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Augmentation surgery on the cartilaginous portion of the vocal fold in a patient with cricoarytenoid joint ankylosis

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ABSTRACT

Surgical management of cricoarytenoid joint (CAJ) ankylosis is challenging and has the risk of worsening voice quality. In the present case, augmentation surgery was performed on the cartilaginous portion of the vocal fold in a patient with CAJ ankylosis. A 24-year-old man sustained blunt trauma to the anterior neck three years prior to developing severe breathiness. Posterior glottal insufficiency resulting from lateral fixation of the right vocal fold was observed during phonation under laryngoscopy. In addition, electromyography and CT scan revealed severe ankylosis of the right CAJ. Type I thyroplasty performed on the right vocal fold did not improve postoperative vocal function. Therefore, augmentation surgery on the cartilaginous portion of the right vocal fold was performed via endolaryngeal microsurgery under general anesthesia with jet ventilation. A piece of temporalis fascia was autotransplanted into the submucosal space created at the posterior cartilaginous portion of the right vocal fold. This resulted in the narrowing of the posterior glottal gap during phonation, leading to improvement in hoarseness. Microsurgical management with autologous fascia augmentation of the cartilaginous portion of the vocal fold can be effective in patients with lateral vocal fold fixation due to CAJ ankylosis.

1. Introduction

Cricoarytenoid joint (CAJ) ankylosis can occur due to rheumatoid arthritis, long-term tracheal intubation, laryngeal trauma, transesophageal ultrasonography, infectious agents, or radiotherapy. Lateralization procedures for median vocal fold fixation caused by CAJ ankylosis have been reported to improve the airway [1,2]. On the other hand, several reports have described surgical procedures (e.g., injection laryngoplasty, adduction arytenopexy, arytenoid adduction with or without type I thyroplasty) for posterior glottal insufficiency with CAJ fixation [3,4]. However, no laryngeal framework surgery can adequately address posterior glottal insufficiency. Moreover, technical difficulties associated with direct surgery on the CAJ and proper positioning of the arytenoid cartilage confer the risk of worsening voice quality. Augmentation surgery is usually performed on the membranous portion of the vocal folds. In the present case, we performed augmentation surgery with autologous fascia on the cartilaginous portion of the right vocal fold in order to address lateral vocal fold fixation caused by CAJ ankylosis.

2. Case report

A 24-year-old man sustained blunt trauma to the anterior neck when he was punched during Karate training three years prior to being referred to our department for worsening

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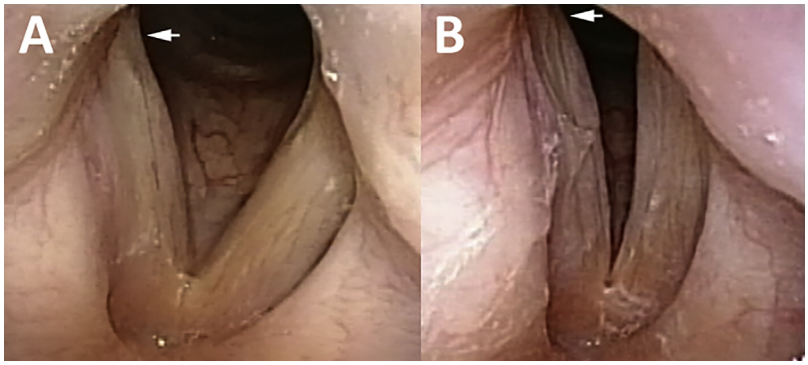

Fig. 1. Preoperative laryngeal fiberscopic views. (A) The right vocal fold was immobilized at the lateral position during respiration. (B) Wide posterior and anterior glottal gaps were observed during phonation. White arrows indicate the cartilaginous portion of the right vocal fold.

breathiness. His voice quality was assessed using the grade-roughness-breathiness-asthenia-strain scale, with a score of G3R0B3A0S2. Voice Handicap Index-10 (VHI-10) score was 35. Laryngeal fiberscopic examination revealed immobility of the right vocal fold fixated in the lateral position (Fig. 1A) and slightly impaired left vocal fold abduction. During phonation, the bilateral ventricular folds moved toward the midline, and wide posterior and anterior glottal gaps were observed (Fig. 1B), with no regular mucosal wave of the vocal fold mucosa. Electromyography showed normal electrical activities of the right thyroarytenoid and cricothyroid muscles during phonation. CT scan and computer generated three-dimensional reconstruction revealed severe ossification around the right CAJ cavity as well as the cricoid lamina (Fig. 2A and B).

As an initial treatment, type I thyroplasty [5] with a silicone block was performed to treat glottal insufficiency due to right vocal fold fixation under local anesthesia. However, postoperative voice quality and function as assessed by acoustic and aerodynamic examination did not improve (Table 1), and the glottal gaps—especially the posterior gap—remained wide during phonation. Therefore, atelocollagen was injected into the submucosal area of the cartilaginous portion of the right vocal fold under local anesthesia. Following this procedure, the patient's voice quality improved temporarily. However,

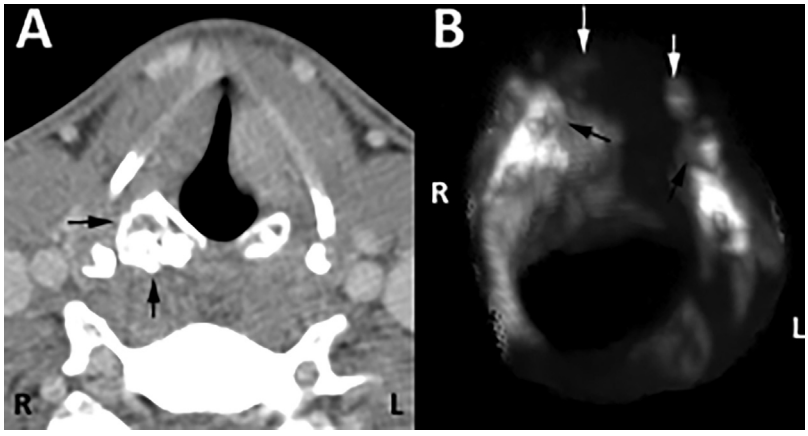

Fig. 2. Preoperative CT scan and computer generated three-dimensional reconstruction images. (A) Axial CT image showing severe ossification (black arrows) in the lamina of the cricoid cartilage at the level of vocal folds. (B) Left antero-superior oblique three-dimensional reconstruction view of the larynx without the thyroid cartilage showing severe ossification in the lamina of the cricoid cartilage and the right cricoarytenoid joint. The left cricoarytenoid joint is normal. White arrows indicate the apex of bilateral arytenoid cartilages. Black arrows indicate bilateral cricoarytenoid joints.

Table 1
Results of acoustic and aerodynamic examination before and after surgeries.

	Preope	POD(1st) 1M	POD(2nd) 1M	POD(2nd) 1Y
MPT (s)	5.2	5.1	7.7	10.5
MFR (ml/s)	771	755	455	307
PPQ (%)	1.08	1.51	0.97	1.12
APQ (%)	3.34	3.49	2.39	2.96
NHR (dB)	0.13	0.17	0.11	0.09

POD (1st) 1M: 1 month after medialization laryngoplasty; POD (2nd) 1M, 1 month after fascial augmentation; POD (2nd) 1Y: 1 year after fascial augmentation; MPT: maximum phonation time; MFR: mean flow rate; PPQ: pitch perturbation quotient; APQ: amplitude perturbation quotient; NHR: noise to harmonic ratio.

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