Surgical management of parapharyngeal space tumors: A 10-year review

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OBJECTIVE: The purpose of this article is to describe the diagnostic evaluation and surgical approaches to parapharyngeal space tumors in a tertiary referral center.

STUDY DESIGN AND SETTING: The study is a retrospective review of 47 patients diagnosed with tumors of the parapharyngeal space (12 with malignant diseases and 35 with benign lesions) and surgically treated during a 10-year period. The transcervical (40%) and the transcervical-transparotid approaches (46%) were the most commonly performed surgical procedures followed by the orbitozygomatic-middle fossa approach (12%) and the transmandibular approach (2%).

RESULTS: The surgical procedures were uneventful and there were no postoperative mortalities. Complications were rare; the most common was transient facial nerve paralysis (5 patients). After an average follow-up of 35 months, only 1 of 35 patients with benign diseases had a recurrence 5 years following transcervical resection of a pleomorphic adenoma. Of 12 patients with malignant tumors, 5 (42%) are alive with no evidence of disease. The sensitivity of preoperative fine needle aspiration biopsy (n = 23 patients) was 87% for detection of malignant disease and specificity was 100%.

CONCLUSIONS: Most benign parapharyngeal space tumors can be removed surgically with a low rate of complications and recurrence. Malignant neoplasms, however, carry an ominous prognosis and a low rate of disease-free survival. Fine needle aspiration may be helpful in preoperative diagnostic evaluation of patients with parapharyngeal space tumors. (Otolaryngol Head Neck Surg 2005;132:401-6.)

The parapharyngeal space (PPS) is one of the potential spaces surrounding the pharynx and harbors 0.5% of all head and neck neoplasms. Tumors of the PPS may be either primary or metastases. The anatomy of this inverted pyramid-shaped space had been described in detail previously, and its complexity accounts for the diversity of surgical approaches for removal of parapharyngeal space tumors (PPSTs). Most PPSTs are benign (70% to 80%) with those originating from the salivary glands comprising 40% to 50% of the total. The rest are neurogenic (20%) or enlarged lymph nodes (15% to 20%).

PPSTs may be undetected for a long period of time, after which they usually present as an asymptomatic mass displacing oropharyngeal structures medially. Manifestations of PPSTs include a mass in the oropharynx, change in voice, trismus, mass in the upper neck, cranial nerve deficits, obstruction of the eustachian tubes, and, rarely, obstructive sleep apnea. A variety of surgical approaches have been described for management of PPST, the more common among them include the transcervical, transparotid-transcervical, and the transcervical-transmandibular approaches. The surgical approach chosen is that which will maximize exposure for complete tumor resection while minimizing functional and cosmetic morbidity.

This article describes our 10-year experience of managing these tumors. We describe the current diagnostic evaluation used for decision making regarding surgical planning and report our surgical approach for removal of tumors of the PPS.

METHODS

Patient Population

This retrospective study includes all patients diagnosed with a PPST between 1993 and 2002 at a referral center. Patients were evaluated by a head and neck surgeon, and if indicated, by a reconstructive surgeon and a neurosurgeon. All patients were operated on by the same surgical team. The medical charts were retrospectively analyzed. Patients were followed for an average of 3 years.
Imaging

A contrast computerized tomographic (CT) scan and a basic magnetic resonance imaging (MRI) study with fat suppression were performed. A T2-weighted study with fat suppression was usually added. Our opinion as well as that of others7,8 is that MRI is superior to CT in diagnosing tumors of the PPS. Anterior displacement of the carotid artery and the internal jugular vein is suggestive for poststyloid tumors and vice versa.

Visualization of a vascular flow void on an MRI study is usually sufficient, but magnetic resonance angiography (MRA) was occasionally added for supportive evidence for vascular tumors.

In a few cases, we used dynamic MRI8 to improve confidence in this aspect. After a bolus injection of a standard dose of gadolinium, a short T1-weighted study is directed at the region of interest and sequentially repeated for about 2 minutes. The time curve of the signal intensity is then generated on a workstation and compared to that of a blood vessel when possible. A sharp and early rise of signal intensity, that is followed by a rapid drop (also called washout), similar in shape and magnitude to that seen in blood vessels, is characteristic of vascular lesions (Fig 1). In our opinion, this is the most accurate noninvasive method for determining the vascularity of a lesion; therefore, we used it in most cases of poststyloid tumors before possible angiography.

For prestyloid tumors, demonstration of a preserved fat plane between the deep parotid lobe and the tumor is indicative of a separate tumor of the PPS, most commonly originating from extraparotid minor salivary glands. The lack of visualization of this plane may indicate a tumor originating in the deep lobe of the parotid gland or a large tumor that is either compressing this plane or, rarely, invading it. MRI is superior to CT in such differentiation8 and high-resolution images are often essential.

Surgical Techniques

Various surgical approaches for the resection of PPSTs were used: the transcervical-transparotid, transcervical, orbitozygomatic middle fossa and transmandibular approach, and combinations thereof.

The transcervical-transparotid approach (n = 22). This approach is suitable for tumors of the PPS originating in the deep lobe of the parotid gland. A routine superficial parotidectomy is performed with dissection of all facial branches as distally as possible to allow maximal mobilization of the branches. The various branches are then sharply dissected away from the deep lobe of the parotid. A routine transcervical exposure of the PPS is gained via the cervical part of the Blair incision. The tumor is removed with blunt dissection that is possible once exposure of the PPS is maximal and the facial nerve has been dissected away from the tumor.

The transcervical approach (n = 19). The transcervical approach for the removal of tumors of the PPS was first described in 19559 and in our experience is the easiest approach for resection of these tumors. The transcervical is the optimal approach for removal of tumors of the PPS that originate in the minor salivary glands and schwannomas of the PPS, both of which account for most tumors of the PPS.

The orbitozygomatic-middle fossa approach (n = 6). This surgical approach for large tumors of the PPS that involve the temporal bone was described in detail by Fisch.10 It is needed only for resection of extremely large tumors of the PPS with considerable skull base involvement, such as lesions invading the clivus, petrous bone, infratemporal fossa, and nasopharynx (Fig 2). For the orbitozygomatic-mid-
dle fossa approach, an orbitozygomatic osteotomy together with a middle fossa pterional craniotomy is performed, gaining access to the infratemporal fossa, lateral skull base, and parapharyngeal space. If needed, a cervical approach may be added in continuity with the hemicoronal-parotidectomy incision. The tumor may be removed after full exposure has been gained (Fig 2). After resection of the tumor, the pterional bone flap as well as the zygoma and lateral orbital wall are plated in their original anatomic position.

**The transmandibular approach (n = 1).** This approach is suitable for patients with extremely large tumors (Fig 3), those with vascular lesions or those with lesions invading the skull base that need better exposure to allow a safe resection. Once the mandible is split, a paralingual incision is made until it reaches the posterior floor of the mouth or until the 2 segments of the mandible can be adequately separated with exposure of the tumor. Further dissection along the anterior tonsillar pillar can be used to gain greater access to the PPS. The tumor is then removed under direct visualization of the surrounding structures (Fig 3).

**Reconstructive considerations.** A primary closure of the surgical defect was routinely used when possible. A reconstructive procedure was performed when sacrifice of the facial nerve was required. In these cases, an interposition nerve graft was used (the greater auricular nerve) during the same procedure. At times a temporalis muscle sling was rotated downwards, passed subdermally and sutured to the oral commissure to achieve better symmetry of the mouth. High-risk patients with a low life expectancy did not undergo reconstruction of the facial nerve. If skin was resected together with the tumor, a primary closure was performed if possible. In selected cases, rotational flaps (cervicofacial flaps) were required. Larger defects required regional flaps (pectoralis major myocutaneous flap, temporalis muscle flap) or free flaps (a radial forearm fasciocutaneous flap or a scapular flap). Large mucosal oroparapharyngeal defects were reconstructed with a radial forearm fasciocutaneous flap. Combined skin and mucosal defects were reconstructed with free flaps folded over themselves (“sandwiched”) with de-epithelialized surface in between the 2 parts of the flap.

**RESULTS**

Forty-seven patients with a tumor of the PPS who were operated on during a 10-year period (1993 to 2002) were enrolled in this study. There were 18 men and 29 women with an average age of 46 years (13 to 82). Of the 47-patient cohort, 35 (74%) presented with benign tumors and 12 (26%) had malignant lesions. The most common histopathologic diagnosis was pleomorphic adenoma of the deep lobe of the parotid gland or minor salivary glands (n = 17, Table 1) followed by schwannomas (n = 7). Eight patients had undergone previous surgery involving the same anatomic region (3 of them had had more 3 surgical interventions before the index operation). Recurrent tumors...
included pleomorphic adenoma of parotid gland origin (n = 5), 1 recurrent squamous cell carcinoma of the skin of the temple invading the infratemporal fossa and the skull base, and 1 recurrent carotid body tumor. One patient with a porocarcinoma of the temporal bone and neck had undergone 17 previous operations. Two patients were previously treated with radiation for an adenoid cystic carcinoma and a mucoepidermoid carcinoma, while 1 patient with a malignant peripheral nerve sheath tumor (malignant PNET) had received chemotherapy prior to his surgical intervention.

Preoperative fine needle aspiration (FNA) was performed in 23 patients and an accurate diagnosis was made in 15 patients (65%). The sensitivity and specificity for a malignant process was 87% and 100%, respectively.

All patients underwent surgical excision of their tumor; 48 surgical interventions were performed (Table 2). Soft tissue reconstruction was needed in 8 patients using a temporalis muscle flap (n = 4), scapular free flap (n = 2), radial forearm free flap (n = 1), and abdominal fat alone (n = 1). The facial nerve was sacrificed in 6 patients and reconstructed with greater auricular nerve interposition graft in 4 patients with satisfactory results. The nerve was not repaired because of a highly malignant neoplasm in 2 patients with significant co-morbidity. In these cases a temporalis muscle sling was performed as previously described.

There were no surgery-associated mortalities. The most common postoperative complication was facial nerve palsy. This occurred in 5 patients (all branches in 1 patient and the marginal mandibular nerve in 4 patients) with spontaneous resolution in all cases. Vocal cord paralysis due to vagal transection occurred in 11 patients with neurogenic tumors of the vagus nerve. One patient with a sympathetic chain schwannoma had Horner’s syndrome and another patient had V2 deficit after resection of a schwannoma of the trigeminal nerve. Other complications included pulmonary embolism (n = 1), necrosis of a skin graft over a pectoralis major myocutaneous flap (n = 1), a decubitus wound (n = 1) and Frey syndrome (n = 1).

Of the 35 patients with benign disease, only 1 with a pleomorphic adenoma recurred 5 years after her initial surgery (mean follow-up, 35 months). Of the 12 patients with malignant tumors, 3 (25%) died of disease (2 malignant schwannomas, 1 non-Hodgkin’s lym-

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**Fig 3. A,** Preoperative MRI of a large recurrent pleomorphic adenoma of the PPS. The tumor reached the internal carotid artery and surrounded the external carotid artery and the internal jugular vein. **B,** Surgical field after tumor resection; the external carotid and internal jugular vein were resected while the internal carotid artery and the lingual, hypoglossal and superior laryngeal nerves were preserved.
phoma), 3 (25%) are alive with disease, and 5 (42%) patients are alive with no evidence of disease. The rate of locoregional control for patients with malignant neoplasms was 50%. Postoperative radiotherapy was delivered to 7 of our 12 patients with malignant diseases. Of these 7 patients, 3 are alive with no evidence of disease, 3 are alive with disease, and 1 died of disease (disease-free survival 40% compared with 50% in 4 patients that did not receive postoperative radiation).

**DISCUSSION**

The purpose of this study was to evaluate the current diagnosis and surgical management of tumors of the PPS. We have used the transcervical or the transcervical-transparotid approach in the vast majority of our patients (41 of 47 patients, 87%). Similarly, Malone et al. and Hamza et al. have successfully used the transcervical approach for resection of tumors of the PPS in 90% and 100% of their patients, respectively. In a larger series of 172 patients, Hughes et al. reported success with the transcervical transparotid approach in 94% of the patients. However, the transmandibular approach in our series was used only once (2%) for resection of an extremely large recurrent tumor invading the skull base. This tumor was previously operated through a transoral approach. Others have also used the transmandibular approach in the minority of their patients with PPS tumors; 6% of 172 patients in 1 series and in 3 of 33 patients in another. Indications for mandibulotomy besides size and skull-base invasion include gaining better exposure of the carotid artery and internal jugular vein in patients with vascular tumors of the PPS.

We have used the orbitozygomatic approach with or without pterional craniotomy more commonly than previously reported. Since our institution serves as a tertiary referral center for skull base and maxillofacial surgery, a large number of patients with extensive and recurrent tumors involving the parapharynx, infratemporal fossa, and middle cranial fossa were referred to our service requiring a more aggressive approach. The excessive use of the orbitozygomatic-middle fossa approach was safe and facilitated tumor removal in this specific group of patients with minimal postoperative morbidity.

We did not use the peroral approach to PPS. Considering the risk of vascular injury as well as the complexity of future resection after adherence of the tumor to the pharyngeal mucosa, we believe that this approach should be minimized for management of tumors of the PPS. Goodwin and Chandler, however, reported their experience with the peroral approach for resection of small tumors of the PPS that were not palpable through the parotid or neck and seemed to be avascular on imaging studies. Although 1 of 4 patients who were followed for more than 5 years recurred locally, those authors felt that the approach may be adequate for patients presenting with avascular tumors of the PPS.

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**Table 1. Pathology of parapharyngeal space tumors**

<table>
<thead>
<tr>
<th>Site of origin</th>
<th>Subsite</th>
<th>Pathology</th>
<th>Number of patients</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parotid gland</td>
<td>Deep lobe</td>
<td>Pleomorphic adenoma</td>
<td>13</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Warthin’s tumor</td>
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</tr>
<tr>
<td></td>
<td></td>
<td>Adenoid cystic carcinoma</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Mucoepidermoid carcinoma</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Myoepithelial carcinoma</td>
<td>1</td>
</tr>
<tr>
<td>Minor salivary glands</td>
<td>Parapharynx</td>
<td>Pleomorphic adenomas</td>
<td>4</td>
</tr>
<tr>
<td>Neurogenic</td>
<td>Parapharynx</td>
<td>Schwannomas</td>
<td>7</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Neurofibroma</td>
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</tr>
<tr>
<td></td>
<td></td>
<td>Paraganglioma</td>
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<td>Invading parapharynx</td>
<td>Carotid artery</td>
<td>Carotid body tumors</td>
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<tr>
<td></td>
<td>Skin</td>
<td>Porocarcinoma</td>
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</tr>
<tr>
<td>Metastatic lymph nodes</td>
<td>Skin</td>
<td>Squamous cell carcinoma</td>
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</tr>
<tr>
<td></td>
<td>Lymphoma</td>
<td>Small cell lymphoma</td>
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</tr>
<tr>
<td>Total</td>
<td></td>
<td></td>
<td>47</td>
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**Table 2. Surgical approach for resection of parapharyngeal space tumors**

<table>
<thead>
<tr>
<th>Approach</th>
<th>Number of cases (%)</th>
</tr>
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<tr>
<td>Transparotid transcervical</td>
<td>22 (46)</td>
</tr>
<tr>
<td>Transcervical</td>
<td>19 (40)</td>
</tr>
<tr>
<td>Infratemporal fossa approach</td>
<td>6 (12)</td>
</tr>
<tr>
<td>Transmandibular</td>
<td>1 (2)</td>
</tr>
<tr>
<td>Total</td>
<td>48* (100)</td>
</tr>
</tbody>
</table>
The low cure rate of our patients with malignant neoplasm of the PPS (disease-free survival, 42%) is in agreement with others. Hughes et al\textsuperscript{13} reported a recurrent disease in 27 of their 35 patients with malignant tumors of the PPS after a mean follow-up of 2.5 years (disease-free survival, 23%). Katsantonis et al\textsuperscript{15} report a 3.5-year survival of 50% of a group of 18 patients with parotid tumors invading the PPS after radical resections. These low cure rates may be attributed to the difficulty in diagnosing these lesions at an early stage, as previously mentioned.

Patients that received postoperative radiation did poorly in our study (disease-free survival, 40%). There is an obvious selection bias in this small group of patients, and thus we cannot conclude that radiotherapy does not improve survival of patients with malignant diseases of the PPS. Because there are no studies evaluating the indications for radiation therapy after resection of malignant tumors of the PPS, we recommend adhering to those described by Carrau et al\textsuperscript{16} that is, postoperative radiotherapy should be considered for patients with high-grade malignancies or when wide surgical margins could not be achieved. With neoplasms of the PPS, these indications will include almost all patients. The role of FNA as part of the routine preoperative evaluation of patients with PPST is still unclear. Hughes et al\textsuperscript{13} reported an accurate FNA biopsy in only 8 of their large group of 172 patients. Cramer et al\textsuperscript{17} however, have used transoral FNA in a group of 7 patients with tumors of the PPS and conclude that FNA may be a helpful tool in the evaluation of these patients especially since an open biopsy is contraindicated. In agreement with our results, Zbaren et al\textsuperscript{18} reported a high rate of accuracy (86%) with FNA cytology for the diagnosis of parotid tumors. In a recent report of 63 tumors of the PPS,\textsuperscript{19} the overall accuracy of FNA biopsy exceeded 88%. We suggest that an FNA is indicated in the majority of patients with tumors of the PPS once the diagnosis of vascular lesions is ruled out (by the imaging studies); the morbidity is almost nonexistent and the advantage of preoperative diagnosis especially of lymphomas, metastatic lesions, and other malignant neoplasms may be of utmost importance. Nonetheless FNA would be inadequate to distinguish benign from malignant paranglioma nor can it definitively distinguish benign from malignant nerve sheath tumors.

In conclusion, tumors of the parapharyngeal space represent a group of interesting though uncommon tumors. Knowledge of the differential diagnosis and a thorough diagnostic workup that includes imaging and FNA should allow for an accurate diagnosis and a safe resection. Surgery of tumors of the PPS may be performed in most patients via the transcervical or transcervical-transparotid approach with no need for any major reconstructive procedures. In a small number of patients with extremely large tumors extending to the skull base, invasive malignancies, or tumors requiring concomitant partial pharyngectomy, the transmandibular or orbitozygomatic middle fossa approach may be used.

We thank Esther Eshkol for her editorial assistance.

REFERENCES