

Computerized tomography of the glottis after intracordal autologous fat injection

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Abstract

According to the committee on speech, voice, and swallowing disorders of the American Academy of Otolaryngology – Head and Neck Surgery, various surgical methods such as laryngeal framework surgery, laryngeal re-innervation, and injection laryngoplasty might be used to palliate inferior laryngeal nerve paralysis. In the present case report we document the survival and exact location of the boluses of autologous fat in one patient in whom this material was used for injection laryngoplasty.

Key words: Vocal fold paralysis; Surgery, operative

Case report

A 67-year-old woman was referred to our clinic with a right inferior laryngeal nerve paralysis after cricotracheal anastomosis for a recurrent papillary carcinoma of the thyroid gland invading the anterolateral portion of the first tracheal ring. The right inferior laryngeal nerve paralysis resulted in breathiness with severe dysphonia. The dysphonia was subjectively classified by the patient as grade 3 according to the scale used by Shindo *et al.* (1996). Stroboscovideolaryngoscopy noted a right inferior laryngeal paralysis with the right true vocal fold in the intermediate position.

Selected speech and voice parameters recorded with the Computed Speech Lab and the Multidimensional Voice Program (Kay Elemetrics) are presented in Table I. Thyroplasty type I and injection laryngoplasty were the treatment options offered. The patient elicited to undergo an intracordal injection of autologous fat. Under general anaesthesia the autologous fat harvested with liposuction was injected with a Bruning syringe (19-gauge needle) within the paralysed right thyroarytenoid muscle using one site of injection lateral to the vocal process of the ipsilateral arytenoid cartilage. The contents of the whole barrel of the Bruning syringe was injected resulting in maximal overcorrection. The voice was considered as normal by the first post-injection month. Selected speech

and voice parameters findings by the third post-injection month are presented in Table I. A slight modification in the voice parameters, noted by the sixth post-injection month (Table I), led to a second injection of autologous fat using the same technique. Twelve months from the initial injection of autologous fat, the voice was considered as normal by the patient even though the voice parameters (except the shimmer and jitter) did not appear to be improved (Table I). A control laryngeal computed tomography CT ruled out local recurrence, and demonstrated the survival and exact location of the boluses of autologous fat injected within the right thyroarytenoid muscle (Figure 1). The patient is now alive without evidence of disease 21 months from the initial intracordal injection of autologous fat.

Discussion

According to the committee on speech, voice, and swallowing disorders of the American Academy of Otolaryngology – Head and Neck Surgery, various surgical methods such as laryngeal framework surgery, laryngeal re-innervation, and injection laryngoplasty might be used to palliate inferior laryngeal nerve paralysis (Benninger *et al.*, 1994). Numerous materials such as Teflon, silicon, gelfoam, collagen, fascia, and fat have been advocated at the time of injection laryngoplasty.

TABLE I
SELECTED SPEECH AND VOICE PARAMETERS (MTHS: MONTHS FROM INITIAL INJECTION OF AUTOLOGOUS FAT, S: SECONDS)

Acoustic parameters	Pre-injection	3 mths	6 mths	12 mths
Fundamental frequency (hertz)	189.1	175.2	182.3	217.1
Maximum phonation time (s)	4	6	4	6
Speech rate (words/minute)	117	124	130	105
Phrase grouping	9	14	12	11
Jitter (%)	3.84	1.06	3.04	1.24
Shimmer (%)	6.42	5.44	9.58	5.41
Noise to harmonics ratio (%)	0.16	0.16	0.27	0.15

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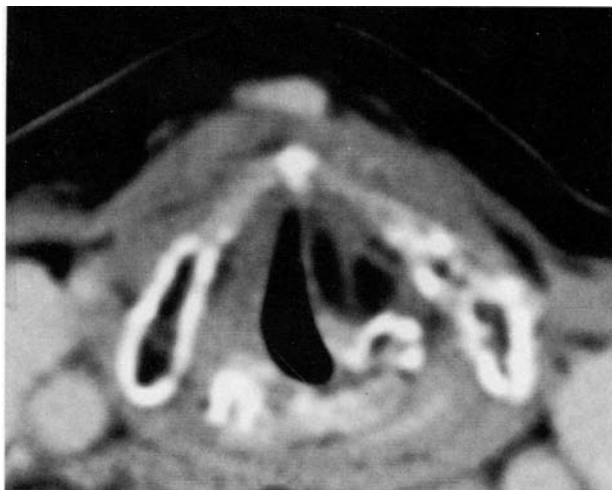


FIG. 1

Computed tomography of the larynx demonstrating i) the presence of two boluses of fat within the right thyroarytenoid muscle, and ii) the medial displacement of the vocal process of the right arytenoid cartilage.

Following the initial report by Mikaelian *et al.* (1991) of the successful use of autologous fat, we elected in our department to use this material when performing injection laryngoplasty in patients with unilateral inferior laryngeal nerve paralysis.

Recently, Shaw *et al.* (1997) documented the successful restoration of speech and voice after the injection of autologous fat within the paralysed true vocal fold. The main drawback of the intracordal injection of autologous fat in patients with unilateral inferior laryngeal nerve paralysis is the unpredictable degree of resorption of this material, once injected within the thyroarytenoid muscle, leading all the authors to state that overcorrection at the time of injection should always be performed to achieve long-lasting improvement (Hill *et al.*, 1991; Mikaelian *et al.*, 1991; Brandenburg *et al.*, 1992; Benninger *et al.*, 1994; Bauer *et al.*, 1995; Mikus *et al.*, 1995; Zaretsky *et al.*, 1995; Brandenburg *et al.*, 1996; Shindo *et al.*, 1996; Shaw *et al.*, 1997).

Our case is in agreement with this notion as reinjection had to be performed six months following the initial injection of autologous fat. Much evidence exists, however, documenting the survival of the injected autologous fat. Bauer *et al.* (1995), and Shaw *et al.* (1997) reported two cases demonstrating persistent autologous fat graft five and 18 months after the intracordal injection. Brandenburg *et al.* (1996) using magnetic resonance imaging (MRI), provided evidence that fat could survive transplantation into the vocal fold as long as 31 months after injection. In the present case, the control CT scan of the larynx demonstrated the survival of the boluses of fat injected within the paralysed right thyroarytenoid muscle. Interestingly, the laryngeal CT scan (Figure 1) also documented the posterior location of the boluses of fat and the medial rotation of the vocal process of the arytenoid cartilage allowing for medialization of the paralysed vocal ligament. Such data are in contrast with the report by Brandenburg *et al.* (1996) in whom the boluses of fat appeared to be

located more anteriorly within the vocal ligament. To our knowledge, our technique of injection of autologous fat using only one site of injection placed as far posteriorly as possible, and lateral to the vocal process of the arytenoid cartilage has not yet been reported. Bauer *et al.* (1995) advocated the injection of several boluses of fat with injection sites in the middle and posterior vocal folds region. Brandenburg *et al.* (1996) also used two sites of injection, one in the posterior lateral aspect of the midthird of the vocal fold and the second into the anterolateral aspect of the midthird of the vocal fold. Mikaelian *et al.* (1991) used three spots of injection along the length of the vocal fold. In our opinion, the autologous fat should be inserted as far as possible posteriorly within the thyroarytenoid muscle and the otolaryngologist – head and neck surgeon should try to achieve rotation of the vocal process of the arytenoid cartilage as well as bulging of the vocal fold to best correct the position of the paralysed true vocal fold when performing injection laryngoplasty with autologous fat.

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