Amplitude of Glottal Mucosal Wave After Vocal Fold Microflap With or Without Fibrin Glue

Ramón González-Herranz, Elizabeth Amarillo, Estefanía Hernández-García, José Montojo Woodeson, and Guillermo Plaza-Mayor, *Fuenlabrada, Madrid, Spain*

Summary: Introduction. The vocal fold microflap technique is the ideal to remove benign vocal fold pathology. Our objective is to compare the amplitudes of the mucosal wave before and after the closure of microflap defect with fibrin glue, and when microflap is left to heal by secondary intention.

Materials and Methods. The present study is a retrospective series, including 32 patients treated by intracordal phonosurgery, with closure of the microflap either with fibrin glue or by healing by secondary intention. They all had both preoperative and 6-month postoperative track records to allow voice analysis, a subjective Voice Handicap Index 10 (VHI-10), and a good image quality strobe.

Results. After selecting the patients was found that the mean overall preoperative VHI-10 was 26.6, and improved up to 10.5 after surgery, a statistical differences ($P = 0.03$). When comparing both groups, with or without fibrin glue, fibrin glue did not improved results in VHI-10. On the contrary, there was a significant difference in the improvement of the open glottal phase after surgery ($P = 0.03$), showing a much higher improvement when fibrin glue was used.

Conclusions. The use of fibrin glue after a vocal fold microflap for advanced pathology, such as sulcus vocalis in pocket, vergeture, or vocal fold scar, increases the amplitude of the mucosal wave of the vocal folds, but does not improve the VHI-10 results in our cohort of female patients. So far, patient-reported outcome shows that healing by secondary intention continues to provide excellent voice results.

Keywords: Glottal mucosal wave–Vocal fold microflap–Fibrin glue–Sulcus vocalis–Vergeture.

INTRODUCTION

The goal of phonosurgery is to restore voice quality, which is directly related to vocal fold vibration. Vocal fold vibration basically depends on biomechanical characteristics of the lamina propria and the preservation of its layered structure. The body and cover of the vocal fold are connected by a transitional layer, which is comprised of the intermediate and deep layers of the lamina propria.[1]

Vocal fold scarring alters the vibratory mechanism, impairing progression of the mucosal wave. Scarring and adhesions are the major causes of dysphonia following a failure microphonosurgery.[2] Once a vocal fold scar has occurred, it becomes a difficult problem to treat.[3] Avoiding as much as possible the lesion of the mucosa or the deeper part of the vocal fold is the best way to avoid fibrosis or scarring in the vocal folds.[4–6]

Experimental studies have increased our knowledge of the scarring process of the vocal folds using rabbit, porcine, or canine models, through different kinds of injuries and restoring methods to regenerate the vocal fold structure.[7–11] Different phases of the scarring process have been demonstrated in animal studies.[8–11]

However, few studies have focused on variations of phonosurgical techniques to prevent or reduce the risk of vocal fold scar formation. The vocal fold microflap technique is the ideal method to remove benign vocal fold pathology. The microflap approach uses the natural planes of the vocal fold to dissect the lesion. It will allow removing the pathology with minimal aggression to the epithelium and lamina propria. This also might avoid damaging deeper layers and help to minimize inflammatory reaction to maintain the vibratory mechanism as best as possible.[12] This procedure is used to repair many of intracordal abnormalities such a mucosal or epidermic cyst or sulcus vocalis, which are pathologies that disturb the normal architecture of the superficial lamina propria.

There are mainly three ways to close the microflap defect: with sutures, with fibrin glue, or with secondary intention healing. So far, it is not clear which method is the best.[13] Some authors have suggested that secondary intention healing would lead to greater inflammatory response,[14] whereas others believe that epithelial migration leads to a more satisfactory healing.[15]

Experienced laryngologists have excellent results with the use of absorbable sutures on eye needles to close microflap defects because this technique does not markedly increase the duration of surgery. A single suture thread can be used to perform more than one stitch.[13,16] Nevertheless, other experts are less prone to the use of this suture, as it might be technically difficult. Some surgeons consider these sutures as a risky maneuver in a final part of the surgery and are afraid to damage the epithelium with the needle.[16,17]

In a study with canine model, a 75% larger average scar cross-sectional area with no sutured microflaps has been reported.[18]

The use of fibrin glue is an attractive alternative with very good results.[19,20] Whereas both the use of fibrin glue and sutures may increase time and cost of microphonosurgical procedures, there remains a lack of evidence concerning whether these methods might truly benefit vocal fold healing and scar formation.[7]

Accepted for publication July 20, 2016.

Conflict of interest: None of the authors has any financial interest in the material discussed herein, nor is there any other conflict of interest.

From the Department of Otolaryngology, Hospital Universitario de Fuenlabrada, Fuenlabrada, Madrid, Spain.

Address correspondence and reprint requests to Ramón González-Herranz, Department of Otolaryngology, Hospital Universitario de Fuenlabrada, C° del Molino, 2. Fuenlabrada 28942. Madrid, Spain. E-mail: rgonzalez.hflr@salud.madrid.org

Journal of Voice, Vol. 31, No. 3, pp. 342–346

0892-1997

http://dx.doi.org/10.1016/j.jvoice.2016.07.013

The present study compares the amplitude of the mucosal wave before and after the closure of microflap defect with fibrin glue, and when microflap is left to heal by secondary intention.

MATERIALS AND METHODS

The present study is a retrospectives series from a university hospital. The voice unit of our center has two otolaryngologist doctors responsible for diagnostic and phonosurgical work-up, supported by two speech therapists responsible for the rehabilitation treatment of patients.

Out of a series of 213 phonosurgeries performed between 2010 and 2013, 32 patients were treated for advanced intracordal pathology, with closure of the microflap either with fibrin glue or by healing by secondary intention. These 32 cases were performed by the first author. Other less advanced microsurgeries such as cysts, polyps, Reinke's edema, or vocal nodules were excluded from the present study, as no fibrin glue was ever used in these cases.

Advanced intracordal pathologies included in the present study were congenital vocal cord lesions, such as vergeture or sulcus, and scar lesions after previously failed microsurgeries. Before surgery was proposed, intensive speech therapy, smoking cessation, management of other diseases like allergy or inflammatory diseases, and treatment with proton-pump inhibitor were done for more than 3 months.

All cases had both preoperative and 6-month postoperative track records to allow voice analysis, and a subjective Voice Handicap Index 10 (VHI-10) was conducted preoperatively and after 6 months.[21]

Furthermore, they all had a good image quality strobe preoperatively and after 6 months, including a complete cycle of the glottis during phonation of /e/, and a complete sequence of individual image frames by selecting the maximum and minimum phase cycle of the glottis.

ImageJ (NIH, Bethesda, MD),[22] an image analyzer that allows selection and the dotted areas measured by the use of a mouse, was used to assess the extent of the glottal waveform. To calibrate the image, a constant value of 100 units at the length between the anterior commissure and the vocal process was assigned (Figure 1). Two representative images of each larynx in the maximum amplitude of the glottal waveform and minimum defect closure were selected.

In each image, we performed two measurements, one with maximum amplitude of the mucosal wave, and a second with the least possible closure defect above a telelaryngoscope image. Subtracting these two measurements gives a differential of area that would correspond to the maximum displacement of the vocal folds. Our objectives in surgery were to achieve a maximum amplitude as large as possible and glottal closure as close to 0, which would correspond to a complete closure.

Surgical treatment was done following the usual phonosurgery steps.[23,24] After microflap elevation, the flap was allowed to heal by secondary intention in the first 10 patients, whereas the other 22 cases were closed by filling the surgical dissection with fibrin glue. First, all patients were selected, and the results of surgery were compared using a nonparametric Wilcoxon test.

The fibrin glue used in each patient was less than 0.5 mL, using the same dosage for every patient, where one vial allows the dosage to three patients, reducing the expense arising from the use of glue to less than 50 euros per case.

In the vergeture and scar cases, the microflap was elevated without excision, whereas in sulcus cases, following Bouchayer's technique, removing the pocket was done.

Finally, in each patient, 1 cc of 40 mg of methylprednisolone was infiltrated in the dissected vocal cord muscle.[3,25]

First, all patients were selected and the results of surgery were compared using a nonparametric Wilcoxon test for paired data. Then, they were grouped according to the surgical technique, and nonparametric Mann-Whitney test was used for comparisons between the two groups for VHI-10 results. The nonparametric Wilcoxon test was used to compare pre- and postoperative results of the areas of the two phases analyzed. Statistical analysis was performed using *SPSS* software (IBM Corp. Released 2013. IBM SPSS Statistics for Windows, Version 22.0. Armonk, NY: IBM Corp.). The significance level was set at 0.05.

RESULTS

All patients in this series were women. The age of the patients ranged between 12 and 58 years, with a mean age of 32.25.

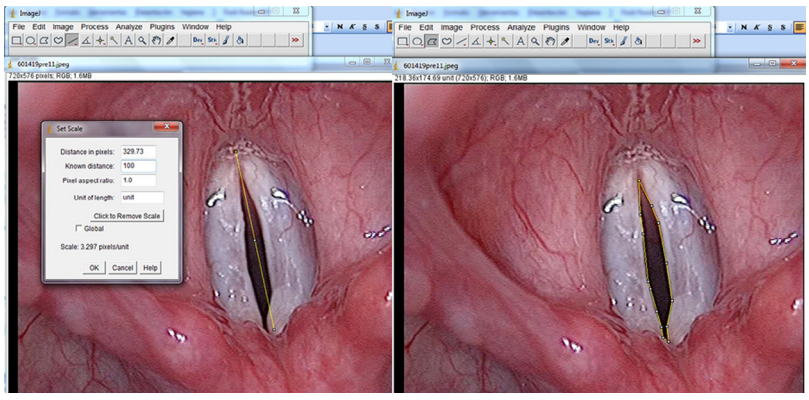

FIGURE 1. Calibration of the image with a constant value of 100 units at the length between the anterior commissure and the vocal process. Dotted areas measured by the use of a mouse to assess the extent of the glottal waveform.