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Reconstructive laryngectomy

by

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Reconstructive laryngectomy, the aim of which is to leave the patient without a tracheostoma, thus preserving the normal pneumophonic function relative to vocal articulation, is a link between the various techniques suggested for conservative laryngeal surgery and classic total laryngectomy.

The aim of this technique is to restore continuity to the airways, so that the patient is able to breathe naturally and subsequently can speak without having to resort to the use of esophageal voice.

As far back as 1959, Majer and Rieder referred to the use of a technique which they called crico-hyoidopexy (and which turned out to be inadequately radical for such cases on a long-term basis), but the credit for having brought to light the functional possibilities and oncological effectiveness of reconstructive laryngectomy should be attributed to Serafini who, in 1970, described his method of subtotal laryngectomy with tracheo-pharyngeal anastomosis. This technique was suggested for the treatment of bilateral or unilateral glottic cancer with fixation of the vocal cord.

Functional recovery after this operation was total for swallowing and adequate for phonation but insufficient for breathing (in fact these subjects were obliged to use a small tracheal cannula) and this was due to the easy deformability of the tracheal rings.

This is the reason for which, in our first case, we decided to preserve the cricoid cartilage (Alajmo, 1971). In the same period, Labayle and Bismuth (1971) referred to the preliminary results of a similar technique in which they also suggested that the arytenoid should be maintained.

After this first stage, many authors wrote of their own experiences, offering suggestions for modifications of the basic technique. Thus, reconstructive laryngectomy was universally claimed as a valid method for the surgical treatment of laryngeal cancer.

The technique adopted by our team contemplates conserving the hyoid bone, the cricoid and, where possible, the arytenoid, as originally suggested by Labayle and Bismuth (1971), the extirpation of the larynx including total removal of the thyro-hyo-epiglottic space. By fixing the cricoid to the hyoid bone—hence the definition of 'crico-hyoidopexy'—we manage to restore the continuity of the airways (Figs. 1, 2 and 3).

Surgical Technique

The operation can be performed either at the same time as a unilateral neck dissection or by itself. In the first case we prefer to adopt the Hayes Martin skin incision, whilst a T-shaped incision is used when laryngectomy alone is performed.

In the latter procedure, after having incised the skin and the superficial cervical fascia, the

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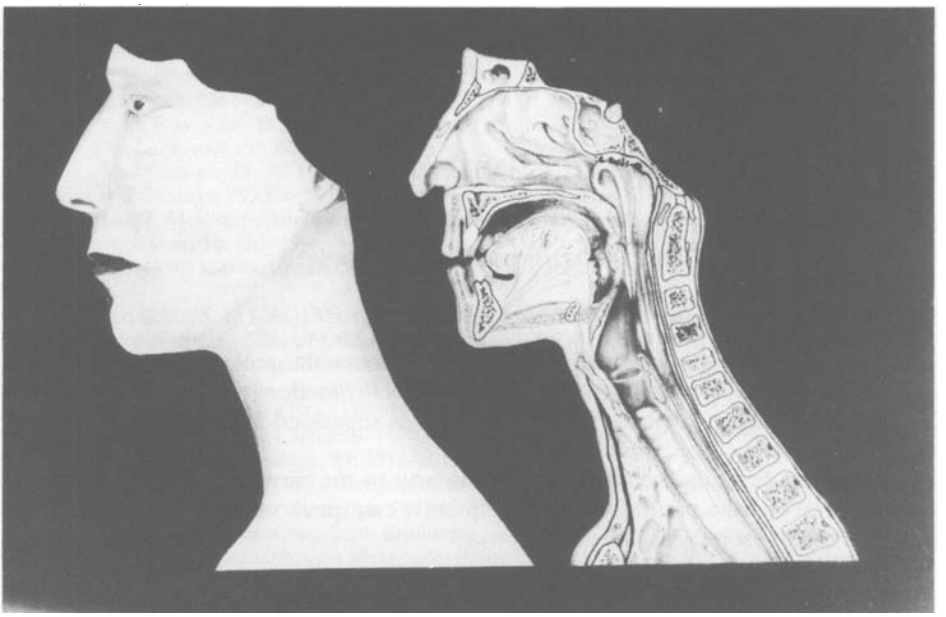


FIG. 1
Normal pre-operative condition.

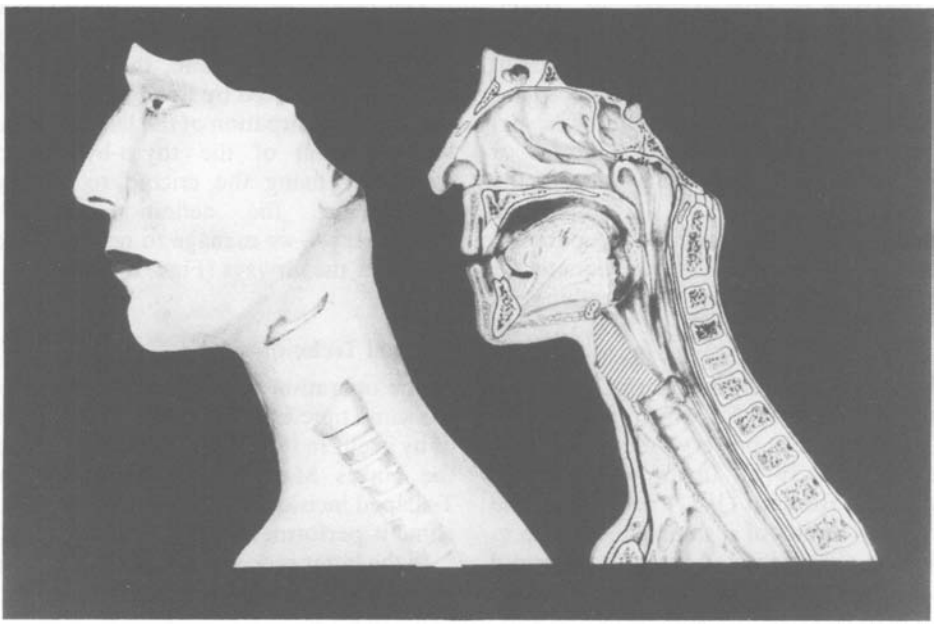


FIG. 2
The upper section of the larynx has been removed; hyoid bone and cricoid cartilage have been preserved.

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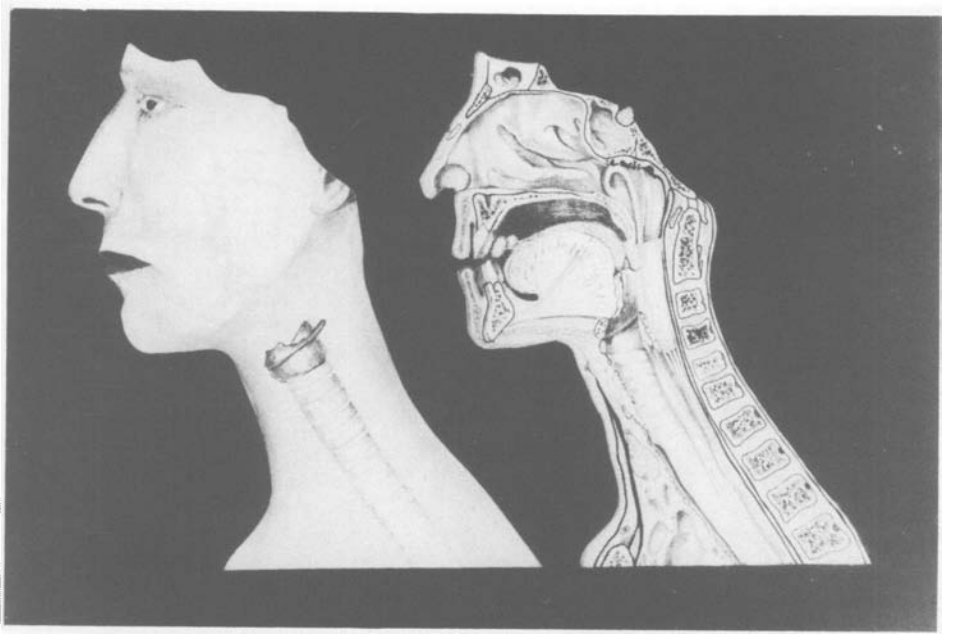


FIG. 3

Air passage has been reconstructed. The hyoid bone and cricoid cartilage appear connected together.

pre-laryngeal muscles are separated along the midline and the perichondrium of the thyroid cartilage is incised and elevated right up to the posterior edge of the thyroid alae. The insertions of the sternohyoid and thyrohyoid muscles into the hyoid bone are severed, after which the superior laryngeal peduncles are ligated. We then carry out the incision of the periostium of the lower edge of the hyoid bone, elevating it posteriorly in order to free the thyro-hyo-epiglottic space and then to remove it altogether as well as the larynx.

The thyroid isthmus is dissected so that tracheotomy can be performed at the level of the third-fourth tracheal ring. General anesthesia is then given through the tracheal opening.

We then carry out the incision of the cricothyroid membrane, close to the cricoid arch, followed by dissection of the cricothyroid muscles and joints. This incision is extended laterally and posteriorly along the upper border of the cricoid cartilage until one arytenoid cartilage has been disarticulated. The interarytenoid wall is then cut along the midline, with the purpose of saving the other arytenoid (if this is feasible from a 'cancerological' point of view), which is thence freed from the piece to be removed, by means of an incision which runs across the aryepiglottic fold, the false cord and the vocal cord.

After removal of the specimen, which comprises the glottic and supraglottic regions as well as the pre-epiglottic space, we proceed to suturing of the mucosa of the anterior and posterior aspects of the remaining arytenoid, followed by that of the postcricoid mucosa to the internal mucosa of the posterior half of the cricoid cartilage in an attempt to reconstruct the two pyriform fossae (Fig. 4). A nasogastric feeding tube is then inserted.

The stage of reconstruction is now fairly simple. Two No. 1 chromic catgut stitches are inserted, going in below the cricoid arch and coming out above the hyoid bone, at a distance of about 0.5–1 cm. from the midline. Having flexed the head of the patient, the two stitches are all tied together in order to bring the cricoid cartilage and the hyoid bone together (crico-hyoidopexy) (Fig. 5).

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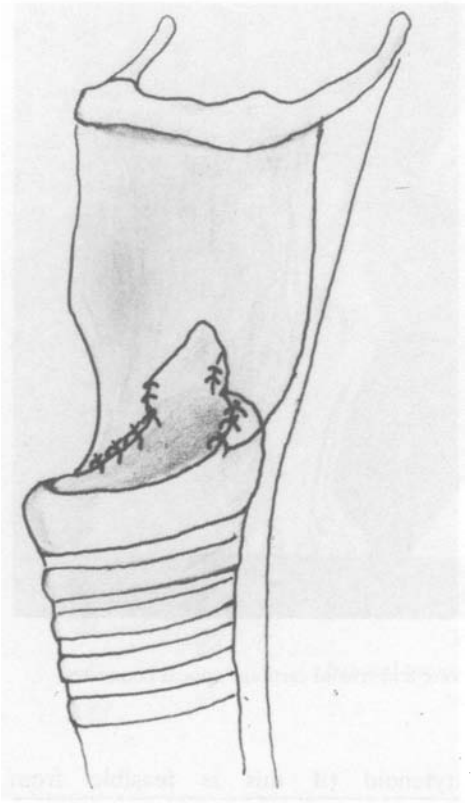


FIG. 4

The specimen has been removed and the pyriform fossae reconstructed by suturing the post-cricoid mucosa to the internal mucosa of the posterior half of the cricoid. The mucosa of the anterior and that of the posterior aspect of the arytenoid have been sutured together.

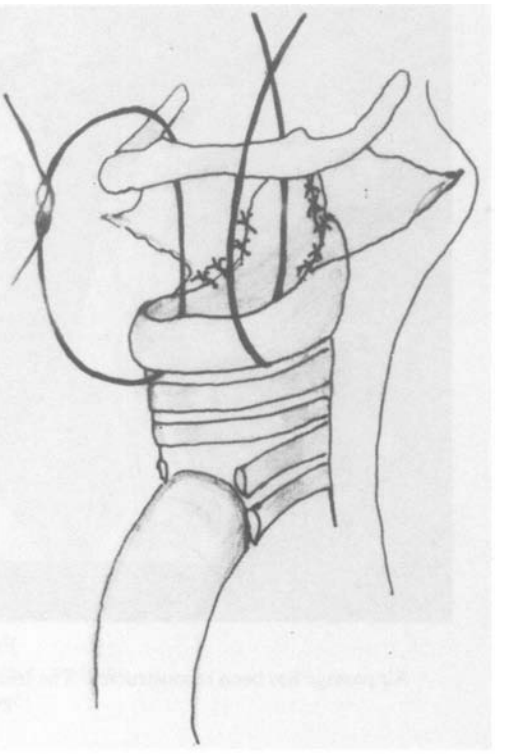


FIG. 5

The cricoid cartilage and hyoid bone are tied together by means of two chromic catgut stitches.

Pharyngeal mucosa does not need any sutures: no fistulas have yet been seen.

The two perichondrial flaps of the thyroid are sutured together along the midline, and the pre-laryngeal muscles are sutured to the hyoid bone.

A cuffed cannula is put into the tracheostomy and is removed a week later and replaced with a fenestrated tube in order to allow the patient to speak as soon as possible. It will be finally removed two to four weeks later, when the patient is able to eat and swallow without trouble. The feeding tube is usually removed a few days before the cannula.

This technique can only be applied to a limited number of cases, namely: in the presence of tumours which cannot be surgically treated with other conservative techniques providing that: (1) the tumour does not penetrate into the hypopharynx or into the subglottic area; (2) it does not extend posteriorly to the glottic plane at the level of the interarytenoid region; (3) the vocal cords are mobile.

Further limits are placed on the use of this reconstructive procedure with cricohyoidopexy by the following general factors: (1) a poor state of general health; (2) the presence of extensive bilateral latero-cervical metastases; (3) old age (it is preferable not to apply this technique to subjects over 65 years of age); (4) previous application of radiotherapy to the neck (which has a negative effect on the trophism and elasticity of the deep neck muscles, thus making recovery of

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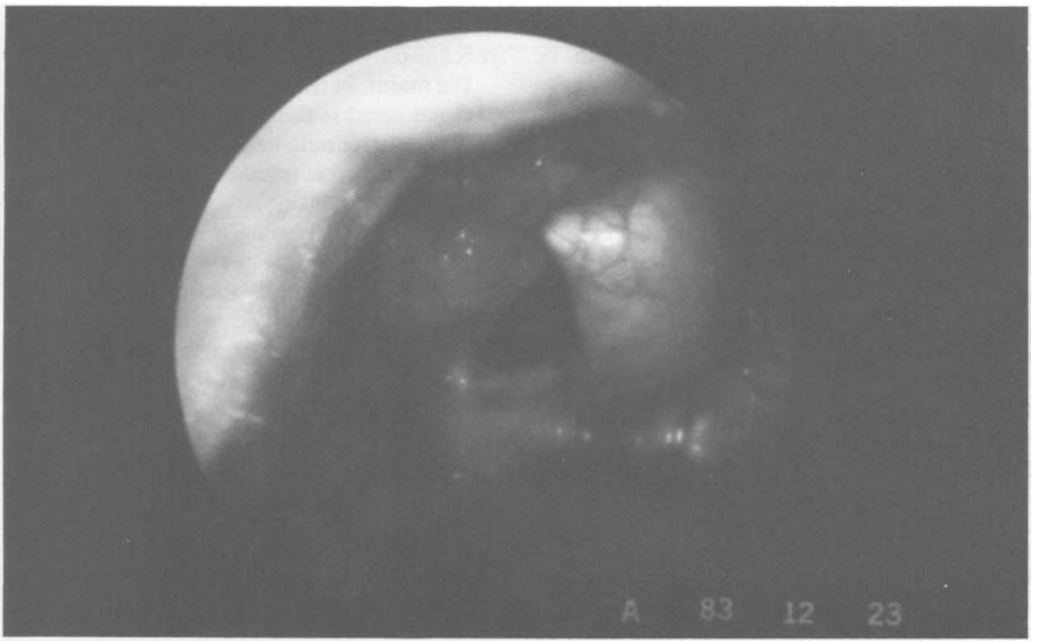


FIG. 6

Endoscopic view of cricoid lumen. Arytenoid cartilage moves inwards during phonation (patient operated on 12 years earlier).

the swallowing function more difficult); (5) inadequate respiratory function, particularly important when breathing out (this could cause broncho-pulmonary complications when the patient starts to eat again by mouth).

With reconstructive laryngectomy with crico-hyoidopexy we can, and must, offer the patient a possibility of recovery equal to that afforded by the classical technique of total laryngectomy, the advantage of the former being found in the extent of functional recovery as manifested by normal swallowing, good respiratory function (Alajmo and Tilli, 1975) and a voice which is much more like that of a normal voice than an esophageal voice (Salimbeni and Polli, 1982).

As so often happens, following the enthusiasm occasioned by Serafini's new technique, both on a national and international level (especially in Spain and France), reconstructive laryngectomy became so popular that it led us to believe that many surgeons tend to prefer this method to the classical conservative forms of laryngectomy. In fact, we have witnessed with the passage of time a much wider application of this technique, together with a general tendency to pay less attention to the contra-indications mentioned initially. However, the sudden boom seen in the first-half of the 1970's could be attributed to the fact that certain parameters were undoubtedly taken too lightly; and these ultimately proved to be of the utmost importance as regards the evaluation of the serious post-operative complications which can follow reconstructive laryngectomy (Alajmo, Brettoni and Tozzi, 1973; Alajmo, 1974).

We have carried out 28 reconstructive laryngectomies with crico-hyoidopexy, in the years between 1971 and 1982.

The first 12 operations were carried out in the short space of time between April 1971 and June 1973, whereas the remaining 16 cases were treated over a period of 10 years. This leads us to two conclusions: either this technique has been found with time to be applicable to fewer cases (which is not the case, as we have constantly adopted the

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parameter of oncological effectiveness), or else long-term results have proved to be unsatisfactory. This also is not true, however, since our own personal long-term results have come up to our expectations, which were in accordance with our choice of action which was constantly based on local indications. On the other hand, what did make us reflect upon this matter more closely, with a reduced application of this technique, was the incidence of post-operative complications which developed in the first group of patients. Therefore, we altered the basic technique slightly and imposed a stricter control on patient selection based on the general condition of each candidate and, in particular, on the condition of the respiratory tract.

Therefore, we can divide our patients into three groups, according to the period in which they happened to be operated upon and defined as follows: a period of enthusiasm (P.E.); a period of meditation (P.M.); and a period of cautiousness (P.C.). Numerically, there is a noticeable difference in the percentage of patients operated upon with the reconstructive technique as opposed to those who underwent conservative or total laryngectomy in our department during these three stages (Table I).

In Table I we compare the number of reconstructive laryngectomies (12) carried out between April 1971 and June 1973—which corresponds to the 'period of enthusiasm'—with the total number of alternative techniques: the incidence of the former group is equal to 4 per cent. Applying the same criteria to the following period—which corresponds to the stages of 'meditation' and 'cautiousness'—the incidence is noticeably less and reaches only 1.5 per cent.

We maintain that this last-mentioned value (1.5 per cent) is the nearest measure of incidence which should be attributed to the application of this reconstructive technique in the surgical treatment of laryngeal cancer.

Our findings, from both a functional and an oncological point of view, would seem to explain the reason why the initial enthusiasm for this new technique was supplanted by moderation and caution; and secondly, under given conditions, they justify our choice of this method which we still consider valid.* It is implicit that such validity depends on a strict respect for the afore-mentioned indications and contra-indications.

The functional results can be seen in Table II. Notice the high proportion of unsuccessful results found in the initial period of enthusiasm (three deaths caused by post-operative bronchopneumonia and three cases in which it was necessary to carry out a second operation with a permanent tracheostome in order to avoid complications.

During the period of meditation, death ensued in one patient due to intra-operative heart failure (and thus was not linked to the type of operation). During the period of caution only one subject had to undergo total laryngectomy, eight months after the reconstructive procedure, for stenosis of the cricoid opening which we attributed to recurrence, but which, in fact, turned out to be a chronic inflammatory condition.

Table III shows the oncological results concerning 21 patients who recovered after surgery; 17 of these had immediate full recovery

TABLE I

	P.E. (26 m.)	P.M.+P.C. (114 m.)
Total laryngectomy	114 (38%)	480 (46%)
Conservative laryngectomy	172 (58%)	546 (52.5%)
Reconstructive laryngectomy	12 (4%)	16 (1.5%)
Total	298 (100%)	1,042 (100%)

P.E. = period of enthusiasm (April 1972—June 1973).
P.M. = period of meditation (18 months: three reconstructive laryngectomies).
P.C. = period of cautiousness (1975–1982: 13 reconstructive laryngectomies).

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TABLE II

Functional results	Good	Total laryngectomy	Death
Period of enthusiasm (12 cases)	6	3	3 (B.P.)
Period of meditation (three cases)	2		1 (H.F.)
Period of cautiousness (13 cases)	12	1	
Total	20	4	4

B.P. = Bronchopneumonia; H.F. = Heart failure.

TABLE III

Oncological results	Recovery		Death	Death (post-operative complications)
	Immediate	Total laryngectomy		
Period of enthusiasm (12 cases)	5	3	1 (recurrence)	3 (B.P.)
Period of meditation and cautiousness (16 cases)	12	1 (recurrence)	2 (metastasis)	1 (H.F.)
Total	17	4	3	4
		Well at 6, 6, 11 and 12 years		
	Well: 10 patients at 5, 5, 6, 6, 7, 8, 9, 9, 12 and 12 years 5 patients at more than 42 months 1 patient at 26 months 1 patient at 13 months			

and four underwent a secondary operative procedure (owing in only one case to suspected recurrence). Seven patients died and of these one had a recurrence and two had metastases (pulmonary in one case).

It is not possible to analyse our data statistically because of the small number of cases, but we do wish to stress the fact that in the majority of cases the outcome has been favourable for more than five years after surgery.

Therefore, we believe that, despite its limited indications, this technique of reconstructive laryngectomy with crico-hyoidopexy is valid in that it allows us not only to obtain effective oncological results but also the possibility of complete functional recovery.

* Three more reconstructive laryngectomies were performed in 1983. The post-operative course was uneventful and the functional results were good.

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