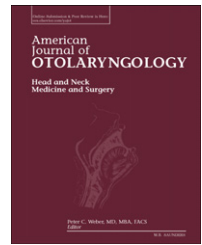


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Subtotal supracricoid laryngectomy: changing in indications, surgical techniques and use of new surgical devices[☆]

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ABSTRACT

Purpose: The aim of this study is to evaluate the evolution of supracricoid partial laryngectomy (SCPL) in indications, surgical techniques and outcomes through last decades.

Materials and methods: A retrospective analysis of 146 patients affected by laryngeal cancer treated with SCPL was carried on. We defined: (1) group A, 100 patients treated by cold instruments between 1995 and 2004; (2) group B, 46 patients treated by harmonic scalpel between 2005 and 2010. Complications rate, and functional and oncological results were documented and a comparison between the two groups was made; histopathological analysis of surgical margins was evaluated and correlated with local incidence of recurrence.

Results: Significant differences in age mean-value ($p = 0.02$), T classification ($p = 0.007$), and in indication for more advanced-staged patients were found in group B ($p = 0.001$). Surgical procedure was shorter in group B ($p < 0.001$), with shorter swallowing recovery ($p = 0.003$). Oncological outcomes did not report any significant differences. Group B showed a higher incidence of post-operative arytenoid edema ($p = 0.03$) associated with a lower rate of pneumonia ($p = 0.038$). Despite a higher rate of close or positive-margins found in group B no higher incidence of local-recurrence was reported ($p = 0.02$) compared to group A.

Conclusions: We documented changing in indications and surgical technique for SCPL because of the development of modern diagnostic techniques and the introduction of low-thermal injury device allowing a more challenging tumor excision as well as with a shorter swallowing recovery in our series.

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1. Introduction

Treatment options for laryngeal cancer include different radiation and surgical techniques, whose choice depends on

extension of the disease, clinical presentation and general health of patients. The main concern is tumor control together with organ function preservation when it is possible. Supracricoid partial laryngectomy (SCPL) provides a good surgical

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alternative to the conventional radiotherapy and total laryngectomy in the treatment of specific glottic and supraglottic cancers [1-4]. Supracricoid partial laryngectomy was initially introduced by Hofmann-Saguez in 1950 [5] and further discussed by Mayer and Rieder in 1958 [6]. In addition, the procedure was refined and found a practical validity and application by Labayle and Bismuth in 1971 [3], Alajmo in 1971 in Florence [7], and Piquet et al. in 1972 [8]. All of these surgeons proposed supracricoid partial laryngectomy as valid surgical alternative to total laryngectomy in elective T1 and T2 laryngeal cancer patients, describing it as a technique able to ensure recovery from the disease and laryngeal function preservation together.

So far, surgical indications have been changed and extended to more advanced staged cancers [1,4,9] because of the improvement of diagnostic technologies such as CAT scan and MRI [10,11], a more precise stage of the disease by endoscopic fiberoptic together with fluorescence or narrow banding imaging (NBI) exams [12-14], as well as because of the advent of new surgical devices [15] which allowed the improvement of the intraoperative management of the operation and the surgical technique as well. All of these changes, together with the help of frozen section analysis in the intraoperative control of resection margins [16,17], have determined a radical turn in the management of these laryngeal cancer patients during the last 40 years, furthermore, with the new concept that recurrent irradiated cancer has to be treated as a primitive one, with no worsening in staging status and surgical indication, with no absolute contra-indication for SCPL [18-20].

Accordingly, here we critically evaluated our personal experience in the last decades with SCPL with the aim to underline changing in indications, potential improvement in functional and oncological results and the impact of new surgical devices recently used at our Institute.

2. Materials and methods

2.1. Study population

We re-evaluated functional and oncological outcomes from 146 consecutive laryngeal cancer patients, treated at our academic tertiary referral center (First Clinic of Otorhinolaryngology, University of Florence, Azienda Ospedaliero Universitaria Careggi, Italy) between 1995 and 2010. The protocol for the retrospective controlled clinical study was approved by the Institutional Review Board, and it was conducted in accordance with all accepted standards for human clinical research. All patients gave written informed consent prior to study enrollment.

All of these patients underwent supra-cricoid partial laryngectomy (crico-hyoid-epiglottis-pexy CHEP or crico-hyoid pexy CHP) [2,3] as primary or salvage treatment for squamous-cell laryngeal cancer. The principal exclusion criteria counted patients with T4 lesions, low index of Karnofsky ($\leq 80\%$), respiratory deficiency, cardiopathies, diabetes, obstructive bronco-pneumopathies, arthritis, neurological deficits, not eligible for open laryngeal conservative approaches [21,22].

To follow our aim, we divided SCPLs into two different groups: (1) group A: 100 patients, treated between 1995 and 2004, who underwent tumor excision by traditional cold instruments; (2) group B: 46 patients, treated between 2005 and 2010, where

primary cases were treated by using harmonic scalpel, while the use of warm instruments was avoided for the remaining 7 salvage cases. We excluded from the histopathological analysis salvage SCPLs that account for a total of 17 patients, 10 of them belong to group A and the remaining 7 patients belong to group B. We decided to perform this comparison between two different time periods in order to analyze and compare changing in surgical indications and technique, and their possible influence on postoperative outcomes and histopathological parameters, because 2005 saw the introduction of harmonic scalpel as a new device in this surgical procedure at our Clinic and the use of more fully-developed diagnostic instruments (i.e.: new CAT scan and MRI) made the staging procedure more accurate, helping in the better classification of laryngeal cancer patient and in giving indications for conservative open partial laryngectomy.

Tumor excision was carried out in accordance with standard surgical practice and indications of head and neck surgical oncology, in the strict observance of sterile conditions in the operating room and in general anesthesia regimen. The harmonic scalpel always presented similar setting when used in each surgical procedure: 55.5 kHz alternative current, with a dissecting tip blade 10 mm long and gently curved. It is able to cut and coagulate at a lower temperature (max 150 °C) using mechanical vibration at 55,500 cycles per second [23,24]. We avoided the use of harmonic scalpel in salvage procedure to reduce the high potential incidence of diffuse edema on irradiated field.

A classic scalpel, blade number 15 was used during the cold procedure in group A and for the 7 salvage cases of group B.

2.2. Re-evaluation of functional and oncological outcomes of the historical series

We applied a functional study protocol to analyze clinical parameters of each patient during their admission. We calculated from patients' hospital records the following data: (1) operation mean duration time, expressed in minutes; (2) difference in preoperative and immediate postoperative hemoglobin (Hb) mean value (g/dL); (3) mean duration time of drainage removal in patients who underwent neck dissection (ND) (mL); (4) total drainage production in patients who underwent ND (mL); (5) decannulation mean time (day); and (6) mean time of removal of naso-gastric-feeding tube (NGT) (day).

To compare functional outcomes, parameters about voice results, expressed in voice-handicap-index values (VHI) [25-27], and dysphagia recovery, analyzed by MD Anderson Dysphagia Inventory (MDADI) [28,29], were evaluated together with the performance of fiberoptic endoscopic analysis, videolaryngeal stroboscopy after the removal of the tracheocannula and videofluoroscopy (VDFS) test in patients near to restarting oral feeding [30,31].

Outpatient clinical follow-up data were collected and they included monthly clinical examination with performance of fiberoptic endoscopy during the first year after surgery, each 2 months during the second year, every 3 months during the third year then, each 4 and 6 months during the last 2 years of follow-up. Imaging study was always complementary to clinical examination, by computer-tomography-scan of neck and chest.

Considering the day of the salvage surgery as the starting day of the observation, follow-up was for a minimum of 2 years or until death (mean 45 months; minimum 6, maximum 180).

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