



ELSEVIER

CIRUGIA Y CIRUJANOS

Órgano de difusión científica de la Academia Mexicana de Cirugía
Fundada en 1933

www.amc.org.mx www.elsevier.es/circir



GENERAL INFORMATION

Histopathological evaluation of the subtotal laryngectomy specimen[☆]



Manuel García-Sánchez^a, Elizabeth Romero-Durán^b, Alejandra Mantilla-Morales^b, José Francisco Gallegos-Hernández^{b,*}

^a Departamento de Tumores de Cabeza y Cuello, Hospital de Oncología, Centro Médico Nacional Siglo XXI, Instituto Mexicano del Seguro Social, México, D.F., Mexico

^b Departamento de Patología, Hospital de Oncología, Centro Médico Nacional Siglo XXI, Instituto Mexicano del Seguro Social, México, D.F., Mexico

Received 27 March 2014; accepted 7 October 2014
Available online 9 December 2015

KEYWORDS

Laryngeal cancer;
Partial laryngectomy;
Laryngectomy

Abstract

Background: The goal of conservative surgical treatment of laryngeal cancer is to obtain oncological control with preservation of laryngeal function. The concept of laryngeal function preservation should be understood as the preservation of the patient's ability to breathe normally with neither tracheostomy nor aspiration, and maintaining intelligible speech. This can be achieved by a balance between two fundamental aspects, proper patient selection (based on tumour extension and preoperative laryngeal function), and an adequate histopathological analysis of the surgical specimen. Supracricoid subtotal laryngectomy is the voice conservative surgical technique that offers the best possibility of control in patients with locally advanced laryngeal cancer. The proper histopathological analysis allows staging and selecting patients for adjuvant therapy, avoiding unnecessary ones as well as designing monitoring and surveillance programs based on risk factors.

Objective: To highlight key points in the histopathological evaluation of the surgical specimen of a subtotal laryngectomy.

Conclusion: The proper communication between the surgeon and pathologist, offering complete information on preoperative clinical evaluation and the knowledge of the key points in the evaluation of the surgical specimen (sites of tumour leakage and surgical resection margins)

[☆] Please cite this article as: García-Sánchez M, Romero-Durán E, Mantilla-Morales A, Gallegos-Hernández JF. Evaluación histopatológica del espécimen de laringectomía subtotal. *Cir Cir*. 2015;83:537–542.

* Corresponding author at: Departamento de Tumores de Cabeza y Cuello, Hospital de Oncología, Centro Médico Nacional Siglo XXI, Instituto Mexicano del Seguro Social, Av. Cuauhtémoc 330, Col. Doctores, 06725 D.F., Mexico. Tel.: +52 56276900x22670.

E-mail address: gal61@prodigy.net.mx (J.F. Gallegos-Hernández).

PALABRAS CLAVE

Cáncer de laringe;
Laringectomía
parcial;
Laringectomía

are fundamental parameters to achieve a proper histopathological evaluation of the surgical specimen.

© 2015 Academia Mexicana de Cirugía A.C. Published by Masson Doyma México S.A. This is an open access article under the CC BY-NC-ND license (<http://creativecommons.org/licenses/by-nc-nd/4.0/>).

Evaluación histopatológica del espécimen de laringectomía subtotal**Resumen**

Antecedentes: La finalidad del tratamiento quirúrgico conservador del cáncer laríngeo es obtener control oncológico con preservación de la función laríngea; a su vez, la preservación de la función debe entenderse como la conservación de la capacidad del paciente para ventilar por vía normal sin traqueotomía y sin aspiración, manteniendo habla inteligible. Este propósito se logra manteniendo el balance entre 2 aspectos fundamentales: la adecuada selección del paciente (con base en la extensión tumoral y la función laríngea preoperatoria) y un adecuado análisis histopatológico de la pieza quirúrgica. La laringectomía subtotal supracricoidea es la técnica quirúrgica conservadora de la voz que oncológicamente ofrece la mejor posibilidad de control en pacientes con cáncer localmente avanzado de laringe; su adecuado análisis histopatológico permite estadificar y seleccionar a los pacientes candidatos a tratamiento adyuvante, evitando terapias innecesarias, y permite diseñar un programa de seguimiento y vigilancia con base en los factores de riesgo.

Objetivo: Señalar los puntos clave en la evaluación histopatológica de la pieza de laringectomía subtotal.

Conclusiones: La adecuada comunicación entre el cirujano y el patólogo, el ofrecer información completa de la evaluación preoperatoria clínica y el conocimiento de los puntos clave en la evaluación de la pieza (sitios de probable fuga tumoral y márgenes de sección quirúrgica) son parámetros fundamentales para lograr la adecuada evaluación histopatológica del espécimen quirúrgico.

© 2015 Academia Mexicana de Cirugía A.C. Publicado por Masson Doyma México S.A. Este es un artículo Open Access bajo la licencia CC BY-NC-ND (<http://creativecommons.org/licenses/by-nc-nd/4.0/>).

Background

Epidermoid cancer is the most frequent tumour to start in the laryngeal epithelium. GLOBOCAN¹ reports 151,000 new cases of laryngeal cancer per year worldwide; it ranks 17th among solid tumours, with a prevalence of 1.1% and standard mortality rate by age of 1.2/100,000.

In Mexico, the Dirección General de Epidemiología reported a total of 855 cases of laryngeal cancer in 2008. The rate was 0.8 per 100,000 inhabitants, and represented 0.2% of total deaths and 1.3% of total tumours.²

The major aetiological factor in the development of laryngeal cancer is tobacco use.^{3,4}

The larynx has different embryological origins, and may be divided into 3 regions: supraglottis (above the vocal folds), glottis (vocal folds and anterior commissure) and subglottis (below the vocal folds). The most common site of tumour origin is the glottic region and vocal fold plane, where the tumour starts and spreads mainly to the supraglottic region.⁵

The aim of treatment for laryngeal cancer is to achieve the right balance between oncologic control, phonation preservation and natural ventilation. Treatment of laryngeal

cancer depends on the tumour stage and general patient conditions.

In patients with laryngeal cancer who are indicated for laryngeal function preservation, the functionality of the cricoarytenoid unit is essential. This unit is formed by the arytenoids cartilage, the cricoids cartilage, the posterior and lateral cricoarytenoid muscles, the interarytenoid muscles and the lower and upper laryngeal nerves; preservation of these structures during functional surgery enables physiological success, since it is this unit which governs correct phonation and swallowing without aspiration.^{5,6}

In initial (T1-2) tumours, a single treatment is normally indicated; this may be either endoscopic resection with laser, radical radiotherapy to the voice box or open surgery aimed at voice preservation. However, in local or advanced local and regional tumours, mutilating surgery is the standard treatment, which involves voice box removal and definitive tracheotomy. Patients with "intermediate stage" cancer, i.e. patients with tumours which may be locally advanced but which do not involve any major impairment of phonation or swallowing, where voice is of an acceptable quality and vocal fold and/or adenoid mobility is sufficient, are usually classified as T2 or T3 and a few at T4a

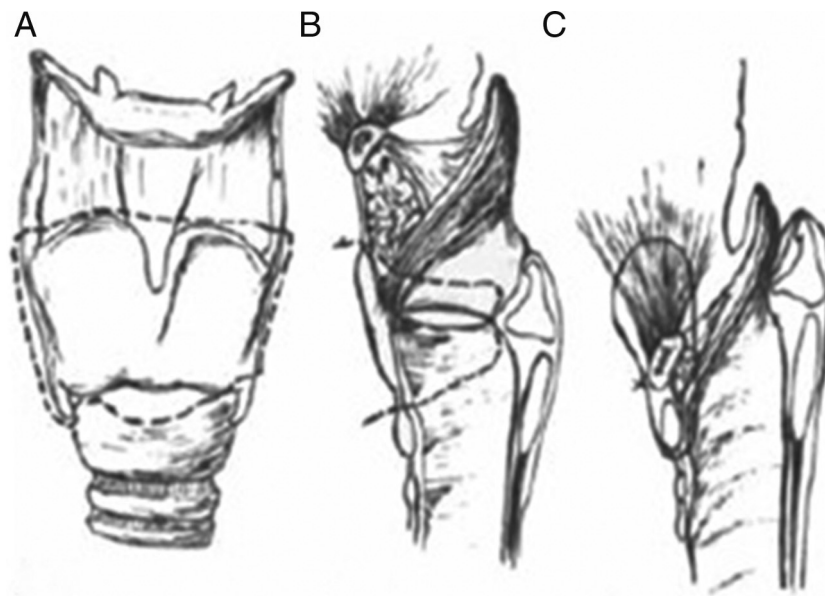


Figure 1 Detail of the surgical technique of subtotal laryngectomy; complete resection of the paraglottic space, removing the thyroid cartilage; laryngeal reconstruction is made by attaching the cricoids to the epiglottis, chords and the base of the tongue.

stage, and for them the normal treatment is total laryngectomy, followed by radiotherapy or chemo and radiotherapy, depending on diagnosis.

It is for this patient group that supracricoid subtotal laryngectomy with laryngeal reconstruction with cricothyroidoepiglottopexy has been designed. The aim of this treatment is the same as that guiding therapy for laryngeal cancer: to obtain a balance between natural phonation-ventilation and satisfactory cancer control, with a cure rate equal to total laryngectomy followed by radiotherapy.⁶⁻⁹

Supracricoid subtotal laryngectomy with laryngeal reconstruction with cricothyroidoepiglottopexy is indicated in patients with advanced tumours but correct laryngeal function, in patients who would otherwise be indicated for total laryngectomy, if treatment were standard. Supracricoid subtotal laryngectomy with laryngeal reconstruction with cricothyroidoepiglottopexy is a step prior to total laryngectomy and a last attempt at laryngeal function preservation.⁸⁻¹⁰

Suitable patient selection⁹ is required, as is appropriate assessment of the operative specimen to enable us to ensure complete removal of the tumour and this is the key to reducing the tumour recurrence rate.

The aim of this paper is to expose the major key points for the appropriate histopathological study of the specimen from supracricoid subtotal laryngectomy in patients with laryngeal epidermoid cancer.

Supracricoid subtotal laryngectomy

This procedure was initially reported by Majer and Rieder,¹¹ and popularised by Piquet¹² in Lille, France; the technique is currently considered as a safe and functional alternative to total laryngectomy in patients with locally advanced cancer of the larynx (Fig. 1). It is a conservative procedure, designed for patients with tumours which invade the

paraglottic space but which preserve ipsilateral arytenoid cartilage; for patients with anterior commissure tumours which penetrate in the submucosa portion of the tumours of the hyoidthyroepiglottic space, and for patients with tumours which invade the bottom of the epiglottis, but which do not spread to its laryngeal side, with no mass invasion of the hyoidthyroepiglottic space or with invasion of the lower third of the epiglottis without suprahypoid invasion.¹⁰

This technique is contraindicated in tumours with subglottic infiltration, arytenoid adherence, bilateral foldial adherence, tomographic infiltration of the hyoidthyroepiglottic space, extralaryngeal tumour and major infiltration of the thyroid cartilage.¹⁰

The prognosis of patients who undergo supracricoid subtotal laryngectomy depends on histological findings from the surgical specimen. One of the most important factors in prognosis of local recurrence is the staging of surgical resection margins. The presence of tumour infiltration in resection is associated with between 22% and 70% of local recurrence. The presence of dysplasia in surgical resection margins is associated with disease recurrence in a shorter period of time, compared with patients without dysplasia in resection margins.^{13,14}

To identify prognostic factors in the surgical specimen of the supracricoid subtotal laryngectomy the following is required: systematic assessment¹⁵ of the real tumour size, of the presence or absence of tumour infiltration to nearby structures, and tumour spread to different anatomical regions of the larynx, mainly the paraglottic region.

The spread of a laryngeal tumour depends on the sub-site of origin; supraglottic tumours therefore invade the preepiglottic area and the supraventricular paraglottic space. Glottic and subglottic tumours invade the infraventricular paraglottic space, from the anterior commissure to the bottom of the epiglottis, its laryngeal side and they spread outwards infiltrating the keel of the thyroid cartilage.

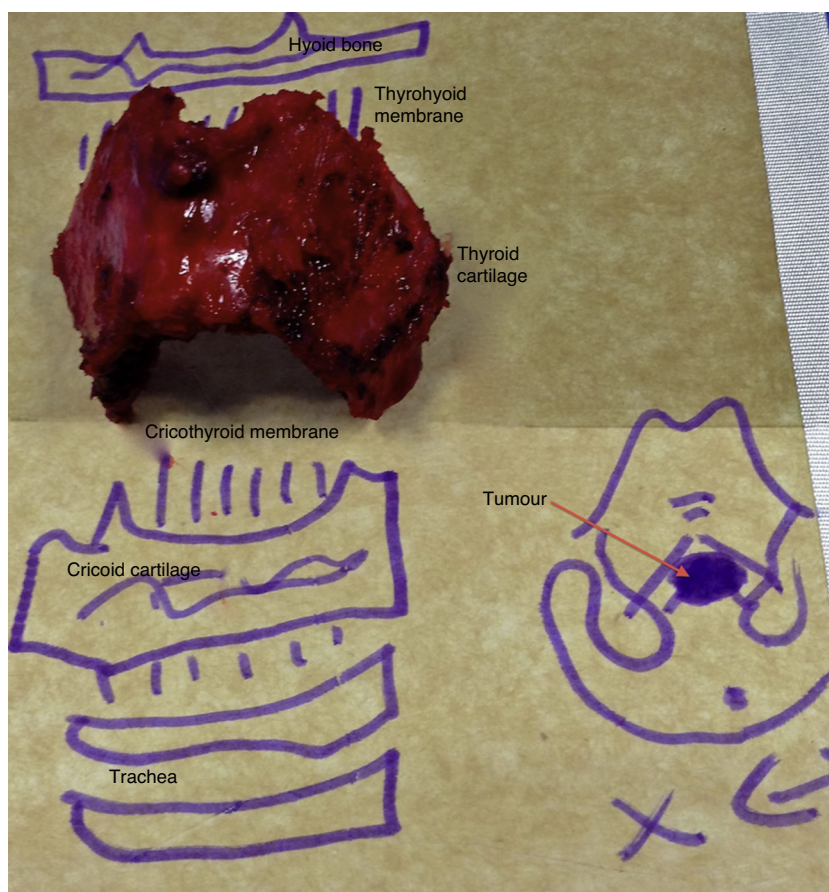


Figure 2 Outline showing the extent of resection, the tumour site and its spread for correct macroscopic assessment in pathology.

Recommendations for the management of supracricoid subtotal laryngectomy specimens

Once the anatomical structures of the specimen have been recognised, the specimen must be sent for histopathological assessment with suitably appropriate guidance regarding the anatomical structures of the tumour site in an outline or a sketch showing where the tumour started (Fig. 2), the surgical resection margins and information relating to the preoperative laryngeal kinetics (vocal fold and arytenoid mobility).

It is highly important the surgeon's direct communication with the pathologist during the procedure to assess the surgical resection margins transoperatively; the presence of a visible tumour in the surgical sites may alter any decisions regarding the extent of surgery and on occasion abort the conservative procedure, with total laryngectomy being performed instead; this situation would arise if the tumour had spread more extensively than assessed preoperatively.

The supracricoid subtotal laryngectomy specimen (Fig. 3) includes: total thyroid cartilage and bilateral paraglottic space, both vocal folds, both Morgagni ventricles, both ventricular bands, the anterior commissure, the bottom of the epiglottis section along its limit with the upper edge of the thyroid cartilage (suprathyroid portion), and may or may not

include the arytenoid cartilage of the same side as the fold with tumour growth.

The surgical edges are identified and dyed with different colours. The upper margin corresponds to the mucous membrane of the bottom of the epiglottis, the bottom of the mucous membrane covering the upper edge of the cricoid cartilage along its margin with the thyroid cartilage (cricoidthyroid membrane) and the back of the posterior segment of the vocal fold in the cricoid-vocal ligament, occasionally including the ipsilateral arytenoid cartilage.

Fresh tumour measurements must be made and the distance from surgical edges and its location must be identified, including both longitudinal and horizontal extension. The specimen is formalin-fixed at 10% for 24 h. 3 mm thick sagittal slices are made and photographed to compare with histological cross-sections; if the thyroid cartilage is calcified, the cuts may be made with a hacksaw or plain scissors and decalcified for 24 h. A parallel cut along the posterior edge of approximately 3–4 mm is made, which is then cut lengthwise to increase the surface area to be assessed.

The sagittal slices taken enable assessment of the upper and lower surgical margins, the band and vocal fold, the ventricle, the paraglottic space and the thyroid cartilage; the central slice shows the anterior commissure, and the most posterior slice shows the posterior third of the vocal fold (fold-arytenoid region) or the arytenoid cartilage. Each

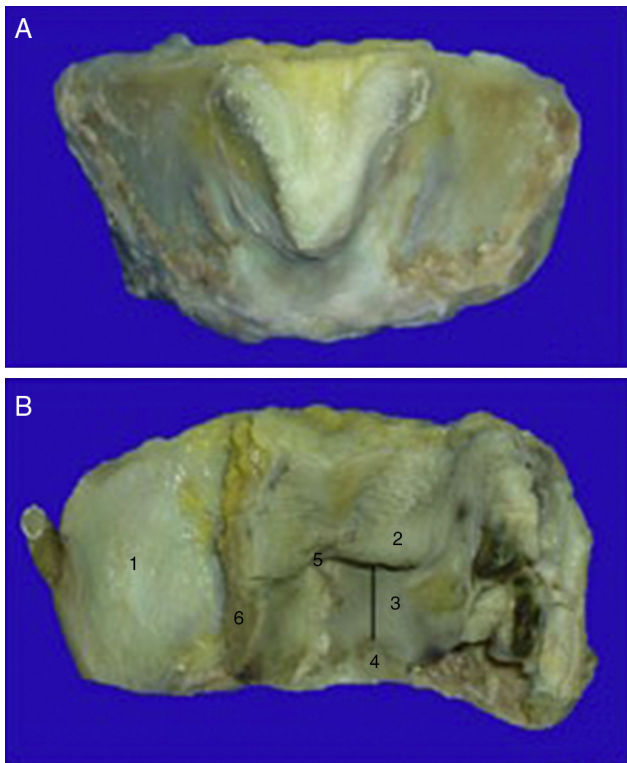


Figure 3 Supracricoid subtotal laryngectomy specimen. (A) Anterior view. (B) Posterior view. 1: Posterior wall of thyroid cartilage; 2: Ventricle band; 3: Vocal fold; 4: Morgagni ventricle; 5: Anterior commissure; 6: Paraglottic area.

slice enables an assessment to be made as to whether the tumour has infiltrated those structures.

All sagittal slices must be included in histopathological study (Fig. 4). Examination of the specimen under the microscope must determine the histological type of malignancy, the level of differentiation, maximum thickness, infiltration to paraglottic space, infiltration to anterior commissure and thyroid cartilage, vascular invasion, perineural invasion, the presence of dysplasia or in situ carcinoma in adjacent mucosa, and lastly surgical margin status. There is positive margin outcome if the tumour cells are in contact with the surgical margin dye.¹⁶

The histopathological report of the supracricoid subtotal laryngectomy specimen must include: (1) specimen sent and type of procedure performed; (2) location of malignant tumour (anatomical sites infiltrated by the tumour); (3) histological type; (4) histological degree; (5) tumour size; (6) tumour thickness (vertical growth towards paraglottic space measured in millimetres from the basement membrane of the epithelium lining); (7) tumour spread; (8) infiltration or non infiltration of anterior commissure; (9) infiltration or non infiltration of the thyroid cartilage; (10) vascular invasion; (11) perineural invasion; (12) presence or absence of in situ dysplasia in adjacent mucosa membrane; (13) surgical margin status.^{17,18}

The sites where infiltrated resection margins are most frequently infiltrated by tumours are: the junction of the vocal fold with the arytenoid mucosa membrane (posterior slice site) or the arytenoids themselves if they were

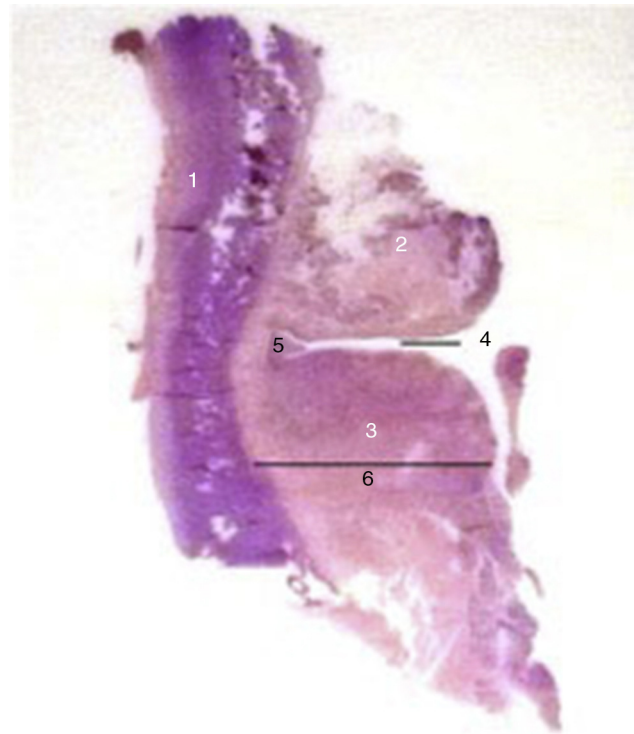


Figure 4 The following structures were identified in the sagittal slice: 1: Thyroid cartilage, 2: ventricle band; 3: vocal fold; 4: Morgagni ventricle; 5: Anterior commissure; 6: Paraglottic area.

included in surgery; tumour presence here involves tumour spread into the interarytenoid area and there is great risk of residual tumour in the remaining arytenoids; the mucosa membrane located below the anterior commissure; the lower surgical margin site, where the glottis connects with the subglottis and the mucous membrane below the vocal folds, which would involve subglottic tumour infiltration.¹⁶⁻¹⁸

Conclusions

Supracricoid subtotal laryngectomy is a therapeutic alternative in patients with locally advanced epidermoid cancer of the larynx where laryngeal function is satisfactory. Patient selection for this technique is based on 3 criteria: identification of the anatomical laryngeal sites invaded by the tumour, assessment of laryngeal function prior to surgical intervention and histopathological study of the surgical specimen.

Specimen analysis requires constant communication between the surgeon and the pathologist, so that the highest possible information relating to tumour status, laryngeal kinetics and determinable resection margins is maintained; correct pathological staging of the tumour depends on this and from here we are able to design a follow-up programme or possible adjuvant therapy.

Inappropriate pathological assessment may lead to the need for unnecessary surgical re-intervention for the patient, with excessive excisional consequences, or unnecessary postoperative radiotherapy with further damage to laryngeal function.

Conflict of interests

The authors have no conflict of interests to declare.

References

1. Ferlay J, Shin HR, Bray F, Forman D, Mathers C, Parkin DM. Estimates of worldwide burden of cancer 2008: GLOBOCAN 2008. *Int J Cancer*. 2010;127:2893–917.
2. SINAI/SINAVE/DGE/SALUD. Secretaria de Salud. Subsecretaria de Prevención y Promoción de la Salud. Dirección General de Epidemiología. Perfil Epidemiológico de los Tumores Malignos en México; 2011. Available from http://www.epidemiologia.salud.gob.mx/doctos/infoepid/publicaciones/2011/monografias/P_EPI_DE_LOS_TUMORES_MALIGNOS_M%C3%A9xico.pdf [accessed 10.08.14].
3. Gallegos-Hernández JF. El cáncer de cabeza y cuello. Factores de riesgo y prevención. *Cir Cir*. 2006;74:287–93.
4. Chu EA, Kim YJ. Laryngeal cancer: diagnosis and preoperative work-up. *Otolaryngol Clin N Am*. 2008;41:673–95.
5. Agrawal N, Ha PK. Management of early-stage laryngeal cancer. *Otolaryngol Clin N Am*. 2008;41:757–69.
6. Cavalot AL, Ricci E, Schindler A, Roggero N, Albera R, Utari C, et al. The importance of preoperative swallowing therapy in subtotal laryngectomies. *Otolaryngol Head Neck Surg*. 2009;140:822–5.
7. Rodrigo JP, Coca-Pelaz A, Suárez C. El papel actual de la cirugía parcial como estrategia de preservación funcional en el carcinoma de laringe. *Acta Otorrinolaringol Esp*. 2011;62:231–8.
8. Tufano RP, Stafford EM. Organ preservation surgery for laryngeal cancer. *Otolaryngol Clin N Am*. 2008;41:741–55.
9. Chawla S, Carney AS. Organ preservation surgery for laryngeal cancer. *Head Neck Oncol*. 2009;1:12.
10. Gallegos-Hernández JF, Minauro-Muñoz GG, Arias-Ceballos H, Hernández-Sanjuan JM, Flores-Díaz R, Resendiz-Colosía J. Faringo-laringectomías parciales para el tratamiento del cáncer faringolaríngeo. *Cir Cir*. 2008;76:213–7.
11. Majer EH, Rieder W. Experiences with cricohioidopexy. *Monatsschr Ohrenheilkd Laryngorhinol*. 1972;106:389.
12. Piquet JJ. Functional laryngectomy (cricohioidopexy). *Clin Otolaryngol Allied Sci*. 1976;1:7–16.
13. Gallo A, Manciooco V, Tropiano ML, Simonelli M, Marvaso V, d’Arcangelo E, et al. Prognostic value of resection margins in supracricoid laryngectomy. *Laryngoscope*. 2004;114:616–21.
14. Gallo A, Manciooco V, Simonelli M, Pagliuca G, d’Arcangelo E, de Vincentiis M. Supracricoid partial laryngectomy in the treatment of laryngeal cancer: univariate and multivariate analysis of prognostic factors. *Arch Otolaryngol Head Neck Surg*. 2005;131:620–5.
15. Mantilla-Morales A, Gallegos-Hernández JF, Posada Sibaja A. Estudio histopatológico en la pieza de laringectomía frontolateral. Puntos de interés clínico. *Cir Cir*. 2005;73:315–8.
16. Mannelli G, Meccariello G, Deganello A, Fiorini FR, Paiar F, Gallo O. Subtotal supracricoid laryngectomy: changing in indications, surgical techniques and use of new surgical devices. *Am J Otolaryngol*. 2014;35:719–26.
17. Buckley JG, MacLennan K. Cancer spread in the larynx: a pathologic basis for conservation surgery. *Head Neck*. 2000;22:265–74.
18. Rizzotto G, Crosetti E, Lucioni M, Succo G. Subtotal laryngectomy: outcomes of 469 patients and proposal of a comprehensive and simplified classification of surgical procedures. *Eur Arch Otorhinolaryngol*. 2012;269:1635–46.