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Case Report

Novel endoscopic suturing technique to mitigate risk of graft extrusion in endoscopic posterior cricoid split and costal cartilage grafting: A case report

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1. Introduction

Posterior cricoid split with costal cartilage grafting is a well-established technique for the management of subglottic stenosis (SGS), posterior glottic stenosis (PGS), and bilateral vocal fold immobility (BVFI) in children [1–3]. Though traditionally performed through an open transcervical approach, endoscopic posterior cricoid split with costal cartilage grafting (EPCSCG), a minimally invasive surgical option with low morbidity, has become increasingly common for posterior glottic and subglottic airway expansion in pediatric patients. Since initially described in a case series by Inglis et al. [4] in 2003, several studies reporting favorable surgical outcomes with few complications using EPCSCG in the treatment of SGS, PGS, and BFVI have been published [5–8]. While the endoscopic approach offers several advantages over the open approach including avoidance of scar, avoidance of injury to the anterior commissure and vocal cords, shortened stay in both the intensive care unit and hospital, and decreased pain and infection risk, it is not without limitations. As the graft is “locked” into place rather than being secured with sutures, there is a potential risk of graft dislodgement and possible airway obstruction. This is often mitigated by stenting either via a period of endotracheal intubation or stent placement above a tracheostomy site [6–8]. We present a case report of two patients who underwent EPCSCG with a novel endoscopic suturing technique for graft securement.

2. Case report

2.1. Case 1

A 3 year old male with history of 22q11.2 deletion syndrome and Tetralogy of Fallot with absent pulmonary valve who underwent repair at the age of 3 1/2 months requiring prolonged intubation post operatively presented to clinic for evaluation of stridor since extubation after cardiac surgery. On exam, patient was noted to have inspiratory stridor and in office flexible laryngoscopy revealed hypomobile vocal cords in paramedian position with limited abduction bilaterally. Subsequent airway evaluation in the operating room revealed multilevel airway obstruction including posterior glottic stenosis with fixation of the arytenoids bilaterally, a subglottic cyst, a small anterior glottic web, and moderate tracheomalacia. Endoscopic posterior cricoid split with costal cartilage graft placement was recommended to address the patient's posterior glottic stenosis and bilateral vocal cord fixation. Informed consent was obtained and patient was brought to the OR.

The patient underwent EPCSCG in similar fashion to the previously described operative technique [4,6,7,9,10], however, in addition to being “locked” into place, the graft was secured by adapting a suturing technique as described by Rosen et al. [11] (Fig. 3). Spontaneous ventilation was used, and exposure of the glottis was obtained with a Benjamin-Lindholm laryngoscope with the patient placed in suspension. A laryngeal spreader was positioned in an inverted fashion to further expose the posterior glottis and secured using rubber bands to the suspension device freeing the use of both hands (Fig. 1). Using the operating microscope, the larynx was visualized and a sickle blade

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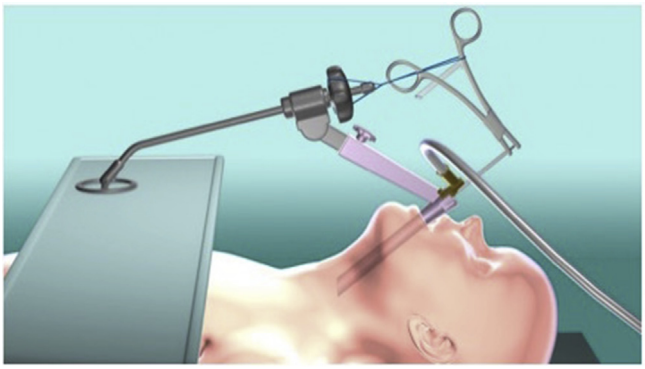

Fig. 1. The laryngeal spreader is secured in place with rubber bands to the suspension device as demonstrated.

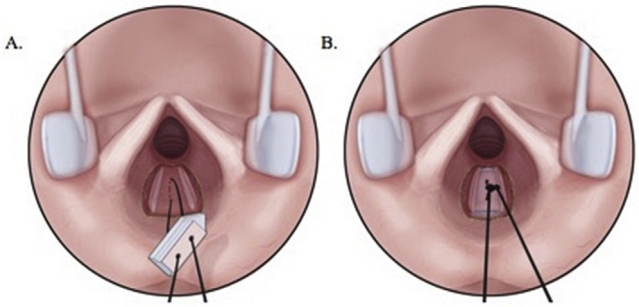

Fig. 2. The graft, with holes slightly larger than the suture, is sutured in place using the novel endoscopic suturing technique.

incision was made to divide the cricoid mucosa and cricoid, sparing the interarytenoid mucosa and muscles. Shallow subcricoid pockets were developed on the posterior surface of the cricoid cartilage using a microlaryngeal spatula. A double needle 5.0 PDS suture was passed post cricoid through the posterior portion of the larynx above the esophageal inlet, entering the cricoid split as a U stitch (horizontal mattress) through to the endolarynx where the graft would be placed and left until cartilage graft was fashioned. An appropriate sized costal cartilage graft was then harvested and carved with anterior flanges, similar to the described literature [4,6,7,9,10]. The inferior aspect of the graft was also slightly tapered. The planned suture placement sites on the cartilage graft were identified and small holes were cored by passing a 22 gauge needle through the cartilage; this slightly larger pathway in the cartilage allows the PDS suture to slide more freely during suturing. The previously placed PDS suture was then passed through the graft at these sites, and the graft was parachuted into the cricoid split and locked into place (Fig. 2A and B). The free edges of the sutures were then tied as described in Fig. 3. This proposed suturing technique essentially describes an endoscopic method of tying a “square-knot” with a single throw. No tracheostomy was performed.

The patient was subsequently extubated on post operative day (POD) 3 in the OR at which time direct laryngoscopy revealed appropriately healing graft secured in position with intact suture. Patient had no post operative complications and was discharged on POD 6. At his 1 month follow up visit, patient's stridor had resolved completely and he had an improved voice and was tolerating regular diet without any issues. Flexible laryngoscopy revealed abducted vocal cords with a well-mucosalized graft and patent glottic airway (Fig. 4). Repeat airway evaluation in the OR 9 months after surgery revealed no evidence of stenosis and a well-healed cartilage graft (Fig. 5).

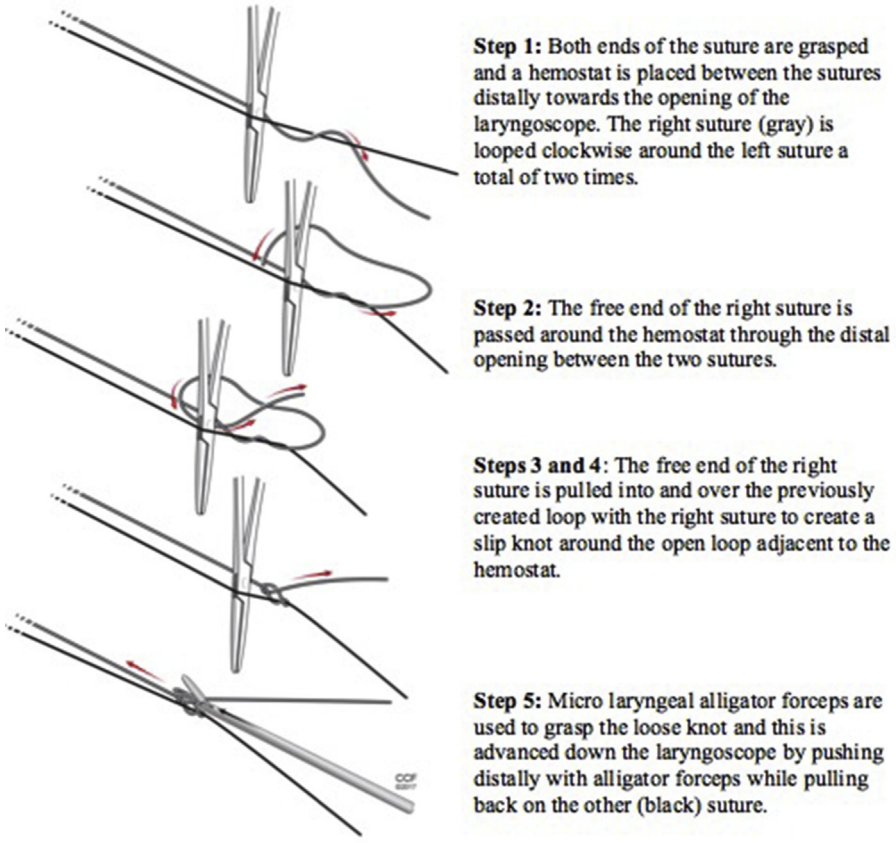

Fig. 3. Endoscopic suturing technique for graft securement.