Abstract

Objectives: 1) Describe surgical procedures to reinnervate the thyroarytenoid muscle (TA) on the paralyzed side utilizing a refined nerve-muscle pedicle (NMP) flap implantation harvested on the unaffected side combined with arytenoid adduction (AA). 2) Assess time-dependent improvement in vocal function during postoperative follow-up.

Methods: Prospective case series. Seven patients underwent refined NMP flap implantation combined with AA for paralytic dysphonia between August 2009 and June 2013. The NMP flap was harvested on the unaffected side because of scar formation on the paralyzed side and was secured to the TA under microscopic control. Three of them were followed over one year and their voice outcomes determined by 5 objective and 2 subjective parameters were evaluated at preoperatively and 4 different time points after surgery.

Results: On the average, maximum phonation time and mean airflow rate improved from 5.4s and 569mL/s preoperatively to 24.2s and 116mL/s 12 months postoperatively, respectively. Jitter, shimmer, and harmonics-to-noise ratio also improved from 10.5%, 16.4%, and 4.2dB preoperatively to 1.7%, 11.2%, and 6.8dB postoperatively, respectively. Grade and breathiness of GRBAS scale became much better from 2.6 and 2.4 preoperatively to 0.2 and 0.0 12 months postoperatively, respectively.

Conclusion: Combination of AA and a refined NMP flap implantation harvested on the unaffected side improves long-term voice outcomes of paralytic dysphonia. Therefore, patients in whom NMP flap on the affected side is unavailable due to high level scar formation could have a great benefit by NMP flap implantation harvested on the unaffected side.

Introduction

Improvement in breathy dysphonia due to unilateral vocal fold paralysis (UVFP) is usually obtained by implementing various kinds of phonosurgical procedures; intracordal injection, type I thyroplasty, arytenoid adduction, and combinations thereof. However, some patients do not recover “normal” voices after surgery. “Normal” voices can be attained by providing the affected vocal fold with the median location and the symmetrical bulk and tension of the unaffected vocal fold.

We reported that immediate recurrent laryngeal nerve reconstruction at the time of thyroid cancer extirpation can provide excellent postoperative vocal function. However, such procedure is not feasible in most patients with paralytic dysphonia because they usually seek treatment for breathy dysphonia after the onset of paralysis. Thus, we refined the technique of nerve-muscle pedicle (NMP) flap implantation onto the thyroarytenoid muscle (TA) and have applied this innovative method together with AA, resulting in excellent postoperative vocal function. However, NMP flap cannot be harvested on the affected side due to severe fibrosis after neck surgeries.

The purposes of the present report are 1) to describe operative procedures to reinnervate the TA on the affected side utilizing a refined technique of NMP flap implantation harvested on the contralateral side combined with AA, and 2) to assess time-dependent improvement in vocal function during postoperative follow-up.

Methods and Materials

Subjects: Seven patients underwent refined NMP flap implantation harvested on the contralateral side combined with AA for paralytic dysphonia between August 2009 and June 2013. The recurrent laryngeal nerve was resected due to invasion of thyroid cancer. Of these seven patients, three (two females and one male) were followed over one year and served as subjects. Their ages were 57, 60 and 66 years with periods from onset to AA+NMP being 9, 35 and 444 months.

Evaluation of vocal function: Maximum phonation time (MPT), Mean airflow rate (MFR), jitter, shimmer, and harmonics-to-noise ratio (HNR) were measured. Grade overall (G) and breathiness (B) of GRBAS scale were rated. These parameters were assessed preoperatively, and 1, 3, 6, and 12 months after surgery.

Results

All parameters improved dramatically one month after surgery and showed gradual amelioration thereafter as shown in Figures 5 through 11. Statistical analysis was not performed because of a small number of subjects. On the average, MPT and MFR improved from 5.4s and 569mL/s preoperatively to 24.2s and 116mL/s 12 months postoperatively, respectively (Figures 5 & 6).

Discussion

Although a combination of NMP flap implantation onto the TA with AA has been proved to provide a patient suffering from breathy paralytic dysphonia with his or her own “near-normal” voice, an NMP flap is sometimes impractical to harvest on the affected side due to severe fibrosis following a previous surgery for thyroid cancer, esophageal cancer and other neck surgery. The results of the present study suggested that a contralaterally harvested NMP flap could be utilized as an alternative.

All parameters measured improved postoperatively. Aerodynamic measures (MPT and MFR) and auditory impressions of G and B reached within normal ranges 12 months after surgery. Further study with a larger number of subjects is necessary to confirm the usefulness of an NMP flap implantation harvested on the unaffected side.

Conclusions

Combination of arytenoid adduction and a refined nerve-muscle pedicle flap implantation harvested on the unaffected side improves long-term voice outcomes of paralytic dysphonia. Therefore, patients in whom formation of an NMP flap on the affected side is impractical due to severe fibrosis after neck surgeries could have a great benefit by these operative methods, although further study with a larger number of subjects is necessary.

References


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