

# Type 3 Thyroplasty for Patients With Mutational Dysphonia

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**Summary: Introduction.** The cases consisted of three men with mutational dysphonia, who were aged 37, 35, and 38 years. The speaking fundamental frequencies (SFFs) at the time of the initial diagnosis were 174.6, 170.2, and 180.0 Hz.

**Methods.** In all three patients, voice therapy proved ineffective; therefore, surgery was considered. In the anterior-posterior compression test performed preoperatively in the three patients, the voice became low-pitched.

**Results.** The SFFs decreased postoperatively to 106.9, 115.4, and 87.5 Hz, respectively, in the three patients.

**Conclusions.** Type 3 thyroplasty (TP3) is effective for the treatment of patients with mutational dysphonia in whom voice therapy proved unsuccessful.

**Objective.** The SFF of men is high in childhood. At the time of the second pubescent sexual orientation, the frequency usually decreases. However, in some cases, the high-pitched voice of childhood may persist without successful switch to a low-pitched voice during puberty. Thus, there are rare cases of adults with a high-pitched boyish voice. Voice therapy is usually effective for the treatment; however, it may fail in some cases. We performed TP3 for subjects in whom voice therapy proved ineffective. With TP3, the tension of the vocal folds decreases, and the voice becomes low-pitched.

**Key Words:** Mutation–Voice therapy–Kayser-Gutzmann method–Androgen–Phonosurgery–Framework surgery.

## INTRODUCTION

The speaking fundamental frequency (SFF) of men is high in childhood. At the time of the second pubescent sexual orientation, the frequency usually decreases because of the effects of androgen. However, in some cases, the high-pitched voice of childhood may persist into adulthood, without successful change to a low-pitched voice during puberty. Thus, there are rare cases of adults with a high-pitched boyish voice, a condition referred to as mutational dysphonia. The chief complaints of these patients are a high-pitched voice persisting until after puberty; however, some patients present with other complaints, such as difficulty in speaking, speaking in a falsetto voice, weak voice, breathy voice, hoarse voice, pitch breaks, or a low voice intensity.<sup>1</sup>

Voice therapy is usually effective in cases of mutational dysphonia<sup>1,2</sup>; however, it may fail in some cases, such as subjects with psychological problems.

Type 3 thyroplasty (TP3) was first reported by Isshiki et al,<sup>3</sup> in 1974, and reported by the same author's group again in 1983.<sup>4</sup> TP3 surgery involves relaxation of the vocal folds. Partial resection of the thyroid cartilage causes the vocal folds to become short and relaxed and with the decrease in the tension of the vocal fold, the SFF decreases and the voice becomes low-pitched. The surgery is also effective for improving the laryngeal efficiency. After Isshiki et al, a few other authors have also reported on the usefulness of TP3.<sup>5–7</sup>

We performed TP3 for subjects with mutational dysphonia in whom voice therapy proved ineffective.

## PATIENTS AND METHODS

The cases consisted of three men with mutational dysphonia who were aged 37, 35, and 38 years, and the surgeries were performed from January to October 2009. The chief complaints were a high-pitched voice persisting until after puberty. None of the patients had any physical anomalies or psychological problems. The SFFs at the initial diagnosis were 174.6, 170.2, and 180.0 Hz, respectively (Table 1). In all three patients, surgery was considered because voice therapy by the Kayser-Gutzmann method proved ineffective. In the anterior-posterior compression test (A-P test) performed preoperatively, the voice became low-pitched in all three patients. Therefore, TP3 was selected as the surgical procedure of choice. Voice evaluation including the measurement of the mean flow rate (MFR) and maximum phonation time (MPT) was made pre- and postoperatively, except in case no. 1, who was operated at another hospital and in whom the MFR was not evaluated.

## OPERATION METHODS

The surgery is performed under local anesthesia because it is necessary to monitor the patient's voice during the operation. Total intravenous anesthesia may be selected in patients suffering from fear of operations.<sup>8</sup>

A horizontal skin incision is made in the neck. A vertical incision is made to separate and retract the strap muscles laterally and expose the thyroid ala of one side. An incision about 7–10 mm long is then made with a no. 11 scalpel on the lateral side of the thyroid cartilage (Figure 1). The cartilage is carefully incised with a no. 11 scalpel so as not to cut the inner perichondrium. If the cartilage is hard, a burr is used. The cartilage is cut layer by layer by gently moving the burr. The cut is better left incomplete, leaving the last paper-thin layer uncut. The last thin cartilage layer is gently cracked with a fine chisel. Care must be taken to never breakthrough the inner perichondrium. Hemorrhage may occur from inside the cartilage in the lower portion of the vertical cut; this bleeding from inside should be

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**TABLE 1.**  
**Backgrounds of Patients**

Case No.	Age and Sex	Chief Complaint	SFF (Hz)
1	37, M	High-pitched voice	174.6
2	35, M	High-pitched voice	170.2
3	38, M	High-pitched voice	180.0

controlled by pinpoint electrocoagulation to prevent the formation of a hematoma later.

First, the cartilage of one side is partially resected, then, the voice is monitored, and after confirming a low-pitched voice, the cartilage of the opposite side is resected. The resection width should be in the range of 1–2 mm (Table 2). Usually, the resection width is set to be narrower on the opposite side than that on the initially resected side.<sup>3,4</sup> Isshiki et al<sup>9</sup> reported that tension imbalance between the two vocal folds does not cause any dysphonia, but a phase lag in the vibratory cycle between the two folds. Therefore, unilateral shortening of the ala seems to be justified as the first step of surgery, even if it yields some tension imbalance.

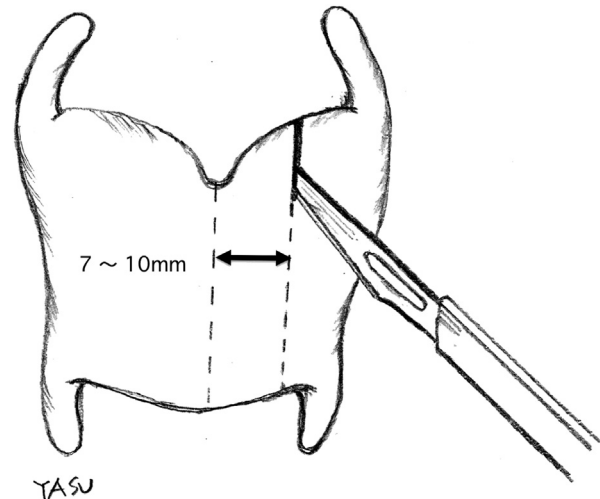
After resection of the cartilage, the edges of the cartilage are fixed using a 3-0 nylon suture in a face-to-face (FTF) manner (Figure 2). In earlier days, absorbable braided sutures were expensive and weak. Isshiki et al<sup>3,4,9,10</sup> usually used a nylon suture for fixation of the framework surgery. However, absorbable braided sutures have now become less expensive and stronger and may be used to fix the cartilage.

Under voice monitoring, the edges may also be overlapped, if necessary. There are two kinds of overlapping (OL): medialization and lateralization (Figure 3). Medialization or lateralization and the OL width are determined under voice monitoring. In our case 1, the right side was fixed in an FTF manner, whereas the left side was fixed by the OL method. During voice monitoring, when the left vocal fold was pushed, the voice became loud; therefore, type 1 thyroplasty (TP1) was also performed on the left side. In cases 2 and 3, the cartilages were resected and fixed in an FTF manner (Table 2).

In all three cases, the voice became low-pitched during the operation. There were no remarkable complications.

## RESULTS

Tables 3 and 4 show the results. The preoperative SFFs in the three patients were 174.6, 170.2, and 180.0 Hz, the values



**FIGURE 1.** Cartilage incision. An incision with a no. 11 scalpel is made on the lateral side of the thyroid cartilage.

decreasing postoperatively to 106.9, 115.4, and 87.5 Hz, respectively. The preoperative MFR values in the three patients were “no measurement” (N.M.) and 144.1 and 436.0 mL/s, the values decreasing postoperatively to N.M. and 73.3 and 420.0 mL/s, respectively. The preoperative MPT values in the three patients were 14, 31, and 13 seconds and the values increasing postoperatively to 32, 38, and 16 seconds, respectively. The pitch range became narrower postoperatively. After surgery, all the patients expressed subjective satisfaction with their voice. The low-pitched voice has persisted up to the time of writing.

## DISCUSSION

We think that voice therapy should be selected as the treatment of first choice for mutational dysphonia. Only patients with mutational dysphonia in whom voice therapy proves ineffective must be considered for surgery. In most cases, voice therapy by the Kayser-Gutzmann method is effective, with the SFF decreasing following treatment. At our institution, the Kayser-Gutzmann method has been used successfully in many patients to achieve a low-pitched voice. However, in few cases, particularly in subjects with a long duration of suffering from a high-pitched voice, voice therapy fails to confer a low-pitched voice. Our three patients were in their mid-30s; they had suffered from a high-pitched voice for a long period

**TABLE 2.**  
**Fixation and Removal Width (mm)**

Case No.	R	R	L	L	Combined With TP1
	Fixation	Removal Width (mm)	Fixation	Removal Width (mm)	
1	FTF	2	OL	2	Left side
2	FTF	1	FTF	1	No
3	FTF	2	FTF	1	No

Abbreviations: FTF, face-to-face fixation; OL, overlapping fixation; TP1, type 1 thyroplasty.

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