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Research article

Larynx stenosis; a challenge for the ENT surgeons

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Abstract

Laryngo-tracheal stenosis is a complex pathology which requires multiple surgical interventions and diligence from the surgeon and patience from the patient so that normal physiology may be restored. The aim of this paper is to evaluate the factors that can influence the evolution of this pathology.

It is presented a retrospective study in which 20 cases of larynx stenosis from 2008 until 2018 were evaluated. The study revealed a predominance of the pathology in men, especially from rural environment. The etiology of larynx stenosis was both iatrogenic and traumatic. Multiple surgical interventions classical and endoscopic were necessary, along with tracheostomy. In 7 cases there was the need for larynx stent to be mounted.

There was no significant correlation between age, etiology and the site of stenosis and the removal of the tracheostomy. Larynx stenosis benefit in present by modern surgical techniques. Current therapeutic options include conservative therapy, endoscopic approach and external approach depending on the site, severity, morbidities of the stenosis. Even if technology is of great help in LS management of many patients, unfortunately there are still cases where therapy is very complex and with poor functional results.

Keywords : larynx stenosis, T tube, trauma, surgical techniques

Highlights

- ✓ Larynx stenosis benefit nowadays by multiple modern surgical techniques.
- ✓ Although technology is of great help in LS management, there still are cases in which therapy is complex and not always with good functional results.

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Introduction

Larynx stenosis (LS) represents a narrowing of the upper airway, partial or complete, which can affect all sites of the larynx. The most affected site is the subglottic region. Endoscopy is the gold standard for evaluating the severity of the stenosis. Surgical therapy is dependent on the site, severity and the symptoms of the stenosis (1).

Some larynx stenosis can be congenital and it is imperative that they are to be distinguished from acquired ones. In children, congenital stenosis is a risk factor for developing acquired LS. In adults LS is caused by iatrogenic trauma, infections, foreign bodies and caustic substances. Supraglottic LS can appear due to tracheostomy or laryngo-tracheal reconstruction. The pathology of LS can include the discontinuity of the lymphatic network, relaxation or trauma of the suprahyoid muscles as well as damage of the hio-epiglotic ligaments. External beam radiation and autoimmune disease are known to be associated to LS. Regarding tracheostomy there is no difference between classical or percutaneous techniques. LS can also be produced by acid reflux and the presence of the intubation and naso-gastric tube. Due to an important number of women are affected by LS sex hormones have been evaluated, but no estrogen receptors were remarked (1). Pathology modifications which appear due to external factors are submucosal oedema followed by fibroblastic proliferation and tissue formation. Ulcerative lesions can evolve to pericondritis with abnormal scar tissue formation with or without aritenoid cartilages fixation (1, 2).

Materials and Methods

The study presents a retrospective analysis in which 20 cases of larynx stenosis from 2008 until 2018 were evaluated. In our study all patients had moderate or severe LS which required surgical management. All the patients were male with a mean age of 62.75 years old. The main symptom at admission was dyspnea accounting for 50% of the cases. Other symptoms included dysphonia and dysphagia. Most LS were acquired after surgery, partial laryngectomy 9 cases, external trauma of the larynx 3 cases, radiotherapy complications 3 cases, caustic substances ingestion 2 cases and idiopathic 3 cases. According to the site of stenosis some 40% were glottic, 20% were subglottic and 10% supraglottic. The rest of the cases were multiple site stenosis.

Results

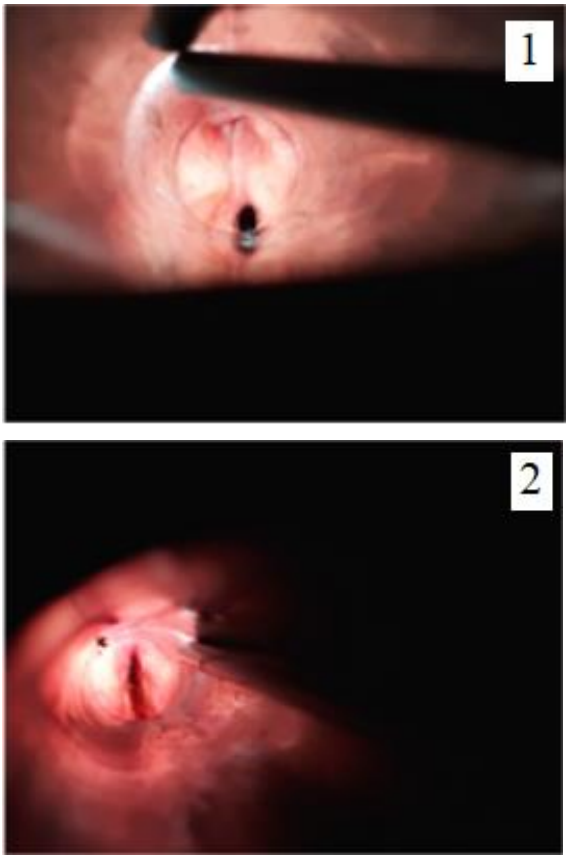
Surgery therapy was tailored according to the site of stenosis, symptoms and patient morbidities. Open surgery techniques used for therapy implied the placing of a Montgomery T tube in 4 cases, Rethy prosthesis in 3 cases. Four patients operated by open techniques had their tracheostomy removed. In 2 cases conservative therapy was preferred. There was no significant association between the rate of tracheostomy removal and the age of the patient, etiology or site of LS. On the other hand, elderly patients required more surgical interventions. Larynx stent placing, although prone to complications was finalized with 4 tracheostomy removals.

Discussions

There are cases of patients that develop granulation tissue with consecutive scar formation after prolonged orotracheal intubation. In most cases the situations are asymptomatic or with minimal functional impairment. Severe LS is defined by the presence of dyspnea, speech impairment and chronic cough, all of which are in direct relation to LS characteristics (2).

The most frequent cause of LS cited in specialty literature is trauma, by external lesions or after orotracheal intubation. For patients without a history of trauma the etiology is unclear in most cases, therefor a differential diagnosis is mandatory. Other causes of LS include infectious disease such as tuberculosis, scleroma, diphteria, benign lesions or malignant neoplasia (squamous cell carcinoma, adenocarcinoma) (3). In our case series the most common cause for LS was internal trauma after larynx surgery (Figures 1, 2). LS located in the supraglottic region is in most cases mild. If there is a case in which the patient is exposed to inhalatory or corrosive agents there is the possibility that a severe LS is likely to occur in the supraglottic region. However, the physician needs to consider the fact that in chemical lesions of the larynx trauma is likely to occur at different and multiple sites. Glottic stenosis is a more frequent appearance being cause by external trauma or iatrogenic complications. There are some cases in which larynx papillomatosis is extensively operated on and scar tissue is likely to form at different sites of the larynx. The same scar tissue formation may occur after radiotherapy for malignant neoplasia. Subglottic stenosis, due to particular architecture of the space implies severe dyspnea. The most frequent cause of subglottic dyspnea is internal trauma caused by tracheal

intubation followed by infectious diseases, congenital and inflammatory pathology. Subglottic stenosis can be complicated by extension to multiple sites of the larynx or trachea, usually severe, caused by trauma or in systemic disease evolution (2, 3).



Figures 1 and 2. Glottic stenosis in a patient operated for larynx malignant neoplasia some 3 years ago. The patient underwent partial laryngectomy. LS operated by radiofrecquency endoscopic approach. (Coltea Clinical Hospital cases).

The symptoms of LS depend on age, morbidities, life-style of the patient as well as extension. Loud breathing (stridor) is a patognomonic sign of larynx stenosis. In case of supraglottic or glottic stenosis stridor is present only during inhaling, while in subglottic stenosis stridor is considered to by biphasic. Other symptoms include apnea, tachipnea, cianosis. In children chronic LS may lead to an impairment in somatic development.

Minimal and moderate LS can be asymptomatic until the appearance of an infectious upper airway episode which causes oedema and the presence of larynx exudate. There are cases in which due to minimal LS orotracheal intubation can be difficult as in children with Down syndrome. In general, congenital stenosis are less severe than acquired LS (3). Voice evaluation must be included in the primary evaluation of a patient with LS. If the scar tissue determining stenosis is located in the anterior part of the glottic region the dominant symptom is dysphonia while if located in the posterior region of the glottic region dyspnea is more likely to occur. LS located in the posterior part of the glottic region associates difficulties in intubating the patient with the possibility of tracheostomy dependence (3).

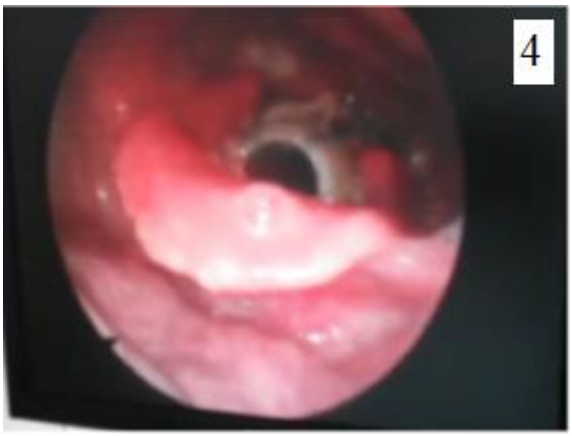
The evaluation of the patient implies flexible endoscopy followed, if necessary, by a direct laryngoscopy and bronchoscopy. High resolution CT scans of the larynx and trachea is mandatory in severe cases of stenosis since there is a great difficulty in assessing the entire stenosis by using only flexible endoscopy. Also, in cases in which lesions of cartilage, trachea and esophagus are present imaging studies are to be used in order to plan therapy management (Figure 3).

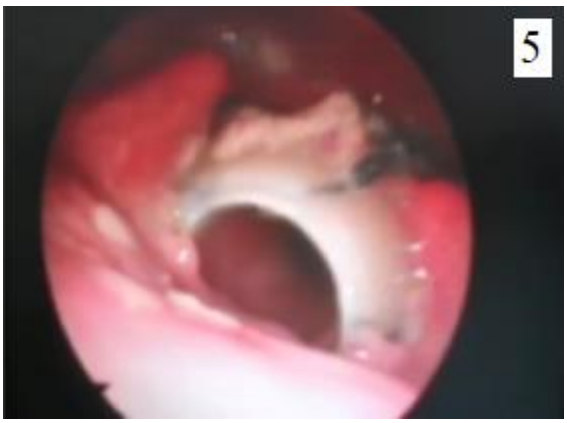
Fig. 3. T tube used for recalibrating the internal architecture of the larynx according to Rethi procedure. The tube is placed inside the cavity of the larynx and kept in place for a 2 months period. The extraction of the tube is performed after larynx and tracheal endoscopy is performed to ensure a normal passage of air towards lower airways.

The management of LS is difficult are requires series of surgical interventions to achieve proper function of the upper airway (4). The discussion with the patient needs to be precise and too comprise all the therapy options, complications and possible outcome. Patients with minor stenosis need to understand that further manipulation of the stenotic region can cause additional scar tissue formation with impaired function and that during therapy tracheostomy may be necessary, even permanent (4). Endoscopic surgery includes mechanical dilatation, cold instruments resection of the scar tissue, LASER or balloon dilatation. This approach is more effective than open approach in early stages of stenosis when the stenosis tissue is soft and flexible. Success rates in the cases is 66 to 80% (3-5).

Open techniques are indicated in cases in which scar tissue is mature, hard, when there is cartilage loss, especially cricoid cartilage or when scar tissue measures

more than 1 cm in length and associates tracheal stenosis (6). A meta-analysis showed that open techniques have a higher rate of success than endoscopic approach (Figures 4, 5) for subglottic stenosis, while endoscopic surgery must be used in early and mild stenosis (7). Other studies indicated that the use of endoscopic approach should be used in selective cases with limited extension (8, 9).





Figures 4 and 5. Endoscopic view of a patient operated for LS after external trauma. The patient had series of surgical interventions. This is the case of Montgomery T tube placing in the lumen of the larynx.

Montgomery T tube offers a stable and patent airway with good physiological outcome so that it can be kept in place for a longer period of time. This is necessary in patients with multiple surgery for whom scar tissue formation is extensive and the moment of tracheostomy removal must be delayed (10). This can be used as a temporary or definitive method of therapy or in the case of extreme morbidities with the impossibility of doing surgery under general anesthesia (11-13). The versatility of this method makes it one of the preferred means of surgical therapy (14-16). Usually, the Montgomery T tube stays in place for up to 6 months. However, there are cases in which this period of time may be increased according to the particularities of the patient and the overall aspect of the case (17-19).

Conclusions

Tissue alteration in the larynx region causing stenosis represents a challenge for the ENT surgeon due to the particularity of all cases and it requires careful planning, a good communication with the patient and the possibility of performing different and multiple surgical interventions. Therapy options include conservative therapy, endoscopic approach and external approach depending on the site, severity, morbidities of the stenosis. Although technology is of great help in LS management there still are cases in which therapy is complex and not always with good functional results.

Conflict of interest disclosure

There are no known conflicts of interest in the publication of this article, and there was no financial support that could have influenced the outcomes. The manuscript was read and approved by all authors.

Compliance with ethical standards

Any aspect of the work covered in this manuscript that has involved human patients has been conducted with the ethical approval of all relevant bodies and that such approvals are acknowledged within the manuscript.

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