

Trauma cervical penetrante auto-infligido com serra-elétrica - Relato de caso

Self-inflicted powered knife penetrating neck injury - A case report

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RESUMO

Fraturas laríngeas constituem um evento raro. Traumas cervicais penetrantes produzidos por ferramentas elétricas podem ser ameaçadores de vida e representam um desafio para cirurgiões de cabeça e pescoço.

Reportamos o caso clínico de um homem do sexo masculino de 51 anos admitido por tentativa de suicídio com recurso a uma faca elétrica produzindo uma lesão penetrante no pescoço. A exploração cirúrgica revelou secção dos músculos infraioideus, expondo a artéria carótida bilateralmente, fraturas laríngeas múltiplas e lacerações na hipofaringe e esófago cervical. A lesão foi considerada como grupo 4 na classificação de Schaefer-Fuhrman. A reconstrução da hipofaringe, esófago e músculos infraioideus foi realizada com fios absorvíveis. A reconstrução da cartilagem tiroideia foi realizada com suturas não-absorvíveis. A avaliação pós-operatória revelou integridade estrutural da hipofaringe e esófago, bem como mobilidade bilateral das cordas vocais 6 meses após a cirurgia.

Para melhorar o prognóstico vital e funcional dos doentes, é importante que cirurgiões de cabeça e pescoço tenham uma compreensão abrangente das abordagens terapêuticas deste tipo de lesões.

Palavras-chave: trauma cervical, suicídio, cirurgia reconstrutiva

ABSTRACT

Laryngeal fractures are a rare event. Penetrating neck injuries produced by powered tools can be life-threatening and pose a challenge for head and neck surgeons.

We report the case of a 51-year-old male that attempted suicide by self-inflicting a penetrating anterior neck injury with a powered knife. Neck exploration revealed section of all infrahyoid muscles exposing the carotid artery bilaterally, multiple laryngeal fractures, hypopharyngeal and esophageal lacerations. We classified the penetrating injury as a Schaefer-Fuhrman group 4. Reconstruction of the hypopharynx, esophagus and strap muscles was done with absorbable sutures. Reconstruction of the thyroid cartilage was performed with non-absorbable sutures. Post-operative evaluation revealed structural integrity of the hypopharynx and esophagus, as well as bilateral vocal fold mobility 6 months after the surgery.

To improve patient survival and outcome, it's of utmost importance that head and neck surgeons have a comprehensive understanding of the management of these unusual type of injuries.

Keywords: neck injury; suicide; reconstructive surgery

INTRODUCTION

In the literature, the incidence of laryngeal fractures has been estimated at 1 in 30000 patients who are admitted to severe trauma centers.^{1,2} Suicide attempts with powered knives or electric saws are rather unusual, and neck injuries produced by these instruments are mainly caused by accidents.³ Few cases of suicide or suicide attempt with the use of a powered knife to produce a neck injury have been reported in the literature. The consequent laryngeal damage may lead to serious airway, voice and swallowing conditions. It is important for surgeons who treat this uncommon condition of acute presentation to have a comprehensive understanding of its management in order to improve patient survival and outcome.

CASE REPORT

History and Examination

We report the case of a 51-year-old man who attempted suicide by using a powered knife to produce an anterior

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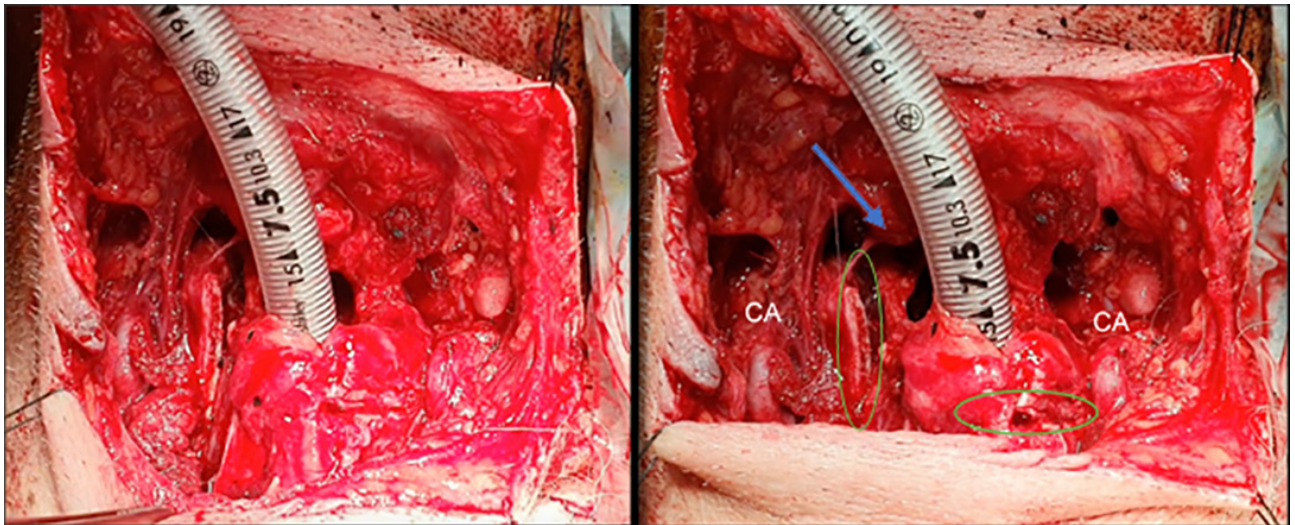
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FIGURE 1

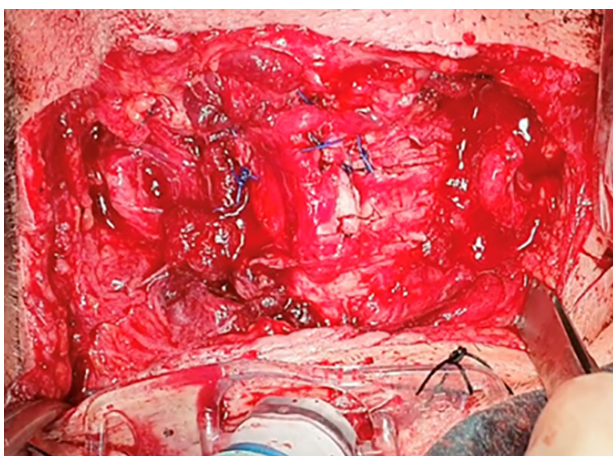
Vertical and horizontal fractures of the thyroid cartilage on the right and left sides respectively (green oval shapes); in this image the hypopharyngeal and esophageal lesion can be appreciated (blue arrow); both carotid arteries exposed (CA), although not injured. R - right side



neck laceration. He was found unconscious by his wife 30 minutes later, with a hemorrhagic neck wound and a powered knife beside him. The emergency physician encountered a hemodynamically stable patient, but unresponsive. On site, cervical spine immobilization was performed, the cervical wound was covered with sterile bandages and the patient was transferred to the Emergency Department of our Institution. Upon arrival, despite being conscious, stable and with little signs of respiratory distress, he was unresponsive and not collaborative. Bleeding was negligible. The patient was immediately transferred to the operating room accompanied by an anesthesiologist and an otolaryngology head and neck surgeon.

FIGURE 2

Tracheotomy in place; laryngeal framework after reconstruction; hypopharynx and retrolaryngeal esophagus were reconstructed in the mucous and muscular planes.



Surgery

Airway was immediately secured with the direct placement of an endotracheal tube through the fractured larynx. Wound exploration showed an anterior neck laceration with irregular borders and section of all infrahyoid muscles exposing the carotid artery bilaterally. Larynx was fractured in multiple sites: complete vertical fracture in the right lamina of thyroid cartilage, partial horizontal fracture in the left lamina and fracture of the thyroid cartilage notch. Laceration through thyrohyoid membrane created an orocervical opening. Hypopharynx was horizontally lacerated, and esophagus showed a 10 cm vertical laceration on the right side (figure 1).

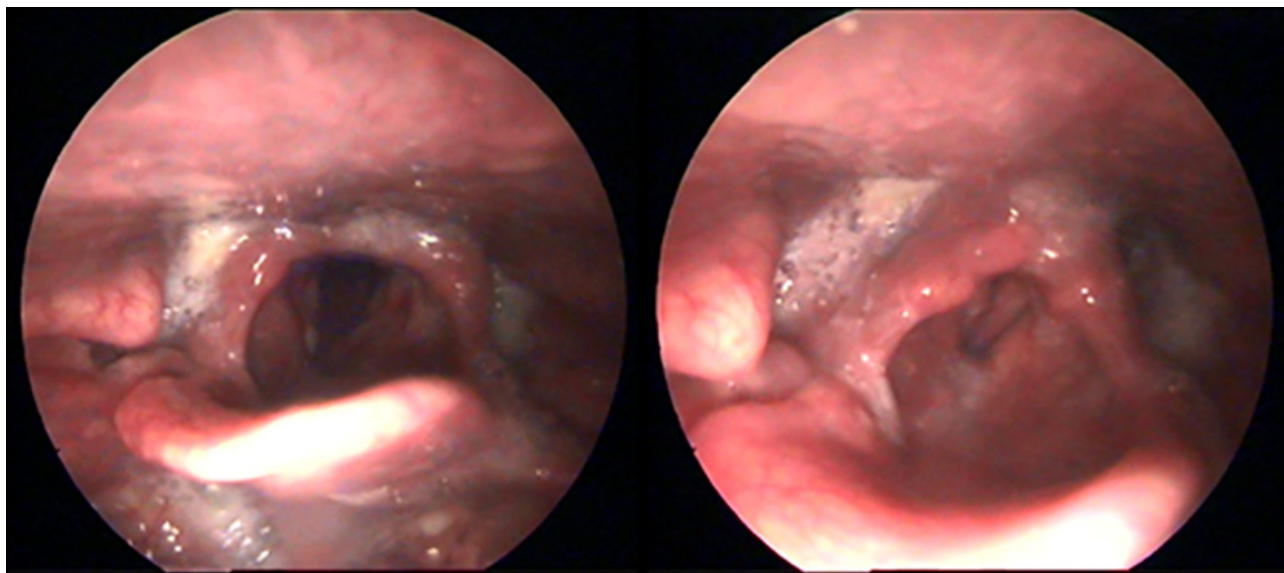
After anesthetic induction, a tracheotomy was performed. Vocal fold status was assessed under direct vision and apart from right vocal fold in abduction, no major injuries beside mucosal laceration were observed. Hypopharynx and esophagus were reconstructed in the mucous and muscular planes, with a simple continuous suture pattern with absorbable suture. Reconstruction of the thyroid cartilage was performed with simple interrupted nylon sutures. Strap muscles defects were also reconstructed. The result of the reconstruction can be observed on figure 2. At the end of the procedure, drains were placed and a nasogastric tube was inserted. The tracheotomy was maintained postoperatively. No intra or immediate post-operative complications were encountered.

Imaging

Imaging was performed after laryngeal and hypopharyngeal/esophageal reconstruction. Computed tomography identified fracture lines on the thyroid cartilage (vertical line on the right side and oblique

FIGURE 3

Fibrosopic view of the larynx 6 months post-operative (A - vocal folds in abduction; B - vocal folds in adduction).



line on the left) and the presence of gas surrounding the medial layer of the deep cervical fascia, in the retropharyngeal space, in agreement with the observed lesions.

Postoperative Course

Patient was admitted in Otolaryngology Head and Neck Surgery ward for observation and antibiotic coverage due to gross open neck contamination. Psychiatric care was offered daily in the ward. After 48hours nil per os, liquid diet was initiated through nasogastric tube. At day 8, per os diet was initiated but severe choking was observed in multiple occasions. Laryngeal endoscopy identified right hemylaryngeal paralysis and a small pouch filled with fibrin in the right pyriform sinus. Upper gastrointestinal endoscopy was performed twelve days after the trauma and there was no sign of tracheoesophageal fistula. A percutaneous endoscopic gastrostomy tube was inserted. Speech and swallow rehabilitation were initiated. Fiberoptic endoscopic evaluation of swallowing still showed liquid and solid food aspiration at 4 weeks after reconstructive surgery. Unidentified tracheoesophageal fistula was suspected.

Laryngeal electromyography and fluoroscopic swallowing study were requested. Owing to increased hospital pressure by increasing cases of COVID-19, studies were delayed. At month 3 patient swallowing function improved greatly, and no more choking events occurred. Tracheotomy tube was removed. Right hemylarynx paralysis resolved within 6 months, with good voice and swallowing function (figure 3).

DISCUSSION

Laryngeal fracture is a rare injury, resulting most frequently from blunt trauma to the neck from vehicle accidents, sports-related trauma, assault or strangulation.⁴ Kim *et al.* inferred that only 2-5 laryngeal trauma patients are admitted to an emergency medical center annually.⁵ Penetrating injuries are most often due to gunshot or knife wounds. Injuries produced by knife are usually confined to the path of the blade, contrasting with gunshot wounds that also produce massive damage to the surrounding tissues.⁶ A powered tool has the potential to produce greater damage when compared to a regular one, but reports are scarce as the incidence of such lesions is very low.⁷⁻⁹

TABLE 1

Fibrosopic view of the larynx 6 months post-operative (A - vocal folds in abduction; B - vocal folds in adduction).

Groups	Severity of Injury
1	Minor endolaryngeal hematomas or lacerations without detectable fractures.
2	More severe edema, hematoma, minor mucosal disruption without exposed cartilage, or nondisplaced fractures.
3	Massive edema, large mucosal lacerations, exposed cartilage, displaced fractures, or vocal cord immobility.
4	Same as group 3, but more severe, with disruption of anterior larynx, unstable fractures, two or more fracture lines, or several mucosal injuries.
5	Complete laryngotracheal separation.

Laryngeal injuries are classified according to the Schaefer-Fuhrman classification (table 1).¹⁰ Originally designed for blunt trauma stratification, it can also be applied to penetrating injuries. The current clinical case can be categorized as belonging to group 4, as we found exposed cartilage and displaced fractures.

In his work, Minard reported a mortality rate for penetrating laryngeal trauma of under 20%, although recent studies are lacking.¹¹ Besides considering the severity of the injury, the most important determinant of mortality is the adequacy and prompt airway management. Airway management methods are controversial. Most published works report the experience in the management of blunt trauma, as it is more frequent than penetrating trauma.^{1,5} In these reports, most cases with unstable airways were managed in the field or upon arrival at the emergency department by oral endotracheal intubation. Subsequent tracheotomy is performed in most cases. To perform an oral endotracheal intubation may present disadvantages as one may cause displacement of arytenoid cartilage or enlarge laryngeal mucosal lacerations. Grewal et al. reported the insertion of an endotracheal tube through an injury in the posterior membranous wall of the trachea into the mediastinum with devastating consequences for the patient.¹² To avoid complications, Schaefer recommended tracheostomy under local anesthesia for blunt trauma patients² and tracheostomy is nowadays considered the preferred method for airway management of such patients, performed during spontaneous ventilation under local anesthesia.¹³ If a fiberoptic laryngoscope is used, one can minimize the risk of complications related to transoral intubation. In our case, the airway was firstly secured by direct placement of an endotracheal tube through the open neck wound (figure 1), as the plane of dissection granted easy access to the tracheal lumen, and a tracheotomy followed.

The management of penetrating zone II neck wounds is also controversial, and strategies have included observation, mandatory exploration under general anesthesia or selective management depending on the use of ancillary tests.¹⁴ Selective management of penetrating neck injuries has been considered the standard of care with minimal risks to patient safety.¹⁵ Several hard signs indicating immediate explorative surgery in penetrating neck injury have been proposed, including shock, airway compromise, hoarseness and neurological deficits.¹⁶ The current patient presented obvious need for surgical exploration, as laryngeal framework and hypopharynx/esophageal reconstruction were mandatory. As such radiologic examination and endoscopic evaluation, including direct fiberoptic laryngoscopy and esophagoscopy, were delayed until after the surgical reconstruction.

If injury to the laryngotracheal complex is identified, repair is usually indicated; small mucosal defects or

undisplaced fractures of the laryngeal framework can be managed conservatively.¹⁷ Repair options include suturing, placement of miniplates and even placement of stents to prevent airway collapse or breakdown in severely displaced and unstable fractures.

Esophageal lesions are less common given its retrolaryngeal and retrotracheal position. Patients with suspected esophageal injury must have antibiotic coverage, nothing-by-mouth and given surgical nutrition.¹⁸ Failure to recognize esophageal injury may lead to leakage of gastric content with devastating consequences such as mediastinitis and abscess or empyema formation.¹⁸ Surgical treatment of esophageal lesions depends on the timing they are identified.¹⁶ If identification of injury occurs within 12 hours of onset, it may be repaired by direct suture and drainage; however, past this time frame, patients should undergo debridement and drainage with a planned delayed repair.^{16,18}

Given the mandatory need for neck exploration in the reported penetrating trauma, there seemed to be no need for preoperative CT scan or angiography in this particular case. For blunt trauma, or penetrating trauma without obvious need for neck exploration, CT scan is the preferred method for evaluation of laryngeal trauma patients, given its diagnostic acuity for superior aerodigestive tract lesions and cartilage framework injury.¹⁹ High resolution CT angiography offers appropriate diagnostic accuracy with minimal risk, making this the initial diagnostic study of choice when available.¹⁴

Kim *et al.* has reported relatively good voice outcomes.⁵ Early treatment after injury has been associated with better voice outcomes.²⁰ However, after treatment of laryngeal trauma, many mechanisms could explain voice changes, including alteration of laryngeal framework and vocal cord paralysis.²¹ Right vocal cord paralysis resulted from our patient's laryngeal injury initially, but it resolved within 6 months (figure 3). No surgical procedure was necessary for voice rehabilitation, as fairly good functional results were obtained from speech and swallowing rehabilitation. Many options for vocal cord medialization are available for patients who fail to achieve good results conservatively.

In conclusion, we report the immediate surgical management of a patient that self-inflicted a penetrating anterior neck wound with a powered knife, creating multiple laryngeal fractures and hypopharyngeal and esophageal lacerations. Of note, no major blood vessels were involved and the thyroid cartilage was transected without involvement of the glottic area. Reconstruction of the hypopharynx, esophagus and strap muscles was done with absorbable sutures, and reconstruction of the thyroid cartilage was performed with non-absorbable sutures, with postoperative anatomical and functional good results.

Conflito de Interesses

Os autores declaram que não têm qualquer conflito de interesse relativo a este artigo.

Confidencialidade dos dados

Os autores declaram que seguiram os protocolos do seu trabalho na publicação dos dados de pacientes.

Proteção de pessoas e animais

Os autores declaram que os procedimentos seguidos estão de acordo com os regulamentos estabelecidos pelos diretores da Comissão para Investigação Clínica e Ética e de acordo com a Declaração de Helsínquia da Associação Médica Mundial.

Política de privacidade, consentimento informado e Autorização do Comité de Ética

Os autores declaram que têm o consentimento por escrito para o uso de fotografias dos pacientes neste artigo.

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Este trabalho não recebeu qualquer contribuição, financiamento ou bolsa de estudos.

Disponibilidade dos Dados científicos

Não existem conjuntos de dados disponíveis publicamente relacionados com este trabalho.

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