

CLINICAL TECHNIQUES AND TECHNOLOGY

Modified supracricoid laryngectomy

Aldo Garozzo, MD, Eugenia Allegra, MD, Alessandro La Boria, MD, and Nicola Lombardo, MD, Catanzaro, Italy

No sponsorships or competing interests have been disclosed for this article.

Supracricoid laryngectomy in its most common modalities, cricothyroidopexy (CHP)¹ and cricothyroidoepiglottopexy (CHEP),² is a conservative surgical technique whose principal objective is the natural restoration of the respiratory function. However, both swallowing and phonation undergo important modifications.³ The objective of this study was to maintain the surgical strategy of supracricoid laryngectomy while focusing on reconstruction of the glottic plane. An essential part of the study was to recreate the anatomical conditions that allow phonation using the sternohyoid muscles for neoglottis reconstruction.

Subjects

Fourteen consecutive patients affected by laryngeal carcinoma and treated with supracricoid laryngectomy (11 patients with CHEP, 3 patients with CHP) between 2003 and 2007 were selected for this prospective study. The protocol was approved by the Institutional Review Board of Magna Graecia University of Catanzaro, Italy. All the patients were informed of the benefits, risks, and complications of this surgical technique and its alternatives before they gave their informed consent.

All the patients were men, and their ages ranged from 45 to 75 years (mean 58.5 years). Nine patients had stage T1b cancer, seven of whom were treated with CHEP and two with CHP. Five patients had stage T2 cancer, four of whom were treated with CHEP and one with CHP. All the patients had mobile vocal cords and the arytenoids were preserved. They were clinically and radiologically N0.

Surgical Technique

In all patients, a preliminary tracheostomy was performed at the fourth to fifth tracheal ring under general anesthesia. A collar incision incorporating the tracheostomy was performed; the incision extended from the anterior border of the sternomastoid muscle on one side to the anterior border of the sternomastoid muscle on the other side. The skin incision was deepened through the platysma, the upper skin

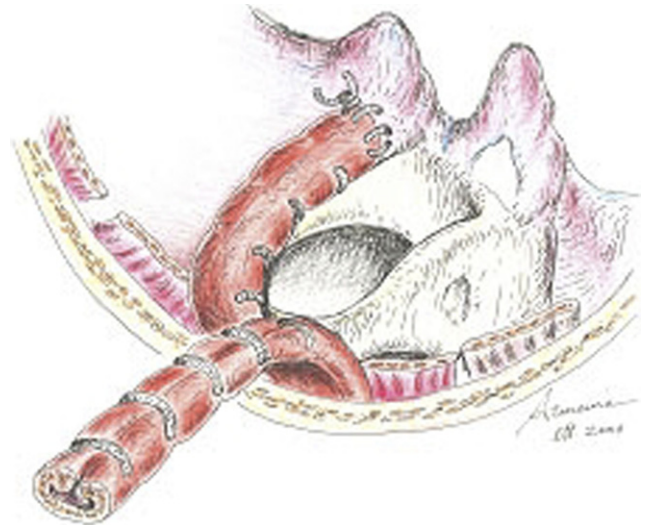


Figure 1 The sternohyoid muscles were placed bilaterally on the free margins of the cricoid and anchored to the vocal apophysis of the arytenoids.

flap was elevated until the hyoid bone was exposed, and the lower skin flap was elevated to the inferior border of the cricoid.

The midline fascia was incised to expose the strap muscles. The sternohyoid muscles on both sides were isolated and detached from the hyoid bone, leaving their inferior vascularization intact. Each sternohyoid muscle was fashioned into a tubular shape with 4-0 Vicryl (Johnson & Johnson, Belgium). Both inferior constrictor muscles along the oblique line of the thyroid cartilage were transected, and the superior neurovascular pedicle was identified and used to ligate the superior laryngeal artery and vein, preserving the superior laryngeal nerve. After transection of the cricothyroid muscles, the cricothyroid membrane was incised to detach the thyroid cartilage from the cricoid cartilage. The thyroid cartilage was removed with or without the epiglottis (CHP or CHEP, respectively) by transecting the inferior horn 1 cm from the cricoid to protect the recurrent laryngeal nerve.

The sternohyoid muscles, prepared previously, were linked on the midline. They were then placed bilaterally onto the

Received May 4, 2009; revised September 6, 2009; accepted September 23, 2009.

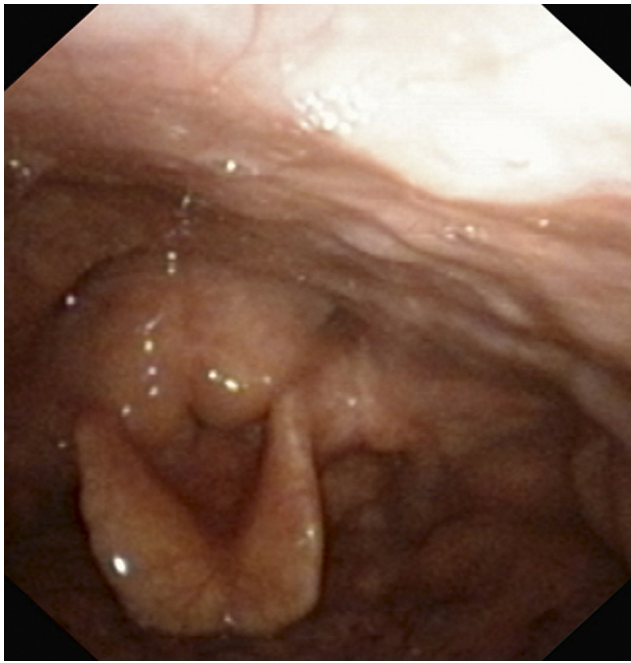


Figure 2 An endoscopic view of the neoglottis, six months after surgery, during phonation.

free margin of the cricoid, anchored to the vocal apophysis of the arytenoids (Fig 1), and finally covered with the redundant mucosa overlying the arytenoids (Fig A1).

The neolarynx was closed with three no. 1 Vicryl sutures: one on the anterior midline and one laterally on each side. Once these sutures were tied, the cricoid came into contact with the hyoid bone, and the neoglottis reconstruction was completed. The incision was closed in two layers after two drains had been positioned bilaterally in the subcutaneous plane.

Neither morbidity nor mortality developed in the patients over a mean follow-up period of 29 months (range 12–48 months).

The nasogastric feeding tube was removed after a mean period of 11 days (range 8–14 days). The tracheostomy was closed after a mean period of 46 days (range 32–68 days) from the operation. We detected no sternohyoid muscle flap necrosis, and detachment from the vocal apophysis of the arytenoids was observed in only two patients.

The anterior–posterior valving of the arytenoids/epiglottis/base of the tongue complex was scored⁴ as 1 in eight patients (57.1%), 2 in four patients (28.6%), and 4 in two patients (14.3%). The lateral–medial valving of the neocords was scored as 2 in two patients (14.3%), 4 in four patients (28.6%), and 5 in eight patients (57.1%) (1 = poor ability to 5 = excellent ability) (Fig 2).

The analysis of voice quality, measured on the INFVo scale,⁵ revealed a final total score for all items of <24 in two patients (14.3%), 24 to 28 in three patients (21.4%), and >28 in nine patients (64.3%). Each item was scored on a 10-point rating scale: 0 = poor quality to 10 = good quality.

Discussion

No complications of tracheostomy closure or swallowing recovery were detected in the patients treated with this modified form of supracricoid laryngectomy. In two patients, one of the two sternohyoid muscles used became detached from the vocal apophysis, creating a free flap. This event did not cause respiratory obstruction, but it contributed to glottic closure.

The benefits of this technique are the good quality of voice achieved and the early recovery of swallowing. Its only disadvantage is its limited indications because both arytenoids must be preserved.

Conclusion

In our experience, the use of the sternohyoid muscles for glottic reconstruction produces more efficient lateral–medial movement of the arytenoids and creates the anatomy required for physiological glottic movement.

We think that this technique offers more advantages relative to standard supracricoid partial laryngectomy in terms of the quality of voice and the early recovery of swallowing (Fig A2). To evaluate this proposition, we are performing a comparative study that considers quality of voice parameters (INFVo, the Voice Handicap Index) and quality-of-life questionnaires.

Acknowledgment

Dr Antonio Armenia, otolaryngologist, produced the image included in the article.

Author Information

From the Department of Otolaryngology–Head and Neck Surgery, University of Catanzaro, Catanzaro, Italy.

Corresponding author: Eugenia Allegra, Unità Operativa di Otorinolaringoiatria, Policlinico Germaneto, Università “Magna Graecia,” Viale Europa-Località Germaneto, 88100 Catanzaro, Italy.

E-mail address: euale@unicz.it.

Author Contributions

Eugenia Allegra, assistant, data collection, manuscript preparation; **Aldo Garozzo**, study concept, supervision, writer; **Nicola Lombardo**, assistant, patient care, data collection; **Alessandro La Boria**, assistant, patient care.

Disclosures

Competing interests: None.

Sponsorships: None.

References

1. Piquet JJ, Desauty A, Decroix G. Crico-hyoido-epiglottopexy. Surgical technique and functional results. *Ann Otolaryngol Chir Cervicofac* 1974;91:681–6.

2. Labayle J, Bismuth R. Total laryngectomy with reconstruction. *Ann Otolaryngol Chir Cervicofac* 1971;88:219–28.
3. Schindler A, Favero E, Nudo S, et al. Long-term voice and swallowing modifications after supracricoid laryngectomy: objective, subjective and self-assessment data. *Am J Otolaryngol* 2006;27:378–83.
4. Woisard V, Rollet A, Puech M, et al. Voice after supracricoid partial laryngectomy: comparison of two phonatory mechanisms. *Rev Laryngol Otol Rhinol* 2004;125:319–23.
5. Moerman M, Martens JP, Crevier-Buchman L, et al. The INFVo perceptual rating scale for substitution voicing: development and reliability. *Eur Arch Otorhinolaryngol* 2006;263:435–9.

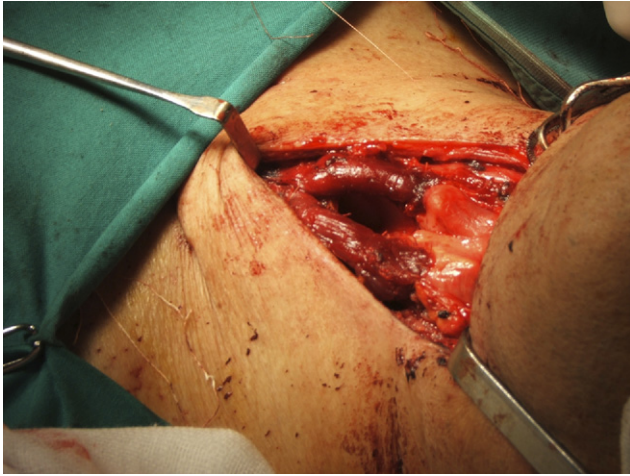


Figure A1 Surgical step in anchoring the sternohyoid muscles to the vocal apophysis of the arytenoids.

Figure A2 An endoscopic view of the closure without neoglottis reconstruction (CHP).