

## DEVELOPMENT AND IMPLEMENTATION OF SURGICAL METHODS FOR THE TREATMENT OF STENOSIS OF THE SUBGLOTTIC LARYNX

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### Abstract

The objective of the present study was to optimize the treatment of patients with subglottic laryngeal stenosis.

**Materials and methods:** We have examined a total of 8 patients presenting with subglottic laryngeal stenosis. The etiological factors and underlying conditions of laryngeal stenosis were the prolonged intubation in 5 patients, Wegener granulomatosis in 3 patients. All the patients underwent balloon dilatation with the application of the video endoscopic technique.

**Results:** The surgical treatment of all the patients made it possible to achieve the persistent expansion of the lumen of the subglottic part of the larynx, to shorten the periods of the in-patient treatment and rehabilitation of the patients. Restenosis of laryngeal lining stenting was observed in one patient presenting with Wegener's granulomatosis which was associated with the relapse of the underlying disease.

**Keywords:** subglottic laryngeal stenosis, balloon dilatation, Wegener's granulomatosis, larynx endoscopy.

In recent decades, the increase in the proportion of chronic laryngeal stenosis in the structure of the pathology of the ENT - organs, primarily, is associated with iatrogenic causes.

Injuries of the hollow organs of the neck, in particular the larynx and trachea, despite their small proportion among the damages of all ENT-organs, always attract special attention from otolaryngologists, surgeons and resuscitators, as they often lead to disruption of vital functions. At present, due to changes in quality of life, technological progress in production and everyday life, despite the safety measures being taken, the level of injuries has increased significantly.

The variety of causes of damage to the larynx and trachea and subsequent gross changes in the anatomy-topographical structure of the neck organs, a great risk to the patient's life in the case of post-traumatic and postoperative complications - all this requires a special, individual and multifaceted approach to such patients. Therefore, these patients are of interest to many specialists: otolaryngologists, surgeons, thoracic surgeons, endoscopic surgeons, resuscitators. Tracheal stenosis is one of the most frequent and severe complications, one's treatment is still quite a challenge.

In order to improve the results of surgical treatment of patients with laryngeal and tracheal stenosis by developing new operations, introducing modern technologies and applying

diagnostic and therapeutic algorithms, we examined 8 patients with chronic stenosis of the larynx and trachea.

The etiology of the development of subligamentous stenosis of the larynx in all patients was prolonged intubation. All patients were operated on by balloon dilation of the sub-fold stenosis of larynx under a direct supporting laryngoscopy using video endoscopic technique. As a result of the treatment, all patients managed to achieve a steady expansion of the lumen of the larynx, reduce the duration of inpatient treatment and the period of full rehabilitation. Restenosis of the larynx was observed only in one patient.

The subglottic laryngeal stenosis (SLS) - is a disease whose main cause is the development of pathological processes in the area of the subglottic part of the larynx, leading to swelling and persistent tissue infiltration, replacement of normal structures with scar tissue and narrowing of the lumen with the development of respiratory failure. One of the most common etiological factors in the development of SLS is post - intubation changes and systemic diseases. As a result of the progressive increase in the number of patients who were given artificial ventilation for various reasons and patients with systemic diseases, the number of patients with SLS is increasing every year.

In Wegener granulomatosis, the damage to the larynx is manifested by the formation of a sub-folding granulomas, often asymptomatic, but in some patients, there is hoarseness, inspirator shortness of breath, stridor. The emerging ulcer-necrotic changes in the mucous membrane of the airways sometimes capture the entire back wall of the throat, extend to the larynx and the soft palate area. Scarring of ulcer defects are the cause of airway stenosis and development.

The main method of surgical treatment of the sub-ligamentous stenosis of the larynx is currently laryngo-plastic operations with resection of scar-altered tissues. However, this disease requires the search for modern and minimally invasive treatments and continues to be an urgent problem of otolaryngology. In many cases, dilating the stenosis of the larynx and trachea with balloon systems has significant advantages over open laryngo-plastic operations. This method is increasingly being introduced into medical practice and is used in patients of different age groups with larynx and trachea stenosis. Currently, the development and use of endoscopic balloon technique allows to determine the exact localization of the stenosis of trachea to consider the force of the impact arising from the use of rigid dilation systems.

Balloon dilation of the subligamentous stenosis of the larynx is a method of delicate and minimally traumatic treatment, which allows to control the radial pressure on the stricture and to predict the diameter of the lumen in the area of stenosis after dilation.

### **Patients and methods**

In the Department of Otolaryngology under our supervision were 8 patients with a SLS with the post-intubation etiology (3 women and 5 men) between the ages of 25 and 59 years. The cause of the development of cords stenosis of the larynx in 5 patients was prolonged intubation.

In 3 patients, the cause of stenosis was Wegener's granulomatosis. Three patients had a tracheostomy at the time of admission to the hospital. All patients were examined clinical-laboratory examination, computed tomography of the larynx and trachea, endophyrolaryngotracheoscopy, study of the function of external breathing, and had consultations of related specialists.

According to the endoscopic study, all patients had a roller-shaped thickening or concentric narrowing of the mucous membrane of the larynx, the mucous membrane was smooth, pink, moist. Pathological separation in the trachea and major bronchus has not been revealed. According to the results of multispiral computed tomography with three-dimensional reconstruction of cartilage skeleton in all patients at the level of ring-shaped cartilage, circular narrowing of the lumen was determined by thickening and sealing of soft tissues in the lumen. The length of the stenosis ranged from 6 to 11 mm, the diameter of the clearance of the narrowest part of it from 4 to 8 mm. In three-dimensional reconstruction of changes of cartilage remains of the larynx is not revealed, its frame function is not disturbed.

The operation was carried out under anesthesia with the installation of direct support laryngoscopy and the use of video endoscopic equipment. In 3 cases, intubation was done through an existing tracheostomy. In 3 cases, the intubation tube was started for the level of stenosis through the installed laryngoscope, in 2 patients it was installed over stenosis. Intubation used tubes with internal diameters of 5 and 6 mm.

Dilatation of scar stenosis of the foothill scan was carried out at 100% of the oxygen content in the blood. A balloon catheter was inserted into the clearance of the stenosis after a pre-removed intubation tube. With the help of a special syringe-manometer in a cylinder with a diameter of 10 mm pumped liquid, reaching pressure in 10 atm. (exposure time 1 min), then the liquid from the cylinder was evacuated and the cylinder removed. After reaching 100% saturation after 5-6 minutes, the procedure was repeated. Dilation was carried out in three approaches, between approaches were carried out artificial ventilation of the lungs.

It should be noted that patients with pronounced scar changes in the tissues of the sub-fold section of the larynx were dilated lumen after endoscopic dissection of scar tissue with the help of an electric coagulator.

## Results and discussions

As a result of the surgical treatment, it was possible to achieve a permanent expansion of the lumen of the subglottic part of the larynx by micro-breaking scar tissue strictly in the diameter of the balloon. There was no narrowing of the lumen in the first minutes after the dilation. At the end of the operation, 4 mg of dexamethasone was injected into the stenosis area.

The duration of inpatient treatment was 3-5 days. Fibrolaringotracheoscopy was performed in the 3rd and 5th days of inpatient treatment. Conservative antibacterial, anti-inflammatory (dexamethasone up to 16 mg intravenously in 1 day and up to 12 mg in subsequent) therapy,

local endoscopic treatment by injection of dexamethasone to the area of the scar of the larynx, alkaline inhalation, inhalation with antiseptic. Patients were prescribed for outpatient observation on the 7th and 14th days after surgery and then observed every month for a year. Patients with tracheostomy in the absence of the process of restenosing the sub-fold department of the larynx, the absence of complaints of difficulty breathing 2 months after the balloon dilatating underwent - the plastic operation of the tracheal defect.

According to the endoscopic study of the larynx and trachea, in the postoperative period in 9 patients there were reactive phenomena in the form of soft tissue hyperemia in the dilation zone, swelling from insignificant to moderately expressed, the presence of fibrin plaque, which were successfully bought by conservative antibacterial and anti-inflammatory therapy, physiotherapy treatment. The duration of inpatient treatment amounted to an average of 4-5days.

Restenosis of the subglottic part of larynx was observed in one patient with Wegener's granulomatosis, it was associated with a recurrence of the underlying disease, poorly amenable to pathogenetic treatment, he needed repeated surgical treatment open laryngoplastic surgery; The patient is still carrying cannula.

According to histological examination of the tissues of the sub-folding part of the larynx, taken by micro-tongs, before the dilation revealed fragments of the mucous membrane of the larynx, covered with several atrophic mature multi-layered flat non-horning Epithelium. In the underlying later there was a picture of sclerotic deformity, as well as lymphocytic infiltration. According to the results of histological study after the balloon dilation, small fragments of the lining of the larynx, covered with mature multi-layered flat non-horning epithelium, with the desquamation of the cover epithelium, were determined. In the underlying sclerosis layer there was a considerable swelling, fiber, as well as multiple merging hearth hemorrhage.

## Conclusion

The balloon dilation system is a modern minimally invasive and minimally traumatic treatment of limited subglottic laryngeal stenosis, which avoids open surgical interventions - laryngotracheal plastic or cryotracheal resection, and significantly reduce the duration of inpatient treatment of patients and period of full rehabilitation.

Expansion of the larynx lumen during balloon dilation occurs due to micro-breaks and fiber of scar-altered tissues.

The operation under direct support laryngoscopy allows to visualize the area of stenosis in detail, to determine the exact localization and to perform surgery under vision control.

In recent years, there has been a trend towards an increase in the number of patients with post-operative stenosis of the larynx and trachea. However, a single tactic, prevention, diagnosis and treatment of patients with post-operative stenosis of the larynx and trachea has not yet developed. Therefore, the development of new and improved existing surgical methods of

laryngotracheoplasty is an urgent and socially significant task and is of important practical importance.

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