



# Buccal mucosa graft for laryngotracheal reconstruction in severe laryngeal stenosis



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## ABSTRACT

**Objective:** An operative technique is described as a salvage treatment for severe subglottic and supraglottic laryngeal stenosis. In addition to expansion of the laryngeal framework with an anterior cartilage graft, as used in a classical laryngotracheal reconstruction, the scar tissue obliterating the airway lumen is excised and a mucosal graft is placed to reconstruct the inner lining of the airway. The graft is harvested from buccal mucosa.

**Methods:** The operative technique is outlined. Three cases, 2 paediatric and one adult, with complete or near complete laryngeal stenosis are presented where this operative technique was employed. In all patients several surgeries had been performed previously which were unsuccessful.

**Results:** In all 3 patients a patent airway was achieved with decannulation of the tracheostomy in the 2 paediatric patients.

**Conclusions:** In patients with severe subglottic or supraglottic airway stenosis where other surgeries have failed, excision of endoluminal scar tissue and placement of a buccal mucosal graft, in addition to conventional laryngotracheal reconstruction, is a promising technique. In revision cases of subglottic stenosis cricotracheal resection might not be an option because of scarring from previous surgeries. This operation is an alternative, which allows an increase in the airway lumen by excising the scar tissue then re-lining the exposed internal lumen. The buccal mucosa reduces granulation formation and re-stenosis.

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## 1. Introduction

Surgical treatment of severe laryngotracheal stenosis remains challenging. For Myer-Cotton grade IV and severe grade III subglottic stenosis many authors would recommend a cricotracheal resection [1,2]. However, laryngotracheal reconstruction is technically easier especially in the patient who has had multiple previous open procedures with long segment scarring, since CTR would require an excision of a long segment and extensive tracheal mobilization. LTR for severe stenosis can be less successful because of granulation tissue formation over the denuded cartilage graft, leading to delayed wound healing and the subsequent risk of re-stenosis. Severe supraglottic stenosis is far less frequently seen and therefore treatment is less standardized. Use of a free mucosal graft can address these problems.

We would like to describe an operative technique, which can be used as a salvage treatment in severe laryngotracheal stenosis and present 3 cases. The surgery consists of resection of the stenotic

tissue through a laryngofissure, reconstruction of the inner lining of the airway with a buccal mucosal graft and expansion of the cartilage framework by LTR with anterior cartilage graft. It is possible to harvest large pieces of mucosa, which allow cover of denuded cartilage circumferentially if necessary. This technique can be used for supraglottic as well as subglottic stenosis.

## 2. Materials and methods

The patient data was collected retrospectively. The study complies with the principles laid down in the Declaration of Helsinki.

From November 2003 to January 2012 3 patients (2 paediatric cases and 1 adult) with severe laryngotracheal stenosis were treated with the described procedure by the senior author at the Evelina Children's Hospital, Guy's and St Thomas' NHS Foundation Trust, London, UK. One patient had complete supraglottic stenosis, one near complete glottosubglottic stenosis and one had complete high tracheal stenosis. All patients had a tracheostomy in situ and had undergone multiple previous airway surgeries. In these 3 patients 4 staged LTRs with anterior cartilage expansion were performed, including excision of the stenotic tissue as well as placement of a

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buccal mucosa graft as a lining of the reconstructed airway lumen. These patients were selected for the LTR procedure with buccal mucosal graft because of multiple failed previous surgeries and because of large bulky scar tissue for which it was possible to be removed with this technique. The first patient (paediatric) had supraglottic obstruction due to a giant teratoma of the anterior neck. Hamartomatous tissue involving the supraglottis caused narrowing and instability of the area with complete collapse. After multiple endoscopic laser treatments and 2 open procedures with laryngofissure and reduction of supraglottic tissue, he developed complete supraglottic and transglottic stenosis. With a high LTR, scar excision and placement of a high anterior cartilage graft as well as a buccal mucosal graft it was possible to regain an airway lumen. Due to persistent instability of the supraglottis, 2 further LTRs with anterior graft were necessary before successful decannulation. The second patient (paediatric) had a severe congenital glottic web with subglottic stenosis (Cohen type IV, Cotton-Myer grade III). The first LTR with anterior cartilage graft failed with restenosis to a Cotton-Myer grade III glottosubglottic stenosis. The first procedure of LTR with scar excision and buccal mucosal graft was undertaken which was successful only for a short term. Three further LTRs with anterior graft followed resulting in a Cotton-Myer grade II stenosis. Only after a further LTR, this time with scar excision and buccal mucosal graft, was it possible to decannulate the patient. The third patient (adult) had a tracheal stenosis after long-term ventilation and tracheostomy (initial grade unknown). Multiple endoscopic procedures had led to a complete obstruction of the high trachea before she was referred. A first LTR with resection of ossified scar tissue and placement of an anterior graft resulted in complete restenosis. A second attempt with removal of the scar tissue, with drilling out of calcified trachea and placement of buccal mucosa to cover the raw surface was successful in regaining a tracheal lumen. At present, the patient who has other co-morbidities remains with her tracheostomy and an excellent voice.

### 2.1. Operative technique

A horizontal neck incision is placed along a skin crease at the level of the stenosis. The strap muscles are divided in the midline. Through a laryngofissure, extended inferiorly as required by the length of the stenosis, the stenotic tissue is dissected out. A large full-thickness mucosal graft is harvested from the cheek and the donor site is closed primarily (Figs. 1 and 2). Care must be taken to remove all the submucosal fat from the mucosal graft, which is then placed onto the denuded cartilage in the airway lumen and secured with fibrin glue (Tisseel®). A stent is introduced and secured by sutures. The airway framework is additionally expanded anteriorly with a cartilage graft using rib or thyroid ala. The final result with healed-in mucosal graft is shown in Fig. 3.

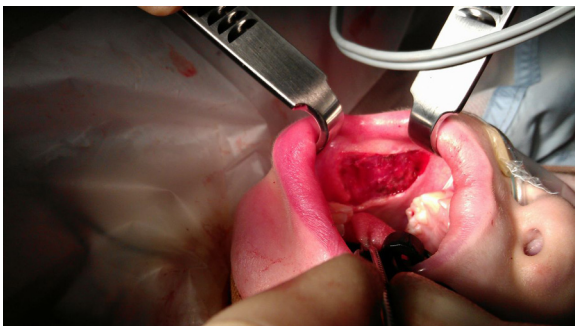


Fig. 1. Harvesting of buccal mucosa.



Fig. 2. Primary closure of donor sight.

## 3. Results

### 3.1. Case 1: Complete supraglottic stenosis

Because of a giant thyroid teratoma taking in the whole anterior neck this patient required an EXIT procedure and was intubated at birth. The teratoma was excised in the first days of life and the patient necessitated a tracheostomy because of bulky hamartomatous tissue involving the supraglottis causing obstruction and a lack of rigidity of the supraglottic laryngeal framework with complete collapse. Moreover the patient suffered from postoperative acquired left vocal fold palsy. The subglottis was normal. Several sessions of endoscopic laser treatment to the left supraglottis, including arytenoidectomy and excision of the left false cord was unsuccessful and resulted in circumferential supraglottic stenosis. Two open attempts to create a patent supraglottis through an extended laryngofissure failed and resulted in a complete supraglottic stenosis due to scarring. In November 2003 at the age of 2 years 11 months (weight 17.6 kg) an LTR with buccal mucosal graft as described above was performed. Scar tissue of 1 cm thickness was excised via a full laryngofissure and passing through pre-epiglottic fat. The scar resection resulted in a circumferential raw surface. The area was covered by a circumferential buccal mucosal graft, which was rapped around a Monnier LT-Mold stent. A high anterior rib cartilage graft was inserted and the stent was left in place for 3 months. At the time of the surgery the left cord remained with palsy the right cord could not be identified. The mucosa graft took nicely and the surgery was successful in regaining a supraglottic opening, which allowed voicing. However, the glottic and 'supraglottic' lumen remained without an open rigid structure and owing to this malacia, 2 further revision LTRs to stabilize the laryngeal framework were necessary. In April 2010 the patient was successfully decannulated.

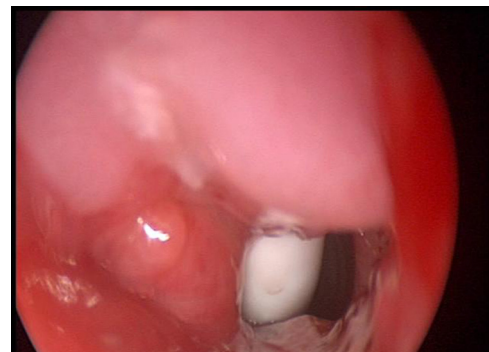


Fig. 3. Postoperative picture of healed-in mucosal graft above canula.

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