

# Unilateral CO<sub>2</sub> laser cordectomy for the treatment of bilateral vocal cord paralysis: a 10-years review

## Abstract

**Background:** Bilateral vocal cord paralysis (BVCP) is the second common cause of stridor in children. Most BVCP cases are managed by tracheostomy. Cases that show no spontaneous recovery after about two years require some sort of lateralization procedure such as cordectomy, arytenoidectomy.

**Objective:** Our study aimed at reviewing BVCP cases, its etiology, and the type and number of interventions needed for decanulation.

**Methods:** Retrospective review.

**Results:** Twenty five patients were identified in the 10 year period to have BVCP at king Abdulaziz University Hospital. Thirteen (52%) were iatrogenic causes. Six (24%) were benign tumors. Four (16%) were congenital. Two (8%) were neurological causes. One (4%) was malignant tumor. One (4%) was unknown. All patients underwent cordectomy for the right vocal cord using CO<sub>2</sub> laser at 5 watts. Among them, eighteen (72%) were decanulated after laser cordectomy. Seven (28%) were still on tracheostomy. Of the 25 patients, eight patients had only one intervention. Nine patients had two. Five patients had three interventions. Two patients had four interventions. One patient had five interventions.

**Conclusion:** Unilateral laser cordectomy offered a quick and effective surgical intervention for treatment of bilateral vocal cord paralysis. It requires special equipment and expertise. Decanulation success is multifactorial and does not correlate with surgery alone.

**Keywords:** Bilateral vocal cord paralysis, Laser, CO<sub>2</sub>, cordectomy, arytenoidectomy, decanulation, tracheostomy

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## Introduction

Bilateral vocal cord paralysis (BVCP) is an uncommon condition that leads to stridor and airway compromise. The etiology of (BVCP) includes: surgical trauma, malignancies, endotracheal intubation, neurologic disease, and idiopathic causes.<sup>1</sup> Most BVCP cases are managed by tracheostomy. Usually surgeons wait for a year or more for the spontaneous recovery of BVCP. Cases that show no recovery require some sort of lateralization procedure such as endoscopic laser posterior cordectomy (introduced by Kashima in late 80s), endoscopic arytenoidectomy, endoscopic arytenoid lateralization, or endoscopic expansion procedure (posterior cricoid split with graft placement) to improve glottic space in order to improve breathing. Our study aimed at reviewing BVCP cases, its etiology, and the type and number of interventions needed for decanulation.

## Methods

The health records of patients with bilateral vocal cord paralysis (BVCP) between 2004 and 2014 at King Abdulaziz University Hospital at Jeddah were analyzed retrospectively. The study recorded the age, gender, cause of BVCP, tracheostomy status, surgical intervention(s) (cordectomy/ arytenoidectomy), duration of the BVCP and the patients' outcomes/decanulation rate. Data was analyzed using STATA v13. Statistical test used for this study is a simple descriptive statistics for the demographics and presenting the study variables through a form of counts and percentages for the categorical and medians and interquartile ranges (IQR) for the scalar variables. Ethical review board approval was obtained from King Abdulaziz University for this study.

## Results

Twenty-five patients were identified in the 10-year period to have BVCP at king Abdulaziz University Hospital that underwent surgical intervention. There were 11 (44%) male patients and 14 (56%) female. The ages were between (5-77) years. Only three patients were children below 12 years of age. The etiology of bilateral vocal cord paralysis is shown in Table 1. All patients had tracheostomy tube insitu. The duration of the tracheostomy was between (1-6) years within an average of 3 years.

**Table 1** Etiologies of bilateral vocal cord paralysis

Etiology	Number	Percentage
Iatrogenic	13	52%
benign tumors	6	24%
Congenital	4	16%
Neurological	2	8%
Malignant tumor	1	4%
Unknown	1	4%

All patients underwent cordectomy for the right vocal cord using Carbon Dioxide (CO<sub>2</sub>) laser at setting of continuous mode with power of 5 watts. Among them, eighteen (72%) were decanulated after laser cordectomy. Seven (28%) were still on tracheostomy, thus failed decanulation. Of the 25 patients, eight patients had only one intervention. Nine patients had two. Five patients had three interventions. Two patients had four interventions. One patient had five interventions. Those decanulated patients had no clinical sings

of aspiration or penetration. Voice quality was serviceable with mild dysphonia. Unfortunately, objective measures for speech and swallowing were not obtained.

## Discussion

Over ten years, we identified twenty-five patients who had surgical intervention for their bilateral vocal cord paralysis (BVCP). The most common cause of BVCP in our institution was iatrogenic which represented 48% of the cases. Similarly, in a study by Benninger et al a review of their 117 cases, iatrogenic cause accounted for 44%. In contrast, another study found iatrogenic causes to be 33%.<sup>1</sup>

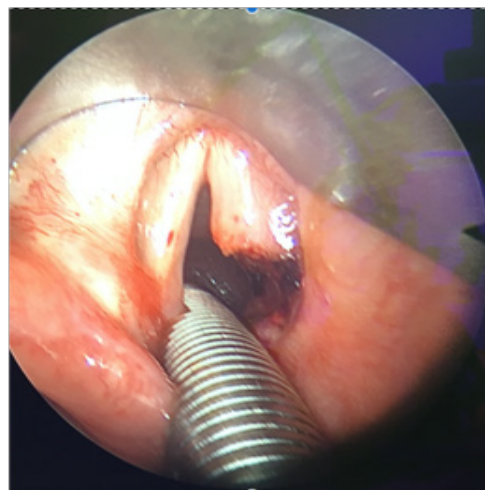
We found that the surgical intervention performed for treatment of BVCP was unilateral Carbon Dioxide (CO<sub>2</sub>) laser cordectomy for all cases. The right vocal cord was the preferred side for the surgeons. In our series, all cases had a tracheostomy insitu before intervention. The duration of the tracheostomy in our study was between (1-6) years within an average of 3 years.

In our series, eighteen of tracheostomized patients (72%) were decanulated while seven patients (28%) were still on tracheostomy despite laser cordectomy. In a study by Maria K et al.,<sup>2</sup> the decanulation rate was 42% while 5% failed decanulation. In another Italian study done on 13 patients of BVCP, 3 out of 10 failed decanulation.<sup>3</sup> Failure of decanulation maybe multifactorial and does not necessarily correlate with the surgery alone. The cause of BVCP, medical condition of the patient, or socioeconomic factors, might play a major role.

In our series, we found that laser cordectomy for BVCP that required one to two interventions to achieve decanulation, was successful in 94.4% of the cases (17/18). While those cases that needed more than two interventions had a success rate of 44.4% only. In a study by Mérite Drancyet.al, six out of seven patients were decanulated after laser cordectomy with a success rate of 92 %.<sup>4</sup>

There are multiple procedures performed for the treatment of BVCP in the literature namely cordotomy/cordectomy (popularized by Kashima), arytenoidectomy, suture lateralization of the vocal cord, and posterior glottis expansion with grafting procedure (proposed by Inglis). There are advantages and disadvantages for each. Cordectomy is easier and faster than arytenoidectomy. In addition, 50% of arytenoidectomy patients had subclinical aspiration.<sup>5</sup> On the other hand, vocal cord lateralization procedures combined with a partial arytenoidectomy achieved decanulation rate of 71%, higher than the cordectomy, which achieved 29%.<sup>6</sup> In another study with an outcome of cordectomy with medial Arytenoidectomy only 6 out of 15 needed tracheostomy and 4 of them successfully decanulated.<sup>7</sup> In a study of posterior expansion graft procedure (Inglis procedure) 25 cases out of 28 successfully decanulated with success rate of 89 %<sup>8</sup> yet the Inglis procedure is lengthier and requires expertise.

In our study, all patients had a tracheostomy tube insitu before CO<sub>2</sub> laser cordectomy. Yet this procedure can be safely done without a tracheostomy and may avoid doing one. In fact, endoscopic management of BVCP whether CO<sub>2</sub> laser cordectomy or arytenoidectomy has proven to be more cost effective on the long term compared to tracheostomy.<sup>9</sup> Endoscopic management of BVCP without tracheostomy can be performed with suspension microlaryngoscopy with spontaneous ventilation, apneic technique, or using laser safe metallic endotracheal tubes (Figure1). Laser cordectomies can be performed simultaneously on both vocal cords. Olthoff and Steiner have showed that this bilateral technique combines excellent airway improvement and satisfactory voice preservation.<sup>10</sup>



**Figure 1** Microlaryngoscopic view showing end result after right CO<sub>2</sub> laser cordectomy. Note the presence of laser safe tube used during the procedure.

## Conclusion

Unilateral CO<sub>2</sub> laser cordectomy offered a quick and effective surgical intervention for treatment of bilateral vocal cord paralysis. In our series, patients who required less than two interventions had a much better success rate compared to those with more than two interventions. Decanulation success rates are multifactorial and do not correlate with surgery alone.

## Acknowledgments

None.

## Conflict of interest

The author declares there is no conflict of interest.

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