**Abstract**

Objective: To describe an endoscopic method of scar excision and graft placement which can achieve full restoration of vocal fold motion with concurrent preservation of voice and swallowing function.

Study Design: Case series with chart review.

Methods: Charts of all patients undergoing surgery for posterior glottic stenosis between October 1, 2003 and December 31, 2014 were reviewed. Charts were reviewed for operative findings, complications, pathological findings, and outcomes.

Results: 10 patients underwent endoscopic resection of posterior glottis stenosis using the CO₂ laser with concomitant placement of a postcricoid advancement flap (PAF). Meticulous suture placement allows ready fixation of the mucosal flap, preventing restenosis and allowing restoration of vocal fold motility. Laryngofissure was avoided in all patients, and nine patients were decannulated. There were no major complications. There was minimal impact on voice and swallowing function, as measured by EAT-10 and VHI-10 grading scales.

Conclusions: In patients with bilateral vocal fold immobility secondary to posterior glottis stenosis, endoscopic repair via PAF can restore full vocal fold motion and allow decannulation, with preservation of voice and swallowing function. In select patients with posterior glottic stenosis, endoscopic repair with PAF should be considered in lieu of ablative methods such as cordotomy, cordectomy, or arytenoidectomy.

**Introduction**

Posterior glottic stenosis may result in bilateral vocal fold immobility, dyspnea and tracheostomy dependence. 1,2 Prolonged intubation, fibrosis secondary to radiation therapy, and scarring secondary to laryngeal surgery are commonly implicated in the disease. Intubation of as little as five days may be enough to result in laryngeal injury, and the depth of injury to the posterior glottis can involve mucosa, muscle, and cartilage.3-4 Staging is based on the degree to which the cricarytenoid units are impacted (Table 1). 2 Traditional open repair has necessitated laryngofissure, scar excision, and graft.1 Endoscopic treatment, while potentially less invasive, may involve ablation of laryngeal structures through such methods as cordotomy, cordectomy, or arytenoidectomy to achieve decannulation, resulting in impairment of deglutition and voice.1,4 Excision of scar and placement of a graft to mitigate scar reformation and promote healing has been recognized as a successful approach to treat posterior glottic stenosis, but graft placement usually necessitates laryngofissure.1,4 Dedo and Sooy reported successful endoscopic scar excision using the CO₂ laser, and mitigation of scar recurrence using an inferiorly based mucosal “trap door” flap.5 The technical challenges of creating the flap, the need to rely on the unpredictable nature of secondary healing, and the need for multiple procedures were unfortunate drawbacks to the procedure.

In 2000, Goldberg introduced the concept of endoscopic excision of scar using the CO₂ laser and interposition of a postcricoid advancement flap (PAF).6 In Goldberg’s procedure, a robust posterior-inferiorly based full-thickness mucosal flap is taken from the postcricoid larynx and endoscopically sutured into position in the interarytenoid region. He reported success in two patients with his technique. A major disadvantage to Goldberg’s procedure is the critical need to suture the flap securely to the subglottic mucosa, an extraordinarily challenging endoscopic maneuver. Hence, however, several modifications are proposed to Goldberg’s procedure which can readily facilitate PAF placement. With these modifications, nine patients with posterior glottic stenosis and bilateral vocal fold immobility have been successfully treated, with preservation of voice and swallowing function.

**Methods**

Surgical Technique: Following tracheotomy, a Dedo-Pilling operating laryngoscope is placed in suspension, and direct laryngoscopy is performed to assess the degree of posterior glottic stenosis and the mobility of the cricoarytenoid joints. (Figure 1). A microscope with CO₂ laser micro manipulator adaptor is positioned. An ultrasonic mode, 200 mg, 5 watts is utilized. Vertical incisions are made medial to each arytenoid and carried down through scar to the superior aspect of the cricoid. A horizontal incision is made in the plane of the posterior aspect of the cricoid plate and the cricarytenoid muscle, and mucosa bordered by this is excised down to the superior aspect of the cricoid plate. Because scar tends to infiltrate the interarytenoid muscle, complete resection of the muscle is indicated. (Figure 2).

Following scar excision, an advancement flap is created from the postcricoid mucosa (Figure 3) and elevated away from the underlying posterior cricoarytenoid muscles. An elevator is used to develop a subperichondrial “trap door” flap in the mucosa of the posterior subglottis (Figure 3). Using three to four 4-0 vicryl sutures on a TF-1 needle, the PAF is advanced into position and sutured into place. (Figures 4 and 5). Postoperatively the patients are maintained on a soft mechanical diet. Patients are decannulated when supraglottic edema has resolved and the patient can breathe without exertional dyspnea with the tube plugged.

**Results**

There were no surgical complications. In the nine patients for whom follow up was available, all were decannulated. Five of the nine were tracheostomy dependent prior to surgery and were decannulated. Complete vocal fold mobility was restored in six patients with Stage 2 stenosis. Of the three patients with Stage 4 stenosis, although vocal fold mobility was not restored, the improvement in the size of the glottic airway was sufficient to allow decannulation. All patients resumed an oral regular diet. No patient required tube feedings. No patient developed postoperative aspiration pneumonia. Mean RSI improved from 21.43 to 11.86 (p = 0.15); mean VHI-10 improved from 18.71 to 11.14 (p = 0.13); and mean EAT-10 improved from 13.57 to 8.86 (p=0.41). None of these changes were statistically significant.

**Discussion**

The flap developed in this technique is thick and robust. It is easily handled and readily accepts suture placement. 4-0 vicryl TF-1 needle provides a suture with strong tensile strength on a needle small enough to be easily maneuvered through a laryngoscope. Creation of the subperichondrial “trap door” flap using an elevator significantly simplifies suture placement - the tip of the needle readily engages into the tissue, allowing for firm approximation of the PAF into the subglottis. The blood supply of the flap is robust and allows for easy dissection and can be utilized in patients with stenosis from radiation, as was done in three patients in this series.

The procedure represents a truly reconstructive endoscopic procedure for the repair of posterior glottic stenosis. The goal of surgery is restoration of vocal fold mobility in patients with stage 1-3 disease, as opposed to ablation of normal laryngeal anatomy. With this technique, the patient need not be faced with the choice between decreased voice and swallowing function for the sake of decannulation. In our opinion, selected patients should be offered this option as opposed to an ablative procedure such as arytenoidectomy or even cordotomy.

Most patients reported no change in the baseline function as represented by VHI-10 and EAT-10 scores. Although not statistically significant, there was a trend toward improvement in voice and swallowing function in most patients.

**Conclusions**

Posterior glottic stenosis is amenable to endoscopic resection and rehabilitation with a local advancement flap based on the postcricoid laryngeal mucosa. Creation of a subglottic "trap door" flap simplifies inset of the postcricoid flap. Resection of the stenosis and reconstruction of the posterior glottis with vascularized tissue can not only restore vocal fold mobility in patients with cricarytenoid joint fixation may allow enlargement of the posterior "respiratory" glottis and allow for decannulation. Therefore, the technique has applicability for all patients regardless of stage of stenosis. Impact on voice and swallowing function appears to be negligible, unlike in patients who undergo ablative endoscopic procedures. Endoscopic reconstruction of posterior glottic stenosis via PAF should therefore be a primary consideration in all patients considering surgery.

**References**