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Management of Severe Glotto-Subglottic Stenosis in Children

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INTRODUCTION

Stenotic lesions involving the glottis and subglottis are commonly caused by intubation injury. Patients with an intubation injury of the larynx may have had an underlying congenital stenosis. Such acquired on congenital lesions (mixed stenosis) are challenging to reconstruct. Glottic involvement may present as posterior glottic stenosis with or without cricoarytenoid ankylosis, vocal fold fusion, or webbing, or a transglottic stenosis caused by distortion of the larynx resulting from sequelae of intubation trauma or a previous failed laryngotracheal reconstruction (LTR).

The two main surgical options for children with a mixed stenosis involving the glottis and subglottis (G-SGS) are LTR with anterior and posterior cartilage grafts and extended partial cricotracheal resection (PCTR) with stenting.[1,2] The quality of the stent is a key factor with regard to the healing process and in relation to final airway patency and voice outcome.[3]

Extended PCTR refers to a PCTR with any additional open airway procedure. Traditionally, it consists of a resection of the subglottic stenosis (SGS) along with an anterior laryngofissure, posterior cricoid split, posterior cartilage grafting, thyrotracheal anastomosis, and stenting. The procedure is therefore always performed in two stages, with secondary closure of the tracheostomy. We present an overview of our experience with extended PCTR for G-SGS, including a brief description of the surgical technique and outcomes.

EXTENDED PCTR

The patient is ventilated through the tracheostomy during the procedure. When the tracheostoma is located distally (ie, below the fourth or fifth tracheal ring), a short subglottic resection is performed and the original tracheostoma can be maintained. If a high tracheostoma contiguous to the subglottis is present, it must be excised with the stenosis and a new tracheostoma must be created distally. The SGS is fully resected as for a conventional PCTR. On the tracheal side, one or two tracheal rings must be partially resected laterally to create a flap of membranous trachea intended to resurface the subglottis. A full laryngofissure is performed, starting above the thyroid notch through the epiglottic petiole. This enables separation of the fused vocal folds in the midline under visual control. The posterior cricoid is then divided vertically in the midline. A diamond burr is used to thin down the lateral cricoid arches from the inside, and a graft of costal cartilage is inserted with its perichondrium in the inside to expand the posterior glottis and subglottis. The width of the rectangular cartilage graft must be carefully selected according to the size of the larynx and degree of posterior glottic stenosis. Overexpansion of the interarytenoid distance would result in inadequate glottic closure and a breathy voice. The tracheal stump is pulled upward and the posterior flap of membranous trachea is sutured up to the interarytenoid mucosa. At this stage, a laryngotracheal mold (LT-Mold) of appropriate diameter and length is inserted and secured with two Prolene sutures.[3] The anterior glottic commissure is precisely reapproximated, and a 5.0 absorbable suture is used to position the anterior aspect of the LT-Mold at the anterior commissure. The supraglottic portion of the laryngofissure is closed with mattress sutures through the epiglottic petiole, thus preventing secondary prolapse of the petiole after removal of the LT-Mold. The thyrotracheal anastomosis is competed with interrupted 4.0 Vicryl sutures and sealed with fibrin glue. The thyroid isthmus and strap muscles are reapproximated in the midline.

RESULTS

From 1978 to 2010, 119 PCTRs were performed in our institution. In this cohort, 41 children (age range, 6 months–16 years) with severe G-SGS underwent an extended PCTR. Preoperative assessment showed Myer-Cotton grade III stenosis in 19 patients and grade IV stenosis in 22 patients. Most of the children (23 of 41) had posterior glottic stenosis with bilateral cricoarytenoid ankylosis, 10 had bilateral restricted abduction, and 8 had unilateral vocal fold fixation.

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Our overall decannulation rate was 80% (32 of 41), and the operation-specific decannulation rate was 66% (27 of 41). The median time to decannulation was 3 months (range, 1–36 months). Those who could not be decannulated (n = 8) were children with either severe comorbidities or congenital anomalies. Of note, all of these 8 patients had a stable and patent airway.

COMMENTARY

Although there are no published data comparing LTR and PCTR for SGS, it is generally accepted that PCTR yields a higher decannulation rate and should be attempted as a primary surgery in children with grades III and IV SGS.[4,5] Extended PCTR provides a fully mucosalized reconstruction on completion of the surgery, with adequate stabilization of the laryngotracheal framework. Furthermore, scar contraction is minimized by using a stair-step closure as opposed to a standard end-to-end anastomosis.

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