

Clinical Outcome of Supracricoid Partial Laryngectomy: Experience on 31 Patients

Keywords: Laryngeal carcinoma; Supracricoid partial laryngectomy; Cricohyoidoepiglottopexy; Cricohyoidopexie

Abstract

Objective: Supracricoid partial laryngectomy with Cricohyoidoepiglottopexy or Cricohyoidopexie is an organ preservation surgery indicated for selected T1 to T3 laryngeal cancers. To evaluate functional and oncological outcomes of supracricoid laryngectomy in our department, a retrospective review was conducted.

Methods: We summarized the clinical and postoperative data of 31 patients who received SCPL at the period from January 2010 and December 2013. In this report, we describe and critique briefly the functional and oncological outcomes of supracricoid partial laryngectomy recorded by the Department of Otolaryngology Head and Neck Surgery of Casablanca University on the bases of recent literature reviews. We analyzed treatment, functional outcomes including respiration, swallowing and phonation. Oncological results of supracricoid partial laryngectomy were evaluated on local and regional recurrences rates.

Results: There were 30 male and 1 female patients with ages ranging from 73 to 75 years (median = 58 years). The tumors were present in the glottis in 21 cases and supraglottis in 10 cases. Patients were restaged according to the 2009 UICC staging system. T1, T2, T3 represented 41.6%, 22.6% and 35.5%, respectively of our patients. None of them had lymph node metastases. There were no serious immediate postoperative complications. Removal of the tracheostomy varied between 5 and 90 days. One patient who received Supracricoid partial laryngectomy with Cricohyoidoepiglottopexy; presented a complete epiglottis prolapse, which obstructed the neoglottis after pexis; he refused to receive a second surgery. Rehabilitation of swallowing was successful in all but one patients; he required a total laryngectomy for unsuccessful rehabilitation six months after surgery. No local or regional recurrences were noted in all patients.

Conclusion: Supracricoid horizontal partial laryngectomy is a reliable and useful procedure surgical oncology technique that yields good functional results for the treatment of selected cases of laryngeal cancer.

Abbreviations

SCPL: Supracricoid Partial Laryngectomy; CHP: Cricohyoidopexie; CHEP: Cricohyoidoepiglottopexy

Introduction

First described by Majer and Rieder in 1959, Supracricoid Partial Laryngectomy (SCPL) was better codified by Labayle and Bismuth in 1971 [1-2]. However, the procedure was popularized and developed in France and throughout Europe in 1990s following dissemination by Laccourreye et al. then it has gained an increasing acceptance in North America and around the world [3-4].

The oncological purpose of SCPL is to remove the whole thyroid cartilage, both true and false cords, ventricles and paraglottic and preepiglottic spaces, sparing only the cricoid cartilage, hyoid bone, and at least one functional arytenoid. The epiglottis may or may



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not be submitted to resection depending on tumor size [3-7]. It is classified according to the type of reconstruction: Crico-Hyoido-Epiglottopexy (CHEP) and Cricohyoido-Pexie (CHP) depending on whether the epiglottis is preserved or not.

Many publications have reported good results for SCPL: Local control and 5-years survival rates are similar for patients undergoing total and SCPL for the treatment of selected T1 to T3 supraglottic laryngeal squamous-cell carcinomas [1-8]. Additionally, these procedures can be used for patients having failed after radiotherapy [9-12] or for having recurred after laser or surgical treatment [13]. Satisfactory function can be obtained, tracheostoma can be closed and the patient can resume breathing from the natural airway leading to improved quality of life [5-6].

The present report is one of the first studies about SCPL in Arabic publications. The aim of this study is to evaluate oncologic and functional results of SCPL recorded by the Department of Otolaryngology Head and Neck Surgery of 20Aout 1953 Hospital in Morocco since 2009.

Patients and Methods

Thirty one patients underwent SCPL for squamous carcinoma of the larynx at the Department of Otolaryngology Head and Neck Surgery of Ibn Roch University Hospital during the period of January 2010 to December 2013. There were 30 male and one female with a mean age of 58.8 years (age range from 43 to 76). Four patients were over seventeen, 19 were smokers and 10 alcoholics. The main complaint was hoarseness in all patients, with duration of symptoms of 7.5 months.

Pre-operative assessment of primary tumor extent was performed via laryngeal endoscopy and neck Computed Tomography (CT), and findings were confirmed by suspension laryngo-microscopy under general anesthesia. Chest radiography, ultrasonography of the liver, pulmonary and cardiac function tests was also performed.

The tumors were present in the glottis in 21 cases and supraglottis in 10 cases. Patients were restaged according to the 2009 UICC staging system. T1, T2, T3 represented 41.6%, 22.6% and 35.5%,

respectively of our patients. None of them had lymph node metastases. Reconstruction was by Crico-Hyoido-Epiglottopexy (CHEP) in 28 cases (90.3%) and by Crico-Hyoidopexy (CHP) in 3 cases (9.7%). In one case, SCL was performed as salvage surgery for failure of laser excision of T1b glottic cancer. One arytenoid was removed in five cases; due to tumor invasion or as part of the surgical margin. SCOL was associated with neck dissection in 26 out of 31 cases (83.9 %).

The mean hospitalization time was 7 days for all cases (ranged from 5 to 9 days). The tracheal cannula was removed when respiratory function returned through natural airways. The swallowing rehabilitation was started in the 10 days after surgery, and the nasogastric feeding tube was removed when patients became able to swallow their own saliva. All patients were reviewed in our outpatient clinic. The follow up ranged from 2 to 7 years.

We analyzed oncological results of SCPL. Functional outcomes were evaluated in terms of postoperative morbidity, time of decannulation, swallowing recovery, and phonatory function.

Results

Postoperative complications

There were no serious immediate postoperative complications. None of the patients died in the immediate postoperative period. No laryngeal stenosis, pexis rupture or cricoid cartilage necrosis occurred. One patient (3.2%) who received SCPL-CHEP at our institute; had a complete epiglottis prolapse, which obstructed the neoglottis after pexis; he refused to receive a second surgery.

Functional results

All but 1 patient were decannulated (96.77%). The average time until decannulation was 7 days (ranging from 5 to 90 days). Two patients could not be decannulated until 2 and 3 months after surgery because of the persistent arytenoid mucosal edema. Concerning the patient who could not be decannulated, his respiratory space remained insufficient because of complete epiglottis prolapse, which obstructed the neoglottis.

The nasogastric feeding tube was removed during the first postoperative month in all in 30 out of 31 patients (96.77%) considered in the present series. It was left in place for an average of 15 days (range 7 to 23). There was one patient whose swallowing rehabilitation was prolonged more than three months resulting in insufficient closure of the neoglottis. He received total laryngectomy 6 months after SCPL-CHEP because of persistent aspiration of liquid diet. Patients with SCL-CHP (3 cases) tended to have difficulty acquiring swallowing function especially with liquid diet.

Voice quality was evaluated in 29 patients in which decannulation were possible. According to the described psychoacoustic evaluation parameters and scales, the vocal quality of all patients' voices was described as significantly hoarse, rough and breathy. Acceptable phonation was achieved by all patients. All patients with SCPL were able to enjoy social activities as before and to resume work for whose working.

Oncological results

During the observation period, local recurrence was not encountered in our series. Adjuvant radiotherapy was indicated in one

patient for positive resection margin but he was loss of view, this case was not included in this series. At December 2015, our preservation of a functional larynx was 93.54%, with 6.45% of patients requiring a total laryngectomy after failed rehabilitation.

Discussion

Supracricoid Partial Laryngectomy (SCPL) was described for the first time in the fifties by Hofmann-Saguez its basic concept was better codified by Mayer Riede from Austria in 1959. The surgical technique was later revised in France by Labayle and Bismuth in 1971 then by Piquet and Chevalier in 1974 [5-6]. Through the first English publications of SCPL-CHEP and SCPL-CHP in 1990, Laccourreye et al. successfully brought worldwide attention and recognition to this surgical procedure [3-4]. He demonstrated that it can provide a good surgical alternative to the vertical partial laryngectomy in the treatment of specific glottis and supraglottic cancers with local control rates similar to total laryngectomy.

The technique involves resection of the entire thyroid cartilage; from the cricoid to the base of the epiglottis allowing removal of the entire paraglottic spaces which cannot be resected during vertical partial laryngectomy or endoscopic laser treatment and thereby achieve a local control rate similar to that of total laryngectomy. The SCPL procedure is based on the preservation of cricoid cartilage, hyoid bone, and at least one functional cricoarytenoid unit. Crico-Hyoidopexy (CHP) or Crico-Hyoido-Epiglottopexy (CHEP) may be used for reconstruction depending on whether the epiglottis is spared or not depending on tumor size [6-14]. Through conservation of a cricoarytenoid unit, SCPL allows the creation of a neolarynx permitting both swallowing and speech [15].

However, successful management of SCPL requires the use of strict oncologic selection criteria and is therefore used only for selected T1 to T3 supraglottic-glottic laryngeal squamous-cell carcinomas [16]. Recent reports also indicate SCPL surgery for post-radiotherapy recurrences or for endoscopic laser treatment failure [9-12]. Currently, pre-operative staging is based on physical examination and CT imaging studies with endoscopy. SCPL indication should be highly selective whereby the posterior commissure must be tumor free, subglottic extension must not reach the superior margin of the cricoid, and no massive invasion of the preepiglottic space, invasion of the base of the tongue, invasion of the thyroid cartilage with extra-laryngeal extension should be present. As indicated previously by Laccourreye et al. [4], arytenoid cartilage fixation is clearly a contraindication for SCPL. Also, at least one of the arytenoids must be salvageable and the patient must have good broncho-pulmonary function as well as psychosocial status, fundamental for successful rehabilitation [3-11]. The pulmonary function should be evaluated and the patients with low blood gases or chronic lung diseases should be excluded from this surgery. Indication should also be carefully contemplated for patients over 70-years-old because of the high risk of aspiration pneumonia during the swallowing rehabilitation [5].

To optimize local control; some authors proposed that SCPL can be extended to resection of one arytenoid [8-17], resection of the anterior arch of the cricoid cartilage (if extension subglottic exceeding by more than 10 mm forward) or pre laryngeal muscles (if infiltration external perichondrium of thyroid cartilage) [8].

The complications following SCPL include aspiration pneumonia, laryngo-cutaneous fistulas, wound infection, skin flap necrosis etc., it ranged from 16.3 to 34.3 % as reported [13]. Among them, aspiration pneumonia was reported as the most common to incur [18]. According to Pellini et al. the proportion of early surgical complications in patients who received radiotherapy was significantly higher than that in patients who did not receive radiotherapy (53% vs 23%; $P=0.04$) [11]. Surgical complications are also more frequent in patients with medical problems [12]. Laryngocele, necrosis of the cricoid cartilage, ruptured pexis, and laryngeal stenosis are rare but associated with SCPL. Nakayama et al. described another postoperative complication as “inverted epiglottis”; it is characterized by prolonged edema of neoglottis and delayed stoma closure [19]. The tip of the epiglottis had entirely prolapsed and fitted into the neoglottis. A similar complication was once described by Naudo et al. as “epiglottis swing”, but in this case, the epiglottis did not manifest complete prolapsed [20]. According to Nakayama the three clinical factors that can be considered causing this complication are wide excision of the petiole of the epiglottis (anterior commissure-upper edge > 25 mm), patients with a low vallecula profile compared with the hyoid bone position and incorrect suturing to the remaining epiglottis at pexispassing the needle vertical to the epiglottic petiole [19].

The main parameters to define the functional success of SCPL in terms of respiration are the decannulation rate and time. Reported decannulation time ranged from 9 to 56 days [1-20]. According to Bron et al. early decannulation has been reported to be a key point for early recovery of swallowing function after SCPL [21]. Early decannulation is useful to stimulate an active cough reflex and thus allow the acquisition of a physiological closure neoglottis sphincter [1-2]. However, some authors favored staged decannulation to minimize the risk of aspiration pneumonia [5]. Considering 121 out of 124 patients who had undergone SCPL with CHP, Naudo and coworkers reported decannulation rates of 99% [20]. Similar decannulation rates were recently described in more limited and large case sets by Bron et al. Gallo et al. Xang et al. and Lima et al. [13,21-23]. Authors seem to confirm that the delay in decannulation was correlated with patient age, preoperative chronic obstructive pulmonary disease and postoperative laryngeal edema [1]. This delay is longer in patients with one arytenoid and in patients who underwent SCPL-CHP when compared with those who underwent SCPL-CHEP [1-17,24]. A non-significant correlation emerged between delays in decannulation after irradiation [11-20].

Among functional surgical procedures for laryngeal cancer, SCPL is the one that seems to present most swallowing recovery-related difficulties. At present, there is no widely accepted way of describing the swallowing function after SCPL. Parameters used by authors are duration of the nasogastric feeding tube or percutaneous gastrostomy, different grading scales of postoperative aspiration, and the time taken to achieve a normal oral diet. The mean time to removal of the feeding tube reported ranged from 15 to 31 days [22-17]. Increased nasogastric feeding tube duration seems to be correlated with chronic obstructive pulmonary disease, diabetes mellitus, increased delay in tracheostomy tube removal and loss of the epiglottis (SCPL-CHP) [1,5-24]. Arytenoid resection may affect the swallowing function in the early postoperative period, but it did not affect the final result after

one year [14-17]. Preoperative irradiation did not affect significantly this parameter [11]. Bron et al. suggest that close to-normal-diet recovery required 6 to 12 months and Naudo et al. reported that 91% of patients had normal swallowing after SCPL without weight loss at one year postoperatively [20,25].

Satisfactory voice intelligibility, which is defined as the ability being able to communicate at the daily activities and social settings, was achieved by more than 93% of the cases in our series. Voice after SCPL is described as rough, breathy, and strained according to the GRBAS scale (grade, roughness, breathiness, asthenicity, and strain) [1-25]. Schindler et al. declared that although endoscopic, aerodynamic, perceptual, and acoustic data showed a highly dysphonic voice after SCPL, the Voice Handicap Index (VHI) revealed relatively satisfied speakers on the emotional, physical, and functional levels suggesting that oral communication was not significantly limited [26]. For all of the parameters that are associated with voice function, there was no statistically significant difference between one arytenoid and two arytenoids for Yuce et al. and between patients who underwent preoperative irradiation and those who didn't [11-12]. Weinstein and coworkers concluded that SCPL patients had better outcomes in all domains pertaining to mental health and social functioning and presented fewer problems in their social and work environments that might be influenced by emotional problems such as anxiety or depression compared with patients undergoing total laryngectomy with trachea-oesophageal puncture [27].

In addition to its functional benefits, the SCPL provides equivalent local control compared to total laryngectomy with 5-year survival from 75% to 95% while advanced stage [3-21]. Laccourreye et al. reported excellent local control rates of 98.2% at 5 years and overall laryngeal preservation rates in T1 and T2 glottic carcinoma with extension to the anterior commissure treated by SCPL when compared with historical series using either vertical partial laryngectomy or radiotherapy [7]. Chevalier and Piquet, in a review of 61 patients with supraglottic squamous carcinoma rated T1 to T4, reported a local control rate of 97% after CHP. The SCPL is a valid alternative to radiotherapy in treating selected patients with T3N0 glottic carcinomas. In a recent publication, Dufour et al. reported local control at 5 years of 91.4% for patients classified T3 glottic cancer treated with SCPL versus 65% for radiotherapy [26,28].

The main determining factor influencing local recurrence and survival after SCPL remains the quality of surgical margins; positive margins are significantly associated with high risk of loco regional recurrences [5-29]. The study of intra operative frozen section margin appears to be an effective way to ensure the validity of the SCPL and is recommended by Nakayama et al. [29]. Also, preoperative T-understating is reported by Cho KJ et al. as a determinant of local recurrence; this is mainly due to the failure to identify thyroid cartilage invasion pre-operatively and it showed higher local recurrence rates, compared with other causes of T-understating, such as failure to identify subglottic extension and pre-epiglottic space extension [8]. Regarding survival, T category, N category, tumor stage, positive resection margins, and recurrence are the most important predictors of oncological outcome [22]. Hence, the authors' recommendations is to perform the adjuvant radiotherapy after SCL only for the patient showing a positive resection margin, extra capsular spread of

metastatic lymph node, and/or multiple lymph node metastases [8-28]. Additionally, Cho KJ et al. recommend that adjuvant radiation therapy needs to be considered in cases where thyroid cartilage invasion is determined pathologically after SCPL [8].

Conclusion

Functional and oncological results of SCPL in the literature showed certain advantages over those of total laryngectomy. Tracheostomy closure, effective swallowing, and satisfactory voice intelligibility can be achieved in a significant number of patients. SCPL fulfils the principle that organ preservation surgery should be technically simple, reliable in its functional impact, and above all does not jeopardize patient survival. It can be considered as one of the reliable organ preservation strategies for treating T1 to T3 laryngeal cancers in properly selected patients.

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