

CO₂-laser therapy for carcinoma of the larynx

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Abstract

A retrospective study was undertaken to assess the outcome of 19 consecutive patients, who underwent endolaryngeal resection with a CO₂-laser for laryngeal carcinomas. Sixteen of these patients had recurrences after primary curative radiotherapy. Seventeen of the patients had a curative operation carried out. So far, four CO₂-laser treatment failures have been observed (median observation time 35 months). None of the patients needed tracheostomy in connection with the operation. Voice quality was in all cases acceptable.

It is recommended, that small recurrences (after radiotherapy of laryngeal squamous cell carcinomas) should be considered for a partial laryngectomy with the aid of a laser.

Key words: Laryngeal neoplasms; Carcinoma, squamous cell; Laser surgery

Introduction

Squamous cell carcinoma of the larynx can be successfully managed by radiotherapy and/or surgery. Successful endoscopic surgical management of laryngeal carcinomas was reported by Lynch (1920), for a series of nine patients. Microlaryngeal surgery was developed from microsurgical techniques commonly used in ear surgery, and Kleinsasser (1964) described the development of using the operating microscope for diagnosis and treatment of patients with laryngeal lesions. Laser surgery evolved naturally as an extension of endoscopic surgery, and Strong and Jako (1972) reported their first experiences with the clinical use of the CO₂-laser coupled to the operating microscope in the treatment of patients with benign and malignant lesions of the larynx.

Since 1983, the CO₂-laser has been used at our ENT Department, in the treatment of laryngeal lesions. All laryngeal cancers were primarily treated by radiation therapy. Recurrences were managed by surgery. The aim of this retrospective investigation was to report indications, for technique of resection, and the results of CO₂-laser surgery for carcinoma of the larynx.

Clinical material

During the 11-year period from 1983 to the end of 1993, 19 consecutive patients (four females, 15 males) received CO₂-laser therapy as the definitive treatment for carcinoma of the larynx. Their median age was 69 years (range 39–81 years). In 1994, a retrospective study was undertaken to analyse the clinical and histological features and the results of treatment. The follow-up varied from two months to >five years (median age was 35 months). All patients were followed-up at fixed intervals over five years. If there was no recurrence after five years the patient was regarded as cured.

Treatment

A CO₂-laser coupled to an operating microscope and the Kleinsasser (1964) suspension laryngoscope was used. Prior to laser resection, a biopsy and histological examination was carried out. As shown in Table I, 16 patients received curative radiotherapy prior to laser resection. The time which elapsed from radiotherapy to the recurrence of carcinoma is also shown in Table I. Three patients did not receive radiotherapy or other therapy prior to laser resection. One of these had a glottic squamous cell carcinoma (T_{1a}) and was primarily treated by laser resection because he was disabled. He was followed-up for 30 months without recurrence. One patient had the epiglottis resected because of a mucoepidermoid carcinoma, and finally a severely retarded patient had six palliative laser resections because of an adenoidal cystic carcinoma located primarily in the epiglottic area.

The location of the lesion and results of treatment are also shown in Table I. All patients had normal mobility of their vocal folds prior to laser resection. Lesions located in the epiglottic area were treated by resection of the epiglottis, and, if necessary, a total resection of the epiglottis to the anterior commissure. Glottic lesions were treated by resection of the affected glottic area, usually including part of the ventricular fold for better exposure. When the glottic lesion was located anteriorly, the anterior commissure and the anterior one third of the unaffected vocal fold were also resected. If the lesion was located posteriorly, an arytenoidectomy was performed. The thyroid cartilage skeleton was not resected. Multiple biopsies were taken from the resection cavities to ensure free margins.

Results

In two cases only palliative laser resection was carried

TABLE I
DATA ON 19 CASES OF LARYNGEAL CARCINOMAS AND THE RESULTS OF LASER RESECTION

Patient no./ age (year) sex	Primary tumour stage	Histology	± primary radiotherapy/ months to recurrence	Site of lesion before laser therapy	± recurrence after intended curative laser therapy/ months to recurrence	Follow-up/ months*
1/69/F	T _{1a}	Sq	+/32	Ant 2/3 R Vf	-	AF/>60
2/69/F	T _{1b}	Sq	+/18	Ant 1/2 R and L Vf	+/24	AF/>60
3/81/M	T ₃	Sq	+/3	Ant 1/3 R Vf + Ant com	+/3	DOD/15
4/65/M	T _{1a}	Sq	+/4	Ant 2/3 L Vf + Ant com	-	DF/>60
5/78/M	T ₁	Sq	+/3	Subglottis	-	DF/2
6/74/M	T _{1a}	Sq	+/7	Arytenoid R	-	DF/39
7/79/M	T _{1a}	Sq	+/26	Ant 2/3 L	-	DF/2
8/57/M	T ₂	Sq	+/20	Epiglottis	+/6	DOD/26
9/66/M	T ₃	Sq	+/23	Epiglottis + ventricular folds	Palliative	DOD/17
10/54/M	T _{1a}	Sq	+/11	1/3 L midcord	-/2	AF/>60
11/39/F	T ₂	Ac	-	Epiglottis	Palliative	DOD/72
12/40/M	T ₁	Mu	-	Epiglottis	-	AF/>60
13/57/M	T ₂	Sq	+/13	Ant 2/3 L Vf + Ant com	-	AF/54
14/75/M	T _{1b}	Sq	+/10	Ant 1/3 L and R Vf + Ant com	+/6	DOD/20
15/72/M	T _{1a}	Sq	+/7	Ant 1/3 L Vf	-	AF/36
16/46/F	T ₄	Sq	+/29	Epiglottis	-	AF/35
17/77/M	T _{1a}	Sq	-	Ant 1/3 L Vf	-	AF/30
18/81/M	T _{1b}	Sq	+/7	Ant 1/3 R Vf + Ant Com	-	AF/13
19/69/M	T _{1a}	Sq	+/13	Arytenoid R	-	AF/6

M = male; F = female; Sq = squamous; Mu = mucoepidermoid carcinom; Ac = adenoidcystic carcinom; R = right; L = left; Vf = vocal fold; Ant com = anterior commissure.

A = alive; D = dead; F = free of laryngeal cancer; DOD = died of disease.

*All time periods indicate time from first laser treatment.

out. One patient (no. 9) developed recurrence 26 months after curative radiotherapy for glottic squamous cell carcinoma. At the endoscopic examination he was estimated unsuitable for laser resection because of adherence of the tumour to the thyroid cartilage anteriorly. He refused total laryngectomy, and therefore only a palliative laser resection was done. He died 17 months later of the disease. One patient (no. 11) who was severely mentally retarded had six palliative laser resections because of adenoidal cystic carcinoma primarily located in the epiglottic area. She died of the disease 70 months after the first palliative laser resection.

In 17 cases curative laser resection was performed, and in 13 of these cases no recurrence was observed. In four cases recurrence was observed after curative laser resection. Two of the recurrences (patients no. 2 and 8) were treated with total laryngectomy and one of these is still alive more than five years after the laryngectomy. The other patient died from recurrent disease 20 months after the laryngectomy. The remaining two patients (no. 3 and 14) with recurrence after laser resection were not treated by laryngectomy or further laser resection because of their advanced age and poor general condition.

The five patients with supraglottic recurrences and resection of the epiglottis were treated with nasogastric tubes two to 14 days post-operatively because of aspiration problems. However no long-term swallowing problems were encountered. One patient had stridor one week post-operatively, but no patients required tracheostomy pre- or post-operatively.

The post-operative voice quality was acceptable in all cases. One patient had a normal voice after resection of a glottic lesion, and in the remaining cases where resection had involved the glottic area the voice was moderately hoarse with some air loss.

Complications

There were no complications directly related to the use of the CO₂-laser.

Six patients (no. 2, 4, 8, 9, 13 and 18) with glottic and supraglottic recurrences complained of intense pain two to three months post-operatively. All but one of these had denudation of the thyroid cartilage. The remaining patient (no. 18) had resection around the anterior commissure. Furthermore one patient (no. 8) had recurrence within six months and one patient (no. 9) had only a palliative resection performed, leaving tumour tissue. Presumably denudation of cartilage caused healing problems and this with tumour growth would explain the prolonged pain.

The healing period after laser resection in seven cases was longer than two months. Resection of the anterior glottic area with denudation of the thyroid cartilage caused prolonged healing with granulation tissue formation up to 10 months post-operatively. In these cases, microlaryngoscopy was performed in order to eliminate the suspicion of a recurrence.

Discussion

The role played by the CO₂-laser in the treatment of laryngeal cancers varies all over the world, depending on the local technical resources and especially on the preferred primary treatment. Reports of laser microsurgery as the first choice for the treatment of small glottic carcinomas have been common (Strong and Jako, 1972; Vaughan *et al.*, 1980; Wetmore *et al.*, 1986; Motta *et al.*, 1987; Chiesa *et al.*, 1991).

Steiner (1993) recommended laser microsurgery for all T₁ and T₂ laryngeal cancers and even for selected T₃ and T₄ laryngeal cancers. Eckel and Thumfart (1992) considered laser surgery to be an effective approach to the curative

treatment of T₁ and T₂ glottic cancers and individual cases of subglottic and supraglottic cancers, but considered laser surgery unfit for the treatment of T₃ cancers of the larynx.

In Denmark, radiotherapy is the primary treatment for laryngeal cancers. Recurrences are treated by surgery, usually by a total laryngectomy.

The difference between our study and most other reports is that the majority of our patients had recurrences after curative radiotherapy, leaving surgery as the only way to cure these patients. Only minor recurrences are suitable for laser resection, but from Table I it appears, that the primary tumours before radiotherapy, in all but one case, were small.

We have endoscopically laser resected recurrences located at and near the anterior commissure. Six patients (no. 2, 3, 4, 13, 14 and 18) had tumours around the anterior commissure and of these two patients died of disease, and one had the recurrence successfully treated by a total laryngectomy. It also appears from Table I that four recurrences after curative CO₂-laser treatment were observed, in total. In three of these the lesions before laser surgery were located around the anterior commissure. Thus a relatively high number of recurrences were observed after laser surgery of lesions around the anterior commissure.

Krespi and Meltzer (1989) warned against laser resection of tumours located at or near the anterior commissure because only 2–3 mm separates the anterior commissure mucosa from the thyroid cartilage. Further, there is no perichondrium, where the anterior commissure tendons insert into the thyroid cartilage. Tumours of the anterior commissure may invade the thyroid cartilage without any invasion of the vocalis muscle, and the vocal fold mobility may thus be preserved. Also mechanical factors such as full dentition, a small oral cavity, and cervical spine disease may limit the exposure of the anterior commissure.

The blunting or web formation of the anterior commissure after resection of anterior glottic lesions, including the commissure and anterior parts of both vocal folds was minor, and only seen in few cases. In most of the cases no web formation was seen, and the voice quality was acceptable.

Small recurrences can be managed by a partial laryngectomy (conserving laryngectomy). The use of the CO₂-laser has not increased the number of partial laryngectomies, but when a partial laryngectomy is possible, it is

done endoscopically with the CO₂-laser, when the lateral invasion of the tumour is obviously limited. Extended recurrences, especially with tumour adherence to the thyroid cartilage, are treated by a traditional open partial laryngectomy when possible, otherwise a total laryngectomy is performed. Laser treatment failures have been treated by total laryngectomy.

The advantages related to endoscopic use of the CO₂-laser compared to conventional partial laryngectomy are: (i) minimal bleeding and greater precision; (ii) a less traumatizing operation; (iii) a shorter operation time; and (iv) a shorter hospitalization time; as well as the fact that (v) a tracheostomy is not necessary and the quality of voice is acceptable.

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