Scientific Research Publishing

Voice of the Publisher, 2025, 11(2), 374-384
https://www.scirp.org/journal/vp
ISSN Online: 2380-7598
ISSN Print: 2380-7571

Laryngeal Trauma: The Challenges of Vital and Functional Management, a Case Report

Moad El Mekkaoui[1*], Amine Oussalem[2], Mouhamad Ezadine[1], Zakaria Arkoubi[1], Zakaria El Hafi[1], Razika Bencheikh[1], Anas Benbouzid[1], Malik Boulaadas[2], Leila Essakalli[1]

[1]ENT-Head and Neck Surgery Department, Hospital of Specialties, Mohammed V University, Rabat, Morocco
[2]Maxillofacial Surgery Department, Hospital of Specialties, Mohammed V University, Rabat, Morocco
Email: *moad_elmekkaoui@hotmail.fr

How to cite this paper: El Mekkaoui, M., Oussalem, A., Ezadine, M., Arkoubi, Z., El Hafi, Z., Bencheikh, R., Benbouzid, A., Boulaadas, M., & Essakalli, L. (2025). Laryngeal Trauma: The Challenges of Vital and Functional Management, a Case Report. *Voice of the Publisher, 11,* 374-384.
https://doi.org/10.4236/vp.2025.112026

Received: April 28, 2025
Accepted: June 13, 2025
Published: June 16, 2025

Abstract

Laryngeal trauma, although rare, can be serious, altering the 3 laryngeal functions and even life-threatening. Clinical signs may be suggestive and alarming, such as dyspnoea, dysphonia, hoarseness and dysphagia. Nasofibroscopy and cervical tomodensitometry can be used to establish the diagnosis, assess lesions and guide treatment. However, in certain severe forms, immediate treatment is required to ensure patency and restore the functional anatomy of the upper aerodigestive tract. In this scientific article, we report the case of a 22-year-old man who was the victim of a road traffic accident with a cervical point of impact. He was admitted as an emergency patient with a laryngeal trauma classified as Schaefer-Fuhrman stage 4, requiring resuscitation measures and immediate surgery to restore the integrity of the upper aerodigestive tract. Post-operative results were rapidly satisfactory, with preservation of all laryngeal functions and no significant complications.

Keywords

Trauma, Larynx, Endoscopy, Surgery, Case Report

1. Introduction

Laryngeal trauma, although rare, can be serious, altering the 3 laryngeal functions and even life-threatening. Clinical signs may be suggestive and alarming, such as dyspnoea, dysphonia, hoarseness and dysphagia. Nasofibroscopy and cervical tomodensitometry can be used to establish the diagnosis, assess lesions and guide treatment. However, in certain severe forms, immediate treatment is required to ensure patency and restore the functional anatomy of the upper aerodigestive tract.

2. Case Report

Initial Presentation: The patient was 22 years old, with no previous medical history, and was the victim of a high-kinetic road traffic accident with a cervico-facial point of impact and initial loss of consciousness. A motorcyclist not wearing a helmet fell on a sharp iron blade, causing a deep cervical wound. The patient presented with respiratory distress and haemorrhagic shock, complicated by impaired consciousness, for which he was admitted directly to the operating room. After orotracheal intubation, emergency resuscitation measures were initiated. The primary finding was a deep, horizontal, arciform, visibly unsoiled cervical wound opposite the thyroid cartilage, extending from the anterior edge of the right sternocleidomastoid muscle to the anterior edge of the contralateral muscle, associated with active bleeding and the presence of blood clots.

Surgical Management: The sectioned arteries and veins were ligated, in particular the two anterior jugular veins, the right facial artery and the right facial vein. The carotid arteries and internal and external jugular veins were not damaged. The superior laryngeal pedicle was intact on both sides.

Secondly, a lesion assessment was carried out, revealing laryngeal trauma classified as Schaefer-Fuhrman stage 4. The hyoid bone was not found, the supra- and infra-hyoid muscles were shredded, and the thyrohyoid membrane was ruptured, with numerous fracture lines in the thyroid cartilage involving both lamina and allowing visualization of the traumatized endolaryngeal mucosa (**Figure 1**), associated with a transverse wound in the hypopharynx extending to the anterior angle of the left piriform sinus (**Figure 2**). The cricoid cartilage and trachea were intact. There was no trauma to the oesophagus. We also visualised a wound on the floor of the mouth and palpated a displaced fracture of the left mandibular body.

The third stage of the surgical procedure involved restoring the functional anatomy of the upper aerodigestive tract with the aim of preserving the 3 main functions, namely breathing, phonation and swallowing. After the introduction of a nasogastric tube through the left piriform sinus, the hypopharyngeal wound was sutured with 3/0 vicryl first to the anterior angle of the sinus, which was closed following the path of the tube. The various fracture lines in the thyroid cartilage were reduced and then stabilised with 2/0 vicryl, and the sectioned thyroid membrane was reattached to the foramen caecum (**Figure 3**). The wound on the floor of the mouth was then sutured. The supra- and infrahyoid muscles were then used to pad the wound after insertion of a Redon drain PVC number 12 (**Figure 4**). A betadine serum wash was then performed, followed by closure of the various subcutaneous and cutaneous planes. A tracheostomy was performed at the end of the operation with the insertion of a number 7.5 PVC cannula followed by inflation of the balloon.

During the operation, the patient was transfused with two packed red blood cells and fresh frozen plasma, together with 3 g of protected amoxicillin. The head-neck axis was not mobilised to avoid aggravating any injury to the cervical spine. A body scan was performed postoperatively to check for associated lesions; the

cerebral floor was normal, a right mandibular parasymphyseal fracture was observed (Figure 5), the cartilage fracture was well reduced (Figure 6), and the cervical spine was intact.

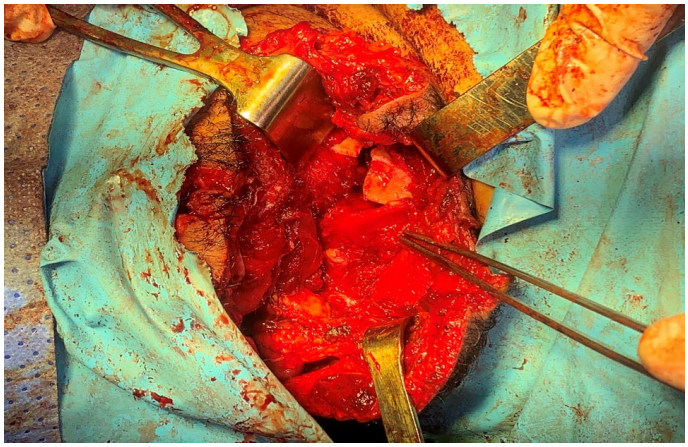

Figure 1. Surgical image showing the numerous fracture lines in the thyroid cartilage.

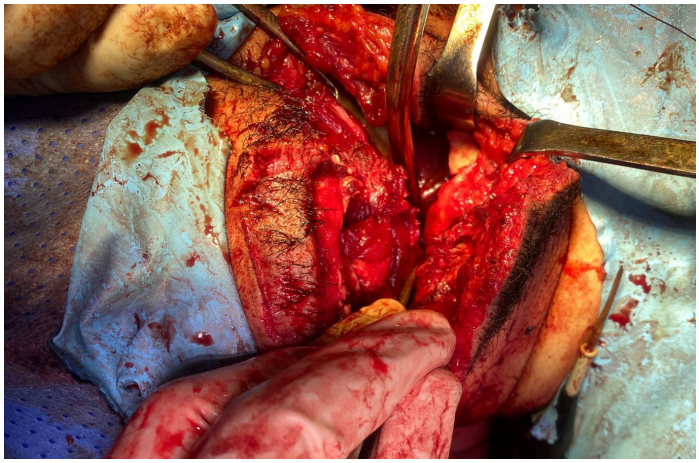

Figure 2. Surgical image showing pharyngeal and laryngeal mucosal lacerations.

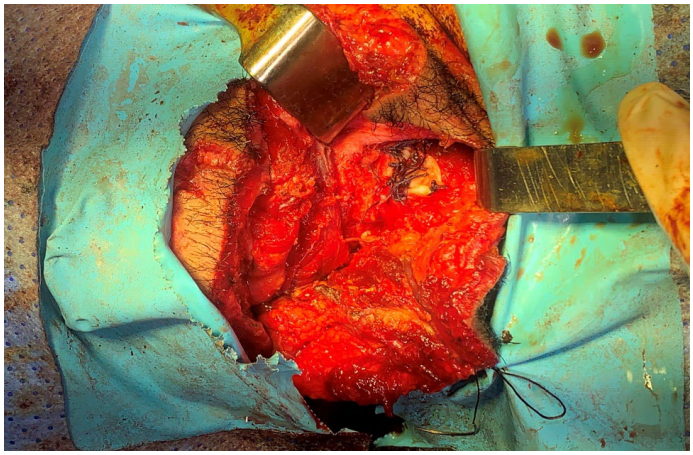

Figure 3. Surgical image showing suture of the thyroid cartilage and reattachment of the thyroid membrane to the foramen caecum.

Figure 4. Surgical image showing placement of a Redon drain (PVC no 12) and padding by the supra- and infra-hyoid muscles.

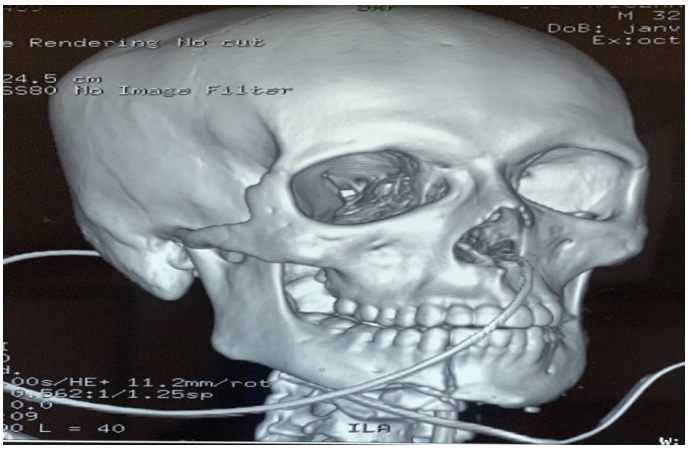

Figure 5. 3D reconstruction CT image of the facial mass showing a right mandibular parasymphyseal fracture.

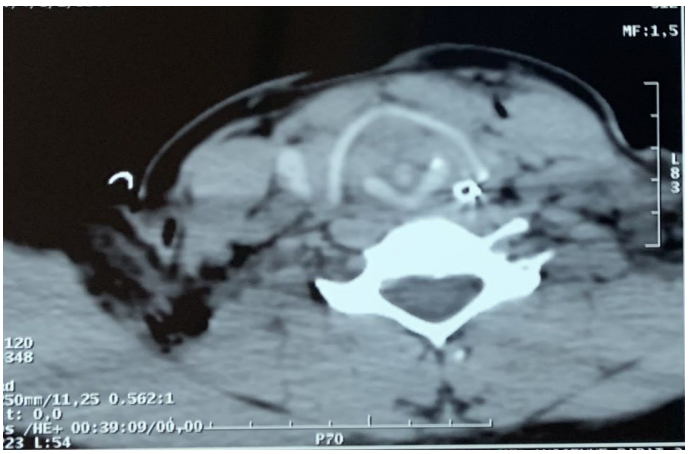

Figure 6. Cervical CT image in axial section showing reduction of the complex fracture of the thyroid cartilage.

The patient was then transferred to intensive care, still sedated, with spontaneous ventilation and inspiratory support. Noradrenaline was stopped after haemo-

dynamic stabilisation. An injectable treatment was started, including amoxicillin with clavulanic acid, double-dose proton pump inhibitors and corticosteroid therapy. The balloon of the PVC cannula was deflated 6 hours after surgery, with sedation stopped at the same time (Figure 7). Once the patient was awake, mechanical ventilation was weaned using a T-tube. The Redon drain, returning less than 50 cc, was removed 48 hours after surgery. Strict measures were then recommended: a semi-seated position while avoiding extension of the head, vocal rest, exclusive feeding via the nasogastric tube without food that could irritate the stomach and cause gastro-oesophageal reflux, and finally, spitting out saliva with washing of the oral cavity with betadine mouthwash diluted in warm water. Once the emergency was over, the patient was operated on for his mandibular fracture via the inferior vestibular approach while avoiding hyperextension of the head in the operating room. A well-articulated block was performed first, followed by reduction of the fracture site and then osteosynthesis using 2 mini-plates with 4 offset holes, each fixed by four 7 mm minivis. Unlocking was performed at the end of the operation, and postoperative control was satisfactory.

Figure 7. Image of the patient awake in intensive care 6 hours after the operation, tracheostomised, on spontaneous ventilation with inspiratory support, nasogastric tube in place.

Postoperative course: The first follow-up nasofibroscopy was performed one week after the first operation, and revealed diffuse oedema of the glottic and supraglottic levels, with significant salivary stasis. The medical treatment previously instituted was maintained. The skin sutures were removed on the tenth day following surgery. Repeated nasofibroscopies showed progressive regression of oedema. At the end of the third week, the laryngeal oedema had almost completely disappeared, with good healing of the endolaryngeal mucosa (Figure 8). The vocal cords were healthy and mobile, but there was a small paramedian slit in adduction due to persistent oedema of the right arytenoid (Figure 9), We found no cricoarytenoid dislocation, and the left piriform sinus was intact after removal of the nasogastric tube, with no salivary stasis opposite (Figure 10). The right piriform sinus was intact. The subglottic region was healthy, and introduction of the flexible nasofibroscope through the tracheostomy orifice allowed exploration of the cervical trachea, which was also healthy. No granulomas or the beginnings of any

laryngeal or tracheal fibrosis were found. Weaning of the tracheostomy was then started, and the cannula was completely closed for 72 hours. Then, it was removed with the placement of a dressing over the tracheostomy orifice. The medical treatment continued to be a budesonide-based oral inhalation aerosol and proton pump inhibitors. Oral feeding was started immediately after the removal of the nasogastric tube, and we recommended keeping the patient on a soft diet at first before gradually switching to solid foods. The patient was seen the following week, and the tracheostomy orifice had largely closed, with good skin healing and no significant fistula (Figure 11). The patient retained a slight dysphonia, so early speech therapy was started in the third week after the operation, with the aim of restoring voice, breathing and phono-respiratory coordination while re-establishing safe swallowing. It was based on specific techniques: laryngeal relaxation and decontraction, gentle vocal exercises, vocal cord stimulation, laryngeal massage, diaphragmatic breathing exercises, voice-breath coordination ("M" on exhalation), "effortful swallow", Mendelsohn exercise and "supraglottic swallow". The frequency of sessions was 3 per week.

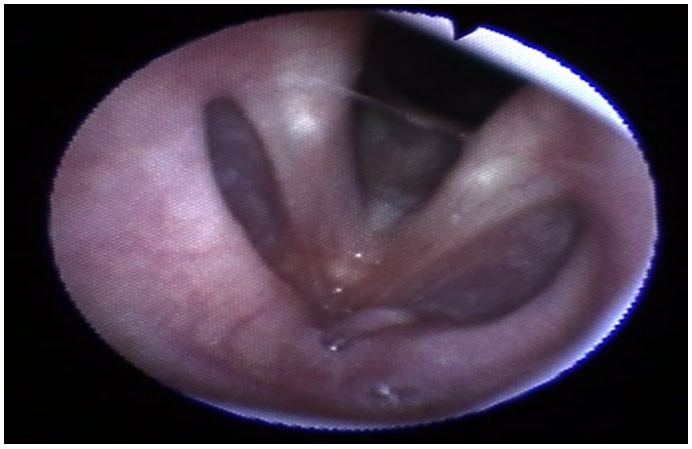

Figure 8. Nasofibroscopic image showing almost complete disappearance of the laryngeal oedema with good healing of the endolaryngeal mucosa, the subglottic layer being respected.

Figure 9. The vocal cords appeared healthy and mobile, with a paramedian slit in adduction due to persistent oedema of the right arytenoid.

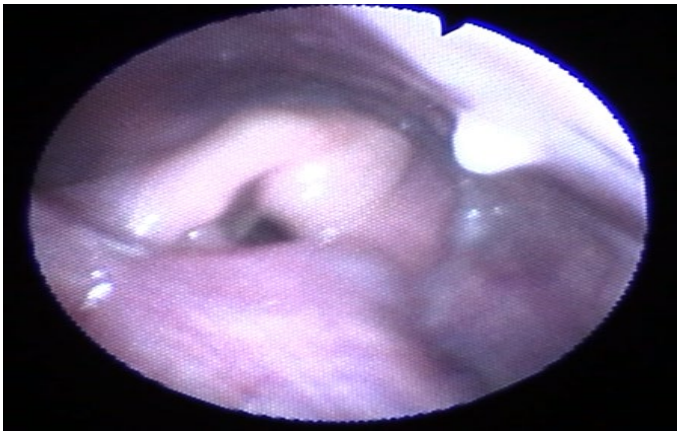

Figure 10. Nasofibroscopic image showing an intact left piriform sinus after removal of the nasogastric tube.

Figure 11. Image of the patient one month after surgery: the tracheostomy orifice had largely closed, with good skin healing and no significant fistula.

By the third month after the trauma, the patient had regained full laryngeal function. His respiratory function was already stable, and he had normal phonation with a strictly normal nasofibroscopy check-up, as well as good swallowing function with no false routes. One year after the operation, the patient did not present any long-term complications, in particular, a possible laryngo-tracheal stenosis. The patient is still being monitored on a regular basis.

3. Discussion

Laryngeal injuries are rare, accounting for less than 1% of all traumatic injuries. However, they can be serious and life-threatening, constituting the second most common cause of death in patients with head and neck trauma after intracranial injuries (Malvi, 2022). Although road accidents are the most common cause of laryngeal injuries, they can also occur in assaults, whether due to strangulation or direct impact by a blunt instrument or sharp blade or in sports accidents. Iatrogenic laryngeal lesions are rarer and occur during intubation, percutaneous tracheotomy and bronchoscopy (Malvi, 2022).

Pathophysiologically, there are two types of laryngeal trauma: penetrating trauma and blunt trauma. In the latter, the larynx is compressed between an intrusive object and the cervical spine, and recoils into position (Jalles et al., 2021). The degree of severity of laryngeal injury is generally proportional to the force of compression and the area to which it is applied. Combined injuries to adjacent structures such as the oesophagus, trachea and cervical spine may be associated (Jalles et al., 2021; Wertz & Elden, 2019). The most serious "clothesline" injury occurs when a motorcyclist collides with a small static object, resulting in severe crumbling and disintegration of the cartilage of the larynx and trachea, which can restrict the airway. Laryngotracheal separation may be seen in severe forms due to shear pressures (Malvi, 2022). In penetrating injuries to the larynx, the mechanism also determines the severity of the injury. High-velocity injuries caused by weapons are generally destructive, fracturing laryngeal cartilage and obliterating laryngeal tissue, resulting in acute respiratory distress; adjacent structures may also be lacerated. Low-velocity injury usually causes minor symptoms initially, but care must be taken to avoid the development of post-injury oedema or haematoma, which may obstruct the airway (Malvi, 2022). In practice, patients presenting with laryngeal trauma are grouped into unstable patients requiring urgent tracheostomy or cricothyrotomy before any assessment of the injury, in order to stabilise the airways, and stable patients in whom nasofibroscopy and the various complementary examinations can be carried out immediately. However, the degree and severity of laryngeal lesions are assessed using the Schaefer-Fuhrman classification system (Malvi, 2022; Schaefer, 2014), which is used to guide patient management and, according to some authors (Jalles et al., 2021; Wertz & Elden, 2019), can predict the outcome for the patient's voice and airway function. (**Figure 12**)

Severity of laryngeal injury (Schaefer Fuhrman's classification)	
Group	**Injury**
I	Minor endolaryngeal hematoma without detectable fracture
II	Edema, hematoma, minor mucosal disruption without exposed cartilage, and nondisplaced fractures
III	Massive edema, mucosal disruption, exposed cartilage, vocal fold immobility, and displaced fracture
IV	Group with disruption of anterior larynx, unstable fractures, two or more fracture lines, or massive trauma to laryngeal mucosa
V	Complete laryngotracheal separation

Figure 12. Schaefer-Fuhrman classification assessing the severity of laryngeal trauma (Schaefer, 2014).

The initial assessment of the patient should look for life-threatening respiratory, haemodynamic or neurological distress requiring urgent intervention. Apart

from extreme emergencies, the patient's history and physical examination are fundamental to the early detection of laryngeal injury. The history should be taken in the context of previous cervical trauma, the mechanism and time of which should be specified. Laryngeal injury should also be suspected in polytrauma patients. Clinical signs to look for include hoarseness or dysphonia, laryngeal dyspnoea, stridor, dysphagia or odynophagia, anterior neck pain, cough and haemoptysis. Physical examination will reveal a sore, haematoma or bruising on the anterior neck on inspection, as well as loss of the distinctive prominence of the thyroid cartilage. Palpation checks the integrity of the laryngo-tracheal axis, the presence of a creak, tenderness or subcutaneous emphysema. The rest of the examination looks for associated lesions, particularly of the cervical spine (Malvi, 2022; Jalles et al., 2021; Shaker et al., 2022). Nasofibroscopy is systematically performed for diagnostic purposes, to visualise the endolarynx and assess the condition of its mucosa, evaluate the function and mobility of the vocal cords, look for crico-arytenoid dislocation and check the integrity of the piriform sinuses and cervical trachea. However, it can prove difficult in the presence of lacerations or mucosal wounds with bleeding, haematoma or significant oedema (Malvi, 2022; Jalles et al., 2021; Schaefer, 2014). Cervical computed tomography (CT) is considered to be the reference complementary examination for assessing the larynx and adjacent structures and guiding therapeutic management by differentiating patients who require little or no treatment from those with severe tissue damage requiring surgery (Jalles et al., 2021; Wertz & Elden, 2019; Riberiro Costa et al., 2017). It is indicated in the presence of alarming clinical or physical functional signs, but also in patients presenting a lesion with significant kinetic energy and minimal signs. However, it has been reported that it fails to identify lesions in paediatric patients in almost 30% of cases (Cheng et al., 2017). At the end of the work-up, the laryngeal lesion can be classified according to the Schaefer-Fuhrman classification. In our case, the patient was stage 4.

Therapeutic management must be early, effective and rapid, with the aim of ensuring airway patency, but also maintaining normal phonation and swallowing functions (Malvi, 2022; Jalles et al., 2021; Schaefer, 2014). In 2014, Schaefer analysed 90 years of literature on acute laryngeal trauma (Schaefer, 2014), which enabled him to establish a therapeutic management strategy. In cases of respiratory distress, tracheostomy and cricothyromia are preferred to orotracheal intubation, as the latter can be difficult because of the deformed anatomy of the larynx, but also because of the risk of aggravating endolaryngeal lesions (Wertz & Elden, 2019; Schaefer, 2014; Cheng et al., 2017). In our case, the patient was intubated by the intensive care unit as soon as he arrived, given the respiratory distress caused by the anterior opening of the larynx and the presence of haemorrhagic shock. Surgical reduction is indicated where there is a risk of airway instability, particularly in the case of displaced fractures (Schaefer-Fuhrman lesions stages 3, 4 and 5), with the aim of restoring the functional anatomy and patency of the upper aerodigestive tract (Malvi, 2022; Jalles et al., 2021). The procedure may include

exploration of the neck, correction of laryngeal or pharyngeal mucosal lacerations, reduction and stabilisation of displaced or unstable laryngeal cartilage fractures, exploration and treatment of possible oesophageal lesions, and soft tissue repair with laryngofissure or stenting in the case of extensive endolaryngeal mucosal lesions (Malvi, 2022; Wertz & Elden, 2019; Shaker et al., 2022). Fixation of a non-displaced fracture is also recommended by some authors in order to restore structural integrity and optimise vocal cord reconstruction (Jalles et al., 2021; Schaefer, 2014). The tracheostomy is maintained until complete recovery of the larynx, which is assessed by iterative nasofibroscopy with the help of a speech therapist. The risk of worsening mucosal lesions due to gastro-oesophageal reflux makes it necessary to insert a nasogastric tube or gastrostomy to allow the patient to be fed. In cases where the airway is stable, nasofibroscopy and cervical computed tomography are performed first, followed by direct laryngoscopy and oesophagoscopy in cases of suspected mild or moderate mucosal lacerations, which may benefit from endoscopic repair to cover the cartilage (Malvi, 2022; Schaefer, 2014). In Schaefer-Fuhrman stage 1 and 2 lesions, close airway monitoring (oximetry, pulse) for at least 24 hours may be sufficient. Strict measures must be taken: elevation of the head, humidified air, analgesics, injectable corticosteroids combined with nebulised steroids can reduce oedema, proton pump inhibitors can reduce the formation of granulation tissue, vocal rest and a clean diet. Speech therapy is essential to improve phonation and swallowing in the long term (Jalles et al., 2021; Ribeiro Costa et al., 2017). Post-treatment complications may arise, ranging from simple granulation tissue to laryngeal or laryngo-tracheal stenosis. Tracheal or laryngo-cutaneous fistulas are rare. Rapid healing of the mucosa, respect for the laryngeal musculature and covering of cartilage help to avoid their occurrence (Malvi, 2022).

4. Conclusion

Although rare, laryngeal trauma can be serious and life-threatening. Treatment must be early, rapid and effective, and must be well codified, with the aim of restoring the integrity and functional anatomy of the larynx and adjacent structures, thereby ensuring the permeability of the upper airways and preserving phonation and swallowing.

Informed Consent

Written informed consent was obtained from the patient for publication of this case report and accompanying images.

All data are available in the patient's medical file.

Approval

All authors approved the final version of the manuscript.

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

References

Cheng, J., Cooper, M., & Tracy, E. (2017). Clinical Considerations for Blunt Laryngotracheal Trauma in Children. *Journal of Pediatric Surgery, 52,* 874-880. https://doi.org/10.1016/j.jpedsurg.2016.12.019

Jalles, F., Janeiro, M., & Gonçalves, M. (2021). Traumatic Laryngeal Fracture: A Case Report. *Trauma Case Reports, 36,* Article 100539. https://doi.org/10.1016/j.tcr.2021.100539

Malvi, A. (2022). Laryngeal Trauma, Its Types, and Management. *Cureus, 14,* e29877. https://doi.org/10.7759/cureus.29877

Ribeiro-Costa, N., Carneiro Sousa, P., Abreu Pereira, D., Azevedo, P., & Duarte, D. (2017). Laryngeal Fracture after Blunt Cervical Trauma in Motorcycle Accident and Its Management. *Case Reports in Otolaryngology, 2017,* 1-3. https://doi.org/10.1155/2017/9321975

Schaefer, S. D. (2014). Management of Acute Blunt and Penetrating External Laryngeal Trauma. *The Laryngoscope, 124,* 233-244. https://doi.org/10.1002/lary.24068

Shaker, K., Winters, R., & Jones, E. B. (2022). *Laryngeal Injury*. StatPearls Publishing.

Wertz, A., & Elden, L. (2019). Pediatric Blunt Laryngeal Trauma: Arytenoid Degloving Report and Management Review. *Ear, Nose & Throat Journal, 100,* 14-15. https://doi.org/10.1177/0145561319861391