

Transoral laser microsurgery outcomes with early glottic cancer: the Dalhousie University experience

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Abstract

Objective: To report the results of transoral laser microsurgery for the treatment of early glottic cancer at our institution.

Design: Cohort study. Retrospective review of charts of patients diagnosed with tumour stage 1 or 2 (early stage; no nodes or metastases), previously untreated, primary glottic cancer, treated with transoral laser microsurgery at the Queen Elizabeth II Health Sciences Centre, Halifax, Nova Scotia, Canada. The minimum follow-up period was two years.

Setting: Tertiary care head and neck cancer centre.

Participants: Fifty-three patients treated between January 2002 and November 2007.

Outcome measure: Kaplan–Meier survival analysis for disease-free survival, overall survival and laryngectomy-free survival, at five years.

Results: The group comprised 46 men and seven women, with a mean age of 66 years (range 30–84 years). Mean follow up was 40 months (range 12–89 months). There were four cases of complications (7.5 per cent). Kaplan–Meier survival analysis revealed a five-year disease-free survival (including salvage) of 96.2 per cent, a five-year overall survival (all causes) of 88.8 per cent and a five-year laryngectomy-free survival of 98.1 per cent.

Conclusion: Transoral laser microsurgery is a safe and effective initial treatment for early laryngeal cancer, and has high rates of laryngeal preservation and disease-free survival.

Key words: Laryngeal Neoplasms; Carcinoma; Lasers; Surgery

Introduction

Due to increasing experience, endoscopic transoral laser microsurgery of early glottic cancer has become established as a safe and effective management option. Patients given impartial information about both radiotherapy (RT) and transoral laser microsurgery have been found to prefer laser treatment.¹ There exists a perception that survival rates are the same for both RT and laser resection, but that voice outcomes are better with RT. However, a growing body of evidence suggests that transoral laser microsurgery has equally good voice outcomes.

In January 2002, the head and neck unit at the Queen Elizabeth II Health Sciences Centre, Halifax, Nova Scotia, Canada, began to offer transoral laser microsurgery to all patients with early stage glottic cancer. This study expands upon preliminary data previously published, to include a larger cohort of patients.

Methods

Between January 2002 and November 2007, our centre used transoral laser microsurgery to treat patients with a diagnosis of early stage (i.e. American Joint Committee

on Cancer (AJCC) tumour (T) node (N) metastasis (M) stage T₁ N₀ M₀ or T₂ N₀ M₀), previously untreated, primary glottic cancer. All procedures were performed by a single surgeon (SMT) in the Division of Otolaryngology Head and Neck Surgery at the Queen Elizabeth II Health Sciences Centre. Prior to definitive surgery, all patients were discussed at regular Head and Neck Oncology Tumour Board multidisciplinary rounds.

In all cases, resection was performed using a Sharplan (Tel Aviv, Israel) CO₂ laser with a power setting of 2–8 W, used in superpulse mode on a continuous setting with a variable spot size. The laser was coupled to an Acuspot micromanipulator (Sharplan). In small T_{1a} cases, the tumour was resected en bloc whenever possible; however, it was frequently necessary to utilise a tumour-splitting approach and to resect the tumour piecemeal. All T₂ tumours were resected using a tumour-splitting approach.

Patients were followed in the head and neck oncology clinic at the Queen Elizabeth II Health Sciences Centre, according to a surveillance protocol. Patients were seen approximately one month following surgery, and then three-monthly for the first year, four-monthly for the

second year, six-monthly for the third to the fifth year, and yearly thereafter. For each patient, a minimum of five years' follow up was planned. Follow up involved clinical enquiry regarding speech, swallowing and respiratory morbidity, as well as clinical examination including neck palpation and flexible laryngoscopy.

All patients were asked to participate in voice studies, which were administered initially by a speech language pathologist and later by a nurse trained specifically to administer the tests. The schedule for voice testing was one test at the pre-operative consultation, one test three months post-operatively and one test 12 months post-operatively. All vocal data were collected prospectively submitted for publication, and have been reported elsewhere.

Collected data included patient demographics, surgical dates, and recorded progress and survival, as recorded in the clinical record. Data were entered into a database (Microsoft Access) and exported to a spreadsheet (Microsoft Excel) for analysis. Further statistical analysis was performed using the PASW 18 software program (SPSS Inc, Chicago, Illinois, USA).

Ethical considerations

The Research Ethics Board granted approval for the study of patient outcomes, prior to the creation of the patient data collection database. No additional patient visits or investigations were required to support this study.

Results

Within the study period, a total of 54 patients were treated with transoral laser microsurgery for early

glottic cancer at our centre. One patient was lost to follow up as they emigrated in the first post-operative year; therefore, results for 53 patients are presented. Patients comprised 46 men and seven women, with a mean age of 66 years (range 30–84 years). Thirty-one patients were staged as T₁ (27 T_{1a} and five T_{1b}) and 22 as T₂. Table I describes patient demographics by tumour stage. The mean follow-up time was 40 months (range 12–88 months). Twenty tumours were located in the left vocal fold and 31 in the right vocal fold; two were bilateral (both were stage T₂).

Four patients suffered complications (7.5 per cent). One T₁ patient developed post-operative respiratory distress requiring re-intubation, but was later successfully extubated the following day. One T₂ patient suffered a significant, delayed (day 7) post-operative haemorrhage requiring emergency tracheostomy and admission to the intensive care unit, as part of a 27-day hospital stay (no other patient in the study group required a tracheostomy). One patient suffered post-operative surgical emphysema which resolved with conservative management. The final patient complication was a day 5 post-operative myocardial infarction requiring coronary artery bypass grafting.

All patients were able to tolerate a normal diet on the day following surgery, and none required a nasogastric tube.

At the time of writing (November 2009), follow-up data collection had identified four cases of second primaries and seven cases of recurrence.

There were two laryngeal second primaries in our cohort of patients. Both of these laryngeal second primaries occurred more than five years after the initial

TABLE I
RESULTS AND DEMOGRAPHICS BY TUMOUR STAGE

Parameter	T ₁	T ₂
Patients (<i>n</i>)	31	22
Men:women (<i>n</i>)	26:5	20:2
Early:late stage (<i>n</i>)	31:0	22:0
Study period	5 y 6 mth*	5 y [†]
Follow-up range (mean; mth)	12–89 (40)	13–67 (41)
Side (L:R:bilat; <i>n</i>)	12:19:0	8:12:2
Trache:no trache (<i>n</i>)	0:31	1:21
Complications (<i>n</i>)	1 (post-op respiratory distress requiring re-intubation)	3 (2 serious (9%))
Adjuvant RT (<i>n</i> (%))	0/31 (0)	2/21 (8.7)
Recurrence (none:local:regional; <i>n</i>)	29:3:0 (1 contralateral 2nd primary, 2 2nd recurrences)	17:2:4 (1 local recurrence actually persistent disease)
Time to recurrence (mean; mth)	912 (10.5)	2–9 (7.4)
Salvage	1 RT then TL for 2nd recurrence 1 Endoscopic supracricoid resection with laser 1 Endoscopic resection; 2nd primary unfit for further surgery so RT	1 TL (poorly differentiated SCC with spindle cell & sarcomatoid differentiation) 2 ND + RT 1 ND + chemoRT 1 ND + palliative RT 1 Further endoscopic laser resection
Alive:dead at 5 y (<i>n</i>)	30:1 (oesophageal Ca)	19:3 (2 from disease, 1 from lung 2nd primary)
Disease-free:diseased (<i>n</i>)	31:0	20:2
Voice (normal:hoarse:laryngectomy; <i>n</i>)	23:7:1 (2 noted vocal fatigue with use)	12:9:1

*1 Jan '02 to 7 June '07; [†]1 Jan '03 to 13 Nov '07. T₁ = tumour stage 1; T₂ = tumour stage 2; y = years; mth = months; L = left; R = right; bilat = bilateral; trache = tracheostomy; post-op = post-operative; RT = radiotherapy; TL = total laryngectomy; SCC = squamous cell carcinoma; ND = neck dissection; Ca = cancer

transoral laser microsurgery procedure. The other two cases of second primaries were of lung and oesophageal origin.

There were seven recurrences in our 53 study group patients. Two of these were T₁ cases and the remaining five were T₂ cases. Both the T₁ cases recurred locally whereas only one of the T₂ recurrences was local, the remaining four being regional.

At five years, the local control rate (without salvage) was 93.8 per cent and the disease-free survival rate (without salvage) was 87.6 per cent. The disease-free survival rate for T₁ cases was 95.6 per cent, compared with 90.6 per cent for the T₂ group.

The mean time to recurrence was 10 months (range two to 21 months). Of the T₁ cases that recurred, one had a further endoscopic resection performed endoscopically (which on completion equated to supracricoid laryngectomy), followed by adjuvant RT; the other had RT but recurred again and went on to require total laryngectomy. The one case of T₂ tumour with local recurrence was noted two months post-operatively; the surgical margins had been noted to be clear but the tumour was an aggressive subtype (a poorly differentiated squamous cell carcinoma with spindle cell and sarcomatoid differentiation). This patient went on to undergo total laryngectomy, offered after he failed RT administered as the primary salvage modality. The remaining T₂ recurrences were all regional; all underwent neck dissection with adjuvant therapy (RT in two patients, chemoradiotherapy in one and palliative RT in one).

At last chart review (November 2009), four patients had died: two from their active disease (distant metastases), one from oesophageal cancer and one from a lung second primary.

Kaplan–Meier survival analysis with censoring was performed for disease-free survival including salvage

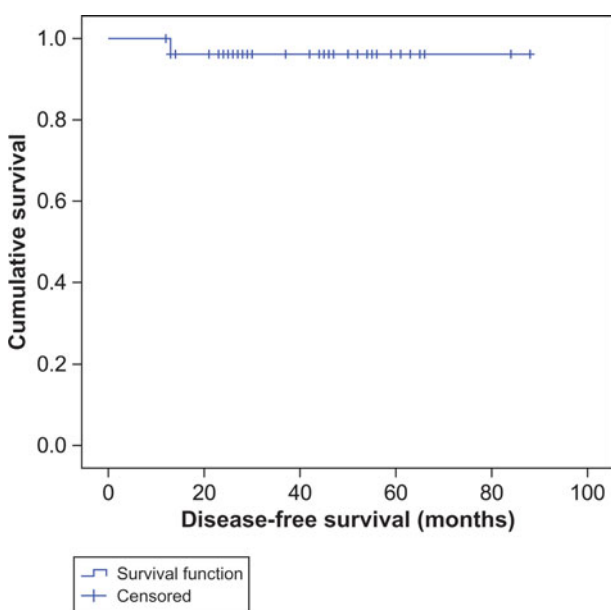


FIG. 1

Disease-free survival, including salvage.

(Figure 1), giving a rate of 96.2 per cent at both 18 months and five years. The overall survival from all causes of death was 93.5 per cent at 18 months and 88.8 per cent at five years (Figure 2). Finally, the laryngectomy-free survival rate was 98.1 per cent at both 18 months and five years (Figure 3).

Discussion

Comparison with other studies

There is general agreement that the recommendations for treatment of early glottic cancer should follow a laryngeal-preserving strategy.² The three main treatments are transoral laser microsurgery, external beam RT and open partial surgery. A Cochrane review of the published data on the effectiveness of these three treatments was unable to definitively recommend any one of the three.³ Published local control rates at five years range from 78 to 94 per cent for T₁ patients⁴ and from 47 to 91 per cent for T₂ patients,^{5,6} with laryngeal preservation rates of 93–100 per cent for T₁ patients and 76–93 per cent for T₂ patients.⁶ Our projected five-year survival rate is in keeping with the upper end of these results. It has recently been suggested that, for patients with T_{1a} tumours, transoral laser microsurgery is superior to RT in terms of disease-free survival, length of time to recurrence⁷ and laryngeal preservation rate.⁸ In our own centre, previously published results for RT⁹ revealed a local control rate (before salvage) of 71 per cent for T₁ cases and 63.3 per cent for T₂ cases, which is much lower than our rate of 83.5 per cent for both stages combined.

Of the three main early glottic cancer treatments listed above, recent years have seen a decline in the use of open partial surgery,¹⁰ possibly correlated with the expansion in availability of transoral laser

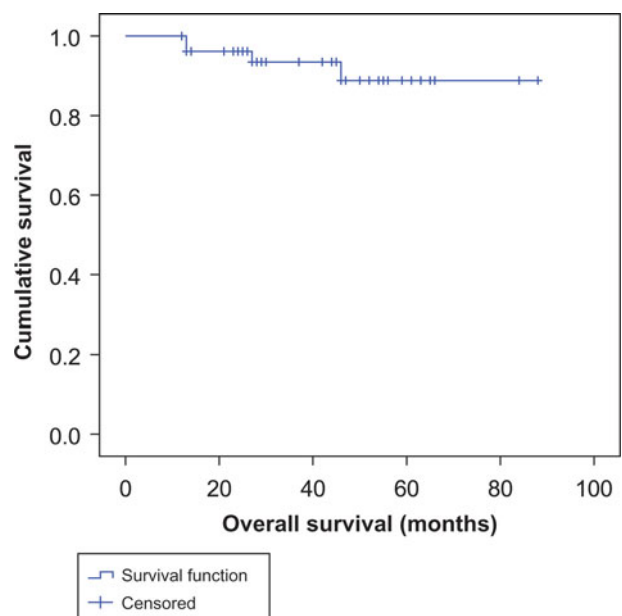


FIG. 2

Overall survival from all causes of death.

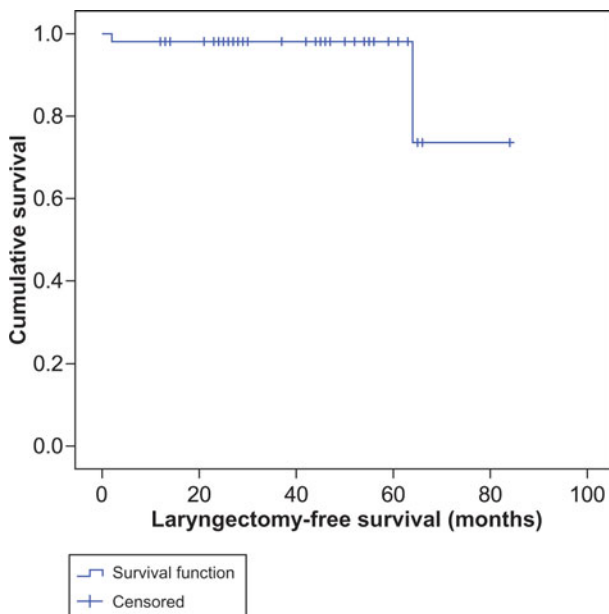


FIG. 3
Laryngectomy-free survival.

microsurgery. Patients have also expressed a preference for transoral laser microsurgery over RT, due to the shorter duration of treatment. In our institution, all patients in this group are offered the choice of RT or transoral laser microsurgery; however, since 2002 no patient has opted for RT.¹¹

A perception of better vocal outcomes has often been used to justify a preference for RT treatment. Assuming similar control rates, this would indeed be a discriminating factor. However, although evidence is sparse, a meta-analysis of published case series has suggested that there is no significant difference in vocal outcomes, comparing RT and transoral laser microsurgery for early glottic cancer; on the other hand, vocal outcomes following partial open surgery are worse.¹²

- This retrospective study analysed 53 cases of early glottic laryngeal carcinoma (tumour stages 1 and 2) treated with transoral laser microsurgery
- At five years, disease-free survival (including salvage) was 96.2 per cent, overall survival (all causes) was 88.8 per cent and laryngectomy-free survival was 98.1 per cent
- Transoral laser microsurgery is a safe and effective initial treatment for early laryngeal cancer, with high disease-free survival and laryngeal preservation rates

Conclusion

This study provides further evidence that transoral laser microsurgery is a safe, effective option for the

treatment of early glottic cancer. Treatment can be repeated if there is residual or recurrent disease, and the option for further, more radical surgery or RT is still available if needed for salvage. Furthermore, there is minimal morbidity and a high laryngeal preservation rate, and patients have demonstrated an overwhelming preference for this option over RT. Thus, transoral laser microsurgery will remain the treatment of choice for patients with early glottic cancer in our centre.

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Mr S Lester takes responsibility for the integrity of the content of the paper

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