Penetrating Neck Injury: A Case Report and Review of Management

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Abstract Penetrating neck injury constitutes 5–10 % of all cases seen in the emergency room. As surgeons we must be prepared to manage these cases. After stabilizing the general condition of the patient the neck injuries are assessed. Management has changed from routine exploration to selective exploration. Injury to aerodigestive tract and vessels are commonly seen.

Keywords Penetrating neck injury · Laryngotracheal injury · Pharyngeal injury

Introduction

Neck wounds that extend deep to the platysma are considered penetrating injuries. Penetrating neck injuries represent approximately 5–10 % of all trauma cases that present to the emergency department and result in significant mortality [1, 2]. Management requires a logical approach with swift assessment of the adequacy of airway and circulation and of the possible presence of any skeletal or neurological damage prior to operative intervention. A case with pharyngeal penetration is described.

Case Report

A 48-year-old male patient came to the emergency and trauma department with a history of alleged assault on the

neck 12 h earlier. A 12 cm horizontal sharp wound extended across the midline (Fig. 1) just below the level of the hyoid bone crossing the anterior border of the sternomastoid muscle on both sides. On the left side the submandibular salivary gland had been exposed, and on the right side there was leakage of air and saliva (Figs. 1 and 2). In the mouth there was clotted blood, and periorbital edema was noted on both sides without damage to vision. There was no free bleeding and no sign of undue swelling in the neck, with painless and free neck movement. Cervical spine injury was not suspected. The systemic circulation appeared stable, but it was considered prudent to carry out a tracheostomy under local anesthetic to secure the airway in view of the uncertainty of the integrity of the larynx and pharynx. Following the administration of general anesthesia, cautious examination with the aid of a flexible fiberscope and suction enabled a diagnosis of an undamaged larynx and of a penetrating injury to the lateral wall of the pharynx on the right to be made. On careful exploration of the neck wound, the main vessels were found to be intact in the anterior triangle. The anterior jugular vein had been damaged and was ligated. The wound was irrigated with povidone iodine and normal saline prior to closure in layers (Figs. 3 and 4). The pharynx was closed with 3.0 vicryl using continuous sutures. A nasogastric tube was passed and antibiotic treatment with ciprofloxacin and metronidazole was started. Tube feeding was continued for 8 days. At this point when sutures were to be removed, some swelling was noted in the right side of the neck and the patient had become febrile. When the wound was opened, a collection of pus mixed with saliva was drained. The tube feeding was continued and the antibiotic was changed to amoxicillin plus clavulanic acid. Following a further 8 days, the wound had healed completely which was tested with a thin barium swallow, and the Ryle's tube was extracted on the 16th day postoperatively.

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Fig. 1 Horizontal cut seen extending from the anterior border of left sternomastoid to right side posterior border of sternomastoid

Review

As soon as a patient with penetrating neck injury comes to the emergency room, rapid assessment of the airway, breathing, and circulation is essential. Once the patient is stabilized, a second survey is carried out checking for symptoms and signs of subcutaneous emphysema, hoarseness, stridor, and respiratory distress and external injuries to the neck are made.

The followings are anatomic areas of the neck (Fig. 5):

- Zone 1—between the sternal notch and the cricoid cartilage
- Zone 2—between the cricoid cartilage and the mandibular angle
- Zone 3—between the mandibular angle and the skull base

Fig. 2 Pharynx seen through the right side wound with salivary leak

Fig. 3 Exposed left submandibular gland

Zone 1 contains the major vascular structures of the subclavian artery and vein, jugular vein, and common carotid artery, as well as the esophagus, thyroid, and trachea.

Zone 2 contains the common carotid artery, internal and external carotid arteries, jugular vein, larynx, hypopharynx, and cranial nerves X, XI, and XII.

Zone 3 contains the internal and external carotid arteries, jugular vein, lateral pharynx, and cranial nerves VII, IX, X, XI, and XII [2].

Approximately 20–30 % cases have laryngeal, tracheal, or esophageal injury. Injury to carotids and subclavian vessels carries a high incidence of mortality [3].

Airway

The respiratory rate and signs of airway distress, including dyspnea and stridor, require immediate assessment, and if

Fig. 4 Showing periorbital oedema and blood in the nasal and oral opening

Fig. 5 Showing the anatomic areas of neck

necessary a tracheostomy should be established where possible. Vocal quality should be noted, and the patient should be questioned about changes in voice. The neck and upper chest should be palpated for subcutaneous emphysema, and the larynx and trachea should be palpated for tenderness and crepitus. Whenever laryngotracheal injury is suspected, intubation should be carried out with great care as further damage to the airway may occur and false passages can be created. Controlled tracheostomy under local anesthesia is always preferred. Flexible laryngoscopy, CT imaging, direct laryngoscopy, and tracheoscopy are done [4].

Vessels

An unstable circulation and free bleeding from the wound or marked swelling of the neck may indicate injury to the great vessels. Therefore, all cases of neck injuries should have a check on distal pulse and bruit. Angiography may be done in hemodynamically stable patients prior to exploration where significant damage to vessels is suspected. This can remain hidden in some cases following the traumatic event.

Injury to Esophagus and Pharynx

Bleeding from the mouth, drooling, and subcutaneous emphysema are all signs suggestive of upper digestive tract injury. Contrast-enhanced study may be done if injury is suspected [5].

Indication of immediate surgical intervention in penetrating neck injuries includes hemodynamic instability, exsanguinating hemorrhage, or expanding hematoma. All patients who are stable must have a thorough evaluation of the vascular structures and of the aerodigestive tract prior to any surgical intervention [6].

Zone 1 Consultation with a thoracic surgeon may be required where resection of clavicle and mediastinotomy, or a formal lateral thoracotomy is required.

Zone 2 All veins in the neck may be ligated and the internal jugular vein is best repaired if possible where the vein on the other side is damaged.

The external carotid artery may be ligated to stop severe hemorrhage. The common carotid artery and the internal carotid artery if injured must be repaired wherever possible, minimizing any period of arterial clamping and avoiding this where the circulation on the other side is compromised. A lateral arteriorrhaphy or end-to-end anastomosis or grafting is done.

Zone 3 Vascular injuries are difficult to access surgically and may require mandibular subluxation or mandibulotomy for exposure [7].

Laryngotracheal Injuries

Approximately 50 % of patients with an airway injury also have a digestive tract injury. Tracheostomy is done if there is airway compromise. Laryngeal injuries are classified by location (supraglottic, transglottic, cricoid, or tracheal) and type (hematoma, mucosal tears or lacerations, cartilage fractures and/or dislocations, or laryngotracheal disruption).

Minor lacerations, small hematomas, and nondisplaced single fractures may be managed with observation and serial examination [8–11]. Lacerations which need exploration and repair are as follows:

- (a) involving the anterior commissure with exposed cartilage
- (b) multiple or displaced cartilage fractures
- (c) vocal cord immobility or arytenoid dislocation
- (d) injuries sufficient to cause airway compromise

Conclusions

Surgeons may be called on to manage penetrating neck injuries in the emergency room and hence be trained in skills enabling them to the following:

1. Assess and achieve an adequate and stable airway
2. Stabilize a collapsing circulation
3. Assess the head and neck injury swiftly in a logical manner prior to surgical exploration

References

1. Gupta B, Gulati A, Gupta D (2011) A rare presentation of pellet injury in the neck. *ISRN Surg* 2011:306126
2. Luntz M, Nusem S, Kronenberg J (1993) Management of penetrating wounds of the neck. *Eur Arch Otorhinolaryngol* 250(7):369–374
3. Monson DO, Saletta JD, Freeark RJ (1969) Carotid vertebral trauma. *J Trauma* 9:987–999
4. Stewart, Michael G (2001) Penetrating face and neck trauma. *Byron J Bailey's Head and Neck Surgery—Otolaryngology*. Lippincott Williams and Wilkins, pp 813–821
5. Maisel RH, Hom DB (1998) Penetrating trauma to the neck. In: Cummings CW (ed) *Otolaryngology head and neck surgery*, vol 3, 3rd edn. Mosby, St Louis, pp 1707–1720
6. Armstrong WB, Detar TR, Stanley RB (1994) Diagnosis and management of external penetrating cervical esophageal injuries. *Ann Otol Rhinol Laryngol* 103(11):863–871
7. Woo K, Magner DP, Wilson MT, Margulies DR (2005) CT angiography in penetrating neck trauma reduces the need for operative neck exploration. *Am Surg* 71(9):754–758
8. Dichtel WJ, Miller RH, Feliciano DV et al (1984) Lateral mandibulotomy: a technique of exposure for penetrating injuries of the internal carotid artery at the base of the skull. *Laryngoscope* 94(9):1140–1144
9. Schaefer SD (1992) The acute management of external laryngeal trauma. A 27-year experience. *Arch Otolaryngol Head Neck Surg* 118(6):598–604
10. Grewal H, Rao PM, Mukerji S, Ivatury RR (1995) Management of penetrating laryngotracheal injuries. *Head Neck* 17(6):494–502
11. Edwards WH Jr, Morris JA Jr, DeLozier JB III, Adkins RB Jr (1987) Airway injuries. The first priority in trauma. *Am Surg* 53(4):192–197