Otolaryngology–Head and Neck Surgery (2006) 134, 466-470

ORIGINAL RESEARCH

Transoral Approach to the Superomedial Parapharyngeal Space

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OBJECTIVES: To present our early experience with the transoral approach to the superomedial parapharyngeal space (PPS) and describe our technique for removal of these neoplasms.

STUDY DESIGN: Consecutive case series by one author (Y.D.).

METHODS: Eight patients with various neoplasms of the superomedial PPS were retrospectively reviewed for type of neoplasm, size, success with the transoral approach, need for conversion to another approach, length of hospitalization, and complications.

RESULTS: The transoral approach described herein safely allowed for en bloc resection of benign neoplasms with intraoperative control and exposure of the internal carotid artery. The most common pathology encountered was that of schwannoma. All patients were started on liquid diet on postoperative day 1. Average length of stay was 3.2 days (range, 2 to 5). Mean tumor size was 3.3 cm (range, 1.5 to 7 cm). No significant complications were felt to be related to the approach itself and visualization was felt to be excellent in each case without the need for conversion to a more extensive approach.

CONCLUSIONS: The transoral approach safely provides access to superomedial PPS lesions with decreased morbidity compared with traditional approaches. This technique is indicated for neoplasms with benign appearance on preoperative imaging or fine needle aspiration. This approach alone may not provide adequate access for resection of malignant lesions especially those with extension intracranially or to more inferior or laterally placed lesions of the parapharyngeal space.

EBM rating: C-4

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Tumors of the parapharyngeal space (PPS) are uncommon and account for only 0.5% of head and neck neoplasms.[1,2] The PPS, which is situated lateral to the pharynx and filled with fat and connective tissue, may be viewed as an inverted pyramid with its base at the cranial base and its apex at the greater cornu of the hyoid bone. It is limited superiorly by the temporal bone, inferiorly by the hyoid bone, posteriorly by the prevertebral fascia and musculature, medially by the superior pharyngeal constrictor, and laterally by the mandibular ramus, deep lobe of the parotid and the medial pterygoid muscle.[3,4] A condensation of fascia extending from the styloid process to the tensor veli palatini has traditionally allowed the parapharyngeal space to be divided into prestyloid and poststyloid compartments. The prestyloid compartment contains the parotid gland, fat, and lymph nodes. The poststyloid compartment contains the carotid sheath with the internal carotid artery, internal jugular vein, cranial nerves IX to XII, and lymph nodes. A variety of neoplasms may arise from any of the normal structures occupying these compartments. Tumors of the PPS include primary neoplasms, direct extension from adjacent regions and metastatic disease. Approximately 80% of PPS tumors are benign and 20% are malignant.[5]

Neoplasms of the PPS often present as asymptomatic lesions that are either discovered on routine physical exam or incidentally on imaging performed for other purposes. These tumors must grow to at least 2.5 to 3.0 cm before becoming clinically detectable.[5] Medial extension of the neoplasm may give rise to symptoms from compression of cranial nerves IX, X, XI, and XII and cause dysphagia, dysarthria, hoarseness, and airway obstruction.

Imaging is critical in the assessment of these patients. Determination of the origin of a given tumor of the PPS may often be determined with significant accuracy from preoperative imaging. A computed tomography (CT) scan with

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doi:10.1016/j.otohns.2005.10.003

and without contrast and a magnetic resonance image (MRI) with gadolinium enhancement are often used together to provide complementary information that allows the surgeon to delineate the size, precise location, and likely cause of these tumors.[6] Generally, prestyloid tumors are salivary neoplasms that displace the carotid sheath posteriorly, and poststyloid tumors displace the internal carotid artery in an anteromedial direction.[6] This displacement pattern places the internal carotid artery into view with the use of the approach outlined below.

The numerous surgical approaches[3,4,6-25] to the PPS discussed in the literature reflect the inherent difficulty of accessing this anatomically complex region in its entirety. The most commonly used approaches include the following: the transcervical approach, the transparotid approach, the transcervical-transparotid approach, the transoral approach, the combined transoral-external approach, and the combined cervical-transpharyngeal approach. Each can be used with the addition of a mandibulotomy if necessary.[26] The choice of approach should be dictated by the size of the tumor, location of the tumor in relation to vascular structures, and the index of suspicion for malignancy.[26] In this article, we describe a transoral approach to benign lesions in the superomedial portion of the PPS and review our experience.

METHODS

Description of Technique

Consent was obtained for conversion to an external approach with possible mandibulotomy in the event that transoral exposure was inadequate or a malignant pathosis was encountered. Intravenous antibiotics, most commonly cefazolin and metronidazole, and intravenous dexamthasone were given on call to the operating room. After orotracheal intubation or nasotracheal intubation via the nasal cavity contralateral to the neoplasm, a mouth gag is placed to retract the tongue. The mouth gag was released every 20 minutes to help alleviate base of tongue edema. An incision was fashioned to extend from the posterior edge of the hard palate, passing along the lateral edge of the soft palate and into the nasopharynx (Fig 1). The mucosa, submucosa and superior constrictor muscle are sequentially divided with needle tip electrocautery (Fig 2). The most important initial structure identified is the internal carotid artery that tends to be displaced anteromedially bringing it into the operative field with blunt dissection technique. Vascular loops are next placed loosely in a nonconstricting fashion around the internal carotid artery while it is separated from the neoplasm (Fig 3). Wounds are thoroughly irrigated with saline solution. Incisions are closed in 3 layers with resorbable sutures placed in the superior constrictor muscle, submucosal tissues, and in the mucosa. Watertight closure is essential.

Postoperative management should include airway observation in a monitored setting during the first postoperative day, perioperative steroid therapy, and intravenous antibiotics during their hospitalization. Patients are started on a liquid diet on the first postoperative day and limited to a soft diet for 2 weeks.

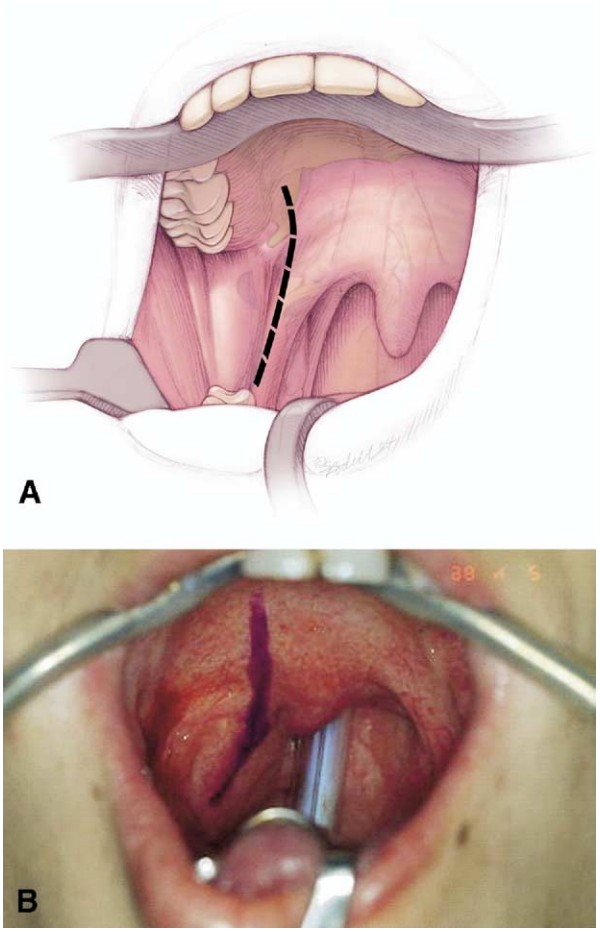

Figure 1 Oropharynx has been visualized and planned access incision has been demarcated.

RESULTS

There were a total of 8 patients treated via this approach by the senior author (Y.D.), with 5 females and 3 males, average age 29.7 years (range, 12 to 56). All patients underwent complete resection of their lesions via the transoral approach. Average length of hospitalization was 3.2 days (range, 2 to 5). Pathology findings included: schwannoma (n = 3), teratoma (n = 2), neurofibroma (n = 1), lyphoepithelioma (n = 1) and lipoma (n = 1). Tumor size varied from 1.5 to 7 cm (mean, 3.3 cm). Postoperative deficits were limited to the expected laryngeal nerve palsies after resection of vagal schwannoma lesions. Two vagal schwannomas were treated with sacrifice of the vagus and 1 was treated by resection of the schwannoma without complete nerve sacrifice. This patient nonetheless developed a poorly compensated vocal cord paralysis that necessitated a secondary thyroplasty because of symptomatic dysphonia and cough,

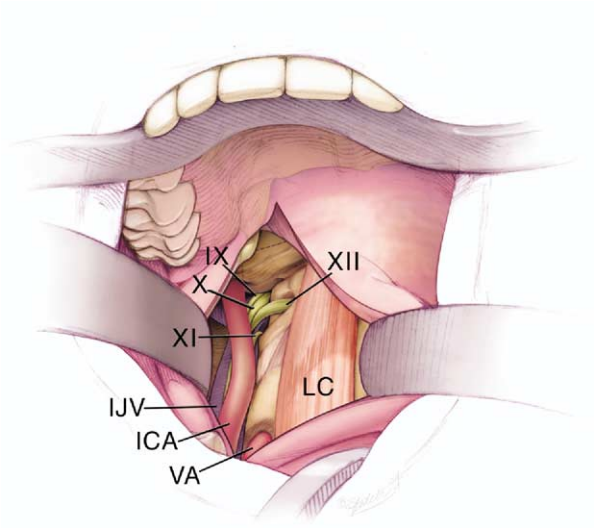

Figure 2 Mucosa and pharyngeal constrictors have been incised and reflected medially to allow direct access to the superomedial parapharyngeal space. (*LC,* longus capitis; *IJV,* internal jugular vein; *ICA,* internal carotid artery; *IX,* glossopharyngeal nerve; *X,* vagus nerve; *XI,* accessory nerve; *XII,* hypoglossal nerve.)

both of which resolved after this procedure. None of the patients developed airway compromise, postoperative infections, or dehiscence of the mucosal incision. None of the patients in this series have demonstrated residual or recurrent neoplasms either clinically or radiographically during their follow-up period (average, 28.2 months, range, 12 to 72 months).

DISCUSSION

Numerous approaches have been described for resection of PPS neoplasms including the transcervical approach, the transparotid approach, the transoral approach, the transcervical-transpharyngeal approach, infratemporal fossa approach, and combinations of the above. Mandibulotomy or mandibulectomy provides increased exposure and may be used in conjunction with the external approaches.[3,6-19] A transcervical approach through the submandibular space may allow removal of small lesions confined in the lower PPS. Division of the stylomandibular ligament, posterior digastric, stylohyoid, and styloglossus muscles allows greater access to the superior PPS.[1,21] A transparotid approach is indicated with deep lobe parotid tumors to facilitate facial nerve preservation.[4,6] The transcervical-transparotid approach provides additional exposure of the PPS by providing access from both a lateral and inferior direction.[1,6]

Anterior dislocation of the mandible with maximal jaw opening provides improved superior exposure with a transcervical approach.[3,20] Mandibulotomy allows wider exposure of the PPS and has been recommended for large neoplasms, malignancies, highly vascular tumors, and lesions that require proximal and distal control of the internal carotid artery.[2] Midline mandibulotomy, also known as the mandibular swing approach, is most often used for resection of oral cavity and oropharyngeal malignancies. An intraoral incision coursing from the floor of mouth to the anterior tonsillar pillar allows the mandible to be retracted laterally. It provides access to the oropharynx, retropharynx, parapharyngeal space, superior cer-

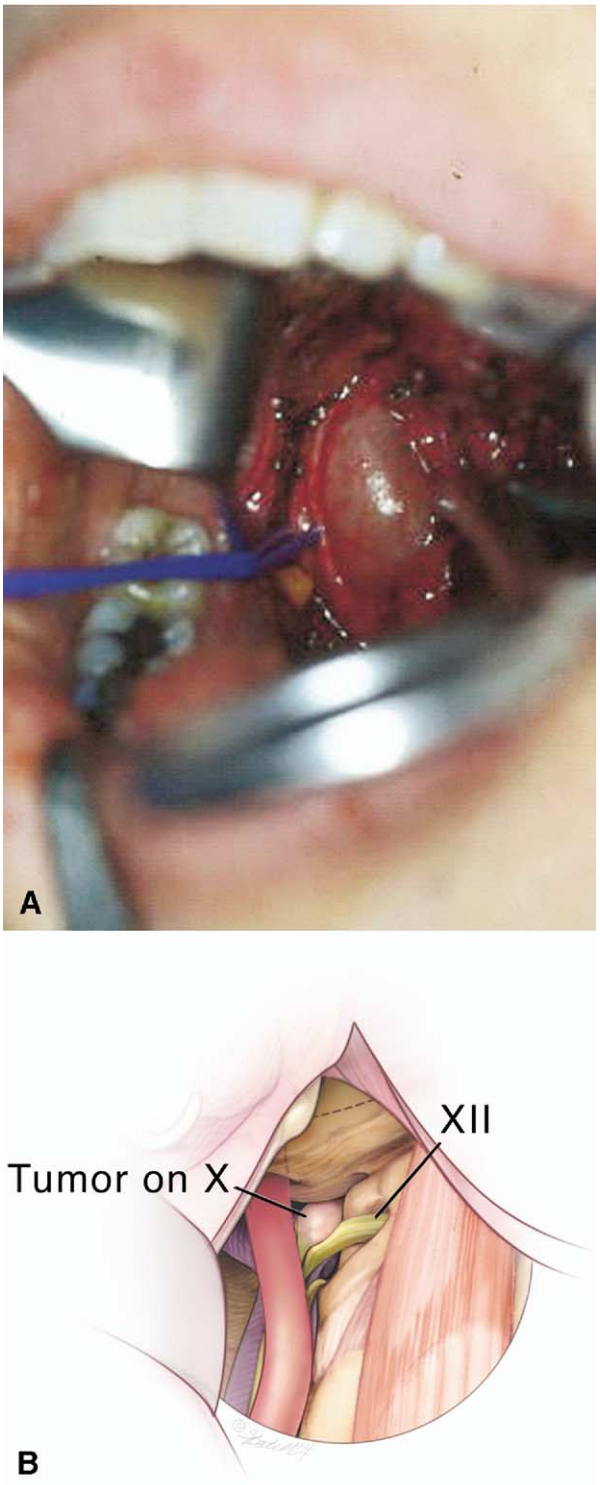

Figure 3 Intraoperative view demonstrates schwannoma of right vagus nerve. *Blue vascular loop* is around internal carotid artery.

vical vertebrae, and skull base.[6,23] A tracheotomy and nasogastric feeding tube are recommended with this approach. Patients managed with a transcervical-transparotid approach with midline mandibulotomy typically have been reported to require hospitalization for 10 to 14 days.[6] Our personal experience is generally somewhat shorter. The parapharyngeal space may also be approached via a lateral mandibulotomy in the ramus.[17,18] A double mandibular osteotomy has also been described for accessing the parapharyngeal space.[11,16]

Osteotomies are made in the parasymphaseal region and horizontally in the ascending ramus superior to the mandibular foramen. The mandibular segment may then be retracted laterally with the attached masseter and cheek.[11,16] The subcutaneous mandibulotomy approach was recently reported to allow resection of tumors greater than 5 cm located in the superior medial PPS. A midline mandibulotomy and division of the mylohyoid, anterior belly of the digastric, and geniohyoid muscles allow the mandible to be rotated superolaterally.[19] This technique avoids the morbidity of intraoral and lip-splitting incisions and the need for a tracheotomy.[19] In most series reviewing PPS neoplasms, mandibulotomy or mandibulectomy was performed less than 10%, with a range of 0-26%.[1,2,6,24-26] Many authors believe that a transoral approach is contraindicated with PPS lesions because of a concern for risk of hemorrhage, damage to cranial nerves, tumor spillage, and decreased exposure.[1,2,26] A review from The University of Cincinnati experience with 123 PPS cases reported an external approach for all lesions.[2] Transoral resection of minor salivary gland and deep lobe pleomorphic adenomas was performed by Allison et al[26] in 3 cases, however, spillage of tumor occurred in 2 of the procedures. They also experienced tumor rupture in 4 of 9 patients managed with a combination transoral-external approach. Lau et al[21] abandoned the transoral-external approach after reporting spillage of tumor in 2 of 3 cases. Goodwin and Chandler[22] recommended a transoral approach be limited to benign salivary tumors of the PPS that were not palpable in the neck or parotid gland.

We have described a transoral approach for resection of superomedial parapharyngeal benign neoplasms with decreased morbidity compared with traditional approaches. This technique provided sufficient exposure for en bloc resection of lesions up to 6 cm without tumor spillage. Proximal and distal control of the internal carotid artery was obtained without vascular complications. Patients were able to start oral intake on postoperative day 1 and had a short hospitalization. In contrast to external approaches, dissection in proximity to facial nerve branches is not required. The potential for postoperative salivary fistula present with transparotid techniques is avoided. Approaches with a mandibular osteotomy have the potential complications of malocclusion, nonunion, loss of dentition, inferior alveolar nerve injury, and often require a lip-splitting incision, tracheotomy, and nasogastric tube. Potential complications of our approach include velopalatal insufficiency and Eustachian tube dysfunction because of the transoral dissection. No patients in this series have been diagnosed with hypernasality or serous otitis media on follow-up. We believe the risk of levator veli palatini muscle or soft palate dysfunction to be low because of meticulous wound closure with loupe magnification. All patients were found to have excellent healing of the incision without functionally relevant deformation of the soft palate.

We use the transoral approach for benign lesions of the superomedial PPS. We believe that the exposure achieved with this approach is superior to that achieved by more extensive approaches. With more traditional approaches to the parapharyngeal space, we feel that access to the superomedial portion of this space is quite limited and at the far limit of the exposure. The transoral approach described above brings the neoplasm directly into view in the superficial portion of the dissection. In addition, control of the internal carotid artery both proximal and distal to the neoplasm is much simpler to achieve with this approach. Distal control of the carotid may not be possible from more inferior approaches. Preoperative imaging with a contrasted CT scan and a MRI with gadolinium is indicated to properly select patients for this approach. With suspected malignant conditions, extensive lesions, deep lobe parotid pleiomorphic adenomas, tumors displacing the carotid artery laterally, tumors involving the jugular foramen, and highly vascular tumors, we use traditional external approaches, often in conjunction with this approach if there is extension to the superomedial PPS.

CONCLUSIONS

The transoral approach to the superomedial PPS achieves excellent exposure for resection of benign neoplasms in selected patients. This technique avoids much of the potential morbidity associated with traditional external techniques while improving carotid artery control and bringing the tumor directly into the superficial aspect of the dissection. We recommend this approach for properly selected benign lesions of the superomedial PPS.

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