

# Introduction to office-based surgery in laryngology

Jamie A. Koufman

## Purpose of review

To provide an overview and perspective on new developments in office-based surgery in laryngology.

## Recent findings

Transnasal esophagoscopy, unsedated office-based laryngeal laser surgery and, specifically, the technique of topical anesthesia for the latter are emphasized.

## Summary

The confluence of new technology allows many unsedated surgical procedures to be performed in the office with safety. These procedures are profoundly cost-saving; however, economic disincentives deter wide proliferation.

## Keywords

esophagoscopy, esophagus, laryngeal surgery, larynx, laser, office-based surgery

Curr Opin Otolaryngol Head Neck Surg 15:000–000.  
© 2007 Wolters Kluwer Health | Lippincott Williams & Wilkins.

Voice Institute of New York, New York Otolaryngology Group, New York, New York, USA

Correspondence to Jamie A. Koufman, MD, FACS, Director, Voice Institute of New York, New York Otolaryngology Group, 9 West 67th Street, New York, NY 10023, USA  
Tel: +1 212 884 8277; fax: +1 212 724 3489;  
e-mail: Jamie.koufman@voiceinstitute.com

**Current Opinion in Otolaryngology & Head and Neck Surgery** 2007, 15:000–000

© 2007 Wolters Kluwer Health | Lippincott Williams & Wilkins  
1068-9508

## Introduction

A technological revolution has occurred in laryngology rendering many time-honored 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. Unfortunately, reimbursement issues still create financial disincentives to the widespread proliferation of remarkable clinical advancements.

## Perspective on new technology in laryngology

Since the introduction of the rigid, distal-lighted esophagoscope by Chevalier Jackson over 100 years ago, the evolution of endoscopic surgery has generally paralleled advances in illumination, optics and instrumentation. Until the 1960s, most otolaryngologic endoscopy (e.g. laryngoscopy, bronchoscopy, esophagoscopy) was performed with the patient awake using rigid instruments and the techniques described by Jackson.

In the 1960s, use of the operating microscope for laryngeal surgery spawned a new generation of endoscopic instrumentation, including wide-bore laryngoscopes, microlaryngeal instruments, optical telescopes and the carbon dioxide laser with micromanipulator. In addition, general anesthesia that allowed sharing of the airway (e.g. jet ventilation) became safer and more accepted. Most operative (rigid) laryngoscopy and bronchoscopy, as well as esophagoscopy for foreign body removal, were done in the operating room under general anesthesia.

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 (TFL) was routinely performed with only topical nasal anesthesia. Until relatively recently, however, because the optics of TFL were not as good as those provided by the optical telescopic view, the *per oral* examination method remained popular despite the fact that laryngeal biomechanics could not be assessed [1].

Introduced in 1999, the distal-chip camera for aerodigestive endoscopy created a new paradigm and an instrument for transnasal esophagoscopy (TNE) was the first major advance [2,3]. The TNE endoscope offered brilliant illumination and unsurpassed, high-resolution imaging with a working channel, as shown by the largest

## 2 Laryngology and bronchoesophagology

reported series by several pioneers in the field [4]. The 2.0-mm channel permitted air insufflation, suction, and the introduction of small, flexible forceps and laser fibers. Advances in techniques of anesthesia and laser technology (that allowed laser energy to be delivered through a flexible fiber) quickly followed. Since the external diameter of that endoscope was 5.1 mm, most patients could easily tolerate having it passed transnasally. Soon after introduction of the TNE endoscope, a smaller, 4.1-mm external diameter, endoscope without a working channel became available for TFL.

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 expensive, high-prevalence diseases. In many cases, it has been the combination of technologies that has resulted in new applications [5–19,20<sup>\*</sup>]. For the author, more than half of her laryngeal surgery is unседated, office-based, laryngeal laser surgery (UOLS) using several different wavelength lasers alone or in combination [20<sup>\*</sup>]. The advantages of UOLS are shown in Table 1. In addition to cost savings [21<sup>\*\*</sup>], UOLS is generally preferred by most patients to traditional surgery [22].

The emergence of UOLS as a viable technology was made possible by the confluence of three developments: distal-chip quality imaging, efficient anesthesia techniques for UOLS, and the development of several different wavelength lasers and fiber delivery systems.

### **Technique of anesthesia for unседated, office-based, laryngeal laser surgery**

Having a quick and effective anesthesia technique is one of the keys to successful UOLS. When we started out, we really did not know what to do. We were uncertain as to the minimum, let alone the optimum anesthesia that patients needed to comfortably tolerate such procedures. At first, we used the old techniques of Jackson that involved spraying the pharynx with a topical anesthetic, then insertion of xylocaine-soaked cotton balls on curved

instruments into the piriform sinuses, followed by direct spraying of the endolarynx using TFL guidance. This made the anesthesia procedure more difficult and time consuming than the surgery for both the doctor and the patient.

We also had patients breathe nebulized 4% xylocaine for 10–20 min, sometimes in combination with oral diazepam and/or topical throat spray. The nebulization method seemed to give variable levels of anesthesia; it worked well for some patients, but not for others. The next alternative that we tried was performing bilateral superior laryngeal nerve blocks. When this worked really well, the patients coughed excessively because they tended to aspirate their own secretions; when one or both injections did not find their mark, the patient complained of discomfort. Again, this technique seemed too complex and unpredictable for everyday application. Indeed, we tried many combinations of methods before settling on what has become for us the simplest and most predictably effective method. The author mentions all of the above suboptimal methods in the hope of helping new UOLS surgeons avoid our trial-and-error learning curve. What is the technique we now recommend?

First, we spray the nose with an ephedrine and pontocaine solution, and then put a cotton or new-gauze pack in one side of the nose. The author being right handed, with the viewing monitor to her right, routinely uses the right side of the patient's nose unless it is obstructed. The nasal packing is left in for 10–20 min and sometimes the patient will note that his or her incisors feel numb. Adequate nasal anesthesia is important. Actually, when patients occasionally do complain about discomfort during UOLS, it is usually due to nasal pain. By the way, for TNE the above nasal anesthesia is all that is used for the vast majority of patients.

Second, the clinician should explain that the numbing process is quick and painless, but that it is nonetheless unpleasant. We tell them that it is unnatural to have any liquid squirted into the larynx, because it will make them cough and sputter. This is assured as the right response, i.e. the coughing and such disperses the anesthetic. Generally, three or four sprays of 4% xylocaine are needed. The standard TNE scope is 60 cm long and the volume of the working channel is about 3.3 ml. That means if 5.0 ml of anesthetic is squirted through the TNE scope into the endolarynx, approximately 1.7 ml of anesthetic will be delivered; the rest will be suctioned up.

The first squirt is delivered from above the palate, the second is aimed at the epiglottis and valleculae and the third (and fourth) are squirted into the endolarynx. The author recommends having the patient phonate a

**Table 1 Advantages of unседated office-based laryngeal laser surgery**

Unседated: no intravenous or other medication
Patient requires no postoperative recovery
Only topical anesthesia (4% xylocaine spray)
Biopsies may be obtained for cytology or histology
Fewer complications (e.g. dental injury, airway)
Actual operating time is usually minimized
Many procedures are technically easier
Global time and cost savings
Increased patient satisfaction because of:
Patient comfort
Safety (few complications)
Excellent (improved) outcomes
Less lost time from work/family
Fewer out of pocket expenses

sustained vowel and squirt at the end of the breath. That is it; next the clinician can insert a laser fiber and go to work. It is worth noting that the posterior larynx is more difficult to anesthetize and that the patient will complain of discomfort about half of the time when having a vocal process granuloma removed.

### Clinical applications and selection of wavelength laser for unsedated, office-based, laryngeal laser surgery

For decades, the carbon dioxide laser was the workhorse in laryngology. It was used mostly in the operating room with a small spot size for excision of lesions such as papillomas, granulomas, polyps and carcinomas. In recent years, the carbon dioxide laser has been used sparingly for benign disease on the vocal-fold striking zones due to potential scarring. Nevertheless, as a water-absorbing laser, it remains the gold standard for removal of most lesions not involving the free edge.

UOLS had its real origins with the pulsed-dye laser (PDL) [5,9]. At 585 nm, it is primarily absorbed by hemoglobin. UOLS it has been shown to be safe and effective, especially for recurrent respiratory papillomas [12,18,19,20<sup>\*</sup>]. A summary of the author's approach to the laryngeal recurrent respiratory papilloma patient is shown in Table 2. One of the chief advantages of the PDL wavelength is that both sides may be treated at the anterior commissure without significant risk of web formation. In addition, for certain lesions such as polypoid degeneration, it may be the wavelength laser of choice [20<sup>\*</sup>].

A hollow-core carbon dioxide laser fiber was introduced in 2004, and it has great potential application in the vaporization and/or excision of bulky lesions [20<sup>\*</sup>]. The first UOLS case done was that of an elderly woman with extensive and obstructing laryngotracheal papillomas that filled the airway to the carina [20<sup>\*</sup>]. In that case, the PDL was insufficient to maintain the airway and the carbon dioxide laser delivered by UOLS was life saving. Later on, the carbon dioxide laser was used first to remove bulk of the disease, and then the PDL was used after to treat residual epithelial disease.

**Table 2 Management of laryngeal recurrent respiratory papillomas**

First procedure in the operating room for biopsies and complete examination
Follow-up unsedated office-based laryngeal laser surgery in 6–8 weeks for residual recurrent respiratory papillomas (pulsed-dye laser allows aggressive treatment of bilateral anterior disease)
For bulky disease, carbon dioxide or thulium:YAG, followed by pulsed-dye laser
Patient-directed pulsed-dye laser treatment intervals, usually for voice
Adjunctive medications generally not recommended

**Table 3 Author's wavelength selection**

Lesion	Pulsed-dye laser	Carbon dioxide	Thulium: YAG
Recurrent respiratory papilloma	++++	+++	++
Leukoplakia	++++	–	–
Granuloma	+++	+++	++
Laryngeal cyst	–	++	+++
Reinke's edema	++++	–	–
Amyloidosis	–	+	+++
Anterior web	++	+++	++
Hemorrhagic polyp	++	–	–

Table modified from [20<sup>\*</sup>].

Different wavelength lasers have different properties based upon their absorption. The thulium:YAG laser is actually intermediate between the carbon dioxide and the PDL in many ways. We have found it especially useful for the treatment of laryngotracheal amyloid [20<sup>\*</sup>]. The potassium-titanyl-phosphate and the PDL lasers are quite similar in their tissue absorptive characteristics.

Contained within this issue of *Current Opinion in Otolaryngology & Head and Neck Surgery*, there are reported the experiences and opinions of several authors using different wavelengths. These emerging technologies are all part of an evolutionary process; as of this writing, there is no one best laser. The author's current wavelength selections/applications are shown in Table 3.

### Current limitations and future proliferation of unsedated, office-based, laryngeal laser surgery

TNE and UOLS provide bone-fide advances that simultaneously decrease morbidity and cost [4,20<sup>\*</sup>,21<sup>\*\*</sup>,22]. In spite of the rather obvious advantages over traditional surgery for some, not all, applications, these technologies have not proliferated as rapidly as might have been expected. There appear to be two reasons for this. First, there has been some resistance from providers and payers who may have economic interests in maintaining status-quo technology, networks and/or referral patterns, and in some cases the issue is lack of training.

Second, the principal barrier to proliferation is inadequate reimbursement. While marginal profitability can justify making a capital investment, sure economic loss is an overwhelming deterrent. In the face of such economic disincentives, advanced technology like TNE and UOLS will stagnate. Hopefully, those issues will be resolved soon as the potential cost savings to society are tremendous, measured in millions, perhaps billions of dollars.

### Conclusion

The spectrum of laryngological office-based procedures has expanded dramatically in the last decade since the

#### 4 Laryngology and bronchoesophagology

**Table 4 Spectrum of laryngological office-based procedures**

Transnasal esophagoscopy
Placement of tracheoesophageal puncture speaking valves
Panendoscopy for cancer screening
Unsedated office-based laryngeal laser surgery
Therapeutic vocal-fold injection (e.g. augmentation, botulinum toxin)
Laryngeal, tracheal and esophageal dilation
Diagnostics, e.g. electromyography, pH testing, biopsy

advent of the distal-chip camera and new laser technology. These procedures are well tolerated by patients, and at the same time minimize morbidity and are cost saving. In the next generation, each of the advances shown in Table 4 will continue to proliferate.

#### References and recommended reading

Papers of particular interest, published within the annual period of review, have been highlighted as:

- of special interest
- of outstanding interest

Additional references related to this topic can also be found in the Current World Literature section in this issue (pp. 000–000).

- 1 Koufman JA, Radomski TA, Joharji GM, *et al.* Laryngeal biomechanics of the singing voice. *Otolaryngol Head Neck Surg* 1996; 115:527–537.
  - 2 Aviv JE, Takoudes TG, Ma G, Close LG. Office-based esophagoscopy: a preliminary report. *Otolaryngol Head Neck Surg* 2001; 125:170–175.
  - 3 Belafsky PC, Postma GN, Daniel E, Koufman JA. Transnasal esophagoscopy. *Otolaryngol Head Neck Surg* 2001; 125:588–589.
  - 4 Postma GN, Cohen JT, Belafsky PC, *et al.* Transnasal esophagoscopy revisited (over 700 consecutive cases). *Laryngoscope* 2005; 115:321–323.
  - 5 Franco RA Jr, Zeitels SM, Farinelli WA, *et al.* 585-nm pulsed dye laser treatment of glottal dysplasia. *Ann Otol Rhinol Laryngol* 2003; 112:751–758.
  - 6 Hsiung MW, Kang BH, Su WF, *et al.* Clearing microvascular lesions of the true vocal fold with the KTP/532 laser. *Ann Otol Rhinol Laryngol* 2003; 112:534–539.
  - 7 Kanagalingam J, Hurley R, Gran HR, Patel A. A new technique for the management of inaccessible anterior glottic lesions. *J Laryngol Otol* 2003; 117:302–306.
  - 8 Peretti G, Piazza C, Bolzoni A, *et al.* Analysis of recurrences in 322 Tis, T1, or T2 glottic carcinomas treated by carbon dioxide laser. *Ann Otol Rhinol Laryngol* 2004; 113:853–858.
  - 9 Zeitels SM, Franco RA Jr, Dailey SH, *et al.* Office-based treatment of glottal dysplasia and papillomatosis with the 585-nm pulsed dye laser and local anesthesia. *Ann Otol Rhinol Laryngol* 2004; 113:265–276.
  - 10 Halum SL, Butler SG, Koufman JA, Postma GN. Treatment of globus by upper esophageal sphincter injection with botulinum A toxin. *Ear Nose Throat J* 2005; 84:74.
  - 11 Clyne SB, Halum SL, Koufman JA, Postma GN. Pulsed-dye laser (PDL) treatment of laryngeal granulomas. *Ann Otol Rhinol Laryngol* 2005; 114:198–201.
  - 12 Zeitels SM, Akst LM, Burns JA, *et al.* Office-based 532-nm pulsed KTP laser treatment of glottal papillomatosis and dysplasia. *Ann Otol Rhinol Laryngol* 2006; 115:679–685.
  - 13 Zeitels SM, Akst LM, Burns JA, *et al.* Pulsed angiolytic laser treatment of ectasias and varices in singers. *Ann Otol Rhinol Laryngol* 2006; 115:571–580.
  - 14 Basterra J, Zapater E, Moreno R, Hernandez R. Electrosurgical endoscopic cordectomy with microdissection electrodes: a comparative study with CO<sub>2</sub> laser. *J Laryngol Otol* 2006; 120:661–664.
  - 15 Hirano S, Yamashita M, Kitamura M, Takagita S. Photocoagulation of microvascular and hemorrhagic lesions of the vocal fold with the KTP laser. *Ann Otol Rhinol Laryngol* 2006; 115:253–259.
  - 16 Zeitels SM, Burns JA, Akst LM, *et al.* Office-based and microlaryngeal applications of a fiber-based thulium laser. *Ann Otol Rhinol Laryngol* 2006; 115:891–896.
  - 17 Kutter J, Lang F, Monnier P, Pasche P. Transoral laser surgery for pharyngeal and pharyngolaryngeal carcinomas. *Arch Otolaryngol Head Neck Surg* 2007; 133:139–144.
  - 18 Hartnick CJ, Boseley ME, Franco RA Jr, *et al.* Efficacy of treating children with anterior commissure and true vocal fold respiratory papilloma with the 585-nm pulsed-dye laser. *Arch Otolaryngol Head Neck Surg* 2007; 133:127–130.
  - 19 Mouadeb DA, Belafsky PC. In-office laryngeal surgery with the 585-nm pulsed dye laser (PDL). *Otolaryngol Head Neck Surg* 2007; 137:477–481.
  - 20 Koufman JA, Rees CJ, Frazier WD, *et al.* Unsedated office-based laryngeal laser surgery: review of 443 cases using three wavelengths. *Otolaryngol Head Neck Surg* 2007; 137:146–151.
- Huge series with minor complication rate of 0.9% and a discussion of applications of different wavelength lasers.
- 21 Rees CJ, Postma GN, Koufman JA. Cost savings of unsedated office-based laser surgery for laryngeal papillomas. *Ann Otol Rhinol Laryngol* 2007; 116:45–48.
- First paper that attempts to quantify the potential cost savings of this type of office-based surgery
- 22 Rees C, Halum SL, Wijewickrama RC, *et al.* Patient tolerance of in-office pulsed dye laser treatments to the upper aerodigestive tract. *Otolaryngol Head Neck Surg* 2006; 134:1023–1027.

**MOO**

Manuscript No. 162

**Current Opinion in Otolaryngology & Head  
and Neck Surgery**  
**Typeset by Thomson Digital**  
**for Lippincott Williams & Wilkins**

Dear Author,

During the preparation of your manuscript for typesetting, some queries have arisen. These are listed below. Please check your typeset proof carefully and mark any corrections in the margin as neatly as possible or compile them as a separate list. This form should then be returned with your marked proof/list of corrections to the Production Editor.

**QUERIES: to be answered by AUTHOR/EDITOR**

**AUTHOR:** The following queries have arisen during the editing of your manuscript. Please answer the queries by marking the requisite corrections at the appropriate positions in the text.

QUERY NO.	QUERY DETAILS	
	No query.	

