



Transoral robotic surgery for prestyloid parapharyngeal space masses

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Parapharyngeal space (PPS) tumors can be divided anatomically into two major categories based upon location relative to the styloid process. Prestyloid masses are usually benign salivary gland tumors. Traditionally, these have been removed by transcervical, transparotid, or transmandibular approaches or a combination of these. While transoral removal of prestyloid masses is not a new concept, it has not been popular due to concerns about safety. The introduction of TransOral Robotic Surgery (TORS) has made removal of prestyloid tumors feasible in the majority of patients. Other parapharyngeal space tumors can be removed transorally as well. The focus of this article is to describe the technical details of TORS removal of prestyloid parapharyngeal space masses. Careful preoperative assessment and attention to intraoperative technical details are the keys to safe surgery in this area. Very specific indications and contraindications exist for the procedure. Numerous advantages of this approach are detailed. Complications have been minor and very uncommon and easily managed using the techniques described herein.

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Parapharyngeal space (PPS) tumors can be divided anatomically into 2 major categories, the prestyloid and poststyloid compartments. The most common primary lesions that originate in the prestyloid PPS are salivary tumors, and the most common histology is pleomorphic adenoma. Prestyloid PPS salivary tumors may arise from either the deep lobe of the parotid gland or from minor salivary rests. The typical radiographic appearance of a prestyloid, benign minor salivary gland tumor is shown in [Figure 1](#). Schwannomas of the trigeminal nerve may also present in the prestyloid PPS. Other entities such as cysts, lymph nodes, and vascular lesions occur infrequently.

Despite concerns for vascular injury, transoral surgery for PPS tumors was one of the more common approaches used in the 1920s.¹ Technological and pharmaceutical

advances during the late 1930s through the 1950s improved the safety of open surgical approaches. This led to the acceptance of open surgery as the preferred approach for PPS tumors in the 1960s.² With the advent of computed tomography (CT) in 1972, there was further refining of external surgical techniques. Carrau et al³ from the University of Pittsburgh published a series of 51 patients with PPS tumors where more than 75% were removed via a transcervical approach. The series demonstrated the efficacy of this approach for many PPS tumors and also showed that advanced imaging could correctly determine the tumor location in 96% of the cases. The Pittsburgh series also showed that complications were common and occurred in 48% of patients, with 11% resulting in permanent injuries. Hughes et al⁴ published the Mayo clinic experience with 172 primary PPS tumors, most of which were effectively treated using a transcervical-transparotid approach. However, 6% of the patients in the Mayo series required mandibulotomy, and vascular injury occurred in 5 patients who underwent an open transcervical approach. Although opinions vary as to the benefit of transparotid approaches for

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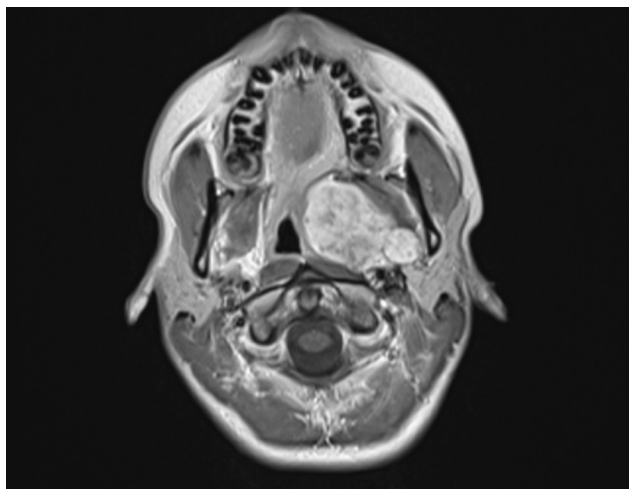


Figure 1 Typical MRI appearance of a prestyloid parapharyngeal space tumor. Axial T1-weighted image showing this tumor is likely a minor salivary gland tumor with a “satellite” projecting near the deep lobe of the parotid gland, but the lesion is separate from the parotid gland. This lesion is ideal for transoral robotic surgery.

PPS tumors, these 2 important series demonstrate that classic transmandibular, transmaxillary, and infratemporal fossa approaches can usually be avoided. These more extensive surgical approaches are typically reserved for very large tumors or those that require adequate visualization and more extensive dissection of the carotid artery at the cranial base.

Improvements in imaging and surgical technology have sparked renewed interest in minimally invasive transoral and even transnasal approaches to the PPS and infratemporal fossa. Transoral surgery with or without endoscopic or microscopic assistance has been described but has not gained widespread popularity. Transoral robotic surgery (TORS) has emerged as a very effective way to manage oropharyngeal carcinoma.⁵ Transoral anatomy in the context of TORS, particularly the anatomy relevant to Transoral robotic radical tonsillectomy,⁶ led to the motivation to apply robotic surgery to transoral resection of PPS lesions. A significant part of the motivation for transoral surgery is that it may reduce or eliminate several complications associated with open approaches. In the same way that TORS has reduced complications in management of oropharyngeal carcinoma, theoretically, similar reductions in morbidity may be accomplished using TORS for selected PPS tumors. The reality of prestyloid PPS resection is that all approaches involve blunt dissection. Although open transcervical approaches do provide access to the major vessels, blunt finger dissection is commonly used to deliver the tumor through the open incisions. O'Malley et al⁷ reported the first series of 10 patients treated with TORS for PPS masses in 2010 and described the techniques, indications, and contraindications for the technique. Although we also apply TORS for retropharyngeal masses, this article focuses on the technical nuances of prestyloid PPS resection for which we now have considerably more experience.

Indications and contraindications

The primary indications for TORS for PPS masses are as follows:

Salivary gland tumors of the prestyloid space are the most common indication for this technique. Most are tumors of the minor salivary glands, but tumors with limited involvement of the deep lobe of parotid are also potential candidates. Pleomorphic adenoma is by far the most common histology in this region. Schwannomas and other benign nerve sheath tumors also present as prestyloid space masses and these are generally schwannomas involving the trigeminal nerve branches (in contrast to poststyloid and retropharyngeal which are usually schwannomas of the lower cranial nerves or sympathetic trunk). Other appropriate indications are benign cysts and other rare benign neoplasms in the prestyloid space.

TORS is contraindicated in patients with lateral poststyloid lesions involving or displacing the internal carotid artery medially, salivary tumors that have significant extension into the stylomandibular tunnel, neoplasms involving the osseous skull base, and all paragangliomas given the common adherence to the carotid artery.

Fine needle aspiration (FNA) showing a malignant salivary gland tumor is also considered a contraindication, although we have treated 1 patient with a malignancy in the prestyloid space. This was found only when the final pathology revealed carcinoma ex pleomorphic adenoma after FNA showed benign mixed tumor. Only 10% of the tumor appeared to be transformed to the malignant form. It was felt to have been resected adequately, so no further surgery was performed, and there has been no recurrence. We believe that FNA can usually identify tumors that are already suspected to be malignant radiographically. Part of the rationale for removing prestyloid tumors is that both nerve sheath tumors and salivary gland tumors may

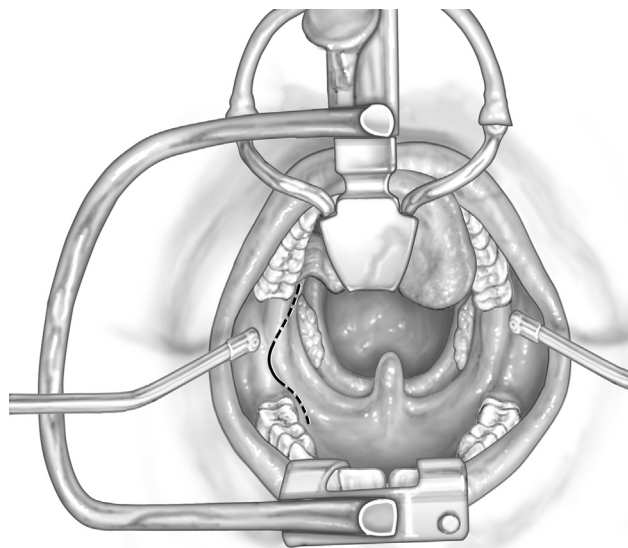


Figure 2 Placement of the Crowe-Davis Mouth Gag with the tongue displaced by the blade showing the proposed incision.

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