

## Radiofrequency posterior cordotomy in bilateral vocal cord paralysis

M. Ö. Pınarbaşı, Ş. Turan, M. K. Gürbüz, E. Kaya, E. Özüdoğru

Department of Otorhinolaryngology, Faculty of Medicine, Eskisehir Osmangazi University, Eskisehir, Turkey

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**Abstract.** *Radiofrequency posterior cordotomy in bilateral vocal cord paralysis. Objective:* To evaluate the efficacy of unilateral posterior cordotomy with radiofrequency in patients with bilateral abductor vocal cord paralysis using a novel method that utilized pixel counts to evaluate the rima glottidis opening of the glottic area postoperatively.

*Methodology:* This retrospective study enrolled patients who underwent unilateral posterior cordotomy with radiofrequency upon the diagnosis of bilateral abductor vocal cord paralysis at our clinic between 2011 and 2016, and who attended regular follow-up visits. The preoperative videolaryngostroboscopic (VLS) images of the rima glottidis opening in patients were compared with the 2 month postoperative VLS images by calculating the pixel count in the rima area using the *Scope View* program.

*Results:* Nine patients were included in the study (7 females, 2 males). Mean age was 54 (range: 34-72) years. Eight patients had a history of total thyroidectomy and the remaining patient had a history of irradiation due to larynx cancer. The most significant complaint of all the patients was respiratory distress. A tracheotomy was opened preoperatively in eight patients and postoperatively in one. Patients' average duration of decannulation was 2.4 months. VLS images obtained at the 2-month postoperative visit revealed an increase of approximately 97% (23-167%) in the rima glottidis area opening ( $p<0.008$ ).

*Conclusion:* Unilateral posterior cordotomy with radiofrequency is a safe surgical method that ensures a sufficient rima glottidis opening and enables early decannulation; however, we believe that it should be preferentially used in patients with tracheotomy due to the edema that may occur during the early postoperative period.

### Introduction

Bilateral abductor vocal cord paralysis often develops secondary to iatrogenic recurrent damage of the laryngeal nerve in patients who undergo thyroid surgery. Other reasons include laryngeal cancers; prolonged intubation; neck, cervical, or thoracic traumas; post-radiotherapy adverse events; and neurological diseases.<sup>1-4</sup> The most important problem for these patients is respiratory distress, which develops due to stenosis of the rima glottidis, resulting in the need for tracheostomy. Surgical approaches such as total arytenoidectomy, unilateral arytenoidectomy, transverse cordotomy, posterior cordotomy with radiofrequency and/or laser, and vocal cord lateralization are used to establish an open airway.<sup>5-7</sup>

Posterior cordotomy with radiofrequency is a surgical procedure, which began to be applied after radiofrequency was introduced to the field of

otorhinolaryngology. With this method, a controlled and local increase in heat is established in the targeted tissue by administering high-frequency radio waves to the tissue using electrodes. Without damaging the mucosa of the implemented area, it causes fibrosis and cell separation in the tissue, leading to a reduction in the volume of the targeted tissue.

In our study, we evaluated the efficacy of unilateral posterior cordotomy with radiofrequency in patients who had bilateral abductor vocal cord paralysis. The method that we used to evaluate the postoperative opening of the glottic area (pixel count in the rima glottidis) was not found in the literature.

### Materials and methods

Prior to this retrospective study, ethics committee approval was obtained (Eskişehir Osmangazi

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This study was presented as a poster presentation at the 9th National Laryngology Congress on 27-29 April 2017, Eskisehir, Turkey.

University Ethics Committee: Date: 13/03/2017 No: 80558721/G-72). This retrospective study enrolled nine patients who underwent unilateral posterior cordotomy with radiofrequency upon the diagnosis of bilateral abductor vocal cord paralysis at our clinic between 2011 and 2016 and who attended regular follow-up visits. However, two patients who were operated on by us did not present for regular follow-ups in the postoperative period and were not included.

The demographic characteristics, medical histories, and vocal cord paralysis etiologies of the patients, presence of preoperative tracheotomy, duration of decannulation, follow-up periods, occurrence of complications, and whether a revision surgery was conducted were reviewed from patients' files and recorded.

### *Surgical technique*

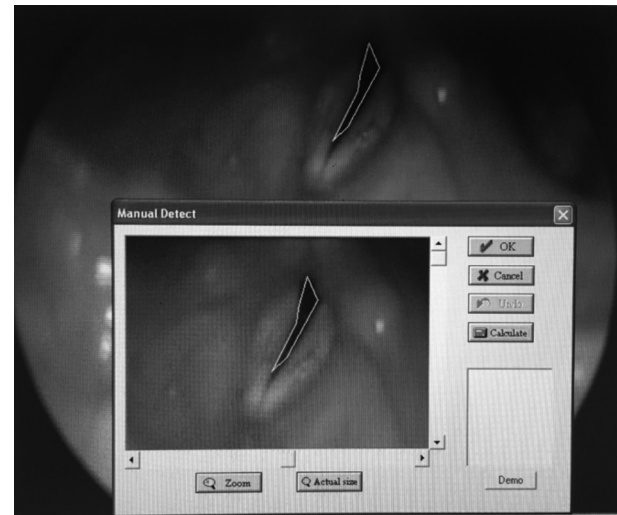
Suspension microlaryngoscopy was performed in all patients under general anesthesia. After the vocal cords became visible, moistened cottonoid was placed in the subglottic area to protect the trachea. An incision was performed with a long radiofrequency monopolar microdissection needle from the anterior part of the vocal process to the inner perichondrium of the thyroid cartilage, including the ventricular base and vocal muscle. After the incision, the carbonized tissues were thoroughly cleaned with a moist piece of cotton. The procedure was stopped when an approximately 5-mm opening was created in the posterior part of the larynx.

The digitally archived VLS images were examined using a Karl Storz® 8020 stroboscopy unit (*Karl Storz Se & Co. Kg, Tuttlingen, Germany*) and a 90-degree Karl Storz® telescope with *Scope View* (*Dr. Speech Tiger Inc. Seattle, WA, USA*) software. The telescope was placed on the posterior wall of the pharynx, parallel to the floor of the room, passing through the left lateral of the half of the middle part of the uvula, and records were taken. The records were stopped at the time of the narrowest and widest rima glottidis area opening, without using the image magnification function in the *Scope View* (*Dr. Speech Tiger Inc. Seattle, WA, USA*) program, and the number of pixels in these areas was calculated. In all patients, the VLS recording method was standardized regarding the distance between the telescope tip and the glottic

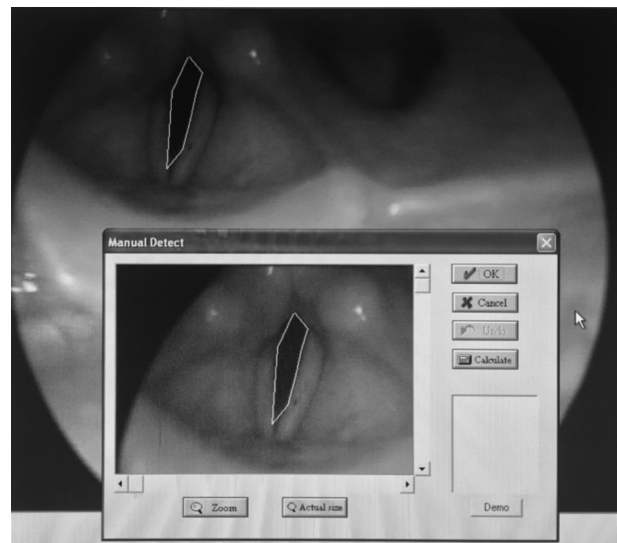
plane. All recordings were taken by the senior author (the last author of the manuscript). Rima glottidis area openings were calculated preoperatively and at postoperative month 2.

The data obtained were compared on a per patient basis to evaluate the efficacy of this surgical method. IBM SPSS Statistics version 21.0 was used for statistical analyses. Wilcoxon matched pair signed-rank test was used to compare the variables measured before and after the operation. A p value less than 0.05 were considered statistically significant.

The evaluation of the rima glottidis opening in one of the cases in our study group using *Scope View* program is shown in Figures 1 and 2.



*Figure 1*  
Evaluation of preoperative glottic area.



*Figure 2*  
Evaluation of the glottic area during postoperative month 2.

## Results

Of the nine patients included in our study, seven were females and two were males. The mean age was 54 (range: 34-72) years. Eight patients had a history of total thyroidectomy and the remaining patient had a history of irradiation due to larynx cancer. Eight patients had a previously opened tracheotomy, and we performed a tracheotomy in one patient intraoperatively. All patients were considered as irreversible cases after a minimum follow-up of 12 months, with the diagnosis of bilateral abductor vocal cord paralysis, after which they underwent surgical intervention. Mean duration of paralysis was 32 months (range: 14-72 months).

Patients' average duration of decannulation was measured as 2.4 months. Our patients were followed for a mean of 30 months (range: 5-60 months) and no complications occurred during follow-up. One patient needed revision surgery using the same surgical method due to a failure to maintain a sufficient airway opening during follow-ups. In addition, edema in the cordotomy area was detected in all patients during the early postoperative period.

VLS images of the rima glottidis obtained during postoperative month 2 showed that the area opening was significantly elevated by mean of 97% (range: 23% to 167%) compared to the area measured during the preoperative period ( $p < 0.008$ ) (Table 1).

## Discussion

Bilateral abductor vocal cord paralysis often develops due to iatrogenic recurrent laryngeal nerve

damage in patients undergoing thyroid surgery. Larynx cancers; prolonged intubation; neck, thoracic, and cervical traumas; diseases secondary to radiotherapy; and neurologic diseases are among the other reasons.<sup>1-4</sup> In our study, a history of thyroid surgery was the most common reason for the patients' etiology.

The most important problem in patients with bilateral abductor vocal cord paralysis is respiratory distress, which occurs due to rima glottidis stenosis. As a result, most patients undergo tracheotomy. Tracheotomy causes cosmetic problems for patients, and their quality of life worsens. Eight of our patients had a previously opened tracheotomy, and one patient had a perioperative tracheotomy.

The aim for these patients is to secure a sufficient airway opening, protect their voice quality as much as possible, and eliminate or avoid aspiration problems. For this purpose, surgical approaches such as total arytenoidectomy, unilateral arytenoidectomy, transverse cordotomy, radiofrequency and/or laser posterior cordotomy, and vocal cord lateralization are used.<sup>5-7</sup> All these methods have advantages and disadvantages.

Especially for the laser arytenoidectomy operation, the quality of the patient's voice is poor after the operation despite achieving a good rima glottidis opening.<sup>8,9</sup> Additionally, aspiration problems were reported to develop during the postoperative period.<sup>10</sup>

In recent years, the literature showed numerous studies regarding cases undergoing unilateral and/or bilateral posterior cordotomy with laser therapy. In unilateral posterior cordotomy performed

Table 1

The results of the pixel count in the glottic area before and after the operation, which was obtained using *Scope View* program

Patient	Preoperative pixel count of the glottic area	Pixel count of the glottic area at postoperative month 2	Increase (%)	P-value
patient 1	470	581	23	* $p < 0.008$
patient 2	363	520	43	
patient 3	208	477	129	
patient 4	200	312	56	
patient 5	406	756	86	
patient 6	317	804	153	
patient 7	225	350	55	
patient 8	188	503	167	
patient 9	294	777	164	

\*Wilcoxon matched pair signed-rank test.

using an endoscopic carbon dioxide laser, a sufficient airway opening and voice quality could be obtained without tracheotomy.<sup>11,12</sup> Significant improvements in the quality of life of the patients who were operated on using the same technique have been reported.<sup>12</sup> Patients who underwent bilateral posterior cordotomy with laser therapy had a very good airway opening, with no need for tracheotomy, but a poor voice quality.<sup>13,14</sup> In addition, a recent study in 2017 reported higher costs for arytenoidectomy and cordotomy that were performed through use of a laser.<sup>15</sup> Considering all these advantages and disadvantages, where the latter features especially higher costs and the lack of wide availability of laser systems, utilization of alternative methods such as radiofrequency is warranted.

Unilateral posterior cordotomy with radiofrequency was performed in all our patients. Although we obtained a sufficient airway opening and the patients' voices were sufficient, edema was observed in the cordotomy area, especially during the early postoperative period. For this reason, we believe that radiofrequency surgery should be performed in patients who previously underwent tracheotomy or who give consent to accept postoperative tracheotomy. A study by Oysu et al.<sup>16</sup> reported posterior cordotomy performed with an arrow tip monopolar needle radiofrequency to be an effective, safe, and user-friendly method, with no need for tracheotomy, but early postoperative edema was not mentioned. In our cases, early edema might be attributed to the model and tip type of the radiofrequency device we used. However, we still feel that radiofrequency surgery should not be performed on patients without tracheotomy because of the risk for early postoperative edema. The early edema in our study regressed within two months, and we decannulated our patients in an average of 2.4 months.

## Conclusion

Unilateral posterior cordotomy with radiofrequency is an inexpensive and safe surgical method that can be used as an alternative to laser posterior cordotomy, establishing a sufficient rima glottidis opening, and enabling early decannulation. However, we believe that it should preferentially be in patients with tracheotomy due to the edema that may occur during the early postoperative period.

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*Radiofrequency posterior cordotomy in bilateral vocal cord paralysis*

269

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Address for correspondence:  
Mehmet Özgür Pınarbaşı  
Department of Otorhinolaryngology, Faculty of Medicine,  
Eskisehir Osmangazi University, Eskisehir, Turkey.  
E-mail: ozgurpinarbasli@gmail.com  
Phone: +90 532 5580722

