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Case Report

Technical Nuances for Endoscopic Management of Complete Supraglottic Stenosis

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Abstract

Purpose: To report successful management of complete supraglottic stenosis using suspension microlaryngoscopy and an endoscopic technique.

Methods: A 51 year-old female with complete supraglottic stenosis was referred for consideration of decannulation. She had been radiated for oropharyngeal carcinoma several years prior, and had gradually developed progressive supraglottic and glottic stenosis requiring tracheotomy. Several endoscopic procedures had previously been done by another surgeon using local tissue flaps or balloon dilation, with only temporary short-term improvement in airway patency. Combined transoral and transstomal visualization was utilized to open a posterior glottic airway with a microlaryngeal spear and KTP laser. A silastic keel sheet was placed in the newly opened supraglottis and glottic aperture and left in place for 3 weeks.

Results: Following keel removal in the office, the patient experienced significant improvement in the patency of her supraglottic and glottic airway and was decannulated after one month. Her post-operative voice and breathing have been markedly improved, with no regression seen 3 months post-operatively.

Conclusion: Endoscopic management of complete Supraglottic cicatrization is feasible and yields excellent voice and airway results. This technique can potentially be applied to other complex cases of laryngeal stenosis.

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INTRODUCTION

Supraglottic stenosis is a rare subset of laryngotracheal stenosis that typically presents with symptoms including shortness of breath at rest or with exertion, inspiratory stridor, voice alterations due to resonance changes, and dysphagia. Most isolated cases have been reported in children after prolonged orotracheal intubation or iatrogenic injury from previous oropharyngeal and supraglottic surgery; other common etiologies include radiation therapy, trauma, caustic ingestion, laryngopharyngeal reflux, inflammatory diseases or autoimmune diseases (e.g., sarcoidosis, Wegener's granulomatosis, cicatricial pemphigoid, systemic lupus erythematosus, and lichen planus) [1,2]. Treatment for laryngotracheal stenosis can involve administration of immunosuppressants or a number of surgical techniques – including tracheostomy, endoscopic laser surgery, and buccal mucosa graft for laryngotracheal reconstruction [3,4].

The extant body of literature involving cases of this nature bears out the difficulty in treatment and the high likelihood that stenosis and other complications will reoccur. Many treatments - including both endoscopic and open - for laryngo-tracheal stenosis have been described in the pediatric population [5]. Custom made silastic sheets [6] have been used but have in large part been replaced by the Aboulker stent, and the Montgomery T-tube stents [7,8] CO_2 laser is also used for supraglottoplasty in the pediatric population [9]. One recent series noted that 8 patients who underwent CO_2 laser removal of supraglottic scar all required revision surgeries [4] The high rate of post-operative complications and reemergence of pre-operative conditions therefore demonstrates the need for improvements to existing techniques and treatments as well as for the cultivation of new approaches. The following case study describes the use of an endoscopic technique with keel placement for treatment of a patient with complete supraglottic stenosis.

CASE REPORT

The patient was a 51 year-old female seen for a second opinion regarding persistent supraglottic stenosis. In 1997 she was diagnosed with Stage 3 squamous cell carcinoma of the left tonsil and underwent definitive radiation therapy. Subsequent to this treatment she developed glottic and supraglottic stenosis requiring tracheotomy. Several endoscopic procedures had

previously been done by another surgeon using local tissue flaps or balloon dilation, with only temporary short-term improvement in airway patency. She was able to generate a small amount of strained voice via finger occlusion of her tracheotomy tube, but she did not find this voice adequate for most communication. The patient denied dysphagia and was able to meet her nutritional needs and maintain her weight with an oral diet. In the past, she had been decannulated with subsequent re-stenosis and replacement of the tracheotomy tube.

Her head and neck exam was normal except for mucosal changes associated with radiation. Vocal quality with tracheotomy tube occluded was extremely strained, and she was unable to tolerate breathing with the tracheotomy tube capped.

Laryngoscopic exam (Figure 1) showed severely stenosed supraglottic structures, with an apparent pinhole airway, though the vocal folds and distal airway could not be visualized from above. The subglottis and trachea were visualized throught the stoma and noted to be normal.

Procedure

The procedure described herein is a novel endoscopic technique for management of complete supraglottic stenosis and was performed by the senior author (DER).

Due to the patient's significantly difficult anatomy a small adult laryngoscope and suspension microlaryngoscopy were used. The presence of complete supraglottic stenosis with no visible aperture was affirmed. Because of the virtual absence of a natural aperture, it was necessary to ensure that the recreated aperture would remain safely within the lumen of the airway and not track out into the neck. The endotracheal tube was removed from the stoma and a 30-degree rigid telescope was introduced through the stoma to shine light superiorly up to the larynx with the room lights dimmed. With the light now visible from above, it was possible to place an endoscopic spear through the scar towards the area of the light. With the spear in place as a guidewire, a KTP laser was used to systematically remove the supraglottic scar on a continuous energy setting. The laser was used to bore a hole along the surface of the spear until the lumen was re-established and continuity was achieved between the upper and lower portions of the airway. There appeared to be approximately 2.4 cm worth of scar tissue that was removed in this manner. Once an adequate amount of tissue was removed, radial cuts were made in the supraglottis. The CRE balloon dilation system (Boston Scientific Microvasive, Natick, MA) was used multiple times to improve the caliber of the supraglottic airway. Finally, a piece of 1-mm silastic sheeting was cut into a keel that was placed in the larynx using the previously described method of Casiano and Lundy [10]. The patient was intermittently ventilated when not operating through her tracheostomy tube throughout the whole case.

The patient was then seen in post-operative follow up 3 weeks later, and the keel was removed in the office (Figure 2a).

RESULTS

The patient experienced significant improvement in the patency of her supraglottic and glottic airway and was able to be decannulated successfully. The patient's post-operative voice and breathing after 3 months are markedly improved as compared to her pre-operative status (Figure 2b).

Figure 1 Preoperative view. The epithelial irregularity on the right side of the epiglottis had been subjected to multiple negative biopsies and had been stable for years.

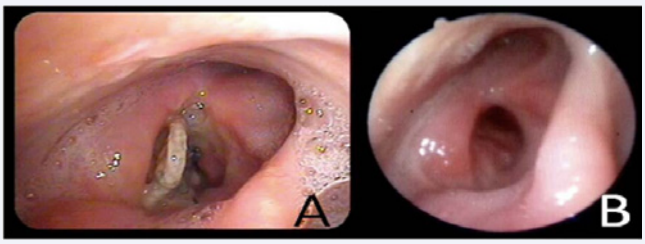

Figure 2 a) Laryngoscopic view 3 weeks post-operatively with keel in position. b) Laryngoscopic view 3 months post-operatively, with glottis aperture now easily visualized.

DISCUSSION

Supraglottic stenosis is a rare condition; it is a subset of laryngotracheal stenosis and is most frequently associated with prolonged orotracheal intubation, iatrogenic injury, radiation therapy, trauma, or autoimmune diseases. Given its uncommon incidence, the treatment strategies are scarce and are often adopted from techniques used for more common areas of laryngotracheal stenosis, such as glottis, subglottis, and trachea. The optimal treatment for this condition is still unclear; however, the placement of the keel in this case has demonstrated notable efficacy in preventing restenosis of the supraglottis. Because stenosis of this severity can be difficult to treat, the positive outcome for this patient may demonstrate that this approach to treatment should be considered alongside other previously established treatments and techniques.

Moreover the use of the endoscope light through the scar tissue provides a guide for the direction of excision preventing the creation of a false passage with subsequent tracheal perforation and the use of laser within the soft tissue of the neck. The light was visible through a 2.4 cm width of scar tissue, however this technique might not be feasible for thicker scars. It remains a viable option if image guidance is not available.

CONCLUSION

The outcome of the surgical technique described above appears to demonstrate that endoscopic management of

complete supraglottic stenosis is feasible, and that in this case has yielded excellent results. The patient's voice and airway constriction have both shown marked improvement, and follow-up examinations at one month and three months show that these improvements have been sustained with little sign of regression or reemergence of stenosis. With these results in mind, this technique can potentially be applied to other cases of this nature and should be considered as a possible treatment for a range of complex cases involving laryngeal stenosis.

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