The Journal of Laryngology & Otology
January 2002, Vol. **116,** pp. 19–23

Experience with vertical partial laryngectomy with special reference to laryngeal reconstruction with cervical fascia

Kostas Apostolopoulos, M.D., Ph.D., Rageed Samaan, M.D., Ekaterini Labropoulou, M.D.

Abstract

In this paper we report our experience of vertical partial laryngectomy using the superficial cervical fascia; we describe the technique and present the functional and oncological results of this method of treatment.

A total of 42 patients with squamous cell carcinoma of the true vocal folds, in stage T_1 (n = 28) or T_2 (n = 14), were treated in our department using vertical partial laryngectomy during the decade 1987–1997. Nine patients had post-operative radiotherapy. The shortest follow-up time was three years. There were six recurrences in all, four in the larynx and two in the neck. All four of the laryngeal recurrences were treated with total laryngectomy and are doing well. Both the patients with neck metastases, who were treated with neck dissection, died. Permanent tracheotomy was necessary in one patient. There were no problems with aspiration. The recurrence rate was 14 per cent, the three-year survival index was 95.2 per cent and the three-year larynx preservation index was 90 per cent. According to our experience, vertical partial laryngectomy, using the method we describe, has a good functional and oncological result for stage T_1 and T_2 tumours.

Key words: Carcinoma; Glottis; Surgical Procedures, Operative

Introduction

Vertical partial laryngectomy, radiotherapy and endoscopic laser excision are conservative methods of treating early glottic cancer that form the oncological standard for T_1 and T_2 tumours. In recent years there has been much discussion concerning the safe treatment and the long-term results of each of these treatment modalities. In spite of that, there is still controversy regarding this matter and the mode of treatment varies from centre to centre.[1–10] Techniques of laryngeal reconstruction and opinions about the usefulness of post-operative radiotherapy for the prevention of local or neck recurrence also vary.[11] In our clinic, cordectomy (for very small T_{1a} lesions) and vertical partial laryngectomy, with reconstruction of the vocal folds using the superficial cervical fascia, are the surgical methods used as treatment of choice for early glottic cancers. The latter procedure is also used in patients who have relapsed following primary radiotherapy, assuming that the tumour is still small (T_1 or T_2).

The purpose of this paper is to report our experience of the use of vertical partial laryngectomy with laryngeal reconstruction, using the superficial cervical fascia, and to present the functional and oncological results of this method of treatment.

Material and methods

Between January 1987 and February 1997, 42 patients with squamous cell carcinoma (SCC) of the true vocal folds, without palpable lymph nodes and no co-existent second primary tumour, were treated with vertical partial laryngectomy in our clinic. There were 41 men and one woman, their ages ranged from 40–73 years (mean 63.5). Five patients had had radiotherapy prior to surgery. The follow-up period was three to 10 years. The clinical diagnosis was T_1 in 28 of the 42 patients and T_2 in the remaining 14.

The indications for partial laryngectomy were as follows: if the carcinoma of the vocal folds extended unilaterally, if the anterior comissure was free or if only a few millimetres were affected by the disease, if the downward extension of the lesion did not exceed 8–10 mm and if the lesion had not extended to the false vocal fold or the stem of the epiglottis. Towards the back, only the anterior section of the arytenoid cartilage could have been infiltrated. A pre-requisite for the procedure was a thorough and recent pre-operative diagnostic study incorporating microlaryngoscopy and computed tomography.

Our surgical technique was designed to preserve as many tumour-free sections of the thyroid cartilage as possible, in order to use them for the reconstruc-

From the Department of Otolaryngology, General State Hospital of Nikea Piraeus, Greece.
Accepted for publication: 3 August 2001.

FIG. 1
The superficial cervical fascia.

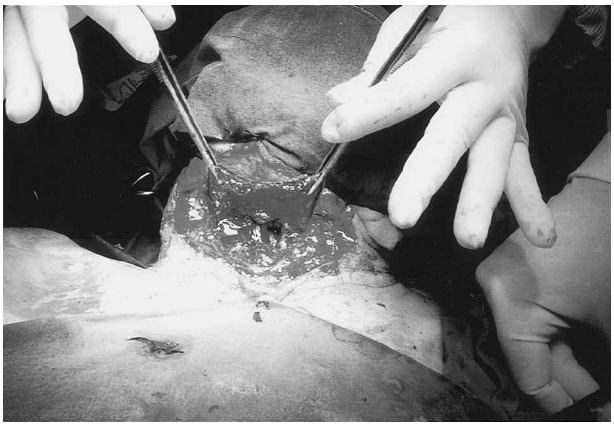

FIG. 3
The way of suturing the fascia in the laryngeal stump.

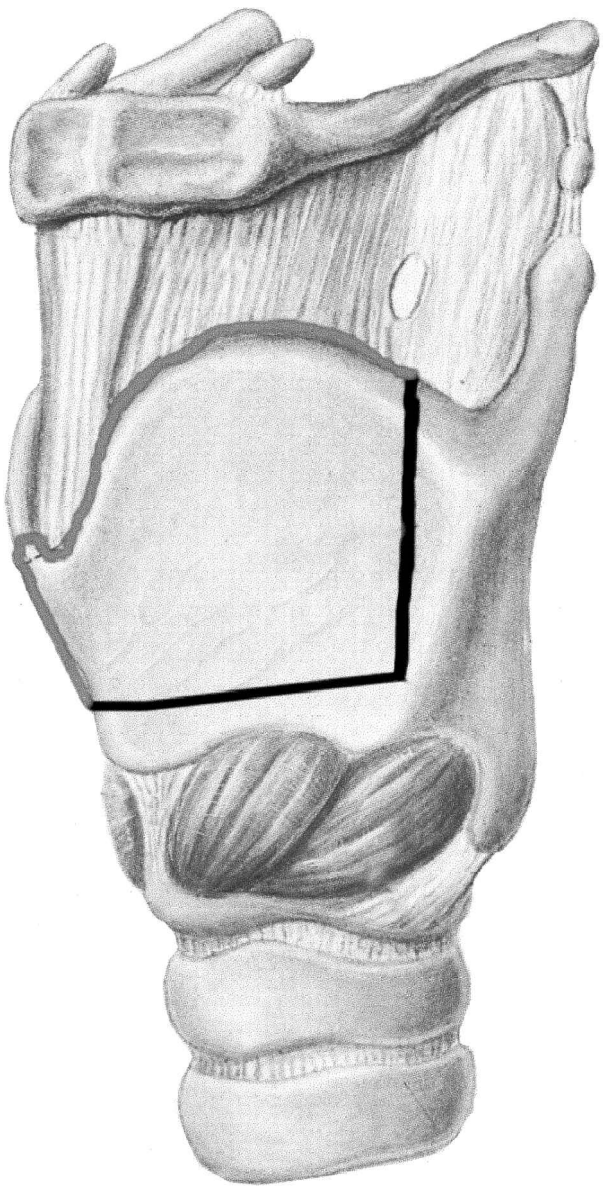

FIG. 2
The incisions in the thyroid cartilage.

tion of a stable laryngeal platform, using the superficial cervical fascia as material for covering the mucal defect and reconstructing the vocal fold.[2]

All our patients first underwent a low tracheostomy under local anaesthesia and general anaesthesia was then delivered through the tracheostome. A U-shaped skin incision was made at a distance from the tracheostome with the branch that was in line with the lesion in a superior position. A skin flap was detached with the platysma and the superficial cervical fascia above the sternohyoid muscle was carefully prepared as a second flap (Figure 1). The fascia was immobilized with damp gauze on top of the flap and was held outside the surgical field. Apart from the medial (or paramedial) incision in the thyroid cartilage, vertical and horizontal incisions were also made as in Figure 2, so as to leave a laryngeal platform extending both backwards and downwards. It was almost always possible to save the arytenoid. Removal of the lesion, following thyreotomy, was performed using a surgical microscope for precise monitoring of the boundaries of the excision, from which frozen sections were always taken. When the Delphian node was enlarged it was sent for histological examination. The petal of the cervical fascia that had been preserved was sutured as a tent (Figure 3) to the stump of the truncated thyroid cartilage and made up the new vocal fold. Suction was applied and the wound was closed in layers. The patient was fed through a nasal-gastric tube for two weeks. When the patient could swallow without aspirations the tracheal tube was removed and the tracheostomy was closed under local anaesthesia (usually after four to six weeks). All patients were followed until their death or until February 2000, that is, three years after the last patient of the study had been operated on.

Results

All patients were decannulated successfully except for one, who suffered from dyspnoea one year after the procedure, probably because of the use of too much 'material' from the cervical fascia for the reconstruction of the vocal fold, the surplus of which

https://doi.org/10.1258/0022215021910285 Published online by Cambridge University Press

TABLE I
COMPLICATIONS FOLLOWING VERTICAL PARTIAL LARYNGECTOMY

	Number of patients	No decannulation	Chronic aspirations	Pronounced hoarseness	Wound rupture
Relapse after radiotherapy	5	0	0	3	1
Vertical partial laryngectomy as first line therapy	37	1	0	8	0

overlay the glottis and restricted the respiratory region. In this patient we were obliged to carry out another tracheotomy. All the patients were generally satisfied with their voice and could communicate without difficulty. Objective measurement of voice quality, (with a method such as pre- and post-operative ultrasonospectography) was not carried out, but in some of the patients (total 11, Table I) who remained extremely hoarse we discovered that this was not the result of the procedure, but due to the patients' continuing to smoke cigarettes even after the operation, in spite of close monitoring and the recommendations of the medical and nursing staff. All patients were able to swallow both liquids and solids without aspirations by the 12th to 15th post-operative day (Table I). Complications from the surgical wound were few. One patient showed wound rupture, that was treated successfully with conservative methods, followed by closure.

In eight patients (five T_1 and three T_2), with a positive frozen section, a supplementary incision was made during surgery. The Delphian node was found enlarged in two cases and infiltrated in one.

There were a total of six recurrences, four in the larynx and two in the neck. Table II shows the profile of the patients who relapsed. The four laryngeal relapses were treated successfully with total laryngectomy and are doing well. The two neck relapses were treated with neck dissection and subsequent chemoradiotherapy, but unfortunately did not survive. No patient with a positive frozen section during surgery relapsed. The overall recurrence rate was 12 per cent.

Post-operative radiotherapy was given in a total of nine cases: 1) to patients with positive surgical margins on the permanent histological preparation (distance from tumour to margin <2 mm), that is, to a total of seven patients, whose course is shown in Table III; 2) to the two patients with relapse in the neck (Table II).

Two patients died from the disease during the three-year follow-up. The three-year survival index for our patients was 95.2 per cent and the three-year larynx preservation index was 90 per cent.

Discussion

The functional results of the procedure as far as speech was concerned ranged from average to good, in our view, but we believe that this greatly depends on the cooperation of the patients: cessation of smoking and speech therapy. Stenosis of the glottis, which may be observed following other kinds of treatment because of the formation of glottic scars or granules, was not seen in any of our patients except for one in whom tracheostomy had to be performed, but this was not the result of a local tissue reaction but was due to the use of an overlarge graft. The post-operative sphincter function of the glottis was satisfactory, since in no patient were there aspirations that obliged us to do a gastrostomy or to leave the tracheostomy open.

In early glottic cancer, it is true that until now it has not been determined beyond doubt which treatment is most beneficial for the patient: radiotherapy or surgical intervention. Despite that fact, in some centres, including our own, surgical therapy is

TABLE II
RECURRENCES AFTER VERTICAL PARTIAL LARYNGECTOMY

Patient	Age/sex	Clinical stage T	Recurrence	Time from initial treatment	Treatment of recurrence	Result	Comments
1	45/M	II	Neck bilateral	3 years	ND-radiochemotherapy	Death	Simultaneous appearance of metastases in liver and entire abdomen
2	58/M	II	Larynx	6 months	Total, laryngectomy, radiotherapy	Doing well	–
3	64/M	II	Neck ipsilateral	2.5 years	ND-radiochemotherapy	Death	–
4	56/M	I	Larynx	2 years	Total laryngectomy, radiotherapy	Doing well	–
5	40/M	II	Larynx	3 months	Total laryngectomy, radiotherapy	Doing well	–
6	63/M	I	Larynx	1 year	Total laryngectomy	Doing well	–

https://doi.org/10.1258/0022215021910285 Published online by Cambridge University Press

TABLE III
COURSE OF PATIENTS WITH POSITIVE SURGICAL MARGINS ON PERMANENT HISTOLOGICAL PREPARATION

Patient	Age	Sex	Stage T	Treatment	Results
A	49	M	T2	Radiotherapy	Disease-free for 9 years
B	58	M	T2	«»	Relapse in the larynx after 6 months. Total laryngectomy. Doing well for 8 years.
C	56	M	T1	«»	Relapse in the larynx after 2 years. Total laryngectomy. Doing well for 6 years
D	62	M	T1	«»	Died 10 years after completion of treatment, from lung cancer.
E	73	M	T1	«»	Died from unknown causes 6 years after completion of treatment.
F	40	M	T2	«»	Relapse in the larynx after 3 months. Total laryngectomy. Doing well for 3 years.
G	55	M	T1	«»	Disease-free for 4 years

most usually used. One advantage is that we may have a reliable histological preparation for the precise evaluation of the size of the tumour. Without such an evaluation it is possible to underestimate the size of such tumours, particularly when they extend to the anterior commissure. Furthermore, radiotherapy is available as a standby treatment, which is very important in this category of patients, who have a high incidence of a second primary cancer. The disadvantage of vertical partial laryngectomy is the quality of voice post-operatively, in spite of the fact that, according to the literature, the final larynx preservation index is higher in patients treated surgically than in those who undergo radiotherapy.[2,5] Moreover, follow-up after radiotherapy is more difficult, because it can be hard to distinguish post-radiation oedema from relapse. In our series the relapse index was 7.1 per cent and 28 per cent for T_1 and T_2 respectively. The relapse index following radiotherapy is on average[3] 15 per cent for T_1 and 30 per cent for T_2, which leads us to believe that surgical treatment offers the patient greater protection against relapse. Apart from that, the cost of radiotherapy in Greece is around $3000, as compared to $1800 for partial laryngectomy, while radiotherapy requires two months overall and partial laryngectomy only two to three weeks.

The use of vertical partial laryngectomy in patients who have relapsed after radiotherapy has come under discussion because of the increased inflammation index, the slower healing and the more frequent aspiration problems that are associated with an irradiated neck. In our series, five patients fell into this category. These patients had received radiotherapy for a T_1 glottic tumour, but without success. In spite of that, the relapse was restricted to the glottis (T_1) and for this reason we decided on conservative surgical intervention. All five patients were disease-free three years later, even though one of them had a malformed neck scar. We believe that the good functional results in this group of patients were due to the properties of the cervical fascia that we used as a graft, that is, to the resistance to inflammation and to maceration with saliva, especially if the preparation included the perimyium of the underlying muscles along with the fascia. Conservative surgery of the larynx may therefore be applied to glottic cancers that do not respond to radiation, provided that the extent of the tumour is limited, as has been reported by other researchers.[3,4]

When the response of the histological preparation shows negative margins and the tumour has been fully removed, relapse is still not ruled out, since three of our relapsed patients (50 per cent) had negative surgical margins on the permanent histological preparation. We believe that close post-operative follow up is a better tactic for the early recognition of relapse. If dyspnoea appears, or a change of voice quality, microlaryngoscopy should be performed directly.

When surgical margins are positive we always give supplementary radiotherapy. Patients with a positive margin (n = 7) showed a relapse rate of 43 per cent, compared with 8.5 per cent for the 35 patients with negative margins. The relation between positive margins and relapse was statistically significant ($\chi^2 = 5.6$, $p = 0.01$). Many authors[5,6] maintain that the difference in overall survival between the two groups is not significant and that patients with a positive margin should be closely followed and treated by salvage surgery with, or without, post-operative radiotherapy on relapse. We agree with this view, but such an approach would be impractical to apply in Greece because of geographical considerations and the distribution of treatment centres. Most patients who are treated in Athens live in border regions or on islands, making close post-operative follow-up difficult or impossible. For this reason, we radiate the larynx in an attempt to minimize the risk of relapse in patients who cannot be followed up in the regular way.

Of the eight patients with a positive frozen section during surgery and a supplementary excision, none suffered relapse. Therefore, frozen sections are a useful aid and we absolutely recommend them in every case.

The problem of metastasis to the lymph nodes, with tumours like these, differs depending on whether or not there is involvement of the anterior commissure. In any case, though, it is extremely rare (two per cent).[8] The existence of a Delphian node may be detected only during surgery. In our patients infiltration was found in only one case (2.3 per cent), which later showed relapse in the neck and metastases to the liver and entire abdomen. There-

https://doi.org/10.1258/0022215021910285 Published online by Cambridge University Press

fore, this gland should always be biopsied when it is enlarged, since a positive lymph gland alters the prognosis because of the possibility of involvement of the neck nodes or extension of the disease beyond the neck.

We believe that surgery is the treatment of choice for early glottic cancer, since we can achieve good survival indexes with preservation of vocal function. In our series of 42 patients the three-year survival was 95.2 per cent and the three-year larynx preservation was 90 per cent. These results are consistent with the mean values reported elsewhere in the literature (97.4 per cent and 88 per cent, respectively).[9–11] It appears that the advantage of the technique we describe rests mainly in the functional results it offers. Having 13 years' experience with this surgical technique, we can say that the use of the superficial cervical fascia has clear advantages for the reconstruction of the larynx, providing excellent fuunctional and satisfactory oncological results. Moreover, it may be combined with the use of pre- and post-operative radiotherapy, given its excellent qualities as a graft.

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Address for correspondence:
Kostas Apostolopoulos, M.D., Ph.D.,
2 Korinthias Str.,
Ampelokipi, 11526,
Athens, Greece.

Fax: 0030-1-3455661
E-mail: lapa@hol.gr

Dr K. Apostolopoulos takes responsibility for the integrity of the content of the paper.
Competing interests: None declared