Annals of Otolaryngology Head and Neck Surgery
Case Report (ISSN 2835-7132)

Injection Laryngoplasty in The Pediatric Population-Consider The Risks

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Citation: Liyona Kampel, Gad Fishman, Oshri Wasserzug, Yael Oestreicher-Kedem, Ari DeRowe. Injection Laryngoplasty in The Pediatric Population-Consider The Risks. *Annal of Otol Head and Neck Surg. 2024;3(5):1-4.*

Received Date: 02 November, 2024; **Accepted Date:** 06 November, 2024; **Published Date:** 08 November, 2024

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ABSTRACT

Background: Unilateral vocal fold paralysis (UVFP) in pediatric patients can be expectantly observed as spontaneous resolution may occur, however, systemic complications and poor quality of life warrant surgical intervention. Injection laryngoplasty is considered efficacious, yet data on its safety in pediatric population is scarce.

Methods: We report on a child presenting with a potentially life-threatening complication of injection laryngoplasty. Renu Voice injection to the false vocal cord resulted in acute respiratory distress. A comprehensive search of recent studies on UVFP focusing on pediatric patients was conducted.

Results: Our search yielded little evidence on the safety of various surgical approaches to treat UVFP. The potential risks are presented and discussed.

Conclusion: Though injection laryngoplasty is considered safe, pediatric otolaryngologists must be aware of its complications, particularly acute airway obstruction.

Keywords: Unilateral vocal cord paralysis; Injection laryngoplasty; Voice; Stridor

INTRODUCTION

Unilateral vocal fold paralysis (UVFP) accounts for 10% to 20% of all pediatric laryngeal abnormalities and is the second most common cause of pediatric stridor [1]. In pediatric patients UVFP may be expectantly observed as spontaneous resolution often occurs, however great impact on child's quality of life may warrant intervention. When medical management, such as feeding modifications and speech therapy fails, surgery is considered in order to improve phonation and decrease aspirations. At present, there is no consensus on the timing and the optimal surgical technique for treating UVFP in pediatric patients. Butskiy et al [2], suggested that the timing should be guided by symptom severity, assessment of UVFP natural history, and the effect of dysphonia on the child.

CASE REPORT

A 6-year-old female patient was admitted to the pediatric ward due to stridor and wheezing that appeared during sleep one week after she underwent injection laryngoplasty. She was born pre-term at 27 weeks of gestation and had been intubated for 3 months. At approximately six months of age, she underwent a ligation of a patent ductus arteriosus and was diagnosed with a left vocal fold paralysis shortly there after. The patient had a poor vocal quality and recurrent respiratory infections, associated with aspirations, and therefore underwent vocal fold augmentation with Renu voice ® under general anaesthesia.

Upon her admission, she underwent a direct laryngoscopy demonstrating a smooth swelling at the anterior part of the left false vocal fold, partially obstructing the airway (Figure 1A). A rubbery texture material was dissected away using a laryngeal microdebrider, while carefully preserving mucosal alignment and the true vocal fold (Figure 1). After the procedure the loud inspiratory stridor resolved.

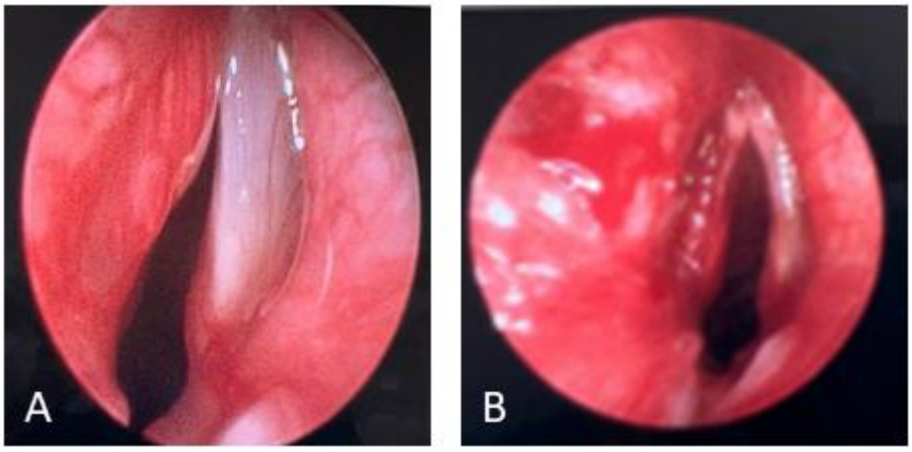

Figure 1: Direct laryngoscopy images of the medialized left false vocal cord partially obstructing the airway (A). The injected material was dissected out and airway obstruction relieved (B).

DISCUSSION

The surgical interventions currently performed for the management of UVFP include transcervical thyroplasty, recurrent laryngeal nerve reinnervation and injection laryngoplasty. In thyroplasty, medialization of the paralysed vocal fold is acquired by a permanent implant inserted and positioned by a trans-cervical approach. This procedure is usually reserved for older children and adolescents due to possible implant migration as the larynx grows during childhood and due to unpredictable long-term results. Reinnervation provides bulk and tone to the denervated vocal fold, enabling complete glottic closure by the contralateral vocal fold. It does not affect laryngeal growth, however, the improvement in voice may take time to appear. Laryngeal reinnervation techniques may be the preferred option for long-term treatment of UVFP in children.

In injection laryngoplasty, the paralysed vocal fold is medialized by the injection of various materials laterally to the vocal fold. In children, it is considered easy and simple to perform, usually trans orally under general anaesthesia during direct laryngoscopy. The results for voice and aspiration are immediate, but temporary due to the resorption of injected materials. Additionally, multiple injections may impair the normal viscoelasticity of the vocal fold. The material used for the augmentation must be biocompatible and safe. It should also be stable and

inert, to decrease the risk of local fibrosis reaction, potentially compromising the viscoelastic properties of the vocal fold.

Injectable materials can be divided into long and short lasting injectables. Long lasting injectables include autologous fat, which is biocompatible and safe, and carboxymethycellulose gels such as Radiesse ® and Renu ® or calcium hydroxyapatite (Renu Voice ®). Short lasting injectables are based on collagen, hyaluronic acid and hydroxymethyl cellouluse [3]. Another injectable substance is the micronized acellular dermal matrix (Cymetra ®) that can potentially carry pathogens from its donor.

Data about the effectiveness of injection laryngoplasty for unilateral vocal fold paralysis in the pediatric population is scarce, based on case series lacking comparative information and small cohorts with no long-term follow up. Medialization laryngoplasty was reported to improve voice and swallowing among pediatric patients without long-term negative effects. A recently published systematic review and meta-analysis by Aires et al [4], suggests that injection laryngoplasty and reinnervation are both effective in improving swallowing and voice in children with UVFP. In the systematic review and meta-analysis by Butskiy et al [2], injection laryngoplasty was successful in improving voice by subjective measures, but objective measures of voice, including videostroboscopy and computerized voice analysis, were only documented in one patient.

All interventions of medialization laryngoplasty are considered safe. Yet, pediatric otolaryngologists must be aware of the adverse events and possible complications, considering the high rates of spontaneous recovery reported in 28-43% of infants within 1-2 years of follow up [1]. In the meta-analysis by Aires et al [4], 11 studies assessed 130 patients who underwent injection laryngoplasty. Fifteen complications were reported (incidence of 11.5%), stridor being the most common (n = 6; 4.6%). Jang et al [5] conducted a survey among the American Society of Pediatric Otolaryngology (ASPO) members to determine the best practice regarding the management of UVFP in infants due to limited data specifically in this population. Adverse events were considered rare, however 33% of responders (11 out of 33) had noted complications of injection laryngoplasty.

Airway obstruction may occur due to misplacement of the injected material, over-correction, or laryngeal edema that temporarily results from manipulations in the larynx. Younger infants are potentially more prone to airway obstruction due to smaller airway diameter. Aspirations are another concern related to the procedure. In general, efforts should be made to ascertain needle position prior to injection to reduce the risk for aspiration and airway obstruction. Intensive care unit (ICU) monitoring and re-intubation may be required in certain circumstances. Other possible adverse events are airway haemorrhage and injuries to adjacent laryngeal structures. Longer term complications relate to reactions to the injected substance. Intense granulomatous and inflammatory reactions, migration of injected material, and even severe systemic reaction have been reported.

Finally, comorbidities commonly associated with UVFP, such as congenital heart disease, bronchopulmonary dysplasia, obstructive sleep apnea and other neurologic and syndromic medical conditions, may further complicate the procedure and post-operative recovery. Many of these children with their comorbidities may still require a tracheotomy (25.7%) or gastrostomy tube (40.8%) [1].

In conclusion, although injection laryngoplasty is generally considered a safe technique, pediatric otolaryngologists must be aware of its potential risks, and particularly airway obstruction. Thorough evaluation of the patient, the severity of symptoms and the potential chance of spontaneous resolution is critical to determine the necessity and timing of the surgical intervention.

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