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Emergency Airway Management in Neck Trauma

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ABSTRACT

Airway management in patients who have sustained direct trauma to the airway is among the most challenging problems for emergency clinicians. Blunt or penetrating injuries to the head, oropharynx, neck, or upper chest can result in immediate or delayed airway obstruction. Immediate, definitive airway management is needed when the patient cannot protect his airway or is unable to sufficiently oxygenate or ventilate. Emergent or urgent airway management is specified when a patient develops respiratory distress or when symptoms are progressing rapidly. In addition, airway management often is indicated when the patient appears clinically stable, but the clinician anticipates clinical decline (e.g., smoke inhalation, edema, subcutaneous air, hematoma) or feels that an unprotected airway presents a risk to the patient who requires transport to another facility or to radiology for extensive diagnostic studies. The higher rate of complicated airways in this population mandates that the clinician has to be prepared to use advanced airway techniques, including a surgical airway.

Keywords: Neck Trauma, Penetrating, Management, Emergency Department.

INTRODUCTION

A clear understanding of the anatomic relationships within the neck and the mechanisms of injury is critical to devising a rational diagnostic and therapeutic strategy. With the neck protected by the spine posteriorly, the head superiorly, and the chest inferiorly, the anterior (larynx and trachea) and lateral regions are most exposed to trauma [1].

Few emergencies pose as great a challenge as neck trauma. Because a multitude of organ systems (e.g., airway, vascular, neurological, gastrointestinal) are compressed into a compact conduit, a single penetrating wound is capable of considerable harm. Furthermore, seemingly innocuous wounds may not manifest clear signs or symptoms, and potentially lethal injuries could be easily overlooked or discounted.

Neck injury may result in the laceration of major vessels, potentially leading to hemorrhagic shock. Extracranial arterial injuries to the brachiocephalic, common carotid, and vertebral arteries can result in major neurologic deficits [2]. Airway occlusion and exsanguinating hemorrhage pose the most immediate risks to life. From the time when Ambroise Pare successfully treated a neck injury in 1552, debate has continued about the best approach for particular neck wounds. Awareness of the various presentations of neck injuries and the establishment of a well-conceived multidisciplinary plan prior to the traumatic event is critical for improving patient outcome. The neck is divided into anatomic zones or regions to assist in the evaluation of neck injuries. The image below illustrates the zones of the neck.

Ultimately, the goal of airway management in trauma is to establish and/or maintain adequate oxygenation, ventilation, and airway protection. It is the first priority in the acute phase of care of the trauma patient and consists of evaluation and, when indicated, intervention using various techniques and devices.

It involves the recognition of any trauma to the airway or surrounding tissues, anticipation of their respiratory consequences, and planning and application of management, keeping in mind the potential for exacerbation of existing airway or other injuries by the contemplated strategies. It also involves prediction and prevention of progression of airway or surrounding tissue injury with increasing airway compromise.

Although with certain modifications, the American Society of Anesthesiologists (ASA) difficult airway algorithm can be applied to various trauma-induced airway issues [3], it may not be applicable in some clinical scenarios. For instance, cancellation of airway management when difficulty arises may not be an option in the acute

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trauma setting. Likewise, awake rather than asleep intubation or a surgical airway from the outset may be the preferred choice in some situations. Modifications of the ASA difficult airway algorithm are available for various trauma-induced clinical situations [4].

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Blunt trauma

Blunt trauma to the neck usually results from motor vehicle crashes but similarly arises with sports-related injuries (e.g., clothesline tackle), strangling, blows from the fists or feet, and extreme manipulation (i.e., any manual operation such as chiropractic treatment or physical realignment or repositioning of the spine) [5, 6]. In motor vehicle crashes in which the driver is not belted, the driver is in danger of shoving forward with the head extended, forcing the anterior neck in contradiction of the steering column.

Shoulder attaches seem to offer some, however incomplete, protection against blunt neck trauma; cerebral vessel and laryngeal harms secondary to shoulder strap compression have arisen. Non penetrating trauma can harm a blood vessel through a multitude of mechanisms.

Direct forces could cut the vasculature. Excessive turning and/or hyperextension of the cervical spine causes distention and stretching of the arteries and veins creating shearing injury and subsequent thrombosis. Intraoral trauma might spread to the cerebral blood supply. Basilar skull ruptures might disturb the intrapetrous portion of the carotid artery [7]. Impact to the uncovered anterior aspect of the neck might crush the larynx or the trachea, mainly at the cricoid ring, and compress the esophagus against the posterior spinal column. Anabrupt increase in intratracheal pressure against a closed glottis (e.g., inappropriate wearing of a seat belt), a crush bruise (e.g., clothesline tackle), or a rapid acceleration-deceleration action might cause a tracheal harm[8].

Strangulation might come about because of hanging (halfway or finish suspension of the body from the neck), ligature suffocation, manual stifling, and postural suffocation (eg, found in youngsters when the neck is set over a question and the body weight produces pressure). Critical cervical spine and spinal line harm occurs in just those hangings that include a tumble from a separation more prominent than the body tallness. Basic suffocation isn't the significant reason for death in hanging wounds. Cervical spinal interruption resulting to strangulation is consistently lethal.

Penetrating trauma

More than 95% of penetrating neck wounds outcome from guns and knives, with the rest resulting from motor vehicle accidents, household damages, sporting events, and industrial accidents. Normally, people suffering a gunshot wound (GSW) endure greater damage than those with stab wounds due to a bullet's proclivity to penetrate deeper and cause cavitation, thus injuring structures lying outside the tract of the missile [9-12]. High-speed bullet wounds (>2000-2500 ft/s) have a tendency to take after an immediate and unsurprising pathway, while low-speed projectiles travel a more whimsical pathway, regularly showing no immediate relationship to the passage or leave wounds. Also, high-speed projectile injuries delivered by military-style weapons or chasing rifles produce stun waves that devitalize encompassing tissues.

High-speed missiles and their resulting impact impacts may suck flotsam and jetsam into the injury tract or cause optional wounds from shot or bone fracture. Low-speed wounds might be delivered by .22-gauge and .38-bore handguns that have a gag speed of 300 ft/s to 800 ft/s. Moreover, bring down vitality wounds (cut, handgun, long-go birdshot or buckshot) cause a half lesser recurrence of clinically critical wounds regardless of what the zone of damage.

A sidelong trans- cervical GSW will probably cause grave damage than a GSW including damage to just a single side of the neck. Short proximity GSWs of the neck that deliver gigantic demolition are generally deadly.

After a GSW to the neck, surgery is demonstrated in 75% of cases, though just half of neck cut injury require surgical investigation. Vascular wounds emerging from entering injury may happen specifically, causing a halfway or finish transection of the vessel or actuating arrangement of an intimal fold, arterio-venous fistula, or pseudo-aneurysm. Damage to the veins can likewise come about because of outer pressure or wall painting injury. Thrombosis is the most well-known difficulty of vein damage, happening in 25-40% of patients. The inside jugular vein (9%) and carotid corridor (7%) are the most widely recognized destinations of vascular wounds. Damage to the pharynx or the throat happens in 5-15% of cases. The larynx or the trachea is harmed in 4-12% of cases. Real nerve damage happens in 3-8% of patients supporting entering neck injury. Spinal line damage happens rarely and quite often comes about because of direct damage instead of auxiliary rigid unsteadiness [13, 14].

SIGNS AND SYMPTOMS

Table 1. Signs and symptoms of neck trauma

Signs of laryngeal or tracheal injury [15-18]	**Signs of spinal cord or brachial plexus injury**
Voice alteration	Diminished upper arm capacity
Hemoptysis	Quadriplegia
Stridor	Pathologic reflexes
Drooling	Brown-Séquard syndrome
Sucking, hissing, or air frothing or bubbling through the neck wound	Priapism and loss of the bulbocavernous reflex
Subcutaneous emphysema and/or crepitus	Poor rectal tone
Hoarseness	Urinary retention, fecal incontinence, and paralytic ileus
Dyspnea	Horner syndrome
Distortion of the normal anatomic appearance	Neurogenic shock
Pain on palpation or with coughing or swallowing	Hypoxia and hypoventilation
Pain with tongue movement	
Crepitus: Noteworthy in only one third of cases	
Signs of esophageal and pharyngeal injury [19, 20]	**Signs of carotid artery injury [7]**
Dysphagia	Decreased level of consciousness
Bloody saliva	Contralateral hemiparesis
Sucking neck wound	Hemorrhage
Bloody nasogastric aspirate	Hematoma
Pain and tenderness in the neck	Dyspnea secondary to compression of the trachea
Resistance of neck with passive motion testing	Thrill
Crepitus	Bruit
Bleeding from the mouth or nasogastric tube	Pulse deficit

Emergency Department Care

Initial assessment and stabilization comprises securing the airway, controlling bleeding, recognizing life-threatening conditions, and providing cervical spine precautions. Most blunt traumatic neck injuries can be managed nonoperatively. Surgical evaluation of penetrating neck injuries regularly needs a greater resolve for operative intervention, even though prior axioms directing surgery as the only option are no longer as absolute[21]. Nonetheless, when an injury violates the platysma, it is sensible and prudent to engage a qualified surgeon, or transfer a stable patient to a trauma center where such care is available [22, 23]. Make sure compliance with EMTALA regulations. Transfers from non-trauma centers to trauma centers are considered medically indicated transfers for the reason that the aim of each transfer is to get the higher level of care needed to treat a patient's condition.

Airway Management

Emergency department care of the patient with neck trauma starts with evaluation and stabilization of the ABCs, starting with the airway first. Unluckily, the same conditions that compel active airway management correspondingly intensify the obstacles to achieving successful intubation. However, a wait-and-see attitude simply invites disaster.Accordingly, a preplanned strategy based on the expertise of the obtainable staff, equipment at hand, the patient's clinical condition, and the determined necessity for further testing should be planned before this scenario arises. An entrenched partnership should exist among all probably involved departments, particularly emergency medicine, surgery, and anesthesiology.Intubating a patient with entering neck injury may prompt choking or hacking, conceivably dislodging a coagulation and setting off enormous seeping from a formerly harmed vein. Furthermore, existent draining and edema quickly twist the encompassing life systems, making oral intubation troublesome, if certainly feasible. All things considered, evaluation of the aviation route takes need over every other activity, including those systems that hazard fueling drain. Early readiness by the experts treating the patient is essential. This incorporates guaranteeing simple entry to a satisfactory suction device and having different measured endotracheal tubes and additionally any instruments and supplies important to play out the surgical aviation route technique close within reach.

Before intubation, clear the mouth of foreign debris with the fingers or manual suction. Remedy partial airway occlusion originating from the tongue by performing a modified jaw thrust. Never do a head-tilt chin-lift maneuver in a patient with a suspected cervical spine injury. Implement

emergent orotracheal intubation in patients displaying signs of acute or impending respiratory distress, such as perceptible noisy breathing, an inability to suitably handle blood, vomitus, or other body secretions, and clear distortion of any neck landmarks, particularly tracheal deviation or existence of massive subcutaneous air.

The choice of technique depends on the expertise of the attending staff and the capability to implement a surgical airway procedure. Notwithstanding worries about changing a partly obstructed airway into a completely obstructed airway, a modern retrospective series by **Mandavia *et al.*** [(24)] proved rapid sequence intubation to be safe and effective when performed by emergency physicians trained in this skill. An awareness of potential laryngeal damage is imperative prior to intubation, even when the airway ought to be emergently secured. A neck hematoma may obscure landmarks, along with causing the danger of causing life-threatening exsanguination. Vast suspicion for laryngeal harm directs execution of a surgical airway procedure to avoid injudicious undertakings at oral intubation that could sever a tenuously attached trachea or larynx, conceivably causing a catastrophe consequent to complete loss of the airway if the larynx detaches and dislodges into the chest.

Numerous large case series for example by Shatney et al [25] determined the safety of oral intubation with cervical in-line stabilization, delivered that direct laryngoscopy and intubation were performed in a gentle, atraumatic manner and explicit cervical spine immobilization was preserved. This is the preferred method for the accomplished intubator in the patient with blunt trauma with suspected cervical spine injury.Alternative methods for securing the airway comprise fiberoptic intubation, gum elastic bougie, percutaneous transtracheal intubation, and wire-guided retrograde intubation. Fiberoptic intubation is a sensible strategy, particularly for patients thought to have maintained cervical spine damage or who show net contortion of the aviation route. Impediments incorporate clinician naiveté, absence of vital gear, and bountiful draining or emissions. Percutaneous transtracheal intubation, likewise alluded to as translaryngeal ventilation, is a snappy and moderately basic method in which a needle is embedded through the cricothyroid film and joined by means of a Y connector to an oxygen supply of no less than 50 psi.

This method is contraindicated when transection of the trachea or harm to the cricoid ligament or the larynx is unequivocally suspected. Barotrauma may happen with percutaneous ventilation. Retrograde tracheal intubation is an obtrusive methodology that might be reasonable when unreasonable measures of blood or discharges block fiberoptic intubation or when neck development must be confined.

Breathing

Signs or symptoms of respiratory discomfiture compel consideration for a hemothorax or a pneumothorax. Zone I damages may breach the chest cavity. Ventilatory distress that persists beyond competent intubation indicates a probable tension pneumothorax, which needs needle decompression and chest tube placement. Blocking of the tracheobronchial tree, whether as a result of a foreign body or iatrogenic, is another cause of ventilatory harms.

Circulation

Control bleeding that originates from neck trauma with direct pressure. Do not sightlessly clamp a transected vessel as inadvertent injury to adjacent structures or extension of blood vessel harm might arise. Never probe, cannulate, or locally explore these wounds in the ED as these actions might cause an air embolus or dislodge a clot and provoke bleeding.Do not remove objects protruding from the neck in the ED.Simultaneous with checking dying, set up intravenous access with no less than 2 expansive bore catheters (14 or 16 gage). On the off chance that damage to the brachiocephalic or subclavian vein is a probability, put 1 intravenous access site in a lower limit site and another entrance site in the furthest point on the uninjured side.Placing the patient in a mild Trendelenburg position to decrease the risk of air embolization may be advantageous.In chose cases, draining that can't be controlled or come to with coordinate weight may profit by swell tamponade. Embed a Foley catheter into the injury. Guide it toward the site of dying, and expand the inflatable until the point that draining purposes or direct protection is noted. For instance, for zone I wounds, slide in a Foley catheter toward the pleural pit, and after that swell the inflatable with clean saline and withdraw it, endeavoring to pack the harmed subclavian vessel against the main rib or clavicle.On uncommon events, for example, with wounds in the pharynx, applying direct strain to wounds might be illogical. These injuries may require a cricothyroidotomy with ensuing pressing of the pharynx as a brief procedure[26].

CONCLUSION

Establishing and maintaining a patent airway is the first priority in severely injured patients. Basic

airway manoeuvres and simple adjuncts will often enable sufficient oxygenation and ventilation until personnel skilled in RSI and tracheal intubation are available. Patients with significant blunt trauma are treated as if they have unstable spinal injuries until formal clearance procedures have been completed. Induction of anaesthesia, laryngoscopy and intubation of these patients is challenging and should be attempted only by those with appropriate training and competency.

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