



## Bilateral hypopharyngeal perforations caused by penetrating trauma to the neck

Delici boyun travması nedeniyle iki taraflı hipofarengeal perforasyonlar

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### ABSTRACT

External laryngeal trauma is a relatively rare-encountered and sometimes life-threatening emergency condition. Recognition of laryngeal injury related to either blunt or penetrating trauma is important for both initial preservation of life as well as long-term airway and vocal function. Treatment options include medical management with observation and open surgical treatment with or without tracheotomy. We, herein, describe a 23-year-old male case who sustained external penetrating trauma to lateral aspect of neck. The etiology, clinical manifestations, investigation modalities and management of penetrating neck trauma were discussed in the light of the literature data.

**Keywords:** Esophagoscopy; external neck trauma; head and neck; hypopharyngeal perforation; management of the neck injury; prevertebral emphysema.

### ÖZ

Eksternal laringeal travma oldukça seyrek görülen ve bazen hayatı tehdit eden acil bir durumdur. Künt veya delici travmaya bağlı larengeal yaralanmanın belirlenmesi, hem başlangıçta yaşamın hem de uzun dönemde hava yolu ve vokal fonksiyonun korunmasında önemli yer tutar. Tedavi seçenekleri arasında gözleme dayalı tıbbi tedavi ve trakeotomili veya trakeotomisiz açık cerrahi tedavi yer alır. Bu yazıda, boynun yan tarafında eksternal delici travmaya maruz kalan 23 yaşında erkek bir olgu sunuldu. Delici boyun travmasının etyolojisi, klinik belirtileri, araştırma yöntemleri ve tedavisi literatür verileri eşliğinde sunuldu.

**Anahtar Sözcükler:** Özofagoskopi; eksternal boyun travması; baş ve boyun; hipofarengeal perforasyon; boyun travmasının tedavisi, prevertebral amfizem.

When compared with internal laryngeal trauma caused by endolaryngeal procedures, trauma to the larynx caused by external forces is relatively rare. External laryngeal trauma accounts for only one in 30,000 emergency room visits.<sup>[1]</sup> Experience in managing laryngeal trauma is limited even in many major trauma centers due to the rarity of the injury.<sup>[2]</sup> Although these injuries are rare, their initial management has a tremendous impact on the immediate probability of survival and the patient's long-term quality of life.

Roon and Christensen<sup>[3]</sup> described a clinical and anatomical division of injuries of the neck into the upper (zone III), middle (zone II), and lower (zone I). Zone I is below the cricoid and represents a dangerous area because the vascular structures in this zone are in close proximity to the thorax. Zone I injury has a fairly high mortality rate of 12%. Mandatory exploration is not usually recommended for zone I injuries; angiography is usually suggested to ensure that the great vessels are not injured.



Zone II (from cricoid cartilage to mandible) is the most frequently involved region (60 to 75%), and injury in this zone has created a great deal of controversy about management in the literature over the past 15 years. There is an ongoing debate about the use of mandatory exploration versus selective exploration with serial examination, endoscopic tests, and angiography. Zone III (the level above the mandible) is protected by skeletal structures and is difficult to explore because of the skull base and the need to divide or displace the mandible. The necessity for craniotomy in exploration, and control of high carotid injury in this location makes zone III treacherous.<sup>[3]</sup>

We report the case of a patient who sustained multiple penetrating neck injuries in zone II who was managed with neck exploration without tracheotomy.

#### CASE REPORT

A 23-year-old male construction worker was admitted to the Emergency Room with hoarseness, respiratory distress, hemoptysis and multiple cervical incisions. He had penetrating neck trauma to the lateral aspect of the neck after falling from the second floor onto iron bars. One iron bar entered the left side of his

neck and exited just inferior to the right angle of the mandible. His co-workers had drawn it out of the neck. On physical exam, the patient was confused, and there were tenderness, abrasions, subcutaneous emphysema, contusions and three irregular incisions over the neck area with no other apparent injury throughout the body. The first neck incision at the left side of the hyoid bone was 3 cm, the second one just inferior to the right angle of the mandible was 2 cm and the third one superior to the right clavicle was 1 cm in length. The first two incisions that showed air leakage during expiration were suspected to be laryngocutaneous fistulae.

Cervical anteroposterior and lateral X-ray films showed precervical air extending from the right greater horn of the hyoid bone to the inferior border of the right angle of the mandible and precervical soft tissue swelling at the level of the hyoid bone and the right supraclavicular area.

On axial (Figure 1) and sagittal (Figure 2) cervical multi detector computed tomography (MDCT) scans there was widespread air dissection of the prevertebral space at the level of C1 vertebra and prelaryngeal area but no bony lesion.



**Figure 1.** Axial cervical computed tomography scan showing; extensive air dissection at the level of the first cervical vertebra.



**Figure 2.** Sagittal cervical computed tomography scan showing; extensive air dissection at the prelaryngeal area.

Under general anesthesia with orotracheal intubation, neither gastric nor esophageal lesion was detected on flexible esophagoscopy. Direct laryngoscopy revealed a mucosal tear on the lateral wall of the left pyriform sinus with otherwise normal vocal cords, ventricles, epiglottis and first tracheal ring. The neck was explored via an apron flap incision, subplatysmal dissection, and midline strap muscle separation, exposing the laryngeal frame. There were no lesions on the hyoid bone, or thyroid and cricoid cartilages. The first incision was found to have perforated the left thyrohyoid membrane, terminating at the left pyriform sinus as a mucosal tear earlier visualized during direct laryngoscopy. The tract of the second incision was followed and terminated just superior to the right greater cornu of the hyoid bone where there was another mucosal tear that was missed during direct laryngoscopy. It was confirmed that air leakage was from these two laryngocutaneous fistula that were in continuity with each other formed by one iron bar. The third incision was explored superiorly until the level of the thyroid cartilage, and no access to laryngeal mucosa was found. The middle third of the hyoid bone was excised to facilitate continuous suturing the right and left hypopharyngeal mucosal tears with 3/0-Vicryl after the larynx was released. Bilaterally, the main vessel-nerve bundles were intact. All contaminated tissues were debrided and hemostasis was provided. A nasogastric catheter was inserted. It was interesting that the laryngeal and laryngopharyngeal mucosa had

minimal edema. Therefore there was no need for tracheotomy.

Postoperatively the patient was held in the intensive care unit for two days (Figure 3). Sutures were unstitched and oral feeding was tried on the seventh day. Oral feeding was stopped due to leakage from the first fistula and parenteral feeding was continued up to the 10<sup>th</sup> postoperative day when patient resumed oral feeding with semi-solid and liquid foods. On the 11<sup>th</sup> postoperative day, axial and sagittal cervical T<sub>1</sub>-weighted MRI showed no lesion other than mild prelaryngeal edema. The patient was discharged on the 15<sup>th</sup> postoperative day and had no complications over a 3.5 year follow-up period.

## DISCUSSION

Hypopharyngeal perforation is a rare clinical condition, and may occur as a result of iatrogenic, penetrating, or blunt trauma to the neck.<sup>[4]</sup> The mechanisms of laryngeal injury can be divided into blunt trauma, including clothesline, crushing, and strangulation injuries; penetrating trauma; inhalation injuries; and injuries caused by caustic ingestion.<sup>[5]</sup> In this case there were three penetrating neck injuries, two of which were in continuity with each other producing laryngocutaneous fistulae. Laryngeal trauma has been classified by many authors,<sup>[3]</sup> but since the resulting injury of the larynx is dependent on the mechanism of trauma,<sup>[6]</sup> it has been recommended that the trauma should be categorized according to the underlying causes, the type and degree of injury, and its sequelae. Recognition of laryngeal injury related to either blunt or penetrating trauma is important for both initial preservation of life as well as long-term airway and vocal function. A history of cervical trauma coupled with signs and symptoms of hoarseness, pain, stridor, hemoptysis, or subcutaneous emphysema should prompt appropriate airway management and evaluation of laryngeal injury. This work up includes flexible fiberoptic laryngoscopy and esophagoscopy, and may include direct laryngoscopy, bronchoscopy and esophagoscopy, and head and neck MDCT scans.<sup>[7]</sup> Associated cervical spine and vascular injuries must also be evaluated. Computed tomography scanning is the initial imaging modality of choice in the hemodynamically-stable patient and is used to guide selective operative management.<sup>[8]</sup> Treatment is based on



**Figure 3.** Postoperative second day. Three sutured cervical incisions, and sutured apron flap incision.

the site and extent of the injury. In any patient with neck injury the first priority is to establish an airway.<sup>[9]</sup> Here, the patient was intubated and serial MDCT scans were performed. Afterwards under general anesthesia, flexible esophagoscopy, direct laryngeal endoscopy and neck exploration were done.

The cases with hypopharyngeal perforation may be accompanied by serious complications such as pneumopericardium or pneumoperitoneum.<sup>[10]</sup> Fortunately, our patient had none of these. An estimated early mortality rate is as high as 30% due to airway obstruction and associated injuries.<sup>[11]</sup> Treatment depends on the localization and extent of the injury. Treatment options include medical management with observation and open surgical treatment with or without tracheotomy. If the selected procedure is observation, major hypopharyngeal and laryngeal injuries must be excluded, with close follow-up in intensive care.<sup>[12]</sup> The major argument for mandatory exploration is the potential to miss occult life-threatening injuries.<sup>[13]</sup>

In conclusion, our experience in managing laryngeal trauma is limited even in many major trauma centers due to the rarity of this injury. There is an ongoing debate about the use of mandatory exploration versus selective exploration with serial examination, endoscopic tests, and angiography. Here, we performed the latter approach of open surgical treatment without tracheotomy and serial examination. We believe that selective exploration with serial examination is the better way for management of penetrating injuries of the neck.

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