The Utility of Second Look Microlaryngoscopy after Trans Oral Laser Resection of Laryngeal Cancer

Ashok M. Shenoy · V. Prashanth · T. Shivakumar · Purushottam Chavan ·
S. Akshay · Rekha V. Kumar · Saraswati Devi

Received: 3 January 2012 / Accepted: 19 January 2012 / Published online: 11 February 2012
© Association of Otolaryngologists of India 2012

Abstract In the past few decades more and more number of tumors of the glottis and supraglottis are been treated with single stage transoral laser microsurgery (TOLS). TOLS for the treatment of glottic and supraglottic carcinoma with anterior commissure (A-com) and/paraglottic space involvement is associated with a high rate of recurrence. We prospectively evaluated the outcomes of laser microsurgery and the impact of second look operation in these patients. Twenty-three patients with glottic and supraglottic carcinoma underwent transoral laser micro resection of the lesions. Subsequently five patients underwent second look microlaryngeal evaluation 6–8 months later for non-satisfactory healing, poor voice, and or suspicion of recurrent disease. Patients with A-com involvement and or paraglottic space involvement were followed up longitudinally for the effectiveness and timing of second look microsurgery. After initial transoral laser micro resection, all patients achieved microscopically clear resection margins. At second look microlaryngeal evaluation, local recurrence was found in four of 23 patients. Of these, two patients were salvaged by second look surgery and are disease free, whereas in two others, the larynx had to be subjected to open surgical intervention. One of two

had extensive local recurrent tumor and underwent total laryngectomy with neck dissection followed by post-operative radiotherapy. Tracheohyoidopexy was done with successful functional and oncologic outcome for another patient who had local recurrence for the third time. Only the patient who underwent total laryngectomy with neck dissection was subjected to adjuvant post-operative radiotherapy. Finally, larynx was saved in 21 out of 23 patients.

Keywords Microlaryngoscopy · Laser surgery · Laryngeal cancer

Introduction

Transoral laser microsurgery (TOLS) is widely replacing open partial laryngeal surgical procedures for early glottic and supraglottic carcinomas [1]. It has a cure rate comparable to open partial procedures as well as to primary radiotherapy [2–5]. Its advantages over other treatment options include minimal morbidity, good functional results, avoidance of tracheostomy, short treatment time, and effective local disease control [6, 7]. Despite these advantages, laser microsurgery is indicated with caution for patients with early glottic carcinoma involving the anterior commissure (A-com) and/paraglottic space, because of the higher local recurrence rates in these conditions [5, 8]. The absence of anatomical barriers and the difficulty in fully exposing the A-com have been identified as factors that lead to incomplete tumor resection and subsequent local recurrence [9]. A clear surgical margin at the primary site is of paramount importance in attaining higher cure rates and locoregional control. It has been well documented in several studies that patients with close or positive resection margins have higher rates of local and locoregional

A. M. Shenoy · V. Prashanth (✉) · T. Shivakumar ·
P. Chavan · S. Akshay
Department of Head and Neck Oncology, Kidwai Memorial
Institute of Oncology, Bangalore, India
e-mail: princeprashanth_2007@rediffmail.com

S. Devi
Department of Anesthesiology, Kidwai Memorial Institute of
Oncology, Bangalore, India

R. V. Kumar
Department of Pathology, Kidwai Memorial Institute of
Oncology, Bangalore, India

recurrences [10]. On the contrary several authors have reported absence of tumor in as much as 30% of the excised specimens after definitive procedure (micro-laryngoscopic or open partial laryngectomy) has been undertaken following diagnostic confirmation of malignancy. Further, Bauer et al. [11] have followed up R1 resections after vertical partial laryngectomy to note recurrence in only 18% (7 of 39). This reflects the low grade histology and efficacy of minimum margins in the realms of 3–4 mm following open partial laryngectomy as well as the recent trend of transtumoral laser microresection in large tumors.

Nevertheless recent reports with TOLS have found that the recurrence rate is higher for patients having A-com involvement than those without A-com involvement [12–14]. Furthermore, the resection of tumors with A-com involvement may result in post-operative scarring, synchiae, web or granuloma formation, and subsequent dysphonia. Patients with A-com involvement therefore require closer surveillance to detect these recurrences or sequelae after A-com resection. Thus, a second look operation may lead to early detection and treatment of local recurrences or other post-operative problems. This study therefore evaluated the efficacy of second—look operations after laser microsurgery in suspicious patients with glottic and supraglottic carcinomas involving the A-com and/paraglottic space.

Patients and Methods

This was a prospective evaluation of 23 untreated patients who initially underwent transoral laser microresection of squamous cell carcinoma of the glottis and supraglottis between 2008 and 2011. Patients with glottic and supraglottic T1, T2, and T3 carcinoma that were deemed to be endoscopically suitable for laser surgery and who subsequently underwent a laser surgical excision of the primary tumor with a curative intent were included. Exclusion criteria were malignancies other than squamous cell carcinoma, simultaneous neck or distant metastasis, previous or simultaneous second primary tumors and previous treatment to the head and neck region with chemotherapy, radiation or surgery. Patients with carcinoma in situ or dysplasia but no invasive carcinoma in the glottis were also excluded.

All patients underwent an initial staging office endoscopy of the oral cavity, larynx and pharynx to facilitate a detailed assessment of the primary tumor stage and to exclude second primaries. Cross-sectional imaging studies were obtained whenever tumor was suspected to be extending laterally into the paraglottic space or involving the A-com. Staging was performed according to the

American Joint Committee on Cancer classification of malignant tumors 2010. The patient's clinical details are shown in Table 1.

Surgical Technique

All patients initially underwent transoral micro resection of glottic or supraglottic carcinomas. If possible, specimens were resected in one piece and oriented anatomically after removal to facilitate adequate histopathological examination of the margins. The CO₂ laser with a 0.3–0.1 mm spot size at powers from 2 to 6 W in a continuous superpulse mode was used in all patients. The depth of infiltration of each lesion was determined and the lesions were removed completely with maximum preservation of the normal vocal fold structures. The vestibular folds or infrahyoid petiole region of the supraglottis were often removed first to allow clear visualization of the A-com lesion and/lateral extent of the tumor. When the lesion was superficial, the epithelium and the lamina propria of the vocal folds and A-com were removed using a stripping procedure. If tumors involved the thyroarytenoid muscle and A-com deeply, the lesions were removed along the inner perichondrium of the thyroid cartilage with the A-com to the upper border of the cricoid cartilage. The resection margins and beds of the tumor were subjected to rigorous pathological examination, and tumors with microscopic positive resection margins were taken up for further resection within 2 weeks to 2 months of preliminary surgery. The extent of the lesion and operative findings were thoroughly documented and grossing with the pathologist ensured correct orientation.

Second Look Operation and Reoperation

Patients were thoroughly followed up for symptoms suspicious of recurrence or any other complaints pertaining to

Table 1

Sl. No.	Parameter		<i>n</i>	Percentage
1	Gender	Male	22	95.5
		Female	1	4.5
2	Age	Mean	65 years	
		Range	40–75 years	
3	Primary tumor site	Glottic	20	85
		Supraglottic	3	15
4	T-stage	pT1	7	30.4
		pT2	12	52.1
		pT3	4	17.3
5	N-stage	pN0	23	100

the larynx with regular office endoscopy and other investigations if needed. Patients with suspicious findings on office endoscopy and/poor voice were subjected to second look microlaryngoscopy under general anesthesia. The intra-operative procedure was followed as in the first operation. Recurrent tumors, granulomas or webs were treated under suspension laryngoscopy simultaneously at the time of second look operation.

Results

A total of 23 patients with early laryngeal cancer underwent transoral laser resection during the study period. The study population consisted of 22 males and one female with a median age of 65 years (range 40–75 years). Twenty patients had glottic tumors whereas three patients had supraglottic lesions. Seven patients were staged as T1 lesions, 12 patients had T2, and four patients had T3 lesions according to TNM staging. Fourteen of 20 patients with glottic tumors had A-com involvement. No patients had lymph node metastasis at the time of presentation.

The type of laser resection done for the patients, categorized according to the European classification is shown in Table 2.

All the patients with type III resection and above were supposed to be having paraglottic extension which mandated resection to the inner perichondrium of thyroid cartilage. All the surgical margins were confirmed by histopathological examination. All patients had R0 resection except one patient with horse shoe shaped lesion of the glottis involving both vocal cords and A-com, who was reported as having moderate dysplasia of the anterior margin. He was kept on close follow up with revision excision and is disease free.

The patients were followed up every 15 days for 2 months, every month for next 3 months and then every 2 months for subsequent follow up. Follow up examinations showed granuloma formation in three patients and synechiae in two patients. The voice was good in 13 patients, acceptable in three patients and was worse in seven patients who had undergone either type III or IV resections.

Table 2

Type of resection	<i>n</i>	Percentage
Type I	2	7
Type II	8	35
Type III	9	40
Type IV	4	18
Total	23	100

Second look microlaryngoscopy was performed in five patients. One patient had only granulation tissue and was treated. A total of four patients had local recurrence of glottic carcinoma 4–8 months after initial surgery. The mean time for detection of recurrence by second look was 6 months. Recurrences of three patients were treated by relaser excision on second look whereas one patient underwent total laryngectomy with neck dissection and received adjuvant radiotherapy. One of three patients who had undergone relaser resection again had recurrence after 3–1/2 months for which tracheohyoidopexy was done whereas the remaining two patients were disease free after second look microlaryngoscopy.

In the final tally, the larynx was preserved in 21 patients with a minimum follow up of 24 months (range 24–36). Recurrence was noted in four patients at second look operation whereas one had gross recurrent disease and lost his larynx and another underwent tracheohyoidopexy. Two other patients were salvaged during second look operation and are disease free. No patient died with disease during the follow up period.

Discussion

After the introduction of micro laryngeal surgical technique by Kleinsasser in 1968 [15] and the CO₂ laser by Strong [15], open procedures and, to a lesser extent radiotherapy, have largely given way to endoscopic techniques in early laryngeal cancers. A transoral resection provides an accurate diagnosis and an effective treatment as a one-stage procedure. If necessary, the treatment can be repeated and does not preclude further therapy. Final histology is the mainstay of deciding completion of surgical resection.

Prior studies have shown that A-com involvement is associated with a higher rate of local recurrence after TOLS. Of these earlier studies [5, 8] one showed that all five patients with T1 glottic carcinomas involving the A-com who underwent endoscopic surgery had tumor recurrence and subsequently underwent salvage surgery and/radiotherapy [5], and the other reported that only four of glottic cancers involving the A-com could be completely resected with laser [8]. This may be due to the lack of anatomical barriers of the A-com ligament and also difficulty encountered in fully exposing the A-com using conventional laryngoscopes [9, 16, 17].

A major concern in TOLS is to obtain safe margins to prevent disease recurrence. Peretti et al. [18], in their study noted that infiltration of the vocalis muscle is one of the significant prognostic factors for disease free survival. Infiltration of the vocalis muscle necessitates more extensive laser resections to obtain a good margin. Heat artifacts

caused by the laser may hinder an adequate histopathological examination of excised margins. Also there is a rare probability that small tumor remnants may be missed in serial sections of margins. So in all suspected cases where the primary resection margin is doubtful, as in cases where tumor involves the A-com or the vocalis muscle, second look microlaryngoscopy under general anesthesia at 3–8 months provides a microscopic re-evaluation of the primary tumor site and to obtain representative tissue samples to facilitate histopathological re-evaluation.

The recurrence of laryngeal cancer after laser microlaryngoscopy may be affected by initial tumor stage. In a study by Pearson et al. [12], of 39 patients with glottic carcinoma with A-com involvement, five patients showed recurrence. Stage wise these were 1/14 T2, 2/12 T3, and 1/4 T4 tumors. In another study, it was seen that T1b or T2b tumors had increased local recurrence rates compared with T1a tumors [13]. In our study, we observed that one patient with T1b, one patient with T2, and two patients with T3 had recurrence. Although, the number of patients in our study was small, our findings together with those of earlier studies suggest that extensive lesions in the A-com may have an increased propensity for recurrence after laser microsurgery [12, 13, 19]. These patients may therefore require careful surveillance for early detection of recurrence after laser microsurgery.

Our study evaluated the effectiveness of second look operation in patients with laryngeal cancer involving the A-com or the paraglottic space. Four local recurrences (17%) were detected in routine second look of five patients over a follow up period of 24 months. Two of them were amenable to relaser microresection, of the other two; one underwent tracheohyoidopexy and the other total laryngectomy with neck dissection followed by EBRT which resulted in successful control of locoregional recurrent disease. In a similar study, 20 of 39 patients with laryngeal cancer involving the A-com underwent elective second look laryngoscopies, with three having residual tumors 2–4 months after initial laser surgery [12]. Of these three patients, two had undergone laser resection and radiotherapy preserving their larynx and the third underwent total laryngectomy. In another study, 25 patients out of 27, who had undergone TOLS, had routine second look operation at 3 months after the operation [20]. Local recurrences were detected in two patients. However, another seven patients were found to have recurrences later. Thus, timing of these second look operation is also important. They are of the opinion that second look should be timed at about 8 months because most of the recurrences occur in between 8 months. The benefit of routine second look in all patients undergoing TOLS also may not be feasible in routine clinical practice. We advise second look only in those patients with suspicious findings on office endoscopy and/

complaints pertaining to the larynx. In all other patients in our study, recurrence was not found during the regular follow up for at least 2 years.

Other advantages of second look operation are in treating the webs, synechiae, and granulomas affecting the airway and also improving vocal function which is one of the worse outcomes of extensive laser resections. Further, it may be oncologically productive as in depth histological examination of the granulations may sometimes reveal malignancies. Additionally, the topical use of antibiotic agents, such as mitomycin C or chitosan may prevent restenosis after lysis of anterior webs [21, 22].

Conclusion

Most earlier studies have shown that laser micro resection is a one time effective treatment modality for early laryngeal cancer, but that it is associated with a high rate of recurrence. These patients should undergo careful surveillance for detection of recurrence. This study addresses the utility of second look operation in tumors with A-com or paraglottic extension which will help detect early local recurrences (17%) and treat post-operative problems affecting the airway or voice (22%).

Acknowledgments The author would like to thank Nanjundappa, Sri Hariprasad, Rajashekar Halkud and Director, Kidwai memorial Institute of oncology, Bangalore.

References

1. Jako GJ (1972) Laser surgery of the vocal cords. *Laryngoscope* 82:2204–2216
2. Steiner W (1993) Results of curative laser microsurgery of laryngeal carcinomas. *Am J Otolaryngol* 14:116–121
3. Ambrosch P (2007) The role of laser microsurgery in the treatment of laryngeal cancer. *Curr Opin Otolaryngol Head Neck Surg* 15:82–88
4. Rosier JF, Gregoire V et al (1998) Comparison of external radiotherapy, laser microsurgery and partial laryngectomy for the treatment of T1N0M0 glottic carcinomas; a retrospective evaluation. *Radiother Oncol* 48:175–183
5. Krespi YP, Meltzer CJ (1989) Laser surgery for vocal cord carcinoma involving the anterior commissure. *Ann Otol Rhinol Laryngol* 98:105–109
6. Motta G, Esposito E, Cassiaano B, Motta S (1997) T1–T2–T3 glottic tumors: fifteen years experience with CO₂ laser. *Acta Otolaryngol Suppl* 527:155–159
7. Press SF, Cramer K, Klussmann JP (2008) Transoral laser surgery for laryngeal cancer: outcome, complications and prognostic factors in 275 patients. *Eur J Surg Oncol* 35(3):235–240
8. Wolfensberger M, Dort JC (1990) Endoscopic laser surgery for early glottic carcinoma: a clinical and experimental study. *Laryngoscope* 100:1100–1105
9. Desloge RB, Zeitels SM (2000) Endolaryngeal microsurgery at the anterior glottal commissure: controversies and observations. *Ann Otol Rhinol Laryngol* 109:385–392

10. Iro H, Waldfahrer F, Steiner W (1998) Transoral laser surgery of supraglottic cancer: follow up of 141 patients. *Arch Otolaryngol Head Neck Surg* 124:1245–1250
11. Bauer WC, Lesinski SG, Ogura JH (1975) The significance of positive margins in hemilaryngectomy specimens. *Laryngoscope* 85:1–13
12. Pearson BW, Salassa JR (2003) Transoral laser microresection for cancer of the larynx involving the anterior commissure. *Laryngoscope* 113:1104–1112
13. Steiner W, Ambrosch P (2004) Impact of anterior commissure involvement on local control of early glottic carcinoma treated by laser micro resection. *Laryngoscope* 114:1485–1491
14. Chone CT, Yonehara E (2007) Importance of anterior commissure in recurrence of early glottic cancer after laser endoscopic resection. *Arch Otolaryngol Head Neck Surg* 133:882–887
15. Strong MS (1975) Laser excision of carcinoma of the larynx. *Laryngoscope* 85:1286–1289
16. Bagetella F, Bignardi L (1981) Morphological study of the laryngeal anterior commissure with regard to spread of cancer. *Acta Otolaryngol* 92:167–171
17. Rucci L, Gammarota L (1996) Carcinoma of the anterior commissure of the larynx: embryological and anatomic considerations. *Ann Otol Rhinol Laryngol* 105:303–308
18. Peretti G et al (2000) Endoscopic CO₂ laser excision for Tis, T1, and T2 glottic carcinomas: cure rate and prognostic factors. *Otolaryngol Head Neck Surg* 123:124–131
19. Rucci L, Gammarota L (1996) Carcinoma of the anterior commissure of the larynx: proposal of a new staging system. *Ann Otol Rhinol Laryngol* 105:391–396
20. Roh J et al (2008) The utility of second look operation after laser microresection of glottic carcinoma involving the anterior commissure. *Laryngoscope* 118:1400–1404
21. Roh JL, Yoon YH (2005) Prevention of anterior glottic stenosis after transoral microresection of glottic lesions involving the anterior commissure with mitomycin C. *Laryngoscope* 115:1055–1059
22. Fang R, Sun J (2007) Comparison between mitomycin C and chitosan for prevention of anterior glottic stenosis after CO₂ laser cordectomy in dogs. *Laryngoscope* 117:2057–2062