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Main Article

Electrosurgical endoscopic cordectomy with microdissection electrodes: a comparative study with CO_2 laser

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Abstract

Microdissection electrodes (MEs) have previously been used to perform endoscopic cordectomies.

We designed a prospective study in order to compare the ME with the CO_2 laser technique. Over two years, 20 patients with T_1 glottic carcinoma were operated on with CO_2 laser and 20 with MEs. The device was chosen alternatively for each new patient. Two patients in both treatment groups had slight glottic incompetence. Three patients in each group showed web formation. The only granuloma was observed in a CO_2 laser patient. Seven of the ME patients developed slight dysphonia, 10 developed medium grade dysphonia and three developed severe dysphonia. Seven of the CO_2 laser patients developed slight dysphonia, seven developed medium grade dysphonia and six developed severe dysphonia. No statistically significant differences were observed on comparing the grade of dysphonia with patient age, T stage, type of cordectomy or surgical device.

We consider the ME to be a useful and inexpensive alternative to CO_2 laser.

Key words: Glottis; Larynx; Carcinoma; Laser; Electrosurgery

Introduction

By confining an electrical current to a small, focussed geometry, a precise electrical scalpel can be obtained. This is the principle of the microdissection electrode (ME). Compared with classical electrosurgery, the ME has advantages in terms of thermal effects and scarring of treated tissue as well as haemostasis while cutting.[1] Animal studies have shown no significant differences in healing time and scarring between CO_2 laser and electrosurgery.[2,3] In the present study, we used MEs to perform endoscopic cordectomy. An analysis is made of the procedure, in comparison with our extensive experience with the CO_2 laser technique.

Materials and methods

This prospective study was started in 2003. Over the following two years, a total of 40 patients with stage T_1 glottic carcinoma (according to the 1997 staging system established by American Joint Cancer Committee/??) were selected. The surgical procedure (either CO_2 laser or ME) was chosen alternatively for each new patient. All patients were operated on by two senior surgeons (the first two authors). Follow up varied from a minimum of six months to two years. All patients were male, with ages ranging from 43 to 78 years (median, 53 years). All patients had a biopsy confirming squamous cell carcinoma, either by previous microsurgery or by extemporaneous evaluation.

Twenty patients were operated upon with a Sharplan 40 C CO_2 surgical laser (Sharplan, Tel Aviv, Israel) set to an output power of 2–3 W in the superpulse mode, with a spot size of 0.5–0.8 mm^2. These patients' ages ranged between 47 and 72 years (median, 59 years).

Another group of 20 patients, aged between 43 and 78 years (median, 58 years), were operated upon with an ME. In 12 cases, we used a straight Cotswold® ultrasharp tungsten needle electrode, length 180 mm (Prima Medical System, Britain). The latter has a 3 micron tip (4 mm exposed). In eight cases, we used the same electrode but with a 1 cm angled tip (Sumedex). Both instruments were connected to a Valleylab Force 2 electrosurgical generator (Pfeizer, Germany) set to an output power of 25–30 W (Fig. 1).

The types of cordectomies undertaken with both the CO_2 laser and the ME were in accordance with the classification proposed by the European Laryngological Society in 2000.[4] Eight transmuscular and 12 extended cordectomies were performed with the CO_2 laser, while 11 transmuscular and nine extended cordectomies were performed with MEs.

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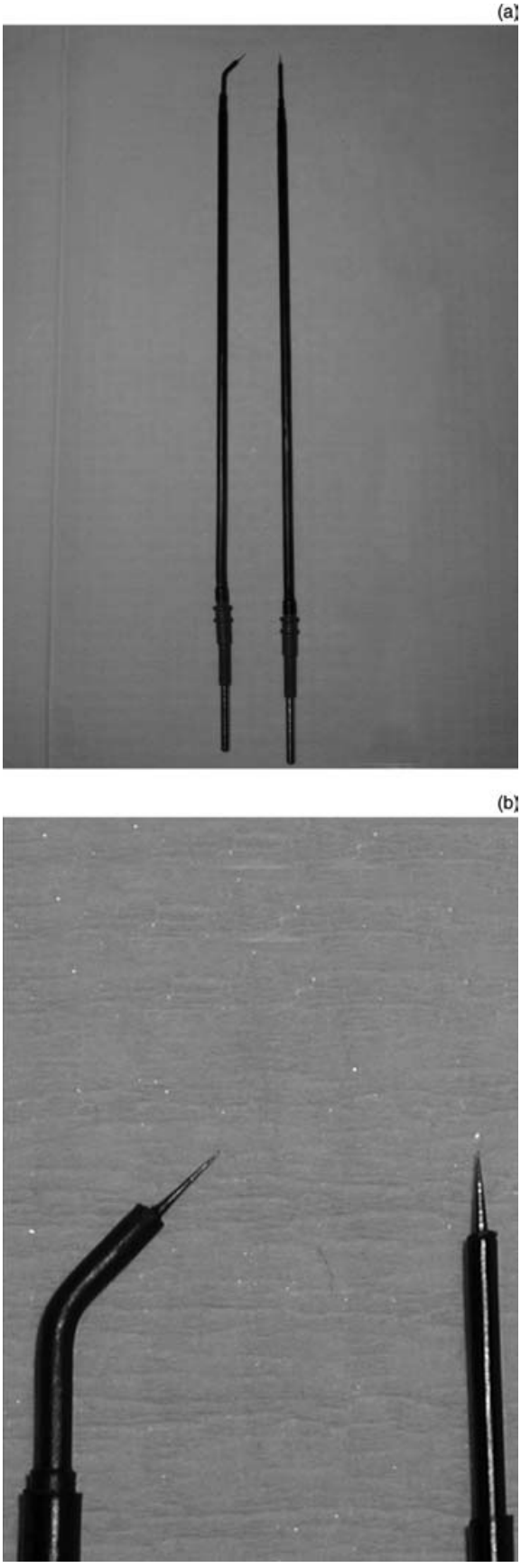


FIG. 1
(a) The large shaft of the electrodes (18 cm) permits access to the glottis. (b) The straight and angled tungsten tips described in the text.

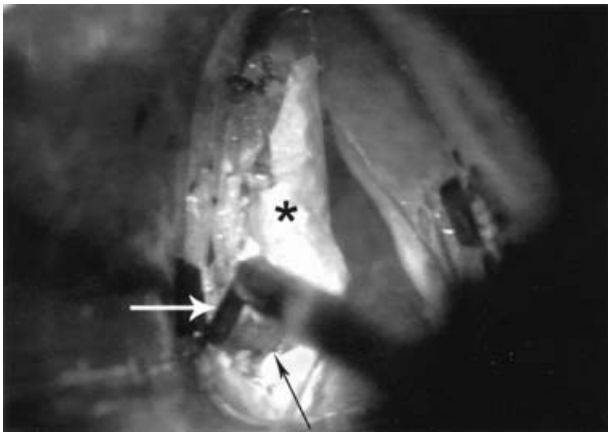


FIG. 2
The left false vocal fold has been removed using the microdissection electrode (ME). The section of the homolateral true vocal fold (asterisk) by the ME (white arrow) is sharp and bloodless (black arrow).

The surgical technique was simple and based on conventional, direct suspension laryngoscopy. The other instruments employed were those used routinely in microsurgery and CO_2 laser endoscopic cordectomy. Once the area for resection was well exposed, traction upon the false vocal fold with microforceps allowed it to be clean-sectioned with the ME if necessary. The true vocal fold was then removed, following similar steps (Fig. 2). No tracheostomy was performed and no immediate post-operative complications were observed in any of the patients.

Over the following six months, laryngoscopies were performed monthly in the out-patient clinic, evaluating the existence of granulomas, web formations or glottic incompetence. Voice quality was evaluated by a single speech therapist, who used the domain G, grade of dysphonia, of the grade, rough, breathy, asthenic and strained (GRBAS) scale.[5] Severity of dysphonia was scored as slight, medium or severe.

A univariate statistical study was performed, comparing the grade of dysphonia with patient age, T stage, type of cordectomy, surgical device (CO_2 laser or ME) and laryngoscopic findings (granulomas, web formation or glottic incompetence). The Pearson chi-squared test was used to determine possible statistical differences.

Results

In all the cases, resection histology margins were free of tumour. Regardless of the technique employed, all patients were alive and free of disease at the time of writing.

Two of the patients operated upon with MEs developed slight glottic incompetence, as did two of the patients undergoing CO_2 laser surgery. All of these patients had a stage T_{1b} tumour and extended cordectomies were performed. Three of the ME patients showed web formation; these patients had stage T_{1a} tumours, and transmuscular cordectomies were performed. Three of the CO_2 laser

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TABLE I
SUMMARIZED RESULTS

	Surgical device	Median patient age (years)	T stage	Cordectomy type	Laryngoscopic findings	Dysphonia grade
	CO_2 Laser	59	12 Tla 8 Tlb	8 transmuscular 12 extended	3 web formations 1 granuloma 2 glottic incompetence	7 slight 7 medium 6 severe
	ME	58	14 Tla 6 Tlb	11 transmuscular 9 extended	3 web formations 2 glottic incompetence	7 slight 10 medium 3 severe
P value	0.25	0.23	0.1	0.06	0.10	

ME = microdissection electrode

patients also showed web formation; all of these patients had stage T_{1a} tumours, and one underwent transmuscular cordectomy while the other two underwent extended cordectomy. The only granuloma in our series was observed in a patient who had undergone CO_2 laser surgery.

Seven of the ME patients developed slight dysphonia, 10 developed medium grade dysphonia and three developed severe dysphonia. Seven of the CO_2 laser patients developed slight dysphonia, seven developed medium grade dysphonia and six developed severe dysphonia. No statistical differences were observed on comparing the grade of dysphonia with patient age, T stage, type of cordectomy or surgical device. All patients with severe dysphonia had undergone extended cordectomy. Summarized results can be seen in Table I.

Discussion

A review of the literature revealed no previous reports of endoscopic cordectomy performed by electrosurgery. We decided to perform these operations after using electrical devices for coagulation in CO_2 laser surgery and, from the literature, comparing the histological appearance of scars and healing produced by both CO_2 laser and the electrical scalpel. Comparison has been made of wound-healing of porcine skin incisions made with either CO_2 laser or electrosurgery, showing the appearance of the scars at five and six weeks to be similar.[6] Referring to studied technique, we considered it important to use the cutting mode of the electrosurgery generator, since in this way the resulting current density would be high at the point of contact with the tissue. Using this mode, at a distance of only a few millimetres the current density is low and induces a minimum thermal effect. Thus, cutting is the result of dissolution of cells in the immediate path of the electrical arc produced by the active electrode, not of heating at the cautery tip. There is no standardized calibration of power settings among different electrosurgical units, or even among individual instruments of the same model. Each electrosurgical generator is unique and its power setting is only of relative value.[7] Surgeons should therefore adjust their device to an adequate power in order to minimize damage.

Based on our cumulative experience, in the above surgical setting there appears to be no difference between the CO_2 laser and the ME. Both systems offer similar results in terms of post-operative complications, glottic tissue evolution, quality of voice and oncological considerations. The grade of dysphonia is affected only by the extent of the resection. Surgical sections performed with MEs have outstanding advantages over those performed with CO_2 laser; they are extraordinarily tidy and clear and are also much faster and more bloodless in comparison with the CO_2 laser technique. In addition, CO_2 laser is an expensive device that may not be available in all hospitals.

Using the ME involves moderate discomfort for the surgeon, because the hand piece of the electrical scalpel sometimes crosses the line of sight. Nevertheless, with brief training and use of an angulated tip, this need not represent a problem. Thus, the ME may be used as a valid alternative to CO_2 laser in the treatment of glottic cancer. At present, we are accumulating further experience in the application of the ME to other laryngeal cancer procedures.

Conclusions

It may be concluded that (a) the ME is a useful and cheap alternative to CO_2 laser; (b) there were no device-dependent differences in resultant voice quality, following endoscopic cordectomy performed with an ME, compared with that performed with CO_2 laser; (c) no patient undergoing ME endoscopic cordectomy developed a granuloma; and (d) ME cordectomy was quicker and less haemorrhagic than CO_2 laser endoscopic resection.

- **This paper compares two techniques of endoscopic cordectomy in patients with T_1 glottic carcinoma: CO_2 laser and microdissection electrosurgery**
- **Microdissection electrosurgery has the advantages of speed and reduced blood loss**
- **Both systems offer similar results with regard to post-operative complications, tissue healing, voice quality and oncological resection**

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