RADIOLOGIA IUGOSLAVICA

SUPPLEMENTUM II

CONSERVATION SURGERY OF THE LARYNX

LJUBLJANA 1977

RADIOLOGIA IUGOSLAVICA

PROPRIETARII IDEMQUE EDITORES: SOCIETAS RADIOLOGIAE ET MEDICINAE NUCLEARIS INVESTIGANDAE ET SOCIETAS MEDICINAE NUCLEARIS INVESTIGANDAE FOEDERATIVAE REI PUBLICAE IUGOSLAVIAE

LJUBLJANA

Suppl. II

Conservation surgery of the larynx

1977

Radiol. Iugosl.

UDK 615.849 (05) (497.1)

Izdajo tega suplementa so namensko materialno omogočili: Otorinolaringološka Klinika Kliničnega Centra v Ljubljani in Onkološki Institut v Ljubljani

RADIOLOGIA IUGOSLAVICA

Suppl. II | **Conservation surgery of the larynx** | 1977

TABLE OF CONTENTS

Radiol. Iugosl. | UDK 615.849(05)(497.1)

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INTERNATIONAL SYMPOSIUM ON CONSERVATION SURGERY OF THE LARYNX

Ljubljana, May 31, 1976

Introduction

This edition presents the papers read at the International Symposium on conservation surgery of cancer of the larynx held in Ljubljana, May 31, 1976, under sponsorship of the Otolaryngological Clinic of the Clinical Centre, Ljubljana, and the Institute of Oncology, Ljubljana.

Although the main topic of the Symposium concerned surgery, this was an exceptional occasion which brought together surgeons, radiotherapists and even pathologists to discuss a constant problem in management of cancer of the larynx, i. e. how to achieve cure with no or as small as possible impairment of laryngeal function. In the past, only radiotherapy could reach this ideal in early cancers, but not without failures. This last fact was a challenge for surgeons to develop various modalities of conservation surgery which are: removal of laryngeal carcinoma with preservation of respiration, phonation and deglution, and at the same time ensuring the highest possible cure rates. This monograph gives a broad survey about the most recent experiences in this field of precision surgery, about its achievements and also limitations. A few reports on the results of radiotherapy alone and of combined radiation and surgical treatment in laryngeal cancer represent a sound complement to the topic, indicating once more that radiotherapy and surgery must not be considered as competitive methods in management of this cancer, but rather as partners. Moreover, from the whole presentation, it is to be concluded that the choice of proper treatment is more demanding today than it was before. Therefore, it requires still closer cooperation between surgeons and radiotherapists in planning treatment of laryngeal cancer. Together they must estimate thoroughly various determining factors, such as precise location and extention of the lesion, the prognosis provided by one treatment modality or another, and not at last, the general physical condition of the patient; physical and social aspects have to be taken into consideration as well. In this way only, the advantages of the modern surgical or radiation techniques and procedures can be made most beneficial to the patients.

B. Ravnihar

INDICATIONS AND LIMITATIONS OF CONSERVATION SURGERY OF THE LARYNX

Alajmo E.

Thirty-five years of conservation surgery of the larynx have shown that many of the cartilagineous, muscular and mucosal components of the larynx and hypopharynx can each be removed without damaging the laryngeal structure and function, and without interfering with normal swallowing.

Each of these operations has proved thoroughly satisfactory from the cancerologic standpoint, being based on the anatomic and embryologic knowledge of the larynx. This is furthermore confirmed by survival rates which are similar to those obtained with total laryngectomy.

Several surgical techniques such as cordectomy, hemilaryngectomy and horizontal supraglottic laryngectomy have already been widely employed for a long time.

These operations can be variously associated with one another and thus allow conservation surgery in patients suffering from tumors which cannot be considered resectable by one of the three above mentioned operations.

Cordectomy can be performed in tumors of the middle third of the vocal cord with normal mobility. If the tumor reaches the anterior commissure it can be treated with **fronto-lateral laryngectomy.** When also the vocal process of the arytenoid is affected, cordectomy must be associated with **arytenoidectomy.** A fixed cord and a subglottic extension of more than 1,5 cm. from the free border of the vocal cord are c o n t r a i n d i c a t i o n s. Impaired mobility requires hemilaryngectomy.

Hemilaryngectomy can be performed in the following cases: 1) cordal tumors with impaired mobility or extending to the ventricle; 2) early tumors of the ventricle with mobile cord; 3) tumors of the false cord extending to the ventricle and/or to the arytenoid. Tumor spread to the anterior commissure needs removal of the latter together with the anterior third of the opposite vocal cord (as performed in fronto-lateral laryngectomy). Tumors with extension to the edge of aryepiglottic fold (or tumors arising from aryepiglottic fold or from the three folds area) need **lateral supraglottic pharyngolaryngectomy** with removal of half of the epiglottis; in some of these cases it is possible to preserve both arytenoid and vocal cord, or at least the latter. When the tumor affects the anterior part of the false cord, a horizontal supraglottic laryngectomy must be performed since the pre-epiglottic space might have been invaded. Fixed arytenoid and advanced tumors of the ventricle are contraindications; in fact in the first case the crico-arytenoid joint might have been invaded and, in the second, the tumor might have spread to the lateral crico-thyroid groove.

Horizontal supraglottic laryngectomy is mainly performed in the infrahyoid part of laryngeal surface of the epiglottis, even when spreading to the false cords and lateral walls of the vestibule. Tumors arising from the suprahyoid part of the epiglottis, or extending to its free border, can be treated with **supraglottic laryngectomy extended to the posterior third of the base of the tongue.** When the tumor spreads to the valleculae or superficially to the posterior third of the base of the tongue, a **supraglottic subglosso-laryngectomy** can still be performed; in this case removal

of the whole hyoid bone is mandatory. If the tumor reaches the free border of an aryepiglottic fold, supraglottic laryngectomy must be extended to the laryngeal aspect of the pyriform fossa; when the later is also affected, the operation must be **extended to the whole pyriform fossa.** Tumor spread to an arytenoid or to the upper surface of a vocal cord, makes it necessary that the operation be **extended to the arytenoid** and the **upper half of the true cord.** When a vocal cord is more widely affected, but is still mobile, cordectomy with arytenoidectomy must be associated to supraglottic laryngectomy: in this case the operation is called **3/4 laryngectomy** (or **horizonto-vertical laryngectomy).** Supraglottic laryngectomy has the following contraindications: 1) deep infiltration of the base of the tongue; 2) infiltration of the thyroid cartilage; 3) tumor spread to anterior commissure; 4) fixed vocal cord or fixed arytenoid for tumor extension; 5) tumor spread to both arytenoids; 6) tumor spread to mucosa of the posterior aspect of the arytenoid as well as to post-cricoid mucosa; 7) extension to the lateral wall of oropharynx; 8) infiltration of pre-laryngeal muscles 9) another contraindication arises from the necessity to extend supraglottic laryngectomy both to the base of the tongue and to one pyriform fossa, since it would be imposible for the patient to restore swallowing properly.

Hemilaryngopharyngectomy can be performed in tumors of pyriform fossa when its floor and the post-cricoid mucosa are free from the disease, provided that vocal mobility is normal and tumor does not infiltrate the larynx deeply.

The association of basic operations such as cordectomy, hemilaryngectomy and supraglottic laryngectomy, can therefore create different types of conservative operations which make it possible to avoid tracheostomy and allow the patient to speak with a laryngeal voice: this voice is very good after supraglottic laryngectomy, and fair when a vocal cord is completely or partially removed.

Only vertical operations (cordectomy, hemilaryngectomy) allow removal of the anterior commissure. In fact it requires resection of the angle of the thyroid cartilage, and then a disconnection of the thyroid alae. This weakens the laryngeal structure so that, when, after a supraglottic laryngectomy, the larynx is tied to the hyoid bone, the thyroid alae rotate and shift.

Involvement of anterior commissure is therefore to be considered, as previously stated, a contraindication to supraglottic laryngectomy. In some of these cases a reconstructive laryngectomy by crico-hyoidopexis is still possible, as the last attempt to preserve the continuity of the air passages.

Conservation surgery has also been recommended for subglottic and bilateral tumors (transversal glottectomy by Calearo). We do not have a direct experience of neither of them. However we cannot but stress how serious subglottic tumors are, so that functional problems become secondary. As regards bilateral glottic tumors, we can treat them either by radiotherapy or by other surgical techniques; in fact early bilateral tumors with mobile cords can be irradiated and curred in a very high percentage. Otherwise they can be treated by bilateral cordectomy and laryngoplasty (according to Bailey). More advanced tumors with preserved cordal mobility can be treated by reconstructive laryngectomy with crico-hyoido-pexis. The most advanced cases, with impaired vocal cord mobility or fixed cord, must be treated only by total laryngectomy.

In conclusion, we believe that, although there are indications and limitations for each of the laryngeal conservative operations, it is not so important that we should be able to plan a certain type of operation, but it is essential that we know the local and general contraindications to conservation; often only in the operating

room, after considering the local situation carefully, and on the basis of pre-operation data, we are able to decide which is the type of conservative operation to be performed.

That is why we would like to point out the general and local contraindications of conservation surgery of the larynx.

General contraindications: 1) Poor general conditions and patients over 70. 2) Serious defect of respiratory functionality. 3) Severe mucosal lesions following previous radiotherapy. 4) Multiple bilateral neck metastases. 5) Fixed lymph-node metastasis. 6) Distant metastases.

Local contraindications: Upward: deep infiltration of more than half base of the tongue. **Laterally:** tumor extension to oropharyngeal lateral wall; thyroid alae infiltration. **Downward:** subglottic tumor extension more than 1,5 cm from vocal cord free edge, and more than 1 cm from the anterior commissure; invasion of floor of pyriform fossa. **Forward:** thyroid cartilage infiltration; crico-thyroid membrane invasion pre-laryngeal muscles invasion. **In Depth:** fixed vocal cord; deep infiltration of ventricle tumors; deep laryngeal infiltration of pyriform fossa tumors. **Backward:** tumor extension to both arytenoid cartilages; crico-arytenoid joint infiltration; cricoid cartilage infiltration.

Summary

Several surgical techniques such as cordectomy, hemilaryngectomy and horizontal supraglottic laryngectomy have already been widely employed for a long time.

The association of the above mentioned basic operations may lead to different types of conservative operations which make it possible to avoid tracheostomy and enable the patient to speak with a laryngeal voice. Indications and contraindications for conservation surgery of the larynx are given.

CONSERVATION LARYNGEAL SURGERY IN THE ELDERLY PATIENT

Tucker H. M.

Although it is generally well-known that Bilroth undertook the first total laryngectomy in 1874, it is less common knowledge that he first performed a hemilaryngectomy in the same patient, resorting to the more extensive procedure only when the subtotal attempt resulted in a recurrence. In the one hundred years since, great strides in surgical technique, better understanding and support for the altered physiology of the surgical patient and much improved diagnostic capabilities have permitted the widespread use of less than total laryngectomy with ever improving cure rates. At the present time, more than half of all the new laryngeal cancers seen are suitable for subtotal laryngectomy.

During the same one hundred years, general improvements in the prevention and management of childhood and adult disease have led to continuing increase in life expectancy to the point that, in many developed countries, 25% or more of the population is over the age of 65. Although many of these individuals are in otherwise reasonable health, major head and neck procedures are often not performed in favor of radiation therapy for cure, even for lesions that would otherwise be considered amenable to surgery in younger patients, on the grounds that the patient is too old to tolerate the necessary procedure. The same argument has been employed in favoring total laryngectomy over subtotal procedures in the older patient.

This report examines the author's experience with conservation laryngeal surgery in patients over the age of 65 at the time treatment was undertaken. It is intended to shed some light on the validity of withholding conservation laryngeal surgery from otherwise suitable patients on the grounds of chronologic age alone.

Materials and Methods. — (Table I) In the period July 1969 through January 1976 a total of 27 patients were seen with lesions suitable for either supraglottic laryngectomy or hemilaryngectomy. Of these, the eldest was 92 years old. Fifteen were supraglottic lesions and twelve were unilateral glottic lesions. One patient in each group had received cobalt teletherapy in the range of 6000 to 6500 rads in an unsuccesful attempt at cure. The others were untreated when first seen. In all cases, complete otolaryngologic workup including direct laryngoscopy and biopsy was performed. In addition, medical evaluation with special attention to pulmonary and cardiac status was obtained. In those cases complicated by coronary artery disease, impaired pulmonary function, diabetes, etc., vigorous treatment regimens

	No. of Pts.	Youngest Pt.	Oldest Pt.
Unilateral Glottic Lesions	9	65	89
Supraglottic Lesions	14	65	92
Total	23		

Table I
Conservation laryngeal surgery in the elderly patient

were implemented to bring these factors under control by the time of the planned surgery. In the group of supraglottic lesions, all of which received approximately 3000 rads planned preoperative radiotherapy, the necessary delay allowed ample time to attend to medical problems without the need to postpone surgery. The cases managed by hemilaryngectomy, on the other hand, did not receive concomitant radiation and it was thus necessary to delay surgery beyond two weeks from the time of biopsy in one case because of a recent myocardial infarction. In four cases, three from the unilateral glottic group and one from the supraglottic group, insurmountable medical problems such that surgery of any kind was precluded dictated the use of radiotherapy for cure as the treatment modality, thus leaving a total of twenty-two cases in the surgical group.

The general surgical management and operation selected were, in each case, the same that would have been employed in similar patients under the age of 65. The unilateral glottic lesions, all of which were T_2 or advanced T_1 lesions, were managed with tracheotomy and vertical hemilaryngectomy appropriate to the particular case. In those cases requiring total removal of the arytenoid, replacement bulk in the form of a muscle pedicle was supplied. The supraglottic lesions were treated with approximately 3000 rads preoperative radiotherapy over a three week period. There followed a three to four week rest period, after which supraglottic laryngectomy (including cricopharyngeal myotomy) and radical neck dissection were performed. In two cases a secondary contralateral neck dissection was done approximately six weeks after the first side. In all neck dissection cases in this group the carotid artery was covered with a dermal graft.[1] Prophylactic broad-spectrum antibiotic coverage was begun intraoperatively and continued for seven to ten days in all cases. Hemovac drains were removed when no more than thirty-five cc. were obtained in a twenty-four hour period. This generally occurred at about the third or fourth postoperative day.

Cuffed tracheotomy tubes were, of course, used in all cases. The cuff was deflated as soon as the patient was awake and alert, which was usually on the morning following surgery. In the hemilaryngectomy cases, aspiration was not usually a problem thereafter and the cuff could be left deflated until removal of the tube. The patients in whom supraglottic procedures had been performed, on the other hand, often required reinflation of the cuff for three or four days, usually beginning on the third or fourth postoperative day. The cuff was again deflated as soon as the patient could manage his own secretions. In general the hemilaryngectomy patients were extubated on the ninth or tenth postoperative day. The supraglottic group usually required the tracheotomy tube until two weeks post surgery.

Postoperatively, feedings were begun within twenty-four to forty-eight hours via a nasogastric tube placed at the time of surgery. This was continued until at least forty-eight hours **after** removal of the tracheotomy tube. At that time, if the patient was having no respiratory difficulties and there were no signs of incomplete wound healing, clear liquids or semi-solid food was begun by mouth, after first removing the nasogastric tube the night before.

In all of the hemilaryngectomy patients and all but two of the supraglottic cases, peroral alimentation was sufficiently well tolerated within thirty-six hours to permit discharge from the hospital. In the two exceptions mentioned, one of which had had a fistula, the nasogastric tube was reinserted and the patient sent home for three weeks. Peroral alimentation was successfully begun in both cases at the next attempt.

Results. — (Table II) There were no surgical mortalities in this series of patients.

	Fistulae	Carotid blowout	Skin breakdown	Delayed discharge
Unilateral glottic lesions	0	0	0	0
Supraglottic lesions	2	0	0	(1)
Total	2	0	0	(1)

Table II
Conservation laryngeal surgery in the elderly patient

Morbidity was defined as: fistula formation, skin breakdown greater than two cm, carotid blowout, or any other untoward result such that additional surgical intervention was required or that delayed discharge beyond three weeks from the day of surgery. As will be seen from the table, there were two fistulae, both in the supraglottic group. Both of these closed spontaneously without further surgical intervention. There were no skin breakdowns, no carotid blowouts and only one case in which discharge was delayed for other than difficulties in postoperative placement. This was a patient in the supraglottic group who experienced no difficulties with healing, extubation or alimentation, but who required a prostatectomy postoperatively when the urinary catheter placed at surgery could not be successfully removed. Complications subsequent to his urological surgery kept him in the hospital for four weeks. Although this is not strictly a complication of his laryngeal surgery, it is included because his urologic problem was precipitated by the catheter which might not have been necessary otherwise. There were no complications in any of the hemilaryngectomy patients.

Discussion. — Total laryngectomy, with or without neck dissection, has been shown to be the procedure of choice for carcinoma of the larynx, against whose curative results all other modalities must be measured. This procedure, when employed in the previously irradiated patient, carries with it a risk of significant morbidity on the order of fifteen to twenty percent overall, of which most will be fistulae.[2] In order to salvage the voice in suitable cases, it is reasonable to accept a somewhat higher morbidity, but not lowered cure rates. Since the advent of wide acceptance of conservation surgery, several series have shown that the cure rate in properly selected patients is essentially equal to that for total laryngectomy.[3, 4] Complications, on the other hand, are generally reported as being somewhat higher in the conservation group, particularly as regards fistula formation in supraglottic cases. In both hemilaryngectomy and supraglottic laryngectomy, problems with deglutition and aspiration of secretions are not uncommon. Neither of these complications occur, of course, in the fully healed total laryngectomy. For this reason, it has generally been held that patient age is a contraindication to surgical treatment in general and to conservation surgery in particular. This rationale assumes that radiotherapy is better tolerated by the elderly patient than is surgery. Although it is difficult to quantify the dry mouth, skin desquamation and/or breakdown and continued problems with deglutition that result from radiotherapy or to compare them with the complications of surgery in a meaningful way,[5] there is the inescapable fact that radiotherapy generaly preserves a much better voice than that achieved by even the best pharyngeal speech in the total laryngectomy patient. On the other hand, the cure rates for radiotherapy alone are in no case as good or better than those achieved by surgery or combined radiation and surgery.

It follows that if appropriate conservation surgery can be applied with preservation of voice, the one real advantage of radiotherapy as a treatment modality is

lost, provided that morbidity and mortality are essentially the same. Complication rates from radiotherapy alone are reported as being from five to ten percent in most series.[5] The total complication rate in the small series reported herein is 13.6 %. Although we cannot give meaningful five-year survival statistics in this small group, it seems reasonable to except as good results as have been reported for similar lesions in large studies in younger patients. These are, of course, better than for radiotherapy alone.

The arguments for withholding conservation laryngeal procedures in elderly patients have centered around the anticipation of higher complication rates than would occur in similar patients of younger age group. If the patients reported in this paper are divided into hemilaryngectomy and supraglottic laryngectomy groups, it can be seen that the complication rate in the former group is 0 % and in the latter the fistula rate is 14.2 %. These figures certainly compare favorably with reported rates in series of younger patients.

In evaluating the elderly patient for such surgery, particular attention must be paid to cardiac and pulmonary status. If cardiac status is, or can be made adequate to permit general anesthesia, the patient should be able to tolerate a conservation procedure. Pulmonary function deficits, on the other hand, may well be the limiting factor in these cases, inasmuch as some degree of aspiration is almost a certainty after supraglottic laryngectomy and is often seen briefly after hemilaryngectomy. In such patients, total laryngectomy remains a suitable alternative, since aspiration is not a problem.

Conclusions. — A review of the author's experience with conservation laryngeal surgery in patients over the age of sixty-five strongly suggests that chronologic age alone need not be a contraindication to such procedures. No mortalities resulted in this series and an overall complication rate of 13.6 % was achieved.

Summary

At the present time, more than half of all the newly diagnosed laryngeal cancers are suitable for subtotal laryngectomy This report examines the author's experiences with conservation laryngeal surgery in patients over the age of 65 at the time the treatment was undertaken.

It has generally been considered that patient's age is a contraindication to surgical treatment in general and to conservation surgery in particular. A review of the author's experiences with conservation laryngeal surgery in 22 patients over the age of sixty-five strongly suggests that chronologic age alone need not be a contraindication to such procedures.

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LES LIMITES DE LA CHIRURGIE PARTIELLE HORIZONTALE DU LARYNX

Cachin Y.

La chirurgie partielle horizontale du larynx est de pratique assez récente. La première intervention de ce type a été effectuée en 1938 par P. C. Huet (Institut Gustave-Roussy, Villejuif) et rapportée dans un numéro des Annales d'Oto-Laryngologie de Paris de la même année.

L'opération effectuée était la **hyo-thyro-épiglottectomie** destinée à enlever une tumeur sus-glottique médiane en même temps que la loge hyo-thyro-épiglottique. Huet précise que »l'exérèse comprend une laryngectomie partielle antérieure sus-glottique complétée en haut par une pharyngotomie para-médiane bilatérale et une transversale sus-hyoïdienne«.

Depuis lors de nombreux types d'intervention ont été décrits, en particulier la laryngectomie sus-glottique (Alonso, 1939). Plus récemment on s'est efforcé d'en élargir les indications à la fois latéralement (margelle du larynx) et vers le bas (étage glottique). Il est donc utile de préciser quelles sont les limites de cette chirurgie, ce qui nécessite tout d'abord le rappel de ses justifications théoriques sur le plan carcinologique et sur le plan fonctionnel.

Justifications théoriques. — 1° — Sur le plan anatomique, le larynx sus-glottique est une région assez autonome disposant de son drainage lymphatique propre. Il est bien limité en bas par les cavités ventriculaires et ses collecteurs lymphatiques sont entièrement distincts de ceux du larynx sous-glottique.

2° — Sur le plan de l'extension tumorale, il existe ainsi des obstacles natureles à l'extension des cancers sus-glottiques vers la glotte. Les cancers vestibulaires purs (face laryngée de l'épiglotte, bandes ventriculaires) s'étendent rarement à la glotte; ils peuvent par contre s'étendre latéralement aux replis ary-épiglottiques; enfin, ils s'étendent fréquemment (80 % des cas opérés) à la loge pré-épiglottique. Ils relèvent donc d'une laryngectomie partielle horizontale.

Seuls les cancers ventriculaires, outre leur extension vers le haut, peuvent s'étendre vers la glotte et la sous-glotte après destruction du cône élastique. Ils constituent donc une contr'indication à la chirurgie partielle horizontale.

Enfin, les cancers de l'épiglotte sus-hyoïdienne se développent pendant longtemps sur place. Leur extension vers la base de la langue en avant et vers la paroi pharyngée latéralement est très tardive, malgré l'absence d'obstacles anatomiques. (Coupes d'étude histologique des pièces opératoires de laryngectomie). Un grand nombre de ces cancers peuvent donc être traités par laryngectomie partielle horizontale.

3° — Sur le plan des résultats carcinologiques, la chirurgie partielle horizontale pratiquée pour des cancers sus-glottiques sans extension au fond du ventricule n'est pratiquement jamais la cause de récidives au niveau de la tranche de section inférieure (1 à 2 % des cas — chiffres de l'Institut Gustave-Roussy).

4° — Sur le plan des résultats fonctionnels, cette chirurgie conserve une voix et une respiration normales. La gêne de la déglutition disparaît quelques semaines après l'intervention.

Indications et limites de la chirurgie partielle horizontale. — Sur la base des considérations théoriques ci-dessus énoncées, il me semble que les indications et les contr'indications de la chirurgie partielle horizontale du larynx peuvent être aisément précisées. Plutôt que de mettre en parallèle les indications respectives des différents auteurs, je pense préférable de soumettre à la discussion celles que l'équipe de l'Institut Gustave-Roussy (Villejuif) a l'habitude de mettre en oeuvre ainsi que le type d'intervention qui lui paraît convenir dans tel ou tel cas.

Il faut distinguer deux types de localisations néoplasiques:

1. Les cancers sus-glottiques médians:

Relèvent de cette chirurgie:

— Cancers du bord libre de l'épiglotte — Intervention conseillée : épiglottectomie.

— Cancers de la face laryngée de l'épiglotte médians — Intervention conseillée : hyo-thyro-épiglottectomie.

— Cancers de la face laryngée de l'épiglotte avec extension à 1 ou 2 bandes ventriculaires — Intervention conseillée : laryngectomie horizontale sus-glottique.

Extensions tumorales permettant la chirurgie conservatrice:

— tiers antérieur de la bande ventriculaire,
— loge pré-épiglottique,
— face linguale de l'épiglotte,
— à la rigueur et dans certaines conditions, le tiers postérieur de la bande ventriculaire, le carrefour des 3 replis, la vallécule.

Extensions tumorales interdisant la chirurgie conservatrice:

— en bas, commissure antérieure et cordes vocales,
— en arrière aryténoïde,
— en avant, cartilage thyroïde,
— en dehors paroi latérale du pharynx,
— en haunt, extension importante à la base de la langue.

Nous déconseillons la chirurgie partielle horizontale dans ces cas soit sur le plan des séquelles fonctionnelles qui risquent de faire perdre le bénéfice de la chirurgie partielle, soit et surtout sur le plan carcinologique, les limites de la tumeur n'étant pas assez précises pour autoriser une résection partielle.

2. Les cancers de la margelle antéro-latérale du larynx:

Relèvent de cette intervention:

— Cancers du tiers externe de l'épiglotte,
— Cancers du carrefour des 3 replis,
— Cancers du repli ary-épiglottique.

Intervention pratiquée: laryngo-pharyngectomie partielle latérale sus-glottique (dite opération d'Alonso).

Extensions tumorales permettant la chirurgie conservatrice:

— Vallécule (une),
— partie externe de la loge pré-épiglottique,
— partie supérieure de la bande ventriculaire,
— atteinte discrète de la paroi pharyngée.

Extensions tumorales interdisant la chirurgie conservatrice:

— En avant, base de la langue,
— En haut, région sous-amygdalienne,
— En arrière, aryténoïde,
— En dedans, ventricule,
— En bas, partie basse du sinus piriforme.

Problèmes à discuter:

A — Chirurgie partielle horizontale du larynx étendue aux extensions basses unilatérales: glotte et même sous-glotte (Intervention type Ogura).

Les indications doivent en être discutées sur la base des résultats carcinologiques; il faut distinguer:

— les extensions glottiques médianes commissure antérieure) par contiguité où cette chirurgie est peut-être possible.

— les cancers à point de départ ventriculaire où la fréquence de l'extension basse, dans les plans profonds, doit la faire repousser. Il est en effet très difficile dans ces cas de préciser quelle doit être la limite inférieure de la résection. On peut se fier à l'extension le long de la muqueuse mais dans la majorité des cas le cancer du plancher du ventricule s'étend vers le bas dans les plans profonds le long du cône élastique. Ou bien il gagne l'espace crico-thyroïdien, ou bien il détruit le cône élastique et envahit la sous-glotte sans aucune manifestation au niveau de la muqueuse. Dans les 2 cas, la qualité de la résection chirurgicale est incertaine.

Cependant, avant de conclure de façon définitive, il faut disposer de résultats en nombre suffisant concernant le survie à 5 ans.

Je pense qu'il est préférable de pratiquer une laryngectomie subtotale reconstructive dans le cas de cancers du ventricule ou de cancers sus-glottiques bas à extension glottique.

B — La chirurgie ganglionnaire associée.

L'existence d'adénopathies mobiles N_1 N_2 uni ou bilatérales, ou fixées N_3 unilatérales ne contr'indique pas la chirurgie partielle horizontale.

Par contre, l'existence d'adénopathies fixées (N_3) bilatérales contr'indique une chirurgie partielle car le double sacrifice de la veine jugulaire interne, la vascularisation favorise l'oedème pharyngo-laryngé et, de ce fait, compromet les suites fonctionnelles. Il vaut mieux dans ces cas recourir à une laryngectomie totale.

C — Radiothérapie pré-opératoire.

La radiothérapie pré-opératoire effectuée avant une chirurgie partielle horizontale du larynx n'apporte aucune amélioration des taux de survie. Ceci paraît maintenant bien établi.

Ogura (3) a comparé (1955—1965) deux groupes de malades opérés de cancers sus-glottiques (69 cas dont 51 laryngectomies partielles). Un groupe recevait une télécobalthérapie pré-opératoire (1.500 à 3.000 rads), l'autre non. Cet essai thérapeutique a montré qu'il n'existait pas de différence significative entre les deux groupes, qu'il s'agisse de la survie à 3 ans ou du pourcentage des récidives locales ou ganglionnaires. D'autres études comparatives concluent dans le même sens (4).

Notre expérience (Institut Gustave Roussy (4) va dans le même sens. Nous avons opéré (5) de 1960 à 1967, 71 malades de laryngectomies partielles horizontales après une radiothérapie pré-opératoire de 4.000 rads. Le taux de survie à 3 ans est de 62 %, à 5 ans de 53 %, ce qui ne constitute pas une amélioration par rapport aux malades opérés d'emblée. Par contre, les suites opératoires ont été beaucop plus longues et les séquelles définitives relativement fréquentes, en particulier les sténoses laryngées chroniques.

La radiothérapie pré-opératoire dans le cadre des cancers sus-glottiques me paraît donc devoir être abandonnée.

Resumé

L'auteur envisage successivement:

1 — les justifications théoriques de la laryngectomie partielle horizontale (notions anatomiques, notions concernant les modalités de l'extension tumorale des cancers sus-glottiques, résultats carcinologiques, résultats fonctionnels).

2 — les indications et contr'indications à cette chirurgie, spécialement pour deux catégories de cancers : cancers sus-glottiques médians, cancers de la margelle laryngée antéro-latérale.

3 — Quelque problèmes particuliers; celui de la laryngectomie sus-glottique élargie, de la chirurgie ganglionnaire associée, de la radiothérapie pré-opératoire.

Les limites de la chirurgie partielle horizontale du larynx sont précisées sur la base de deux critères : valeur carcinologique (taux de survie à 5 ans), qualité des suites fonctionnelles.

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POSSIBILITIES AND LIMITS OF CONSERVATIVE LARYNX SURGERY — ANALYSIS OF 15 YEAR EXPERIENCE

Minnigerode B.

Partial resection of the larynx strives towards a worthwhile combination of radical tumor surgery encompassing the preservation of the organ and its function. While remarkably good functional results and lasting successes can be obtained in individual cases, a critical evaluation of a large number of relevant operations during a period of 15 years indicates, however, that we are still a long way from achieving our aim. Between 1960 and 1975, 366 partial resections of the larynx were carried out at the Ear, Nose and Throat department, University Hospital, Essen. The success of these operations depends upon the extent of the tumor and the method of surgery adopted.

From this review one can draw the following conclusions:

1. Tumors limited to the glottic region with or without the inclusion of the sinus Morgagni, have an excellent prognosis providing they could be treated by thyreotomy and chordectomy or extended chordectomy. The respiratory function was undisturbed in all of these cases, whereas the vocal function was poor, due to the inevitable loss of tissue.

For reasons of conservation and preservation of the vocal function, we have extended the radium contact irradiation, which is still used in our clinic, for tumor stages II and III. The utilization of this extremely preservative method, which is in the true sense a radio-surgical therapeutic method, may a priori appear as a high risk treatment in the forementioned tumor stages. However, results of the nearly 20 year experience have justified our continued use of the method. From a total of 97 treated cases of stage II, we achieved 63 successful cases (65 %) where healing occured over a period of more than 3 years, 38 of which (39,2 %) were succesful over a 5 year period; and, in 104 treated cases of stage III, we achieved 56 successful cases (53,8 %) where healing occured over a period of more than 3 years, 44 of which (42,3 %) were successful over a 5 year period. These results exceeded all our expectations. The remarkable feature of radium contact irradiation, the so-called overstepped indication, is that even in its failure, the possibilities and chances of healing following partial resections, are not impaired.

2. On the contrary, tumors which have spread to the ventral part of the larynx or effect only one side, but have a vertical extension, and which could be treated by: the anterior partial resection (Tapia, Leroux-Robert); the fronto-lateral partial resection (Leroux-Robert), or by the hemi-laryngectomy (Gluck, Soerensen, Hautant), gave completely unsatisfactory results in relation to healing and function (respiration and voice). On the strenght of our experience, the unsatisfactory nature of the results depends on two reasons:

The transmuscular invasion of the tumor in the anterior and/or the lateral thyroid cartilage, in particular along the tendon of the anterior Commisura, which is rich in lymph channels and, which is evident at its point of insertion on the larynx as the macula flava and is directly

bound with various ligaments, muscle and membranes of the larynx into which it radiates. Each cartilaginous part in this region makes a conservative operation precarious, even on a large cartilage resection. This is because there are frequently patho-histologically identifiable small bands of tumor cells, which have already entered the cartilage lamina and have grown into the prelaryngeal soft tissues. In this case the carcinoma tends to enter the ossified spongy part of the cartilage as a means of penetration. As a result of this, it could be said that primary transglottic carcinomas are very aggresive towards the thyroid cartilage.

The bilateral subepithelial growth of the tumor. — In 30 cases where a laryngectomy was performed, after the tumor was seen macroscopically strictly confined to one side. However, on histological examination of the apparently healthy side, some interesting facts were revealed. Namely, that in 21 cases, subepithelial spreading of the tumor had extended in this region to beyond the middle of the vocal cord. The results of the histological findings show that because of the transmuscular invasion of the tumor into the cartilage and its subepithelial spread, the danger of the resecting operation being carried out too close to the border of the tumor, is completely concealed and so the possibilities of a vertical part resecting or a one side resectioning of the larynx is totally reduced.

3. Supraglottically, inside the vestibulum laryngis and above the level of the vocal cord and floor of the sinus Morgagni, the preservation of the glottis by horizontal resectioning of a growing carcinoma can only lead to a good result and a long term healing with undisturbed voice and breathing functions, if the operative indications of such a tumor can be limited and when the tumor has not yet reached the petiolus region of the epiglottis. That is, those tumors which are at least 3 mm, distant from the anterior Commissure and have not infiltrated the angle between the epiglottis and the plica aryepiglottica. Otherwise a deep paraglottic growth in the caudal direction must be reckoned with. Finally, tumors which invade the surface of the ventricular fold, of which the anterior-to-dorsal third is not overstepped, one must in this, and in other cases where there exists a rich lymphatic network, anticipate the invisible extralaryngeal tumor penetrations.

The above mentioned, strictly drawn indications for a horizontal partial resection, have formed the basis for all our cases, and which have probably resulted in our relatively good therapeutic results. The so-called »extended« supraglottic partial resection, favoured particularly by O g u r a and his collaborators, as well as by S h u m r i c k is refuted in principle by us.

On the strenght of these results which represent 15 years of experiences in conservative laryngeal surgery and of the specified causes, I feel reasonably justified in continuing to perform partial resections of the larynx in carefully selected cases. Unfortunately, in the majority of cases partial resection proves to be impracticable. In these and in doubtful cases I prefer to perform a total laryngectomy followed by plastic reconstruction of the vocal function according to a personal modification of the A s a i-technique. In the final analysis radical tumor surgery must above all, preserve function. The completion of a partial resection of the larynx with simultaneous essential neck dissection is, however, in my opinion a contradictio in se, as is a pre- or postoperative irradiation, because it would suggest that, in the opinion of the surgeon, the tumor now extends beyond the limits of the larynx. Under these conditions the decision for a total laryngectomy should be taken. In this respect I am in agre-

ement with the results of Roy and Beahrs of the Mayo Foundation, whose investigations covered more than 200 patients.

Summary

In the period of 1960 to 1975, 366 partial resections of the larynx were carried out at the ENT department of the University Hospital in Essen.

The succes of these operations depends on the extent of the tumor and the method of surgery adopted.

For reasons of conservation and preservation of the vocal function, the radium contact irradiation is extened to the glottic tumors of stages II and III. Indications and contraindications for supraglottic laryngectomy are given.

PARTIAL LARYNGECTOMY FOR RECURRENT CANCER AFTER IRRADIATION

Shaw J. H.

The purpose of this paper is to draw attention to the additional difficulties and hazards in performing conservation surgery of the larynx in order to ablate cancer persistent or recurrent after conventional irradiation. These difficulties require careful assessment in relation to the morbidity and results of such surgery. Some limitations of method will require to be accepted.

Enough evidence has grown up over the last 20 years to establish the newer techniques based on the older principles of vertical glottic and horizontal supraglottic resection to obtain high cure rates from these operations with the bonus of retaining a natural airway and voice, (Ogura & Mallen 1967, Som 1970, Bocca et al. 1968, and Leroux-Robert 1961). However, despite the excellent results now reported for operation on non-irradiated larynges, little objective evidence has been given regarding surgical indications and results in the irradiated case. This despite statements and warnings against conservation surgery especially for supraglottic lesions. (Ogura, Som, Stell, 1974).

Furthemore, it is important to establish the facts of this situtation in view of opinions by radiotherapists that all cases of laryngeal cancer with few exceptions should be given a full course of irradiation for cure initially, with the possibility of a second chance by surgery if this fails. (Lederman 1970). The attractions of this thesis are obvious and beguiling to all parties but it is necessary to examine whether it fits the facts in relation to the main regions and sites within the larynx.

Disease Incidence & Treatment trends in the U. K. — The general incidence of larynx cancer in England and Wales at present is almost static although there is some evidence of a slight relative increase in females in recent years. It is also well established that glottic lesions are much more frequent than supraglottic lesions, the reverse of the situtation in many peoples of Southern European origin who show a much greater incidence of supraglottic lesions.

In the U. K. for the last 30 years we have enjoyed the facilities and support of skilled radiotherapists working in well equipped regional clinics readily accessible to the larger population centres. These facts together with excellent figures for cure obtained by irradiation in the more common cases of limited glottic cancer, also the potent philosophy of »painless cure« and »saving the patient from surgical mutilation« have resulted in many years of radiotherapeutic domination in the treatment of laryngeal cancer.

More recently this attitude is slowly changing with a realization of the greater effectiveness of combined treatment in advanced lesions and the more selective application of irradiation and/or surgery for the earlier lesions. As a result of this predominance of irradiation we are perhaps in a unique position to assess the application of surgical techniques after irradiation.

Radiotherapy. — Irradiation technique during this period has been almost entirely using the Cobalt or Caesium Teleradiation apparatus. In a few cases the

older Radium machine was used. Total tumour dose per patient has averaged 6,500 rads to the larynx, fractionated over a period of 6 or 7 weeks.

Types of Operation. — For this study, the period 1964—1975 has been taken mainly since it is only since 1964 that horizontal partial laryngectomy has been performed at the Royal Marsden Hospital and that it represents a more complete view of the results of partial laryngectomy as performed to date at this hospital.

A total of 35 patients underwent forms of either vertical (18) or horizontal (17) partial laryngectomy during this period. Only one carcinoma out of each of these groups was non-irradiated prior to surgery. Five horizontal operations were done for benign tumours (Table 1).

This small number of partial and total laryngectomies performed despite a total number of 1547 new cases of laryngeal cancer seen at the hospital during this period can be explained by the facts of a large »open« Radiotherapy Department whose policy has been to irradiate nearly all cancers, using surgery to salvage the failures. Also to the fact that the Radiotherapists receive cases from and refer them back to a number of outside clinics and hospitals, so that surgery is frequently performed elsewhere.

In addition a series of 21 cases of vertical partial laryngectomy performed at the Royal National Throat Hospital, London, during the period 1961—1975 is presented. Total new cases of laryngeal cancer at that Hospital amounted to 634 in the same period (Table 2).

A diagram illustrating the trends in partial laryngectomy at the Royal National is also shown for the last 30 years. This indicates well the diminished number of such operations performed over the years in the U. K. In later years they have been mainly for recurrence after irradiation, especially since the early

PARTIAL LARYNGECTOMY

ROYAL MARSDEN HOSPITAL (1964 - 1975)

Total Treated = 35

Vertical PL. 17 - after full irradiation
1 - non irradiated

Horizontal PL. 11 - after full irradiation
6 - non irradiated
(5 benign lesions)

Age Range = 24 - 78. Median 58

Sex Incidence = M28 : F0

(Total laryngectomy 1964 - 1975 = 153)

Table 1 — Partial laryngectomies performed at the Royal Marsden Hospital (1964—1975)

PARTIAL LARYNGECTOMY

ROYAL NATIONAL THROAT HOSPITAL (1961 - 1975)

Total Treated = 21

Vertical PL. 9 - after full irradiation
1 - irradiated post opn.
11 - non-irradiated

Horizontal PL. None

Age Range = 43 - 83. Median 62

Sex Incidence = M23 : F0

(Total laryngectomy 1961 - 1975 = 357)

Table 2 — Partial laryngectomies performed at the Royal National Throat Hospital (1961—1975)

1960's with the introduction of improved Telecurie techniques.

At the Royal Marsden Hospital, there were two extended vertical operations both including the anterior commissure and the anterior third of the opposite vocal cord.

The other vertical operations were of the standard pattern reaching back from the anterior commissure posteriorly to include whole vocal cord and laryngeal musculature back to the arytenoid vocal process and from the upper surface of the ventricular band to 5 mm below the edge of the true cord. In all cases the major portion of the thyroid cartilage on the affected side was excised.

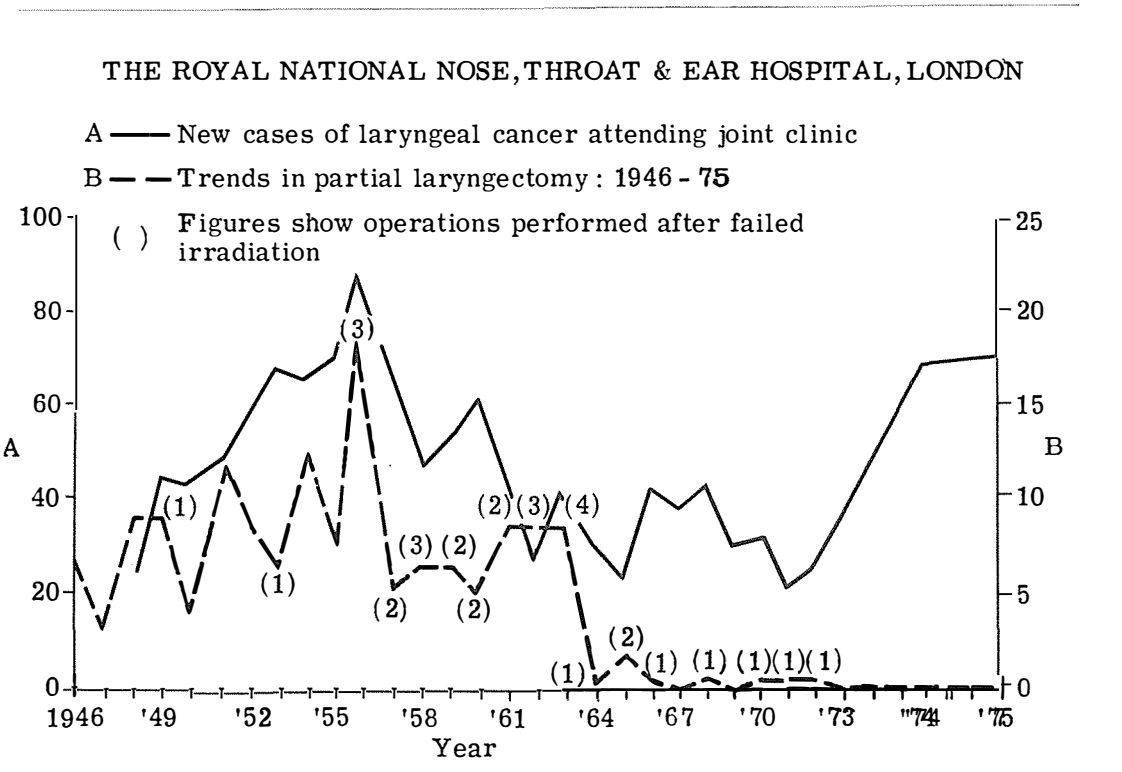

Diagram — Trends in partial laryngectomy at the Royal National Nose, Throat & Ear Hospital, London (1946—1975)

Most horizontal supraglottic operations were also standard, mainly following the technique of Som to include epiglottis, valleculae, pre-epiglottic space and hyoid bone, ventricular bands and ventricles with part of the aryepiglottic folds. However, in 4 out of the 17 operations, the resection was extended. Two included one arytenoid cartilage in each specimen, one of these also being extended to resect a vocal cord and adnexae on the same side, and one to include the top of the pyriform fossa on the same side. Two others were extended to resect part of the tongue base. All patients had one previous full course of Telecobalt irradiation to a total dose of approximately 6,500 rads at varying intervals prior to surgery. Of the 5 radical neck dissections carried out, only one was simultaneous with a vertical partial laryngectomy. The others were all for supraglottic lesions and when required initially were staged in order to minimize healing and swallowing difficulties.

Complications. — In relation to the 26 vertical operations post-operative problems were few. Decannulation was usually possible within 7 days of surgery, although in one case laryngeal oedema and some stenosis was persistent requiring the retention of a valved tracheostomy tube, but speech remains good (Table 3).

The two cases of surgical emphysema soon resolved and presented no difficulties although one was temporaily severe. In another case a few weeks delay in regaining a normal swallow occurred and in one other there was evidence of residual perichondritis which persisted for

PARTIAL LARYNGECTOMY – COMPLICATIONS AFTER FULL COURSE IRRADIATION

	R.M.H. 1964 - 1975	
Vertical PL (17 cases)	Surgical emphysema < 7 days:	2
	Delayed swallow 6 weeks:	1
	Perichondritis 3 months:	1
	Persistent laryngeal oedema: (retains trach. tube)	1
	No complications:	12
Horizontal PL (11 cases)	Swallow solids only > 6 years: (retains gastrostomy)	1
	Delayed swallow 1 year: (temporary gastrostomy)	1
	Delayed swallow 2 - 8 weeks:	3
	Broncho-pneumonia:	3
	Temporary small fistula:	1
	Gross wound breakdown:	1
	No complications:	4
	R.N.T.E.H. 1961 - 1975	
Vertical PL (9 cases)	Surgical emphysema 5 days:	1
	Delayed swallow 4 weeks:	1
	Slight wound infection:	3
	No complications:	4

Table 3 — Partial laryngectomy — complications after full course irradiation

five months eventualy settling on prolonged systemic antibiotics.

The post-operative picture for the 11 post-irradiation horizontal partial laryngectomies gave more cause for concern. Only 4 patients healed per primam with no complications and none of those was an extended procedure.

Laryngeal spillover was common in the early post-operative period and resulted in at least 3 cases of severe bronchopneumonia. In one this eventually resulted in his death a year later although adequate swallow was regained. A variable degree of delayed swallow was common. Although removal of feeding and tracheostomy tubes was usually accomplished in 2—3 weeks, one patient required gastrostomy for one year, and in another it has become permanent for the intake of liquids only, solids being swallowed normally. None the less, his voice remains weak though serviceable and the natural airway is regained. This was an extended operation to include the ipselateral vocal cord.

Large scale wound breakdown has occurred in only one patient and is thought to be partly a consequence of inclusion of the tongue base in the resection. Plastic closure was by delto-pectoral flap and the patient has so far regained a normal swallow and good voice with no recurrent tumour at 8 months.

Functional rehabilitation. — Healing is inevitably delayed in irradiated patients to an unpredictable degree. However, no great problems have been encountered in patients after the vertical type of operation, apart from the one case of laryngeal stenosis described already. Removal of the ala of the thyroid cartilage facilitates healing which is probably not complete for about 6 weeks.

The assistance of the Speech Therapist is of great benefit to patients' morale after operation and to the eventual quality of speech regained. During the healing period attempted use of the voice must be minimal with an absolute ban on smoking or excess alcohol.

Following the horizontal supraglottic operation the greatest problem relates to regaining the natural swallow and the prevention of chest infection by spillover. Much has been written on this subject and the problem is inevitably aggravated by the increased local oedema and delayed healing in irradiated patients. Our limited experience so far would indicate that any extension of the standard supraglottic operation invites disaster in such patients. More especially since repair of the sphincter mechanism cannot be carried out with any assurance in the irradiated larynx. This alone must restrict the use of the operation in these subjects.

The value of cricopharyngeal myotomy in this series was doubtful. In all it was carried out it only 5 patients out of the total 17, two of these five being the extended

operations which required gastrostomy and who did not in fact rehabilitate well. However, it is a logical step, easily carried out after the resection and before repair of the defect.

It is felt that there cannot be much place for the more sophisticated reconstructive procedures such as cartilage transposition, muscle transplants or fat and fascia grafts in an irradiated larynx. Repairs have comprised only the use of local mucosal rotation flaps and simple approximations.

Due to the impediment of an open tracheostomy tube and the inability to fix the chest in the swallowing act, early plugging or decannulation of the tracheostomy as soon as the airway is safe greatly facilitates the return to a normal swallow.

No special attempt is made to spare the superior laryngeal nerves as it is felt that their internal branches must inevitably be divided at some point in their course. However, the main trunks external to and within the pharyngeal walls are preserved so far as possible.

Radical neck dissection was needed on 5 occasions in 4 patients requiring horizontal partial laryngectomy, one having bilateral dissection. These were all staged in view of the increased risk to healing and swallow if they were simultaneous. This was borne out in one patient who developed quite severe dysphagia for a few weeks immediately after the neck dissection although swallow had recovered well after the initial laryngeal resection.

Two further measures were thought desirable to ensure optium healing. All patients were placed on wide spectrum antibiotic cover for at least 3 weeks from operation and surgical technique was as atraumatic and meticulous as possible without the use of coagulating diathermy. Any septic foci in the teeth or upper air passages were also eliminated before operation.

Finally, the patient should go to operation with a normal haemoglobin level and good general condition. All blood loss at surgery must be at once made good by whole blood replacement.

End Results. — The numbers of patients treated were insufficient to draw any final conclusions, but enough to indicate certain trends. There would seem little doubt that the combined two Hospitals minimum 3 year survival rate of 18 out of 26 (or 70 %) patients undergoing vertical partial laryngectomy after failed irradiation is significant in spite of a few healing difficulties and even including the three patients obtaining salvage by later total laryngectomy (Table 4).

However, a minimum 3 year survival rate of only 4 out of 11 horizontal operations, taken together with the serious complications resulting and the high rate of local and regional recurrence, two patients also died with distant metastases, would indicate great caution in proposing these operations after full course irradiation. Such results should also be viewed alongside the excellent survival rates reported for the horizontal operations in non-irradiated patients, (Bocca, Ogura, Som, etc.), and the less satisfactory results obtaining for the treatment of supraglottic cancer by radiation alone. (Lederman 1970, Oloffson et al. 1972, Duncan & Dalby 1962)

Conclusions. — This study would seem to confirm the view that limited glottic cancer should initially be treated by external irradiation. Failures of treatment would then have a good chance of cure by vertical partial laryngectomy where possible in most cases and even salvage by total laryngectomy should recurrence again occur. (Shaw, 1966.) It is felt that contraindications to the partial operation after irradiation would then be as follows:

1. Immobility of the involved vocal cord.
2. Definite transglottic spread.
3. Detection of cartilage invasion or perichondritis.

PARTIAL LARYNGECTOMY — END RESULTS & SALVAGE AFTER FULL IRRADIATION

A. ROYAL MARSDEN HOSPITAL: 1964 - 1975

Type of Operation	Patients Treated	Local Rec.	Total Lty.	Cervical Metas-tasis	Radical Neck Dissec.	Died of Other Causes	Died of Disease	Alive & Well
Vertical PL.	17	3	3 (2 S)	1	1	1	1	15 (>3 yr: 12)
Horizontal PL.	11	2	2 (0 S)	5	4	1	5	5 (>3 yr: 4)

B. ROYAL NATIONAL THROAT HOSPITAL: 1961 - 1975

Vertical PL.	9	1	1 (1 S)	1	1	2	1	6 (>3 yr: 6)
Totals	37	6	6	7	6	4	7	26 (>3 yr: 22 = 60%)

Table 4 — Partial laryngectomy — end results and salvage after full irradiation

In supraglottic cancer this thesis does not seem tenable for the majority of irradiation failures, and primary operation by horizontal partial laryngectomy is likely to give the best survivals with the lowest morbidity rates.

For the fully irradiated case of supraglottic cancer, therefore, horizontal partial resection will be contraindicated unless:

1. The primary lesion is confined to the anterior vestibule from the start of irradiation and is followed closely by the surgeon throughout.

2. Irradiation is limited to 4,000 rads planned before operation and followed by the surgeon throughout.

3. Fulfilling the above conditions the patient must also be under the age of 65 and with good pulmonary function.

4. Exceptional circumstances in which a patient may refuse total laryngectomy.

In all other instances the safest treatment for persistent supraglottic cancer after a full course of 6,000 or more rads of Teleradiation is total laryngectomy.

These cases call for considerable experience and skill in this type of surgery. They are not for the occasional operator and should not be undertaken by anyone unprepared to deal with the complications.

Acknowledgements. — The Author wishes to thank Consultant colleagues at the Royal Marsden Hospital and the Royal National Throat, Nose and Ear Hospital for their cooperation and help.

Summary

This report seems to confirm the view that limited glottic cancer should initially be treated by external irradiation. Failures of treatment would then have a good chance of cure by vertical partial laryngectomy. In supraglottic cancer a primary operation by horizontal partial laryngectomy is likely to give the best survival with the lowest morbidity rates.

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EPIGLOTTOPLASTY — NEW METHOD FOR LARYNGEAL RECONSTRUCTION

Kambič V.

Introduction. — There are very few surgical methods accepted with enthusiasm immediately after their innovation. Also the value and efficiency of the total laryngectomy, first performed in 1873 by Billroth for laryngeal cancer, became a topic of many discussions until later experiences proved that this was, and in some cases still is, the only successful therapy for laryngeal carcinoma.

The same occured in vertical hemilaryngectomy, also first performed by Billroth, in 1878 (Gosepath, 1972). This method was further developed by his pupils, Gluck and Soerensen. After some enthusiasm in the beginning the method was rejected. Although, there have been numerous refinements of the technique with the extension of criteria and usefulness of these procedures since then, the efficiency of conservation laryngeal surgery is still being questioned by some otolaryngologists. Some are of the opinion that vertical hemilaryngectomy is too conservative a procedure, others think that functional effects postoperatively are not satisfactory.

Already in 1956, J. Pressman (Pressman, 1956) put an end to a wide discussion on the importance and value of vertical hemilaryngectomy and conservation laryngeal surgery in general, in favour of these functional operative procedures in his study on the laryngeal lymphatic distribution. We may point out that already in 1891, Hajek (Hajek, 1891) reported on the same problem.

With today's knowledge of laryngeal anatomy and embriology with respect to the lymphatic drainage, conservation surgery is becoming increasingly more realistic as an approach to tumor therapy and, as Som (1970) says, we may speak now of the revival of conservation laryngeal surgery.

On the other hand, patients with cancer of the larynx now come to the doctor earlier so that the disease is discovered in less advanced stages than previously.

Laryngomicroscopy, which makes possible the observation of very small lesions, has helped a lot in establishing an early diagnosis. It also enables us to obtain material for histologic examination exactly from the site we wish to examine. In spite of this, nowadays, there are still many doctors in my country and in Europe, including Great Britain, who refuse this type of surgery. Radiotherapists in particular, are against it. They want to treat all patients in stage T2 by radiotherapy, and only when they fail they are ready to send the patient to the surgeon who, unfortunately very often in such cases, can only perform total laryngectomy.

According to the localisation and characteristic spreading of the malignancy of the larynx, various surgical techniques have been developed which all try to irradicate the disease and preserve the function of the organ.

On the basis of the long term clinical statistics and pathohistological examinations, accurate indications for partial laryngectomy have been developed. However, we cannot always define the exact limits of the tumor by mirror laryngoscopy, direct laryngoscopy, laryngomicroscopy and contrast laryngography, and so the final decision for the partial laryngeal surgery can be made very often only during the operation itself and not before it.

Today, many patients are informed about partial laryngectomy by communication media. They demand, very determinedly, a conservation larynx operation and want speech and respiration to function normally after the surgery, also when we know that such an operation is not possible. We are of the opinion that in no case must we let ourselves be influenced by the patient, because we may compromise the method and harm the patient as well.

Although, this report will not discuss the basic principles of partial laryngectomy, we may outline very briefly the general problems of the partial vertical laryngectomy. Since it would be premature to discuss our postoperative results from the oncologic point, survival rates and recurrences will not be considered in this report.

Basic principles of vertical laryngeal surgery. — Vertical hemilaryngectomy (frontal and frontolateral) is recommended for the treatment of certain forms of glottic carcinoma where more than half of the larynx can be removed vertically and its functions, phonation, respiration, deglutition, are still preserved (Leonard, Holt and Maran, 1972), (Fig. 1). We would like to stress that postoperative oncologic results do not depend on the surgical technique for laryngeal reconstruction but that they should be considered in the light of proper indications for partial vertical laryngectomy; these are:

1. A true cord lesion which extends to involve the anterior commissure. The first third of the opposite cord may be involved, too.
2. A true cord lesion which involves the vocal process or the anterior and superior portions of the arytenoid.
3. A true cord lesion which extends to within 10 mm subglotticaly.
4. Certain selective cases of carcinoma of the vocal cord with extension laterally into the ventricle.
5. The vocal cord should be mobile.

For many authors, these indications are too narrow, for others they are too broad.

We must point out that for us, the patient's age is not a prerequisite for the operation and, in this respect we absolutely agree with prof. Tucker (Tucker, 1976), however, we must take into consideration the patient's general state of health.

The success of partial laryngectomy depends on:

— resolving the oncologic problem and
— preserving laryngeal function (respiration, glutition, phonation).

The solution of the oncologic problem depends on:

— the properties of the tumor,
— the immunobiological state of the patient,
— the radicality of the operation.

It must be stressed that no compromise should be made between the radical approach to the surgical procedure and the conservation of the laryngeal function. Obviously, the more radical the surgical procedure the more difficult reconstruction becomes, which relates to the laryngeal surgery in particular. The radicality of the operation is opposed to the possibility of reconstruction.

The preservation of the laryngeal function depends entirely upon the efficiency of the reconstructive procedure.

Methods of reconstruction. — The surgeons's question is always: what is the best method for the laryngeal surgery to preserve the stable, rigid structure of the larynx, an adequate lumen and, a lining to prevent the formation of obstructive granulation tissue and cicatrix.

Postoperative laryngeal reconstruction following vertical hemilaryngectomy has been described by many authors. Informative surveys of the development of laryngeal surgery have been presented by Alonso (1970), Bailey (1971), Gosepath (1972), Schechter and Morfit (1965), and

many others. I am sure we are all familiar with the pioneer efforts of Gluck and Soerensen (1912), Alonso (1970), Hautant (1929), Leroux-Robert (1965), Miodonski (1962), Pressman (1956), Ogura (1972), Som (1951), Quinn (1970), Bailey (1971), and many others, for the functional surgery of the larynx despite the radical tumor removal.

Each of these authors has proposed a slightly different surgical approach to the laryngeal reconstruction following vertical hemilaryngectomy. Some of them favour mucosal graft from the hypofarynx or free grafts taken inside the lips, others recommend free skin grafts for endolaryngeal repair. Some prefer split thickness grafts and foam rubber moldstaints for endolaryngeal repair and stricture prevention. Some propose also the technique for vocal reconstruction after vertical partial laryngectomy. We think that respiration and glutition are of primary importance to the patient while phonation is secondary. Therefore, we are of the opinion that, after vertical hemilaryngectomy, the surgeon should not be burdened by the attempts of the complicated reconstruction of the glottis which might disturb postoperative functional result.

Also the use of temporary stents or keels for lumen conservation by some authors, requires a long postoperative treatment with a long-term tracheostomy and is considered unpractical and awkward for the patient as well as for the surgeon (Goodyear, 1949; Som and Silver, 1968), (Figs 1, 2).

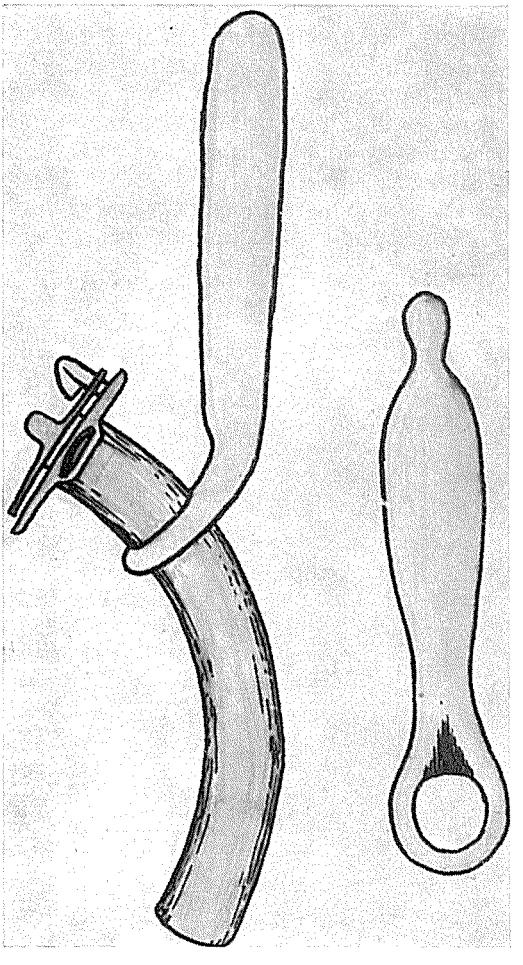

Fig. 1 — Goodyear's acrylic obturator

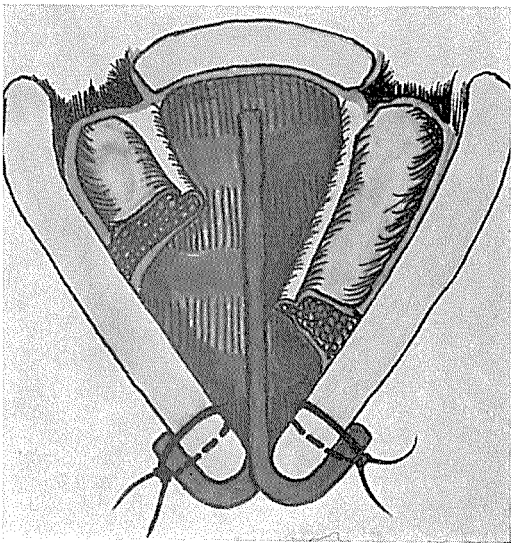

Fig. 2 — Mc Naugt's dilatator

A careful view of the different proposed methods serves to emphasize the fact that no procedure is perfect. Each has at least one limitation or deficiency that prevents it from being an ideal surgical approach.

Reconstruction with the epiglottis. — It is our feeling that the best laryngeal reconstruction after vertical hemilaryngectomy can be achieved by repairing the deficiency with the epiglottis. This was first performed by Bouche. Freche and Husson (1965) and is called epiglottoplasty. It was originally used for supraglottic stenosis after a trauma and only later for laryngeal reconstruction following vertical hemilaryngectomy. Sedlaček (1965) also used the epiglottis for the laryngeal reconstruction. He did not know about the work of Bouche and his collaborators and he performed the epiglottoplasty independetly (Sedlaček, 1965).

Some years ago we had the opportunity to observe epiglottoplasty and witness postoperative results. The method at once seemed extremely logical, simple and, what is most important, successful. There is no need for postoperative dilatators and keels. As a result of our observations, we began to perform the procedure for the larynx reconstruction after vertical hemilaryngectomy at our clinic. This method is used for the reconstruction of the deficiency following frontal and fronto-lateral hemilaryngectomy performed according to the standard indications explained before.

We must point that vertical hemilaryngectomy is not performed when there is evidence of neck metastases since we estimate that, in this case, primary has passed beyond the limits for this kind of conservation surgery.

Neck metastases in glottic cancer indicate a very agressive malign growth and

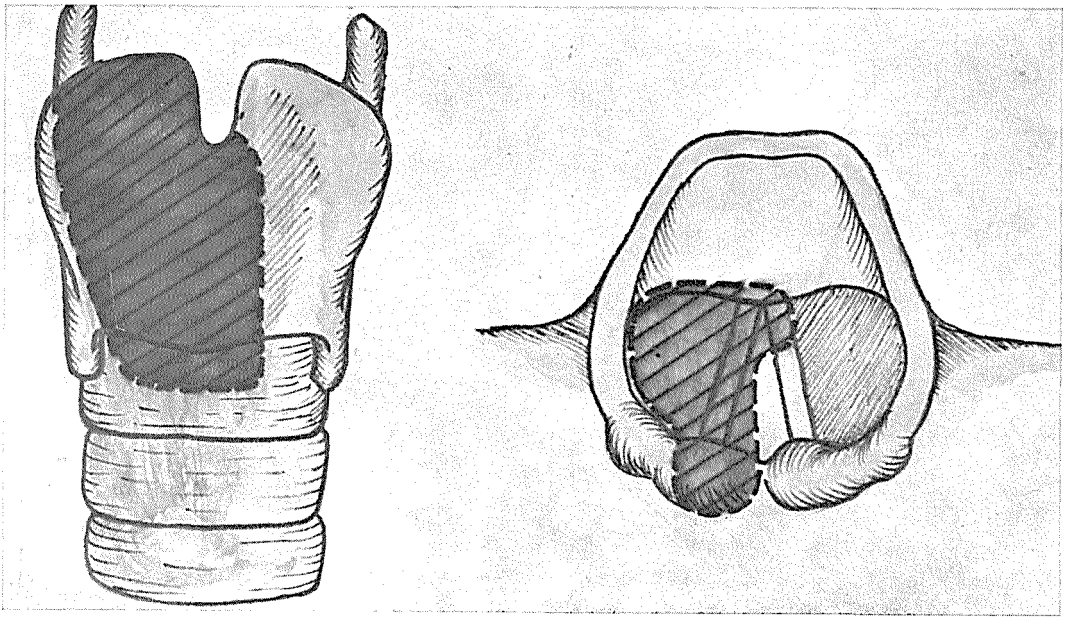

Fig. 3 — Extent of resection possible with vertical hemilaryngectomy

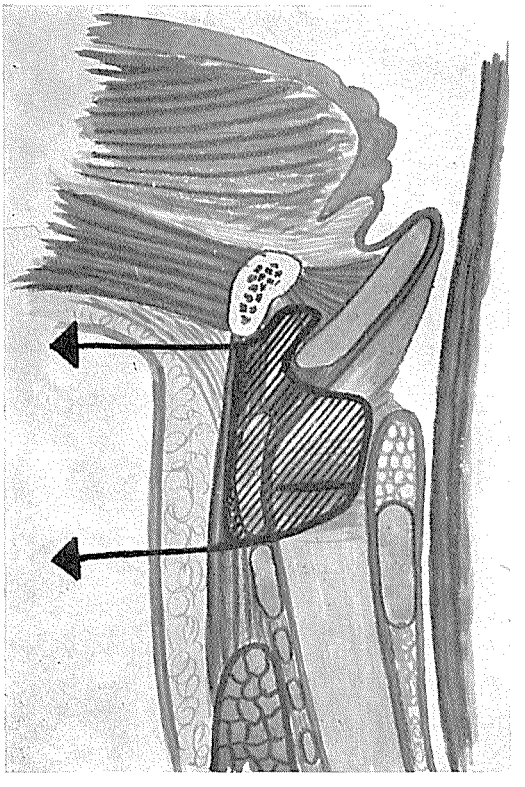

Fig. 4
Part of the larynx removed by vertical hemilaryngectomy (striped field) also preepiglottic soft tissue is removed (side view)

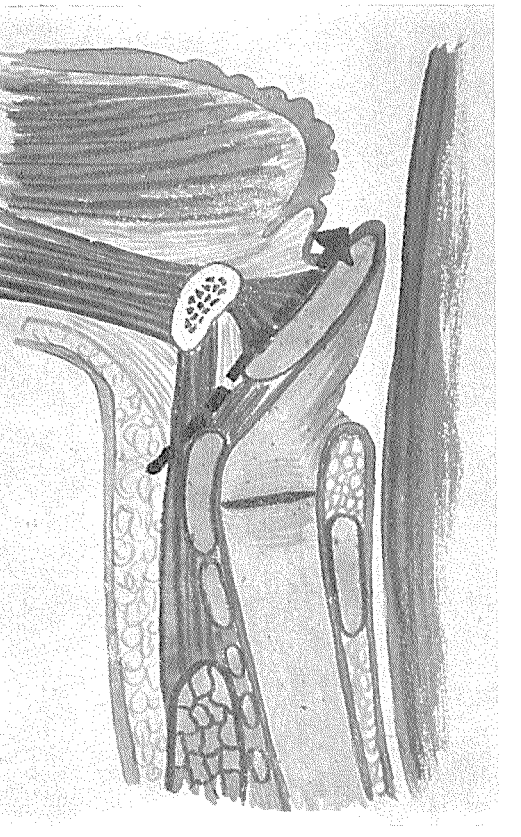

Fig. 5
Interrupted line with arrow shows the direction of preparing the epiglottis (side view)

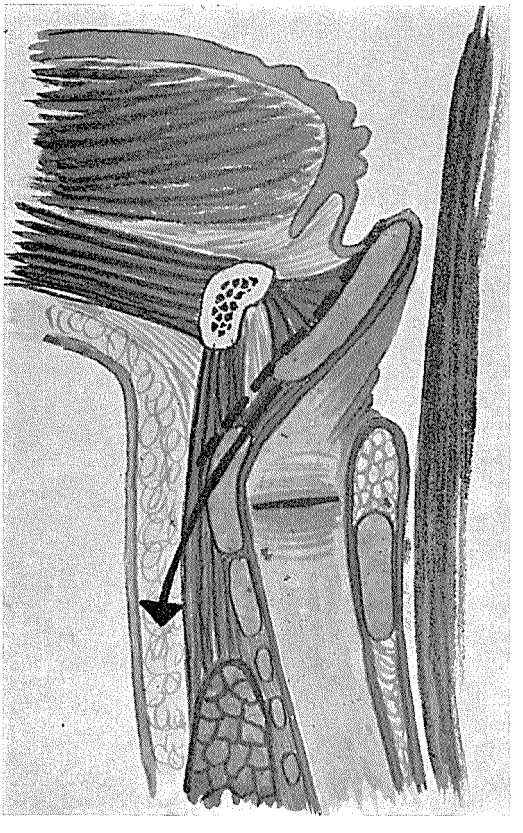

Fig. 6 — Pulling the epiglottis downwards to cover the deficiency (side view)

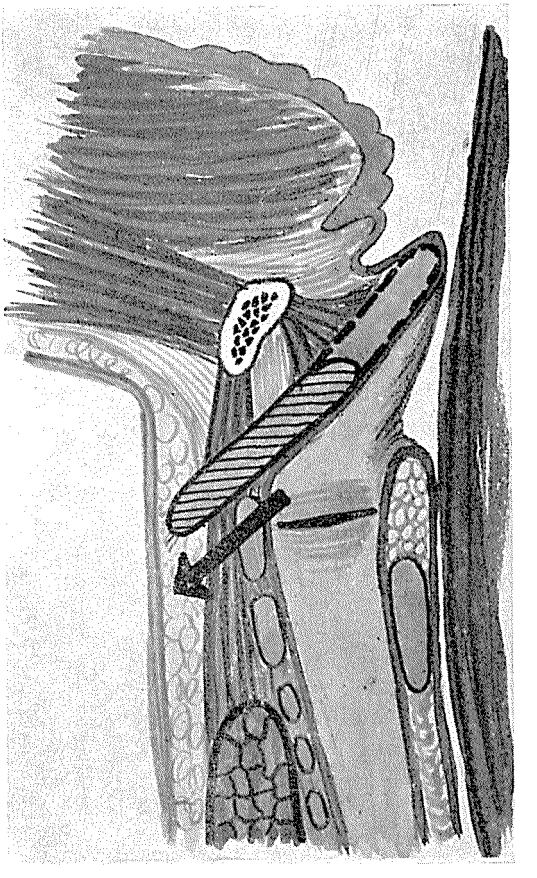

Fig. 7 — The epiglottis is pulled down

may denote that cancer has already exceeded the limits of this region. In this case the conservation therapy is doubtful. We have to be very careful in the case of prelaryngeal nodes in particular, because they correspond to their lymph drainage function. Involvement of the prelaryngeal nodes is to be expected in subglottic growths only. When these are present in glottic or supraglottic tumors, it indicates a subglottic extension of the growth, whether this is seen macroscopically by indirect or direct laryngoscopy or not (Minnigerode, 1964). There is a big difference in supraglottic localisation where the lymphatic network is thick and the metastases correspond to it. In supraglottic horizontal hemilaryngectomy, the metastases represent no disadvantage to conservation surgery. In such cases we always perform also the bilateral elective RND in this operation, as suggested by Bocca (Bocca, 1968).

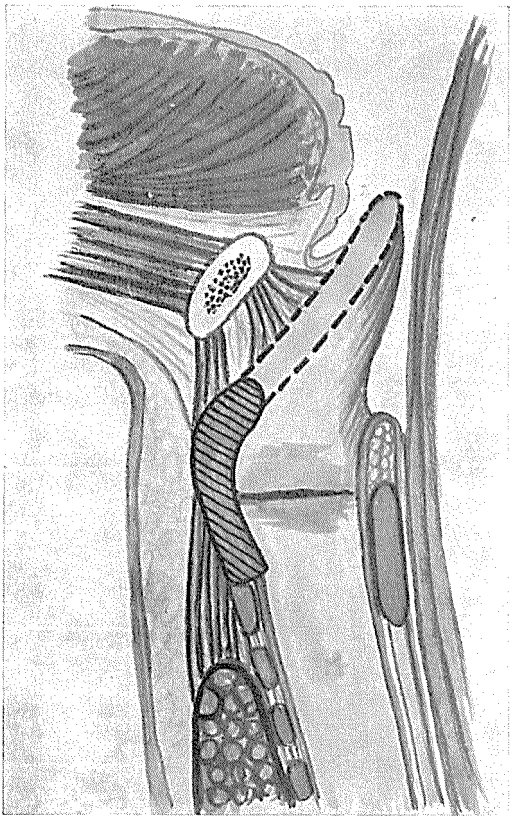

Fig. 8 — The epiglottis covers the deficiency after vertical hemilaryngectomy (side view)

Finally, let us come to the fundamental principles of the reconstruction of the larynx, after hemilaryngectomy, with the epiglottis.

For the reconstruction, the epiglottis has to be completely healthy. A special advantage is that it provides, apart from mucosa, a cartilage which reinforces the laryngeal wall and prevents the formation of stenosis.

Verticofrontal or verticolateral hemilaryngectomy done in the routine way is then followed by reconstruction with the epiglottis. After having performed the hemilaryngectomy and liberated the base of the epiglottis, the pre-epiglottic fat and soft tissue are carefully dissected. The epiglottic mucosa is then prepared on the pharyngeal side, i. e., the side turned toward the tongue. We then proceed with the operation without removing the hyoid bone, as in laryngectomy, but it may be removed too. Then, we cut the mucous membrane along the edges of the epiglottis. In this way we relax the epiglottis, pulling or moving it downwards. It is important to be particularly careful during the dissection not to cut the mucous membrane on the top of the epiglottis, since this would damage arteries that are of vital importance to the blood supply of this part of the larynx.

The epiglottis, laterally mobilized and relaxed, is pulled down on the laryngeal defect made by hemilaryngectomy. The lateral edges of the epiglottic mucosa are sewn on to the rest of the thyroid cartilage first, and finally, the base of the epiglottis with the rest of the cricothyroid membrane, or the rest of the cricoid cartilage. Sutures are reinforced

by sewing cartilage to cartilage using catgut suture, to which additional strength is provided by covering with the perichondrium and muscles. If the epiglottis or the deficiency after hemilaryngectomy are very large we can sew the epiglottis to the overlaying tissue. In this way its eventual collapsing into the lumen is prevented. It is evident that we must introduce a feeding tube and make tracheostomy. This surgical technique does not cause any difficulties, and there is no need for a special head positioning after the operation (Figs. 3, 4, 5, 6, 7, 8, 9, 10).

Vascularization of the epiglottis. — In order to study the vascularization of this part of the larynx, which is important for the nutrition of the mobilized and dislocated epiglottis, we filled, on corpses, the arteria thyreoidea superior with suspension of cinnabar and India ink in fluid gelatine. After a thorough fixing in formaldehyde solution, the larynx together with muscles and subcutaneous tissue were removed and made transparent by Spalteholtz method. Photographs of the transparent preparations were made. In the described technique, capilaries and vein network were not filled with dyes on purpose. In total, 15 preparations were made. They all showed the following properties: the upper laryngeal artery delivers two branches, namely, ramus epiglottidis superior and inferior and not only one, as it is described in anatomic maps. For the survival of the dislocated epiglottis it is very important to preserve at least the upper branch (Fig. 11). If we sacrifice all of them we may compromise the blood supply of the transposed epiglottis, which might be detrimental to the succes of the operation.

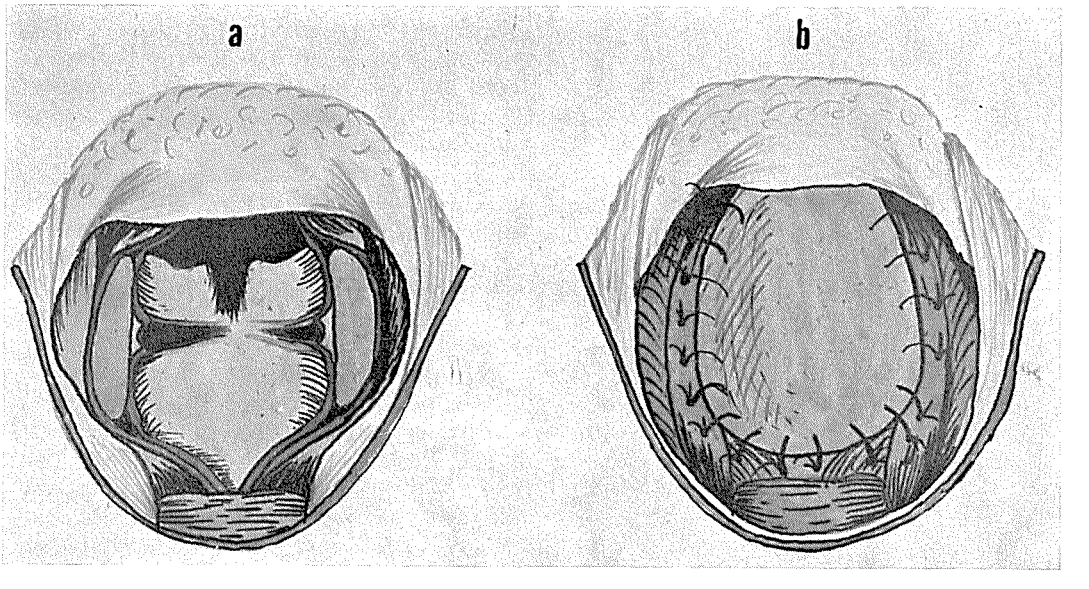

Fig. 9 — a) — Deficiency of thyroid cartilage after frontomedial hemilaryngectomy — b) — Deficiency replaced by epiglottis

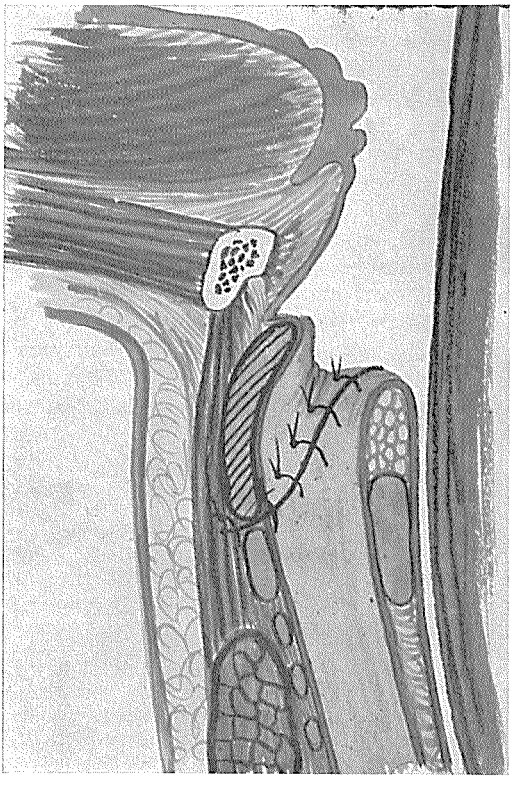

Fig. 10 — Lateral epiglottic edge is sewed on thyroid cartilage edge (side view)

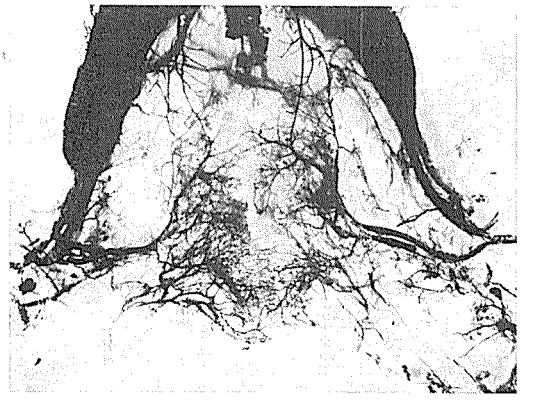

Fig. 11 — Vascularization of the epiglottis
Art. laryngica superior
a) Ramus epiglottidis superior
b) Ramus epiglottidis inferior

Our results. — After vertical hemilaryngectomy performed on 20 patients, we reconstructed the larynx using the described method, namely, the following operations were made: in 1972 two, in 1973 three, in 1974 four, in 1975 seven and in 1976 four.

The localisation and spreading of the malignancy in our patients were the following: three times cancer involved the left vocal cord with the anterior commissure extending to the anterior third of the right vocal cord; four times tumor involved the right vocal cord with extension to the anterior commissure and the anterior third of the left vocal cord: four times malignancy involved the left vocal cord with the vocal process; five times it involved the right vocal cord with the vocal process (twice, it extended subglottically); two times the left vocal cord was involved extending into the ventricle and twice, the malignancy was

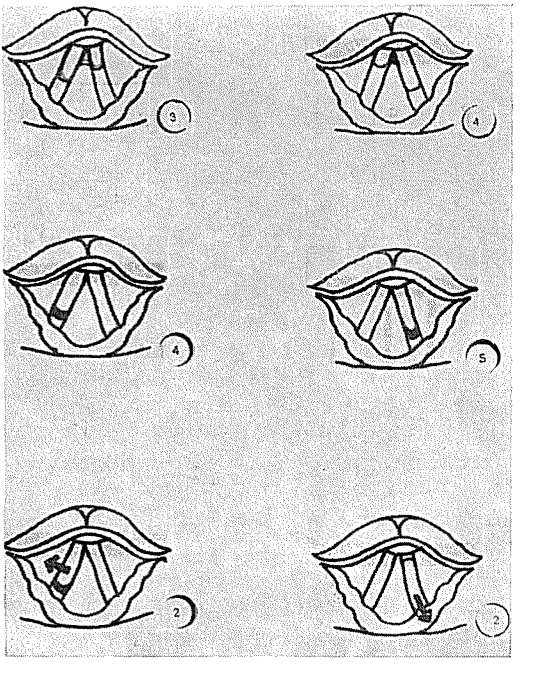

Fig. 12 — Location and extent of malignancy

on the right vocal cord with extension to the anterior and superior portion of the arytenoid (Fig. 12).

In all the patients, the postoperative functional results were excellent. We will not discuss postoperative results from the oncologic point since, as we have already stated, these do not depend on the reconstruction. They depend more on the exact indication for the conservation procedure. Besides, the time for the evaluation of the oncologic results has been too short. Four of our patients had been previously treated by cobalt therapy (each had received 700 Rtg to the tumor) without success and this did not influence the postoperative healing process. In all patients the feeding tube was removed on the ninth or tenth postoperative day, an extubation was done by the fifteenth to the twentieth day. Respiration and deglutition are excellent in all patients, phonation is satisfactory.

Conclusion. — The purpose of the present report is not to evaluate the oncologic results of our work, because 20 operated patients represent a modest material and the time after the operations has been too short. However, we feel that our results are excellent with respect to the laryngeal function following the reconstruction with the epiglottis, after hemilaryngectomy, when compared to the results obtained by authors using other, more complicated methods.

In our opinion, the laryngeal reconstruction with the epiglottis following hemilaryngectomy is logical, simple and succesful method of the laryngeal reconstruction when the vertical hemilaryngectomy is indicated. Epiglottoplasty is an ingenious and anatomically sound operative procedure.

Advantages of the laryngeal reconstruction with the epiglottis, after vertical hemilaryngectomy, are:

1. simple way of reconstruction,
2. laryngeal reconstruction is made with the mucous membrane and the cartilage that provides strong buttress,
3. postoperative stents or keels are not necessary,
4. short postoperative care,
5. excellent functional result.

Finally, let me point out that the correct indication is the first and the most important consideration for the successful hemilaryngectomy, if it is followed by a well-performed reconstruction.

Failure of the conservation surgery is frequently not the fault of the surgical technique but rather of poor or improper selection of the patient for this kind of surgery.

Summary

There are several methods available for reconstruction of the larynx after vertical hemilaryngectomy. In the opinion of the author, epiglottoplasty approaches an ideal solution.

At the ENT clinic of Ljubljana, 20 reconstructions of the larynx after vertical hemilaryngectomy were made in the period of 1972 to 1976. 4 patients had been previously unsuccessfully irradiated with the radical dose which did not influence the postoperative healing process at all. In all the patients feeding tube was removed on the 9th or 10th day after the operation and, extubation was made between the 15th and the 20th day. Respiration and glutition are excellent, phonation is satisfactory.

Advantages of the laryngeal reconstruction with the epiglottis after vertical hemilaryngectomy are:

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— short postoperative care
— excellent functional result.

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SOME ASPECTS ON CONSERVATION SURGERY OF SUPRAGLOTTIC CARCINOMA

Siirala U.

The history of laryngeal carcinoma reflects the individual's living circumstances and habits. Generally well known is the apparent relationship between tobacco smoking and carcinoma of the larynx and lungs. There are, however, other everyday circumstances which seem to have some influence upon the epidemiology of this illness. Changes in the standard of living combined with other factors apparently influences morbidity. In the long run, improvements in social services also seem to have an effect on general health.

In Finland we have had a relatively high incidence-rate of laryngeal carcinoma compared with our neighbouring countries — for example Sweden. Over the last few years we have noticed a slight decrease in the number of new cases of this disease. This must be due to several factors — probably a better socio-economic situtation, improvement of general hygiene and teeth-care as well as the anti-tobacco propaganda which has resulted in a decrease in smoking, particularly among educated people. Also improved medical services have resulted in early diagnosis of the tumors and improved therapeutic results.

Patients having a supraglottic carcinoma are often elderly and their general condition is poor; the typical patient has been a heavy smoker and hard drinker for years. Living habits of these patients have often, in addition to cancer, caused other serious illnesses, such as cardiovascular disease, liver cirrhosis, pulmonary emphysema and chronic bronchitis. They may also frequently have dental caries, sinusitis, diabetes and anemia; thus, the patients as such may not be able to stand the tremendous therapy required for their carcinoma. The examination and treatment, which their poor condition and associated diseases demand, consume a certain amount of the available time which is short.

The choice of therapy presents considerably larger problems in the case of advanced supraglottic carcinomas (stage III and IV), than in stage I and II cases. In the latter, we have adopted a fairly schematic treatment as a rule: preoperative telecobalt (about 3,300 r) supraglottic laryngectomy and radical neck dissection on one (the more involved) side, and possible functional neck dissection on the contralateral side. In only very few cases, where the patient's condition is poor or the tumor is very small, has this scheme not been strictly adhered to. and the patient has been treated with the radiation dose of about 6,600 r. Recently, neck radiation has increasingly supplanted neck dissection in cases with no palpable lymph nodes on the neck.

Treatment for advanced supraglottic carcinomas cannot follow such a uniform scheme. In some of the cases radical treatment is already out of the question. In operable cases the patient's general condition may prevent an extensive operation, possibly followed by reconstruction. The risk for the patient must be kept in mind even though surgical removal appears possible. The choice between total laryngectomy and supraglottic resection is sometimes difficult.

The prerequisite for selection of cases for conservative supraglottic surgery is,

naturally, that the disease with all probability will be cured by this operative procedure. We have recently — at the Centennnial Conference of Laryngeal Cancer in Toronto, (1974) presented a report on our experiences with advanced supraglottic carcinomas. In this investigation we found that surprisingly many of the aged people had difficulties in swallowing after a supraglottic resection.

This inability to swallow food and beverages resulted in aspiration pneumonia and some patients died in a couple of weeks after the operation due to pulmonary complications. After these sad experiences the question arises: is there a method that could be used to estimate in advance the patient's ability to learn to swallow after supraglottic laryngectomy? The patient's age and alertness are some criteria that may be helpful in foracasting the postoperative ability to swallow. The technique and radical nature of the operation of course also plays a decisive role in the postoperative function of the pharynx and larynx. We have not noticed that cutting of the pharyngeal constrictor muscle should decisively influence the patient's postoperative ability to swallow.

To render swallowing easier the food must have suitable viscosity. Thin beverages easily get into the trachea instead of the esophagus. Solid food can not be swallowed during the first postoperative days. The most suitable consistence of food during this critical postoperative period is a semi-solid porridge or soup or sourmilk or buttermilk — and why not ice-cream — which all have the suitable viscosity.

If a supraglottic operation is performed, it is mostly a final procedure because usually the patient's general condition does not allow a second operation, for example a total laryngectomy, to be performed later. Therefore the pros and cons must be carefully considered before the decision on the type of operation is made.

In our material of supraglottic carcinomas none of the stage IV patients was alive after 5 years independently of the given treatment. Of the stage III patients with supraglottic laryngectomy 20 % were alive after 5 years. When the operation was total laryngectomy the percentage of the 5 year survival was 64 %.

The type of operation must be seriously considered in these advanced cases.

Because of the heavy load of the operative treatment we had to abstain from neck dissections in cases without palpable nodes in the neck. Instead of operative neck dissection the neck was radiated. The results seem now, after 3 to 5 years, to correspond with the results achieved by operative dissection. There have not been many troubles with neck metastases and inconvencies caused by neck dissection to the patients are avoided.

In spite of the prophylactic medication and isolation of the patient, the operation wound may become infected, often resulting in one or more fistulas from hypopharynx to the skin particularly in cases of total extirpation of the larynx, but fistulation appears sometimes also after a supraglottic operation.

Fistulas may postpone the removal of the nasogastric feeding tube for several weeks, which is very annoying for the patient.

We have tried a couple of methods to occlude the postoperative fistulas. This is a very difficult task as every movement of deglutition causes pressure through the fistula and pushes the covering material, which easily results in loosening of the covering tissue and reopening of the fistula. We had great difficulties in several cases where fistulas developed, before we came to the idea of filling instead of closing or covering the fistula. The filling was effected with a round stalk flap, which was drawn through the fistula. The skin was removed in the area rendering the fistula filled but at the very end, a small skin

area was preserved, this being sutured to the edges of the external opening of the fistula. With the help of this technique, we also succeeded in healing the most resistant fistulae apparently because the pedicle flap eliminated the lumen of the fistula canal and made it resistant to the pressure which every motion of swallowing causes to the area.

A very common postoperative complication in laryngeal surgery is bacterial infection. It is often harbored already preoperatively in the tumor region and has an exellent opportunity to spread through the whole operated area in the postoperative period.

Attention must also be paid to nosocomial infection, which might be harbored in hospital wards, where these patients and operations may succeed one other. Isolation in specially desinfected rooms may be advisable during the first postoperative days.

A preoperative sample of pharyngeal bacterial flora may predict the bacterial strain of infection. In most cases it is advisable to give the patient a prophylactic medication with adequate antibiotic and/or chemotherapy. This must be done in spite of the fact that fungi may spread. — This complication: fungal infection of the operative field is often a troublesome factor interfering with postoperative recovery. Such an infection is very likely to occur, since the patients are old persons, who in addition to the strain of radiation and operation, may have received large amounts of antibiotics. This problem of fungal growth can usually be averted by avoiding unnecessarily large doses and prolonged use of antibiotics and with the help of antimycotic medication.

At our University we have been interested in immunotherapy of malignant tumors for a couple of years. Encouraging results have been achieved particularly in cases of hypernephroma. Also in some other malignant growths there have been favourable results. Thus, in three cases of carcinoma of the neck the tumors were reduced in size and the lifetime of the patients apparently prolonged. The research in this field is very active and we hope that this method of treatment will be profitable also for laryngeal malignancies.

For a doctor administering treatment it is important to know something about the patient's subjective feelings and thoughts about the disease and treatment. Therefore it may be of interest to hear a larynx-carcinoma patient tell of his own experiences. The operation was a supraglottic resection and bilateral neck dissection combined with postoperative radiation.

The patient tells:

»In my case the relationship between the operating surgeon and the patient was good. The degree of confidence may be seen in the fact that I felt like an interested observer of the skilled »technicians«. The relationship was composed.

During the postoperative period of time the most common features were disturbances in circulation, disfunction and lack of control of the musoles and nerves in the neck, shoulders and arms. During postoperative radiation therapy the lower jaw became rigid and almost imobile. It was dificult to get pieces of bread enter the mounth between the dental arches. After the operation it was, and it is even now, a comon experience that uncontrolled sudden biting movements cause breakage of teeth or dental fillings and injury of the tongue and buccal mucous membranes to the point of bleeding.

Naturally the loss of speech is the most difficult consequence of laryngectomy. The patient is most sensitive and vulnerable at the stage when he feels most helpless. The interrelationship of mood and the development trend in convalescence is greater than generally appreciated.

The consequences of operation and radiation were complete disfunction of the salivary glands for almost five years and

exessive need and expenditure on dental treatment. Speech was unclear and the taking of food messy and difficult.

The laryngectomee is adversely affected by cold weather. I myself suffer continually from »coldness« of the collar-bones. Speech becomes more difficult in below-zero weather. Neck protection must be used at night. Driving a car is difficult and dangerous due to limitation of head turning.

I suspect that »neck dissection« may affect brain circulation. Concentrated thinking increases »tension« in the head and the face becomes bright red. Impatience or irritation seems to increase with age more rapidly than in the case of other aging people. A contributory factor may be that laryngectomees often tend to have an increased need to consume alcohol in their loneliness. Hangover difficulties (e. g. pain and slow recovery) increase markedly after the operation.

Consulting a speech therapist does not only open up a road to the technique of speech: it also has a great importance psychologically. I find it easy to believe that psychological factors are involved in this disease. Many of my fellow sufferers have experienced some serious disappointment in life. The convalescing patients, on the other hand, notice small pleasant things as the sweet smell in the park after rain, the song of birds etc.

Talks with two doctors, books on surgery, and a booklet dealing with social security benefits — all these together helped me to chart my chances of surviving the crisis. Although the overall result of this estimate was not encouraging, the feelings created were libertaing. Since that time there was no problem of choice I have been able to value these years and find life good.«

These words of a cured patient may give us something to think about. We are combating the disease — but let us not forget the patient.

Summary

In stages I and II of supraglottic cancer, a fairly schematic treatment is adopted as a rule: preoperative telecobalt (about 3300 r), supraglottic laryngectomy and radical neck dissection on one (the more involved) side, and possible functional neck dissection on the controlateral side. Recently, neck radiation has increasingly supplanted neck dissection in cases with no palpable lymph nodes on the neck. The author has not observed that cutting of the pharyngeal constrictor muscle should decisively influence the patient's postoperative ability to swallow.

The importance of the patient's subjective feelings and thoughts about the disease and treatment is pointed out.

ÜBER DIE SOGENANNTE GLOTTISCHE HORIZONTALRESEKTION

Gramowski H. K.

Konservative Larynxchirurgie besagt, daß es sich dabei um funktionsschonende Tumoroperationen handelt. Der Begriff »konservativ« bedeutet aber nicht, daß bezüglich der Radikalität irgendwelche Zugeständnisse erlaubt sind, mit anderen Worten, die bei der Tumorexcision zu fordernde Einhaltung eines Sicherheitsabstandes von mindestens 1 cm muss gewährleistet sein. Wir haben an der HNO-Klinik der Medicinischen Akademie Erfurt und nun auch an der HNO-Klinik der Friedrich-Schiller-Universität Jena, in zunehmendem Masse von der Möglichkeit der konservativen Larynxchirurgie Gebrauch gemacht. Die Zahl der Totalextirpationen ist dadurch eindeutig zurückgegangen. Begünstigt wurde aber auch diese Tendenz durch die Tatsache, daß infolge der in den letzten Jahren erzielten besseren halsnasen ohren-fachärztlichen Betreuung in Stadt und Land mehr Frühfälle den zentralen Kliniken zugeführt werden. Sicherlich läßt sich bezüglich der Stimmbandtumoren die Früherkennung noch durch eine entsprechende Gesundheitserziehung der Bevölkerung, wobei schon in der Schule begonnen werden könnte, verbessern.

Im Nachfolgenden möchte ich unsere Erfahrungen mitteilen, die wir in der zurückliegenden Zeit mit einer von Moser 1961 angegebenen Methode sammeln konnten. Es handelt sich dabei um eine sehr ausgedehnte fronto-laterale Teilresektion, für die Moser die Bezeichung »glottische Horizontal-Resektion« gewählt hat, weil bei volliger, d. h. maximaler Realisierung dieses Verfahrens, nahezu die gesamte Circumferenz der Glottis in der Horizontalebene exidiert wird. Die Resektion umfasst also das gesamte Stimm- und Taschenband einschliesslich des Aryknorpels der erkrankten Seite und, in Abhängigkeit von der Tumorausdehnung im Bereich der vorderen Kommissur und darüber hinaus, die Hälfte ja sogar bis zu 2/3. des Stimm- und Taschenbandes der Gegenseite. Die Tumorsicherheitszone wird durch Heraussägen entsprechender Knorpelfenster auf der erkrankten wie auch auf der Gegenseite geschaffen, wobei auch das Ligamentum conicum mit einbezogen wird. Man kann sagen, da letzlich ein Knorpelresektionszustand resultiert, der einer erweiterten und doppelseitigen Resektion nach St. Clair Thompson entspricht. Befürchtungen, die wir anfangs hegten, daß bei dieser großen horizontalen glottischen Ausweidung und der dadurch bedingten großen Wundfläche, die wir der sicheren Rezidivkontrolle wegen nicht mit Spalthautlappen oder Schleimhauttransplantat decken, später ungünstige Narbenbildungen mit Funktionsbehinderungen entstehen, haben sich nicht bestätigt. Wir sind der Ansicht, dass die 10—14 tägige Einbringung einer mit Gummifolie überzogenen Streifentamponade, die eine entsprechende Völle aufweisen muss, um als Platzhalter zu fungieren, wesentlich ist, um solchen Narbenstenosen vorzubeugen. Erwähnenswert ist noch, daß der Eingriff nach vorausgegangener Tracheotomie in ITN über den Weg einer Thyreotomie vorgenommen wird, und daß wir für die Zeit der intralaryngealen Tamponade eine Füttersonde legen. Die Indikation für das vorgenannte Vorgehen ist gegeben, wenn bei einem Stimmbandtu-

mor der Befund vom Prozessus vokalis des Aryknorpes bis zur vorderen Kommissur reicht, auch darüber hinaus geht, wobei Befall des vorderen Viertels der Gegenseite die Indikation limitiert. Die Taschenbänder und die lateralen Ventrikelwände müssen tumorfrei sein. Subglottisch ist die Ebene des Schildknorpelunterrandes der Begrenzunglinie. Die Beweglickheit der Stimmbänder soll nicht wesentlich eingeschränkt sein.

Eine wichtige Erfahrung möchte ich noch mitteilen: Bei der präoperativen Diagnostik ist unbedingt eine etwa vorhandene Trachealstenose als Nebenbefund auszuschliessen. Wir haben bei 2 Fällen Schwierigkeiten beim Dekanulement, das Normalerweise ebenfalls 10—14 Tage nach der Operation erfolgen kann, gehabt, weil neben dem Tumorbefund im Stimmbandbereich zusätzlich noch eine anfangs unerkannte Trachealeinengung, einmal durch Struma zum anderen durch frühere Halsverletzung verursacht, vorherrschte.

Wie schon erwähnt, ist ansonsten eine postoperative Einengung der Atemwege nicht zu befürchten. Andererseits ist angesichts des geschaffenen ausgedehnten Operationsdefektes bezüglich der späteren Stimmfunktion mit Heiderkeit und Verhauchtsein der Stimme zu rechnen. Die verbliebenen sprachlichen Kommunikationsmöglichkeiten sind aber stets ausreichend gut. Moser, der ein Krankengut von 86 Patienten, bei denen eine glottische Horizotalresektion durchgeführt wurde, überblickt, gibt eine Heilungsquote nach nahezu 15 Jahren von 82 % an.

TREATMENT OF EARLY LARYNGEAL CARCINOMA AT THE INSTITUTE OF ONCOLOGY, LJUBLJANA, IN THE PERIOD OF 1963—1971

Budihna M., L. Šmid, L. Furlan

The incidence of laryngeal carcinoma in Slovenia is steadily increasing (1, 6). In 1971 the incidence was 10 cases per 100.000 male population which is twice as much as compared to the year 1963. The incidence of laryngeal cancer in women is approximately 20 times lower and is not increasing. Between January 1, 1963 and June 31, 1971, 505 cases of laryngeal cancer were registered at the Cancer Registry of Slovenia. More than half of them were admitted to the Institute of Oncology in Ljubljana. The aim of this study was to analyse the results of treatment of patients with early laryngeal cancer.

Material and methods. — Two hundred and fourteen patients with histologically proved carcinoma of all stages were analysed retrospectively.

Patients who had not been treated with radiation, either: beacuse of their poor condition, or because they refused treatment, or because the data about the tumor were unsufficient for retrospective staging, were excluded from the analysis.

Patients were classified retrospetively according to TNM classification rules (UICC 1974). Alltogether 214 patients were evaluated and 92 of them were in stage I and II (Table 1).

The patients were treated in the following way (Table 2):

1. by irradiation only
2. by irradiation first and by surgery for residual or reccurent tumors
3. by surgery first and by irradiation for residual or recurrent tumors
4. by postoperative radiation when surgery was not complete.

Stage / Site	I	II	III	IV	Total
Supraglottis	16	12	58	18	104
Glottis	32	29	40	3	104
Subglottis	1	2	3		6
Total	49	43	101	21	214

Table 1 — Carcinoma of the larynx (1963—1971). Site of origin by stage

Between 1963—1965, the patients were treated with orthovoltage irradiation. Since 1964, cobalt has mostly been used, two opposing fields, i. e. 5×5 cm to 6×8 cm with a focus-skin distance of 50—80 cm, five to six times weekly, and 150—130 rads daily, the total dose beeing 4500 to 6500 rads. Since 1968, most of the patients have received split-course treatment. They were placed on two to three

	Radio-therapy	Radio-therapy & Surgery	Surgery & Radio-therapy	Total
Supraglottis	17	4	7	28
Glottis	32	12	17	61
Subglottis	2	1	—	3
Total	51	17	24	92

Table 2 — Early Carcinoma of the Larynx Stage I & II (1963—1971) Treatment in relation to origin

week rest interval following 3000 to 4000 rads, the total dose beeing 7000 to 7600 rads.

In the patients in whom surgery was the first treatment, chordectomy or partial laryngectomy was performed, and in ten cases with stage II total laryngectomy was done. In the cases where surgery followed unsuccessful irradiation partial laryngectomy or total laryngectomy was performed, together with radical dissection of the neck lymph nodes or without it. When the primary tumor was cured by irradiation and regional metastases appeared only dissection of the neck lymph nodes was performed.

The patients were regulary followed by a radiotherapist and otolaryngologist during the first year every second month,

	Number of Patients		
	Treated	NED After first Treatment	NED After Treatment of Recurrence
First Radiotherapy	56	34	45
First Surgery	22	16	19
Total	78	50	64

Table 3 — Early Carcinoma of the Larynx (1963—1971). Results of Treatment

each following year the intervals were prolonged for a month. When a recurrence was suspected, direct laryngoscopy and, if necessary, biopsy were performed.

Patients who survived 5 years or more without evidence of tumor were considered as cured.

Fourteen patients out of 92 died within the first 5 years after the treatment had been completed with no evidence of the tumor and were excluded from the evaluation of the results. Of these, 8 patients died from new primary tumors outside the larynx and 6 died from an intercurrent disease.

	Number of Patients				
	Treated	With Failures	Salvaged by Surgery		With ultimate Failures
Stage I	7	1	1/1	PLE & RND	0/7
Stage II	9	5	2/3	1 PLE & RND 2 RND	3*
Total	16	6	3/4		3

* Two patients not treated
PLE = Partial Laryngectomy
RND = Radical Neck Dissection

Table 4 — Early Supraglottic Carcinoma (1963—1971). Failures. First Treatment Radiation

Among 78 patients, 56 were treated first by radiotherapy. Fourty-five patients of 56 were cured: 34 by radiotherapy alone and 11 by additional surgery for local residual or recurrent disease or regional metastases. Twenty-two patients were treated first by surgery followed by irradiation. Ninetteen patients were cured, 3 of them had two surgical treatments (Table 3).

The treatment failed in 6 out of 16 patients with stages I and II of supraglottic cancer, first treated with irradiation. Four patients accepted surgery which cured three of them (Table 4).

	Site of Failures	Possible Cause of Failure
Stage I	Local	1 Too Low Dose (1500 RET)
	Regional only	/
Stage II	Local	1 Too Low Dose (1500 RET) 1 Too Long Split (40 Days) 1 Unknown
	Regional only	2 Outside Previously Treated Area

Table 5 — Early Supraglottic Carcinoma (1963—1971). Analysis of Radiation Failures

	Number of Patients				
	Treated	With failures	Salvaged by further Treatment		With of Ultimate Failures
Stage I	PLE 2 TLE 1	1 PLE	1/1	RND	0
Stage II	TLE 3	1	0/1	RT	1
Total	6	2	1/2		1

PLE = Partial Laryngectomy
TLE = Total Laryngectomy
RT = Radiotherapy
RND = Radical Neck Dissection

Table 6 — Early Supraglottic Carcinoma (1963—1971). Failures. First Treatment Surgery

Table 5 shows possible causes for unsuccessful irradiation in early supraglottic carcinoma. In one patient local recurrence of stage I developed, probably because the dose was too low. In 3 cases the tumor of stage II did not disappear after irradiation. It is possible that the dose was too low for one patient and, that the rest interval of the split-course treatment was too long and caused failure in two cases. In one case there was no obvious reason for failure. In two cases regional metastases appeared outside the irradiated area while primary tumor was cured by irradiation alone.

Among six patients with supraglottic cancer of stages I and II, who had been treated by surgery followed by irradiation, two patients needed additional treatment. One was cured with RND for regional metastases while one patient received palliative irradiation for recurrences at the tracheostomy (Table 6).

	Number of Patients				
	Treated	With failures	Salvaged by Surgery		With Ultimate Failures
Stage I	23	7	4/6	5 TLE 1 TLE + + RND	3*
Stage II	15	7	4/6	4 TLE 1 TLE + + RND 1 PLE	3*
Total	38	14	8/12		6

* One patient not treated
TLE = Total Laryngectomy
PLE = Partial Laryngectomy
RND = Radical Neck Dissection

Table 7 — Early Glottic Carcinoma (1963—1971). Failures. First Treatment Radiation

	Number of Failures*		Possible Cause of Failures
Stage I	7	4	Too Low Dose (1765 RET) Too Low Dose (1500 RET) Too Low Dose (1500 RET) Too Low Dose (985 RET)
		1	Understaged
		2	Unknown
Stage II	7	4	Too Low Dose (1760 RET) Too Low Dose (1730 RET) Too Low Dose (1670 RET) Too Low Dose (1500 RET)
		2	Understaged
		1	Unknown

* All failures were local

Table 8 — Early Glottic Carcinoma (1963—1971). Analysis of Radiation Failures

Among 38 patients with stages I and II of glottic cancer who had been first treated by irradiation, the irradiation failed in 14 cases. Twelve patients accepted surgery which cured eight of them (Table 7).

Among 14 patients in whom irradiation for glottic carcinoma had been performed, local recurrences of stage I appeared in four cases. In four patients with stage II, the tumor did not completely disappear after irradiation (Table 8). In 8 cases the dose was probably too low,

	Number of Patients						
	Treated		With Failures		Salvaged by Further Treatment		With Ultimate Failures
Stage I	CE PLE	5 1	2	(CE)	1/2	Excision & RT CE & RT & TLE	1*
Stage II	CE PLE TLE	1 2 7	1 1	(PLE) (TLE)	1/2	RT & TLE RND	1
Total		16	4/16		2/4		2

* 5 years alive with disease
CE = Cordectomy
PLE = Partial Laryngectomy
TLE = Total Laryngectomy

Table 9 — Early Glottic Carcinoma (1963—1971). Failures. First Treatment Surgery

in three cases the tumor was probably understaged, and in three cases the cause of failure could not be established.

Among 16 patients with stages I and II of glottic cancer, who had been treated with surgery followed by irradiation, four patients were not cured. They underwent additional surgery, three of them had additional irradiation as well. In this group, two patients could not be cured,

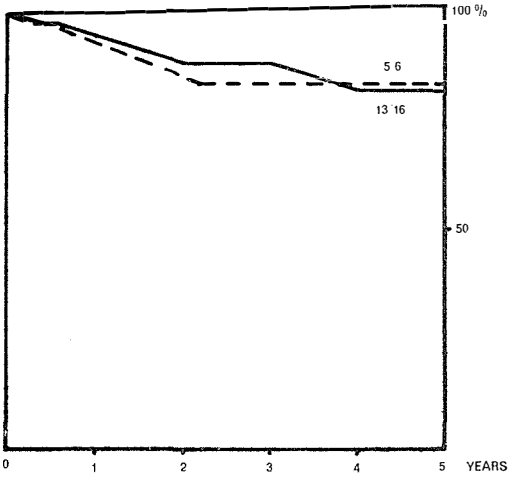

Fig. 1 — Carcinoma of the supraglottis stage I & II (1963—1971)
Comparison of 5 year survival by different treatment

— — — — Surgery first
———— Radiotherapy first

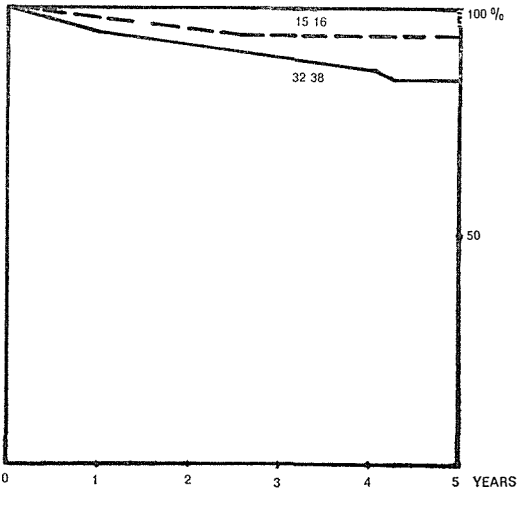

Fig. 2 — Carcinoma of the glottis stage I & II (1963—1971)
Comparison of 5 year survival by different treatment

— — — — Surgery first*
———— Radiotherapy first
* One patient alive with disease

although, one of them survived beyond 5 years (Table 9).

There was a case with stage I of subglottic cancer and a patient with stage II. Both were treated by irradiation alone. None survived beyond one year after the irradiation had been completed.

Figures 1 and 2 compare the five year survival of the early supraglottic and glottic carcinoma by different treatments.

Results observed in this series of patients (over 80 % in both treatment groups) can be compared to those reported by other authors (1, 2, 3, 4).

Conclusions. — This report is retrospective and the number of patients treated is relatively small, we cannot draw any conclusions regarding which combination is better: radiotherapy followed by surgery or surgery followed by radiotherapy. However, occurences of regional metastases in our patients after the completion of treatment in early stages of supraglottic cancer suggest hat in these cases local and regional treatment is required. Patients who had been treated with surgery alone were not included in this report, therefore, it is difficult to decide upon the best therapy for early stages of laryngeal cancer.

Summary

92 patients treated by early laryngeal carcinoma with combination of radiotherapy and surgery or vice versa, were analysed at the Institute of Oncology in Ljubljana in the period 1963—1971.

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COMBINED RADIOTHERAPY AND CONSERVATIVE SURGERY IN LARYNGEAL CARCINOMA

Sorensen H.

Introduction. — Treatment of laryngeal carcinoma in Denmark is centralized in the Radium Centres and the collaborating E. N. T. departments. All cases are seen and evaluated before treatment by an otolaryngologist as well as a radiotherapist at a joint conference at which the patient is demonstrated. The treatment is planned after direct laryngoscopy under general anaesthesia, assessing the site extent of the tumor and establishing the histological diagnosis.

All tumours are now classified according to the UICC, 1972.

The incidence of laryngeal carcinoma in Denmark is 3 in 100,000 of the population. This means that 150—200 patients arrive for treatment each year, 10 % are women. In recent years the incidence has been rising, especially for males (2). In urban areas the incidence is 3—4 times higher than in rural districts.

Material. — In Copenhagen 1546 patients were treated during the period 1931—1971.

Treatment is in practically all cases primary radiotherapy. As a rule the total dose is 6000 r in 6 weeks (1).

During the treatment the subsidence of the tumor is followed by laryngoscopy.

In the total material from Copenhagen surgery was performed in about 20 %. In 85 % of these cases it consisted in total laryngectomy (1).

However, conservative surgery of the irradiated larynx can also be performed with good results as appears from our series.

In the years 1931—1971, 103 patients underwent partial surgery after full irradiation dosage.

Hemilaryngectomy	67
Fronto-Anterior Laryngectomy	7
Superior Laryngectomy (Alonso)	10
Cordectomy	19
Total	103

Table 1 — Differents kinds of conservative surgery in 103 patients who underwent full irradiation treatment

Table 1 shows that in most cases the operation was performed as a hemilaryngectomy i. e. a laryngofissure followed by excision of one half of the thyroid cartilage with the vocal cord and varying quantities of tissue above and below it.

In 19 cases the cartilage could be preserved as there was no deep tumour infiltration in the tissue that could freely be removed from the cartilage. In such cases the operation is designated chordectomy. Only a few fronto-anterior or superior laryngectomies were performed.

The results of the partial surgical interventions appear from Table 2. Local recurrences were limited to totally 17 % and the number of complications were few; thus only 12 % of the patients devel-

Supraglottic	0/2	
Glottic T_{1a}	4/27	15 %
Glottic T_{1b}	0/2	
T_2	4/20	20 %
T_3	1/2	50 %
Total	9/53	17 %

Table 2 — Local recurrence after hemilaryngectomy in irradiated patients

oped fistulas that all closed spontaneously after varying time.

Tracheostomy that was performed in connection with the operation could also be closed in all cases. All the patients were controlled by direct laryngoscopy, and complete followup carried out for more than three years. For comparison, the results after primary hemilaryngectomy that was performed in only a few patients are shown in Table 3.

It appears that in these patients where no pre- or postoperative radiation was given local recurrence occured in 50 % of the cases.

Supraglottic	2/3	
Glottic T_1		
Glottic T_2	3/6	
Glottic T_3	1/1	
Subglottic	1/4	
Total	7/14	50 %

Table 3 — Local recurrence after primary hemilaryngectomy

Discussion. — Principles of treatment must be evaluated in terms of the number of patients, in whom the larynx can be preserved, so that natural voice function is maintained. Generally the combined therapy of laryngeal carcinoma offers the best possibility of an acceptable cure-rate combined with a low percentage (20 %) of total laryngectomy. According to such a policy of treatment, surgery is essentially reserved for residual or recurring tumours. This often results in a high rate of fistulas after total laryngectomy (up to 30 %) and may be considered a prohibition for conservative surgery. In our experience however, only few complications will appear after partial laryngectomy combined with irradiation. The fistula rate is acceptable low and, as the recurrence rate after partial surgery is as low as 17 %, it adds to the low laryngectomy rate that can be obtained only by combined therapy. In our series only simple methods of resection have been applied, but in some cases plastic reconstructive procedures may also succeed (3).

Summary

In 103 patients with residual or recurring tumor after irradiation therapy, conservative surgical operation was performed.

The complication rate was low 12 % and developed temporary fistulas that closed spontaneously. Local recurrences appeared in 17 % of the patients.

Acknowledgement: I am indebted to dr. Hanne Sand Hansen for having placed at my disposal the material from The Finsens Institut, Copenhagen, which also comprises patients from the University ENT department, Rigshospitalet (Head prof. H. K. Kristensen).

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CONSERVATIVE SURGERY OF THE LARYNX

Sala O.

Many techniques have been worked out for the conservative surgery of the larynx. The most common, important one — as well as the most debated — is that of transverse supraglottic laryngectomy, original or modified. However, we believe that the indications for such surgical technique are less numerous than one is inclined to believe at present, and this for many reasons.

The concept of the larynx being composed of two hemilarynges with a barrier at the point of the glottis, is based on embryologic criteria, but this concept does not apply to the neoplastic process, particularly if the tumour is of a deeply infiltrating type.

The tumour may spread beyond the laryngeal commissure and may also invade the subglottic region (Olofsson and van Nostrand, 1973; Ferlito, 1976). Furthermore, a neoplastic growth originating from the laryngeal ventricle may spill laterally and invade the subglottic region. Extended transverse laryngectomy and in particular the three-quarters laryngectomy after Ogura are often followed by recurrences — actually in about 40 % of cases within 2 to 5 years according to Bocca (1974).

The main error in tumour disease is to consider the malignant lesion as a static entity and to evaluate it on the basis of the TNH system which takes into account only two parameters, that is, the site and extension of the tumour.

A critical investigation now being carried out at our Department has demonstrated that a laryngeal neoplasm must be evaluated taking into consideration three additional factors, that is, the histologic type, the histologic grading of malignancy and the tumour-host relationship.

The course of the tumour disease is almost always predictable right from the moment the diagnosis is made, if the lesion is evaluated not in terms of surgical possibilities but from the biological point of view.

A series of 104 patients with squamous cell carcinoma of the larynx has been studied with regard to tumour-host interaction (Sala and Ferlito, 1976). Prognostic evaluation was based upon histologic grading and morphological evidence of cellular immune response, judged by the presence and degree of lymphocyte and plasma cell infiltration in tumour stroma. Histologic grade and degree of immune response proved to correlate with the 5-year survival, though such reactive phenomenon seemed to be a favourable prognostic sign only for well-differentiated tumours. In that series, all poor differentiated neoplasms showed minimal or no cellular response. The survival rate, however, appeared to increase with the increasing intensity of cellular response within each class of tumour cell differentiation. Small lymphocytes are the basic elements of cell-mediated immune response. Upon antigenic stimulation, they change into immunoblasts which produce immune lymphocytes capable of recognizing and destroying tumour cells.

In some tumours, the histologic type, the histologic grading of malignancy and the tumour-host relationship are strictly consequential, as for instance in the case of verrucous squamous cell carcinoma of

the larynx (Ferlito, 1975), the prognosis of which is always favourable. The opposite may be seen in undifferentiated tumours, and particularly in the cat cell carcinoma of the larynx for which the prognosis is definitely poor (Ferlito, 1976).

In most laryngeal tumours, the above three factors may be associated in a varying combination and may be modified in the course of the disease for pathological and iatrogenic reasons. For instance, a virus disease, TBC infection and syphilis, by altering the mechanism of cellular immunity, reduce the body's active biologic defensive potential against the neoplastic growth. Among iatrogenic causes of cellular immunity disturbance there is radiation therapy, which if adopted for a lesion with intense cellular immune response such as the verrucous squamous cell carcinoma, may induce anaplasia leading to a rapid dissemination. Treatment by means of ECG vaccine is increasingly being opposed as it seems to cause an easier, atypical metastatic spread of the tumour.

What has just been said indicates our present position as to the possibilities and limits of transverse supraglottic laryngectomy.

1. Transverse supraglottic laryngectomy may be adopted, if the site and extension of the tumour allow the choice of this technique, only if the neoplasm is well- or moderately well-differentiated and displays marked or moderate cellular immune response.

2. The tumour may be located in a site and have an extension which surgically would allow the choice of transverse supraglottic laryngectomy as the most adequate mode of treatment. However, a poorly differentiated tumour, with a high histologic grading of malignancy and a poor cellular immune reaction in the stroma makes it necessary to perform total laryngectomy, because of the predictably unfavourable biologic behaviour of the lesion. Usually, these tumours are not markedly exophytic, appear to be alcerated and display microscopic and macroscopic necrotic foci, with oedema of the surrounding tissue, at times very intense.

3. In the current practice, all the five factors mentioned — that is, site, extension, histologic type, histologic grading of malignancy and tumour-host relation — appear in a varying combination among them, and the clinical experience of the laryngologist, with the support of that of the pathologist-clinician, will make it possible to adopt the most adequate treatment for each patient.

Of course, the above considerations apply to conservative surgery of the larynx in general, though the example has been restricted on purpose to supraglottic laryngectomy.

Likewise, removal of draining and regional lymph nodes must be reconsindered in the light of these new acquisitions. Such removal is not necessary when the primary tumour exhibits an intense cellular immune response (as in case of verrucous squamous cell carcinoma of the larynx), whereas it becomes mandatory and must be as radical as possible and performed bilaterally at the same time when the laryngeal tumour shows marked indications of biological malignancy for the reasons we have just mentioned.

In the light of this knowledge, the choice of radiation therapy must be carefully considered in each case, because it might be harmful when the cellular immune response in tumour stroma is marked. Radiation would cause lymphocyte depletion, thereby a diminished immune response.

A thorough examination of the neoplastic lesion in its different aspect and in particular in its biological characteristics will enable laryngologists to establish a "tailor-made" treatment for each patient. It appears therefore that the TNM system of tumour classification is now incomplete and outdated.

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TOLUIDINE STAINING AS A GUIDE TO BIOPSY IN PRECANCEROUS LESIONS OF THE LARYNX

Bosatra A.

During these recent years two major developments have increased the diagnostic and therapeutic possibilities of Laryngology. One of the developments is direct suspension microlaryngoscopy, the other is a wider application of conservative surgery, and you can easily see how they often pose to us perplexing and contradictory problems.

Direct suspension microlaryngoscopy is a procedure well known at this ENT clinic of Ljubljana which, I believe, has been one of the first to follow Kleinsasser's pace. Its value is very great both from the diagnostic and the surgical point of view, and the advantage of the method is greatly increased if an adequate anesthesiological technique is adopted so that no orotracheal intubation is required, and the full laryngeal field is brought into view, over long periods of time, that is up to 45—60 minutes.

In this case the condition of the whole mucosal layer can be observed together with the plasticity and the spontaneous mobility of the organ.

It is under these conditions that one fully appreciates how often the mucosous membrane has undergone pathological evolution aside and beyond the localized change which is responsible for the more prominent clinical picture.

In other words, beside the polyp or the localized leucoplasic plaque or the chordal hyperthrophia which is responsible for disphonia, etc., and which brought the patient to the laryngologist, we can observe other alterations in nearby or controlateral regions of the larynx.

This improved observation of the organ, therefore, shows with an even greater evidence that several biopsies are necesarry and that a choice of the appropriate site shall be made. As it has been said previously, these observations and the results of the multiple biopsies will often puzzle us about the feasibility of a very conservative surgical treatment, once a really cancerous lesion has been identified.

It was with the purpose of giving a **guide** as to where the biopsies must be taken that a previous staining with **toluidine blue** of the entire laryngeal mucosa has been suggested.

This method follows the experience of the gynecologists, concerned with analogus problems, and is based on the assumption that a stronger staining, easily observed under magnification, will reveal the sites where the epithelial layer has undergone an etheroplastic evolution, or at least, where there is a greater concentration or enlargement of cellular nuclei, which retain the staining.

The manouver is easily carried out: the mucous membrane is gently swept by a cotton swab soaked in a 1 % solution of toluidine blue: after 5 minutes the colour is washed away with another cotton swab soaked in a 1 % acetic acid solution. Beside the corpuscled mucous also some areas of the epithelial layer may then appear to be more strongly coloured and in these places the biopsy is taken together with other areas judged to be abnormal.

The indentification of these areas is quite easy under direct microlaryngosco-

py especially when no orotracheal tube is present.

This procedure has been applied at our clinic for 2 years in 38 cases all showing a composite pathology of hypertrophy, polyps, leukoplakia, etc. scattered in various areas of the larynx.

The clinical impression has often been that beside the areas of mucosal reddish hypertrophy also the so called »leukoplasik« areas had a tendency of retaining the dye.

The areas showing the usual clinical sings of cancerziation: swelling, irregular surface easily bleeding, etc., were also strongly coloured.

The pathological report has demonstrated that a positive correspondence exists between histological precancerous picture and stronger staining only in 58 % proportion, whereas the proportion is nearly 100 % in the etheroplastic lesions already very suspicious for cancer on the clinical ground.

In several instances the stronger staining has been observed in cases of simple hypertrophy with keratinization but in other the appearance of an unsuspected area of staining has lead to the discovery of a patch of »precancerous« lesions.

The number of cases examined till now is too small to draw absolute conclusions. We are enlarging our researches also to the whole total-laryngectomy specimens and applying also different staining techniques. In any case we beleive that the staining procedure, which is quite easily and quickly carried out should be routinely adopted as a useful diagnostic tool.

Summary

The improved observation of the larynx due to direct suspension microlaryngoscopy shows that general biopsies are necessary and that a choice of the appropriate site should be made. It is with the purpose of giving a guide as to where the biopsies must be performed that a preliminary staining with toluidine blue of the entire laryngeal mucosa has been suggested.

HISTOLOGICAL AND ULTRASTRUCTURAL CHARACTERISTICS OF LARYNGEAL PRECANCEROSES

Sugár, J., É. Szabó

Introduction. — The precursor lesions of laryngeal carcinoma may represent various stages of the process leading to cancer. A controversy exists as to which diseases can be considered as preneoplastic alternations of the larynx (1, 2, 4, 5, 6, 7, 8, 9, 10, 11, 12). Precancerous alternations are visible steps in the dynamic process of neoplasia which may or may not progress. They allow us to establish histologic degrees of gravity.

Degree »A« represents diffuse or multiplex epithelial hyperlasia, **degree »B«** implies focal proliferation with initial sings of atypia and **degree »C«** indicates intraepithelial or incipient carcinomas with possible microinvasions.

The incidence of pachyderma, papilloma in adults and intraepithelial cancer has been examinated in our laryngeal biopsy material taken in the course of 20 years. Attempts have been made to define the period needed for the malignant transformation of precancerous lesions. Characteristic submicroscopic lesions can be detected in the laryngeal precanceroses (13, 14). In addition, our present paper deals with the ultrastructural changes that refer to differentiation anomalies.

Material and Methods. — Biopsies were taken from patients at the Otolaryngology Department, National Institute of Oncology, Budapest. Laryngeal biopsies examined by us from 1954 to 1975 totaled 869. Specimens were generally taken from the glottic and supraglottic regions and, less frequently, from the subglottic and hypopharyngeal areas. Microexcisions were made if the lesions were localized on the vocal cords. The material was fixed in 4 per cent formalin solution, embedded in parafin and stained with hematoxylin-eosin and, when required, with Gömöri silver-impregnation, Van Gieson, -and/or PAS method.

In 12 cases, the light microscopic studies were complemented with electron microscopic examination, as well. For electron microscopy the samples were fixed in 2,5 per cent glutaraldehyde solution. Post fixation was done in 1 per cent osmium tetroxide. Dehydration in alcohol was followed by embedding in Durcupan Fluka. After staining with 1 per cent toluidin blue, semi-thin sections were prepared from the material. For electron microscopic examination the most suitable tissue portions were selected from these sections. The ultrathin sections were made with an LKB ultramicrotome, stained with Raynold's lead staining procedure and examined under JEM 6C electron microscope.

Results. — Laryngeal carcinoma was predominant in males (94 per cent). Nearly 85 per cent of the patients were over 50 at examination (Table I). Carcinoma was not found in patients under 31. Analysing the age distribution of patients with cancerous and non-cancerous lesions, it is conspicuous that the accumulation of precancerous diseases in patients with cancer occurs 10 years earlier.

In histologic examination, 92 per cent of the carcinomas turned out to be squamous cell cancer, occasionally, less developed or anaplastic carcinomas were noted. Adenocarcinoma did not occur at

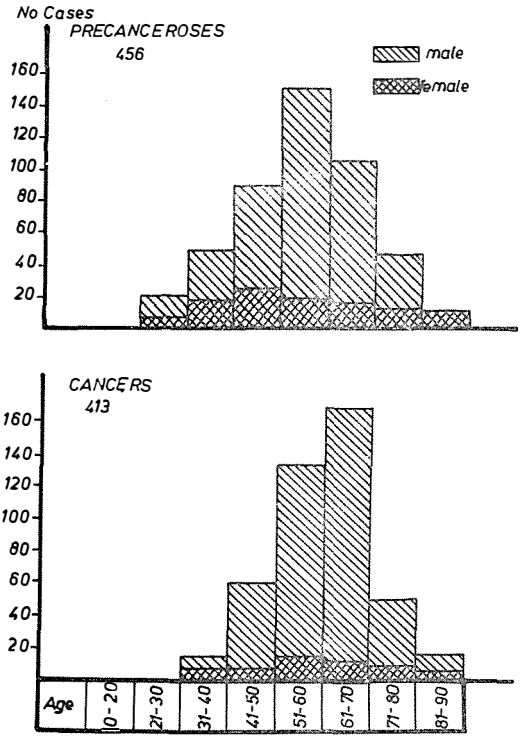

Table I: Age and sex distribution of laryngeal cancers and precanceroses

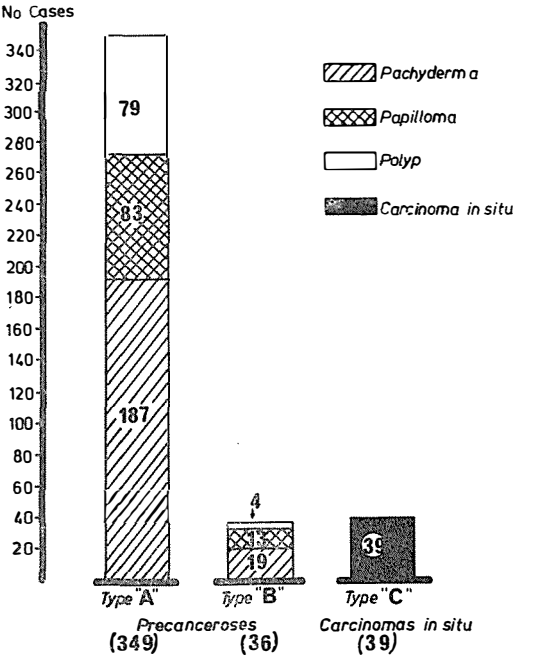

Table II: Frequency of laryngeal precanceroses considering their histological degrees of gravity

all. Among the non-cancerous lesions mostly pachyderma, papilloma in adults, and polyps were noted. Carcinoma in situ was also included in this group. The non-cancerous lesions turned out to be pachyderma in 206 biopsies, papilloma in adults in 96 and polyp in 83 excisions (Table II).

In cases of **degree** »A«, well differentiated diffuse hyperplasia developed in the epithelium (Fig. 1), the basic disease was clearly recognizable. This group comprised two thirds of patients with pachyderma and papilloma and nearly all the patients with polyp.

In **degree** »B« precanceroses, some irregular mitoses and moderate nuclear atypia could be observed. The original stratification of the epithelium became disintegrated (Fig. 2). Atypia was found in 19 cases of 206 patients with pachyderma, in 13 cases of 96 patients with papilloma and in 4 cases with polyp (Table II).

In precanceroses of **degree** »C« (39 cases), pronounced cellular atypia and polymorphism were present in the epithelium. The epithelial structure was completely disintegrated, the dermo-epidermal border was not distinct, however, the invasive growth could not definitely be proven. In the adjacent connective tissue, marked lymphocytic infiltration was observed (Fig. 3).

The biopsy material selected for electron microscopic studies included pachyderma of degrees »A« and »B«, papilloma and carcinoma in situ. Differentiation ano-

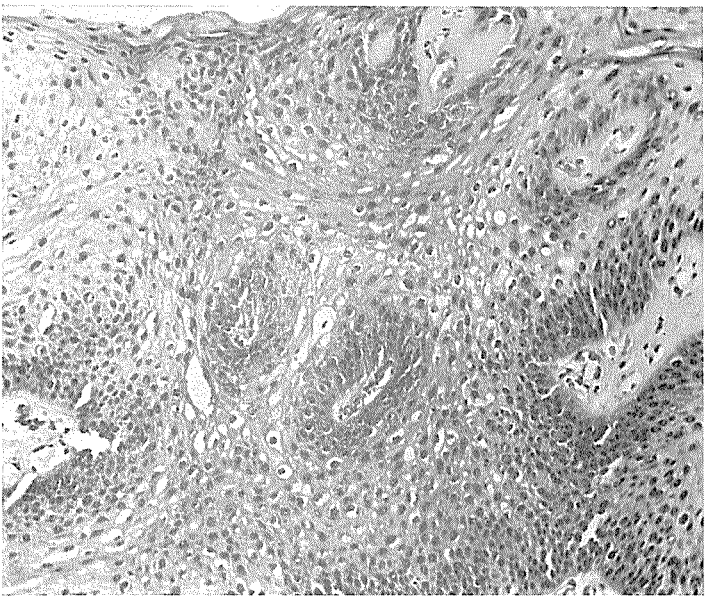

Fig. 1: Pachyderma of the vocal cords. Precancerosis of degree »A«. In the hyperplastic epithelium well differentiated cells are observed
x 145, H. E.

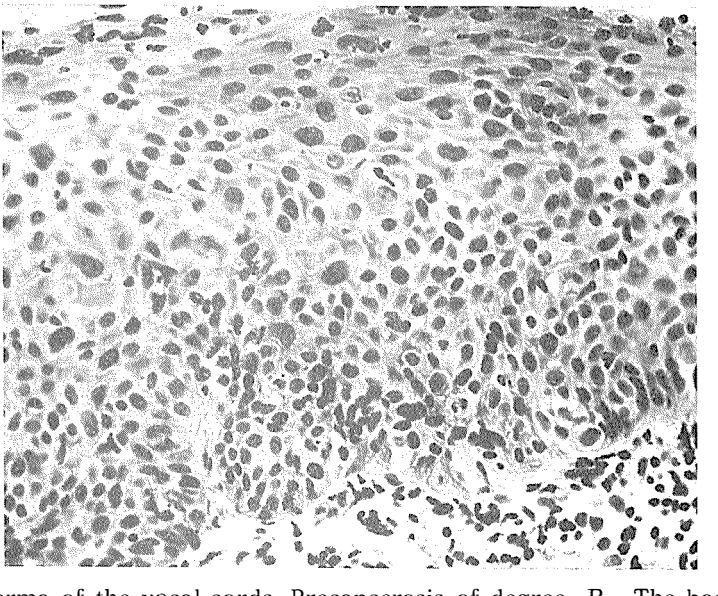

Fig. 2: Pachyderma of the vocal cords. Precancerosis of degree »B«. The basal layer is extended. Cells with hyperchromatic and enlarged nucleus are seen in the upper layer of the epithelium.
x 290, H. E.

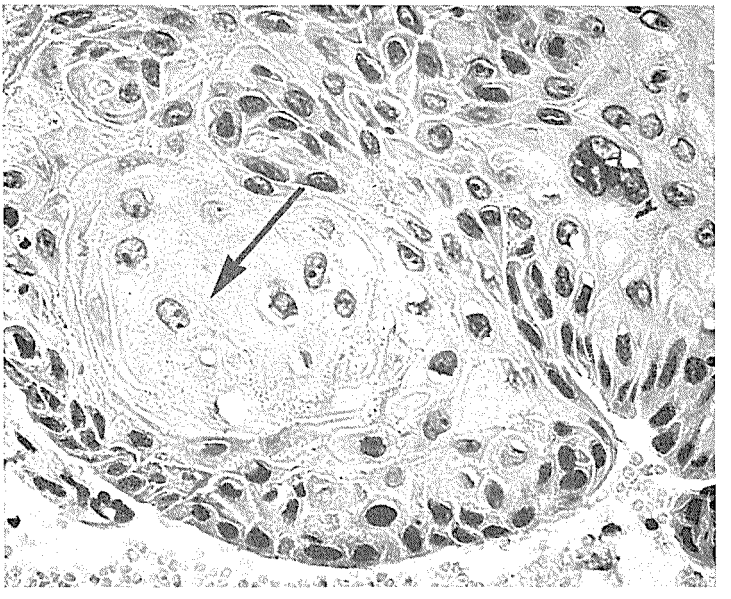

Fig. 3: Carcinoma in situ on the vocal cord. The epithelial structure is transformed. Intraepithelial polymorphism with multi-nucleated giant epithelial cells is present. Early signs of keratinization can be noted (arrow)
x 350, H. E.

malies of the epithelium were studied in regard to the development of filaments, namely, that of tonofilaments and keratinization. Hyperkeratosis, parakeratosis and dyskeratosis could be detected either by light or electron microscopy.

In hyperkeratotic type keratinization, in the basal and suprabasal layers the tonofilaments appeared in bulky, aggregated bundles encircling the nucleus like a crown of thorns (Fig. 4). The cell surface became villous. Clumps of desmosomes were generally accumulated in the intercellular spaces (Fig. 5), however, occasionally they seemed to be projected to the intracytoplasmic regions. Similarly to the keratinization of skin epidermis, the keratohyalin granules grew in size by continouous accumulation. Large electron dense keratin patterns and thick keratin layers were formed. The horny layers were but loosely attached to one another.

In the parakeratotic type keratinization, the decomposition of the cell nucleus was missing, consequently the keratin formation was also inhibited. The nuclei of the affected epithelial cells were encircled by lipid granules and several vacuoles. The tonofilaments appeared poorly developed and fragmented, sometimes accompanied by phagolysosomes. In the keratogenous zone, keratohyalin granules were scarcely visible, no keratin pattern developed. The desmosomes were absent on the cell surface, the intercellular spaces dilated and the cells exfoliated from the surface epithelium (Fig. 6). In dyskeratosis, the keratinizing process affects single cells in layers which are otherwise devoid of keratinization. This phenomen is well demonstrated by electron microscopy as well. The cytoplasm of the epithelial cells was filled with markedly accumulated and aggregated tonofibrils dislocating the nu-

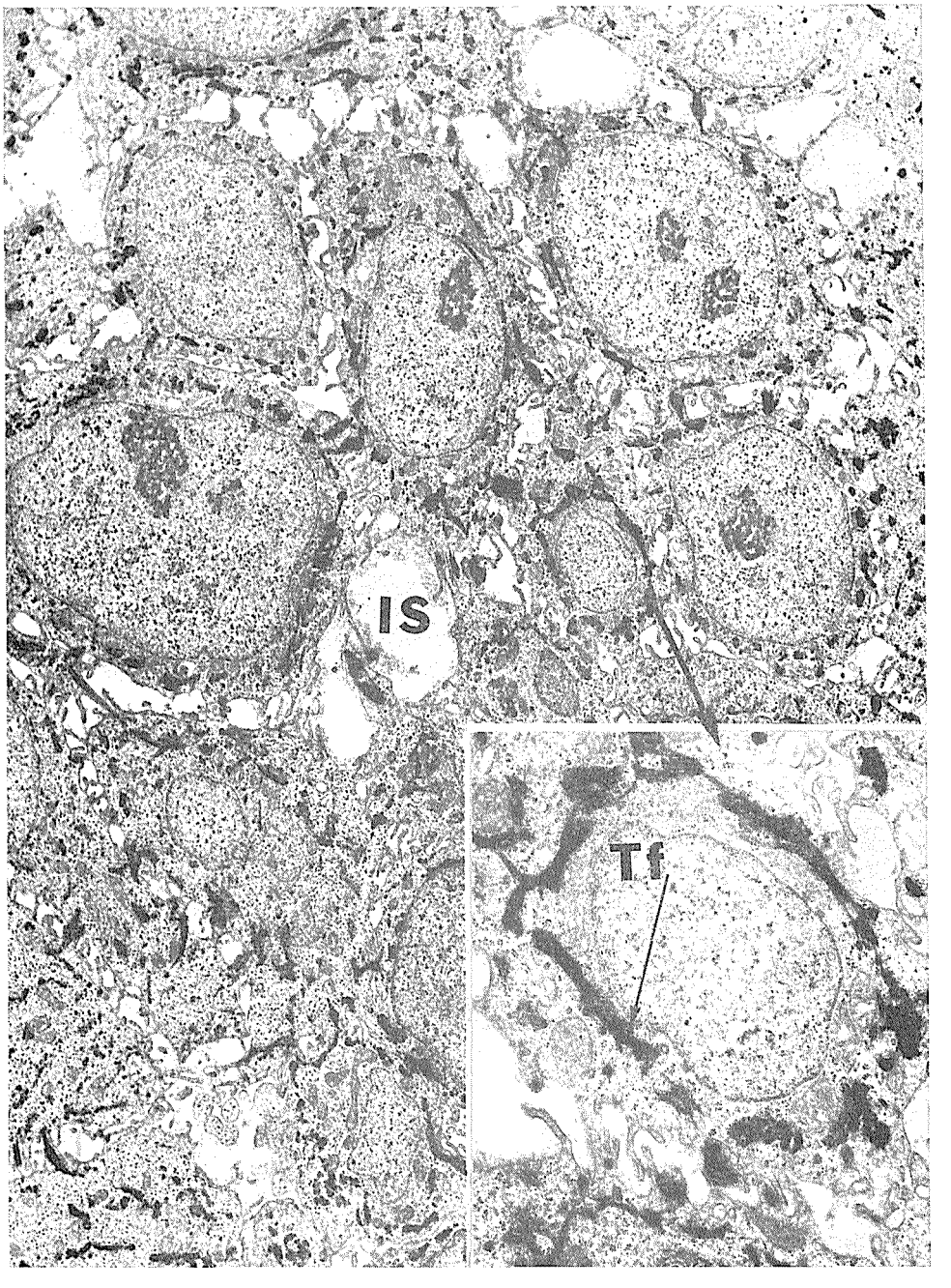

Fig. 4: Disturbance of cell differentiation. Lower part of the hyperkeratotic epithelium. Bulky, aggregated bundles of tonofilaments are arranged in a »crown of thorns« pattern. The intercellular spaces are dilated.
x 4375. Inset: The cell marked with arrow at higher magnification. x 5200.

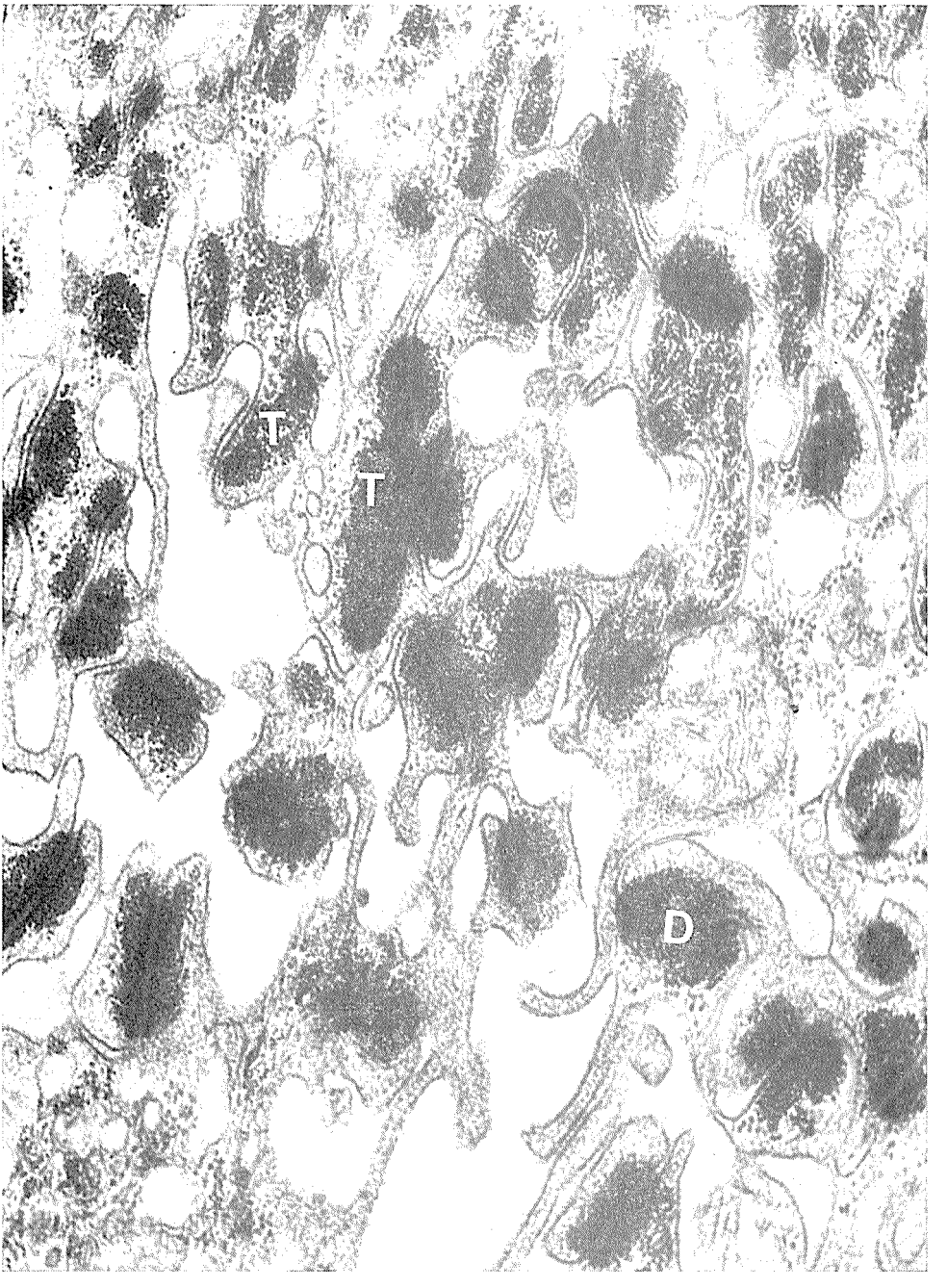

Fig. 5: Clumps of desmosomes generally accumulated in the intercellular spaces. Desmosomes are associated with tonofibrils (T) cut transversely.
x 42000.

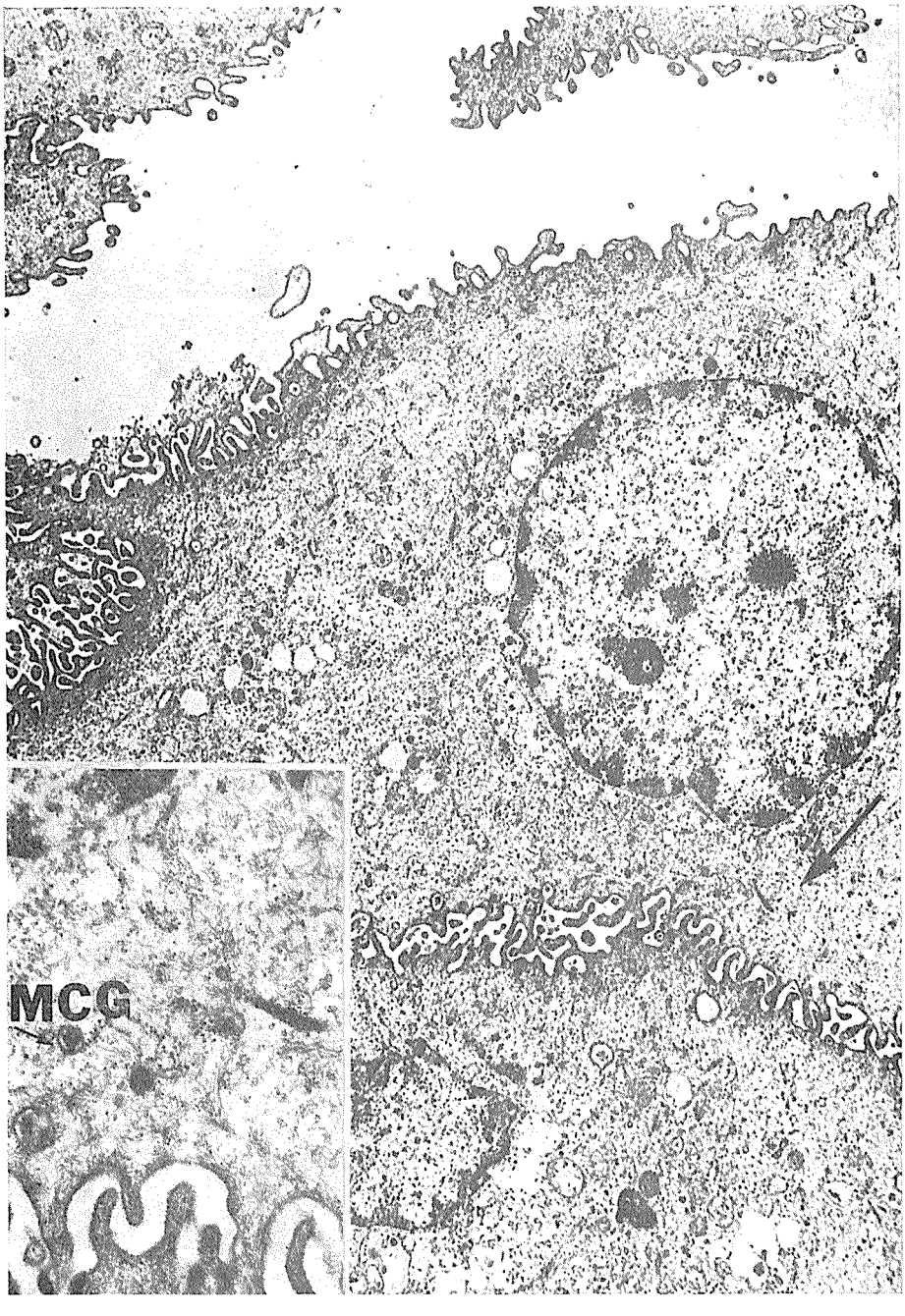

Fig. 6: The cytoplasm contains fragmented tonofibrils and electron dense membrane coating granules (MCG) (See inset). The shape and structure of the nucleus are still preserved. The cell surface of the connecting and exfoliated cells is villous.
x 4800; x 7000.

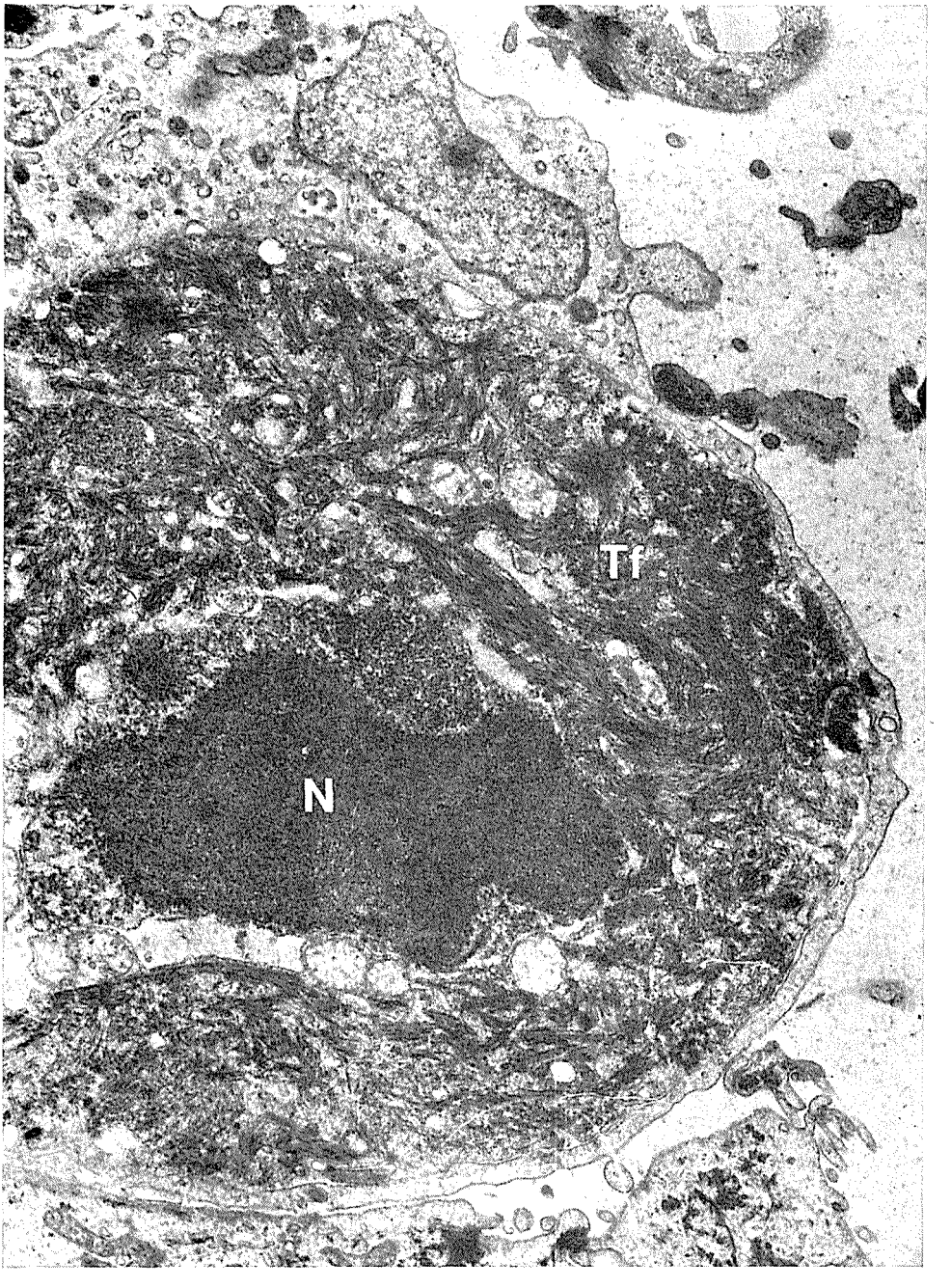

Fig. 7: Dyskeratosis with clumping cell. In the cytoplasm tragmented and aggregated tonofibrils are visible. The nucleus is pycnotic. Desmosomes are missing.
x 12500

cleus. Sometimes the cell organelles were still present. The entire cytoplasm was occupied by fragmented, accumulated tonofibrils of low electron density embedded in a less electron dense matrix. On the cell surface the desmosomes were absent, no connection with the adjacent cells could be detected (»clumping cells«, Fig. 7).

Discussion. — The various stages of the process leading from the pathological condition to cancer, i. e. here the morphogenesis of laryngeal cancer, can be followed by light and electron microscopy. The histological structure of laryngeal precanceroses practically corresponds to that of the precancerous lesions of portio vaginalis cervicis uteri (3). Considering the clinical picture, course of disease and histomorphological finding, the precursor lesions can be distinguished as reversible, i. e. »facultative« and irreversible, i. e. »obligatory« precanceroses.

Lesions in degree »A« are simple epithelial hyperplasias, they are benign. Precanceroses of degree »B« are considered to be facultative while those of degree »C« to be obligatory ones. Pachyderma and papilloma in adults belong to the facultative precanceroses. Age distribution of patients suggests that nearly 10 years are needed for the development of cancer from the precursor lesions. This is a relatively long period of time, sufficient for prevention. The high number of borderline lesions detected in our material represent successful efforts in the early detection of laryngeal cancer.

In our earlier studies, anomalies of cell connections and organelles, microinvasion started after the impairment of the dermoepidermal junction have been represented. In the present paper, the detailed description of the disturbances of cell differentiation, i. e. of hyperkeratosis, parakeratosis and dyskeratosis, yields additional information for the ultrastructural characterization of laryngeal precanceroses.

Summary

Pachyderma and papilloma in adults were found to be precancerous lesions. In the biopsy material accumulated in the course of 20 years, precancerous lesion was diagnosed in 341 cases which were divided into three groups according to the histologic degrees of gravity. Precanceroses of degree »A« displayed hyperplasia in the epithelium, those in degree »B« cellular atypia while cases of degree »C« proved to be intraepithelial carcinoma. Analysing the age of patients with cancerous and precursor lesions, the persistence of precanceroses was found to be of long duration. Electron microscopic examination of these alterations revealed disorders in the differentiation of the epithelial cells.

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GEDANKEN ÜBER INDIKATIONEN UND RESULTATE DER KONSERVATIVEN THERAPIE DES KEHLKOPF-KARZINOMS

Kup, W.

Obgleich die Behandlung des Kehlkopfkrebses zu den wichtigen und traditionellen Aufgaben unseres Fachgebietes gehört, werden die Methoden immer wieder diskutiert, um einen vertretbaren Kompromiss zwischen onkologischer Sicherheit und Erhaltung wichtiger Funktionen zu finden. Unter diesem Gesichtspunkt nehmen wir eine Auswertung des Verlaufes von 260 Malignomen des Kehlkopfes vor, die an unserer Klinik behandelt worden sind. Es handelt sich dabei durchweg um Plattenepithelkarzinome. Die über das TNM-System (SCHWAB) gewonnene Stadieneinteilung ergibt folgende Zahlen:

Stadium	I	60 Fälle
	II	109
	III	60
	IV	31
		260

Wenn wir davon ausgehen, daß eine konservative chirurgische, radiologische oder kombinierte Behandlung nach den heute gültigen Anschauungen nur in den Stadien I und II indiziert ist, kämen ohne Berücksichtigung des Tumorsitzes und des Allgemeinzustandes des Patienten immerhin 65 % aller Fälle in die engere Wahl. Dieser Prozentsatz erfährt seine Einschränkung allerdings durch das Lebensalter. Wir sind oberhalb des 65. Lebensjahres äußerst zurückhaltend mit Teilresektionen, da die Erlernung des Schluckaktes nur bei sehr guter Disziplin und Eenergie des Patienten möglich ist. Das gilt natürlich für Laryngofissuren. Immerhin ist in unserem Krankengut die Altersverteilung so, daß nur 31 % der Patienten noch unter der kritischen Grenze von 60 Jahren lagen.

30 — 39 J.	4 Fälle
40 — 49 J.	18
50 — 59 J.	59
60 — 69 J.	105
70 — 79 J.	65
80 und mehr	9

Die Häufigkeit der von uns eingeschlagenen Therapie ist in folgender Tabelle wiedergegeben:

Chordektomie	36 Fälle	(13,8 %)
frontolater. Res.	8	(3,1 %)
horizontale Res.	8	(3,1 %)
Hemilaryngektomie	3	(1,1 %)
totale Laryngekt.	108	(41,6 %)
Strahlentherapie	88	(33,8 %)
Palliativbehandl.	9	(3,5 %)

Das konservativ-chirugische Vorgehen macht also 21 % aller Fälle aus. Das zeigt, daß wir die Indikationen streng stellen. Zusammen mit der reinen Strahlentherapie laufen aber unsere Behandlungspläne in etwa 50 % aller Fälle auf eine Erhaltung der Kehlkopffunktionen hinaus. Man muß dabei allerdings berücksichtigen, daß zu einem kleinen Teil eine Strahlentherapie auch nur deshalb eingeschlagen wird, weil der Patient nicht operationswillig ist. Das verändert die Aussage aber nicht grundlegend.

Unsere chirurgischen Indikationen sind:

— Chordektomie bei Tumorbegrenzung auf ein Stimmband bei erhaltener Grobmotorik. Keine »erweiterte« Indikation.

— fronto-laterale Resektion beim Befall eines oder beider Stimmbänder im vorderen Bereich, auch bei geringer subglottischer Ausdehnung.

— supraglottische horizontale Resektion bei begrenzten Tumoren der Epiglottis und des Taschenbandes.

— Hemilaryngektomie bei Befall nur einer Kehlkopfseite bei sauberer Aussparung der Mittellinien, der Epiglottis und des Hypopharynx.

Zusätzliche Strahlentherapie wurde von uns bei Teilresektionen vermieden. Die nachstehende Tabelle gibt die Resultate wieder:

Chordektomie	27/ 36 = 75,0 %	5-J. Heilung
frontolaterale R.	6/ 8 = 75,0 %	
horizontale Res.	3/ 8 = 37,5 %	
Hemilaryngktomie	2/ 3 = 66,7 %	
Laryngektomie	66/108 = 61,1 %	
Strahlentherapie	30/ 88 = 34,1 %	
Palliativther.	0/ 9	
	134/260 = 51,5 %	

Die Zahlen geben die Fünfjahres-Heilungen wieder. Am günstigsten liegen die Ergebnisse also bei der Chordektomie und der frontolateralen Resektion, die sich aber auch auf frühe Tumorstadien beschränken. Auch die Hemilaryngektomie liegt noch über der durchschnittlichen Heilungsquote, doch ist die kleine Zahl wenig beweiskräftig. Für unbefriedigend halten wir die Ergebnisse bei der supraglottischen horizontalen Teilresektion. Das hat seine Gründe sicher in der Fehleinschätzung der Tumorausdehnung bei der präoperativen Diagnostik. Durch die Untersuchungen von GÜNNEL u. BAERTHOLD sowie von OLOFSSON u. NOSTRAND wissen wir, daß die Ausdehnung gerade der Tumoren des Kehlkopfeinganges über das optisch erkennbare hinausgeht. Sie wachsen außerhalb des Kehlkopfes oder unter der Schleimhaut unsichtbar in die Tiefe bis unter das Stimmbandniveau. Diese Ausläufer werden bei der Horizontalresektion nicht mehr erreicht. Wir sind mit dieser Indikation in den letzten Jahren sehr vorsichtig geworden.

Noch ein paar Worte zur Strahlentherapie: zusammen mit den Radiologen des Krebsforschungszentrums in Berlin-Buch (DDR) haben wir eine alternierende Reihe bei Patienten mit Kehlkopfkrebs untersucht. Wenn der Lokalbefund sowohl die Strahlentherapie als auch die partielle Resektion erlaubten, ließen wir das Los über das Verfahren entscheiden (randomisierter Versuch). Wir übersehen jetzt 20 Patienten in jeder Guppe mit einem Intervall von mindestens 4 Jahren. Der Vergleich zeigt:

Operation	Bestrahlung
19 Fälle	20 Fälle
geheilt 12	geheilt 7
Rezidive 6	Rezidive 11
Zweit-Ca 1	verschollen 2

Die Bestrahlung erfolgte mit Cobalt 60 in 18 Fällen und mit schnellen Neutronen in 2 Fällen. Unter den Operierten wurden also rund zwei Drittel geheilt, unter den Bestrahlten ein Drittel. Unter den Rezidiven bzw. Resttumoren der Bestrahlungsgruppe waren 9 klassiche Stimmbandkarzinome. Sitz des Tumors und Ausdehnung haben auf die Prognose entscheidenden Einfluss.

Operation		Bestrahlung
Stadium I	geheilt 7	geheilt 5
	Rezidive 2	Rezidive 2
Stadium II	geheilt 5	geheilt 2
	Rezidive 1	Rezidive 5
Stadium III	geheilt 3	geheilt 0
	Rezidive 1	Rezidive 4

Im Stadium I finden wir also annähernde Gleichheit der Heilungen, in den fortgeschrittenen Stadien verschiebt sich der Erfolg auf die Seite der Chirurgie. Das stimmt auch mit den Erjahrungen großer Geschwulstatistiken unseres Landes überein (BOCKMÜHL).

Wir ziehen daraus die Konsequenz, daß funktionserhaltende Tendenzen nicht dazu verleiten dürfen, die chirurgische Radikalität abzuschwächen. Die Indikationen für die konservatische Chirurgie müssen sehr streng gestellt werden. Der Chemotherapie kommt ohnedies nur eine unterstützende oder palliative Bedeutung zu.

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MANAGEMENT OF LARYNGEAL CARCINOMA

Pearson Dorothy

The management of patients with laryngeal carcinoma has two main objectives. The first and most obvious is the cure of the patient, and the second is that if possible the voice should be preserved. The voice is a most cherished possession and despite the replacements by artifical means and the development of the oesophageal voice being useful and ingenious, there is no substitute for the natural voice — even one which is slighty impaired. On the other hand it is important that no risk should be taken as far as cure is concerned just so that the voice can be preserved.

Our general approach to these patients in Manchester has been to use primary radiotherapy with careful follow-up and surgery in reserve for those patients, who develop recurrence or necrosis after radical radiotherapy.

The radiotherapy technique now most commonly used is a careful beam direction using a pair of wedge fields and megavoltage radiation. A tumour dose of 5500 rads in 16 exposures in 21 days is most commonly used. For larger tumours or where nodes are involved a parallel pair of fields may be used. The dose may be modified because of increase in irradiated volume, or age or general condition of the patient, but 85 % of all patients received over 5000 rads.

The results I wish to present are those for the years 1962—65, when there was a total of 419 cases of carcinoma of the larynx managed in this way. 291 were glottic in origin.

Subsequent surgery was performed either for continuing radiation problems or for recurrent tumour.

The radiation problems were of varying severity. Surgery consisted of either temporary or permanent tracheostomies or laryngectomy and the salvage rate was 80 %, of the 50 % of patients who developed radiation problems.

There were 20 % of patients who developed recurrences, but only half of these had subsequent laryngectomy and the salvage for the whole group was only 35 %, although it was 64 % for those who had surgery. Looking at those which did not get subsequent surgery we find there are two groups. (1) Those in whom the original disease or their general condition made radiation the only possible treatment and always remained unsuitable for surgery, and (2) those who might have had surgery and either refused or were left too long before surgery was decided upon. There is obviously little chance to improve the situtation in (1) — except perhaps in the future by cytotoxic therapy, but there are some lessons we can learn from a study of the second group. We found that often, despite continued clinical problems, there was a reluctance to proceed with surgery without histological proof of recurrence and in retrospect false negative histology was common. It is now our confirmed opinion that it is necessary on some occasions to proceed to surgery without histological proof of recurrence, especially if there is any clinical deterioration, a policy advocated most sharply by others especially Lederman, who thinks surgery should be proceeded with if the larynx is not entirely well a few months after radiation.

As a result of the dosage observations of Stewart and Jackson, on our patients we

see that as the dose given in 21 days increases from 5250 rads through 5500 to 5750 rads the radiation problems increase. On the other hand, for locally more advanced T_2 and T_3 tumours the recurrence rate falls as dose increases. For T_1 tumours the dose at these three levels produces the same recurrences rate, so we have chosen for those patients the middle dose of 5500 rads.

By increasing the dose in the more locally advanced tumours, the recurrences are reduced and necrosis increased, but subsequent surgical salvage — 80 % as opposed to 35 % was better for necrosis than recurrence, and hence a better overall cure rate should be achieved.

Applying these findings and following the policy of radical radiotherapy with surgical salvage for failure we have achieved in the period under review an overall five-year cure rate of 70 %. For T_1 tumours 89 % — T_2 and T_3 66.5 % and T_4 or $T_1T_2T_3 + N_1$ 30.4 %. It is interesting that an 8 % improvement compared with an earlier period occured in the T_2 & T_3 or more locally advanced tumours, where we had been able to salvage more by subsequent surgery. Better results for survival, but also important that the great majority of the survivors also had their natural voice — a great asset.

TREATMENT OF LARYNX CARCINOMA AND PROGNOSTIC FACTORS

Littbrand, B., Å. P. Jakobsson, D. Killander

In Sweden the incidence of carcinoma of the larynx is continuously increasing with 4 % per year. In 1971, 161 new cases were registered of which the glottic type was dominating. The managemet of the patients in Stockholm considering investigation, treatment and follow up has been worked out in cooperation with the radiotherapists and ENT-doctors. All the tumors are staged according to the TNM-system recommended by UICC (Geneva, 1968), and are proven histologically. The radiotherapy is given with kilocurie ^{60}Co with two beams with wedge filters. The dose distribution varies within $\pm$ 5 % in the target area. Only larynx is planned to be in the target area in cases of T1 and T2 tumors, whereas at T3 the cervical nodes are included as well. All T1 and T2 tumors are treated with radiation alone, 200 rad a day, 5 days a week, totally 6400—6600 rad with 2 weeks of rest after 4000 rad. An investigation of 230 consecutive patients with glottic carcinoma treated at Radiumhemmet in Stockholm 1956—1966 (Jakobsson, 1973) showed that 12 % of the patients with T1 tumors had local recurrence and/or secondary metastases, 94 % were alive after 5-years of observation (Jakobsson, 1973). Corresponding figures for T2 were 25 % recurrences and/or metastases, and 90 % survival. The treatment of T3 tumors has been more discussed. In a series consisted of 578 consecutive cases of cancer of the larynx treated at Karolinska sjukhuset 1940—1959 it was found that with only irradiation of the T3 tumors 67 % were alive after 5 years and the same proportion was found after laryngectomy with no preoperative irradiation (Martensson et al., 1967). However, the frequency of secondary lymph node metastases was more pronounced in the irradiated group, 12 and 4 % respectively after 5 years of observation. It was also found that the mobility of the cords was an important prognostic factor for the success of radiotherapy. Therefore one decided that the patients with normal or impaired mobility (T3 A and B) should be treated with radiation alone with the same fractionation scheme as for T1 and T2 described above. The patients with fixed cords (T3 C) should be given preoperative radiotherapy and after two weeks of rest operated with laryngectomy and neck dissection on the same side as the tumor. The preoperative treatment was decided to be 200 rad a day, 5 days a week and totally 4000 rad. According to our present experience the rate of surgical complications is not increased by the preoperative irradiation. The patients with T3 tumor treated only with radiation are carefully controlled by direct laryngoscopy each three months during the first two years because of the high risk of recurrence. Laryngectomy at recurrence after the radiotherapy of 6400 rad means an increased risk for surgical complications, but according to our experience today this risk is of minor importance. In conclusion: the radiotherapy of glottic cancer gives a favorable therapeutic ratio with a low rate of recurrences and a good function of the larynx. At recurrence laryngectomy can be performed with acceptable risk of complications.

To be able to individualize the treatment and follow up we need more knowledge

about prognostic factors. In an attempt to do this a histological grading of malignancy and its significance in relation to progosis of the radiotherapy has been performed. (Jakobsson et al., 1973). The study is based on a histological analysis of the biopsy prior to the treatment and the subsequently clinical course of 230 histologically verified glottic carcinoma of the larynx treated at Radiumhemmet 1956—1966 with radiation. The follow up period was at least 5 years. All the patients were classified according to the recommendation of UICC (Geneva, 1968) by the TNM-system. The material consisted of 131 patients with clinical stage T1, 64 patients T2, 44 patients T3 and 1 patient T4. Only two patients had regional lymph node metastases, and no patient had evidence of distant metastases on admission. The histological grading of malignancy of the squamous cell carcinoma in the series was based upon the registration of certain different morphological criteria, commonly applied in the diagnosis of squamous cell carcinoma. The evaluation of the tumor cell population itself, was considered separately from an analysis of the tumor-host relationship. In each group four individual morphologic parameters were

Tumor cell population	Points			
	1	2	3	4
Structure	Papillary and solid	Strands	Small cords and groups of cells	Marked cellular dissociation
Differentiation	Highly: keratinization	Moderately: some keratinization	Poorly: minimum keratinization	Poorly: no keratinization
Nuclear polymorphism	Few enlarged nuclei	Moderate number of enlarged nuclei	Numerous irregul. enlarged nuclei	Anaplastic immature enlarged nuclei
Mitoses	Single	Moderate number	Great number	Numerous

Table 1. Histologic Grading of Malignancy Based on Tumor Cell Population (Jakobsson et al., 1973)

Tumor-host relationship	Points			
	1	2	3	4
Mode of invasion	Well defined borderline	Cords, less marked borderline	Groups of cells no distinct bordeline	Diffuse growth
Stage of invasion	Possibly	Micro-carcinoma (few cords)	Nodular into connective tissue	Massive
Vascular invasion	None	Possible	Few	Numerous
Cellular response (plasmolymphocitic)	Marked	Moderate	Slight	None

Table 2. Histologic Grading of Malignancy Based on Tumor-Host Relationship (Jakobsson et al., 1973)

graded according to 1—4 points system. The grading system was thus based upon arbitrary units. The basis for the histologic grading of the tumor cell population is given in Table 1, and grading system of the tumor-host relationship in Table 2 (Jakobsson et al., 1973). Multivariate analysis (Automatic Interaction Detector analysis) was performed in order to determine which factors were of the most importance in the prediction of the 5-year result recurrence or not. In order to get an idea of the influence of the predictors clinical stage and total malignancy point value have been forced in the AID analysis showed in the AID-tree in Fig. 1. One could see that in the T1 group 47 patients with a total malignancy point value of 15 or less showed a recurrence frequency of 0 %, compared to the patients with a point value of 16 or more having a recurrence rate of 20 %. The same principal results were also obtained in T2—4 group with no recurrence at all in the group of patients with malignancy point value of 15 or less and a recurrence rate of 49 % with the point value of 16 or higher. The analysis showed that in patients with T1 tumors and a malignancy point value more than 16 there was a significant prognostic factor of the point values of mode of invasion with a recurrence rate of 5 % with a point value of 1 or 2, and 30 % of recurrence rate when the point values were 3 or 4. In the group of T2—4 tumors the point values of nuclear polymorphium were of

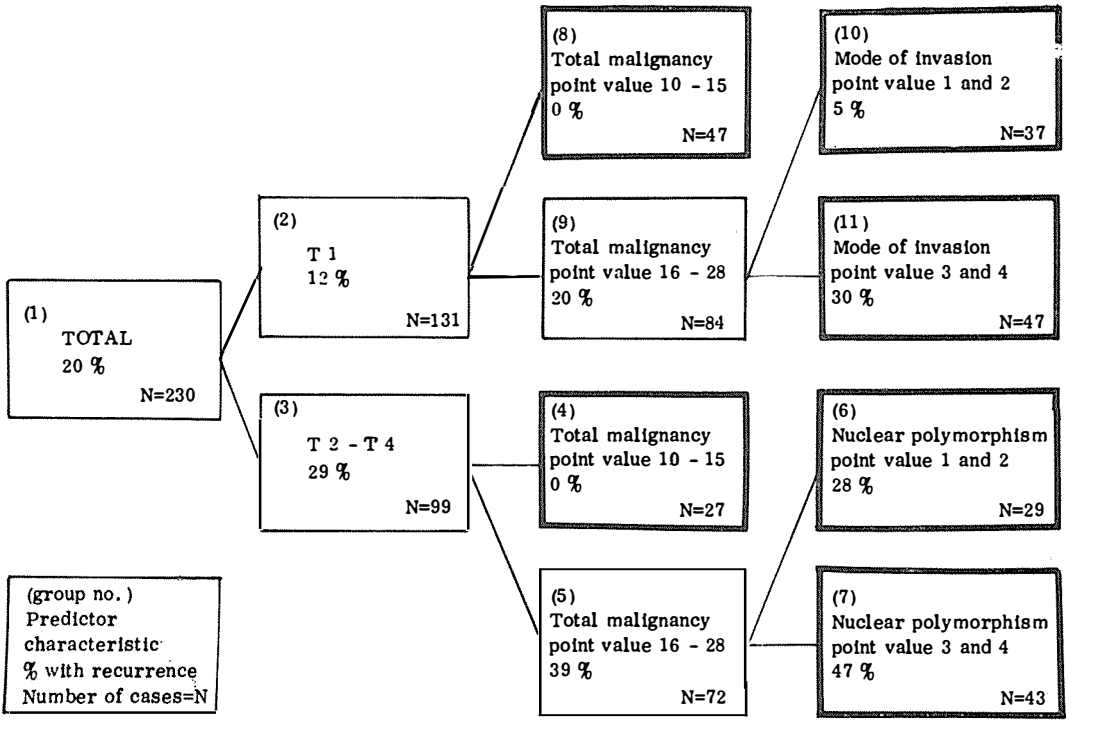

Figure 1: AID analysis, percentages of patients with recurrences in the different groups of predictors of morphologic criteria, T-stage and total malignancy point value. T-stage and total malignancy point value have been forced (Jakobsson, 1975)

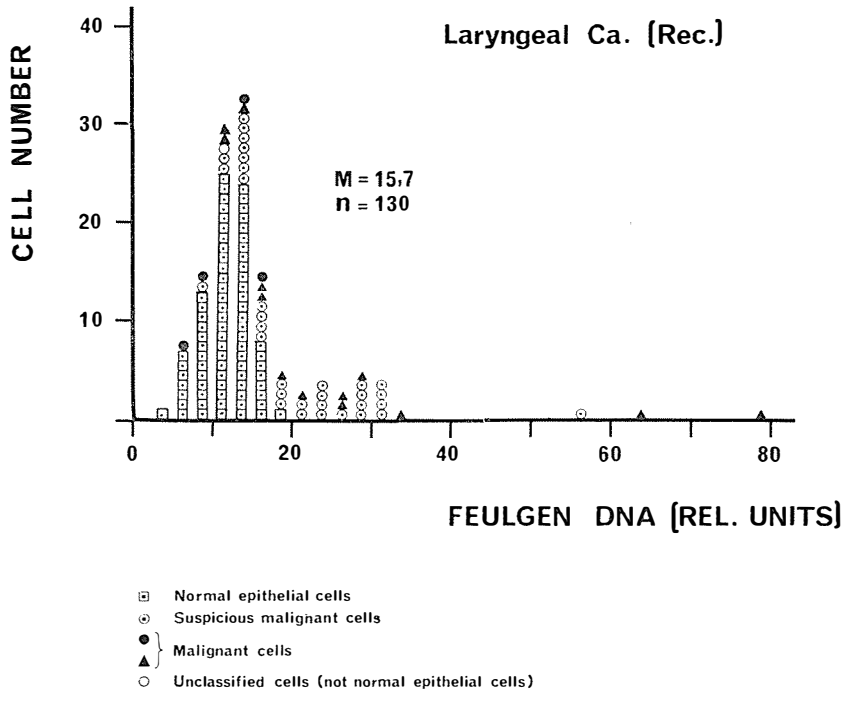

Figure 2: Frequency distribution of the amount of DNA in individual cells from case of recurrent laryngeal carcinoma. Cell types are indicated (Jakobsson et al., 1975)

prognostic significance, the value of 1 or 2 given 28 % of recurrence and point values of 3—4 47 % of recurrences.

Nuclear and cell polymorphism is to a great extend a result of cell proliferation and of differences in the degree of ploidy. Information of cell proliferation and polyploidy can be obtained by the determination of the cellular amounts of DNA. In such a way nuclear polymporphism could be measured in a more objective way.

Figure 2 illustrates one example of this type of analysis (Jakobsson et al., 1975). The patient had recurrence of larynx carcinoma with a high total malignancy point value (22 points). The cells, obtained by scraping the surface of the tumor, were Feulgen stained. Parallell cell preparation was stained by standard cytological technique. The Feulgen DNA-amount of the individual cells was measured in a rapid scanning microspectrophometer (Caspersson and Lomakka, 1970). There was a wide spread distribution of the DNA-values (Fig 2). However, the population of cells with normal epithelial morphology were found to have low DNA-amounts with narrow DNA-distribution, regardless of normal or malignant source of origin, whereas cells with higher amounts had malignant or suspiciously malignant morphology. The practical value of the DNA analysis as a more objective prognostic factor is now being studied in a larger clinical material comprising patients with squamous cell carcinoma in the upper respiratory tract.

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