

Surgical approach to submucosal lesions of the supraglottic larynx: the supero-lateral thyrotomy

JOHN S. RUBIN, M.D.,* CARL E. SILVER, M.D.** (New York, USA)

Abstract

The surgical approach to the hypopharynx by lateral pharyngotomy as described by Trotter has found widespread use in management of supraglottic carcinoma. A similar but more conservative approach may be employed for removal of cysts and benign or well-encapsulated neoplasms of the epiglottis and supraglottic space. We call this approach a supero-lateral thyrotomy, to differentiate it from the classic lateral pharyngotomy.

Surgery consists of subperichondrial resection of the superior half of the ipsilateral thyroid cartilage with preservation of internal lining and superior laryngeal nerve. The lesion may then be enucleated or resected, and the defect, if any exists, closed with overlying mucosa and the flap of preserved perichondrium. The technique has been employed in cases of paraganglioma, haemangiopericytoma and saccular cysts.

Introduction

The first documented approach to the pharynx via lateral pharyngotomy was performed by David Cheever, a clinical professor at Harvard in 1869, as part of a procedure for removal of a malignant tumour of the tonsil (Cheever, 1878).

This procedure was popularized by Wilfred Trotter in England in the second and third decade of this century. In 1920, Trotter stated, 'experience has convinced me that the best method of opening the pharynx to obtain access to growths and permit of their removal is through the lateral wall. The decisive advantage of this route is that it has no natural limits above and below.' Trotter demonstrated that a large portion of the laryngeal skeleton can be removed with good functional recovery (Trotter 1928); in so doing he gave credence to the concept of conservation surgery to the laryngopharynx.

Orton became interested in Trotter's work, and introduced it into American surgery in 1930. Following a period of disuse, Alonso in Uruguay (Alonso, 1952) and Som and Ogura in the United States (Som *et al.*, 1966) published on lateral pharyngotomy. Portmann (1949) and LeRoux-Robert (1965) proposed variants wherein a pharyngostome was created. By the mid 1960s, lateral pharyngotomy was utilized by many Head and Neck surgeons (Beekhuis and Croushore, 1963; Som *et al.*, 1966).

The concept of anterior (trans-hyoid) pharyngotomy is ascribed by Jeremitsch (1895) to the anatomist Vidal DeCassis. Jeremitsch appears to have been the first surgeon to actually perform the procedure in 1894. Spisharny and Grunwald both published successful case reports using the technique in 1906. Blassingame (1952) notes

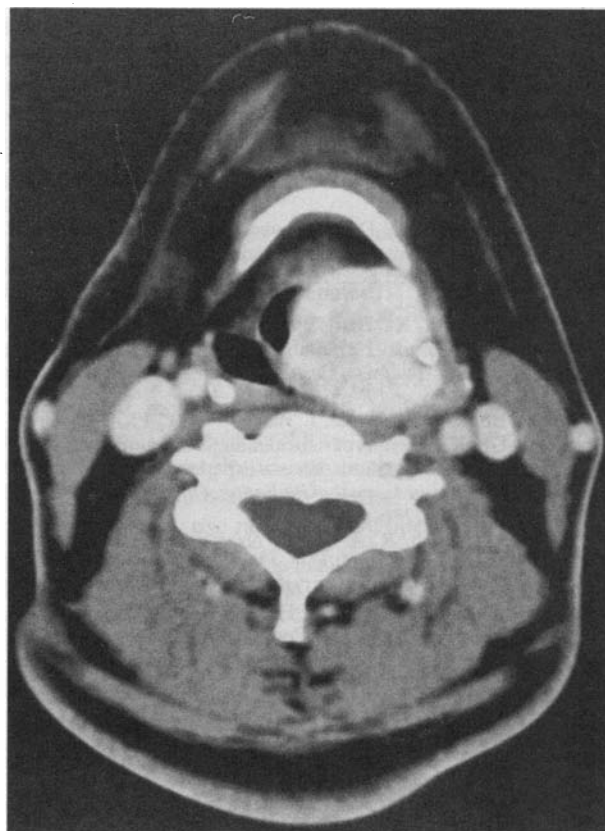


FIG. 1

Computed tomography of vascular supraglottic mass (haemangiopericytoma) demonstrating marked contrast enhancement.

*Departments of Otorhinolaryngology, and **Surgery, Montefiore Medical Centre, Bronx, NY, USA.

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that Grunwald's subsequent experience was unsatisfactory, causing him to criticize the technique, and the technique to fall into disuse for 50 years. In the early 1950s, Kloop and Delaney (1950) and Blassingame (1952) published on the technique, causing a renaissance of interest in it. In the 1960s, Yarrington and Frazer suggested the technique for internal laryngocoeles (Yarrington and Frazer, 1966).

Materials and methods

In selected cases of submucosal lesions of the supraglottis, we have been using a direct approach through removal of a small portion of the laryngeal skeleton. We have named this the supero-lateral thyrotomy approach, to decrease confusion with the traditional lateral pharyngotomy. This technique is a variant of that described by Som *et al.* (1966). Patients in whom the technique has found favour include those with vascular lesions of the supraglottis, and those with saccular or ventricular cysts who have failed laser marsupialization.



FIG. 2

Oesophagram of vascular supraglottic mass (haemangiopericytoma) demonstrating large filling-defect in hypopharynx.

The patient is worked up pre-operatively with Computed Tomography (CT) with contrast enhancement of the larynx and neck. Intense enhancement indicates a vascular tumour (Fig. 1). Angiography may provide further information, but has not been deemed necessary, to date, in our patients. Contrast oesophageal studies are occasionally performed to investigate the motility of the oesophagus and to identify the inferior extent of the lesion (Fig. 2). Pre-operative biopsy is contraindicated, as the bleeding may be uncontrollable through the endoscope, thus necessitating an emergency open procedure.

Operative management begins with tracheotomy. Exposure for the supero-lateral thyrotomy is obtained through a horizontal incision centred over the middle of the thyroid cartilage. Flaps are elevated in the sub-platysmal plane. On the side of the lesion, the strap muscles and inferior constrictor muscle are mobilized off of the thyroid cartilage, and the superior cornu of the thyroid cartilage is removed. The procedure now varies slightly depending on the nature of the pathology. If a vascular tumour is suspected, better exposure will be required than for a saccular cyst; in the former, the ipsilateral greater cornu of the hyoid bone is mobilized and removed; in the latter, the hyoid bone can be left in place.

The perichondrium is then carefully freed from the superior half of the ipsilateral thyroid cartilage (Fig. 3). A horizontal incision is made through the ipsilateral thyroid cartilage at mid-thyroid level, and the superior half of the ipsilateral thyroid lamina is removed. Care is taken to



FIG. 3

Operative technique: supero-lateral thyrotomy external perichondrium is elevated from the ipsilateral thyroid cartilage (haemangiopericytoma).

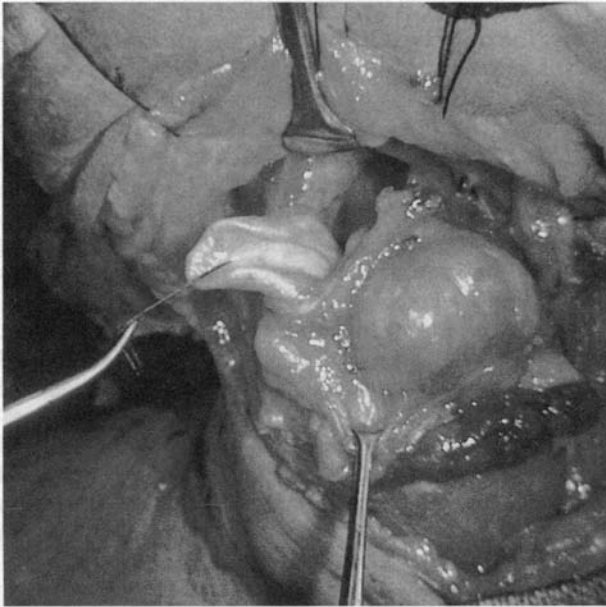


FIG. 4

Operative technique: supero-lateral thyrotomy supero-lateral thyroid cartilage now removed; perichondrial flaps are elevated. Pharyngeal mucosa is incised and epiglottis grasped in tenaculum. Tumour mass (haemangiopericytoma) is evident.

avoid damage to the inner perichondrium of the thyroid cartilage, which is also important in the repair of the defect.

An inferiorly based flap of this inner perichondrium is then developed. If the pathology is that of a saccular or ventricular cyst, the cyst will become immediately apparent once the inner perichondrial plane is developed. The cyst is readily mobilized and excised extramucosally, without disruption of pharyngeal mucosa.

If the pathology is that of a vascular tumour, a determination is made regarding extra- versus trans-mucosal extirpation. In our cases of vascular tumours, we elected to incise the pharyngeal mucosa, in order to achieve satisfactory exposure. The epiglottis was grasped with a tenaculum and the hypopharynx visualized directly (Fig. 4). At this point the tumour was easily removed.

After extra-mucosal removal, the pharynx must be carefully inspected for minute tears. Following trans-mucosal excision, the mucosa is sutured directly, and the suture line reinforced with both internal and external perichondrium, as well as with reapproximated strap muscles.

Case reports

Case 1:

A 49-year-old female presented in January 1985 with laryngeal obstruction requiring emergency tracheostomy, followed by endoscopy and attempted biopsy of the lesion. The biopsy produced considerable bleeding and was non-diagnostic. Work up, prior to transfer to our service included a CT scan demonstrating a large supraglottic mass which was partly intra and partly extra-laryngeal.

The patient was stabilized on our service and then taken to the operating theatre. Endoscopy revealed a large, extramucosal mass completely obstructing the endolar-

ynx. Supero-lateral thyrotomy was then performed. A vascular tumour mass was seen interposed between the thyroid cartilage and the hyoid bone on the right side. Due to the extent of the tumour, removal required a trans-mucosal approach. Reconstruction was performed with direct suture and closure with perichondrium. Pathology revealed paraganglioma, which was felt to probably be benign.

The post-operative course was uneventful, and the patient was decannulated within two weeks. Five years post-operatively, the patient has no difficulty swallowing, but is slightly hoarse. Fibreoptic evaluation of the larynx reveals minimal oedema of the arytenoids but excellent vocal cord mobility. There is no evidence of disease.

Case 2:

A 56-year-old male, noted slowly progressive dysphagia over a two year period. He denied haemoptysis or weight loss. He presented in January of 1987 with a sub-mucosal mass in the left side of the hypopharynx obliterating the left piriform sinus. Contrast oesophageal studies and CT scan were obtained which demonstrated a lobulated vascular mass in the hypopharynx, extending across mid-line but not obstructing the airway.

As the patient was not in respiratory distress, he was electively taken to the operating theatre, where a tracheostomy was initially performed. Supero-lateral thyrotomy was then performed. The superior laryngeal artery was noted to be feeding the tumour, and was ligated. A horizontal incision was performed through the pharyngeal mucosa and the epiglottis identified to facilitate removal of the lesion. Thereafter the tumour was easily removed without further violation of the pharyngeal mucosa. Pathology revealed a haemangiopericytoma, which was considered on histological grounds to be benign.

The patient did well in the post-operative period and was decannulated on the twenty-second post-operative day. Four years after operation there is no evidence of disease; the vocal cords are mobile and normal in appearance.

Case 3:

A 74-year-old female initially presented with respiratory distress in July 1988. The patient underwent a tracheostomy followed by endoscopy which revealed a large cystic mass protruding from the left ventricle. The lesion was laser marsupialized. The pathology was consistent with a saccular cyst, without evidence of malignancy. Initially the patient did well and was subsequently decannulated.

At one year after operation, the patient complained of dysphagia, and was noted to have recurrence of the saccular cyst. This was confirmed by a CT scan. A decision was made to approach the lesion externally. The patient had the tracheostomy re-opened, followed by supero-lateral thyrotomy with extramucosal removal of the saccular cyst. The patient is free of recurrence at two years post-operatively and has good laryngeal function, as demonstrated by fibreoptic laryngoscopy and objective measurements.

Case 4:

A 47-year-old woman presented in April 1989 with a

ten week history of hoarseness. Fiberoptic examination revealed a submucosal mass in the left side of the supraglottic larynx. CT scan demonstrated a well-circumscribed 3 cm mass in the left paralaryngeal space. At surgery, she underwent a tracheostomy, followed by supero-lateral thyrotomy. A respiratory lined epithelial cyst, arising from the ventricle was identified. It was excised extra-mucosally. She was decannulated on the eighth post-operative day.

After three months, fiberoptic endoscopy revealed normal vocal cord anatomy and motion. All external incisional scars are well healed and the patient was swallowing well.

Discussion

Any procedure which violates the pharyngeal mucosa risks post-operative dysphagia. The surgeon must weigh the advantage of exposure for potential restricted motility. Lateral pharyngotomy was a great advance when it was developed, in that it allowed for generous exposure of the pharynx with relatively little morbidity. The risk of injury to the ansa hypoglossi or the external branch of the superior laryngeal nerve, or the possibility of restriction from incision of the constrictor muscles is of little importance when weighed against the benefit of *en bloc* resection with adequate margins in cancer surgery. The technique has withstood the test of time.

Trans-hyoid pharyngotomy causes relatively little morbidity, as long as great care is taken to preserve the internal (sensory) branches of the superior laryngeal nerves, which are at risk as the surgeon attempts to increase exposure by laterally extending the incision in the trans-hyoid membrane. But the exposure is limited under the best of circumstances.

Laser laryngoscopy allows for good exposure endolaryngeally while avoiding disruption of pharyngeal integrity. Treatment of internal laryngocoeles and saccular cysts differs from one institution to another regarding an external *versus* endoscopic approach. While external approaches are the traditional conservative approach (Myssiorek and Persky, 1989), several centres have published on endoscopic marsupialization with or without laser (Booth and Birck, 1981; Komisar, 1987; Myssiorek and Persky, 1989). Holinger *et al.* (1978) recommended an endoscopic approach to saccular cysts but noted that recurrence, especially with lateral saccular cysts, is high, requiring an external surgical approach. Laser laryngoscopy is not appropriate for vascular tumours of the supraglottis.

Supero-lateral thyrotomy is a happy medium. It permits good exposure of the hypopharynx and endolarynx with little functional disability. Of greatest importance, the procedure allows for intraoperative flexibility. Unlike either lateral or trans-hyoid pharyngotomy the surgeon is not forced to disrupt the pharyngeal mucosa in order to obtain access. He can make the decision, once the cartilage is removed and the perichondrial flaps are elevated, as to an extra-mucosal *versus* trans-mucosal approach to the lesion.

Vascular submucosal tumours of the supraglottis are uncommon. If these were the only indication for supero-

lateral thyrotomy, it would be so little used as to be almost forgotten. Its use can, however, also be extended, as our service has demonstrated, to encompass saccular cysts and laryngocoeles which have failed endoscopic treatment. The technique undoubtedly has application to early carcinomas of the tip of the epiglottis and posterior pharyngeal wall; however, we have not yet used it as such. The technique is simple, easy to learn and to teach.

References

- Alonso, J. M. (1952) Conservation of function in surgery of cancer of the larynx: bases, technics and results. *Transactions of the American Academy of Ophthalmology and Otolaryngology*, **56**: 722–730.
- Beekhuis, G. J., Croushore, J. E. (1963) Surgical approach to neoplasms of the mesopharynx. *Laryngoscope*, **73**: 519–536.
- Blassingame, C. D. (1952) The suprahyoid approach to surgical lesions at the base of the tongue. *Annals of Otolaryngology and Laryngology*, **61**: 483–489.
- Booth, J. B., Birck, H. G. (1981) Operative treatment and post-operative management of saccular cyst and laryngocoele. *Archives of Otolaryngology*, **107** (8): 500–502.
- Cheever, D. W. (1878) Cancer of the tonsil: removal of the tumour by external incision (A second case). *The Boston Medical Journal*, **99**: 133–139.
- Grunwald, L. (1906) Pharyngotomia suprahyoidea. *Zentralblatt für Chirurgie*, **36**: 972–973.
- Harris, P. F., Rosenfeld, L., Ward, P. H. (1968) Lateral pharyngotomy approach for lesions of the base of the tongue, pharynx and larynx. *Southern Medical Journal*, **61**: 1276–1280.
- Holinger, L. D., Barnes, D. R., Smid, L. J., Holinger, P. H. (1978) Laryngocoele and saccular cysts. *Annals of Otolaryngology and Laryngology*, **87**: 675–685.
- Jeremitsch, T. (1985) Pharyngotomia suprahyoidea (proprie sic dicta). *Archiv für Klinische Chirurgie Berlin*, **49**: 793–802.
- Kloop, C. T., Delaney, A. (1950) Anterior (median) pharyngotomy. *Archives of Surgery*, **60**: 1161–1170.
- Komisar, A. (1987) Laser laryngoscopic management of internal laryngocoele. *Laryngoscope*, **97**: 368–369.
- LeRoux-Robert, J. (1965) Les possibilités thérapeutiques du cancer du larynx par la chirurgie et les associations radio-chirurgicales a propos d'une statistique personnelle de 1,000 cas operes depuis plus 5 ans. *La Presse Medicale*, **73**: 1031–1036.
- Myssiorek, D., Persky, M. (1989) Laser endoscopic treatment of laryngocoeles and laryngeal cysts. *Otolaryngology—Head and Neck Surgery*, **100** (6): 538–541.
- Orton, H. B. (1930) Lateral transthyroid pharyngotomy: Trotter's operation for malignant conditions of the laryngopharynx. *Archives of Otolaryngology*, **12**: 320–328.
- Portmann, G. (1949) Surgery at the base of the tongue by transpharyngeal approach. *Archives of Otolaryngology*, **50**: 373–376.
- Som, M. L., Silver, C. E., Carbajal, P. G. (1966) Surgical approaches to the hypopharynx for benign disease. *Archives of Otolaryngology*, **83**: 222–230.
- Spisharny, J. K. (1906) Pharyngotomia suprahyoidea. *Zentralblatt für Chirurgie*, **29**: 797–798.
- Trotter, W. (1920) A method of lateral pharyngotomy for the exposure of large growths in the epilaryngeal region. *Journal of Laryngology, Rhinology and Otolaryngology*, **35**: 289–295.
- Trotter, W. (1928) Operations for malignant disease of the pharynx. *British Journal of Surgery*, **16**: 485–495.
- Yarrington, C. T., Frazer, J. P. (1966) An approach to the internal laryngocoele and other submucosal lesions of the larynx. *Annals of Otolaryngology, Rhinology and Laryngology*, **75**: 956–960.

Address for correspondence:

Dr John S. Rubin, M.D.,
Department of Otorhinolaryngology,
Montefiore Medical Center,
111 East 210th Street,
Bronx, New York,
USA.

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