

Surgical Management of Broad-based Sessile Vocal Cord Polyps: Transnasal Vocal Fold Polypectomy Versus Microlaryngoscopic Surgery- Our Experience in 159 Cases

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Abstract

Objectives: In this study, we retrospectively reviewed and intended to further compare the treatment outcomes and complications of office transnasal vocal fold polypectomy (TVFP) with those of microlaryngoscopic surgery (MLS) for different clinical and histopathological features of broad-based sessile vocal fold polyps. **Methods:** We retrospectively reviewed the records of 159 consecutive patients with broad-based sessile vocal fold polyps treated by TVFP or MLS. The differences in efficacy and complication between these two surgical techniques were compared according to the different types of vocal fold polyps. **Results:** Satisfactory outcomes of both TVFP and MLS treatments were reported in patients with edematous, gelatinous and vascular types of vocal fold polyps ($p > 0.05$). The efficacy of TVFP was slightly worse than MLS in fibrous polys group ($p < 0.05$). The TVFP-treated patients did not exhibit obvious complications, whereas several MLS-treated patients had suffered different complications. **Conclusion:** The therapeutic effects of both TVFP and MLS on the treatment of broad-based sessile vocal cord polyps are related to their clinical characteristics and histological types. Satisfactory outcomes are achieved in edematous, gelatinous, and vascular types of polyps after either surgical procedure. TVFP has fewer surgical complications than MLS which can be a preferred option for the treatment of broad-based sessile vocal cord polys at outpatient setting. TVFP also can be an alternative surgery option for patients who could not tolerate general anesthesia or laryngeal suspension. In contrast, MLS has proven to be particularly advantageous in patients who have fibrous type of polyps.

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Conclusion: The therapeutic effects of both TVFP and MLS on the treatment of broad-based sessile vocal cord polyps are related to their clinical characteristics and histological types. Satisfactory outcomes are achieved in edematous, gelatinous, and vascular types of polyps after either surgical procedure. TVFP has fewer surgical complications than MLS which can be a preferred option for the treatment of broad-based sessile vocal cord polyps at outpatient setting. TVFP also can be an alternative surgery option for patients who could not tolerate general anesthesia or laryngeal suspension. In contrast, MLS has proven to be particularly advantageous in patients who have fibrous type of polyps.

Keywords : polyps, vocal cords, endoscopy, laryngoscopy, clinical pathology

Key points

1. The effectiveness of surgical treatment varies depending on the various histological features of vocal cord polyps.
2. We classified vocal cord polyps into four different histological types: edematous, gelatinous, vascular, and fibrous type.
3. Satisfactory outcomes are achieved in edematous, gelatinous, and vascular types of polyps after either TVFP or MLS.
4. TVFP has fewer surgical complications than MLS and TVFP can be an alternative surgery option for patients who could not tolerate general anesthesia or laryngeal suspension.
5. In contrast, MLS has proven to be particularly advantageous in patients who have fibrous type of polyps.

INTRODUCTION

Vocal cord polyps are one of the most common diseases that cause hoarseness. They are lesions of the larynx that are second only to the vocal cord nodules. Vocal cord polyps are the most common laryngeal proliferative lesions as well. They are the products of voice overuse, misuse and abuse. However, vocal cord polyps can also be caused from a traumatic vocal cord injury.^{1,2} Vocal cord polyps are typically unilateral benign lesions, most of which are located at the edge of the anterior 2/3 of vocal folds and can be classified as pedunculated or sessile.^{3,4} The vocal folds are made up of three major layers from superficial to deep: the epithelium or epithelial tissue, the lamina propria and the vocalis muscle. The most superficial layer is the epithelial layer of the squamous epithelium. The middle section is lamina propria which consists of three layers referred to as superficial, intermediate and deep layers. The superficial layer of the lamina propria is a jelly-like material made up of elastin and interstitial fluid. The intermediate layer is made up of elastin and the deep layer is mostly collagen, and together they form the vocal ligament. The thyroarytenoid muscle is the deepest layer of the vocal folds and is a muscle which is related to activating chest voice.⁵

Mechanical vibrations produce strong force during the vocal fold movement, which may lead to vasodilatation of the submucosa of the vocal folds, increased permeability of the vascular wall, and edema.⁶ The basic lesions occur in the lamina propria and accompanied by vascular changes. The major features of pathological characteristics of vocal fold polyps are increased swelling, inflammation and vascular lesions in the lamina propria layer.^{7,8} The histological features of vocal cord polyps are characterized by their appearances (gelatinous or translucent), fibrous tissue proliferation, and vascular changes (hemangioma-like changes or hemorrhages). The typical pathological changes include diffuse or localized edema, fibrosis, dilated blood vessels, and degeneration of hyaline and basophils in the lamina propria.^{6,9} Although some small and hemorrhagic vocal cord polyps may recover spontaneously or with conservative treatment, the vast majority of vocal cord polyps require surgical treatment, especially sessile vocal cord polyps.^{10,11}

Surgical management of vocal cord polyps usually includes microlaryngoscopic surgery, electronic flexible laryngoscopic surgery, rigid laryngoscopic surgery, etc. Microlaryngoscopic surgery is mostly performed under general anesthesia at hospital. Electronic flexible laryngoscopic and rigid laryngoscopic surgery can be performed under local anesthesia in an outpatient setting, which have more advantages in the simplicity of treatment.^{12,13} Sessile polyps are less effective and more difficult to treat by surgery than pedunculated polyps. Meanwhile, the effectiveness of treatment varies depending on the various histological features of

vocal cord polyps. To the best of our knowledge, there is no report on the evaluation of the effectiveness of surgical performance for different histopathological types of vocal cord polyps. Based on the differences of clinical features and histopathological characteristics, we retrospectively analyzed the clinical efficacy of transnasal electronic flexible laryngoscopic vocal fold polypectomy and transoral microlaryngoscopy in the treatment of broad-based sessile vocal cord polyps.

MATERIALS AND METHODS

Patient Cohort and Procedure

Patients with broad-based sessile vocal polyps who were treated in our hospital from January 2016 to December 2019 were retrospectively selected. Our hospital offered patients alternative surgery options (TVFP and MLS) and the attending physicians described the advantages and disadvantages of both procedures to them (e.g. local versus general anesthesia, length of hospital stay, cost, surgical risks, complications, and perioperative discomfort). The patients made decisions independently after careful evaluation.

The patients with sensitive and strong pharyngeal reflex might choose MLS under general anesthesia, whereas the patients who were unwilling to accept general anesthesia might choose outpatient TVFP under local anesthesia. According to our past experience, either surgical method could be considered for vocal cord polyps with a diameter of 3-6 mm. For those vocal cord polyps which were larger than 6 mm, we would suggest patients to choose MLS. For some special cases, the patients who were not suitable for general anesthesia or laryngeal suspension such as cardiovascular disease, cervical spine disease, oropharyngeal stenosis, and high laryngeal body due to obesity, we would recommend them to choose TVFP under local anesthesia.

The broad-based sessile vocal cord polyps were defined according to their appearances. They appeared on the free edge of the vocal folds and generally larger than those with peduncles. The large enough polyps result in dysphonia by interrupting vocal fold closure. In our study, the broad-based vocal cord polyps developed in the anterior and middle margin of the vocal cords and more than 3 mm long along the edge of the vocal cords. The polyps with an inactive broad base with a fusiform or semicircular shape, protruding from the edge of the vocal cords were included. Meanwhile, the polyps with a diameter greater than 3 mm but length less than 3 mm at the base were excluded.

All clinical diagnosis and different types of pathological tissue were determined by the pathological examination. According to the morphology of electronic laryngoscope and pathological features, we classified vocal cord polyps into four different histological types: edematous, gelatinous, vascular, and fibrous type (Figure 1). The patients were subsequently divided into corresponding group depending on the histological characteristics of their tissues. Each group was divided into two subgroups upon their surgical treatment: TVFP under local anesthesia and MLS under general anesthesia. The surgical effects and complications of each group were compared and analyzed.

Transnasal Vocal Fold Polypectomy

PENTEX EPM 3500 electronic flexible laryngoscope and PENTEX surgical flexible oval micro cup forceps were used for TVFP. The nasal and pharyngeal mucosa was anesthetized with 1% tetracaine. 1 ml of 1% tetracaine was dripped through the operative channel (OC) of electronic laryngoscope onto the epiglottis and glottic area. The patient was placed in a supine position on a headrest. The electronic laryngoscope was inserted through the contralateral anterior nostril, and the flexible forceps were introduced through the OC. When the operation time was prolonged, 1% tetracaine could be added from the OC and the total amount of tetracaine was controlled within 20mg for adults. The polyps were removed with forceps vertically along the base of the polyps, and the residual tissue was trimmed until the vocal cord was flattened (Figure 2). The revision surgery was performed approximately 2 weeks after the previous operation.

Microlaryngoscopic Surgery

MLS was performed under general anesthesia. The patient was lying in a supine position with the head in a rearward extension. The incisors were protected with sterile gauze. The vocal folds were exposed to a

suspended laryngoscope, and the polyps were removed under the microscope. And then the free edge of the vocal folds was trimmed.

Outcome Evaluation

A comprehensive evaluation of the curative effect was carried out in all cases one month after surgical operation. GRBAS (grade, roughness, breathiness, asthenia, strain) is the scale of the Japan Society of Logopedics and Phoniatrics, which gives a 4-point grading scale (0, normal; 1, slight deviance; 2, moderate deviance; 3, severe deviance) for perceptual analysis of voice. We used GRB as evaluation system to rating the patient cases which were obtained preoperatively and postoperatively.¹⁴ Videolaryngostroboscopy (VLS) examination was performed preoperatively and postoperatively when the patient sustained phonation of the vowel /i/. The main parameters examined were including the degree of the vocal fold edge profile, glottic closure, and mucosal wave. For each VLS parameter, a 4-point grading scale mentioned above was used. According to the accumulated points obtained after evaluation, each group was assigned into three grading scale (0, normal; [?]2, slight deviance; [?]3, deviance).^{15,16}

Statistical Analyses

Continuous variables were presented as mean \pm SD, and the differences of comparison depended on one-way analysis of variance (ANOVA). The comparison of the baseline characteristics and treatment outcomes between two treatment groups were conducted using Mann-Whitney U Test. A p value of < 0.05 was considered statistically significant. The SPSS software version 21.0 (IBM Corp., NY, USA) was used for data analysis.

Ethics statement

This study was approved by the ethics committee of our hospital(2022KY206).

RESULTS

A total of 159 patients (70 men and 89 women) were treated in our hospital and consisted of TVFP with 66 cases and MLS 93 cases . All cases were retrospectively reviewed at a mean follow-up of 6 months. Age range of cases was 24 – 75 years was mean 51.9 \pm 11.6 years. Our study found no significant differences in sex, age, disease course, preoperative GRB and VLS(Table 1 and Table S1).

All the surgical operations were completed successfully. For the TVFP treatment group, the polyps were removed within 2 -10 minutes. 2 patients were cured after twice operations. There were 12 patients (5 cases with severe cardiovascular disease, 4 cases with cervical spine disease, and 3 cases with obese oropharyngeal cavity stenosis and high laryngeal body) underwent TVFP treatment instead of MLS treatment.

The surgical outcomes were evaluated one month after the operation, the postoperative GRB and VLS were significantly improved ($p < 0.001$)(Table S2). Among the patients with edematous, gelatinous and vascular polyps, the postoperative outcomes were satisfactory for both TVPF and MLS treatment groups ($p = 0.853$ versus $p = 0.786$). The efficacy of TVFP was slightly worse than MLS in the fibrous type of polyps group ($p = 0.009$ versus $p = 0.019$) (Table 2).

The patients in the TVFP treatment group had no surgical complications, whereas 7 patients in the MLS treatment group had loose and worn upper incisors, 9 patients had bruising and pain in the soft palate and lateral oropharyngeal wall, 5 patients had laceration in the lateral oropharyngeal wall, and 3 patients had numbness in the tongue. However, all patients recovered after symptomatic treatment without leaving permanent damage (Table3).

DISCUSSION

Based on the clinical morphological and pathological characteristics of vocal cord polyps, we divided sessile vocal cord polyps into four different histological types: edematous, gelatinous, vascular, and fibrous types. The edematous and gelatinous types of polyps are usually display with translucent and gelatinous in clinical morphology, the vascular type presents as opaque hemangioma, and the fibrous type shows gray-white and

dull fibrous. The edematous, gelatinous and vascular types of polyps are soft, brittle and elastic. They are edema-like, translucent and pale red color tissues, which are easy to remove. The fibrous type of polyps is hard and less elastic. It's a grayish or dark red color tissue, which is hard to remove. The representative images are shown in Figure 1 (A – D). Meanwhile, we assessed the pathological features of these 4 different types of vocal cord polyps by IHC. We observed a loose, myxoid, vascularized stroma with pale gray or pink color in edematous type and gelatinous type of polyps (Figure 1, a and b). The vascular type contained many dilated vessels with occasional granulation tissue and hemorrhage (Figure 1, c). In the fibrous type, the fibrin-like substances were distributed around the vascular space and the spindle cells can be seen in a dense fibrous matrix (Figure 1, d).^{6,17}

Vocal cord polyps are classified based on their morphological manifestations and pathological characteristics. The clinical manifestations of different types of vocal cord polyps influence their surgical treatments and outcomes. To verify this clinical observation, we retrospectively compared the surgical outcomes of TVFP with those of MLS for these types of vocal cord polyps. Through the retrospective analysis, we found that the edematous, gelatinous, and vascular types of polyps were technically easier to remove due to their sparse texture and edema-like structure. Therefore, the surgical operation time was shorter. The surgical outcome is as well as MLS treatment. For the fibrous type of polyps, the operation time is longer due to the dense texture which is relatively difficult to remove. Compared with the MLS treatment, TVFP treatment has a significant worse surgical outcome.

Electronic flexible laryngoscope has the characteristics of high resolution imaging, flexible and less irritation. A simultaneous imaging operation can be performed with specific flexible forceps through the operative channel.¹⁸ Nowadays, it has been commonly used in the otolaryngology clinic and become an indispensable diagnostic and therapeutic tool for ENT (Ear Nose and Throat) doctors. When patients require a quick and low-cost surgical treatment, with the help of electronic flexible laryngoscope, we can perform a surgery under local anesthesia in an outpatient setting at the same day without hospitalization. It also can be an alternative surgical option for patients who are not suitable for general anesthesia or laryngeal suspension. When we performed the surgery, the patient was placed in a supine position and the anti-bending tube with camera at the front end was inserted through the contralateral side of nose. Meanwhile, the flexible forceps within laryngoscope can be easily operated with bending and less stimulating. The curved channel fits the natural orifice perfectly, so the patient's mouth does not remain rigidly open. The whole procedure enhances the patients' comfort and significantly reduces the complications such as surrounding soft tissues damage caused by large tension producing from inserting and suspending the direct laryngoscope through the mouth.

CONCLUSION

The therapeutic effects of both TVFP and MLS on the treatment of broad-based sessile vocal cord polyps are related to their clinical characteristics and histological types. Satisfactory outcomes are achieved in edematous, gelatinous, and vascular types of vocal cord polyps after either surgical procedure. The surgical treatment of broad-based sessile vocal cord polyps by office-based TVFP is a practical surgical operation with minimal trauma and complications compared with MLS. This surgical procedure also saves patients' time and money. Therefore, TVFP can be a preferred option for the patients who require fast and low-cost surgical treatment in outpatient setting. The TVFP also can be an alternative surgical treatment for the patients who could not tolerate general anesthesia or laryngeal suspension. In contrast, MLS has proven to be particularly advantageous in patients who have fibrous type of vocal cord polyps.

Abbreviations

TVFP: transnasal vocal fold polypectomy; MLS: microlaryngoscopic surgery; OC: operative channel; G: grade, R: roughness, B: breathiness; VLS: videolaryngostroboscopy; ENT: Ear Nose and Throat.

Supplementary Material

Supplementary table S1 to S2.

Conflict of Interests

The authors declare that they have no conflict of interest.

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Figure Legends

Figure 1 Legend

Figure 2 Legend

- Table 1
- Table 2
- Table 3
- Figure 1 with legend
- Figure 2 with legend
- Supplementary Material

Table S1

Table S2Figure Legends

Figure 1. Typical images of four different histological types of vocal cord polyps. (A-D) Photographic images of four different histological types of vocal cord polyps. (a-d) Representative images of histologic sections of formalin-fixed, paraffin-embedded vocal cord polyps from four different types. Sections were stained with H&E (40 x). The edematous (A) types of polyps was translucent in appearance clinically. H&E staining of a typical tissue showed polyp surface epithelium covered on the surface of edematous stroma with few cells(a). The gelatinous (B) types of polyps appeared as a translucent gel with basophilic mucous material separates the small astrocytes(b). The vascular type of polyps was angiomatous in appearance (C) with dilated blood vessels, granulation tissue and hemorrhage (c). The fibrous type of polyps was grayish color lusterless fibrous protrusion in appearance (D). H&E staining of a typical tissue showed a cellulose-like substance distributed around vascular space with spindle cells (d).

Figure 2. Clinical Photographs of Surgical Procedure for Vocal Fold Polyps with Electronic Flexible Laryngoscope. A. Vocal fold polyp, a bulge with fusiform pale red appearance on the right side. B. The electronic flexible laryngoscope was inserted through the left nostril. The flexible forceps was opened against the base of the vocal fold polyp on the right side. C. The flexible forceps was reached to the right side of the vocal fold polyp along the edge of the vocal folds, and clamped vertically on the vocal fold polyp. D. The electronic flexible laryngoscope was inserted through the right nostril. The flexible forceps was pressed against the surface of the vocal folds to excise a bulge of tissue on the left vocal fold. E. Bleeding was occurred after bilateral vocal fold polyps excision. A flattened surface of vocal folds was visible. F. One month follow-up version of vocal folds. Two bands of smooth vocal fold were visible in the larynx.

Histological type	N	Sex Male Femal	<i>P</i> Value	Age(years)	<i>P</i> Value	Location Left Right Bilateral	Course(months)	<i>P</i> Value
Edematous polyps	68	28 40	0.657	52.7±11.3	0.827	20 25 12	6.1±2.5	0.268
Gelatinous polyps	19	8 11		51.3±13.1		11 8 0	6.0±2.3	
Vascular polyps	30	12 18		52.0±12.7		13 17 3	6.6±2.7	
Fibrous polyps	42	22 20		50.6±10.9		17 25 2	7.0±2.6	

Table 1. The Clinical Characteristics of 159 patients of Vocal Cord Polyps with Different Histological Types

Table 2. Comparison of Treatment Outcomes between TVFP and MLS Surgical Treatment Groups

Outcome parameters	Edematous 、gelatinous and vascular polyps group(N) TVFP	Edematous 、gelatinous and vascular polyps MLS
GRB		
Normal	42	55
Slight deviance	8	11
Deviance	1	0
VLS		
Normal	43	57
Slight deviance	7	9

Deviance	1	0
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TVFP=transnasal vocal fold polypectomy; MLS= microlaryngoscopic surgery; GRB=grade, roughness and breathiness; VLS=videolaryngostroboscopy.

Table 3. Surgical Complications in 159 Patients with Vocal Cord Polyps

Complication	TVFP	MLS
Loosening and abrasion of the upper incisors	0	7
Congestion and pain in the soft palate and oropharyngeal wall	0	9
Oropharyngeal lateral wall laceration	0	5
Tongue numbness	0	3
Postoperative bleeding	0	0

TVFP=transnasal vocal fold polypectomy; MLS= microlaryngoscopic surgery



