

The Comparison of Functional Outcomes between Supraglottic Horizontal Laryngectomy and Supracricoid Partial Laryngectomy

Bilici Suat ^{1,*}, Turanoglu Artunc Kaan ², Yigit Ozgur ¹, Longur Ecem Sevim ¹

1. Istanbul Training and Research Hospital, Otorhinolaryngology Department
2. Arnavutköy State Hospital, Otorhinolaryngology Department

Abstract

Objectives

The aim of this study was to compare the functional outcomes (including swallowing, respiration and phonation) of supraglottic horizontal laryngectomy (SGHL) and supracricoid partial laryngectomy (SCPL).

Methods

The clinical and pathological data were evaluated for 36 previously untreated patients who were diagnosed with laryngeal carcinoma and underwent SGHL or SCPL at the Department of Otorhinolaryngology-Istanbul Training and Research Hospital from 2010 to 2016. Removal of the nasogastric tube, decannulation and hospitalisation times were recorded in both groups and postoperative complications were noted.

Results

The SGHL group contained 15 patients and the SCPL group contained 21 patients (14 cases of cricohyoidoepiglottopexy (CHEP) and 7 cases of cricohyoidopexy (CHP)). The mean age of the subjects was 57.4 years in the SGHL group, and 59.7 in the SCPL group. Patients in the SGHL group were decannulated after 65.2 days, whereas the average decannulation time was 72.6 days in the SCPL group. This difference in decannulation time between the groups was not statistically significant ($p>0.05$). The mean hospitalisation time was 23 days, with no statistically significant difference between the groups (>0.05). The nasogastric tube was removed from the patients after 37.9 days in the SGHL group and after 35.8 days in the SCPL group. No statistically significant difference was determined in the time to start feeding between the groups ($p>0.05$). Surgical wound infection, the occurrence of pharyngo-cutaneous fistulas and rupture of the pexy sutures were complications.

Conclusion

Functional outcomes of SCPL were similar to those of patients who underwent SGHL. The preservation of the hyoid bone is the most important consideration for preserving the swallowing function.

Corresponding author: Suat Bilici, Istanbul Training and Research Hospital, Otorhinolaryngology Department/Istanbul/Turkey 34500, suatbilici@yahoo.com, Phone: 090532 2334600- 090212 6691893, Fax: 090212 6320060

Keywords : Supraglottic laryngectomy, supracricoid laryngectomy, swallowing, decannulation

Received : Nov 09, 2016; **Accepted :** Dec 15, 2016; **Published :** Jan 5, 2017

Introduction

Providing patients with an ideal quality of life is a desired outcome after laryngeal cancer surgery. Therefore, organ preservation is an important surgical consideration, in addition to elimination of the disease [1].

Supraglottic horizontal laryngectomy (SGHL) is a technique which removes en-bloc the upper 1/3 part of thyroid cartilage, epiglottis, false cords, aryepiglottic folds, a large portion of the ventricle and the pre-epiglottic field. Reconstruction is done by hanging the hyoid and tongue root of the remaining thyroid cartilage with sutures [2].

Supracricoid partial laryngectomy (SCPL) is a technique consisting of an en-bloc resection of the thyroid cartilage, along with the paraglottic and preepiglottic space starting at the cricoid cartilage and continuing to base of the epiglottis [3-6]. SCPL has two subtypes in terms of reconstruction type: cricohyoidoepiglottopexy (CHEP) and cricohyoidopexy (CHP) [6].

Partial laryngectomy surgeries cause anatomical changes in the intersection region of the upper aerodigestive tract, leading to partial disruption of the basic functions of the larynx, such as respiration, phonation and swallowing. Ensuring the adequacy of these functions is difficult with a newly created neolarynx and it requires a certain time. The presence of arytenoids and extended resections result in differences in the recovery of various functions. Postoperative complications are inevitable. However, both procedures are considered to be true organ preservation techniques, and they allow the physiological rehabilitation of speech, swallowing and respiration [6].

The decannulation, which occurs on different days depending on arytenoid oedema, is especially important for beginning nutrition. Decannulation and swallowing problems in SCPL and SGHL patients are the main causes of prolonged hospitalisation and increased treatment costs [1]. The literature describes different parameters of the functional consequences of single partial laryngectomy techniques, but no accepted guidelines are available to evaluate these consequences.

The aim of this study was to compare the postoperative functional outcomes, such as swallowing, respiration and phonation, in patients who underwent SGHL or SCPL and to share our experiences.

Materials and methods

The clinical and pathological data were evaluated retrospectively for 36 previously untreated patients who were diagnosed with laryngeal carcinoma and who underwent SGHL or SCPL at the Department of Otolaryngology- Head and Neck Surgery, Istanbul Training and Research Hospital, Turkey, from 2010 to 2016. The patients were clinically assessed before surgery by fibre optic endoscopy and computed tomography of the larynx. All patients were subjected to functional respiratory tests and nutritional assessment. The indications for SGHL and SCPL were dependent on the application of absolute oncological selection criteria. The patients were categorised into two groups (group I and group II) and staged according to the 2010 edition of the tumour, node and metastasis (TNM) classification of the American Joint Committee on Cancer (AJCC). The primary localisation of the tumour was clarified.

Tracheostomy was performed all patients in both groups perioperatively and a nasogastric tube was used for nutrition in the early postoperative period. The study did not include patients receiving preoperative radiotherapy or chemoradiotherapy.

Exclusion criteria included surgical margin positivity, as well as synchronous/metachronous lung cancer, patients who underwent extended surgical procedures, patients who died due to other comorbidities (cardiac, renal, etc.) in the early postoperative period, people who were not decannulated due to indications for radiotherapy.

Removal of the nasogastric tube (NGT) to have adequate oral feeding, decannulation time (DT) to provide appropriate breathing function and hospitalisation time were recorded in both groups. In addition, postoperative complications were noted.

Statistical analysis

Statistical analysis was conducted using the SPSS 20.0 version (SPSS Inc., Chicago, IL, USA). Numerical variables were presented as mean \pm standard deviation (SD). Nominal variables were given as number of cases and percentages. An independent samples t-test was used for a few parameters with normal distribution. A value of p less than 0.05 was considered statistically significant.

Results

There were 15 patients in the SGHL group (Group I) and 21 patients in the SCPL group (Group II). Group II was composed of 14 cases of CHEP and 7 cases of CHP. The mean age of the subjects was 57.4 years (range, 45 to 69 years) in the SGHL group and 59.7 (range, 51 to 73) in the SCPL group and all patients in both groups were men. The tumour originated from the supraglottis in all cases in group 1. In group 2, the primary localisation of the tumour was the transglottic, glottic and supraglottic in 16, 4 and 1 patients, respectively. According to pathological stages, 14 patients were T2 stage and one patient was T1 stage in the first group. In the SCPL group, 13 patients were T2 stage and 6 patients were T3 stage (Table 1). The patients in group I were decannulated after 65.2 days (range, 11 to 240 days). The average DT was 72.6 days (range, 9 to 197) in group 2. No statistically significant difference was

observed in DT between the groups ($p > 0.05$). The mean hospitalisation time was 23 days and no statistically significant difference was determined between the groups (> 0.05) (Table 3).

The nasogastric tube was removed from the patients after 37.9 days (range, 11 to 105 days) in the SGHL group, and after 35.8 days (range, 4 to 120 days) in the SCPL group. No significant difference was noted in time to the start of feeding between the groups ($p > 0.05$) (Table 4).

Three patients (8.3%) in the SCPL group had post-operative complications: a surgical wound infection was resolved conservatively with combined antibiotherapy; a pharyngo-cutaneous fistula necessitated surgical exploration and was repaired; and a rupture of the pexy sutures was reoperated and repaired (Table 2). Phonation was considered intelligible in all patients, based on their clinical assessments.

Discussion

SCPL, a partial laryngectomy technique, is a surgical technique with oncological outcomes comparable to a total laryngectomy while sparing the function of the larynx. The survival rate in patients who underwent SCPL was 92.62% in recently reports [7]. The

Table 1: Demographic features, tumour location and distribution by clinical T stage

	Supraglottic laryngectomy	Supracricoid laryngectomy CHEP (n=14) CHP (n=7)
Total	15	21
Age (min-max) Mean	45-69 57,4	51-73 59,7
Gender (n) Man Women	15 0	21 0
Tumour location Supraglottic Glottic Transglottic	15 0 0	1 4 16
Tumour stage T1 T2 T3 T4	1 14 0 0	1 13 6 1

Table: 2 Outcomes and complications

	Supraglottic laryngectomy(n=15)	Supracricoid laryngectomy (n=21)
Decannulation (min-max)	11-240	9-197
Mean	65,2	72,6
Removal of nasogastric tube (min-max)	11-105	4-120
Mean	37,9	35,8
Duration of hospitalisation	23,1	23
Complications		
Wound infection	0	1
Rupture of pexy suture	0	1
Pharyngo-cutaneous fistula	0	1

use of this oncologically safe operation technique is spreading all over the world.

SGHL remains an appropriate therapeutic alternative for supraglottic carcinoma, offering an excellent oncological outcome. The postoperative functional morbidity is substantial, indicating the need for careful patient selection, but good laryngeal function recovery is the rule. The surgical alternative is endoscopic laser surgery.

The major effect of the hyoid bone on swallowing physiology is accepted by all experts. Both surgical techniques examined here preserve the hyoid bone and provide support structures to form a neolarynx. Protection of the hyoid bone varies depending on tumour prevalence and infiltration [7]. We preserved the hyoid bone in all patients, since none of the tumours involved the bone. In addition, we preserved the intactness of the hypoglossal nerve and the superior and inferior laryngeal nerves to allow functional swallowing after surgery. The swallowing function was evaluated by the nasogastric tube removal time and no significant difference was observed in the time to start feeding between the groups.

Alicandri-Ciufelli et al have reported that the type of partial laryngectomy does not seem to affect the

deglutition results, whereas radiotherapy significantly and negatively affected the dysphagia score^[8]. To our knowledge, the present study is the second in the literature to evaluate postoperative functions between SGHL and SCPL. We found no significant difference in swallowing outcomes between the SGHL and SCPL groups. Laccourreye et al demonstrated that the dosage of RT negatively affected the swallowing function^[9]. However, we excluded patients who were to undergo RT; therefore, we did not evaluate whether RT had an effect on the swallowing function.

The decannulation of patients is of considerable importance to the start of oral feeding. The oedema of the arytenoid mucosa necessitates examination of the neolarynx at regular intervals in the postoperative period and is the most important factor that prolonged the decannulation time in the SCPL group. Early decannulation preserves the cough reflex and early arytenoid movement. This results in the evolution of swallowing.

The literature contains studies showing different outcomes in terms of the effect of the number of arytenoids on the swallowing function. Laccourreye et al reported that aspiration grades were longer in patients with one arytenoid^[6]. Kılıç et al. reported that the number of arytenoids does not change the time to the

Table: 3 Group statistics of decannulation time

		Groups	N	Mean	Std. Deviation	Std. Error Mean				
Decannulation time	SCPL		21	72,62	48,163	10,510				
	SGHL		15	65,27	65,698	16,963				
Independent Samples Test										
		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
Decannulation time	Equal variances assumed	,603	,443	,388	34	,700	7,352	18,949	-31,156	45,861
	Equal variances not assumed			,368	24,305	,716	7,352	19,955	-33,806	48,510

Table 4: Group statistics of oral feeding time

		Groups	N	Mean	Std. Deviation	Std. Error Mean				
Oral feeding	SCPL		21	35,86	33,108	7,225				
	SGHL		15	37,93	26,866	6,937				
Independent Samples Test										
		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
Oral feeding	Equal variances assumed	,440	,512	-,200	34	,843	-2,076	10,376	-23,162	19,010
	Equal variances not assumed			-,207	33,365	,837	-2,076	10,016	-22,445	18,293

start of oral feeding ^[1]. Ozturk et al. showed that resection of an arytenoid had a negative outcome on swallowing ^[10]. We believed that the arytenoids have a secondary importance in swallowing. However, our data

suggest that the number of arytenoids has a greater effect on the decannulation time.

The respiration function was interpreted based on the decannulation time. Different authors, including Uluşan et al.^[11] and Bron et al.,^[12] have reported a mean decannulation time of 17 days for patients who undergo SGHL. This time for patients in the present study was consistent with the literature. According to the literature, the mean decannulation time for patients who undergo SCPL ranges between 9 and 30 days^[11]. Kılıç et al reported that this time was 7 to 12 days for patients with SCPL^[11]. The decannulation time in the present study was longer than that reported in the literature. The number of patients with one arytenoid was greater than the number of SCPL patients with two arytenoids in our series, so the decannulation time may have been longer than that of previous reports due to the remaining mucosal membrane after one arytenoid is removed.

Hospitalisation time was shorter than the NGT removal time and decannulation time in the current series. Our patients were discharged earlier but with close follow up, because this allowed them to perform their swallowing and breathing exercises in their homes in a more relaxed environment.

This study had some limitations. The primary limitation was the small number of patients who underwent SCPL and SGHL. The second limitation was the subjective nature of the phonation test based on clinical assessment. Further studies should assess a larger number of patients for functional results.

Conclusions

Although SCPL is a more extensive surgery, functional outcomes were similar to those of patients who underwent SGHL. In both operations, the preservation of the hyoid bone is of prime importance for preservation of the swallowing function.

Acknowledgments

SB: Designed study, collected data, wrote article, AKT: Analyzed data, ÖY: Designed study, ESL: Collected data.

References

1. Kılıç C, Tunçel Ü, Kaya M, Cömert E, Özlügedik S. (2016) Swallowing and aspiration: How much is

affected by the number of arytenoid cartilages remaining after supracricoid partial laryngectomy? Clin Expl Otorhinolaryngol doi:10.21053/ceo.2015.01837.

2. Dedo HH. (1968) Supraglottic laryngectomy, indications and techniques. *Laryngoscope*, 78 (7),1183-94.
3. Bron L, Brossard E, Monnier P, Pasche P. (2000) Supracricoid partial laryngectomy with cricohyoepiglottopexy and cricohyoidopexy for glottic and supraglottic carcinomas. *Laryngoscope*.110(4), 627–34.
4. Goncalves AJ, Bertelli AAT, Malavasi TR, Kikuchi W, Rodrigues AN et al. (2010) Results after supracricoid horizontal partial laryngectomy. *Auris Nasus Larynx*. 37, 84–88.
5. Laccourreye H, Laccourreye O, Weinstein G, Menard M, Brasnu D. (1990) Supracricoid laryngectomy with cricohyoepiglottopexy: a partial laryngeal procedure for glottic carcinoma. *Ann Otol Rhinol Laryngol*. 99, 421-6.
6. Laccourreye H, Laccourreye O, Weinstein G, Menard M, Brasnu D. (1990) Supracricoid laryngectomy with cricohyoidopexy: a partial laryngeal procedure for selected supraglottic and transglottic carcinomas. *Laryngoscope*. 100(7), 735-41.
7. Szyfter W, Leszczynska M, Wierzbicka M. (2011) Outcome after supracricoid laryngectomies in the material of ENT Department, Poznan University of Medical Sciences. *Eur Arch Otorhinolaryngol*. 268 (6),879-83.
8. Alicandri- Ciuffelli M, Piccinini A, Grammatica A, Chiesi A, Bergamini G et al. (2013) Voice and swallowing after partial laryngectomy: Factors influencing outcome. *Head Neck*. Feb;35(2):214-9.
9. Laccourreye O, Hans S, Borzog–Grayeli A, Maulard–Durdax C, Brasnu D et al.(2000) Complications of postoperative radiation therapy after partial laryngectomy in supraglottic cancer: a long term evaluation. *Otolaryngol Head Neck Surg*. 122, 752-757.

10. Ozturk K, Akyildiz S, Gode S, Turhal G, Kirazli T et al. (2016) Post-Surgical and Oncologic Outcomes of Supracricoid Partial Laryngectomy: A Single-Institution Report of Ninety Cases. *ORL J Otorhinolaryngol Relat Spec.* 78(2), 86-93.
11. Ulsan M, Basaran B, Orhan KS, Çomoğlu S, Yıldırım K et al. (2012). Oncologic and functional outcomes of open surgery in early supraglottic tumors: is it still a valid technique? *Kulak Burun Bogaz Ihtis Derg.* 22(3),129-35.
12. Bron LP, Soldati D, Monod ML, Megevand C, Brossard E et al. (2005) Horizontal partial laryngectomy for supraglottic squamous cell carcinoma. *Eur Arch Otorhinolaryngol* 262(4), 302-6.