. Emergency airway management in penetrating neck injury. Ann Emerg Med 2000; 221–225.)

especially for wounds with a narrow external opening (**Fig. 7**).[10] The balloon is inflated with water or saline (10–15 mL), the catheter is clamped to avoid intracatheter retrograde bleeding through the lumen, and the neck wound is sutured around the catheter.

DIAGNOSTIC MANAGEMENT OF NECK TRAUMA

After the airway and hemorrhage control have been achieved and the primary trauma survey has been completed, an inspection of a neck injury is performed as a part of the secondary survey to determine if the platysma muscle has been violated. Traditionally, all neck trauma patients are triaged based on the most recent algorithm of the 2013 Western Trauma Association for evaluation and management of penetrating neck trauma (**Fig. 8**).[7] This diagnostic algorithm is based on the neck zones and recommends operative interventions for patients with hard signs (**Table 3**) or patients who are hemodynamically unstable. Operative evaluation (neck exploration and/or endoscopy) is recommended for all symptomatic patients with zone 2 injuries and for hemodynamically stable patients with CTA evidence of zone 1 and 3 injuries. Although this neck zone-based algorithm for neck injury can provide a useful guideline in the evaluation and management of penetrating neck trauma, disadvantages include difficulty zoning transcervical or multiple injuries and poor correlation between the location of neck wounds and internal organ involvement.[27]

Recent literature supports that most trauma centers have adopted a more modern nonzonal algorithm and diagnostic approach for the evaluation and management of penetrating neck trauma, as it provides a more accurate assessment of the neck injury, prediction of vascular or aerodigestive tract injury, and better clinical outcomes (**Fig. 9**).[25,34,35] This algorithm combines clinical signs on physical examination with advanced imaging utilizing multidetector computed tomographic angiography (MDCTA) and considers the neck as a single unit. Based on the physical examination, patients are classified according to their risk of vascular or aerodigestive tract injury as follows: 1—high risk (hard signs), 2—intermediate risk (soft signs), and 3—low risk (no signs)[34,36] (see **Table 3** for hard and soft signs of vascular and aerodigestive tract injury). Hemodynamically unstable patients with hard signs will undergo operative management, whereas hemodynamically stable patients with soft signs will undergo MDCTA as an initial screening imaging method.[37] For asymptomatic patients with no clinical signs of neck injury, the probability of having a significant vascular or aerodigestive tract injury is nearly 0, and observation is recommended. This nonzonal approach algorithm has been associated with a low negative neck exploration rate of up to 10%.[37–39]

Advances in radiology imaging for the evaluation of patients with neck trauma have developed significantly over the last few years. MDCTA technology has dramatically improved imaging quality (1–2 mm cuts and up to 320 slice scanning) and speed. Currently, it is considered the gold standard screening modality for assessing hemodynamically stable patients with penetrating neck trauma, particularly in evaluating vascular and aerodigestive structures in the neck with high sensitivity and specificity.[40] The American College of Radiology 2017 guidelines for patients with penetrating neck injury recommended an initial CTA for patients with injuries that are not immediately

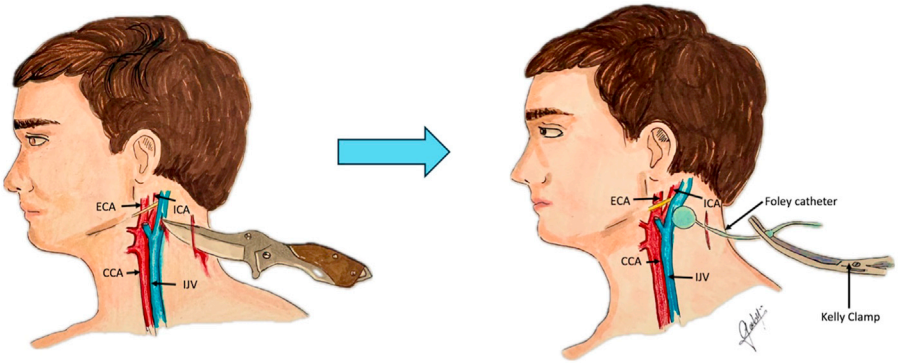

Fig. 7. Foley balloon catheter tamponade technique. CCA, common carotid artery; ECA, external carotid artery; ICA, internal carotid artery; IJV, internal jugular vein. (*Data from* Burgess CA, Dale OT, Almeyda R, et al. An evidence-based review of the assessment and management of penetrating neck trauma. Clin Otolaryngology 2012; 44–52; *Courtesy of* Gabriela Alejandra Pinero-Ortega.)

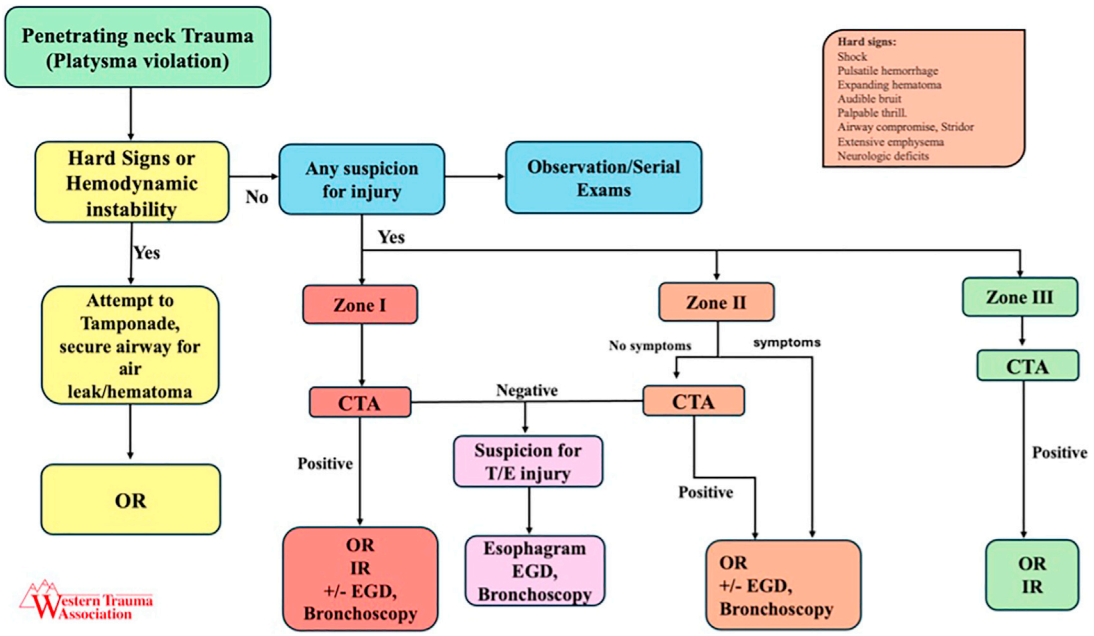

Fig. 8. Western Trauma Association management algorithm "zone approach" for managing penetrating neck trauma. EGD, esophagogastroduodenoscopy; IR, interventional radiology for endovascular techniques, angiography embolization; OR, operating room for neck exploration/repair. (*Data from* Sperry JL, Moore EE, Coimbra R, et al. Western Trauma Association critical decisions in trauma: penetrating neck trauma. J Trauma Acute Care Surg 2013;75(6):936–40. https://doi.org/10.1097/TA.0b013e31829e20e3. PMID: 24256663.)

life-threatening.[41] One of the advantages of MDCTA over conventional catheter-based angiography and endoscopy is that the surrounding venous, musculoskeletal structures and wound tract are better visualized, with reduced radiation and contrast amount. For patients with vascular injury, the sensitivity of MDCTA was between 90% and 100% and the specificity was 97% to 100%.[41,42] However, there are some limitations of MDCTA, including artifacts from metal fragments, incorrect contrast bolus timing, and the potential for motion artifact.[43]

Assessment of Vascular Injury

Even in patients with hard signs, CTA may be used as an initial diagnostic tool prior to operative exploration. In a retrospective study by Marrotte

Table 3
Hard and soft signs of penetrating neck trauma

	Vascular	Aerodigestive Tract	Neurologic
Hard signs	Shock (refractory to IV fluids) Pulsatile hemorrhage Expanding hematoma Audible bruit Palpable thrill	Airway compromise Stridor Air bubbling in wound Extensive subcutaneous air and emphysema Massive hematemesis Massive hemoptysis	Neurologic deficits (indicative of cerebral ischemia from vascular injury)
Soft signs	Stable/Small hematoma Minor bleeding Hypotension (responds to IV fluids) Pulse or systolic blood pressure discrepancy	Hoarseness/voice changes Odynophagia Dysphagia Mild subcutaneous emphysema and minor hematemesis Minor hemoptysis	Local neurologic deficits suggestive of direct injury

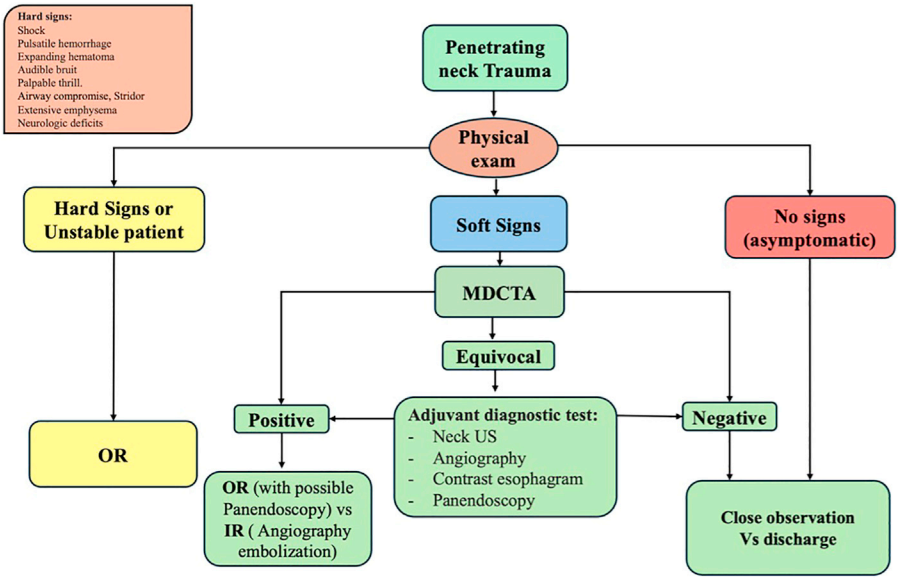

Fig. 9. Algorithm for a "no zone" approach for managing penetrating neck trauma. IR, interventional radiology; OR, operative room for operative neck exploration/repair. (*Data from* Ibraheem K, Khan M, Rhee P, et al. "No zone" approach in penetrating neck trauma reduces unnecessary computed tomography angiography and negative explorations. J Surg Res 2018;221:113–120; Shiroff AM, Gale SC, Martin ND, et al. Penetrating neck trauma: a review of management strategies and discussion of the 'No Zone' approach. Am Surg 2013;79(1):23-29. doi: 10.1177/000313481307900113. PMID: 23317595.)

and colleagues,[44] using the American Association for the Surgery of Trauma Prospective Observational Vascular Injury Treatment registry database, 44% of penetrating neck trauma patients with hard signs underwent CTA as the initial diagnostic modality, after which 18% underwent open repair, 7% underwent endovascular repair, and 19% did not require any intervention. Therefore, initial imaging can facilitate endovascular options or nonoperative management even in those with hard signs. Conversely, soft signs predict vascular injury requiring intervention in 16% of patients, which is why all patients with soft signs should undergo MDCTA to determine the need for further evaluation.[45,46]

Physical examination followed by MDCTA has a sensitivity of 90% to 100% for vascular injury and a specificity of 98% to 100%.[37,42,47] In a large prospective multicenter study by Inaba and colleagues,[37] the sensitivity of physical examination for detecting neck injuries requiring imaging was 100% with a mean of 3 days of inpatient observation. Therefore, physical examination can safely reduce unnecessary imaging or operative intervention. In a 2015 retrospective study at a local hospital in Thailand, Prichayudh and colleagues[36] analyzed 86 patients with penetrating neck trauma and found that the selective management of penetrating neck injuries based on physical examination and selective use of CTA (nonzonal approach) had a low negative exploration rate (7%) and no missed injuries.

While some data support that discharging patients without clinical signs of neck injury from the emergency department is safe,[48] depending on the institution protocols, it is also reasonable to obtain MDCTA for asymptomatic patients to expedite discharge, especially in patients with GSW or stab wound injuries, who have a higher rate of significant internal injury,[48] or those with blunt neck trauma and delayed symptoms onset. Blunt cerebrovascular injuries (BCVI), is defined as the presence of damage to the carotid or vertebral arteries from blunt trauma.[49,50] The incidence of BCVI has been reported in 1% to 2% of blunt neck trauma admissions and reported mortality of up to 40% if symptoms are present.[51] MDCTA is the diagnostic tool of choice for stable patients with blunt neck injuries, due to its high sensitivity for detecting BCVI, as well as for aerodigestive tract injuries.[49]

Given the high sensitivity and specificity of MDCTA to detect vascular injury, it is imperative to be familiar with radiological direct signs of vascular injury including vessel wall dissection, thrombosis or occlusion, avulsion or vessel rupture, pseudoaneurysm, lack of vascular enhancement, arteriovenous fistula, luminal caliber change, and intramural hematoma. Indirect signs include perivascular hematoma, gas, fat stranding, or foreign body adjacent to the vessel (**Table 4**).[19,52]

Table 4
Direct and indirect radiological signs of vascular injury on multidetector computed tomographic angiography

Direct Signs	Indirect Signs
Vessel wall dissection	Perivascular hematoma
Thrombosis or occlusion	Gas
Avulsion or vessel rupture	Fat stranding
Pseudoaneurysm	Foreign body adjacent to the vessel
Lack of vascular enhancement	
Arteriovenous fistula	
Luminal caliber change	
Intramural hematoma	

Data from Nowicki JL, Stew B, Ooi E. Penetrating neck injuries: a guide to evaluation and management. Ann R Coll Surg Engl 2018;100(1):6–11; Borsetto D, Fussey J, Mavuti J, et al. Penetrating neck trauma: radiological predictors of vascular injury. Eur Arch Otorhinolaryngol 2019;276(9): 2541–2547.

Assessment of Aerodigestive Tract Injury

A retrospective study published by Soliman and colleagues[53] demonstrated the vital importance of the clinical examination to screen for the presence of aerodigestive injuries and the role of endoscopy to guide surgical repair of injuries. If hard signs of aerodigestive tract injury are found (see **Table 3**), performance of triple endoscopy including direct laryngoscopy, bronchoscopy, and rigid esophagoscopy is indicated. The sensitivity of MDCTA for aerodigestive injuries is between 92% and 100%, with a specificity of 90% to 100%.[41,54,55] The MDCTA typically does not show direct signs of aerodigestive injury, but may show indirect radiological signs, including gas adjacent to the trachea or esophagus, leading to other adjuvant tests such as esophagrams or endoscopic studies. If there are aerodigestive tract wall defects or wound tracts into aerodigestive structures noted on MDCTA, this alone is considered a strong indication for surgical repair.

For hemodynamically stable patients with suspected esophageal injury, a gastrografin (water-soluble contrast) esophagram is recommended as a first study, as barium extravasation outside of the esophagus is more toxic (causing mediastinal inflammation and fibrosis) and distorts soft tissue planes for other studies. However, aspiration of gastrografin can cause severe pneumonitis, is less sensitive than barium, and may miss 15% to 22% of esophageal injuries compared to barium esophagrams.[56,57] Thus, a confirmatory barium esophagram is almost always recommended in patients with a negative gastrografin esophagram, especially if suspicion of esophageal perforation is high.

The utility of flexible esophagoscopy to diagnose cervical esophageal injury evaluation decreases the need for general anesthesia during a rigid endoscopy, however missed perforation by the cricopharyngeus and hypopharynx have been reported, as the flexible endoscopy cannot fully visualize this area given the mucosal redundancy.[58] Missed esophageal injuries represent most delayed injuries, causing increased morbidity and mortality rates especially if they progress to mediastinitis.[59]

Patients with laryngotracheal injuries may be assessed by physical examination, flexible nasal laryngoscopy, and neck computed tomography scans. The MDCTA is useful in a stable patient with laryngotracheal injuries, as it provides anatomic detail of the larynx and trachea.[60] These imaging modalities help triage patients into those who may be observed (superficial/small lacerations and nondisplaced laryngeal fractures with no airway compromise) and those who require surgical intervention (thyrotomy or open fracture reduction and mucosal approximation for deep/large lacerations and displaced fractures). If a large laryngeal mucosal laceration is identified, an early surgical repair within 24 hours is recommended to decrease the rate of airway scarring and long-term dysphonia.[58]

Additional Diagnostic Tests

Once a patient with a penetrating neck injury has been stabilized, and a complete physical examination and MDCTA has been performed, further adjuvant diagnostic tests may be recommended for patients with equivocal MDCTA findings, which should be done promptly to decrease the morbidity and mortality associated with delayed neck structures injuries repair, particularly esophageal injuries.[61] The accuracy of these adjuvant diagnostic tests is described in **Table 5**.

Ultrasound is often available at the bedside and may be used to rule out vascular injury in patients with penetrating neck trauma; previous studies reported a sensitivity of up to 92% and specificity of 98% to 100%.[8,41] Catheter-based angiography, which may be both diagnostic and therapeutic, has a sensitivity of 98.5% to 100% and a specificity of 95% to 100% for arterial injury.[16,62,63] Therapeutically, embolization or stent placement of injured vessels may be performed if vessel injury is detected. However, the main limitations of this modality include risk for stroke, access site complications, and a larger contrast load when compared to MDCTA.[42] As stated previously, contrasted esophagram is recommended as an additional imaging modality in patients with indirect

Table 5
Accuracy of selective adjuvant diagnostic test in penetrating neck trauma

	Vascular		Aerodigestive	
Diagnostic modality	**Sensitivity (%)**	**Specificity (%)**	**Sensitivity (%)**	**Specificity (%)**
Neck ultrasound	91–92	98–100	N/A	N/A
Catheter-based angiography	98.5–100	95–100	N/A	N/A
Contrast esophagram	N/A	N/A	78	100
Esophagoscopy	N/A	N/A	96–100	92–100
Direct laryngoscopy/ bronchoscopy	N/A	N/A	87–100	85–100

Abbreviation: N/A, not applicable.

signs of esophageal perforation on imaging or an equivocal endoscopic procedure.[64] Gastrografin followed by barium contrast esophagram has a sensitivity of 78% and specificity of 100% when ruling out esophageal injury.[65] For flexible esophagoscopy, the most recent data described a sensitivity of 96% to 100% and a specificity of 92% to 100%[16,66–68] for detecting esophageal injury, and direct laryngoscopy has a sensitivity of up to 92% for detecting laryngotracheal injury, increasing to 100% when bronchoscopy is added, and a specificity of 85% to 100%.[16]

SUMMARY

The evaluation and management algorithm of traumatic neck injuries has evolved over the last few decades, especially in patients with penetrating neck trauma. Management always starts with an initial evaluation and stabilization of patients according to ATLS protocol. Subsequent workup, including when to proceed with operative neck exploration has shifted from a neck zone-based approach to a nonzonal approach. Most trauma centers have MDCTA available in their emergency department, leading these institutions to adopt the nonzonal diagnostic approach to neck trauma. Using this algorithm, hemodynamically unstable patients with hard signs of vascular or aerodigestive tract injury should undergo operative management, while stable patients without hard signs of vascular or aerodigestive tract injury should be assessed using a physical examination combined with MDCTA. This diagnostic approach is associated with a low negative neck exploration rate, low missed injury rate, and avoids unnecessary invasive testing.

CLINICS CARE POINTS

- The initial evaluation of patients with traumatic neck injuries should follow the Advanced Trauma Life Support (ATLS), where airway management is the priority.
- Physicians should be prepared to perform a surgical emergent airway immediately if fiberoptic, oral or nasal intubation fails or is not possible.
- Regardless of the algorithm diagnostic approach utilized, all hemodynamically unstable patients and hard signs of vascular or aerodigestive tract injury should undergo emergent surgical intervention.
- The selective management of penetrating neck traumas based on physical examination and selective use of MDCTA (nonzonal approach) is a safe screening method with a low negative exploration rate (7%) and no missed injuries.
- The MDCTA is considered the gold standard screening modality for assessing hemodynamically stable patients, assessing for vascular and aerodigestive injury with high sensitivity and specificity.
- Routine neck exploration in a zone approach in hemodynamically stable patients has been associated with poor clinical outcomes, with high negative neck exploration rate (around 50%), prolonged hospital stays, and an increased rate of complications.

DISCLOSURE

The authors have nothing to disclose.

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