The "Gregorio Marañón" Hospital Experience in the Treatment of Laryngeal Carcinoma

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A retrospective analysis has been carried out of 4100 patients with pharyngolaryngeal carcinoma who were seen at the Hospital Gregorio Marañón between 1962 and 1993. 1287 patients were excluded from this study, leaving 2813 patients available for analysis. The great majority of the 2813 pharyngolaryngeal carcinomas were primary laryngeal tumours (2519). These are the subject of our study.

We present our theoretic protocol for treatment of laryngeal carcinoma, both glottic and supraglottic, with special attention to the partial surgery. Our oncological and functional results are presented and discussed.

Key Words

Laryngeal tumors, glottic, supraglottic, conservative surgery.

PATIENTS AND METHODS

A retrospective analysis has been carried out of 4100 patients with pharyngolaryngeal carcinoma who were seen at the Hospital Gregorio Marañón between 1962 and 1993. This number represents 58.9% of all head and neck cancer seen at our Center during the same time period.

1287 patients were excluded from this study because there was no histological confirmation of malignancy or the patient who had primary treatment in another institution prior to Gregorio Marañón Hospital, leaving 2813 patients available for analysis. It had to be noted that, for a number of years, our Hospital was considered a reference Center for cancer treatment, so many patients came to us only for complementary radiotherapy or because of locoregional recurrences and/or distant metastases.

The statistical analysis has been performed with the SPPSS/program, and the actuarial method of calculating statistics has been used; data were presented in the form of uncorrected actuarial survival. Statistical significance was calculated using the Chi-squared test. Test of significance were done between competing survival curves using the algorithm of Lee and Desu.

The great majority of the 2813 pharyngolaryngeal carcinomas were primary laryngeal tumors (2519). These are the subject of our study.

This population comprised 2% women and 98% men; their ages ranged from 21 to 91 years (median 58 years). The highest incidence of the disease was noted in the 5th and 6th decades of life.

All patients were staged retrospectively according to the 1988 AJCC classification (1). Distribution by primary site is presented in Table I. 5% of patients had very advanced local disease that precluded identification of the exact origin of the tumor. Distribution by stage was : State I 32.8%, State II 23.2%, Stage III 24.3% and Stage IV 19.7%.

PRIMARY SITE		
	N	%
Supraglottic	1632	66
Glottic	661	27
Subglottic	41	2
Total Larynx	134	5

Table I

In our Center, the primary treatment for laryngeal cancer has been surgery, using radiotherapy for

some early glottic tumors and for supraglottic tumors when partial surgery was not suitable because of the general condition of patient and when the patient refused surgical treatment. During the last years a selected group of patients with unresected tumors were treated with induction chemotherapy in an attempt to prepare patients for surgery. The primary treatment modalities are partial laryngectomy 50.1%, total laryngectomy 32.7%, radiotherapy 14.2%, and primary chemotherapy 3%.

RESULTS

The actuarial uncorrected survival (for all patients) is 69%, 62.1%, 55.2% and 50.2% at 5,

LARYNGEAL CANCER OVERALL SURVIVAL

Fig. 1

10, 15 and 20 years respectively (Fig. 1). Causes of death are listed in Table II.

Fig. 2 shows the overall survival related to stage and treatment modality. The actuarial uncorrected survival is : Stage I (81.6%, 72.8%, 67.3%), Stage II (71.9%, 66.1%, 55.9%), Stage III (65.1%, 58.2%, 55.7%), Stage IV (44.7%, 41.4%, 38%)

CAUSES OF DEATH	
	%
Alives	54.6
Laryngeal Cancer	32.8
Postoperative Death	2.3
Others Cancers	5.9
Others Causes	4.4

Table II

LARYNGEAL CANCER SURVIVAL RELATED TO STAGE

Fig. 2

at 5, 10 and 15 years respectively. As expected, stage is a prognostic factor for actuarial uncorrected survival (Stage I vs II $p < 0.05$; Stage II vs III $p < 0.05$; Stage III vs IV $p < 0.05$).

5 and 10 years survival related to primary treatment were, 79.3% and 73.2% for partial surgery, 63.6% and 55.8% for total laryngectomy, and 51.7% and 42.1% for radiotherapy. Although survival is clearly better in patients with primary surgery than in primary radiotherapy again we have to say in our Center basic therapy has been surgery and only patients with medical contraindications to surgery or who refused surgery were treated by primary radiotherapy.

In 61% of the operated patients, a partial laryngectomy was made.

LARYNGEAL CANCER FREE DISEASE INTERVAL

Fig. 3

The free disease interval curve of all patients is presented in Fig. 3. As illustrated by the free disease interval curve which has no plateau, there

are some late recurrences. A quarter of the failures occur after the third year, which is unusual in other head and neck cancers.

INTRODUCTION

From the first total laryngectomy, performed more than one century ago Billroth, laryngeal surgeons have always tried to avoid the consequences, of the complete resection of the larynx. It is estimated that 50% to 70% of laryngeal lesions are amenable to conservation surgery (2). The goal of such surgery is eradication of disease with preservation of voice, deglutition and a adequate airway.

The basic principles of partial surgery of the larynx and hypopharynx were stated at the end of the past century and at the first half of the present, and include three basic techniques: cordectomy, hypopharyngectomy with lateral pharyngectomy and horizontal supraglottic laryngectomy. From these three techniques an according to the particular needs of tumor exeresis, more complex techniques have been developed. These complex techniques, often a combination of horizontal and vertical techniques, should be discussed and evaluated in terms of their oncological and functional results on the basis of important series of patients, the only possible way to prove their reliability.

From a theoretical point of view, some basic principles must be stated regarding the subject of partial surgery :

1. Early stage squamous cell carcinoma of the larynx may be successfully treated with either radiotherapy or surgery. The treatment recommended often depends on which door the patient enters.

2. Invasive T3 and T4 cancer of the larynx infrequently cures without surgery (3, 4, 5, 6). With radiotherapy only, the vocal folds are preserved, but in large tumours the recurrence rate is higher than with surgery. The number of voices than can be saved must be weighted very carefully against the possible decrease in survival, which could result from a lower local control rate with radiotherapy than with primary laryngectomy. In these locally advanced tumors,

total laryngectomy has been used for two main reasons : first, to many laryngeal surgeons, this was the only oncologically acceptable procedure and, from a physiological point of view, extending the classical limits of partial laryngectomy was incompatible with a satisfactory sphincter function. As we will explain, we think that these two reasons are no longer valid to reject the possibility of partial laryngectomy in selected cases.

3. The management of cervical metastases is still controversial. Nevertheless, during the last years, indications have become somewhat more precise.

4. The indications for the different surgical techniques should be based on oncological as well as functional results, always on the basis of large series of patients, the only valid way to confirm its reliability.

PATIENTS AND METHODS

The medical charts of 1304 patients who had undergone partial surgery for laryngeal carcinoma at the Gregorio Marañón Hospital of Madrid between 1962 and 1993 were reviewed (834 horizontal partial laryngectomies and 470 partial vertical laryngectomies).

Disease was staged retrospectively using the criteria set forth in 1988 by the American Joint Commission on Cancer. 34.6% of the 1304 patients with glottic and supraglottic tumors

VERTICAL LARYNGECTOMIES TYPES OF SURGERY	
	Nº
Endoscopic Surgery	55
Laryngofissure	237
Frontolateral L.	29
Hemiglottectomy	35
Frontal Anterior L.	19
Classical Hemilaryngectomy	55
Extended Hemilaryngectomy	32
Crico-Hioido-Pexy	5

Table III

HORIZONTAL LARYNGECTOMIES TYPES OF SURGERY	
	Nº
Classic Supraglottic L.	587
S. L. Extended to Base of Tongue	88
Hemipharyngo S. L.	10
S. L. Extended to Arytenoid	58
Three-Quarter Laryngectomy	66
S. L. Extended to 2 Locations	8

Table IV

treated with partial surgery were advanced tumors (stages III and IV). Tables III and IV the different techniques performed.

Fig.4
Chordectomy by laryngofissure

Our theoretic treatment protocol was as follows:

A. Glottic Tumors

For T1 lesions involving only the middle third of the true vocal cord, we used radiotherapy or cordectomy (Fig. 4). Patients were advised to have surgery if they were under 50 years, not vocal professionals, would not comply with follow-up, or were difficult to examine. Cordectomy by laryngofissure has been progressively replaced during recent years by endoscopic laser surgery.

For T1 lesions extending to the posterior third of vocal cord, without affecting the arytenoid, we perform a hemiglotectomy (7).

For T1 lesions extending to the anterior third of the vocal cord we perform a frontolateral laryngectomy (Fig.5).

For T2 lesions we perform a classical hemilaryngectomy.

For T3 lesions we perform a extended hemilaryngectomy (Fig.6). As it has already been mentioned, a fixed vocal cord has been traditionally considered a contraindication to partial surgery. However, in 1971, Kirchner and Som (8) conclude, after the evaluation of a series

Fig.5
Frontolateral laryngectomy

Fig. 6

Extended vertical hemilaryngectomy

of specimens from total laryngectomies carried out according to this vocal cord fixation criterium, that most of them could have been adequately resected by means of a more or less extensive hemilaryngectomy.

The following are the criteria for conservative surgery in T3 glottic tumors:

- The tumor should exceed neither than 1 cm in subglottic extension in the anterior and medial part of the vocal cord, no more than 5 mm. in subglottic posterior extension where the cricoid is immediately below the arytenoid and may be invaded.
- The tumor must be restricted to the vocal cord and anterior commissure.
- The arytenoid must not have been invaded.

The resection includes the thyroid cartilage completely on one side, as well as the medial segment of the contralateral thyroid and the hemicricoid so as to ensure a better lower margin in the case of subglottic extension, together with

the soft endolaryngeal parts (the vocal cord, the anterior commissure and the anterior third of the contralateral cord, the ventricular band, ventricle and arytenoid).

Reconstruction is mandatory to prevent aspiration. This is accomplished by epiglottic laryngoplasty (9, 10, 11, 12).

The treatment of vocal cord carcinoma involving the anterior commissure is a controversial issue. The anatomy of anterior commissure is such that an apparent T1 lesion may actually be a T4 lesion if it involves the thyroid cartilage. The exact pretreatment evaluation of anterior commissure tumors, particularly with regard to deep infiltration, is very difficult even with direct laryngoscopy and also with CT and MRI. We draw support from the conclusion of Maisel (13), Sessions et al (14), Toker (15), Krespi and Meltzer (16), Zohar et al (17) and Rucci et al (18) that, for lesions of the anterior commissure, conservation surgery is recommendable due to the less satisfactory control rate achieved with radiation

Fig.7

Frontal anterior laryngectomy

therapy. For this lesions involving the anterior commissure we performed frontal-anterior laryngectomy (Fig.7). Other alternative technique is subtotal laryngectomy with crico-hyoid-pexy (Fig.8) (19).

B. Supraglottic Tumors

In T1 tumors we perform a classical supraglottic laryngectomy (Fig.9) unless the patient has and advanced age or presents a poor respiratory status.

In T2 tumors, if the arytheno-epiglottic fold is affected, the arytenoid may be fixed because of the weight of the tumor, whereas mobility of the vocal cord is not affected and its posterior intrinsic musculature is preserved. In these cases, conventional supraglottic resection is extended back towards the cricoarytenoid junction and vocal apophysis of arytenoid.

In T2 tumors, if the vocal cord is involved, without affectation of its mobility, we perform a supraglottic laryngectomy extended to the vocal cord, accordingly to the technique of Ogura and Dedo (Fig.10) (20). In these cases, the lower third

of the thyroid ala is preserved and the reconstruction of the glottic plane is done with the sternothyroid muscle sutured to the subglottic mucosa, with the external perichondrium over it (21).

A more extensive form of three-quarter laryngectomy can be carried out in the case of T3 supraglottic tumors, where the vertical component of the resection includes not only the vocal cord but the whole of the ipsilateral thyroid ala and even part of the cricoid. In such cases, the reconstruction of the glottic plane is done with the homolateral thyroid gland pediculated to the upper thyroid artery, using the technique of Mozolewsky (Fig.11) (22).

If the lesion extend beyond the laryngeal vestibulum laterally toward the aritenoeplottic fold or medial wall of the piriform sinus, supraglottic resection could be extended to include the complete aritenoeplottic fold and the medial wall of the piriform sinus, above the level of the vocal cord. If the vocal cord is fixed and the piriform sinus is affected below the level

Fig.8
Crico-hyoid-pexy

of the crico-arytenoid junction partial surgery is contraindicated.

In T4 tumors involving the lingual face of the epiglottis, vallecula and base of the tongue, supraglottic resection can be extended upwards (Fig. 12). The limits to the resection of the base of the tongue are defined by functional problems. In general, we say that the resection should not reach the circumvallate papillae and at least one hypoglossal nerve should be conserved. In these cases, in order to avoid the problems caused by resection of the base of the tongue, we carry out the reconstruction with the thyroid gland pediculated in the upper thyroid artery.

We have to consider, though, in the management of laryngeal cancer, not only the treatment of the laryngeal tumor, but also the management of the cervical node metastases. In N0 glottic tumors, the lymph nodes of the neck have not been treated, but in supraglottic and subglottic tumors our policy has been changing through these years, from a "wait and see policy" to prophylactic radiotherapy during the first years, to prophylactic neck dissection. N+necks have been systematically treated with neck dissection.

RESULTS

Survival

– Vertical partial laryngectomies.

Fig.9
Partial horizontal supraglottic laryngectomy

The 5 years uncorrected survival rate is 85.6% for stage I; 71.4% for stage II; and 71% for stage III. The 5 years survival rate related to "T" stage is 87.5% for T1a; 78.7% for T1b; 69% for T2; and 74.9% for T4. Causes of death are listed in Table V.

– Horizontal partial laryngectomies.

The 5 years survival rate is 83.9% for stage I; 83.2% for stage II; 78.5% for stage III; and 55.3% for stage IV. The survival related to "T" stage is 81.6% for T1; 77.4% for T2; 76% for T3; and 60.4% for T4. The 5 years survival related to "N" stage is 81.6% for N0; 74.1% for N1; 59% for N2a; 59.9% for N2b; 47.3% for N2c; and 34.9%

for N3. The causes of death are listed in Table VI.

Recurrences

– Vertical partial laryngectomies.

Local recurrences developed in 21.3% of the patients (Table VII). Among the patients in whom treatment failed, 80% underwent salvage surgery. The 5 years local control by stage shows differences between stage I 93%, II 81.7% and III 73.2%. Table VIII shows a comparison of local recurrences according to "T" stage in glottic tumors treated with total or partial laryngectomies.

Fig.10
Three quarter laryngectomy

– Horizontal partial laryngectomies.

Local-regional failure occurred in 32.9% patients overall. The most common site for local-regional failure was the cervical lymph nodes (Table IX).

Local control by stage does not show any differences, except in case of stage IV (87%, 89.1%, 82.2% and 66.6% at 5 years for stages I, II, III and IV respectively).

Table X shows that there are no differences in local control between patients treated with partial or total laryngectomy.

Complications

Complications for partial laryngectomies are listed in Tables XI and XII.

Functional Results

Quality of voice, swallowing and respiration have been evaluated according to a three grade scale (Table XIII) and Tables XIV and XV show functional results obtained in vertical and horizontal laryngectomies.

In vertical laryngectomies 87.8% of patients were able to eat normally before two weeks, and only 1% of cases the nasogastric tube was removed more than one month later. Decannulation is achieved in 81.1% before two weeks, in 6.8% of cases decannulation takes place more than one month later, and only 2.4% of patients do not achieve decannulation.

In horizontal laryngectomies, reeducation of swallowing and respiration is much more complex than in vertical laryngectomies, so that the removal of the nasogastric tube takes place more than one month later in 10.5% of patients, with a mean time of 20 days. Likewise, decannulation is not achieved in 10% of cases and, in 37.7% of patients decannulation takes place more than one month later.

Neck Management

The extent of cervical lymph node metastases is the most important prognostic factor in laryngeal cancer. The 5-years uncorrected actuarial survival related to "N" stage is 73.9%, 59.4%, 44.2%, 58.5%, 30.3% and 19.7% for N0, N1, N2a, N2b, N2c and N3 respectively.

Fig.11

Larynx reconstruction using thyroid gland

No Palpable Adenopathy (N0)

Table XVI shows the different treatment policies observed from 1962 to 1993 in N0 laryngeal cancer excluding glottic tumors.

Fig.13 shows that there are not significant difference in uncorrected survival and local control between prophylactic radiotherapy and prophylactic neck dissection. However, we found an significant difference in survival between prophylactic neck

dissection and wait and see policy.

Late cervical metastases developed in 8.6% of patients who underwent surgery compared with 11.7% of patients who underwent radiation therapy. This differences was not statistically significant by χ^2 test at the 5% confidence level.

We didn't found statistical differences in neck recurrences between comprehensive (4.5%) and anterolateral or supraomohyoid (5.1%) prophylactic neck dissections.

– Prognostic factors in clinically N0 necks.

The percentage of occult disease in N0 necks was 22.2%.

We studied factors that could conditionate a higher rate of occult disease in N0 necks. Only poorly differentiated carcinomas and tumors with deep invasion of the preepiglottic and paraglottic spaces have higher frequency of lymph node involvement.

Histologically positive neck disease without extracapsular spread (pN+ R-)

Fig.14 shows that there are not statistically significant differences on uncorrected survival when using or not complementary radiotherapy.

Extracapsular spread in neck nodes (pN+ R+)

Fig.15 shows a statistically better uncorrected survival in patients treated with combined therapy.

DISCUSSION

It is widely accepted that early stage carcinoma of the vocal cord may be successfully treated by either radiotherapy, hemilaryngectomy and more recently transoral laser excision (18, 23, 24, 25, 26, 27, 28, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48). Initial treatment takes into consideration tumor staging.

For T1a vocal cord carcinoma, external beam irradiation has been the dominant form of treatment. The wide acceptance of radiotherapy, even among surgeons, lies in a better quality of

Fig.12

Partial horizontal supraglottic laryngectomy extended to the base of the tongue

voice with radiotherapy than with cordectomy by laryngofissure. Nonetheless, radiation has several disadvantages. It is both costly and time consuming, and it may have considerable side

effects in some patients. For that reason the concept of endoscopic resection has gained considerable popularity since the introduction of the CO₂ laser by Strong in 1975 (49). Cure rates

VERTICAL LARYNGECTOMIES CAUSES OF DEATH	
	%
Alives	74.8
Laryngeal Tumor	15.4
Surgery	0.2
Other Tumors	5.9
Others Causes	3.7

Table V

HORIZONTAL LARYNGECTOMIES CAUSES OF DEATH	
	%
Alives	66.0
Laryngeal Tumor	23.3
Surgery	0.9
Others Tumor	4.0
Others causes	5.8

Table VI

VERTICAL LARYNGECTOMIES RECURRENCES	
	%
No Recurrence	69.6
Local	22.8
Regional	6.8
Metastasis	0.8

Table VII

VERTICAL L. VS. TOTAL L. LOCAL RECURRENCES			
	Vertical	Total L.	p
T1a	53/246 (21.5%)	1/7 (14.3%)	<0.05
T1b	11/71 (15.5%)	0/7 (0%)	
T2	14/63 (22.2%)	8/42 (19%)	<0.05
T3	6/26 (23.1%)	5/39 (12.8%)	<0.05
T4	1/3 (33.3%)	1/8 (12.5%)	<0.05

Table VIII

HORIZONTAL LARYNGECTOMIES RECURRENCES	
	%
No Recurrence	64.7
Local	12.7
Regional	20.2
Metastasis	2.4

Table IX

HORIZONTAL L. VS. TOTAL L. LOCAL RECURRENCES			
	Horizontal L.	Total L.	p
T1	13.6%	12.8%	<0.05
T2	8.2%	6.0%	<0.05
T3	12.5%	9.3%	<0.05
T4	14.6%	17.6%	<0.05

Table X

following laser resection of early glottic carcinomas are the same as those achieved by radiotherapy (50) and it offers several advantages over radiotherapy. The duration of treatment is short and there is minimal hospitalization required, so is significantly expensive. It is a local

VERTICAL LARYNGECTOMIES COMPLICATIONS	
	%
No Complications	91.1
Wound Infections	6.6
Pneumonia	1.3
Fistula	0.5
Postoperative Death	0.3

Table XI

HORIZONTAL LARYNGECTOMIES COMPLICATIONS	
	%
No Complications	76.7
Wound Infections	13.3
Pneumonia	3.5
Fistula	4.9
Postoperative Death	1.5

Table XII

PARTIAL LARYNGECTOMIES FUNCTIONAL RESULTS	
● Quality of Voice :	
– Good: Normal to near-normal voice.	
– Fair: Mild or intermittent hoarseness.	
– Bad: Severe hoarseness.	
● Swallowing :	
– Good: Normal swallowing.	
– Fair: Occasional aspiration with liquids.	
– Bad: Persistent problems with liquids.	
● Respiration :	
– Good: Adequate airway for sport activity.	
– Fair: Adequate airway for normal activity.	
– Bad: Permanent tracheotomy.	

Table XIII

treatment than can be repeated if necessary. Laser resection does not preclude the later use of radiotherapy. Follow-up and detection of recurrent tumors are easy and complications are unusual. In addition, laser cordectomy offers same quality of voice as radiotherapy.

NO GLOTTIC LARYNGEAL CANCER NO NECK SURVIVAL RELATED TO NECK POLICY

Fig.13

VERTICAL LARYNGECTOMIES FUNCTIONAL RESULTS			
	Swallowing	Respiration	Fonation
Good	96.7%	94.1%	82.9%
Fair	3%	3.5%	16.2%
Bad	0.3%	2.4%	0.9%

Table XIV

HORIZONTAL LARYNGECTOMIES FUNCTIONAL RESULTS		
	N	%
Neck Dissection	334	27.5
Radiotherapy	160	13.2
Wait and See Policy	720	59.3

Table XVI

HORIZONTAL LARYNGECTOMIES FUNCTIONAL RESULTS			
	Swallowing	Respiration	Fonation
Good	91.2%	84%	82.3%
Fair	7%	6%	14.6%
Bad	183%	10%	3.1%

Table XV

For T1b and T2 vocal cord tumors, external beam irradiation offer better quality of voice than

hemilaryngectomy and when patients treated with surgical salvage are included, rate control of disease and cure approximate those of surgery along. However tumour recurrence after primary radiotherapy is higher than with surgery (48). Since local failures after primary radiotherapy can rarely be treated with salvage conservation surgery (51, 52, 53, 54), the voice preservation rate is higher with hemilaryngectomy than with primary radiotherapy. The need for a surgical salvage with total laryngectomy is explained by

LARYNGEAL CANCER "pN+ R-" SURVIVAL RELATED TO POSTOPERATIVE RADIOTHERAPY

Fig.14

the frequency of late diagnosis, and difficulties is precisely dening the extent of disease. That's why, when partial surgery is indicated, we prefer conservation surgery instead radiotherapy. This concept may be modified according to th current possibilities of exploration with flexible fibre optic, CT scan and MRI. These methods may now allow an earlier detection of some local recurrence and a better appreciation of their extension towards the paraglottic space anteriorly and the subglottis inferiorly. The indications for partial vertical surgery could thus be more precisely defined.

The management of advanced glottic cancer remains the subject of considerable debate, with some authors advocating surgery as primary treatment and others defending radiotherapy with rescue surgery for local failures or for the patients with insufficient regression after radiotherapy (55, 56, 57, 58, 59, 60, 61, 62). Patients with

advanced glottic cancers when radiated have a 50% probability of recurrences and will need retreatment. The argument of voice and voice quality preservation in such situations deserves serious considerations. There is not dispute that the quality of voice in a successfully radiated early cancer is good, but in advanced cases, irradiated patients have neither a satisfactory voice nor a good chance for salvage by second treatment with total laryngectomy. Hence, in our opinion radiotherapy should not be used for curative purpose in these patients. Of the surgical options, total laryngectomy is generally accepted as the procedure necessary to give a reasonable chance of cure. However is possible to perform partial laryngectomies in selected cases with a local control rates that are comparables to those obtained with total laryngectomy (63, 64, 65, 66, 67, 68).

For early stages (I/II) of supraglottic carcinoma, the treatment of choice with regard to primary tumor varies between partial laryngectomy (69, 70, 71, 72, 73, 74, 76, 76) or primary radiation therapy (77, 78, 79, 80, 81). There is a general agreement that control of the primary in surgical treated early supraglottic cancer is not a serious problem. Irradiation alone is about 30% less effective for primary control. Some of the patients who failed irradiation can be salvaged, usually by total laryngectomy. When total laryngectomy was the only surgical option, the voice-sparing potential of irradiation for cure and operation for salvage was attractive, but that time is over. Conservation surgery saves more voices and offers better survival. That's why in early supraglottic carcinomas we perform a supraglottic laryngectomy unless the patient has an advanced age, presents a poor respiratory status or refused surgery.

Locally advanced supraglottic tumors are usually treated with total laryngectomy, but in selected cases can be performed a conservation surgery. When carefully selected, supraglottic laryngectomy did not result in any difference in achieving primary control compared to total laryngectomy. The patient who is a potential candidate for extended supraglottic laryngectomy must be carefully evaluated not only to determine whether the tumor is technically resectable with preservation of voice but also to identify host factors that may add unnecessary risk to this approach.

No primary cancer in the head and neck can be treated without concomitant attention directed to regional metastases, and there are many questions about the correct management of this aspect of disease.

LARYNGEAL CANCER "pN+ R+"

SURVIVAL RELATED TO POSTOPERATIVE RADIOTHERAPY

Fig.15

Many of the traditional controversies revolve around elective neck treatment of the N0 neck:

– Elective versus therapeutic neck treatment: There is not statistically evidence in the head and neck cancer literature to indicate any detriment to patient survival by delaying neck treatment until nodes becomes clinically evident in patients who present an N0 neck (4, 30, 82, 83, 84, 85, 86, 87). However our results shows a better survival in those patients who suffered prophylactic neck dissection versus those patients who were no treated.

– What features of the primary tumor are useful in estimating the incidence of occult metastases? The results of our study indicates that only poorly differentiated carcinomas, and tumor with deep invasion of paraglottic and preepiglottic spaces are accompanied by higher rate of lymph node involvement. The high frequency of such involvement, even subclinical, should require routine treatment.

– Radiotherapy or surgery for subclinical cervical node metastases. Comparisons between elective neck irradiation and elective neck dissection usually show approximately equivalent recurrence rates for each modality when the primary tumor is controlled (88). The advantage of routine surgical treatment is to provide knowledge of the current state of involvement and to follow it up with post-operative radiotherapy adjusted on the basis of

the degree of the involvement.

– Comprehensive or selective neck dissection in N0 patients? Based on the knowledge of patterns of cervical node metastases form squamous carcinoma of the larynx (89, 90, 91) Byers et al., in several retrospective studies have demonstrated the anterior neck dissection (containing cervical nodal levels II, III and IV) to be adequate therapy for primary tumors of the larynx with N0 patients (92). We have found no statistically significant difference in recurrence rates between comprehensive and selective neck dissections.

– Indications for combining therapy for control of neck disease. The results of our study and a number of series in the literature indicate that surgical therapy alone achieves survival equivalent to combined therapy and some show that survival of patients on combined therapy programs is poorer than that for patients treated with surgery alone, even when treatment groups were compared by stage of lesion (93, 94). Nevertheless the levels involvement and the number of positive nodes should be taken in consideration.

– Node involvement with capsular rupture (N+R+). Our results and those of the literature suggest that patients treated with postoperative radiotherapy have better survival than patients treated without postoperative radiotherapy (95).

References

1. American Joint Committee on Cancer, (1988): *Manual for Staging of Cancer* (3rd edition). J. B. Lippincott Co., Philadelphia.
2. Schechter G. L. (1986): *Conservation surgery of the larynx*. In: *Otolaryngology–Head and Neck Surgery* (Chap. 109) Cummings, C. W. et al (Eds.). C. V. Mosby Publishing Co. St. Louis.
3. De Santo L. W. (1985): *Laryngoscope*. 94: 1311-1315.
4. Scola B., Vega M. T et al (1985): In: Garsi (Ed.) *Frcasos con cirugía y/o radioterapia en el carcinoma laringeo*. *Actas del XII Congreso Nacional de la Sociedad Española de O. R. L.*
5. Van Den Bogact W. et al (1983): *The primary treatment of advanced vocal cord caner: laryngectomy or radiotherapy*. *Int. J. Radiat. Oncol. Biol. Phys.* Vol 9, pp 329-334.
6. Van Acht M. J. J. et al (1989): *Glottic and supraglottic carcinoma; a retrospective comaparison of radiotherapy alone with sandwich therapy in 366 patients*. *Radiotherapy and Oncology*. 14, 103-112.
7. Guerrier Y. (1977): In: *Traité de thecnique chirurgicale O. R. L. et cervico-faciale*. Tome 3. *Pharynx et larynx*. Masson.
8. Krichner H. and Som M. L. (1971): *Laryngoscope*. 81; 1029.

9. Kambic V. et al (1977): Laryngeal reconstruction with epiglottis after vertical hemilaryngectomy. *J. Laryngol Otol.* 9: 467-473.
10. Tucker H. M. et al (1979): Glottic reconstruction after near-total laryngectomy. *Laryngoscope.* 89: 109-618.
11. Schechter G. L. (1983): Epiglottic reconstruction and subtotal laryngectomy. *Laryngoscope.* 729-731.
12. Vega M. F., Scola B. et al (1984): Hemilaringectomías con reconstrucción con epiglottis. *Actas de las comunicaciones presentadas al XII Congreso Nacional de la Sociedad Española de O. R. L.* Oviedo, Ed. Garsi. Madrid.
13. Maisel R. H. (1986): Carcinoma of the larynx and laryngopharynx. In: *Head and Neck Cancer.* D. G. McQuarrie, G. L. Adams and G. A. Browne (Eds.) Year Book Medical Publishers, Chicago, p.285.
14. Sessions D. G. et al (1975): The anterior commissure in glottic carcinoma. *Laryngoscope.* 85: 1624-32.
15. Tucker H. M. (1987): Malignant tumors, In: *The larynx.* H. M. Tucker (Ed) Thieme Verlag. New York, p. 278.
16. Krespi Y. P. and Meltzer C. J. (1989): Laser surgery for vocal cord carcinoma involving the anterior commissure. *Ann. Otol. Rhinol. Laryngol.* 98: 105-109.
17. Zohar Y. et al (1992): The controversial treatment of anterior commissure carcinoma of the larynx. *Laryngoscope.* 102: 69-72.
18. Rucci L. et al (1991): Glottic cancer involving anterior commissure: surgery vs radiotherapy. *Head and Neck.* 13: 403-410.
19. Piquet J. J. et al (1974): Crico-hyoido-epiglottopexie; technique opératoire et résultats fonctionnels. *Ann. Otolaryngol. Chir. Cervicofac.* 91: 681-690.
20. Ogura J. H. and Dedo H. H. (1965): *Laryngoscope.* 75: 865.
21. Vega M. F. and Scola B. (1993): Surgical treatment of locally advanced laryngeal carcinoma. In: *Head and Neck Cancer. Volume III.* J. T. Johnson and M. S. Didolkar Editors. Elsevier Science Publishers.
22. Mozolewsky E. et al (1984): Vascular pedicled flap of the thyroid gland in the so-called 3/4 laryngectomy. In Wigand M. E., Steiner W. and Stell P. M. (Eds.) *Functional Partial Laryngectomy.* Berlin; Springer-Verlag.
23. Ton-Van J. et al (1991): Comparison of surgery and radiotherapy in T1 and T2 glottic carcinomas. *Am. J. Surg.* 162: 337-340.
24. Rothfield R. E. et al (1989): The role of hemilaryngectomy in the management of T1 vocal cord cancer. *Arch. Otolaryngol. Head Neck Surg.* 115: 677-680.
25. Olsen K. D. et al (1993): Indications and results of cordectomy of early glottic carcinoma. *Otolaryngol. Head Neck Surg.* 108: 277-282.
26. Campora E. (1991): Le laringectomie parziali verticali (laringectomia frontale anterior, laringectomia frontolaterale). *Indicazioni e risultati a distanza. Acta Otorhinol. Ital. Suppl.* 33, XI: 39-44.
27. Danilidis J. et al (1990): Our experience in the surgical treatment of T1 carcinoma of the vocal cord. *J. Laryngol. Otol.* 104: 222-224.
28. Neel H. et al (1980): Laryngofissure and cordectomy for early cordal carcinoma: outcome in 1218 patients. *Otolaryngol. Head Neck Surg.* 88: 79-84.
29. Guerrier Y. et al (1984): Vertical partial laryngectomy. Functional partial laryngectomy. In: *Conservation surgery for carcinoma of the larynx*, pp 145-149. Editors: M. E. Wigand, W. Steiner and P. M. Stell. Springer Verlag, Berlin.
30. Vega M. F., Scola B. et al (1991): Conservative surgery in laryngeal carcinoma. In: *Otorhinolaryngology Head and Neck Surgery.* Eds.: T. S. Acriscean, J. J. Alvarez-Vicent, J. Bartual, F. Antoli-Candela and L. Rubio. Kugler & Ghedini.
31. Motta G. et al (1991): L'impiego del laser a CO2 nella chirurgia conservativa dei tumori glottici. *Acta Otorhinol Ital.* 11: 25-34.
32. Shapshay S. et al (1990): Laser excision of early vocal cord carcinoma: Indications, limitations and precautions. *Ann. Otol. Rhinol. Laryngol.* 99: 46-50.
33. Chiesa F. et al. (1991): CO2 lasersurgery in laryngeal cancers: Three years results. *Tumori.* 77: 151-154.
34. Krespi Y. et al (1989): Laser surgery for vocal cord carcinoma involving the anterior commissure. *Ann. Otol. Rhinol. Laryngol.* 98: 105-109.
35. Cragel S. P. et al (1993): Laser cordectomy or radiotherapy: cure rates, communications and cost. *Otolaryngol. Head Neck Surg.* 108: 648-654.
36. Lusinchi A. et al (1989): Radiation therapy in the treatment of early glottic carcinoma: The experience of Villejuif. *Radiother. Oncol.* 15: 313-319.

37. Epstein B. E. et al (1990): Stage T1 glottic carcinoma: Results of radiation therapy or laser excision. *Radiology*, 175: 567-570.
38. Kelly D. M. et al (1989): Definitive radiotherapy in the management of stage I and II carcinomas of the glottis. *Ann Otol. Rhinol Laryngol.* 98: 235-239.
39. Burke D. H. et al (1990): T2 glottic cancer: recurrence, salvage and survival after definitive radiotherapy. *Arch. Otolaryngol. Head Neck Surg.* 116: 830-835.
40. Fernberg J. O. et al (1989): Radiation therapy in early glottic cancer. *Acta Otolaryngol.* 108: 478-481
41. Turesson I. et al (1991): Primary radiotherapy for glottic laryngeal carcinoma stage I and II. *Acta Oncologica.* 3: 357-362.
42. Inoue T. et al (1992): Prognostic factors of telecobalt therapy for early glottic carcinoma. *Cancer*, 70: 2797-2801.
43. Pelliteri P. K. et al (1991): Radiotherapy: The mainstay in the treatment of early glottic carcinoma. *Arch. Otolaryngol. Head Neck Surg.* 117: 297-301.
44. Fein D. A. et al (1993): T1-T2 squamous cell carcinoma of the glottic larynx treated with radiotherapy: a multivariate analysis of variables potentially influencing local control. *Int. J. Radiation Oncol. Biol. Phys.* 25: 605-611.
45. Terhaard C. H. J. et al (1991): Radiotherapy in T1 laryngeal cancer. Prognostic factors for locoregional control and survival, uni and multivariate analysis. *Int. J. Radiation Oncol. Biol. Phys.* 21: 1179-1186.
46. Cellai E. et al (1990): Causes of failure of curative radiation therapy in 205 early glottic cancers. *Int. J. Radiation Oncol. Biol. Phys.* 19: 1139-1142.
47. Teshima T. et al (1990): Radiation therapy for early glottic cancer (T1N0M0): II. Prospective randomized study concerning radiation field. *Int. J. Radiation Oncol. Biol. Phys.* 18: 119-123.
48. Stalpers L. J. A. et al (1989): Radiotherapy or surgery for T2N0M0 glottic carcinoma? A decision-analytic approach. *Radiotherapy and Oncology*, 14: 209-217.
49. Strong M. S. et al (1975): Laser esision of carcinoma of the larynx. *Laryngoscope.* 85: 1286-1289.
50. Wolfensberger M. et al (1990): Endoscopic laser surgery for early glottic carcinoma: A clinical and experimental study. *Laryngoscope*, 100: 1100-1105.
51. Lavey R. S. et al (1991): Partial laryngectomy for glottic cancer after high-dose radiotherapy. *Am J. Surg.* 162: 341-344.
52. Nichols T. et al (1991): Partial laryngectomy after irradiation failure. *Ann. Otol. Rhinol. Laryngol.* 100: 176-180.
53. Shaw H. J. (1991): The role of partial laryngectomy after irradiation in the treatment of laryngeal cancer: A view from the United Kingdom. *Ann. Otol. Rhinol. Laryngol.* 100: 268-273.
54. Shah J. P. et al (1990): Conservation surgery for radiation failure carcinoma of the glottic larynx. *Head Neck Surg.* 12: 326-331.
55. Scola B., Vega M. F. et al (1984): Resultados con cirugía y/o radioterapia en el carcinoma laríngeo. *Actas de las comunicaciones presentadas al XII Congreso Nacional de la Sociedad Española de O. R. L. Oviedo.*
56. Jones A. S. et al (1992): Treatment of T3 carcinoma of the larynx by surgery or radiotherapy. *Clin. Otolaryngol.* 17: 433-436.
57. Terhaard C. H. J. et al (1991): Local control in T3 laryngeal cancer treated with radical radiotherapy, time dose relationship: the concept of nominal standard dose and linear quadratic model. *Int. J. Radiation Oncol. Biol. Phys.* 20: 1207-1214.
58. Mendenhall W. M. et al (1992): Stage T3 squamous cell carcinoma of the glottic larynx: a comparison or laryngectomy and irradiation. *Int. J. Radiation Oncol. Biol. Pys.* 23: 752-732.
59. Harwood A. R. et al (1980): T3 glottic cancer: An analysis of dose time-volume factors. *Invt. J. Radiation Oncol. Biol. Phys.* 6: 675-680.
60. Harwood A. R. et al (1979): Management of advanced glottic cancer. A 10 years review of the Toronto experience. *Int. J. Radiation Oncol. Biol. Phys.* 5: 899-904.
61. Razack M. S. et al (1989): Management of advanced glottic carcinomas. *Am J. Surg.* 158: 318-320.
62. Biller H. F. et al (1986): Partial laryngectomy for vocal cord cancer with marked limitation or fixation of the vocal cord. *Laryngoscope.* 96: 61-64.
63. Kessler D. J. et al (1987): The treatment of T3 glottic carcinoma with vertical partial laryngectomy. *Arch. Otolaryngol. Head Neck Surg.* 113: 1196-1199.
64. Tucker H. M. et al (1989): Near-total laryngectomy with epiglottic reconstruction. Long-term results. *Arch. Otolaryngol. Head Neck Surg.* 115: 1341-1344.
65. Laccourreye O. et al (1989): Supracricoid laryngectomy with cricohyoido-epiglottopexy: A partial laryngeal procedure for glottic carcinoma. *Ann. Otol. Rhinol. Laryngol.* 99: 421-426.

66. Laccourreye O. et al (1990): Supracricoid laryngectomy with cricohyoidopexy: A partial laryngeal procedure for selected supraglottic and transglottic carcinomas. *Laryngoscope*. 100: 735-741.
67. Piquet J. J. et al (1990): Subtotal laryngectomy with cricohyoido-epiglottopexy for the treatment of extended glottic carcinomas. *Am J. Surg*, 162: 357-361.
68. Vega M. F. , Scola B. et al (1984): Resultados con cirugía y/o radioterapia en el carcinoma laríngeo. *Actas de las comunicaciones presentadas al XII Congreso Nacional de la Sociedad Española de O. R. L.* Oviedo.
69. Vega M. F and Scola B. (1984): Conservation surgery for supraglottic carcinoma. In: *Functional partial laryngectomy*. Edited by M. E. Wigand, W. Steiner and P. M. Stell. Springer verlag.
70. Ogura J. H. et al (1980): Results of conservation surgery for cancer of the supraglottis and pyriform sinus. *Laryngoscope*. 90: 591-600.
71. Bocca E. et al (1983): Supraglottic laryngectomy: 30 years experience. *Ann. Otol.* 92: 14-18.
72. Cachin Y. (1975): Supraglottic carcinoma : The early cases *Laryngoscope*. 85: 1617-1620.
73. Calearo C. et al (1979): Supraglottic surgery in vestibular cancer. *Arch. Otorhinolaryngol.* 224: 207-220.
74. Leroux-Robert J. (1974): La laryngectomie horizontale susglottique. *Tumori*. 60: 507-510.
75. Desanto L. W. (1990): Early supraglottic cancer. *Ann. Otol. Rhinol. Laryngol.* 99: 593-597.
76. Lutz C. H. K. et al (1990): Supraglottic carcinoma: Patterns of recurrence. *Ann. Otol. Rhinol. Laryngol.* 99: 12-17.
77. Hoekstra C. J. M. et al (1990): Squamous cell carcinoma of the supraglottic larynx without clinically detectable lymph node metastases: problem of local relapse and influence of over all treatment time. *Int. J. Radiation Oncol. Biol. Phys.* 18: 13-21.
78. Harwood A. R. et al (1983): Supraglottic laryngeal carcinoma: an analysis of dose-time volume factors in 410 patients. *Int. J. Radiation Oncol. Biol. Phys.* 9: 311-319.
79. Freeman D. E. et al (1990): Irradiation alone for supraglottic larynx carcinoma: can CT findings predict treatment results? *Int. J. Radiation Oncol. Biol. Phys.* 19: 483-490.
80. Inoue T. et al (1993): Prognostic factors in Telecobalt therapy for early supraglottic carcinoma. *Cancer*, 72: 57-61.
81. Million R. R. (1992) The larynx... so to speak; everything I wanted to know about laryngeal cancer I learned in the last 32 years. *Int. J. Radiation Oncol. Biol. Phys.* 23: 691-704.
82. Desanto L. W. et al (1982) : Neck dissection: is not worthwhile? *Laryngoscope*. 92: 502.
83. Lee J. G. and Krause C. J. (1975) : Radical neck dissection: elective, therapeutic and secondary. *Arch. Otol.* 101: 656.
84. Mustard R and Rosen I. Cervical lymph node involvement in oral cancer. *A. J. R.* 90: 978.
85. Stell P. M. and Green J. R. (1976): Management of metastases to the lymph glands of the neck. *Proc. R. Soc. Med.* 69: 411.
86. Terl J. J. and Farr H. W. (1975): Carcinoma of the tonsillar fossa. *Surg. Gynecol. Obstet.* 3: 581.
87. Vandenbrouck C. et al (1980): Elective versus therapeutic radical neck dissection in epidermoid carcinoma of the oral cavity. Results of a randomized clinical trial. *Cancer*. 46: 386.
88. Chow J. M. et al (1989): Radiotherapy or surgery for subclinical cervical node metastases. *Arch. Otolaryngol. Head Neck Surg.* 115: 981-984.
89. Candela F. C. et al (1990): Patterns of cervical node metastases from squamous carcinoma of the larynx. *Arch. Otolaryngol. Head Neck Surg.* 116: 432-435.
90. Shah J.P. (1990): Patterns of cervical lymph node metastases from squamous carcinomas of the upper aerodigestive tract. *Am J. Surg.* 160: 405-409.
91. Wening B. L. et al (1991): The submandibular triangle in squamous cell carcinoma of the larynx and hypopharynx. *Laryngoscope*. 101: 516-518.
92. Byes R. M. et al (1988): Rationale for elective modified neck dissection. *Head Neck Surg.* 10: 160-167.
93. Grandi C. et al (1983): Surgery vs combined therapy for cancer of the anterior floor of the mouth. *Head Neck Surg.* 6: 633.
94. Schuller D. E. et al (1979): Symposium: Adjuvant cancer therapy of head and neck tumors: Increased survival with surgery along versus combination therapy. *Laryngoscope*. 89: 582.
95. Hirabayashi H. et al (1991): Extracapsular spread of squamous cell carcinoma in neck lymph nodes: prognostico factor of laryngeal cancer. *Laryngoscope*. 101: 502-506.