



Endoscopic laser surgery for large benign cysts and cyst-like lesions of the pharynx and larynx

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Abstract. *Objectives:* Large benign cysts and cyst-like lesions of the pharynx and larynx are rare and difficult to suspect because of the non-specific nature of the symptoms. Not infrequently it is an accidental finding during esophagogastroduodenoscopy or medical imaging. From a surgical standpoint, these lesions are also challenging, especially if endoscopic removal is selected. The objectives were to evaluate the efficacy and safety of endoscopic laser removal of large benign pharyngolaryngeal lesions.

Methods: This study was a case series with chart review. We performed retrospective analysis of patients with large benign pharyngolaryngeal lesions, who underwent surgery at the ENT Department of Pavlov First Saint Petersburg State Medical University (Russia) between 2010 and 2017.

Results: Six patients with large benign pharyngolaryngeal lesions (two lipomas, two cysts, one leiomyoma, and one neurofibroma) had surgery, which was done under general anesthesia via direct microlaryngoscopy. A near-infrared diode laser was used as a surgical tool in all cases, and laryngeal shaver was used in two cases. A high-frequency jet ventilation via thin catheter provided a completely unobscured operative field. Despite the bulkiness of the lesions, there were no airway complications during anesthesia or after surgery. The post-operative period was uneventful in all cases.

Conclusions: Bulky benign pharyngolaryngeal lesions can be safely and completely removed via an endoscopic approach without prior tracheostomy. An experienced laryngeal surgeon and anesthesiologist, who are familiar with jet ventilation technique, are important for a favorable outcome. The diode laser is a convenient instrument for such surgery, allowing almost bloodless tumor dissection. Level of Evidence: 4.

Introduction

Benign lesions of the pharynx and larynx usually do not cause symptoms until they reach a large size. Large lesions usually cause some sort of swallowing discomfort, but not pain, which rarely pushes the patients to seek medical help. Thus, not infrequently they are incidental findings during esophagogastroduodenoscopy or medical imaging. These lesions can cause a variety of symptoms, which are usually associated with breath disturbances while awake and sleep-disordered breathing^{1,2,3}. Otolaryngologists face the dilemma of whether to use an endoscopic or external surgical approach, and which variant of anesthetic technique to choose when such a tumor is diagnosed. Another subject of debate is whether to take a biopsy prior to surgery.

Lipomas of the larynx or hypopharynx are rare in clinical practice², accounting for less than 1%

of all benign tumors of the larynx, and no more than 100 clinical cases are presented in the current literature³. Laryngeal lipoma usually has a similar clinical picture with a cyst: patients complain of discomfort when swallowing, shortness of breath during exertion, voice change. It is almost impossible to distinguish a cyst from lipoma of the same localization with endoscopy. Cysts seem to be the more frequent pathology than lipomas. Some authors suggest differentiating these lesions using computed tomography (CT)⁴ and magnetic resonance imaging (MRI)². According to the medical literature, surgery is the method of choice for the treatment of benign tumors and cysts of the larynx and pharynx. Small tumors can be removed endoscopically, but an external approach is recommended for large tumors. It is assumed that due to the tumor properties its removal should not be too difficult, but the topographic anatomy of this region is quite complicated. Moreover,

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many authors warn that relapse may not only mean inadequate excision of the tumor but also the presence of high-grade liposarcoma. Of course, a histological examination determines the final diagnosis⁵.

Epiglottic (or vallecular) cyst is a benign lesion, which accounts for about 4.3-6.1% of all benign tumors and tumor-like lesions of the larynx. Despite the benign nature of the disease, symptoms may vary from mild discomfort to the development of asphyxia and death, depending on the size of the cyst⁶. Large epiglottic cysts may cause airway problems during induction of general anesthesia^{7,8}. Generally, cysts of the lingual surface of the epiglottis are asymptomatic, but they can sometimes cause wheezing, coughing, foreign body sensation, and dysphonia. Epiglottic cyst diagnosis is usually based on medical history, mirror laryngoscopy, and flexible fiberoptic laryngoscopy. Surgical removal of epiglottic cysts is the treatment of choice^{9,10}.

Leiomyomas and neurofibromas are extremely rare in the larynx and pharynx, and only anecdotal reports are present in the current literature^{11,12,13,14}.

Materials and methods

We performed a retrospective analysis of patients with large benign lesions of the pharynx and larynx, who underwent surgery at the ENT Department of the Pavlov First Saint Petersburg State Medical University (St. Petersburg, Russia) between 2010 and 2017. Medical charts, photo, and video materials, and surgeons' impressions were collected. We extracted and analyzed the following data: demographics, clinical presentation, symptom

duration, tumor localization (attachment point), size, endoscopic appearance and morphology, course of operation, and post-operative period.

Results

Chart review revealed six cases of large benign pharyngeal and laryngeal lesions that were treated surgically: two lipomas, one leiomyoma, one neurofibroma, and two vallecular cysts (Table I). All patients were males aged 39 to 71 years old. Typical complaints were mild dysphagia, snoring, witnessed sleep apnea, dyspnea on physical exertion, and orthopnea. Patient with leiomyoma suffered from dyspnea, which was accompanied by recurrent episodes of syncope, probably because of temporary airway obstruction by the large tumor. Duration of symptoms varied from 4 months to more than 10 years. Only one patient with a neurofibroma of the posterior wall of the hypopharynx lacked symptoms. The tumor was an accidental finding during esophagogastrosocopy.

All lesions were well visualized with fiberoptic laryngoscopy. They were covered by normal mucosa, had a round shape, and looked like cysts (Figure 1). In the lipomas and cysts, some yellowish content was visible through the mucosa. The true tumor sizes were underestimated due to extension of the lipoma into the preepiglottic space in one case, and submuscular location of the neurofibroma in the other. Density measurements with CT provided valuable information for differential diagnosis between solid tumors and cysts (Figure 2). The true sizes of the lesions were evident on the CT scans. The capsules of the lesions were also

Table 1
Sample characteristics and main results

Name	Gender	Age	Symptoms	Symptom Duration	Localization	Diameter (cm)	Pathology	Follow-up	Result
N.	Male	45	DE, D, WSA, S	1.5 years	Epiglottic vallecula	4	Cyst	2 years	CRS
D.	Male	47	D, DE, O, WSA	4 months	Right piriform sinus	3.5	Cyst	9 months	CRS
C.	Male	57	S, O, D	>10 years	Epiglottic vallecula	6	Lipoma	4 years	CRS
G.	Male	39	No symptoms	-	Posterior hypopharyngeal wall	2.5	Neurofibroma	LTF	No data
P.	Male	71	SE, DE, O, D, S	6 months	Left piriform sinus	3.5	Leiomyoma	6 months	CRS
O.	Male	46	S, WSA	5 years	Left aryepiglottic fold	3	Lipoma	1 year	CRS

WSA: witnessed sleep apnea, S: snoring, D: dysphagia, DE: dyspnea on exertion, O: orthopnea, SE: syncope episodes, LTF: lost to follow-up, CRS: complete resolution of symptoms

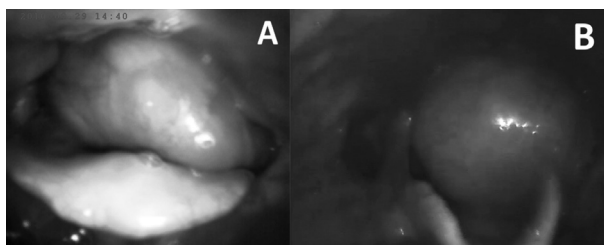


Figure 1

Laryngoscopic pictures of patient P. with leiomyoma of the hypopharynx (A) and patient O. with lipoma or left aryepiglottic fold (B).



Figure 2

CT scans of a vallecular cyst (A), hypopharyngeal leiomyoma (B), and laryngeal lipoma (C). Note the obvious differences in density among the cyst's liquid content, the leiomyoma (density similar to the neck muscles), and the hypodense fat tissue of the lipoma.

clearly visible, but in three cases it was not possible to precisely determine the attachment point.

All patients were subjected to surgery under general anesthesia. A thin catheter (1.4 mm in diameter and 10 cm length) was introduced into the tracheal lumen through the neck in the midline using the Seldinger technique (Figure 3). Inhalation of pure oxygen with a flow of 6 L/min through a face mask was performed during insertion of the catheter. After the catheter had been fixed, a trial of oxygen insufflation was done. High-frequency jet ventilation using Monsoon "Acutronic" (Switzerland) with 100 breaths per minute, inspiratory time of 30%, and 2.5 atm pressure then followed. All tumors were visualized using the Weerda-type distending laryngoscope.

Patient N. had a large cyst, originating from valleculae. It was visualized with distending laryn-

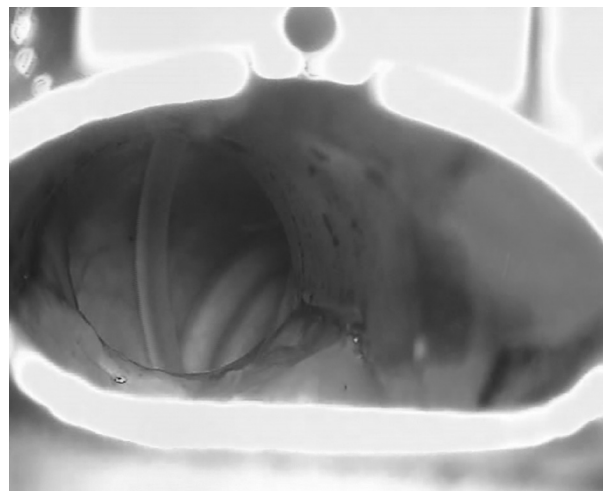


Figure 3

A thin catheter for jet ventilation in the tracheal lumen below the distal end of the laryngoscope.

goscope and incised with an 810 nm wavelength diode laser at a power of 9 W in continuous mode. About 10 mm thick homogenous yellowish content with a bad odor was aspirated, after which the capsule was completely excised. The pathologic examinations showed that the cyst's capsule was represented by fibrous tissue covered with stratified squamous epithelium, and the cyst was filled with a viscous sebum-like substance.

In the case of patient D., a cyst of the right piriform sinus was first punctured, and about 20 mL of very thick brownish fluid was aspirated. Then it was completely excised with the laser in the same fashion. Cytology of the aspirate showed many deformed blood cells, which may have occurred as a result of hemorrhage into the cyst. The patient mentioned that disease symptoms developed soon after blunt neck trauma. A pathological study showed that the cyst's wall was covered with squamous epithelium and was rich with glands.

Patient C. was also operated on via direct laryngoscopy. A round shaped mass in the epiglottic valleculae seemed to contain fluid when palpated with a probe, and laser incision of the mucosa showed a thick fibrous capsule underneath the mass. Adipose tissue was found under the capsule. For better ventilation and visualization, adipose tissue was partially removed with a laryngeal shaver. Only that maneuver and strong manual external counter-pressure allowed complete en bloc removal of the tumor with forceps and a 980 nm diode laser. The wound was closed with interrupted catgut sutures. During the operation, it was observed

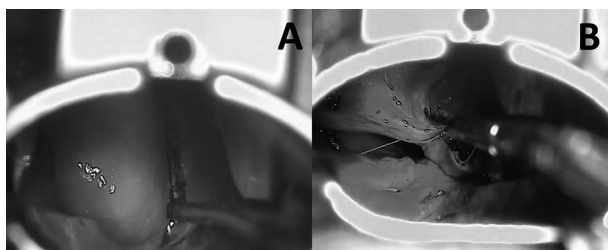


Figure 4

Intraoperative pictures of leiomyoma removal: A, laser incision for piecemeal resection of the tumor; B, the left piriform sinus after the residual tumor was cut at its base.

that a significant portion of the tumor was inside the preepiglottic space. Macroscopically it was an oval-shaped soft-elastic yellowish tumor about 6 cm in diameter with a dense fibrous capsule. The pathology report showed lipoma.

The hypopharyngeal neurofibroma in patient G. appeared as a round-shaped wide-based mass on the posterior wall of the hypopharynx and was covered with intact mucosa. Under direct microlaryngoscopy, the mucosal and muscular layers were incised above the tumor. The tumor with its capsule was then carefully dissected from surrounding tissues with a 980 nm diode laser in 7W continuous contact mode. Minor bleeding was managed with monopolar suction cautery. Macroscopically the tumor was soft elastic, about 2.5 cm in diameter, covered with a dense capsule. The pathology report showed neurofibroma.

In the case of patient P., who had a huge leiomyoma of the hypopharynx, direct microlaryngoscopy via distending Weerda laryngoscope was done. Because the tumor was too large to be removed en bloc through the laryngoscope, piecemeal laser resection was utilized to reduce its size. Then residual tumor was cut at its base (Figure 4). Mild bleeding was managed with monopolar suction cautery. It turned out that the tumor grew from the left piriform sinus. Macroscopic examination showed a piece of hypopharyngeal wall with a dense encapsulated tumor about 3.5 cm in diameter (Figure 5). On the cut surface, it was fibrous and variegated with alternating whitish and yellowish areas. Near the attachment point, we found a similar smaller tumor nodule. Microscopically, the tumor presented with bundles of muscle cells with a substantial amount of fibrous tissue (Figure 6A). The tumor had a well-defined fibrous capsule covered with stratified squamous non-keratinized epithelium (Figure 6B). Immunohistochemistry showed that the tumor



Figure 5

Gross specimen of leiomyoma after piecemeal laser removal.

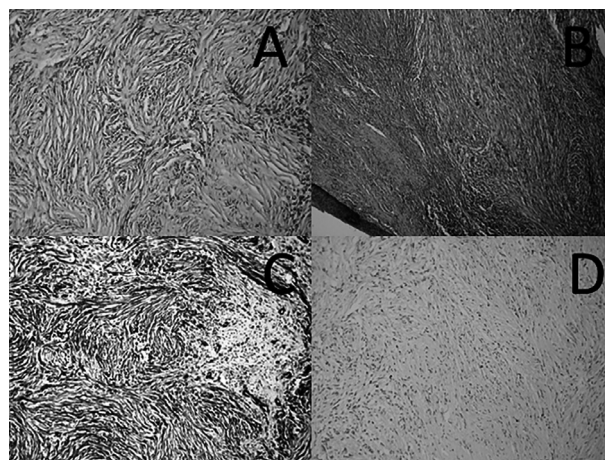


Figure 6

Microscopic appearance of leiomyoma: A, The tumor is composed of bundles of muscle cells with a significant amount of fibrous tissue (hematoxylin and eosin staining, 200 \times); B, The tumor is well delineated and encapsulated, and the capsule is covered with stratified squamous non-keratinized epithelium (Van Gieson staining, 80 \times); C, Immunohistochemical analysis clearly shows expression of alpha-smooth muscle actin (immunohistochemistry staining, 200 \times); D, No expression of neurofilaments (immunohistochemistry staining, 160 \times).

cells strongly expressed alpha smooth muscle actin (Figure 6C) and did not express neurofilaments (Figure 6D). The final diagnosis was leiomyoma of the hypopharynx.

A lipoma of the left aryepiglottic fold in patient O. was removed in a similar manner as for patient C. Initially, an incision through the mucosa and capsule was done and tumor volume was reduced with a shaver. Then the remaining lesion was completely excised with a 980 nm diode laser at 7W.

On the first post-operative day, all patients complained of mild to moderate pain, and mild



dysphagia without any signs of aspiration. Pain control was achieved with nonsteroidal anti-inflammatory drugs. Patients reported significant improvement in breathing and overall well-being. Endoscopy showed mild local post-operative edema and inflammation without airway compromise. Edema was more pronounced after removal of the lipoma, originating from the aryepiglottic fold. All patients received systemic steroids and antibiotics for 1 week. The post-operative course was uncomplicated in all cases. Oral feeding was started the day after surgery. All patients (except one without pre-operative complaints) reported complete resolution of symptoms. We are not aware of any recurrences. The follow-up period varied from 6 months to 4 years. The patient with neurofibroma was lost to follow-up.

Discussion

Six clinical cases of large benign hypopharyngeal tumors of various histological structures have been presented. Large hypopharyngeal tumors manifested with mild to severe dysphagia but did not cause any pain. The main manifestations of this disease were sleep-related breathing disorders and mild dysphagia. One patient with a hypopharyngeal lesion of 2.5 cm in diameter had no complaints. The patient with a giant preepiglottic space lipoma had sleep apnea episodes, which were witnessed by a bed partner, without any daytime complaints. The patient with leiomyoma suffered from an episodic loss of consciousness that was misinterpreted as a manifestation of cerebrovascular disease. Flexible laryngoscopy showed a big pedunculated balloting tumor originating from the right piriform sinus wall, which was able to completely obstruct the laryngeal inlet.

It is difficult to differentiate a hypopharyngeal cyst from a benign tumor with only endoscopy. Diagnosis of the cyst cannot only be based on the fluctuation symptom. In the lipoma case in our series, this symptom seemed to be positive. This fact should be kept in mind when planning surgery for cysts, which are much more common than tumors of the hypopharynx.

In all of the presented cases, the surgery was done without previous biopsy because endoscopy and CT clearly showed the presence of a capsule and homogenous structure (soft tissue in four cases, fluid in two cases). Biopsy of large hypopharyngeal

cysts under local anesthesia may lead to its emptying with subsequent aspiration of a substantial amount of liquid content. In our opinion, CT is not mandatory in all cases of hypopharyngeal cysts. CT or MRI examination seem to be indicated for large wide-based lesions of the hypopharynx with the purpose of measuring their exact size, structure, and extension into the deep neck spaces. A surgeon needs all of this information for adequate treatment planning. Neck ultrasound may provide valuable additional information in some cases.

Various anesthesiologic and surgical approaches are possible in patients with large hypopharyngeal tumors. Tracheotomy under local anesthesia may be the safest choice for the surgeon and anesthesiologist, but is not easily accepted by the patient considering the benign nature of the disease and elective type of surgery. Awake fiberoptic intubation under local anesthesia is another option, but it requires skills and a cooperating patient, especially in the case of a large mass in the hypopharynx. Repeated unsuccessful intubation attempts may provoke local edema and/or laryngospasm and require an urgent tracheotomy. High-frequency jet ventilation is routinely used in our department for endoscopic laryngeal and hypopharyngeal surgery, and may be performed via a thin laryngotracheal or transtracheal/translaryngeal catheter. The latter allows access to the airways in the absence of direct visualization of the larynx, can be easily performed under local anesthesia, and is preferable from the patient's standpoint. It is worth noting that it is the surgeon's responsibility to provide enough space in the larynx/hypopharynx for passive exhalation during the operation. Modern jet ventilating machines inform a surgeon with a sound signal if the airways are completely obstructed and exhalation is impossible. In such a case, ventilation is automatically stopped by the machine until the lumen is restored. From the surgeon's point of view, this method of ventilation is attractive because the operating field is not obscured by the tube. In cases of large lesions of the larynx and hypopharynx, we found the following strategy to be useful. First, the surgeon introduces the Weerda laryngoscope and distends it maximally to provide some space around the lesion sufficient for passive exhalation. Then it is advisable to reduce the lesion size in some way; either by aspirating the contents of a cystic lesion, resecting a piece of a solid tumor with laser, or removing some adipose tissue from the lipoma with



a shaver. Subsequently, it is much easier and safer to find the attachment point and remove the lesion in a precise manner. The near-infrared diode laser (810 or 980 nm wavelength) appears to be the most appropriate surgical instrument for this type of surgery because of its excellent hemostatic abilities and flexibility.

Conclusions

Bulky tumors and cysts of the larynx and hypopharynx can be safely and completely removed via an endoscopic approach without prior tracheostomy. An experienced laryngeal surgeon and anesthesiologist, who are familiar with jet ventilation technique and have good coordination between them, are of paramount importance for a favorable outcome. A near-infrared diode laser is an appropriate hot instrument for such surgery, given the risk of bleeding and subsequent blood aspiration.

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Authorship

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