

Office-Based Phonosurgery

Essay Submitted for the Partial Fulfillment of Master Degree in Phoniatics

By

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List of abbreviations

CCD	Charged Coupled Device
MAPLS	Minimal Associated Pathological Lesions
VFI	Vocal fold injection
PDMS	polydimethylsiloxane
CaHA	Calcium hydroxylapatite
FDA	Food and drug administration
VHI	Voice Handicap Index
KTP	potassium- titanyl-phosphate laser
PDL	pulsed-dye laser
CO2	carbon dioxide
YAG	thulium-yttrium-aluminum-garnet
SD	spasmodic dysphonia
EMG	electromyography
TA-LCA	thyroarytenoid-lateral cricoarytenoid muscle complex
PCA	posterior cricoarytenoid muscle
ABSD	abductor spasmodic dysphonia
ADSD	adductor spasmodic dysphonia
PVFM	Paradoxical vocal fold movement
HR	Heart rate
SBP	Systolic blood pressure
DBP	Diastolic blood pressure

• INTRODUCTION

The term phonosurgery refers to any operation designed primarily for the improvement or restoration of voice (**Friedrich et al., 2007**).

Office-based laryngeal surgery is a type of phonosurgery performed at an outpatient office under local anesthesia, with the help of high-resolution fiberoptic stroboscopy, high-quality CCD video camera, and monitor. The surgery was created recently and is emerging as a reliable and practical method of treating a number of laryngeal lesions. This style of minimally invasive surgery became increasingly popular all over the world (**Tai et al., 2003**).

A technological revolution has occurred in Laryngology making lengthy surgical procedures obsolete. Significant advances in flexible endoscopes, Laser delivery systems and topical anesthesia have made it possible to perform surgery and many other office-based laryngeal procedures safely, with excellent results, patient acceptance and cost savings. Since 1960s, laryngological surgery was performed with the patient awake using rigid instruments (**Koufman, 2007**).

When flexible fiberscopes became available in the 1970s, otolaryngologists began to examine the aerodigestive

tract (especially the larynx) of awake, unsedated patients in the office. Diagnostic transnasal flexible laryngoscopy was routinely performed with only topical nasal anesthesia **(Koufman et al., 1996)**

In the last decade, the focus has been on the growth and development of ‘minimally invasive’ (less-invasive) methods for both diagnosis and treatment, particularly targeting costly, high-prevalence diseases. In many cases, it has been the combination of technologies that has resulted in new applications **(Mouadeb and Belafsky 2007; Franco et al., 2003)**

The major advantages of office-based phonosurgery over traditional surgery are avoidance of general anesthesia, allowing real-time assessment of results and voice outcome during the procedure. Lower cost, more efficient use of the patient’s and surgeon’s time, patient satisfaction, and improved outcomes which; make this surgery popular all over the world **(Koufman et al., 2007)**.

Office- based phonosurgery is indicated in

- Management of glottal insufficiency as vocal folds paralysis, vocal folds atrophy and vocal folds scar **(Mallur and Rosen, 2010)**.

- Management of some MAPLS (Minimal Associated Pathological Lesions); such as laryngeal cysts, Reinke's edema and hemorrhagic polyp (**Clyne et al., 2005 and Mallur et al., 2011**).
- Some organic disorders like recurrent respiratory papillomas, vascular lesions, and glottal leukoplakia/dysplasia (**Guo et al., 2003 and Burns et al., 2010**).
- Management of spasmodic dysphonia and vocal tremor (**Shah and Johns, 2013**).

Phonosurgical procedures include the following categories (**Flint and Cummings, 1993 and Kotby, 1995**):

1. Extirpation endolaryngeal phonosurgeries: used to dissect or remove laryngeal lesions from the vocal folds or laryngeal area. These surgeries include:

- Microscopic endolaryngeal phonosurgery (endolaryngeal microsurgery) (**Kleinsasser, 1968**).
- Telescopic video endolaryngeal phonosurgery (**Milanesi and Milanesi, 1990**).
- Fiberoptic (flexible) video endolaryngeal phonosurgery (**Omori et al., 2000**).

- Stroboscopic microscopic endolaryngeal phonosurgery (**Saito et al., 1975**).

2. Laryngeal injection techniques: used for injecting supportive material or chemical agents into the vocal folds.

3. Laryngeal framework phonosurgery: involves surgeries that manipulate the skeletal framework of the larynx in order to change position (horizontal and/or vertical) or the tension (increase or decrease) of the vocal folds. Laryngeal framework surgery has been further categorized by **Isshiki et al. (1989)** into four types based on functional alteration of the vocal folds: medial displacement (type I), lateral displacement (type II), shortening or relaxation (type III) and elongation or tensioning procedures (type IV).

4. Neurophonosurgery: involves surgeries that manipulate the innervation of the larynx aiming at:

- Laryngeal re-innervations: through anastomosing, implanting or transplanting branches of the recurrent laryngeal nerve or nerve-muscle pedicle.
- Laryngeal denervation: through gross sectioning of the branches of the recurrent laryngeal nerve or fine blockage of the neuromuscular nerve endings in the laryngeal muscles.

5. Reconstructive phonosurgery: involves surgeries that aim at restoring the structural and functional integrity of the vocal folds after major insults such as:

- Following laryngeal trauma: aiming at releasing the acquired scar tissue and reconstructing the vocal fold and/or the overall laryngeal structure after a sharp or blunt trauma to the larynx in order to function optimally during phonation.
- Following partial laryngectomy: aiming at creating a fixed mass at the side of the laryngectomy, against which the unaffected vibrating vocal fold, can meet and coapt properly during phonation (**Hirano, 1976**).
- Following total laryngectomy: aiming at creating a new path to re-direct the pulmonary air to a new vibrator (e.g. pharynx or esophagus) in order to create a pseudo voice that the patient can use for communication (**Hirano, 1976**).

Office-based phonosurgery includes:

- Vocal folds injection (hyaluronic acid injection, fat injection, collagen injection etc.) (**Mallur and Rosen, 2010**).
- Surgical management by laser (polyps, cysts, granulomas, papillomas etc.) (**Mallur et al., 2011**)
- Laryngeal biopsies (**Zeitels et al., 2004**).
- Botox therapy (**Shah and Johns, 2013**).

The following are specific factors that should be taken into consideration when deciding whether anesthesia in the office setting is appropriate:

Patient’s mental abilities: Initial screening for office-based injection should begin with assessment of the candidate’s mental ability. A patient should be cooperative, able to follow commands appropriately and should have relatively intact cognition; this excludes very young children and patients with deficits of mental status (**Mathison et al., 2009**).

Patient’s physical and anatomic aspects

The second consideration in screening for office-based surgery should be the physical and anatomic aspects of the candidate. Adequate nasal patency and presence of septal deflections should be assessed, as most office-based surgeries are performed with a larger-caliber working-channel flexible

laryngoscope (**Mathison et al., 2009** and **Young et al., 2012**).

Anxiety

Anxiety should be assessed during the pre procedural visit; however patients who are able to overcome anxiety are more likely to be selected for office-based procedures (**Mathison et al., 2009**).

Gag reflex

A strong gag reflex may not be overcome even after adequate anesthesia, so its evaluation is an important factor (**Young et al., 2012**).

The technique is highly effective, especially for patients who are not candidates for general anesthesia, with proper patient selection; this is a cost-effective surgery of low invasiveness and high applicability. Other advantages include; the ability to target the blood supply while preserving the vibratory structure of the vocal folds, patient requires no postoperative recovery, biopsies may be obtained for cytology or histology, fewer complications (e.g. dental injury), in addition to lower duration and higher magnification of the laryngopharynx (**Koufman, 2007**).

Aim of the work

The aim of this work is to highlight the importance of office- based phonosurgery in the management of different voice disorders in order to focus on using it as an easy outpatient procedure.

VOCAL FOLD INJECTION

(APPROXIMATION LARYNGOPLASTY)

Vocal fold injection is a procedure that has over a 100 year history but was rarely done as short as 20 years ago. An evolution has occurred in vocal fold injection due to new technologies (visualization and materials) and new injection approaches (**Mallur and Rosen, 2010**).

Vocal fold injections classified into: deep vocal fold injection and superficial vocal fold injection

Deep vocal folds injection:

Deep vocal fold injection (VFI) usually used to correct glottal incompetence from various causes. It is most commonly used to manage dysphonia associated with vocal fold immobility or paralysis. Advances in the safety profile of injection materials have broadened the indications to include glottal insufficiency arising from vocal fold hypomobility or paresis, vocal fold atrophy, and vocal fold scar or sulcus vocalis (**Rosen et al., 2009 and Sulica et al., 2010**).