

Comparison of Effects on Voice of Diode Laser and Cold Knife Microlaryngology Techniques for Vocal Fold Polyps

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Summary: Aim. To compare the effects on voice of endolaryngeal microsurgery (EMS) with cold instruments and a new method, “diode laser,” for vocal fold polyps.

Patients and Methods. Fifty-one patients with vocal fold polyps suffering from dysphonia who were treated in the Erciyes University Department of Otolaryngology were included in the study. Voice analysis was performed in a sound-proof room, holding the microphone 15 cm away from the patients’ mouth and by recording a sustained [a] vowel for at least 10 seconds. Fundamental frequency (F_0), Jitter, Shimmer, and noise-to-harmonic ratio (NHR) parameters were evaluated in terms of vocal analysis. All patients were asked for to fill in a questionnaire, after being informed about the voice handicap index (VHI). EMS was performed with a diode laser and cold knife on 26 and 25 patients, respectively. Patient follow-up was performed 8 weeks after surgery. Changes in F_0 , Jitter, Shimmer, and NHR values were measured and recorded. VHI was also completed and reassessed.

Results. There was a significant difference in each technique’s VHI score between the preoperative and postoperative questionnaire ($P < 0.001$). Postoperatively, there was no significant difference in VHI scores between two groups ($P > 0.05$). There was a significant difference in voice analysis values measured preoperatively and at the postoperative controls for both groups ($P < 0.05$). Postoperatively, there was no significant difference in voice analysis values between two groups ($P > 0.05$).

Conclusion. In the treatment of vocal polyps, EMS with both diode laser and traditional cold knife is effective.

Key Words: Endolaryngeal microlaryngosurgery–Phononosurgery–Diode laser–Vocal polyp.

INTRODUCTION

Vocal fold polyps are one of the most common benign lesions of the larynx and primarily cause hoarseness, which can have a negative impact on quality of life. Polyps are usually unilateral, pedunculated lesions that are particularly located between the anterior and middle thirds of vocal folds, and mechanical and chemical irritation are the frequent responsible factors in the etiology.¹ In particular, excessive and improper use of the voice as a result of chronic laryngeal irritation is considered as the most influential etiologic factor for the formation of vocal fold polyps.^{1,2}

Currently, excision of vocal fold polyps by endolaryngeal microsurgery (EMS) is a standard approach. EMS is performed with a microscope and thus provides perfect exposure, bright light, binocular vision, bimanual instrumentation, and magnification for precise surgical manipulations.³ EMS is performed with either cold or hot (laser) tools. Cold instruments have been used for many years in EMS. The CO₂ laser was first used in the early 1970s^{4,5}; however, the diode laser has been used since the end of the 1990s for otolaryngological

interventions.⁶ The diode laser has found use in recent years and has been applied at increasing rates for EMS.

Surgical intervention for vocal folds can lead to difference in voice by either altering normal physiology or correcting abnormal circumstances. Literature has proven that voice analysis methods are able to measure the response to therapy and also compare preoperative and postoperative results. These methods can be divided into two parts as subjective and objective tests. Subjective methods include the evaluation of patient voice by physicians with the GRBAS scale (Grade, Roughness, Breathiness, Asthenia, Strain) and assessment of the patient’s own voice with the voice handicap index (VHI) questionnaire.⁷ Voice analysis programs are the most important test among the objective methods. Acoustic measurement variables such as Jitter, Shimmer, and noise-to-harmonic ratio (NHR) are used by many voice laboratories.³

The aim of this study was to investigate the effects on voice of the diode laser, which is a new method for EMS, compared with cold instruments.

PATIENTS AND METHODS

The study was approved by the Institutional Review Board of Erciyes University, and prior the study, all patient gave informed consent. Fifty-one patients with vocal polyps who were admitted to Erciyes University Otolaryngology Department with complaints of dysphonia were included in the study. Patients were consecutively divided into two groups. First, we carried out EMS with diode laser to 26 patients and then the next 25 patients with cold instruments. All patients completed the study in terms of surgery and voice analysis. History of all patients was taken before the interventions, and at the end

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of the routine otolaryngological examination, a laryngoscopic record was made (Figure 1).

Before and after the surgery, VHI questionnaire and voice analysis were performed by a blinded person to both surgery. The *Multi-Dimensional Voice Program (MDVP)* (Kay Elemetrics Corp., Lincoln Park, NJ) was used in voice analysis by a personal computer. The additional hardware consisted of a standard sound card such as "Sound Blaster" (Creative Technology, Inc., Paris, France) and an SM48 vocal microphone (Shure Inc., Niles, IL). Voice analysis was performed in a soundproof room by holding the microphone 15 cm distance from the mouth and taking a voice sample consisting of sustained emissions of the /a/ vowel at standard pitch and intensity for 10 seconds. Fundamental frequency (F_0), Jitter, Shimmer, and NHR values were measured. The patient filled out a questionnaire after being given information about the VHI. Data were recorded under four main topics as functional (F), physical (Fi), emotional (E), and total information (T).

All operations were performed under general anesthesia by the same surgical team who were unaware of preoperative and postoperative voice analysis input (VHI scores and acoustic analysis parameters values). In both surgical techniques, the polyps were excised while preserving the vocal ligament and muscle as much as possible with minimal mucosal damage by working without any damage to deep layers and avoiding interventions that could cause a retraction in the vocal fold surface. Removal of vocal polyp in cold instrument surgery is performed with microscissors or cold knife. However, during diode laser application, a 980 nm and 25 W (Max.) Gallium-aluminum-arsenide diode laser device (biolitec AG, Bonn, Germany) was used at a constant current 3–5 W power in continuous contact mode, and the laser was delivered with a flexible, bare-tipped, 400-mm glass fiber that passed through a handheld fiber guidance system. The setup time was less than 5 minutes, and

after the setup, the lesions were excised in all cases by direct contact of tip of the laser fiber on the surgical area. The vocal polyps were slightly retracted by a microforceps and excised with laser beam. We benefited from diode lasers in all lesion, mainly by its cutting and coagulation effect and maybe a minimal vaporization effect to remnant tissue after the excision of majority of vocal polyp mass. All lesions were histopathologically diagnosed as vocal polyp.

Postoperatively, patients were asked to comply with strict voice rest for at least 7 days, and quitting smoking was also recommended. After about 1 week, the patients were allowed to start talking at normal speech tones with 5–15 min/h of voice rest. Whistling, throat clearing, heavy lifting, and strenuous exercise were restricted, and consuming of at least eight glasses of water was advised.

Eight weeks after the surgery, the patients were checked. At the control, physical examination and voice analysis were repeated. After the laryngeal examination, F_0 , Jitter, Shimmer, and NHR variables were measured for voice analyses and the VHI was filled out and re-evaluated.

Statistical evaluation of the results was performed using *SPSS*, Ver. 16.0 (SPSS, Inc., Chicago, IL). Kolmogorov-Smirnov test was used for the determination of normal distribution of groups. Wilcoxon Signed Rank test was used to determine whether there were statistically significant differences for groups with regard to preoperative and postoperative measures. After treatment, the Mann-Whitney U test was used to compare the differences between the two groups. Statistical significance at $P < 0.05$ was considered significant.

RESULTS

Twenty-six patients were treated with the diode laser. Ten of them were female and 16 were male, and the mean age was

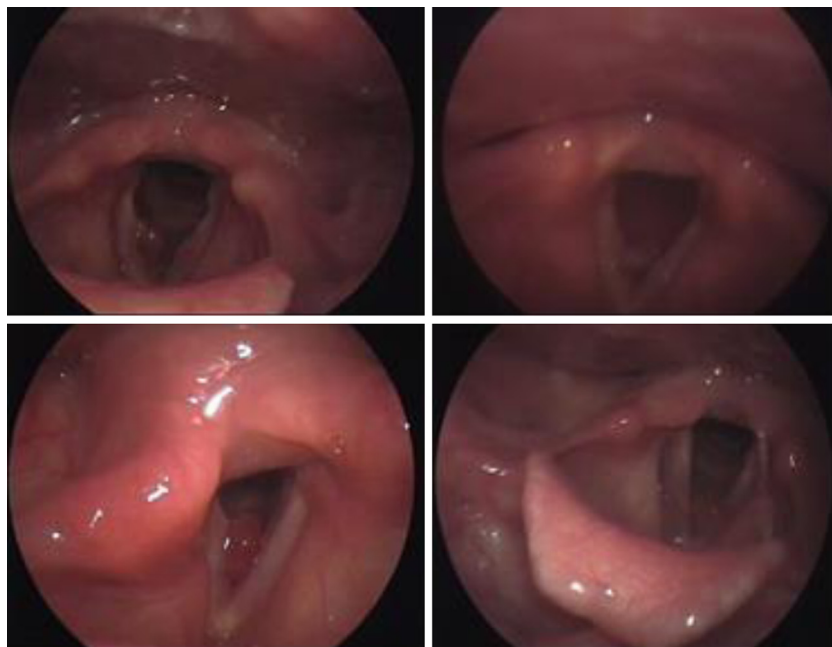


FIGURE 1. The preoperative appearance of vocal fold polyps.

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