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Quality of life and functional evaluation after supracricoid partial laryngectomy with cricohyoidoepiglottopexy in Mexican patients

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Abstract

This study assessed the functional results in patients treated primarily through supracricoid partial laryngectomy (SCPL) with cricohyoidoepiglottopexy (CHEP).

Fifteen patients with a diagnosis of epidermoid carcinoma of the glottis region admitted to the Instituto Nacional de Cancerología (México) between June 2001 and September 2002 were studied. Three patients were at stage I, five at stage II, six at stage III, and one at stage IV. Both cricoarytenoid units were preserved in 12 patients, and only one in three. Each case was assessed through the clinical grading post-operative aspiration (CGPA) scale, the performance status scale for head and neck cancer (PSS-HNC), and the Karnofsky Performance Scale (KPS). Likewise, voice quality of the patients was assessed regarding tone and intensity using the *SpeechViewer* version 1 (IBM) and data were obtained with the *Cool Edit 2000* software.

Twelve patients received phoniatric rehabilitation and three were left without rehabilitation. The average time for decannulation was 12 days and 23 days for removal of the nasogastric catheter. The degree of aspiration was 0 in four patients and one in 11. According to PSS-HNC, the mean for normalcy in the diet was 95 and the mean for those eating in public was 91. Intelligibility reached an average of 90. Karnofsky's assessment was related to the disease and not to the treatment, as it remained at 100 per cent in most patients and was never below 80 per cent. The mean intensity of quality of voice was –18 dB below normal; however, the mean frequency was 243.7 Hz.

SCPL and CHEP allows the preservation of the basic function of the larynx; however, a clear alteration in voice occurs after the procedure, although normal frequency is kept when both arytenoids are preserved. Likewise, preservation of both arytenoids shortens the time needed for cannula and feeding catheter removal. PSS-HNC, Karnofsky, and CGPA assessments demonstrated that patients can reach an almost normal bio-psycho-social integration. It is recommended that all patients be subjected to phoniatric rehabilitation.

Key words: Laryngectomy; Voice quality; Speech Intelligibility; Surgical Procedures, Operative

Introduction

Supracricoid partial laryngectomy (SCPL) with cricohyoidoepiglottopexy (CHEP) was initially described by European otorhinolaryngologists at the end of the 1950s,[1–3] and it is in this region where the greatest experience is reflected in the literature. In the American continent, the largest published series corresponds to Lima *et al.*[4] in Brazil, whereas, in the USA, Weinstein has fostered this surgery at the University of Pennsylvania, working together with the Paris group.[3] It is worthwhile mentioning that none of the reports from the American continent specifically analysed the quality of life or made functional evaluations. This paper presents the results of a prospective study performed in Mexican patients to assess SCPL with CHEP as a safe surgical procedure, easily performed and providing a better quality of life for those patients affected by an epidermoid carcinoma of the glottis.

Patients and methods

Fifteen patients (one woman and 14 men) were studied from June 2001 to September 2002. Their

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mean age was 59 years (range 37–78 years). All patients were subjected to SCPL with CHEP as the primary treatment for epidermoid carcinoma of the glottis and were staged according to AJCC.[5]

Therapy without food was started in the phoniatric therapeutics area, afterwards rehabilitation was continued with a soft to semisolid diet, as this causes less aspiration, and finally liquids. Once these were adequately tolerated, the catheter was removed. Two types of behaviour were followed. The first consisted of using assisted therapy, in which patients received instruction about the exercises required for their rehabilitation, using for this purpose: 1) super-supraglottis swallowing, which helps to close the airways before and during swallowing, 2) neck position technique, with neck inclination to the front or to the most affected side, which allows for a better position of the epiglottis to protect the larynx, 3) glottis knocking exercises to provide mobility to the arytenoids, 4) breathing control during swallowing, as the super-supraglottic technique requires the patient to be able to retain the air while food is passing at the pharyngeal swallowing phase during which the airway closes avoiding food aspiration, and 5) tongue movements.

The second behaviour consisted of a compensation technique in which patients achieved swallowing without aspiration and without following a rehabilitation treatment (patient's choice). The compensation exerted by the patients consisted of neck rotation or inclination and fast swallowing.

Clinical grading of post-operative aspiration was performed according to the scale used by Leipzing[6] and Pearson[7] (0 = none; 1 = occasional cough, no clinical problem; 2 = consistent cough worsening with meals or swallowing; 3 = pulmonary complications).

Functional evaluation was performed at least one month after surgery and/or when patients were free from nasogastric tube feeding and tracheostomy.

This study used the performance status scale for head and neck cancer (PSS-HNC), as described by List *et al.*[8] to assess functional skills for eating and speaking. PSS-HNC consists of three discrete subscales that describe performance effectively in terms of diet, speech, and eating in public (Table I). The normalcy of diet subscale assesses the degree of which a patient is able to eat a normal diet. The scale includes 10 food categories arranged from easy-to-eat at the low end, to hard-to-eat at the high end, and ratings are based on the highest ranking food the patient is able to eat. The intelligibility of speech subscale includes a five-item scale with descriptors ranging from 'never understandable' to 'always understandable', and ratings are based on the degree to which the interviewer is able to understand the patient's speech. It is important to note that this scale

TABLE I
PERFORMANCE MEASURES[8,9]

Performance Status Scale for Head & Neck Cancer (PSS-HN)	
Normalcy of diet	
100	Full diet (no restrictions)
90	Peanuts
80	All meats
70	Raw carrots, celery
60	Dry bread and crackers
50	Soft chewable foods (eg, macaroni, canned/soft fruits, cooked vegetables, fish, hamburger, small pieces of meat)
40	Soft foods requiring no chewing (eg, mashed potatoes, apple sauce, pudding)
30	Pureed foods (in blender)
20	Warm liquids
10	Cold liquids
0	Non-oral feeding (tube fed)
Eating in public	
100	No restriction of food, companion (eats out at any opportunity)
75	No restriction of place, but restricts diet when in public (eats anywhere, but may limit intake to less 'messy' foods)
50	Eats only in presence of selected persons
25	Eats only at home in presence of selected persons
0	Always eats alone
Understandability of Speech	
100	Always understandable
75	Understandable most of the time; occasional repetition necessary
50	Usually understandable; face-to-face contact necessary
25	Difficult to understand
0	Never understandable; may use written communication
Karnofsky Scale of Performance Status	
100	Normal, no evidence of disease
90	Able to carry on normal activity, minor signs of disease
80	Normal activity with effort, some signs or symptoms of disease
70	Cares for self. Unable to carry on normal activity or do active work
60	Requires occasional assistance, is able to care for most needs
50	Requires considerable assistance and frequent medical care
40	Disabled, requires special care and assistance
30	Severely disabled, hospitalization indicated but death not imminent
20	Hospitalization necessary, active supportive care necessary, very sick
10	Moribund, fatal processes progressing rapidly
0	Death

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TABLE II
DISTRIBUTION AND TIME NEEDED TO REMOVE CATHETERS

Patient	Age	Gender F/M	Tracheostomy	SNG	Hospitalization days	Preserved arytenoids 1 or 2
1	55	F	5	18	13	2
2	59	M	6	18	6	2
3	65	M	30	60	14	1
4	37	M	6	14	8	2
5	55	M	6	18	11	2
6	55	M	6	17	14	2
7	66	M	32	32	11	1
8	67	M	6	18	7	2
9	69	M	49	54	45	2
10	45	M	6	18	7	2
11	78	M	8	10	10	2
12	67	M	7	16	7	2
13	62	M	8	12	8	2
14	52	M	7	14	8	1
15	55	M	6	28	7	2
Mean (Range)	59 (37–78)	1/9	12 (5–49)	23 (14–60)	11 (6–45)	3/12

measures intelligibility but not the quality or type of speech. The eating in public subscale assesses the degree to which the patient eats in presence of other people. It contains five levels ranging from 'always eat alone' to 'no restriction of place, food or companion' at the high end, and ratings are based on the patient's report of whom he eats with and in what settings.

The Performance Karnofsky Scale[9] (PKS) (Table I) was used to assess the patient's physical activity after surgery.

Quality of voice was assessed regarding tone and intensity with the *SpeechViewer* version 1 software (IBM) and data were obtained with the *Cool Edit 2000* software. The microphone was always placed at a distance of 10 cm from the mouth. The mean normal frequency was 100 Hz (range 84–440 Hz), and mean intensity was 40 dB (range 20–60 dB). Two patients were not assessed for voice quality because they died before performing the corresponding study.

Statistical analysis was performed using the Mann-Whitney U test.

Results

Distribution according to clinical staging revealed three patients to be at stage I, five at stage II, six at stage III, and one at stage IV. The average hospital stay was 11 days (Table II). Removal of the cannula was performed after an average of 12 days. It was important to decannulate first to be able to start rehabilitation for oral feeding with a soft to semisolid diet. The nasogastric catheter was left in for an average of 23 days, being removed once the patients tolerated oral feeding, without restrictions.

Both cricoarytenoid units were preserved in 12 patients, and only one of them in three patients. The average time to the removal of the tracheostomy was 12 days; all patients had physiological phonation at the time of cannula removal. Comparison of the average times of decannulation and removal of the nasogastric catheter between patients preserving only one or both cricoarytenoid units revealed that the time was shorter for the latter, however the difference was not statistically significant (Table III).

In general, patients who were subjected to the phoniatric technique rehabilitation started oral feeding without aspiration of liquids at one week after starting therapy by means of the supersupraglottic technique. Patients using compensation strategies (without therapy) needed 15 to 20 days to be able to feed orally without aspiration of liquids.

Based on the assessment of the post-operative clinical degree of aspiration, three patients presented no complications at all and 12 presented grade 1 aspiration (Table IV). Assessment through PSS-HNC, with regard to normalcy of the diet, revealed a mean of 95, and only one patient presented a restriction, eating only soft food. Twelve patients ate in public without any restriction (100), two patients ate in the presence of chosen persons (50), and one ate in public but only a limited diet, yielding a mean of 91. Intelligibility reached an average of 90. Nine patients made themselves understood always and six achieved it most of the time, occasionally requiring repetition when in a noisy environment. KPS was related to the disease and not to the treatment, as it remained at 100 per cent in the 13 surviving patients and was never below 80 per cent (Table IV). All these patients returned to their normal working activities. Quality of voice presented a mean frequency (tone) of 243.7 Hz; only in one patient was it abnormal. However, the mean intensity was –18 dB, below normal (Table IV).

TABLE III
ASSESSMENT OF ONE ARYTENOID VS TWO ARYTENOIDS

	All (Days)	One arytenoid (Days)	Two arytenoids (Days)
Tracheostomy	12	23	10
Swallowing (SNG)	23	35	20
Hospital stay	11	13	12

Mann-Whitney U for one arytenoid *vs* two arytenoids in tracheostomy $p = 0.057$ and for SNG $p = 0.270$

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TABLE IV
FUNCTIONAL EVALUATION AND QUALITY OF SPEECH

Case	CGPA 0/1	ND	EP	US	KPS (%)	With therapy	Without therapy	Tone Hz	Intensity dB
1	0	100	100	100	100	Yes	–	136.2	–15.22
2	0	100	100	75	100	–	Yes	77.85	–14.28
3	1	100	100	75	100	Yes	–	350	–14.38
4	1	100	100	75	100	Yes	–	408.7	–15.97
5	0	100	100	75	100	–	Yes	291.9	–16.07
6	1	100	100	100	100	–	Yes	467.1	–15.26
7	1	100	100	100	100	Yes	–	175.1	–15.38
8	1	100	100	75	100	Yes	–	175	–17.57
9	1	100	100	100	100	Yes	–	116.7	–25.89
10	1	100	100	100	100	Yes	–	350.3	–24.77
11	0	100	50	100	100	Yes	–	291.9	–30.02
12	1	50	50	75	80	Yes	–	*	*
13	1	80	75	100	90	Yes	–	*	*
14	1	100	100	100	100	Yes	–	161	–17
15	1	100	100	100	100	Yes	–	167	–18
Mean	4/11	95	91	90		7	3	243.7	–18

ND = normalcy of diet; EP = eating in public; US = Intelligibility of speech; KPS = Karnofsky Performance Scale; CGPA = Clinical grading of post-operative aspiration; Hz = Hertz; dB = Decibels, *Not evaluated, patient died before the evaluation

Discussion

The attempts to preserve laryngeal function have generated diverse strategies for the optimal treatment of patients affected by larynx cancer. To maintain the airways without tracheostomy, swallowing without aspiration or the need of feeding tubes, and the ability to talk are the main goals of these strategies, as they exert a relevant impact on the quality of life of these individuals. The development of SCPL with CHEP has allowed the maintenance of a near to normal quality of life; in this study, it was attempted to quantify the degree of dysfunction occurring after this surgery and the actual impact of this on patients.

Early decannulation in patients subjected to SCPL with CHEP is the first important step leading to their prompt rehabilitation, as demonstrated by Laccourreye *et al.*[3] Firstly, it avoids infections at the site of the tracheostomy and, secondly, it allows for a normal elevation of the larynx at the time of swallowing. We have followed the same philosophy at our institution, hence, the average decannulation time (12 days) used in this study is similar to that used by the aforementioned authors. Late decannulation seems to induce delays in swallowing, as inferred from the studies by Bron *et al.*[10] and Lima *et al.*,[4] in which mean average time to achieve adequate swallowing was 25 and 38 days, respectively, whereas it took an average of 22 days in our series, which is similar to other series.[2,11]

In our series, separating patients according to the preserved arytenoids (one or both) yielded differences in decannulation and removal of the nasogastric catheter time (Table III); however, these differences were not statistically significant, probably due to the small number of patients. Notwithstanding, if we compare our series, in which most patients (12) retained both arytenoids against the Bron *et al.*[10] series, preserving only one arytenoid in most patients, it can be observed that their patients required an average time for decannulation and removal of the nasogastric catheter similar to the time observed in our patients with one preserved arytenoid. The aforementioned data suggest that it is better, in terms of functionality, to preserve (whenever possible) both arytenoids.

The impact of treatment on physical activity was meaningless, since the Karnofsky scale remained approximately the same in most patients as when admitted to the institution: all patients returned to their normal working activities.

Intelligibility of speech was not altered in nine patients, six patients had communication problems in noisy environments, which is explainable when analysing voice intensity and considering the capacity of these patients regarding their air reserve and its passage through the vocal folds as compared to normal subjects. These latter functions were altered in our patients, being below the minimally normal since vocal folds are non-existent; however when the mucosa of the arytenoids is prominent it can develop this ability. The negative intensity values indicate the recognition of rather grave sounds. Frequency in cycles of sound is measured in hertz, indicating that there is movement in the arytenoids when emitting a sound. CHEP narrows the airway, drawing the arytenoids closer to the remaining epiglottis, thus helping in phonation. The best recognized sounds were the a, e, i vowels.

In our series the mean frequency was 243 Hz, and it was below normal only in one patient. Other series,[12,13] in which the frequency after SCPL was kept normal, also preserved both arytenoids in most patients. On the other hand, in the series by Bron *et al.*[14] the median of the frequency was 70.1 Hz (below normal), and the reason for this could be that, in that series, only one arytenoid had been preserved in most patients.

In conclusion, all patients must receive phoniatric assistance. Differences in the time of removal of the cannula and feeding tube seem to be related to the preservation of one or both arytenoids, being best for the latter; however, a larger number of cases

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must be studied to be able to reach more precise conclusions. PSS-HNC demonstrated that these patients can reach an almost normal bio-psycho-social integration. PKS revealed that surgery had no important impact on the physical activity after treatment. CGPA revealed that a relevant number of patients presented occasionally with coughing but without clinical after-effects that might require medical treatment. There is a clear alteration in voice after SCPL as reported in previous studies.[15,16] The abnormal voice intensity is produced by the lack of vocal folds, related to the procedure; however, it seems that normal frequency is mainly determined by the preservation of both arytenoids.

- **This paper assesses the functional results in patients treated primarily through supracricoid partial laryngectomy (SCPL) with cricohyoidoepiglottopexy (CHEP)**
- **SCPL with CHEP allows the preservation of the basic function of the larynx. There is, however, a clear alteration in voice after the procedure**
- **Preservation of both arytenoids not only retains normal frequency but also shortens the time of cannulation and feeding by catheter**
- **Patients can reach an almost normal bio-pyschosocial integration**

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