

Horizontal glottectomy: functional and oncological results

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Abstract

The authors report on their experience with 25 cases of horizontal glottectomy and discuss the functional and oncological results of this operation. Indications for this procedure are T_{1a} and T_{1b} glottic carcinomas. The overall three-year and five-year survival was respectively 94 and 88 per cent. Distant metastasis appears to be the major long-term failure, three patients dying of lung carcinoma. Short functional rehabilitation was observed in all cases. Decannulation was achieved in 100 per cent of the cases and none of our patients had laryngeal stenosis. The average time of removal of the nasogastric tube was 11.8 days. Because of its high local control and reduced functional after effects, horizontal glottectomy appears to be a reliable and safe procedure for limited glottic carcinomas and must be included in their therapeutic management.

Key words: Laryngeal neoplasms; Glottis; Surgery, operative; Laryngectomy

Introduction

The options for the treatment of glottic carcinomas include the choice between surgery or radiotherapy. The selection of treatment depends on the patient evaluation of the sequelae (i.e., vocal quality), according to the age, against the chances of recovery. In our institution and practice, surgery is the preferred option for the treatment of selected glottic carcinomas (Traissac and Verhulst, 1991).

A wide variety of surgical treatment approaches to glottic carcinoma has been advocated in the literature, leading to a large choice of therapeutic procedures. Some are employed less now than in the past, such as the frontolateral laryngectomy, because of the high risk of secondary glottic stenosis and the too restricted glottic excision provided by this technique. Other partial laryngectomies, including both horizontal and vertical thyrotomy, allow specific glottis excision with a low range of sequelae. In the vertical procedure, partial laryngectomy as described by Tucker has been widely used and popularized because of its good functional and oncological results (Tucker *et al.*, 1979).

First described in 1978, horizontal glottectomy is still little used (Calero and Teatini, 1978). Only a few publications have reported on functional and oncological results (Traissac *et al.*, 1984; Calero and Merlo, 1992; Zietek *et al.*, 1993). Horizontal glottectomy allows the removal of selected glottic carcinomas, preserving the swallowing status. The oncological results are similar to those of cobalt-

therapy. The purpose of this study is to update our experience with horizontal glottectomy and to review the functional and oncological results of this surgical technique.

Materials and methods

From 1 January 1980, to 31 December 1995, 25 previously untreated patients with squamous cell carcinoma of the glottic level were treated at the department of Otorhinolaryngology of Bordeaux Hospital. Twenty-two patients (88 per cent) were male, with an average age of 59.6 years (range, 31 to 79).

All patients underwent surgical treatment with horizontal glottectomy for the primary disease. No neck exploration was performed. Pathological staging according to the 1987 UICC classification was used for the primary tumour and the neck. Patients were classified according to the TNM system of the International Union Against Cancer (1987) for glottic cancer as follows: 13 T_{1a}, 12 T_{1b}. All patients were N₀ at the time of diagnosis. Post-operative radiotherapy was used in five patients (20 per cent), 6000 cG delivered in a 200 cGy/day, five day/week schedule. Indication for post-operative radiotherapy included in all cases positive laryngeal margins. Swallowing training began three to five days after surgery. The tracheostomy and the feeding tube were not removed until the patient was able to swallow without significant aspiration.

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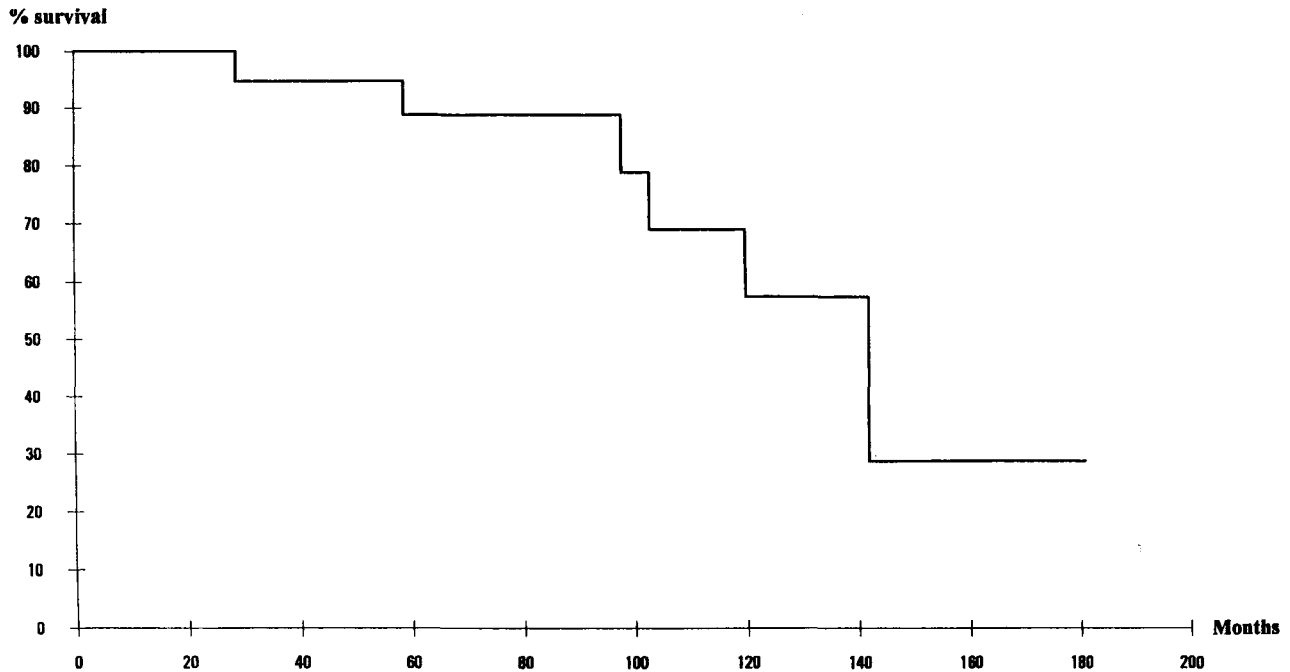


FIG. 1

Overall survival of 25 operated horizontal glottectomy patients.

Follow-up data were obtained for all patients until the time of death or until 30 September 1996. No patient was excluded from evaluation, and short follow-up was maintained because of the small number of patients. The data were collected from the head and neck cancer register database and analysed for post-operative hospitalization, surgical resection (i.e., unilateral arytenoidectomy), complications, cause of death, site of recurrence, treatment of recurrence, survival, quality of swallowing and speech. The Kaplan-Meier actuarial method was used for statistical analysis. Differences in survival rates were analysed by X^2 test and Fisher's exact test. Levels of $p < 0.05$ were assumed as significant.

Results

Local control was 96 per cent. The three-year actuarial survival according to T stage was 94 per cent. No significant difference was found with sex, T-stage, post-operative radiotherapy, positive margins remission status. The overall three-year actuarial survival was 94 per cent, five-year 88 per cent. Ten

years after operation, 69 per cent of the patients are still alive (Figure 1). Four (16 per cent) patients died of unrelated causes with no evidence of disease. Only one patient had local recurrence (four per cent) three years and 10 months after surgery. He underwent a salvage procedure with total laryngectomy and is alive six years after the second operation. Two patients (eight per cent) had general evolution with lung metastasis with an average time of 18 months. Both patients died less than a year later. Another one had an undifferentiated lung carcinoma six years after surgical treatment. It has to be considered rather as a different carcinoma than lung recurrence because of the different histopathological diagnosis. Table I summarizes the local and general recurrence with reference to the treatment and outcome.

Post-operative hospitalization ranged from 12 to 23 days (average 15.5 days). No wound complications, delayed healing, wound sloughing, or fistulae were observed. Only one pulmonary complication due to aspiration was seen. The time required to restore deglutition (removal of the feeding tube) and ordinary breathing was taken into consideration. All

TABLE I
INCIDENCE OF LOCAL RECURRENCE AFTER HORIZONTAL GLOTTECTOMY

UICC classification	Site of failure	Recurrence months	Treatment	Status
T _{1a}	Undifferentiated lung carcinoma	87	Radiotherapy	DOD 11 months
T _{1a}	Lung metastasis	15	Palliative	DOD 1 month
T _{1b}	Lung metastasis	19	Palliative	DOD 10 months
T _{1b}	Supraglottis	44	Total laryngectomy	NED 79 months

(DOD: dead of disease; NED: no evidence of disease).

patients had few swallowing problems once they began to swallow. Oral feeding is initiated by the fifth post-operative day. The feeding tube was removed between three and 27 days after surgery with an average of 11.8 days. At the end of the follow-up, 80 per cent of the patients had no problems with aspiration, 20 per cent had occasional but minor aspiration when drinking liquids, but not with normal and diversified food. None of our patients had recurrent pulmonary infection or significant weight loss. No totalization was necessary for functional problems.

Decannulation was possible in all patients. It ranged from four to 20 days, for an average 10.5 days. No laryngeal stenosis was seen. Few arytenoid oedema were encountered, without respiratory distress. One patient had a granuloma on the false vocal fold requiring a direct laryngoscopy with laser to remove the mucosal flap and obtain a safe glottic airway. Voice production was estimated at the last follow-up and classified in four types: respectively adequate (52 per cent), intermediate (nine per cent), poor (eight per cent) and breathy (four per cent). Phonation is provided by a band voice and inward translation of both arytenoids pressed against the epiglottis (Figure 2).

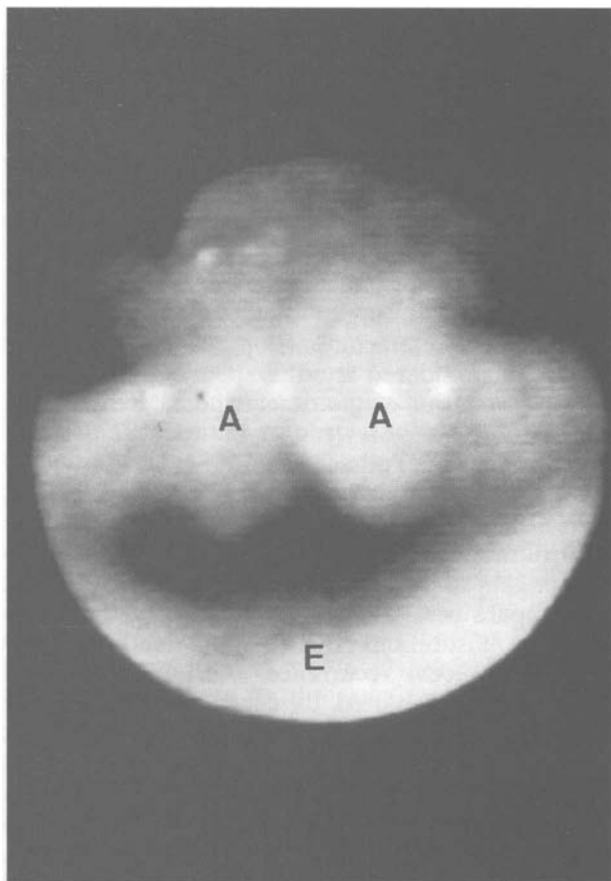


FIG. 2

Nasoendoscopic view of the remnant larynx after horizontal glottectomy in phonation showing arytenoids (A) pressed against the epiglottis (E).

Discussion

The treatment of glottic carcinoma is still a controversial issue. The curative procedure is divided between conventional surgery, radiotherapy, and recently laser surgery for selected patients. Each option has its own functional and oncological consequences. The therapeutic decision depends on the experience and philosophy of the institution and responsible physician.

In our team, each surgical procedure or radiotherapy has its own and specific indications and careful selection of patients is needed to provide the maximum benefit from these procedures. The tumour stage itself is not the only factor influencing the choice of treatment. Other factors should include the age of the patient, the pulmonary function and the social or professional surroundings. Radiotherapy is more often indicated for superficial and middle vocal fold carcinoma occurring in an 'older' patient. The highest cure rate and best vocal rehabilitation are allowed with this procedure. For the same localization and because of the possibility of recurrence, cordectomy is preferred for young people, with the possibility of radiotherapy in the case of recurrent carcinoma. In more extended carcinoma, invasion of the anterior commissure has proved its specific outcome and needs resection at the glottic level. Systematic ablation of cartilage allowed by this surgical procedure makes it of great interest. According to the degree of local extension, indications are divided into other partial laryngectomies, such as horizontal glottectomy or vertical subtotal laryngectomy as described by Tucker (1979). In all cases, fold mobility must be normal. Horizontal glottectomy is the preferred option for double cancer of the vocal folds with posterior extension to the vocal process of the arytenoids while a vertical subtotal laryngectomy is reserved for an anterior glottic lesion invading the contralateral fold through the anterior commissure. Horizontal glottectomy is also indicated for unilateral lesion (T_{1a}) with diffuse and contralateral hyperkeratosis. Both of these partial laryngectomies appear to be more economic in resection than other partial laryngectomies. More extensive invasion beyond the true fold, i.e. ventricular fold, epiglottis, aryepiglottic fold, require extended subtotal laryngectomies like cricohyoidoepiglottopexy (CHEP) or cricohyoidopexy (CHP) (Majer and Rieder, 1959; Piquet *et al.*, 1974; Piquet and Chevalier, 1991).

Horizontal glottectomy was first described and well codified in 1978 by Calero. It consists of the removal of the entire glottis, including the anterior commissure and vocal folds together with their cartilage skeleton (Figure 3). If necessary, the resection may be extended to one arytenoid cartilage, and also to one ventricle. In this review, arytenoid has been removed in four cases, and ventricular fold in one. Closure of the remnant larynx is provided by a horizontal cricothyropexy, restoring the continuity of the air passage without the help of any local plasty or muscular flap. Because

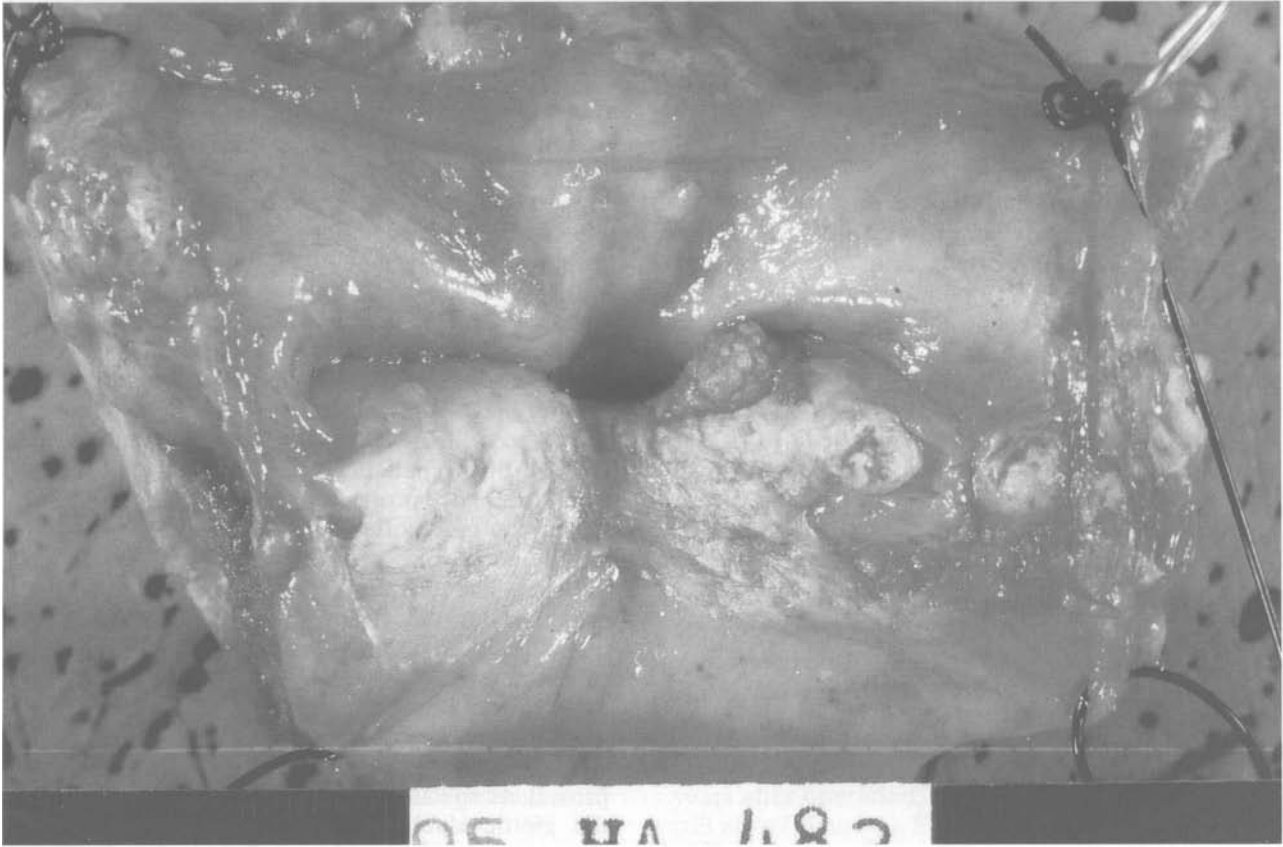


FIG. 3

Operative specimen of glottic cancer removed by horizontal glottectomy. Growth is entirely superficial to the mobile folds with invasion of the anterior commissure.

of these surgical principles and the horizontal pexy, horizontal glottectomy may be included among horizontal laryngectomies such as supraglottic or near total reconstructive laryngectomies, rather than vertical techniques like surgical cordectomy, frontolateral or frontal laryngectomy.

Adequate clinical and laryngoscopic tumour examination are essential to rule out anterior commissure involvement, extension to the arytenoids or ventricular folds, or involvement of the petiole of the epiglottis. All these extensions are critical for patient selection and feasibility of the surgical procedure. The final decision about whether to perform a horizontal glottectomy or subtotal laryngectomy (i.e., cricohyoepiglottopexy) is made after frozen section examination of the surgical margins. These surgical margins have to be taken from the patient and not from the surgical sample. Special attention has to be paid to possible extensions to the ventricular fold, bilateral arytenoid invasion, anterior subglottis or epiglottis, as it was encountered three times in our experience. These submucosal spreads of carcinoma *in situ* surrounding the carcinoma of the glottis were only revealed by histopathological examination. Thus, frozen sections are now made systematically in all cases to avoid such disagreement. Relying on radiotherapy for incomplete tumour removal is a risky oncological concept, even if no statistical difference on survival

rate was observed between the two groups. Radiotherapy for the positive margin does not adversely affect local tumour control and overall mortality but may compromise functional rehabilitation by creating adverse effects such as oedema or laryngeal condritis. Because surgery is employed in these cases as a curative treatment, post-operative radiotherapy has to be considered as a therapeutic failure.

Local control of glottic carcinoma treated with horizontal glottectomy ranges between 82 per cent and 96 per cent (Traissac *et al.*, 1984; De Gasquet *et al.*, 1989; Calearo and Merlo, 1992; Pencroffi *et al.*, 1996). This seems to be slightly superior to the control rate of radiotherapy, ranging between 84 to 91 per cent in the literature. It is, however, difficult to compare results from different series treated in different institutions by different methods. Few reports on local recurrence after vertical partial laryngectomy reported a recurrence rate ranging between two and 17 per cent (Zanaret *et al.*, 1993; Zanaret *et al.*, 1995). Laccourreye demonstrated that the local failure rate was significantly increased when the tumour involved the commissure with a propensity to spread subglottically (Laccourreye *et al.*, 1991). 'En bloc' exenteration of both the vocal fold with the anterior commissure provided by a horizontal glottectomy may explain the low rate of local recurrence. The thickness between mucosa and contiguous cartilage at the anterior commissure is

not more than two or three mm and explains the deep and quick invasion by cancer. Systematic ablation of cartilage by horizontal transection allowed by this surgical procedure makes it of great interest, avoiding vertical transection of the thyroid cartilage through an involved anterior commissure. In this latter case, the use of crico-hyoidoepiglottopexy or vertical laryngectomy has been preconized, but horizontal glottectomy may be an alternative and more economic technique. Our results are similar to those reported in other surgical series concerning the same surgical procedure. In many reports, a local relapse is generally found after a wide period of time between one and five years and concerns 9.5 to 17 per cent (Calearo and Teatini, 1978; Zanaret *et al.*, 1993; Pencroffi *et al.*, 1996). The efficiency of the salvage procedure requires either radiation therapy or total laryngectomy. Little difference in survival is provided by this procedure which has a high cure rate. The risk of neck metastasis is usually absent in true early glottic cancer, and explains why no neck dissection has to be made. Neck recurrence seems to be a rare condition and was only reported by Calearo in seven per cent (Calearo and Merlo, 1992). In spite of surgical salvage, neck failure comes from bad prognostic significance, all patients dying less than a year after a distant metastasis.

Although aspiration is the most frequent post-operative complication, most patients are able to eat satisfactorily within two weeks post-operatively. Preservation of the entire epiglottis improves dramatically the swallowing possibilities of these patients. For our team, horizontal glottectomy would appear to be a better surgical procedure for swallowing rehabilitation than vertical partial laryngectomy as described by Tucker. Following Tucker's surgery, the feeding tube was removed between five and 28 days, with an average of 17 days (Perrin *et al.*, 1986; Zanaret *et al.*, 1993; Zanaret *et al.*, 1995). The epiglottoplasty employed for laryngeal closure seems to decrease its mobility, creating a laryngeal recess leading to aspiration. However, this rigid epiglottis made an obstruction of the laryngeal lumen, pushing back the time of decannulation. Surprisingly, removing one arytenoid, usually associated with increased aspiration and delayed rehabilitation, does not improve the recovery time for normal swallowing. No statistical difference was found between the groups ($p = 0.89$). The average time for ablation of the feeding tube was 11.6 days for the group with both arytenoids, while it was 12.75 for the second one. In the same way, Calearo in a review of 31 cases, found no difference in time for

normal deglutition in patients in which the exeresis was enlarged to an arytenoid cartilage or the ventricular fold (Calearo and Merlo, 1992). Table II reviews the average time of a few series.

For decannulation, the mean time was 10.5 days. Only one patient had problems with the removal of the cannula, due to a granuloma of the ventricular fold. Laryngoscopy with laser was required for excision. These mucosal flaps, generally located in the periarytenoid or false fold area, seem to be a very rare condition, ranging between three per cent and four per cent. Effectiveness of decannulation in all patients was demonstrated in all but one report in the literature (Zietek *et al.*, 1993) and confirms the efficacy of this procedure in providing a safe airway channel.

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TABLE II

FUNCTIONAL RECOVERY ACCORDING TO THE TIME OF DECANNUATION AND DEGLUTITION

Authors	Number of patients	Time of deglutition	Time of decannulation
Calearo (2)	31	7 days	9 days
Pencroffi (6)	21	5 days	5 days
Our series	25	11.8 days	10.5 days

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