



REVIEW ARTICLE

TRANSORAL LASER MICROSURGERY OF LARYNGOPHARYNGEAL CHEMICAL INJURY: CASE SERIES

M. Hachemi, N. Oukil, FZ Touarigt, Y. Amourache, M. Hasbellaoui

ENT Department and CCF CHU Bab El Oued, Algeria

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*Corresponding author:

M. Hachemi

ABSTRACT

Introduction and importance: The accidental or intentional consumption of caustic substances is a rare but serious medical emergency with potentially severe consequences and high mortality rates. While damage to the gastro-esophagus from these substances is well-recognized, injury to the pharyngolaryngeal structure is less common. Still, it poses a significant risk to life and has not been extensively documented. We presented the surgical treatments for these injuries and assessed patient outcomes following the intervention. **Case Presentation:** Ten patients were treated at the ENT department in Algiers, Algeria, from January 2018 to November 2023, presented with pharyngolaryngeal and oesophageal narrowing due to chemical substances and were referred by general surgeons for pharyngolaryngeal stenosis surgery in preparation for oesophageal reconstruction. We retrospectively analyzed the clinical data, surgical interventions, and patient outcomes following research to the PROCESS reporting guidelines. **Clinical Discussion:** Our study revealed a higher prevalence among females with a median age of 25. Intentional ingestion of caustic substances was the most common cause of 7 patients, and 8 of 10 patients required a tracheostomy. All patients had a healthy glottis, without scar and mobility onset (confirmed by endoscopy and CT) and received a feeding jejunostomy. Following endoscopic and CT assessments, all patients underwent transoral laser microsurgery (TLM), with a hospital stay of 24 hours and positive surgical outcomes. Two patients required additional procedures, but after one month, all patients demonstrated highly satisfactory results with almost complete resolution of hypopharyngeal and laryngeal stenosis, decannulation for tracheostomized individuals, and referral to general surgery for further management. **Conclusion:** Caustic pharyngolaryngeal and esophageal stenosis is challenging for specialist teamwork. Otolaryngologists can play a crucial role in managing these patients by utilizing TLM to help address this difficult condition.

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INTRODUCTION

Differentiate between caustic, chemical and corrosive trauma or injury carries significant risks, including high rates of illness and death [1]. Effective management necessitates a swift and collaborative approach involving various specialists: emergency physicians, intensivists, gastroenterologists, otolaryngologists, digestive surgeons, and psychiatrists. The severity of injuries resulting from ingesting or inhaling these substances is influenced by factors such as quantity, concentration, pH level (acidic or alkaline), and the duration of tissue contact [2]. While 75% of cases are mild, severe burns can be life-threatening and have long-term consequences, with immediate and delayed mortality rates approaching 10% [1]. Children under the age of 6 are particularly vulnerable to accidental poisoning at home, whereas exposure in adults is typically a suicidal attempt [3]. Within 2 to 4 days, the necrotic surface layer of corrosive lesions begins to separate, which can lead to perforation or scarring and contracture as fibroblasts regenerate.

Approximately one-third of patients experience long-term complications of stricture at the level of the oropharynx, laryngopharynx, and oesophagus [3,4]. The vocal cords are usually protected during caustic ingestion due to the sphincter-like action of the epiglottis and false vocal folds. However, supraglottic structures are more commonly affected, and long-term complications like stenosis can arise. While various surgical approaches have been documented for oesophageal and gastric injuries, there is limited literature describing surgical treatments for long-term pharyngolaryngeal complications. The aim of our study was to strengthen and improve knowledge on the management of these types of pathologies.

MATERIAL AND METHOD

The work has been reported in line with the PROCESS criteria.

This retrospective study reported ten patients with pharyngolaryngeal and esophageal stenosis due to chemical trauma treated at the ENT department in Algiers, Algeria, between January 2018 and November 2023. We performed a Transoral Laser Microsurgery release technique for stenosis to facilitate subsequent esophagoplasty. All patients underwent comprehensive ENT examinations, including endoscopy and CT scans. These assessments confirmed the presence of stable, non-inflammatory pharyngo-supraglottic stenosis, characterized by multiple adhesions between the epiglottis and the posterior and lateral pharyngeal walls (Figure 1). Varying degrees of dysphonia were also observed in all patients—endoscopic examinations using flexible and 70° rigid telescopes. The work has been reported in line with the SCARE criteria.

RESULTS

The study consisted of four men and six women with a median age of 25 years (range 23-36). All patients had been managed by gastroenterology and general surgery for 1 to 3 years due to caustic-induced oesophageal stenosis. Eight of 10 patients had intentionally ingested the substance in a suicide attempt, while 2 of 10 had accidental etiologic. Seven patients required emergency tracheostomy due to respiratory distress following ingestion, and three patients experienced dyspnea on exertion. All patients had complete aphagia, necessitating a feeding jejunostomy, with a body mass index (BMI) within the normal range (15-18). None of the patients had any associated comorbidities. The pathologic examination revealed scar tissue between the suprahyoid epiglottis and the posterior and lateral pharyngeal walls, with narrowing of the pharyngolaryngeal level estimated at 60% in 2 patients and 80% in 5 patients, or in a healthy glottis there is no flange. Total obliteration of the pyriform sinuses was observed in all patients. However, movement of the vocal cords is normal, confirmed by a CT scan in cases with difficulty in direct visualization.

Surgical technique: All patients underwent pharyngolaryngeal reconstruction under general anesthesia using DPEL (diode-pumped Erbium: YAG laser). Six patients were ventilated through their tracheostomy, while four were intubated after clearing a sufficient passage for a 5mm endotracheal tube. Two types of lasers were employed: a C-Las of CO₂ laser from A.R.C. coupled with a micromanipulator (300-micron spot size) in super pulse and continuous modes (2-5W) and a Fox 810 nm Diode ARC Laser in a continuous mode (5-7W). The epiglottis was released (figure 2) through laser debridement, radial incisions, and hypopharyngeal thickened mucosa to create a laryngopharyngeal channel [5]. Particular attention was given to the left hypopharynx, which would be the site for subsequent esophagoplasty. Intraoperatively, the glottis and subglottic integrity were confirmed in all patients, regardless of the severity of pharyngeal stenosis. All patients received an 8-day course of antibiotics and a 5-day course of corticosteroids upon discharge. One day after surgery, all patients reported improved voice and breathing, with tracheostomy tubes removed, enabling them to breathe through their mouths. All patients were discharged within 24 hours, and no operative or postoperative complications were observed. A follow-up endoscopic examination one month later revealed healing of the pharynx and larynx in 8 of 10 patients, who were then decannulated.

However, two patients experienced a recurrence of pharyngo-epiglottic adhesions, necessitating a second laser procedure three months later. This second intervention resulted in near-complete healing of the pharyngolaryngeal structure. Three months postoperatively, none of the patients showed any signs of recurrent pharyngolaryngeal stenosis (Figure 3). Their tracheostomy sites were closed, and they were referred back to the general surgery department for esophageal reconstruction (esophagoplasty). Any surgical technique present risks, other the risks of anesthesia, the risks of laser endolaryngeal surgery (burns, tracheal or balloon perforation, oedema laryngeal) and the risks of not being able to expose lesions that must be known to the surgeon and be well explained to the patient.

The day after the operation, all of patients reported an improvement in voice and breathing with closure of the tracheal cannula allowing mouth breathing, with a hospital stay of 24 hours for all patients, no operative incidents. or postoperative was observed, an endoscopic check was systematically carried out 1 month later where we observed in seven cases a healing of the pharynx and larynx with decannulation of the tracheotomized patients and we noted in Two patients the reappearance pharyngo-epiglottic clamps or a 2nd laser session was done 3 months later allowing almost complete healing of the pharyngolaryngeal tract. Three months after surgery, the patients showed no signs of recurrence of pharyngolaryngeal stenosis (Figure 3), their tracheostomy port was closed and were re-referred to their general surgery department for esophagoplasty. Although the sample to be studied in our work is not important (ten patients) which is related to the rarity of this pathology, but our results and techniques can be produced over a long period for having obtained a retreat and patients for our results.

DISCUSSION

Up to one-third of patients who ingest caustic substances experience long-term complications, including strictures and stenosis at the level of the oropharynx, laryngopharynx, and esophagus [4]. The onset of this delayed phase can occur as early as two weeks after ingestion [3]. These complications can manifest as upper airway obstruction, difficulty swallowing (dysphagia), and voice problems ranging from hoarseness (dysphonia) to complete loss of voice (aphonia) [5]. Laryngeal fibrosis often leads to supraglottic stenosis, typically sparing the vocal cords; caustic lesions are characterized by severe excessive fibrosis in the oropharynx and supraglottic region [6].

Endoscopic pharyngolaryngeal surgery was initially developed to remove localized tumors [7]. In recent years, Transoral Laser Microsurgery has emerged as a technique for pharyngolaryngeal reconstruction to address non-cancerous dysfunction of the pharynx and larynx [8,9], as well as the complication of surgical intervention and radiotherapy for head and neck cancers. The cases presented here demonstrate the value of laser technology, commonly used in ENT for voice surgery and the removal of small pharyngolaryngeal tumors [7,8]. However, its applications have expanded to include TLM. In this surgical approach, the laser can be used for tissue reshaping and dissection with minimal risk of bleeding [10]. The laser can also excise thickened tissues, minimizing collateral thermal damage and reducing the risk of scarring and tissue repair [11].

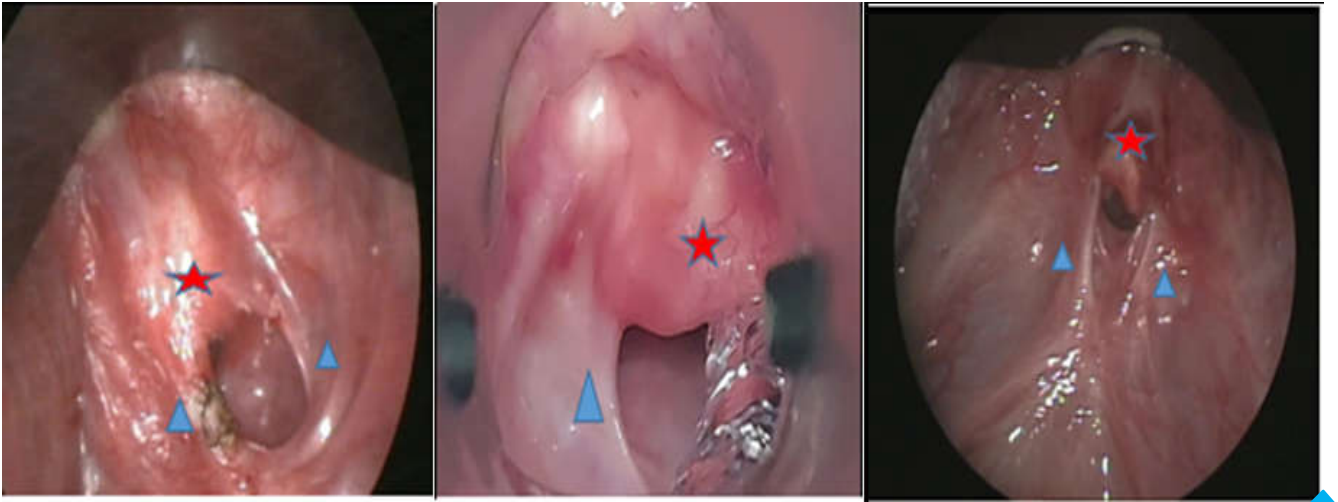


Fig. 1. Intraoperative endoscopic view of the pharynx and larynx. Complete flanges between the epiglottis and the posterolateral walls of the hypopharynx. ★: lingual surface of the epiglottis; ▲: scarring between posterolateral walls of the pharynx and the epiglottis.

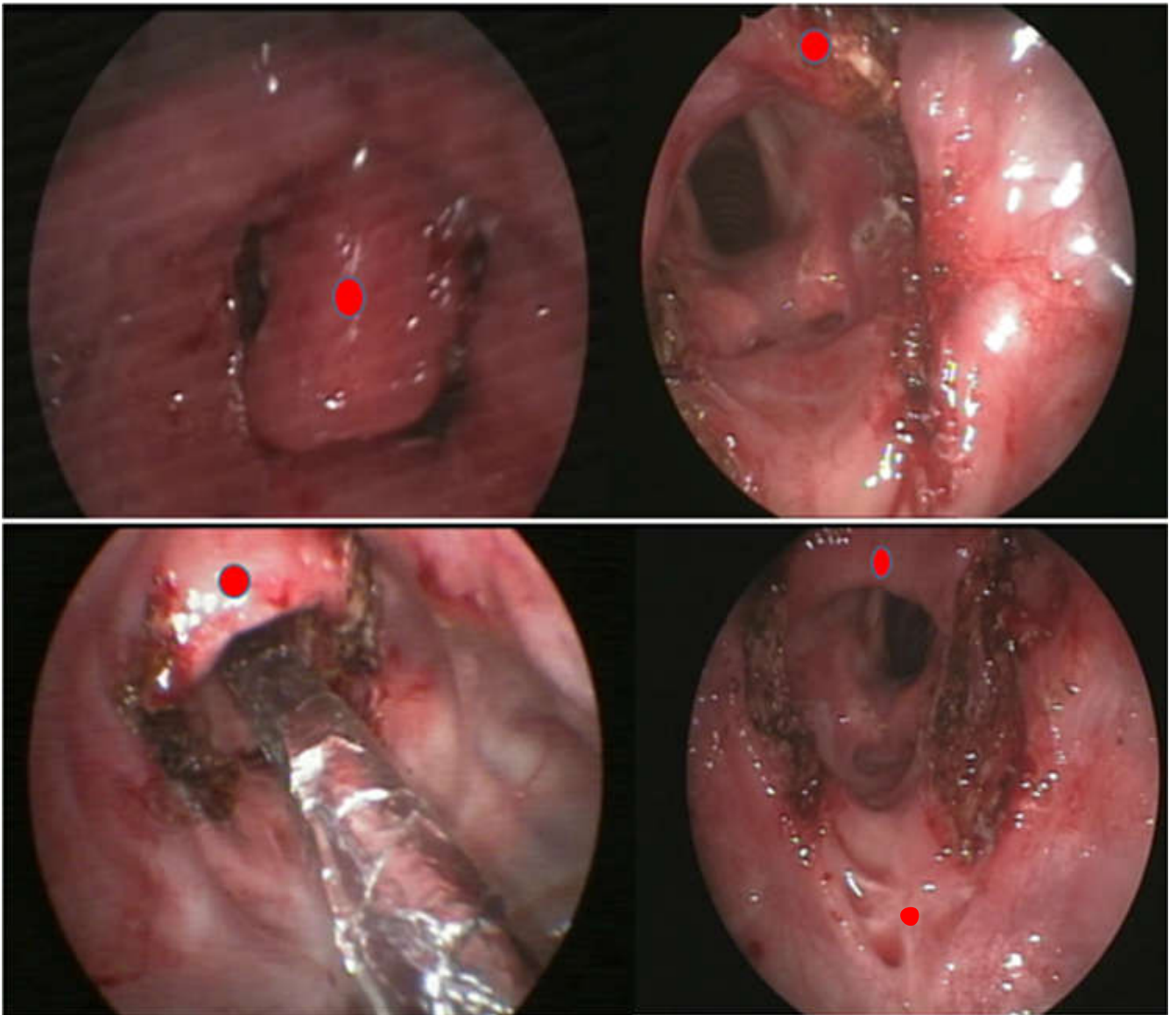


Figure 2. Intraoperative view of the larynx after surgery: debridement and release of the epiglottis (●) and its release with radial incisions of the scar tissue at the level of the pyriform sinuses with healthy appearance of the glottis

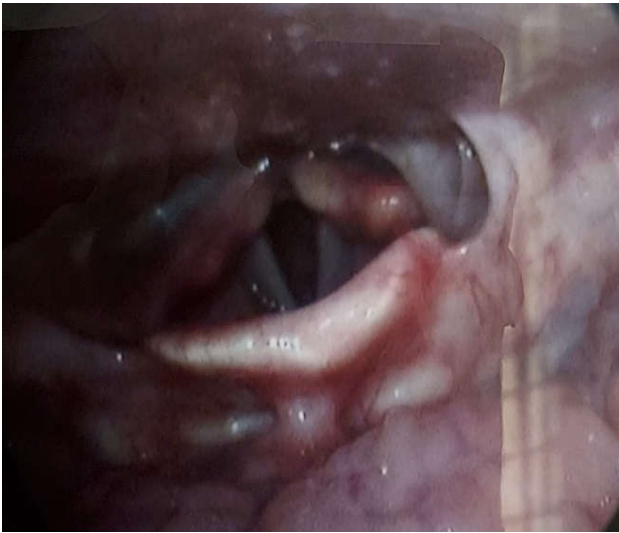


Figure 3. Endoscopic view of the pharyngolaryngeal region 3 months after surgery

Creating radial incisions during surgery decreases the likelihood of recurrent stenosis, mainly because they are easily and quickly performed using a laser. Limited data exists regarding endoscopic pharyngolaryngoplasty following caustic ingestion. Berlucchi et al. described a case in a 3-year-old child where the scar tissue was excised with a CO2 laser, and Mitomycin C was applied [12]. Atallah, I et al [5]. report using sutures to restore normal anatomy. These techniques differ from ours, which involved creating radial incisions with a laser along the debridement wounds. Our method proved faster, less complex, and equally effective, enabling permanent decannulation and hypopharyngeal release. Patient follow-up showed no fibrous adhesions or synechiae recurrence, except in two cases where the patient was successfully treated with a second procedure.

External pharyngolaryngoplasty could be considered, but the surgical risks, procedure duration, and postoperative recovery would be more complex than an endoscopic approach. The advantage of the endoscopic method is that failure is tolerable since the laser doesn't destroy tissues or cause retractile scars, allowing for multiple procedures without complications. We recommend that ENT specialists evaluate patients in remission from caustic ingestion with pharyngolaryngeal stenosis and severe esophageal damage who are under the care of gastroenterologists and digestive surgeons. This comprehensive assessment allows for a thorough understanding of the pharyngolaryngeal lesions and the potential for TLM to prepare the patient for esophagoplasty. It may also provide an opportunity for decannulation of tracheostomy-dependent patients.

CONCLUSION

Caustic-induced pharyngolaryngeal and esophageal stenosis presents a complex issue for various medical specialists.

Otolaryngologists play a crucial role in managing these challenging cases by utilizing TL. Currently under development broader applications and refinement that can be considered a solid alternative to improve the quality of life of patients and facilitate surgical access to restore oral nutrition with minimal complications.

Disclosure of interest: The authors declare that they have no competing interests.

REFERENCES

1. Hawkins DB, Demeter MJ, Barnett TE. 1980. Caustic ingestion: controversies in management. A review of 214 cases. *Laryngoscope*. 90:98-109.
2. Meredith W, Kon ND, Thompson JN. 1988. Management of injuries due to ingestion of liquid detergent. *J Trauma*. 28:1173-1180.
3. Sawalha AF. 2008. Poison control and drug information center: the Palestinian experience. *Isr Med Assoc J*, 10:757-760.
4. Kikendall JW. 1991. Caustic injury by ingestion. *Gastroenterol Clin North Am.*, 20:847-857.
5. Atallah I, Manjunath MK, Omari AA, et al. 2017. Reconstructive transoral laser microsurgery for the posterior glottic web with stenosis. *Laryngoscope*; 127:685-90.
6. Thirlwall AS, Friedman N, Leighton SE et al., 2001. Caustic soda ingestion: case presentation and review of the literature. *Int J Pediatr Otorhinolaryngol.*, 59:129-135.
7. Iizuka T, Kikuchi D, Hoteya S et al., 2009. Endoscopic submucosal dissection for the treatment of mesopharyngeal and hypopharyngeal carcinomas. *Endoscopy.*, 41:113-7.
8. Atallah I, Manjunath MK, Omari AA, et al., 2017. Reconstructive transoral laser microsurgery for the posterior glottic web with stenosis. *Laryngoscope.*, 127:685-90
9. Sohrabi C, Mathew G, Maria N, Kerwan A, Franchi T, Agha RA. 2023. The SCARE 2023 guideline: updating consensus Surgical Case Report (SCARE) guidelines. *Int J Surg Lond Engl.*, 109(5):1136.
10. Mathew G, Agha RA, Sohrabi C, Franchi T, Nicola M. 2023. Kerwan A and Agha R for the PROCESS Group. Preferred reporting of case series in surgery (PROCESS) 2023 guidelines. *International Journal of Surgery*, DOI: 10.1097/JS9.0000000000000940.
11. Strong MS, Jako GJ, Polanyi T et al. 1973. Laser surgery of the aerodigestive tract. *Am J Surg.*, 126:529-33.
12. Berlucchi M, Barbieri D, Garofolo S et al., 2014. About a case: pharyngolaryngeal stenosis in a child due to caustic ingestion treated with transoral CO2 laser microsurgery. *Ann Otol Rhinol Laryngol* 123:847-51.
