

Bilateral Abductor Vocal Fold Paralysis; Outcomes of Surgical Management in Adult Yemeni Patients

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ABSTRACT

Objective: Bilateral vocal fold paralysis is characterised by complete or partial immobilisation of the vocal folds, resulting in narrowing of the airway at the glottic level and breathing difficulty. This study aimed to evaluate the outcomes of surgical treatments for bilateral vocal cord paralysis, focussing on airway patency, voice quality, and associated complications.

Materials and Methods: A prospective study was conducted on 25 female patients, aged 20–50 years, who presented to our department between June 2016 and May 2021 with a diagnosis of bilateral vocal cord paralysis. All patients underwent posterior cordotomy or partial arytenoidectomy.

Results: Following surgery, significant improvement was observed in breathing, and voice quality improved to an acceptable level over a 2-month period. The applied surgical procedures demonstrated satisfactory outcomes in terms of breathing and voice functions.

Conclusion: The findings of this study suggest that posterior cordotomy and partial arytenoidectomy are effective surgical interventions for treating bilateral abductor vocal fold paralysis. These procedures resulted in improved airway patency and acceptable voice quality, thereby providing satisfactory outcomes for patients.

Keywords: Posterior cordotomy, Bilateral vocal fold paralysis, Arytenoidectomy, Bilateral abductor palsy, outcomes, Yemen

INTRODUCTION

Bilateral abductor paralysis can cause respiratory distress. Causes of this condition include neck surgery, particularly thyroid procedures, prolonged intubation, trauma, neurological disorders, and malignancies (1). The most common cause, accounting for 90% of cases, is peripheral laryngeal paralysis resulting from damage to the vagus nerve or recurrent laryngeal nerve (RLN). Accurate diagnosis requires awake laryngeal endoscopy, and comprehensive airway endoscopy under general anaesthesia is recommended to rule out other airway-related pathologies (2). Evaluation and treatment of bilateral vocal fold paralysis present significant challenges due to critical airway involvement and the complexity of selecting an appropriate treatment plan.

In acute airway emergencies, tracheostomy is typically performed, providing an effective airway and voice. However, many patients prefer to avoid the long-term burden of living with a neck tube (3). Tracheotomy offers the advantage of

restoring the airway without altering laryngeal anatomy while allowing for potential spontaneous recovery of vocal fold function, which occurs in 33-65% of cases (4, 5). To prevent lifelong tracheostomy dependency, various endoscopic and external methods have been introduced (6). Historically, tracheostomy was the only management option for bilateral vocal cord paralysis to get rid of respiratory dyspnoea until 1922 (7). In subsequent years, surgical techniques were developed to improve the airway. Extra laryngeal arytenoidectomy was suggested by King in 1939 (8). Woodman introduced external arytenoidectomy in 1946 as the preferred method for patients with challenging endoscopic exposure (9). Endoscopic arytenoidectomy was introduced in 1948, as reported by Thornell (10).

In 1989, Dennis and Kashima invented one of the most effective procedures: endoscopic laser posterior cordotomy. This entails cutting the vocal fold transversely directly in front of the vocal process, excising a tiny piece of the false cord, and extending tissue resection laterally until it reaches the

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thyroid cartilage's inner perichondrium (11). Crumley in 1993 proposed endoscopic medial arytenoidectomy to preserve the phonatory structure where a resection of the medial part of the arytaenoid body is performed and the other aspects of the cartilage are preserved (12).

Laryngeal reinnervation and functional electrical stimulation show promise for treating bilateral vocal fold palsy, but research in these areas is limited, especially in children (13). The results of laryngeal pacing, which demonstrated improvements in spirometric parameters without compromising voice quality and swallowing, were reported in 2016 by Mueller et al. (14, 15). Surgeons have also proposed and adapted various minimally invasive endoscopic procedures for the management of abductor palsy. Apart from reinnervation, all surgical procedures cause breathiness in the voice. The choice of surgical method depends on achieving a balance between phonation and maintaining a clear airway (6). Post-operative oedema, infection, scar formation, granuloma, and arytaenoid perichondritis due to cartilage exposure are reported complications (16).

An internet search was performed using the key words (arytenoidectomy, posterior cordotomy, bilateral vocal cord paralysis with Yemen). No results have been found for previous studies on these topics in our country. Our objective was to evaluate abductor paralysis surgical management in adult Yemeni patients, focussing on airway patency, voice quality, and associated complications.

MATERIALS and METHODS

This prospective study was conducted at the AL-Thawrah Teaching Hospital in Sana'a, Yemen, from June 2016 to May 2021. After Ethical approval was obtained from our department, all patients presenting with a diagnosis of bilateral paralysis of the vocal cord and signed written informed consent were enrolled in this study. All patients had a minimum of a 12-month interval between diagnosis and inclusion in the study. Full medical history and was examined to determine the underlying cause of paralysis. Flexible laryngoscopic examinations were performed to evaluate the mobility of vocal folds, rule out airway masses, and monitor patients during follow-up visits. Preoperative data, postoperative complications, and patient progress were meticulously recorded and documented using Microsoft Excel. Data was analysed using SPSS (IBM SPSS Corp., Armonk, NY, USA) 26.0 for Windows where $p < 0.05$ is considered significant.

Surgical technique

Under general anaesthesia, using a cuffed endotracheal tube (size 5.5mm), suspension laryngoscopy was performed to expose the glottis. The surgical procedure was performed using either microlaryngoscopy or videolaryngoscopy. A saline-soaked cotton piece was delicately placed beneath the vocal cord to cover the tube cuff.

Using electrocautery, all patients underwent unilateral posterior cordotomy or partial cordoarytenoidectomy. A C-shaped

wedge (diameter 3.5–4 mm) was carefully removed from one vocal fold at its posterior end. Starting from the free border anterior to the vocal process, the excision was extended 4 mm laterally over the false vocal fold (Figure 1). This procedure created an approximately 6-mm opening in the posterior part of the glottis. Anti-reflux medications were prescribed for a duration of 8 weeks following the surgery, and patients were advised to be in voice rest for 10 days postoperatively. Follow-up assessments were conducted for a minimum of 1 year for all patients.

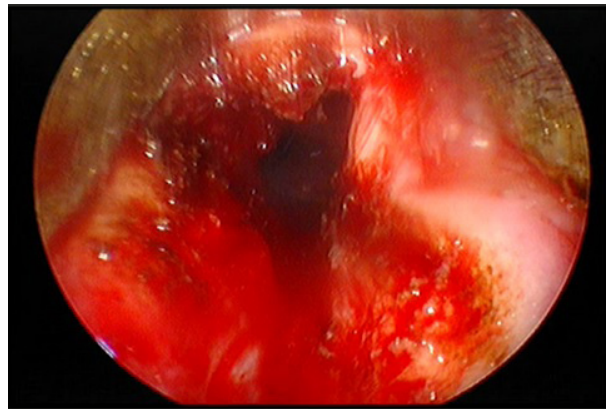


Figure 1: Right vocal fold posterior cordotomy -1

RESULTS

In this study, 25 female patients with bilateral abductor vocal fold paralysis were enrolled. Their ages ranged between 25 and 50 years. All patients were post-thyroidectomy and presented with difficulty in breathing and stridor on exertion. Moreover, two patients presented with a tracheostomy tube in situ, but adhesion between vocal folds at the membranous part was observed in one patient (Figure 2). This patient was decannulate after 3 weeks with no recurrence of adhesion. Postoperative aspiration occurred in 5 (20%) patients for 4 weeks, especially in cases that underwent partial cordoarytenoidectomy. There was a decrease in voice for 10–12 weeks then improved gradually to an acceptable level, with improvement in breathing in all

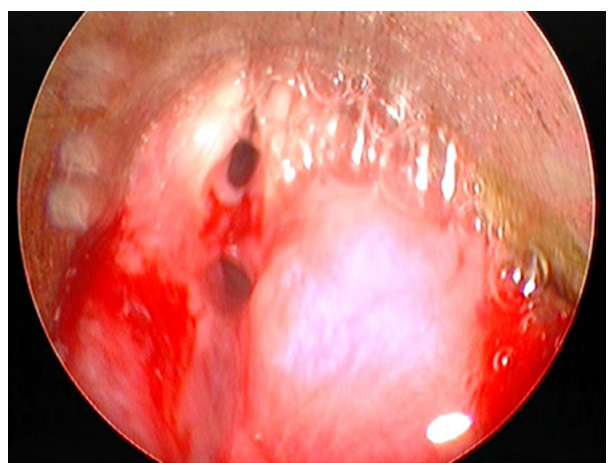


Figure 2: Adhesions between the vocal fold -1

patients. Only two patients complained of inspiratory dyspnoea postoperatively and required reoperation (partial cordo-arytenoidectomy) after 6 months.

DISCUSSION

Natural laryngeal function rarely recovers spontaneously after paralysis of both recurrent laryngeal nerves. Consequently, various approaches to surgically overcome glottic narrowing were coined and are being used when spontaneous recovery is not anticipated. The primary objective of treating bilateral palsy is to secure the patient's airway and restore smooth breathing. However, it is also crucial to restore additional functions of the larynx, including phonation and swallowing, to ensure a good quality of life (17). Effortless breathing was achieved in all our patients as the primary outcome of the surgical interventions and smooth swallowing and acceptable phonatory function.

With the advent of endoscopic surgery and the use of CO₂ lasers in laryngeal surgery, advancements were made. The advantages of these techniques include accurate targeting, decreased intraoperative oedema and precise haemostasis. However, these procedures do have some disadvantages, as they may result in granulation tissue formation, voice worsening, adhesions, aspiration, dysphagia, and inflammation of the cricoid cartilage's perichondrium (18). To our knowledge, CO₂ laser is not available in Yemen, neither in private nor in governmental health facilities.

Tracheotomy used to be the prevailing procedure for establishing a secure airway for patients with bilateral vocal fold paralysis, particularly in cases of glottic obstruction (3). The vocal fold and arytaenoid abduction are two examples of anatomical components that may be realigned or removed during glottic expansion treatments. The reversibility of laterofixation and its limited influence on swallowing and speaking abilities make laterofixation a viable alternative to tracheostomy. Nevertheless, tracheotomy is not favoured by most patients because of the existence of an opening with a tube in the neck, the necessity for long-term care, and the resultant reduction in quality of life (19). In this context, two of our patients presented with a tracheostomy tube in situ which was used as the first-line management. Moreover, tracheostomy can be performed by neck surgeons other than otolaryngologists.

In our study, 25 female patients aged between 25 and 50 years who had undergone thyroidectomy with no evidence of other causes were managed during the study period. Thyroid surgery represents the only cause of paralysis in our patients, which could be attributed to the prevalence of this operation. This is comparable with the findings of Vajpayee et al. (6), where total thyroidectomy was the most frequent cause, but prolonged intubation was second in their study.

Among our patients, two presented with tracheostomy tubes, which were successfully removed 2 weeks after the operation, resulting in satisfactory breathing. This aligns with the findings of Bizakis et al. (20), who reported decannulation in (100%) of

his patients, as well as Boslely et al. (21). We also observed no difference in outcomes between partial arytenoidectomy and posterior cordotomy procedures, which is consistent with previous research (6).

In order to maximise laryngeal airway while preserving voice quality, both procedures (posterior cordotomy and medial arytenoidectomy) were implemented for management of bilateral abductor palsy patients (21). These procedures preserve the vocal cord's vibrating segment, which helps to minimise alterations in voice quality; however, if the vocal cord's vibrating portion is damaged, it can result in a hoarse and breathy voice and a deterioration in overall voice quality (19). In our study, there was a decrease in voice for 10–12 weeks before gradually improving to an acceptable level. This was aided by voice rest and voice therapy during the recovery period.

We selected cases for posterior cordotomy and partial arytenoidectomy after at least 12 months had passed since the diagnosis of bilateral abductor paralysis. Some studies suggest waiting for 12 months to allow for the resolution of the underlying neurological cause (6), whereas others suggest waiting only 6 months after the diagnosis (17).

Airway narrowing can result from complications such as scar formation and granuloma development, which can occur after medial arytenoidectomy and posterior cordotomy surgeries. One or more revision procedures are usually necessary in such circumstances (1). This was the situation with two of our patients who complained of inspiratory dyspnoea; a revision partial cordo-arytenoidectomy was performed after 6 months and was successful.

Although surgical intervention is commonly indicated, it is also essential to manage inflammatory and infectious conditions that may contribute to paralysis. Corticosteroids have demonstrated effectiveness in conditions such as sarcoidosis, polychondritis, and Wegner's granuloma. In children, spontaneous resolution of symptoms occurs in over 50% of cases within the first 12 months (22). Therefore, before considering invasive surgical interventions that could affect phonation and swallowing, this aspect should be carefully considered. In adults, prognosis is highly dependent on the underlying cause. However, if a patient is experiencing increased work of breathing or significant stridor, surgical intervention to improve the airway becomes necessary, even if spontaneous recovery is anticipated (23).

It is important to acknowledge the limitations of our study, including the absence of a control group to compare outcomes with alternative treatment modalities such as laser therapy and the relatively small number of cases.

CONCLUSION

The results of the current study contribute to the existing body of evidence on surgical interventions for BVFP, demonstrating the potential benefits of posterior cordotomy and partial cordoarytenoidectomy in improving respiratory and phonatory outcomes. The management of bilateral vocal fold paralysis

must be highly individualised, and the treatment approach may vary depending on the specific needs and goals of each patient.

Ethics Committee Approval: This study was approved by the Ethics Committee of the Sana'a University (Date: 10.05.20216).

Informed Consent: Written informed consent was obtained from patients who participated in this study.

Peer Review: Externally peer-reviewed.

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