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Supraglottic laryngectomy–series report and analysis of results

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Abstract

Between October 1987 and October 1993, 92 patients with squamous cell carcinoma of the supraglottis were treated by supraglottic laryngectomy and neck dissection in our department. There were 33 T_1, 46 T_2, six T_3 and seven T_4 cases. All patients with N+ necks and T_3 or T_4 tumours received post-operative radiotherapy (5,000–6,500 cGy). The patients were followed for a minimum of 36 months or until death. The incidence of local recurrence was 7.6 per cent. Neck recurrence was observed in 13 per cent of patients. Decannulation was achieved in 93.4 per cent of the cases with three patients undergoing gastrostomy because of aspiration. The average hospital stay was 26 days. The overall three-year survival was 83.6 per cent, with eight patients dying of unrelated causes. There was a significant difference in recurrence rate between patients in the N_0 and the N+ stage.

Key words: Laryngectomy, supraglottic; Laryngeal neoplasms

Introduction

Horizontal supraglottic laryngectomy (HSL) is a conventional surgical procedure which is performed in selected cases of cancer of the larynx. Supraglottic carcinomas do not penetrate to the true vocal folds and this fact, together with the different embryological origin of the supraglottic from the glottic and subglottic portions, provides the logical basis for HSL as one of the most effective therapeutic alternatives for supraglottic carcinoma. If the indications are favourable, HSL has a success rate similar to that of total laryngectomy. The advantage of HSL is that it preserves speech and avoids permanent tracheostomy. Its disadvantages include possible complications, such as aspiration and difficulty swallowing.

In this study we report our experience with HSL and describe the functional and oncological results of the procedure.

Material and methods

Between 1987 and 1993, 581 patients with cancer of the larynx were treated in our department. Of these carcinomas, 92 had a supraglottic location and were treated with HSL, with or without neck dissection according to the stage. None of our patients had received any modality of treatment previously. The mean age of the 92 patients was 55 years (range 45 to 80): 88 were men and four, women. The histological findings in all cases showed squamous carcinomas of various degrees of differentiation.

All patients who underwent HSL were carefully evaluated before operation. The decision to operate was based partly on a cervical computed tomography (CT) scan, but mainly on a precise and detailed assessment of the extent of the tumour under general anaesthesia (microlaryngoscopy). Because of the high risk of post-operative complications, and the poor functional results, the arytenoid and the pyriform sinus were not removed, but HSL was combined with excision of the base of the tongue when the upper extent of the tumour was at least 1 cm from the foramen caecum. When the excision has to be performed beyond the circumvallate papillae or when at least one sublingual nerve or one lingual artery cannot be preserved, we prefer another procedure, such as total laryngectomy.

TABLE I
CONDITION OF THE LYMPH NODES IN RELATION TO THE STAGE OF THE PRIMARY TUMOUR

	N_0		N_1		N_2		N_3	
Stage	Number	%	Number	%	Number	%	Number	%
T_1	24	26	4	4.3	3	3.2	2	2.1
T_2	32	34.7	5	5.4	6	6.5	3	3.2
T_3	3	3.2	2	2.1	0	0	1	1.08
T_4	5	5.4	1	1.08	0	0	1	1.08

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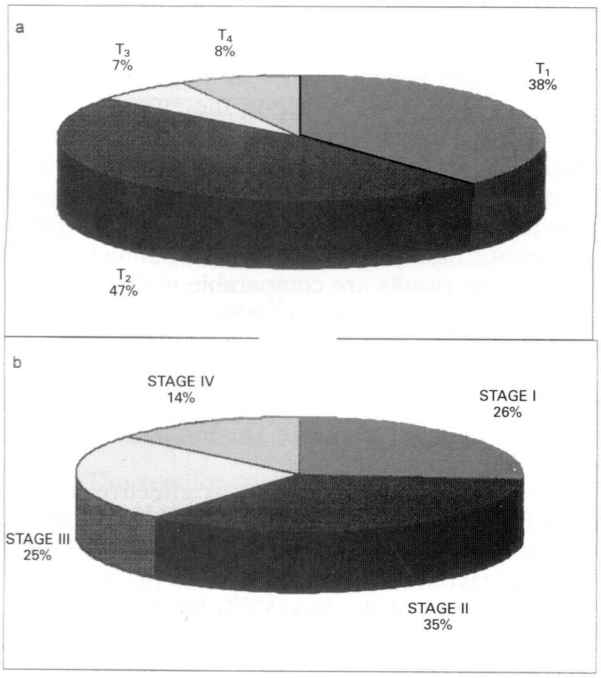

FIG. 1
Distribution according to T stage (a) and total TNM (b), according to the UICC criteria.

The 1987 UICC classification was used to categorize the primary tumour (T) and the neck metastases (N) (Table I). Of the 92 tumours, 85.8 per cent were in the T_1 or T_2 stage. Taking the T and N stage into account, 36 patients were classified as stages III and IV (Figure 1). Post-operatively radiotherapy was used in all cases with a histologically N+ neck and in all those with T_3 or T_4 tumours.

The follow-up continued until October 1996, that is, three years after the operation on the last patient included in the series. The following information was recorded for each patient:

(1) The duration of hospitalization;
(2) Complications;
(3) Recurrences, sites of recurrence and treatment;
(4) Survival (date and cause of death).

The classification of the surgical procedures is shown in detail in Table II. Sixteen of the patients had no palpable lymph nodes pre-operatively, they had a negative cervical CT scan and no affected lymph glands were found during operation. For this reason HSL alone was performed. In the remaining 76 patients unilateral or bilateral neck dissection (31 and 45 cases, respectively) was also performed. Of the 121 neck dissections, 48 involved an N_0 neck. In these patients, we performed functional neck dissection (FND). A FND is a 'cervical lymphadenectomy in which the accessory nerve, the jugular vein, the sternocleidomastoid muscle and the contents of submandibular triangle, are preserved: (Johnson, 1988). Histologically positive lymph nodes were found in nine preparations (19 per cent) of the 48 N_0 necks. Of the 28 radical neck dissections (RND), which were performed on a clinically positive neck, three preparations were found to be negative for malignancy.

TABLE II
CLASSIFICATION OF SURGICAL PROCEDURES

Number	Type of procedure
16	Supraglottic laryngectomy
21	Supraglottic laryngectomy + unilateral FND
27	Supraglottic laryngectomy + bilateral FND
18	Supraglottic laryngectomy + ipsilateral RND + contralateral FND
10	Supraglottic laryngectomy + ipsilateral RND

TABLE III
TIME OF FEEDING TUBE REMOVAL

No. of patients	%	Post-operative day of removal
12	13	10–15
38	41.3	16–20
16	17.39	21–25
16	17.39	26–35
10	10.8	After day 35

Results

Post-operative complications

Swallowing. Most patients had difficulty swallowing. However, in most cases they could swallow by the 12th post-operative day. Table III shows the days on which the feeding tube was removed.

Aspiration. Aspiration occurred in 28 patients. Persistent aspiration and pneumonia appeared in eight patients, who were given encouragement and further training. At the six-month post-operative follow-up 52.1 per cent of the patients had no difficulty swallowing, 38 per cent occasionally had slight aspiration of fluids and 6.54 per cent had frequent problems of aspiration. In three of these latter patients gastrostomy was performed. All three managed to swallow well after four to six months and the gastrostomy was closed.

Decannulation

Decannulation was possible in 93.4 per cent (86/92) of our patients. Most were decannulated after four weeks. In four cases with arytenoid oedema an attempt was made to remove the oedema with a laser but the result was not good. Three of these patients developed annular fibrous stenosis above the glottic level and were given a cannula with a speech valve. Two patients could not be decannulated because of laryngeal stenosis. Other surgically related complications are shown in Table IV.

TABLE IV
POST-OPERATIVE COMPLICATIONS

Complication	No.	%
None	80	86.95%
Post-operative haemorrhage	2	2.17
Pharyngodermal fistula	6	6.5
Post-operative abscess	1	1.08
Post-operative haematoma	1	1.08
Post-operative wound disruption	2	2.17
Death	0	0

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TABLE V
RECURRENCE IN RELATION TO T AND N STAGE

	Local recurrence		Recurrence in cervical nodes
T_1	1/33 (3%)	N_0	7/64 (10%)
T_2	4/46 (8.6%)	N_1	2/12 (16%)
T_3	1/6 (16%)	N_2	1/9 (11%)
T_4	1/7 (14%)	N_3	2/7 (28%)

Recurrences

Of the 92 patients, 19 had recurrences, seven local and 12 in the cervical lymph nodes (Table V). Four of these 19 also had distant metastases and three had neoplasms with a second primary focus.

Local control. Three years after operation the local control of the disease was 92.39 per cent. An analysis of the local recurrences and their outcome is shown in Table VI. Five patients died in spite of salvage treatment (71.4 per cent). The most common site of recurrence was the base of the tongue (four out of seven patients).

Recurrence in the cervical lymph nodes. Twelve patients had recurrence in the cervical lymph nodes. Table VII summarizes the recurrences, their location, the treatment given and the outcome. Ten of these patients died in spite of treatment (83 per cent). In nine of the 12 (75 per cent) the recurrence appeared within the 18 months following the operation. The three-year survival was 89.06 per cent for the N_0, 58.3 per cent for the N_1, 66.1 per cent for the N_2 and 57.1 per cent for the N_3 patients.

Survival

The overall three-year actuarial survival was 83.6 per cent. A total of 15 patients died from the disease. Eight patients died of other causes with no indication of disease (Figure 2).

Hospitalization

The duration of post-operative hospitalization ranged from 15 to 108 days (mean 26 days). In 46 patients (50 per cent) the hospitalization lasted less than 20 days and in 14 (15.2 per cent) it was more than 25 days. In 32 patients (34.7 per cent) the hospitalization lasted more than 35 days and it was in this group that the above mentioned complications occurred.

Discussion

There is no agreement in the international literature regarding the best way of treating supraglottic carcinoma. The debate is between conventional surgery and radiotherapy, with laser treatment also having a place in the discussion. The decision depends mainly upon the custom and the philosophy of each centre, apart from the results which are achieved. The analysis of results from different centres is difficult because of the different ways in which results are presented and the different therapeutic indications. Bearing this in mind, we can say that our results are comparable with those from other centres, since in our patient population the overall three-year disease-free survival was 83.6 per cent, a figure which is in concordance with the 67–90 per cent rates which have been reported internationally (Ogura *et al.*, 1980; De Santo, 1985; Lee *et al.*, 1990).

Conservation surgery is just as effective a treatment for the local control of supraglottic carcinoma as is total laryngectomy, provided that the indications are favourable (no extension to the vocal folds or the skeleton of the larynx). It has been reported that the survival of patients who have undergone HSL is 89 per cent, compared to 78 per cent for total laryngectomy. The index of local recurrence supports this view, being one to three per cent for HSL and two to eight per cent for total laryngectomy (Robbins *et al.*, 1988; Lutz *et al.*, 1990). In this study, the index was 7.6 per cent, which might be explained by the fact that 39 per cent of our patients were in stages III and IV.

Harwood *et al.* (1983) reported a local control rate for T_1 supraglottic lesions treated by irradiation alone to be 78 per cent. This dropped to 67 per cent for stage II lesions. In a study of T_2 and T_3 supraglottic carcinomas by Robbins *et al.* (1988), primary control of cancer at three years was seen in 100 per cent of patients treated by HSL with post-operative irradiation, and only 69 per cent of patients treated by radiotherapy alone. Ogura *et al.* (1980) reported a 30 per cent local recurrence rate in 20 patients with stage I and stage II supraglottic lesions treated by irradiation. In contrast he found nine per cent recurrence rate in 119 patients treated by conservation surgery, 98 of whom had HSL. Bocca *et al.* (1983) found only three local recurrences in 124 patients with T_1, and T_2 lesions treated by HSL. All these series strongly suggest that HSL leads to significantly higher local control rates than irradiation alone.

In any case, it seems that survival depends more on regional rather than local control. The N stage is the most significant prognostic factor in supraglottic

TABLE VI
ANALYSIS OF LOCAL RECURRENCES (LR)

TNM	Site of recurrence	Treatment–Outcome
$T_4N_0M_0$	Base of the tongue	Total laryngectomy: died from LR–haemorrhage
$T_3N_2M_0$	Base of the tongue	Total laryngectomy: died from LR–haemorrhage
$T_2N_0M_0$	Larynx	Total laryngectomy: disease free for 38 months
$T_2N_1M_0$	Larynx	Total laryngectomy: died from LR–haemorrhage
$T_2N_2M_0$	Larynx	Total laryngectomy: died from LR
$T_2N_3M_0$	Base of tongue and neck	Total laryngectomy: died from LR
$T_1N_0M_0$	Base of tongue and neck	Total laryngectomy: disease free for 52 months

LR = Local recurrence

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TABLE VII
ANALYSIS OF RECURRENCES IN THE LYMPH NODES

TNM	Site	Initial operation	Rad.	Treatment of recurrence	Outcome
$T_4N_0M_0$	Ipsilateral	Unilateral FND	Y	RND	Disease free
$T_2N_0M_0$	Contralateral	Unilateral FND	N	RND + rad.	DR
$T_2N_0M_0$	Ipsilateral	Bilateral FND	Y	Chem.	DR
$T_1N_0M_0$	Contralateral	Unilateral FND	N	TL + RND + rad.	DR
$T_4N_0M_0$	Ipsilateral	Bilateral FND	Y	Chem.	DR
$T_2N_0M_0$	Ipsilateral	Unilateral FND	Y	Chem.	DR
$T_2N_0M_0$	Contralateral	Unilateral RND	N	RND + rad.	Disease free
$T_2N_1M_0$	Contralateral	Unilateral RND	Y	RND	DR
$T_3N_1M_0$	Contralateral	Contralateral FND + Ipsilateral RND	Y	Chem.	DR
$T_2N_2M_0$	Ipsilateral	Bilateral	Y	Chem.	DR
$T_2N_3M_0$	Contralateral	Unilateral RND	Y	RND + chem.	DR
$T_3N_3M_0$	Ipsilateral	Bilateral	Y	Chem.	DR

Rad. – radiotherapy, Chem. – chemotherapy, DR – died from recurrence.

cancer. The relationship between N and recurrence can be seen most clearly in the comparison of N_0 and N+ patients:

- Of the total of 28 N+ patients, seven had recurrence (25 per cent)
- Of the total of 64 N_0 patients, five had recurrence (7.8 per cent), ($p = 0.05$).

This difference was thus statistically significant at the five per cent level ($X^2 = 5$ with one degree of freedom).

In each N+ neck we gave post-operative radiotherapy. Many have reported (Gavilan and Gavilan, 1989) that in an N+ neck radical neck dissection (RND) should be performed alone and not in combination with radiotherapy, claiming that post-operative radiation does not increase survival but increases the incidence of recurrence (De Santo *et al.*, 1982). In a 10-year study by Bocca *et al.* (1983) a comparison was made between the combination of surgery and radiotherapy and surgical treatment alone. The authors found no improvement in the stage-related prognosis of patients who received the combined treatment. Schuller *et al.* (1979) showed that survival, the index of local recurrence and the index of recurrence in the cervical lymph nodes did not improve as a result of the combined treatment as compared with surgical treatment alone. In our patients the recurrence rate following combined therapy was four per cent. The three-year survival index after radiotherapy was slightly greater than that reported by others (De Santo, 1982) who performed RND alone, although the difference did not reach statistical significance, and for this reason we are continuing this mode of treatment.

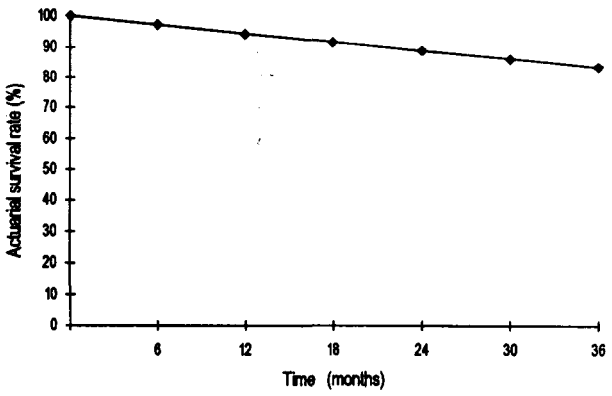

FIG. 2
Total three-year survival after initial treatment.

The incidence of regional metastases in supraglottic carcinomas ranges between 25 and 50 per cent. Only in seven per cent of patients who undergo bilateral neck dissection is there recurrence, while in 21 per cent of those who undergo unilateral neck dissection there is recurrence on the non-operated side (without post-operative radiotherapy). Failure on the opposite, non-operated side is responsible for 75 per cent of the failures to control disease of the neck (Marks *et al.*, 1979).

On the basis of the above observations, our decision to irradiate the neck post-operatively when our criteria are satisfied (T_3 T_4, or N+) contributes to the control of the disease on the opposite side of the neck.

Recurrences in the neck have been observed in five to 29 per cent of patients with supraglottic cancer, whether they received surgical or combined therapy with a mean value of 14 per cent (Bocca *et al.*, 1983; Levendang *et al.*, 1989). The stage of the primary tumour does not contribute to the index of recurrence in the neck except in the case of T_4 tumours.

Aspiration was the most common complication in our patients. It was more frequent in patients with extensive supraglottic laryngectomy, such as when the excision extended to the base of the tongue. The achievement of swallowing without aspiration in these patients is probably due to the combination of a number of factors. The selection of suitable patients pre-operatively, based on their pulmonary function or their biological age, ensures a post-operative course without aspiration. In our series there was no case where total removal of the larynx was required because of aspiration following HSL. In three patients temporary gastrostomy was performed and maintained for three to six months.

Five of our patients were over 75 years old (two aged 79, two aged 75 and one woman aged 80 years). All five were judged to be suitable candidates for HSL, in spite of their advanced age, since their pulmonary function and general health were good. Their post-operative course was good, similar to that of the younger patients, even though in one case we were obliged to perform total laryngectomy because of recurrence in the laryngeal remnant of the larynx.

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This bears out the view expressed in many studies, that the choice of patients should be based on biological, rather than chronological age.

Obstruction of the airway delays decannulation. It may be due either to arytenoid oedema or to glottic stenosis. According to our experience, delay in decannulation may be avoided in the following ways:

(1) Avoiding extended manipulations of the remnant of the larynx during surgery;
(2) Removal of the false vocal folds, even if they are tumour free;
(3) Preservation of the tracheostomy in patients who are to receive post-operative radiotherapy;
(4) Reduction of the radiation field after a level of 5,000 cGy has been reached in order to exclude the arytenoids.

There are reports in the international literature (Nikolaou *et al.*, 1993) which maintain that preventive lymph node dissection is not necessary because the recurrence index without preventive neck dissection (13.5 per cent) is lower than with neck dissection (17 per cent) (Bernstein and Calcaterra, 1985). We believe that the fact that in 19 per cent of the cases, where we performed neck dissection, positive lymph nodes were found means that preventive neck dissection contributes to a good oncological result in supraglottic cancer. Furthermore, the recurrence rate after functional neck dissection in our patients was 14.5 per cent (seven out of 48).

We had seven cases of local recurrence (7.6 per cent). Of these, three were in the larynx and four at the base of the tongue. All the patients with recurrences underwent total laryngectomy. One of the three with recurrence in the larynx have been disease-free for more than three years. One of the four with recurrence in the base of tongue have been disease free for more than four years. The other five patients developed regional recurrence: two of them were given chemotherapy and three radiotherapy, but all five finally died from haemorrhage.

We noted four cases with distant metastases and three with neoplasms of second primary focus. This proportion is rather low compared with other series (Nikolaou, 1993). Three of the patients had metastases in the lungs, while one exhibited rare metastasis to the petrous bone. All three second primary foci were in the lung.

According to Levendang (1989), in patients with primary supraglottic cancer death due to the cancer only occurs in those patients with recurrence in the neck. Almost 66 per cent of patients with recurrences in the neck died from the cancer, while none of the patients without recurrence in the neck died. In our patients, 9.6 per cent (three out of 31) of those who underwent unilateral neck dissection and post-operative radiotherapy developed recurrence in the opposite side of the cervix. Studies which did not employ radiotherapy after neck dissection have reported a recurrence rate of 17 per cent (Hernanz *et al.*, 1993). Most investigators recommend bilateral neck dissection because this reduces the rate of failure to control the disease by three to six (Suarez *et al.*, 1993). Thus, the involvement of the opposite side of the neck in this disease, along with the prognostic consequences of recurrence in the neck, strongly suggests that we should direct our attention to both sides of the cervix, since in our series the neck dissections which were performed on a clinically N_0 cervix led to positive histological findings (N+) in 19 per cent of cases.

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