Laryngeal Lipotransfer: Review of a 14-Year Experience

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Summary: Objective. To determine the efficacy of lipotransfer for treatment of various vocal fold (VF) pathologies.
Study Type. Retrospective review.
Methods. We reviewed retrospectively the indications for and techniques of laryngeal lipotransfer and its effect on glottic closure and mucosal wave. One hundred four patients treated with lipotransfer between 1997 and 2010 were screened for inclusion in this study. Fifteen patients were excluded. Strobovideolaryngoscopic examinations for the 89 included subjects were reviewed to determine the change in glottic closure and mucosal wave. The degree of improvement, if any, was graded as mild, moderate, or substantial. The population was divided into the following four groups for analysis: (1) single lateral lipoinjection, (2) combination of lipoinjection and thyroplasty, (3) multiple lipoinjections with or without other injection medialization procedures, and (4) lipoimplantation for treatment of VF scar.
Results. Lipotransfer was used alone and as an adjunct procedure to treat glottic insufficiency (GI) secondary to VF motion abnormality or vibratory margin pathology. Augmentation was accomplished either by lateral injection or by medial implantation through an access tunnel. Most patients showed a statistically significant improvement in glottic closure because of lipoinjection and in mucosal wave because of lipoimplantation. Few minor and no serious complications occurred.
Conclusion. Laryngeal lipotransfer is safe and effective for treatment of GI and VF scar.
Key Words: Laryngeal–Lipotransfer–Lipoimplantation–Lipoinjection–Glottic–Mucosal.

INTRODUCTION

Glottic insufficiency (GI) and vocal fold (VF) scar are common causes of dysphonia. Although many materials and techniques have been proposed over the years to address these problems, no completely satisfactory approach exists for either condition. To eliminate complications that led to the abandonment of surgery with products, such as paraffin and teflon, autologous fat has been advocated for use in the larynx.

Fat has been used surgically for more than a century. Neuber[1] introduced the use of fat to fill soft tissue defects in 1893. For decades, fat was harvested by direct surgical resection. Liposuction was introduced in 1974[2] and provided a minimally invasive option for fat harvest. In 1975, Dedo[3] introduced the use of fat in the larynx for reconstruction after cancer surgery. The use of fat injection for medialization for treatment of GI was published initially in 1991 by Mikaelian et al.[4] The senior author (R.T.S.) has continued to use that technique, and this article provides insights into its efficacy.

The use of fat on the vibratory margin for treatment of VF scar did not appear in the literature until 1997.[5] VF scar is a particularly challenging impairment. The senior author's experience with fat implantation of 23 VFs is reviewed in this article.

Fat has some obvious advantages and disadvantages. Its advantages include low likelihood of inflammatory reaction, virtually no likelihood of rejection (autologous tissue), nearly universal availability, and minimal donor site morbidity. The primary disadvantage is unpredictable resorption, although some fat is retained indefinitely in most patients. In addition, occasionally small granulomas may appear on the superior surface of the VF at the injection site, if fat herniates through the injection site. Such granulomas may be resected easily in the operating room or office, if they are symptomatic. Because of the safety of autologous tissue coupled with concerns about long-term fat survival, review of clinical results is important to assess safety and efficacy.

METHODS

A retrospective review of the indications for and techniques of laryngeal lipotransfer and its effect on glottic closure and mucosal wave was conducted. One hundred four patients treated with lipotransfer between 1997 and 2010 were screened for inclusion in this study. Fifteen patients were excluded for the following reasons: (1) an arytenoid adduction procedure had been performed, (2) the strobovideolaryngoscopic examinations were unavailable for analysis, and (3) follow-up was less than 1 month. Strobovideolaryngoscopic examinations for 89 subjects were reviewed to determine the change in glottic closure and mucosal wave. The degree of improvement, if any, was graded as mild, moderate, or substantial. Any impairment of mucosal wave was noted. The population was divided into the following four groups for analysis: (1) single lipoinjections, (2) combinations of lipoinjection and thyroplasty, (3) multiple lipoinjections with or without other injection medialization procedures, and (4) lipoimplantations.

The senior author's lipoinjection and lipoimplantation techniques have been described elsewhere.[4,6,7] Briefly, abdominal fat is harvested for injection using an 8–10-mm liposuction cannula, washed with saline and injected lateral to the thyroarytenoid muscle using an 18-gauge needle with a Bruenings syringe. The VF is overinjected by about 40% in anticipation of expected fat reabsorption (Figure 1). Fat for implantation is

Accepted for publication March 22, 2013.
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Journal of Voice, Vol. 27, No. 4, pp. 512-515
0892-1997/$36.00

http://dx.doi.org/10.1016/j.jvoice.2013.03.009

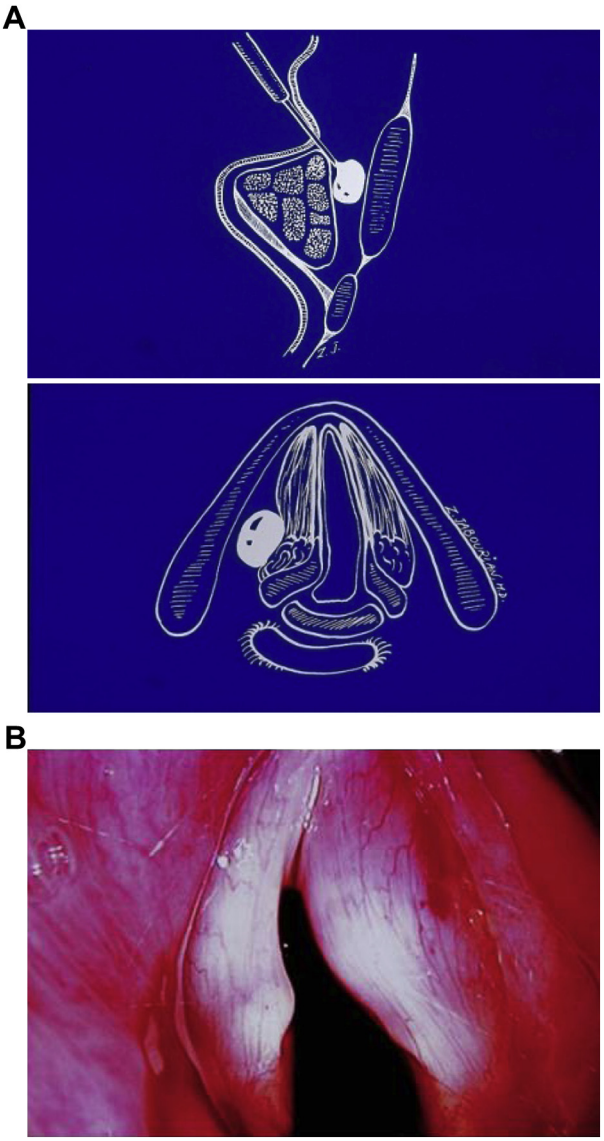

FIGURE 1. (**A**) Harvested fat is injected lateral to the thyroarytenoid muscle using an 18-gauge Bruenings needle (republished with permission from ref. 6). (**B**) The vocal fold is overinjected by approximately 40% in anticipation of the expected resorption.

TABLE 1.
Various Etiologies of GI in Group 1 Cohort

Pathology	Etiology
Atrophy	Denervation
	Presbyphonia
Scar	Posthemorrhagic
	Iatrogenic
	Radiation
Arytenoid dislocation	Traumatic
Paresis and paralysis	Myasthenia gravis
	Idiopathic and iatrogenic SLN and RLN injury

Abbreviations: SLN, superior laryngeal nerve; RLN, recurrent laryngeal nerve.

harvested in a similar manner. VF scar and adhesions are lysed through an access tunnel, a pocket is creased on the medial edge, and the fat is then placed subepithelially through the access tunnel (Figure 2).

RESULTS

Group 1

Thirty-one patients had 41 single VF injections (some had both VFs treated). The primary indication for lipoinjection was GI. The various etiologies of GI in our population are listed in Table 1. A *t* test was applied to evaluate the degree of change in glottic closure after lipoinjection. Statistical significance (<0.05) was achieved both when looking for any degree of improvement and when looking for substantial improvement to complete closure. Table 2 shows the distribution of the degree of change in glottic closure.

Group 2

Twenty-nine patients had 40 procedures consisting of VF lipoinjection and thyroplasty combinations. These were performed either as part of a planned staged sequence or as part of an unplanned sequence. Although it is our customary practice to discuss the potential need for future additional medialization procedures with all patients, nine patients in this group were

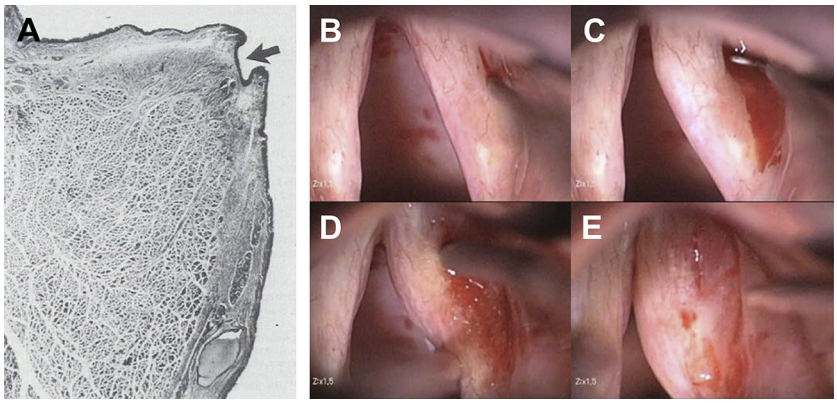

FIGURE 2. (**A**) The arrow in this histological section points to an area of scar along the medial vocal fold edge. Note the deficiency of superficial lamina propria deep to the vocal fold epithelium. (**B–E**) These sequential intraoperative photographs illustrate the senior author's lipoimplantation technique by which fat is placed subepithelially through an access tunnel after lysis of adhesions. Drawings of this procedure may be found elsewhere.[6(p1311)]