

# EARLY DETECTION OF SUBGLOTTIC BRIDGE-STENOSIS FOLLOWING LONG-TERM TRANSORAL INTUBATION AND TRACHEOTOMY

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## ABSTRACT

Subglottic bridge stenosis (SgBS) after long-term intubation, followed by tracheostomy, which separates the subglottic lumen into an anterior and posterior channels presents a rarity. If not diagnosed it could lead to impairment of the breathing and can be mistaken for bilateral vocal fold paralysis. **MATERIAL AND METHODS:** A prospective study of the value of transstomal endoscopy with angulated endoscopes to detect subglottic lesions in patients, subjected to tracheostomy after being intubated through the larynx as a routine examination before decannulation. Rigid angulated endoscopes of the Hopkins type with 70° and 90° degrees were used for retrograde transstomal laryngoscopy. **RESULTS:** Examined were 23 consecutive patients (17 male, 6 female, aged 55,4 ±14 years), which had initially transoral intubation for assisted mechanical ventilation, which later was changed to tracheostomy. In 19/23 (82,6%) of the patients the endoscopic examinations revealed no pathology. In 3/23 (13,4%) transoral laryngoscopy showed immobile vocal folds. The supplementary retrograde transstomal laryngoscopy allowed to differentiate between SgBS (two cases; 8,7%) and vocal fold paralysis (one case; 4,3%). The two cases with SgBS were successfully treated using an endoscopic microlaryngeal technique. **CONCLUSION:** SgBS are hard to be noticed with standard transoral/transnasal laryngeal endoscopy. The clinical constellation of long-term transoral intubation, followed by tracheostomy seems to be predisposing for the formation of SgBS. The retrograde transstomal laryngoscopy is a low resource consuming method, which can be used even in unconscious patients, which do not cooperate for the examination. It allows for optimal examination of the subglottis, the stoma and the trachea before decannulation.

**Key words:** laryngeal bridge-stenosis, endoscopy, tracheostoma, ventilation

## INTRODUCTION

Prolonged intubation is a recognized risk factor for laryngeal and tracheal stenosis (3,6). The variety of localization, morphological types and grades of stenosis is huge. Subglottic bridge-like stenosis are thought to be a rarity with only few reported cases in the literature (1,2,4,7). In this morphologic type there is a fibrous bridge covered by epithelium, which separates the subglottic lumen into two channels (anterior and posterior). Such bridges may remain clinically silent with no signs of impaired respiratory or phonatory function of the larynx (4,7), or they can cause dysphonia and/or dyspnea and present on laryngoscopy as bilateral vocal fold immobility.

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## MATERIAL AND METHODS

This is a prospective study on the value of transstomal endoscopy to detect subglottic lesions in patients, subjected to tracheostomy after being intubated through the larynx in the context of long term mechanical ventilation. Examined were 23 consecutive patients (17 male, 6 female, aged 55,4±14 years), which had initially transoral intubation for assisted mechanical ventilation, which later was changed to tracheostomy. These patients were from the Intensive respiratory department and the Department for intensive care and anesthesiology at the Sveta Marina University hospital in Varna. The average time of ventilation with transoral intubation before tracheostomy was 7,6 ±2,4 days. The tracheotomies were performed in a standard way in the operating theater in general anesthesia. We used the standard approach through a horizontal skin incision, blunt dissection of the pretracheal soft tissues along the linea alba, section of the

isthmus of the thyroid gland, opening of the trachea with a horizontal incision between two cartilages and creation of a plastic channel by approximating the skin to the mucosa with nonresorbable sutures. Cuffed tracheal cannulas were inserted through the stoma and respiration was continued via this new airway. The presented 23 patients survived till weaning from ventilation. Afterwards the cuffed cannulas were changed to plane uncuffed fenestrated ones. Before decannulation all patients were examined endoscopically with a fibroendoscope through the natural airways. Complementary we performed transstomal retrograde endoscopy of the subglottic structures of the larynx and tracheoscopy towards the carina. The examination was performed during routine canula change at the bedside or in the ambulatory office. A rigid 4 mm 70° endoscope (Karl Storz, Tuttlingen, Germany) was introduced through the stoma with no local anesthesia. First the subglottic space above the stoma was examined (Figure 1). Then the endoscope was rotated 180 degrees and the trachea and carina were visualized below the stoma (Figure 2). The findings of the standard and transoral endoscopies were compared.

## RESULTS

In 19/23 (82,6%) of the patients the endoscopic examinations revealed no pathology. In 3/23 (13,4%) transoral laryngoscopy showed immobile vocal folds. The supplementary retrograde transstomal endoscopy allowed to differentiate between subglottic bridge-stenosis (two of these cases; 8,7%) and with vocal fold paralysis (one case; 4,3%). During the follow-up in this last patient reinnervation occurred.

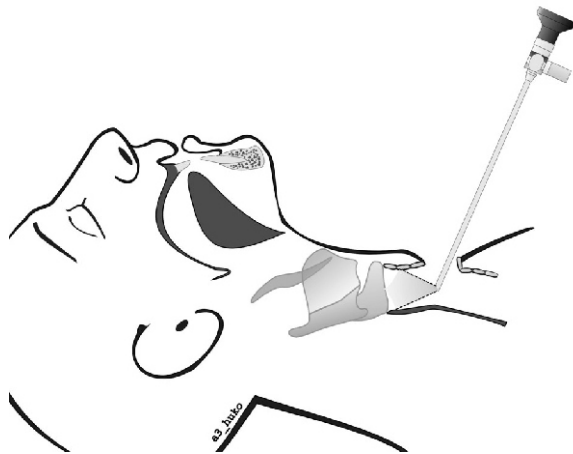


Fig. 1: Retrograde transstomal laryngoscopy with a 70° endoscope.

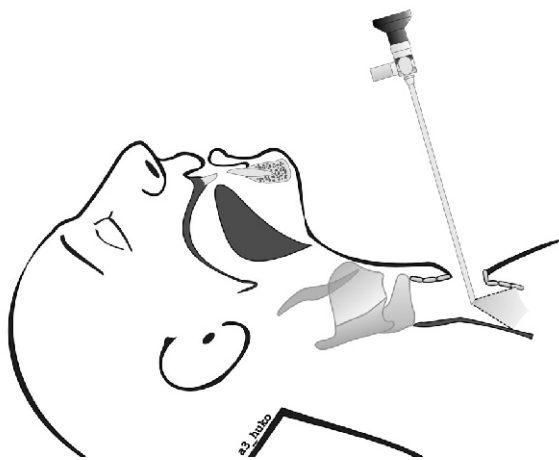


Fig. 2: Transstomal tracheobronchoscopy with a 70° endoscope.

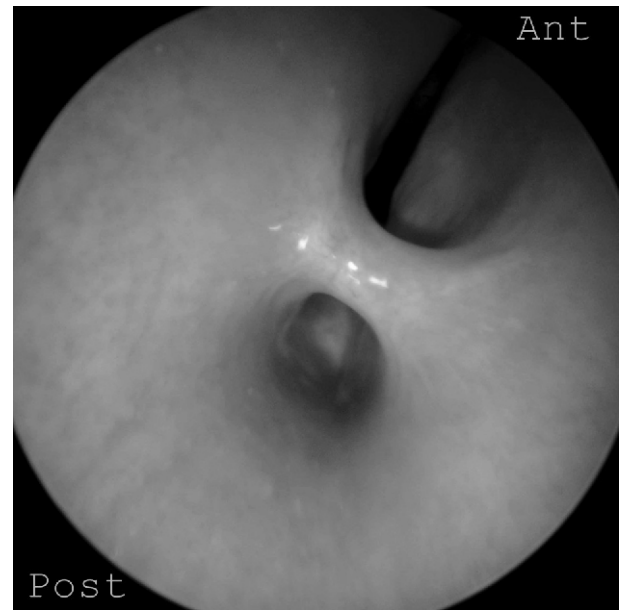


Fig. 3: Subglottic bridge-stenosis. A fibrous bridge covered by epithelium separates the subglottic lumen into two channels (**Anterior** and **Posterior**). View through the tracheostoma with a 70° endoscope.

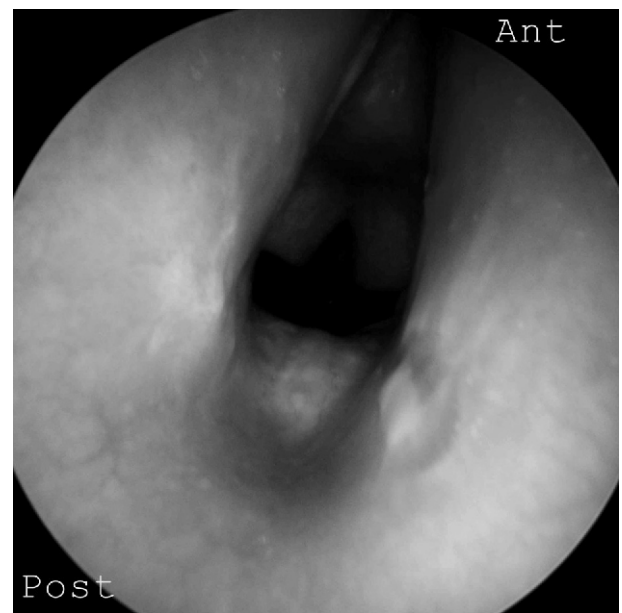


Fig. 4: Late postoperative result after endoscopic resection and stenting of the bridge-stenosis. **Anterior** and **Posterior** parts of the larynx. View through the tracheostoma with a 70° endoscope.

In 1/23 case (4,3%) circular subglottic stenosis was found, attributable to injury of the cricoid cartilage by a to high tracheostomy. Case report: A 38-year-old male patient was subjected to long-term ventilation for respiratory failure after exacerbation of COPD. Initially this was performed with transoral intubation, replaced on the 6<sup>th</sup> day for tracheotomy. Five months after weaning from the respirator and improvement of the general condition the patient was still with a tracheotomy for what was believed to be bilateral vocal fold immobility. Transstomal endoscopy with a rigid angulated endoscope (70°) revealed subglottic bridge stenosis to be the underlying cause (Figure 3). After transoral resection and short term stenting the mucosa of the subglottis healed uneventfully (Figure 4). Vocal fold movement reappeared on the right side. The left vocal fold remained still. The patient was able to breath through the natural upper airways and later was decannulated.

## DISCUSSION

In many intensive care units the initial transoral intubation is routinely followed by tracheotomy for long term ventilation. In this clinical pattern the endoscopic evaluation of the larynx after the switch to tracheostoma is often neglected (4). The subglottic space represents a predelection site for laryngeal injury because of its specific anatomy. The inner surface of the posterior cricoid lamina is not a flat plate, but undergoes a marked change in configuration. Just below the glottis it consists of two lateral plates joined at an angle, whereas at the level of the cricothyroid joint it is ring-shaped (8). Thus the ruling diameter of the adult larynx is the upper part of the cricoid ring and not the glottis (9). The higher part of the cricoid lamina and covering soft tissues have to tolerate the highest pressures by a tracheal tubus within the subglottic space (8).

After the switch to tracheostomy, the healing in the subglottis begins in a milieu deprived of normal ventilatoin and clearance and full with secretions, blood and inevitably affected by bacterial colonization (5). This may lead to improper scaring and explain the formation of tissue bridges. So far the patients breathes through the canula these bridges remain uneventful.

Retrograde transstomal laryngoscopy showed to be a very easy to perform examination, which gives very good overview of the subglottic space and trachea. We tested three endoscopes - 90°, 70° and a flexible one. The 70° showed to be the most appropriate one. The examination takes only few seconds and can be performed in short apnea during the change of the canula in ventilated patients. In spontaneously breathing patients it causes no extra discomfort. The method allows observation of the mucosal lining, airway patency and vocal fold mobility. Retrograde transstomal laryngoscopy complements well the standard transoral/transnasal laryngoscopy. For the transoral endoscopy we did not use any local anesthesia. The examination does not

cause any excess discomfort for the patient than the change of the cannula itself. In conscious patients we asked them to try speaking and thus examined the vocal fold mobility, as well as the competence of the larynx to close and effectuate its protective function.

## CONCLUSIONS

In the tracheostomy period postintubational laryngeal injuries tend to undergo impaired healing which can result in subglottic stenosis of different types. Bridge stenosis is a peculiar type, which is probably related to oval rather than round cross-section of the lumen at the cricoid cartilage. Transstomal retrograde laryngoscopy and tracheoscopy with 70° angulated rigid endoscope could be very helpful in diagnosing such conditions. Being minimally time and resources consuming it could be introduced as a routine screening method in all patients with a switch from intubation to tracheostomy.

## BIBLIOGRAPHY

1. Chong Z. K., B. Jawan, Y. Y. Poon, J. H. Lee. Unsuspected difficult intubation caused by a laryngeal web. *Br J Anaesth.* **79**, 1997, 396-397
2. Deitmer Th. Brückensynechien des Larynx nach Langzeitintubation. *Laryngorhinootologie.* **70**, 1991, No 3, 151-153
3. George M., F. Lang, P. Pasche, P. Monnier. Surgical management of laryngotracheal stenosis in adults. *Eur Arch Otorhinolaryngol.* **262**, 2005, No 8, 609-615
4. Giraud O., A. Lienhard, J. B. Nottet, B. Lenoir. Une cause d'intubation impossible: la bride sous-glottique. *Ann Fr Anesth Reanim.* **17**, 1998, No 1, 65-67
5. Girou E., A. Buu-Hoi, F. Stephan, A. Novara, L. Gutmann, M. Safar, J. I. Fagon. Airway colonisation in long-term mechanically ventilated patients. Effect of semi-recumbent position and continuous subglottic suctioning. *Intensive Care Med.* **30**, 2004, 225-233
6. Lorenz R. R. Adult laryngotracheal stenosis: etiology and surgical management. *Curr Opin Otolaryngol Head Neck Surg.* **11**, 2003, No 6, 467-472
7. Nguyen N. K. Unexpected tracheal web encountered during difficult intubation in the operating room. *Proc (Bayl Univ Med Cent).* **19**, 2006, No 3, 224-225
8. Reidenbach M. M., H. M. Schmidt. Anatomical Aspects of Postintubational Subglottic Stenosis. *Clin Anat.* **8**, 1995, No 4, 273-280
9. Seymour A.H., N. Prakash. A cadaver study to measure the adult glottis and subglottis: defining a problem associated with the use of double-lumen tubes. *J Cardiothorac Vasc Anesth.* **16**, 2002, No 2, 196-198.