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MAIN ARTICLE

Outcomes of transoral laser microsurgery for recurrent head and neck cancer

L F REYNOLDS, M H RIGBY, J TRITES, R HART, S M TAYLOR

Division of Otolaryngology-Head and Neck Surgery, Dalhousie University, Halifax, Nova Scotia, Canada

Abstract

Objective: To report our outcomes with salvage CO_2 laser surgery following recurrence of laryngeal and oropharyngeal cancer after radiotherapy.

Method: This study entailed a prospective review of patients treated with transoral laser microsurgery for recurrent laryngeal and oropharyngeal cancer between 2002 and 2010 at the Queen Elizabeth II Health Science Centre in Canada.

Results: Sixteen patients were identified, with a mean follow up of 30.6 months. Five patients died of recurrence. Complications were common in patients with oropharyngeal cancer. The overall survival and disease-free survival rates at an average of 29.8 months follow up were 50 per cent and 68.8 per cent respectively.

Conclusion: Salvage surgery using transoral laser microsurgery should be considered in the management of patients with recurrent laryngeal and oropharyngeal cancer. This technique offers acceptable salvage rates with less comorbidity than other treatments.

Key words: Neoplasm Recurrence, Local; Carcinoma; Tonsil; Tongue; Larynx; Chemotherapy; Radiotherapy

Introduction

Current management strategies for laryngopharyngeal cancer include open surgery, transoral laser microsurgery and chemoradiotherapy. Outcomes of these treatments are comparable in terms of survival, but vary with respect to treatment-related morbidities and cost.[1–4] The local control rates for the treatment of glottic cancer in patients with primary T_1 and T_2 stage tumours have been reported to be as high as 92 per cent and 88 per cent with one treatment using transoral laser microsurgery or radiotherapy respectively.[5,6] The advantages of performing transoral laser microsurgery over radiotherapy are: decreasing length of treatment and hospital stay, resulting in decreased cost;[1,6,7] and specific targeting of pathology, resulting in fewer side effects and improved surveillance due to a very short period of swelling and erythema.[8]

The positive oncological and functional outcomes that have been observed following transoral laser microsurgery in early glottic cancer cases (in patients with T_1 and T_2 stage tumours) suggest that this is an effective primary treatment.[9] However, it is less clear whether this is the best treatment option for the management of recurrent laryngopharyngeal cancers following radiotherapy failure. Open surgery has acceptable survival outcomes but is associated with a long hospital stay, functional outcome deficits, and morbidity associated with long-term tracheostomy and gastrostomy requirements.

This article aimed to review the outcomes of patients with recurrent laryngopharyngeal cancer who underwent surgical salvage with transoral laser microsurgery at our centre following radiotherapy failure.

Materials and methods

Patients

In our centre, patients who develop recurrence of laryngopharyngeal cancer following chemoradiotherapy are given the option of transoral laser microsurgery as a curative treatment. The criteria for offering curative transoral laser microsurgery include recurrent laryngeal tumours that are radiologically staged as T_3 or less. Selected patients with recurrent oropharyngeal cancer are also offered salvage transoral laser microsurgery based on the lack of pericarotid involvement.

The study comprised patients for whom primary treatment for laryngeal and oropharyngeal cancer with radiotherapy or chemoradiotherapy failed, and who subsequently underwent transoral (CO_2) laser microsurgery between January 2002 and January 2010. A total of 16 patients (12 males, 4 females), with a mean age of 65.2 years (range 49–82 years), were identified.

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Patients with tumour–node–metastasis (TNM) staging of $T_1N_0M_0$ or $T_2N_0M_0$ glottic cancer received only radiation, while all other patients in this study received chemoradiation therapy. Data on these patients were prospectively collected from an electronic database. All patients for whom chemoradiotherapy failed were assessed using endoscopy and imaging techniques (computed tomography, magnetic resonance imaging and positron emission tomography) in order to determine the extent of disease, metastasis and staging. Cancer staging was based on the post-operative surgical pathology report in line with the 2002 American Joint Committee on Cancer TNM staging system.

Treatment

All operations were performed by the senior author (SMT) within the Division of Otolaryngology-Head and Neck Surgery at our institution. The surgical procedures were carried out using a Sharplan CO_2 laser (Tel Aviv, Israel). Resection was performed using a CO_2 laser coupled with an Acuspot micromanipulator (Sharplan, Tel Aviv, Israel) at a power setting of 2–6 watts, in a continuous super-pulse mode, with a variable spot size. A tumour splitting approach was used in all cases. All tonsil resections were taken down through the superior constrictor into the parapharyngeal fat pad.

Follow up

All patients were followed up in the head and neck oncology clinic at the Queen Elizabeth Health Science Centre, in Halifax, Canada. The standard protocol for follow up entails an initial appointment within the first month after surgery, followed by three-monthly visits for the first year, four-monthly visits for the second year, six-monthly visits up to five years and yearly thereafter. All patients received a full head and neck examination, and flexible nasopharyngoscopy on follow-up visits, in order to check for any signs of local or regional recurrence. Patients were also asked routine questions regarding functional morbidities associated with swallowing and speech, and responses were documented in charts.

Outcome measures

A descriptive analysis of outcomes was conducted. The end points analysed were: resumption of oral intake, complications, locoregional control (defined as a second recurrence occurring after the completion of the initial salvage surgery), recurrence-free survival and overall survival.

Results

A total of 16 patients were identified, of which 10 patients had recurrent laryngeal cancer, 4 had recurrent tongue base cancer and 2 had recurrent tonsillar cancer. All of the recurrent tumour cases included in the study were radiologically staged between $T_1N_0M_0$ and $T_3N_{2b}M_0$ (Table I). At the time of the initial salvage transoral laser microsurgery, three patients underwent unilateral neck dissection and one patient underwent bilateral neck dissection. Mean follow-up time was 30.6 months (standard deviation of 29.5). Three patients in the laryngeal cohort developed locoregional recurrence and three of the six patients that had recurrent oropharynx cancer developed locoregional recurrence.

Although the disease process for cancers of the aero-digestive track may be different, the overall survival and disease-free survival rates for all patients in this study, at an average of 29.8 months of follow up (median of 17.5 months), were 50 per cent and 68.8 per cent respectively. The respective survival and

TABLE I
PATIENT DATA

Pt no	Tumour site	Sex, age (y)	Stage	ELS	Temp G tube?	Temp trach?	Recurrence?	FU (mth)	Cause of death
1	Supraglottic	F, 49	$rT_3N_0M_0$	IVb	Y*	N	Local	56	–
2	Supraglottic	M, 60	$rT_3N_0M_0$	IVb	Y*	N	N	6	–
3	Supraglottic	M, 82	$rT_3N_0M_0$	IIIb	Y*	N	N	15	–
4	Supraglottic	M, 81	$rT_2N_1M_0$	IVb	N	N	N	3	Small cell ca
5	Supraglottic	F, 68	$rT_2N_{2c}M_0$	IIIb	N	N	N	5	–
6	Glottic	M, 60	$rT_2N_0M_0$	Vc	N	N	Local	24	Recurrence + mets
7	Glottic	F, 73	$rT_2N_0M_0$	Vb	N	Y*	N	40	–
8	Glottic	M, 52	$rT_2N_0M_0$	IV	N	N	N	18	–
9	Glottic	M, 80	$rT_1N_0M_0$	III	N	N	N	8	Small cell ca
10	Glottic	M, 71	$rT_3N_0M_0$	Vd	Y*	Y	Locoregional	50	Recurrence + mets
11	Tongue base	M, 67	$rT_2N_0M_0$		Y	Y	N	63	COPD
12	Tongue base	M, 55	$rT_2N_0M_0$	–	N	Y	N	75	–
13	Tongue base	M, 61	$rT_3N_{2b}M_0$	–	Y	Y	Local	17	Recurrence + mets
14	Tongue base	M, 56	$rT_3N_0M_0$	–	Y	N	Local	6	Recurrence
15	Tonsil	M, 67	$rT_1N_{2a}M_0$	–	N	Y	Regional	6	Recurrence
16	Tonsil	F, 61	$rT_2N_0M_0$	–	Y	Y	N	98	–

*Indicates placement for greater than four months. Pt no = patient number; y = years; ELS = European Laryngological Society classification; temp = temporary; G tube = gastrostomy tube; trach = tracheostomy; FU = follow up; mth = months; F = female; rTNM = radiologically staged tumour–node–metastasis classifications; Y = yes; N = no; M = male; ca = carcinoma; mets = metastases; COPD = chronic obstructive pulmonary disease

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disease-free survival rates were 60 per cent and 80 per cent for laryngeal cancer, and 33.3 per cent and 50 per cent for oropharyngeal cancer. Overall, five patients died due to disease recurrence and three died of causes unrelated to aerodigestive cancer.

Two of the six patients who had locoregional recurrence after salvage transoral laser microsurgery were treated with subsequent open surgery. One of the patients underwent total laryngectomy, and left and central neck dissection with a forearm free flap. This patient was retreated with radiotherapy, which was successful. The other patient received a partial laryngectomy, and the patient suffered local and metastatic recurrence. For all other patients who had recurrence, palliation was the only appropriate treatment.

All patients had negative margins after the salvage surgery with the exception of 1 patient who underwent successful repeat salvage transoral laser microsurgery within 30 days. No patients died as a result of treatment and the average length of stay in hospital following transoral laser microsurgery was 6.9 days (range of 1–20 days). Unfortunately, one patient was lost to follow up six months post-operatively.

With regards to functional outcomes, seven patients had a temporary tracheostomy following salvage transoral laser microsurgery (five of these were for oropharyngeal surgery), all of which were removed before discharge. Temporary nasogastric feeding tubes were placed in eight patients (50 per cent of the cohort), with three nasogastric tubes and one percutaneous endoscopic gastrostomy tube remaining in place for more than four months. Excluding the four aforementioned patients who required long-term supplemental feeding, full oral diet was restarted by post-operative day three for the remaining patients. Three of the four patients who needed supplemental feeding eventually returned to a normal oral diet. The patient who did not resume an oral diet died of recurrence. Post-operative aspiration was observed in two patients. No patients experienced any significant post-operative bleeding.

Discussion

Traditionally, the therapy of choice for recurrent laryngeal cancer following radiation treatment failure has been total laryngectomy. Total laryngectomy, although effective, is associated with significant functional morbidities which preclude the use of this technique when conservative methods are deemed appropriate. Alternatives to total laryngectomy include transoral laser microsurgery and open partial laryngectomy. The local control and survival rates of the open partial laryngectomy salvage procedure have been reported as being (approximately) 80 per cent[10,11] and 70–89 per cent respectively.[11–14] This procedure is a good option for lower stage disease, especially in centres without the experience and equipment for salvage transoral laser microsurgery.[14] Unfortunately, there is a high risk of serious post-operative complications associated with this procedure such as fistulisation, delayed decannulation and aspiration.[15]

Transoral laser microsurgery is an alternative technique for salvage surgical treatment following chemoradiotherapy. A study by Roedel *et al.* investigated the outcomes of this technique for recurrent glottic cancer cases (carcinoma in situ (T_{is}) to T_{4a} stage tumours) after radiotherapy. These authors found that the locoregional control rates at 3 and 5 years following the first transoral laser microsurgery procedure were 46.1 per cent and 38.8 per cent respectively, with overall survival rates of 67.5 per cent and 53.3 per cent.[16] In comparison, Steiner *et al.* reported a 71 per cent locoregional control rate (for tumours radiologically staged between T_1 and T_4) in those who had undergone 1–4 transoral laser microsurgery procedures.[15] These authors reported 3 and 5 year survival rates of 74 per cent and 53 per cent respectively. Ansarin *et al.* found that 35 per cent of patients developed recurrence at 44 months (median), with a 5-year actuarial survival rate of 86 per cent for T_{is}, T_1 or T_2 radiologically staged cancers.[17] More recently, a meta-analysis has shown that at 24 months, single salvage transoral laser microsurgery procedures for laryngeal cancer resulted in a local control rate of 58.2 per cent.[18]

Only a few studies have investigated the outcomes of salvage transoral laser microsurgery for oropharyngeal cancers. Recent evidence showed a 75 per cent local control rate at 2 years, with survival rates of 68 per cent and 46 per cent at 2 and 5 years respectively.[19] Compared with other salvage treatments, transoral laser microsurgery survival rates are acceptable, and the risk of complication is much lower.[20–23] In our study, two of the four patients who underwent tongue base salvage transoral laser microsurgery suffered recurrence and died, both of whom had stage T_3 cancer. Unfortunately, if the initial salvage surgery for recurrent tongue base cancer is not successful, the options for a second salvage treatment are limited; however, the possibility of open surgery with free flap reconstruction may still exist.

Salvage transoral laser microsurgery is not possible for every patient. Some patients who have undergone radiotherapy develop distorted anatomy, scarring and severe trismus, which makes an endoscopic approach impossible.[24] Other contraindications to performing salvage transoral laser microsurgery include fixation of both vocal folds, involvement of both arytenoid cartilages, or extensive infiltration of the thyroid, cricoid cartilage and soft tissue of the neck.[15] It is also important to bear in mind (before considering a conservative approach) that the histological analysis of recurrent tumours shows different growth patterns compared with primary tumours; recurrent tumours can have submucosal invasion and microscopic tumour foci that can be understaged by endoscopy and imaging.[25] The risk of understaging advanced tumours should be considered when planning salvage surgical treatment.

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Moreover, surgeon experience becomes increasingly important when performing salvage surgery on previously irradiated tissues, and it is our belief that this is a significant contributing factor in the success of transoral laser microsurgery, particularly in a salvage situation.

- **Salvage treatments for upper aerodigestive cancer following chemoradiation failure include open surgery and transoral laser microsurgery**
- **Success rates for salvage surgery vary considerably**
- **Salvage transoral laser microsurgery is associated with less morbidity than total laryngectomy**
- **This treatment should be offered to select patients following chemoradiation failure**

Transoral laser microsurgery salvage procedures offer a number of advantages over open surgery, such as a decreased risk of fistula formation,[24,26] and preserved voice and swallowing function. Although a number of patients in this study had tracheostomies at the time of surgery, all were decannulated before discharge. At our centre, it is now rare for tracheostomy to be performed for salvage transoral laser microsurgery; this has decreased the risk of functional complications. In addition, repeat salvage surgery is less complicated, as tissue is better preserved compared with a free flap reconstruction. Roedel *et al.* argue that transoral laser microsurgery is a less invasive treatment than open surgical procedures, and it offers a method of tumour resection that is comparable to open surgery.[16] Adjunctive treatments such as a neck dissection are not contraindicated, because poor wound healing and associated complications are less of a concern.[27] Finally, salvage transoral laser microsurgery is less expensive than open surgery, it results in shorter hospital stays, and it decreases the need for tracheostomy and the associated comorbidities.[28]

Salvage surgery following radiotherapy for aerodigestive cancers can be performed using various methods, each of which has its own benefits and morbidities. A major advantage of salvage transoral laser microsurgery is tissue preservation and the option to carry out more invasive surgery if there is persistent disease. In this small prospective study, the use of salvage transoral laser microsurgery achieved acceptable oncological outcomes, and was associated with less morbidity and better function compared with open surgery.

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Address for correspondence:
Dr S M Taylor,
Department of Surgery,
Division of Otolaryngology-Head and Neck Surgery,
Dalhousie University,
Halifax, Nova Scotia, Canada

Fax: 001 902 473 4016
E-mail: smtaylorwashu@yahoo.com

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