

4.1 Practical Tips for Laser Resection of Laryngeal Cancer

F. Christopher Holsinger^a, N. Scott Howard^a, Andrew McWhorter^b

^aDepartment of Head and Neck Surgery, The University of Texas M.D. Anderson Cancer Center, Houston, Tex., and

^bLSU Voice Center, Department of Otolaryngology – Head and Neck Surgery, Louisiana State University Health Sciences Center, Our Lady of the Lake Hospital, Baton Rouge, La., USA

PEARLS

- Laryngeal mobility is in part determined by muscle infiltration. Arytenoid fixation is predictive of deep invasion of the paraglottic space and is a contraindication for conservation surgery.
- Videostroboscopy and speech therapy assessment of rehabilitative potential are essential. Early speech therapy to prevent arytenoid ankylosis and repeat videostroboscopy to detect subtle hyperplasia, scar tissue, or vocal fold changes that may indicate recurrence should be routinely performed.
- Maintaining one functional cricoarytenoid complex and sensory innervation reduces the risk of postoperative aspiration.

PITFALLS

- Poor exposure is the most common cause of failure.
- Previously irradiated tissues will have edema and submucosal fibrosis and there will be difficulty in differentiating tumor from healthy tissue.
- At the anterior commissure, there is no conus elasticus or perichondrium, which provides a diminished natural barrier to spread. In addition, ossified cartilage has reduced resistance to tumor spread.

Introduction

Strong and Jako [1] first introduced the carbon dioxide laser to the head and neck surgeon in 1972, when they declared that the transoral laser microsurgery was ‘ready for clinical trial’. Steiner and Ambrosch [2] have successfully adapted the fundamental aspects of open procedures to the endoscope with excellent results. The carbon dioxide laser is used because water absorbs this frequency of light (10,600 nm), minimizing collateral damage to nearby structures.

Conservation surgery of laryngeal cancer has excellent 5-year local control rates and good functional outcomes when compared with total laryngectomy, chemoradiation or radiation alone. Compared to open techniques, laser surgical procedures are less invasive, allow for a more rapid return to voice use, and reduce swallowing dysfunction.

Margins vary with the primary site of the tumor. For the glottic larynx, 1–3 mm may be adequate. Larger margins of 5–10 mm are more appropriate in the supraglottis. For patients undergoing TLM after radiation failure, even larger margins of resection should be taken.

Close collaboration intraoperatively with the pathologist is of paramount concern, in order to maintain proper orientation of the specimens. Reconstruction is not typically performed and healing occurs by secondary intention. Granula-

tion tissue forms, followed by contraction and remucosalization with the contracture process helping to eliminate dead space [3].

Practical Tips

- ① Staging operative endoscopy should be performed to determine extent of disease prior to consideration of laser surgery. 0, 30 and 70° endoscopy provides the gold standard assessment of disease extent.
- ② CT or MRI of larynx should be performed to evaluate the extent of primary tumor, any evidence of spread to the preepiglottic or paraglottic space or cartilage invasion.
- ③ Consider a modified barium study/FEES or esophagoscopy if obstructive symptoms exist or if there is interarytenoid or posterior involvement.
- ④ Intraoperatively, the microscope allows for a better view of the surgical field and assessment of dysplastic or neoplastic changes. Intraoperative judgment afforded by this technique enables safe but close margins, while preserving as much normal tissue as possible to optimize functional outcome.
- ⑤ Infusion of saline solution into Reinke's space may allow for improved differentiation of Tis and early invasive disease.
- ⑥ The use of a 'pulsed', rather than a continuous, mode provides better tissue handling properties under microscopic visualization. Short pulses of laser irradiation leave a smaller thermal damage zone, which may lead to faster healing. Pulsed laser settings decrease carbonization and improve the ability of the surgeon to discern tumor from normal mucosa during microsurgery [4].
- ⑦ Anterior commissure lesions may extend down the thyroid cartilage and extend anteriorly through the cricothyroid membrane [5]. An infrapetiolar release and exposure of the superior inner thyroid perichondrium of the thyroid cartilage may be required for proper exposure of this difficult area.

⑧ Assessment of tumor extent following radiation therapy is difficult to evaluate due to fibrosis and edema causing TVC motion abnormalities, changes in imaging characteristics, and difficulty distinguishing between radionecrosis and tumor recurrence.

⑨ For optimal functional and oncologic outcomes in laryngeal cancer, a multidisciplinary team approach is recommended: speech language pathology, radiation therapy, medical oncology, and dental oncology.

Recovery and Follow-Up

Oral diet may generally be resumed on the day after surgery. Wound healing is usually complete after 3–4 weeks. Video strobe assessment is scheduled at 4–6 weeks following surgery. Second-look procedures with excision of scar tissue to evaluate for residual carcinoma rests are performed at 3–6 weeks.

References

- 1 Strong MS, Jako GJ: Laser surgery in the larynx. Early clinical experience with continuous CO2 laser. *Ann Otol Rhinol Laryngol* 1972;81:791–798.
- 2 Steiner W, Ambrosch P: *Endoscopic Laser Surgery of the Upper Aerodigestive Tract – with Special Emphasis on Cancer Surgery*. New York, Thieme, 2000.
- 3 McWhorter AJ, Hoffman HT: Transoral laser microsurgery for laryngeal malignancies. *Curr Probl Cancer* 2005;29:180–189.
- 4 Niemz MH: *Laser-Tissue Interactions: Fundamentals and Applications (Biological and Medical Physics, Biomedical Engineering)*. New York, Springer, 2000.
- 5 Kirchner J: *Atlas on the Surgical Anatomy of Laryngeal Cancer*. San Diego, Singular Publishing, 1998.