ORIGINAL ARTICLE

Transoral Laser Surgery for Early Glottic Cancers

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Objective: To demonstrate the oncologic safety of transoral endoscopic laser surgery in early glottic cancers.

Patients: The study included 107 patients with early glottic cancers. The disease was in situ in 21 (19.6%) and infiltrative in 86 (80.4%), of which 52 (48.6%) were stage T1a, 17 (15.9%) were T1b, 13 (12.1%) were T2, and 4 (3.7%) were TX lesions. One hundred three patients (96.3%) were treated primarily, whereas 4 patients (3.7%) were operated on after radiotherapy failure. Anatomically, 77 lesions (72.0%) involved the anterior or middle third of the vocal cord; 14 lesions (13.1%) involved a single cord and the anterior commissure; 4 "horseshoe" lesions (3.7%) involved both cords and the anterior commissure; 7 lesions (6.5%) involved the posterior third of the cord reaching the vocal process of the arytenoid; and 5 cases (4.7%) involved both cords separately.

Results: There were 17 (15.9%) local recurrences (10 among patients with single cord lesions, 5 among patients with cord and anterior commissure lesions, and 2 among patients with lesions involving both cords), and 1 regional recurrence. One hundred one patients (94.4%) were alive and disease free at a median of 40.7 months. Three patients (2.8%) were alive with disease. One patient (0.9%) died of other causes. Two patients (1.9%) died of a second primary cancer. The overall larynx preservation rate was 92.5%. Recurrence-free survival was 86.6% at 2 years, 84.1% at 5 years, and 78.1% at 10 years.

Conclusion: Transoral laser surgery is an oncologically safe, function-preserving modality for treatment of early glottic cancers.

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IN THE TREATMENT of laryngeal cancer, equal emphasis is laid on maximizing cures and preserving laryngeal function. In early glottic cancers, radiation therapy (RT) and open partial laryngectomy (OPL) achieve these objectives with more or less comparable results; surgery is slightly superior in cure rate,[1-5] but RT achieves better voice quality. The use of OPL also involves a temporary tracheotomy and hospitalization, both of which are drawbacks of this treatment modality.

Transoral endoscopic laryngeal laser surgery (TLS) obviates this disadvantage, since it is performed on an outpatient basis and tracheostomy is not required. Cure rates with TLS are reported to be comparable to those after RT or OPL.[6-8] All of these factors make endoscopic laser resection a useful voice-conserving treatment modality for early glottic cancers. This study was undertaken to evaluate the effectiveness of TLS as a superior treatment of early glottic cancers.

METHODS

Between January 1, 1991, and January 31, 2002, 179 patients with glottic cancers were treated with the carbon dioxide laser at the Tata Memorial Hospital, Mumbai, India. Data from 107 patients with a minimum follow-up of 18 months were analyzed. The disease was in situ in 21 (19.6%) and infiltrative in 86 (80.4%), of which 52 (48.6%) were stage T1a, 17 (15.9%) were T1b, 13 (12.1%) were T2, and 4 (3.7%) were classified as TX lesions. All were clinically node negative. One hundred three patients (96.3%) were treated primarily, while 4 (3.7%) were operated on after failure of RT. All of the patients were treated on an outpatient basis, and none of them required tracheostomy after laser excision.

Anatomically, there were 77 lesions (72.0%) involving the anterior or middle third of the vocal cord, 14 lesions (13.1%) involving a single cord and anterior commissure, 4 "horseshoe" lesions (3.7%) involving both cords and anterior commissure, 7 lesions (6.5%) involving the posterior third of the cord reaching the vocal process of the arytenoid, and 5 cases (4.7%) involving both the cords separately.

RESULTS

There were 18 recurrences: 17 local (15.9%), of which 15 were salvaged, and 1 regional (0.9%), which was salvaged. Five patients (4.7%) developed second primary cancers: 4 occurred on the opposite cord (1 was salvaged with repeat laser treatment, 1 with repeat laser and RT, 1 with total laryngectomy, while 1 patient refused salvage treatment and later died), and 1 patient developed esophageal cancer and died of it (**Table**).

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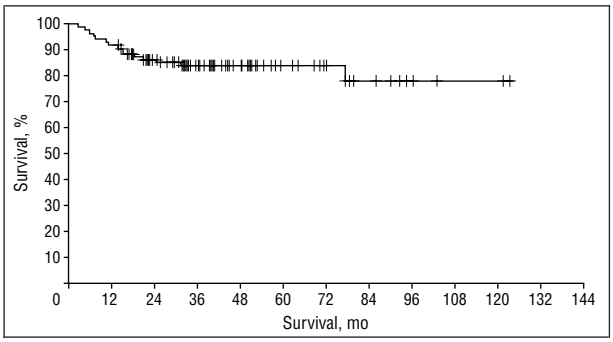
Results of Transoral Laser Surgery in 107 Patients*

Result	No. (%)	Salvage		
		Yes	No	Unknown
Recurrence				
Local	17 (15.9)	15	0	2
Regional	1 (0.9)	1	0	0
Second primary cancer				
Opposite cords	4 (3.7)	3	1	0
Esophagus	1 (0.9)	0	1	0
Current status				
Alive, disease free	101 (94.4)			
Alive with disease	3 (2.8)			
Died of other cause	1 (0.9)			
Died of second primary cancer	2 (1.9)			

*The larynx preservation rate was 92.5%.



Recurrence-free survival in early glottic cancers (N=107).

Of the 77 patients with single-cord lesions, 10 (13.0%) developed local recurrence. Among 14 patients with cord and anterior commissure lesions, 5 (35.7%) developed local recurrence. Of the 5 patients with lesions involving both cords, 2 (40.0%) developed local recurrence.

One hundred one patients (94.4%) were alive and disease free at a median follow-up of 40.7 months (range, 18-124 months). Three patients (2.8%) were alive with disease, 1 patient (0.9%) died of another cause, and 2 patients (1.9%) died of a second primary cancer. The overall larynx preservation rate was 92.5% (Table). The actuarial recurrence-free survival analysis by the Kaplan-Meier method showed a survival of 86.6% at 2 years, 84.1% at 5 years, and 78.1% at 10 years (**Figure**).

COMMENT

Early glottic disease encompasses lesions ranging from carcinoma in situ to T2 lesions with normal cord mobility. Traditionally, treatment for these lesions would be either RT or OPL, depending on various factors such as the type of tumor, location within the glottis, age and vocation of the patient, availability of technology and instrumentation, and the philosophy of the treating physician. The ideal treatment modality for early glottic cancers would be one that offers high cure rates and good voice quality, is single staged, does not require hospitalization, and most important for the patient, does not necessitate a tracheostomy—even a temporary one.

Radiotherapy offers good local control rates in Tis, T1a, and T1b lesions,[9-13] ranging from 86% to 98%. In T2 lesions, most investigators have reported reduced control rates[9,11-13] ranging from 68% to 73%. Thus, the promise of good control rate with organ preservation does not hold true with RT, as the laryngeal preservation rates in the series mentioned ranged from 95% to 98% in Tis to T1 lesions, but dropped to 76% in T2 lesions. Morbidity associated with the prolonged duration of the treatment (6-7 weeks), mucosal radiation reaction, and long-term side effects such as xerostomia are also deterrents for selecting RT as the treatment of choice. Also, anterior commissure involvement,[14,15] restricted cord mobility,[16-18] and large tumor volume[19] respond poorly to RT. Voice quality after RT is nearly normal, and that is often the basis for preference of RT in early glottic cancers. However, some investigators have shown that the voice does not return to normal after RT and is perceptually different.[20-22] Finally, the surgical salvage rate for postradiation failure is in the range of 50% to 80%.[23]

Open partial laryngectomy has a proven role in local control of early glottic cancers, with local control rates in the range of 91% to 98% for T1 and 84% to 86% for T2 lesions.[2-4] These are better than local control rates with RT, especially for lesions involving the anterior commissure[3,24] and those with impaired cord mobility.[17] After OPL, because of the manipulation of the laryngeal skeleton, there is postoperative pain and edema and a temporary tracheostomy is necessary. Both are deterrents to selecting this treatment modality. Voice quality after OPL is audible and coherent but is definitely inferior to postradiation voice quality. Salvage is possible after local recurrence in more than 70% of patients[25] with total laryngectomy or RT.

With the advent of the laser beam coupled with the microscope, treatment of squamous cell carcinomas of the vocal cord has been revolutionized. The magnified view through the microscope and the precision of the laser beam allows the resection to be carried out with narrow margins, thus conserving useful paraglottic tissue including the vocalis muscle in carcinoma in situ. The resection is relatively bloodless and requires no hospitalization and no tracheostomy. The voice quality after TLS is definitely superior to that after OPL and, although inferior to that after RT, is nevertheless good.[26-28]

CONTROL RATES

In our series, among the Tis cases, there were 3 local recurrences (14.3%). All were salvaged: 1 with OPL, 1 with total laryngectomy, and 1 with repeat laser.

Among the T1a cases, there were 5 local recurrences (9.6%), of which 1 was salvaged with OPL and 3 with total laryngectomy; 1 patient opted for RT for salvage and thereafter was lost to follow-up. In the T1b group, there were 6 local recurrences (35.3%), of which 3 were salvaged with repeat laser and 2 with total laryngectomy; 1 patient opted for RT for salvage and later stopped coming for follow-up. One regional recurrence was salvaged with neck dissection and postoperative RT. Thus, the local control rate in Tis, T1a, and T1b lesions was 84.5% with a larynx preser-

vation rate of 93.4%, which is comparable to conventional modalities and findings of other investigators.[6,29-31]

Among the T2 cases, there were 3 local recurrences (23.1%), of which 1 was salvaged with OPL, 1 with near-total laryngectomy, and 1 with total laryngectomy. The local control rate in T2 lesions was 72.9% with a larynx preservation rate of 92.3%, which is as effective as conventional modalities and comparable to findings of other investigators.[7]

ACCESSIBILITY

Being an endoscopic procedure, TLS is hindered by narrow access and, at times, inadequate exposure. The anterior commissure is not easily accessible and, hence, oncologic safety may be compromised.[32,33]

In our study, there were 14 cases (13.1%) of vocal cord lesion with anterior commissure involvement and 4 cases (3.7%) of horseshoe lesions with involvement of the anterior commissure and anterior ends of both cords. Among the horseshoe lesions, there were no local recurrences, while there were 5 local recurrences (35.7%) among the vocal cord lesions with anterior commissure involvement. Three of these recurrences were salvaged with total laryngectomy and 1 with repeat laser, while one was lost to follow-up after the patient opted for RT as salvage.

In addition to the fact that the area of the anterior commissure is not easily accessible endoscopically, anterior commissure lesions are often understaged; the involvement of the thyroid cartilage is often missed or misjudged, with the result that a true T4 lesion may be treated as T2 with consequently poor results. Many workers, therefore, do not recommend the use of endoscopic laser surgery for lesions of the anterior commissure.

While cautioning against the use of TLS for anterior commissure tumors, Rebeiz et al[34] described a combined endoscopic and open technique called the "window partial laryngectomy" for tumors at this site, which seems a viable alternative. Thus, glottic lesions with anterior commissure involvement merit careful clinical and radiologic evaluation before TLS is considered as a treatment option.

CONCLUSIONS

Transoral endoscopic laser surgery is an oncologically sound, voice-conserving treatment modality. It has the added advantage that it requires no hospitalization and no tracheostomy. Voice quality after laser resection is slightly inferior to that after RT, but definitely superior to that after a vertical partial laryngectomy or a laryngofissure with cordectomy. Cure rates are comparable to those after RT or OPL. Caution should be exercised in resecting lesions of the anterior commissure. These should be subjected to endoscopic laser surgery only when the exposure is adequate and the tumor is not infiltrative.

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