

The role of endoscopic laterofixation of the vocal cord in the treatment of bilateral abductor paralysis

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Abstract

Different techniques were compared in management of 36 patients with bilateral abductor paralysis of the vocal cords. Ten patients were treated by microsurgical arytenoidectomy through a mid-line thyrotomy, with successful decannulation in only three. Fifteen patients were treated by endolaryngeal microsurgical arytenoidectomy, with failure to decannulate four cases.

The procedure of endoscopic laterofixation of the vocal cord was used to treat 11 patients. Ten patients had an adequate long-lasting airway with a socially acceptable voice function. One patient had a revision surgery and was successfully decannulated. The technique was found to be a reliable option in the management of bilateral abductor paralysis. It is a modifiable procedure with a feasibility to adjust the position of the vocal cord under endoscopic control. It can be combined with endolaryngeal arytenoidectomy if the gain in the airway size produced by laterofixation is found insufficient.

Introduction

Patients with bilateral abductor paralysis of the vocal cords may suffer from stridor, particularly on exertion or during upper respiratory infection. Thyroidectomy is still the most common cause of this condition. The vocal cords are paralyzed in a median or a paramedian position. The final position of the paralyzed cord is determined by several factors: the function of cricothyroid muscle (supplied by the superior laryngeal nerve), fibrosis in the denervated muscles, ankylosis in the cricoarytenoid joint, tension of the conus elasticus and weight of the vocal cord.

The magnitude of the airway compromise in a patient with bilateral abductor paralysis depends on several factors; important are the cardiopulmonary reserve and the position of the paralyzed vocal cords (Kirchner, 1979). Tracheotomy in a patient with bilateral abductor paralysis offers a quick solution for the compromised airway with minimal trauma. It defuses the immediate problem, and allows more leisurely evaluation and decision making (Tucker, 1980). It may be also used as a temporary means for ventilation of the patient during arytenoidectomy (Ossoff *et al.*, 1990). However, the long-term management of the tracheotomized patient is often fraught with difficulties, as for example, the need for a nursing care and unacceptance by the patient and family.

Bilateral cord paralysis can also be managed by the nerve-muscle pedicle reinnervation procedure (Tucker, 1976), or by lateralization of the vocal cord through several approaches: submucous resection of the vocal cord (Hoover, 1932), extralaryngeal arytenoidopexy (King, 1939), extralaryngeal arytenoidectomy (Kelly, 1941;

Woodman, 1946), endolaryngeal arytenoidectomy (Thornell, 1948), arytenoidectomy through mid-line thyrotomy (Scheer, 1953), microsurgical arytenoidectomy through mid-line thyrotomy (Helmus, 1972), endoscopic CO₂ laser arytenoidectomy (Strong *et al.*, 1976; Ossoff *et al.*, 1984), endoscopic CO₂ laser posterior cordectomy (Dennis and Kashima, 1989) and endoscopic laterofixation of the vocal cord (Ejnell *et al.*, 1984).

The aim of this report was to evaluate the role of endoscopic laterofixation of the vocal cord (modified from Ejnell *et al.*, 1984) compared to other techniques, in the management of bilateral abductor paralysis.

Material and methods

Our study included 36 adult patients with bilateral abductor paralysis of the vocal cords, most of them following thyroidectomy. They were classified into four groups. In the first group, microsurgical arytenoidectomy through a mid-line thyrotomy (Helmus, 1972) was performed in 10 patients during the period 1980–1983. In the second group, 15 cases were treated by endolaryngeal microsurgical arytenoidectomy during the period 1984–1987 (Table 1).

The third group included 11 patients treated by endoscopic laterofixation of the vocal cord (modified from Ejnell *et al.*, 1984). On presentation to us, six patients had a tracheostomy and five had not.

The operation was performed under general anaesthesia. The patients were ventilated via a small endotracheal tube (no. 5) in the non-tracheotomized group or through the tracheostome in the tracheotomized group.

TABLE I
POST-OPERATIVE AIRWAY

Group	Operations	Postoperative airway		Total
		Adequate	Inadequate	
<i>First group</i>	Microsurgical arytenoidectomy through mid-line thyrotomy	3	7	10
<i>Second group</i>	Endolaryngeal microsurgical arytenoidectomy	11	4	15
<i>Third group</i>				
*Non-tracheotomized cases	Endoscopic laterofixation	4	1	5
Tracheotomized cases	Endoscopic laterofixation	3	–	6
<i>Fourth group</i>				
*Failed endolaryngeal arytenoidectomy	Endoscopic laterofixation	1	–	1
*Failed arytenoidectomy via mid-line thyrotomy	Endoscopic laterofixation	2	–	2
*Failed endoscopic laterofixation	Endolaryngeal arytenoidectomy	1	–	1
*Cric arytenoid joint fixation	Endoscopic laterofixation + endolaryngeal arytenoidectomy	1	–	1
*Median position of both cords	Endoscopic laterofixation + endolaryngeal arytenoidectomy	2	–	2

Two surgeons operated on the patient; one was an endoscopist working through Kleinsasser's operating laryngoscope and the other was an external surgeon. The external surgeon made a 3 cm long transverse skin incision, at the level of the centre of thyroid cartilage, starting from the mid-line laterally. The lamina of the thyroid cartilage was identified and exposed. A 16 g injection needle was inserted through the lamina 4 mm anterior to and 2 mm below the midpoint of the oblique line. If the endoscopist found the needle in its correct position (above the tip of the vocal process), a second needle was inserted about 5 mm below the first one (below the tip of the vocal process) (Ejnell *et al.*, 1984). A monofilament thread (Nylon No. 0) was then passed through the lower needle and an epidural catheter (19 g) through the upper one. The endoscopist gripped both of them and threaded the filament through the catheter (Figs. 1 & 3). The catheter was then withdrawn from the upper needle to form a nylon loop around the posterior end of the vocal cord. The two needles were removed and the external surgeon tightened the loop until the vocal cord was judged by the endoscopist to be sufficiently lateralized (at least 5 mm wide glottis) (Figs. 2 & 4). The thread was tied over a silastic pad on the lamina of the thyroid cartilage and the wound closed.

The patient was observed overnight for inspiratory stridor, because of the potential risk of post-operative laryngeal oedema. Tracheotomized patients were decannulated the next day. The respiratory and phonatory functions of all patients were followed-up for one year.

The last group was treated by both endolaryngeal arytenoidectomy and endoscopic laterofixation of the vocal cord. The combination of both procedures was done when the gain in the airway size produced by laterofixation of the vocal cord was judged by the endoscopist to be insufficient. It was also done in cases of failure after either technique.

Results

In the first group (microsurgical arytenoidectomy through mid-line thyrotomy), three cases could be

decanulated two weeks post-operatively while seven cases could not. In the second group (endolaryngeal microsurgical arytenoidectomy), 11 cases could be decannulated with an improved airway while four cases could not.

The procedure of laterofixation of the vocal cord usually took half an hour. In some cases, the first needle had to be inserted through the thyroid cartilage two or three times before it was correctly positioned. A few patients were treated with perioperative corticosteroids because of moderate laryngeal oedema. The average length of post-operative hospital stay was 4.6 days (range: 3–7 days). All patients had a socially acceptable voice. In the non-tracheotomized cases, four or five patients had successful restoration of adequate airway. One patient developed severe post-operative laryngeal oedema and troublesome bleeding, and was tracheotomized. She had been under hormonal therapy. She required a revision operation together with endolaryngeal arytenoidectomy after two months. After five days the patient was decannulated, with a good airway.

In the tracheotomized cases, three patients gained an adequate airway with the endoscopic laterofixation alone, while the other three required a combination of endoscopic laterofixation and endolaryngeal arytenoidectomy; one because of cricoarytenoid fixation and the other two because of median position of both cords, leading to inadequate gain in the airway size after laterofixation only.

Endoscopic laterofixation was also performed in three patients with failed arytenoidectomies: one via the endolaryngeal approach and two via a mid-line thyrotomy. The granuloma was excised, the posterior laryngeal web was divided and the cord was lateralized by the nylon loop. All the third and fourth groups were successfully decannulated.

Discussion

The endoscopic operations of the paralyzed larynx have many desirable features, including the conservative nature of the procedure and the ability to produce surgical changes predictable from the onset (Kirchner,

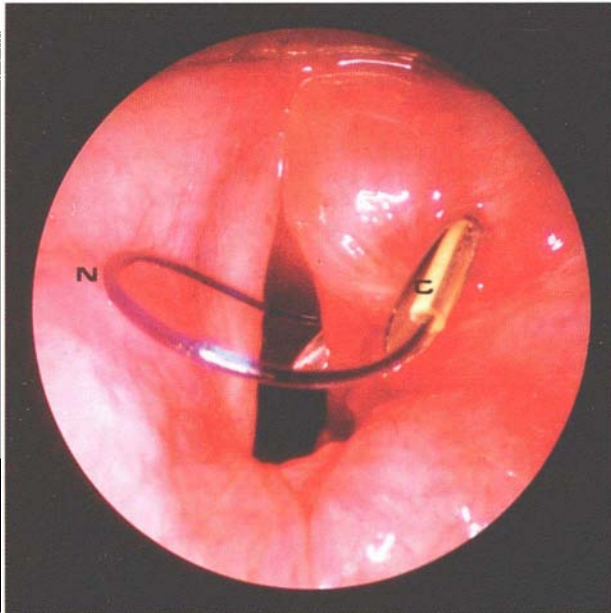


FIG. 1

An endoscopic picture of laterofixation of the vocal cord in a tracheotomized patient showing an epidural catheter (C) passing through the upper needle and a nylon filament (N) through the lower needle. The nylon filament was threaded through the epidural catheter.

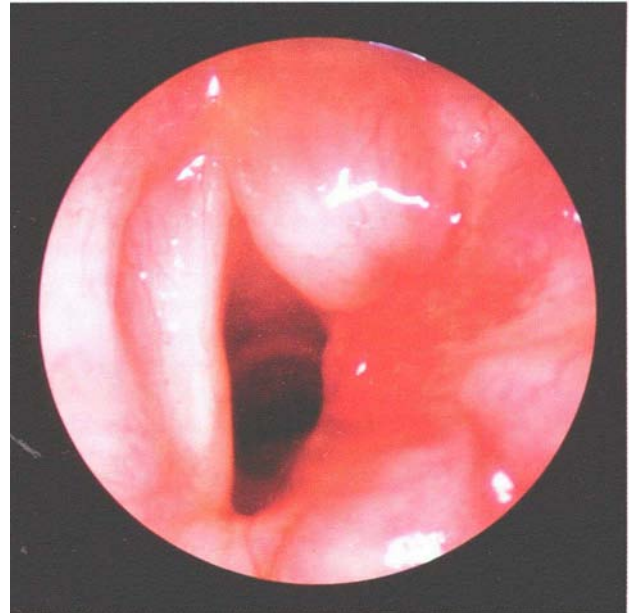


FIG. 2

An endoscopic picture of the above patient showing lateralization of the paralyzed vocal cord after removal of both needles and tightening of the nylon loop.

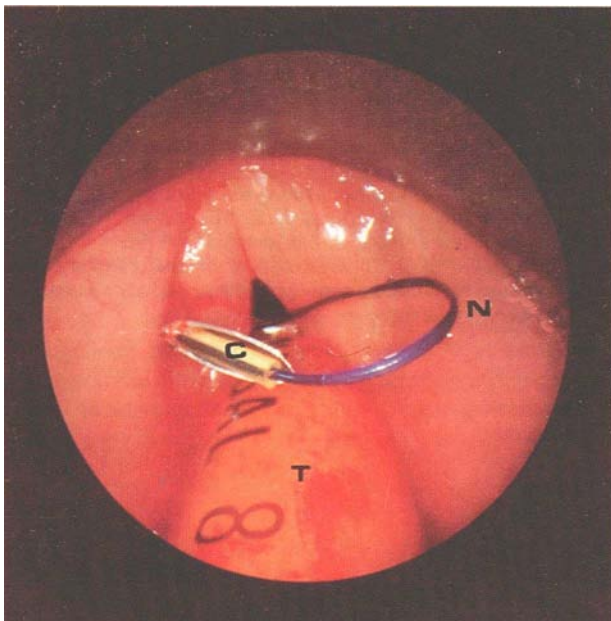


FIG. 3

An endoscopic picture of laterofixation of the vocal cord in a non-tracheotomized patient showing an epidural catheter (C) passing through the upper needle and a nylon filament (N) through the lower needle. The nylon filament was threaded through the epidural catheter (T = endotracheal tube).

1979). It avoids the complications of neck dissection associated with the extralaryngeal approach, and blunting of the anterior commissure following mid-line thyrotomy. However, there is less control in the placement of vocal cord following endolaryngeal arytenoidectomy. Oedema and troublesome bleeding are much less with the use of CO₂ laser (ossoff *et al.*, 1990). A common cause of failure to decannulate a patient after arytenoi-

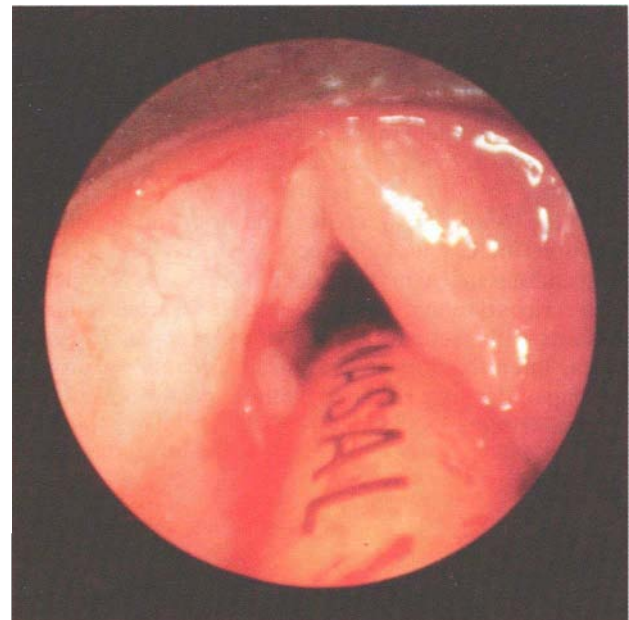


FIG. 4

An endoscopic picture of the same patient showing lateralization of the paralyzed vocal cord after removal of both needles and tightening of the nylon loop.

dectomy is the formation of a granuloma and the formulation of a posterior glottic web, leading to remedialization of the vocal cord and reduction in the anteroposterior diameter of the glottis.

The endoscopic laterofixation of the vocal cord (modified from Ejnell *et al.*, 1984) proved to be a technically simple procedure. It took about half an hour to perform and involved only minor surgical trauma. It allowed immediate assessment of the airway size. A considerable long-lasting improvement in respiration was achieved at no expense of voice function (Geterud *et al.*, 1990). This procedure influenced the quality of speech positively by

reducing the inspiratory stridor and negatively by increasing the phonatory leakage. Most patients still have a socially acceptable voice function, because of the surgeon's ability to accurately open the posterior laryngeal lumen to create an adequate airway while leaving the anterior half of the vocal cords untouched and in close apposition.

Moreover, this technique is a modifiable one, with a feasibility to adjust the position of the vocal cord, to reach the balance between its respiratory and phonatory functions under endoscopic control. The possibility for reoperation remains to modify this balance.

However, the gain in the width of the glottis produced by laterofixation of the vocal cord was found insufficient in most tracheotomized patients with median position of both cords. It should be combined with endolaryngeal arytenoidectomy, because removal of the bulk of arytenoid markedly opens the posterior laryngeal lumen. The suturing technique allowed lateralization of the vocal cord and healing of the arytenoid bed in a predictable way, without granuloma or posterior web formation. The combination of both techniques can be also used in management of cases associated with cricoarytenoid fixation, or after failure of either technique.

Conclusion

The endoscopic laterofixation of the vocal cord was found to be a reliable treatment option in the management of patients with bilateral abductor paralysis. It is a simple procedure that resulted in a considerable long-lasting improvement in the airway at no expense of voice function. Moreover, it is a modifiable technique with a feasibility to adjust the position of the vocal cord to reach the balance between its respiratory and phonatory functions under endoscopic control. It can be combined with endolaryngeal arytenoidectomy in cases associated with cricoarytenoid fixation and in tracheotomized patients with median position of both cords. In these cases, laterofixation of the vocal cord allows proper healing of the arytenoid bed, without posterior web formation or remedialization of the cord.

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