CASE REPORT

A new procedure of arytenoid adduction combined with type I thyroplasty under general anesthesia using a laryngeal mask

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Abstract
Laryngeal framework surgery is usually performed under local anesthesia. However, some patients are unable to tolerate extended surgery. A case of an 82-year-old woman who underwent medialization thyroplasty and arytenoid adduction of direct lateral cricoarytenoid (LCA) muscle pulling at the same time under general anesthesia using a laryngeal mask is reported. Endoscopic observation through the laryngeal mask allows direct visual control of the vocal cord. The LCA pulling method does not touch the posterior border of the thyroid cartilage so that the laryngeal mask does not disturb the arytenoid adducts.

Keywords: General anesthesia, laryngeal mask, arytenoid adduction, LCA-pull, thyroplasty

Introduction
Laryngoplasty is usually performed under local anesthesia because the patients need to phonate during operation. Endoscopic confirmation of the vocal cord medialization on phonation gives a more reliable operative result. In case of severe unilateral vocal cord paralysis, arytenoid adduction combined with type I thyroplasty is needed to obtain a good voice. However, since a long operative time is required, we may hesitate to operate on some cases. Here we report an 82-year-old woman who was found to be unable to tolerate extended surgery under local anesthesia for several reasons. We performed a new procedure of arytenoid adduction and type I thyroplasty simultaneously under general anesthesia, while observing the vocal cord using a laryngeal mask. The voice improved to almost normal after operation.

Case report
An 82-year-old woman had left recurrent nerve paralysis after aortic aneurysm surgery conducted in February 2004. Since her voice had not improved at 8-month follow-up, she requested surgery for voice improvement. The maximum phonation time (MPT) before the operation was 2 s and the mean flow rate (MFR) was >1000 ml (values >1000 ml could not be measured due to the limitation of the equipment). On phonation, a wide posterior glottal chink was observed. Therefore, we considered combining the arytenoid adduction with type I thyroplasty in order to enable a better voice. However, she had a marked gag reflex on insertion of the endoscope. This made it difficult to observe the vocal cord for any length of time. Therefore, vocal cord observation during operation was considered to be difficult. In addition, her strength had decreased after the aortic aneurysm surgery and she did not wish to undergo surgery under local anesthesia. For these reasons, we performed surgery using a laryngeal mask, which allows observation of the vocal cord, under general anesthesia. We obtained her consent and explained that this method could be potentially inferior in improvement of voice compared with surgery under local anesthesia, as it would not be possible to hear her voice during the operation.
After induction of standard general anesthesia, a laryngeal mask airway was inserted. An L-shaped connector was fitted to the laryngeal mask and ventilation was performed from the point shown by the arrow in Figure 1. Consequently, endoscopic observation of the vocal cord became possible.

After cervical incision, the lateral wall of the thyroid cartilage was exposed. First, arytenoid adduction (AA) was performed. Two windows were created on the lamina as shown in Figure 2. The posterior window exposes the lateral cricoarytenoid muscle (LCA). The arytenoid was adducted and fixed by traction and fixation of the LCA was achieved as shown in Figure 2, as described previously [1]. After confirming that the arytenoid was adducted with the endoscope, the arytenoid was fixed.

The anterior window was used in thyroplasty type I. After the AA was conducted, type I thyroplasty was performed using Gore-Tex fabric. While observing the vocal cord endoscopically, it was medialized and the Gore-Tex fabric was implanted.

Figure 3 shows the endoscopic operative views. Before the adduction (Figure 3A) both sides of the vocal cord were spread due to higher ventilation pressure. The positions of the vocal process of both sides were consistent. Figure 3B shows the view after AA. The left vocal process was adducted and was more posterior than the right vocal process. As the posterior support was fixed, the left vocal cord tension was regained and the cord was not relaxed despite ventilation.

Results

Figure 4 shows the views of the larynx on phonation before and after operation. The view after operation indicates that the glottal chink had disappeared and good glottal closure was observed. Table I shows the vocal data 6 months after operation. The MPT improved to 20 s, from 2 s, and the MFR decreased to 110 ml/s. Although shimmer and jitter could not be measured before operation, they were 3.143 and 1.098 after operation, respectively. These values were all within the normal range and the patient’s voice was also normal in terms of perceptual impression.

Discussion

Although there are some reports of type I thyroplasty performed under general anesthesia [2,3], there are very few reports of AA under general anesthesia. Bielamowicz et al. performed AA at the same time for patients who underwent vagus nerve resection during skull base surgery [4]. However, this operation was performed via regular endotracheal intubation and it was impossible to hear the patient’s voice.
and observe the vocal cord. In order to obtain a good voice, intraoperative observation of the vocal cord would be helpful even if it is impossible to hear the patient's voice. In the reports where medialization thyroplasty was performed under general anesthesia, a laryngeal mask was used in order to observe the vocal cord, as in our procedure. However, there is no report of AA performed using a laryngeal mask. The reason is considered to be associated with the operative procedures of AA. In the original Ishihik method, thyroid alar cartilage is extended outward and the hypopharyngeal mucosa is dissected to reach the cricoarytenoid joint [5]. The pyriform bulge of the laryngeal mask obstructs dissection of hypopharyngeal mucosa because it fits in the hypopharyngeal space. In recent years, as Netterville et al. [6] and Maragos [7] reported, the procedure that removes the posterior portion of the thyroid cartilage to reach the muscular process is common. However, also in this method, the bulge of the laryngeal mask prevents the surgeon from exposing the muscular process. A procedure that pulls the LCA to adduct the arytenoid was reported by Iwamura and Kurita in 1996 [8], and it is called LCA-pull. In Japan, additional studies were conducted in several facilities [9]. In 2005, we reported a modified procedure of Iwamura's original method [1]. The LCA-pull procedure does not remove the posterior border of the thyroid cartilage, so the laryngeal mask does not become an obstruction. Some cases require dissection of the hypopharyngeal mucosa to expose the LCA; however, they are rare. In most cases, effective

Figure 3. (A) Before adduction. (B) After adduction. Views of the vocal cord on pressurization. Panel B shows that the left vocal process is located more posterior than the right vocal process due to adduction of the left arytenoid. Since the left vocal cord was extended forward and backward and the tension was obtained, it does not relax as much as the right vocal cord, even on pressurization.

Figure 4. (A) Laryngeal findings on phonation before operation: a wide posterior glottal chink was observed. (B) Laryngeal findings on phonation after operation: good vocal cord closure was obtained.
adduction can be obtained only by traction of the LCA without exposure of the muscular process. LCA-pull allows the operation under the same operative view as in type I thyroplasty and this makes it convenient to simultaneously conduct adduction and type I thyroplasty in patients with severe vocal cord paralysis.

References


Table I. Voice evaluation before and after operation.

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<thead>
<tr>
<th>Parameter</th>
<th>Preoperative value</th>
<th>Postoperative value</th>
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<tbody>
<tr>
<td>MPT (s)</td>
<td>2</td>
<td>20</td>
</tr>
<tr>
<td>MFR (ml/s)</td>
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<td>110</td>
</tr>
<tr>
<td>Shimmer (%)</td>
<td>Aphonic</td>
<td>3.143</td>
</tr>
<tr>
<td>Jitter (%)</td>
<td>Aphonic</td>
<td>1.098</td>
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MPT, maximum phonation time; MFR, mean flow rate.

Arytenoid adduction combined with type I thyroplasty

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