IJSRM
INTERNATIONAL JOURNAL OF SCIENCE AND RESEARCH METHODOLOGY
An Official Publication of Human Journals

Human Journals
Research Article
March 2023 Vol.:24, Issue:1

Evaluation of Parapharyngeal Space Tumours Operated by Transcervical Route in 3 Years of Teaching Medical Institute

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INTERNATIONAL JOURNAL OF SCIENCE AND RESEARCH METHODOLOGY
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Submitted: 25 February 2023
Accepted: 03 March 2023
Published: 30 March 2023

Keywords: Parapharyngeal Space, Tumours, Transcervical Route

ABSTRACT

Parapharyngeal space tumours are most challenging to diagnose and treat. A retrospective study conducted at Dr Ulhas Patil Medical College and Hospital, between 2019 and 2021;identified thirty cases treated for PPS tumours. The study included preoperative symptoms, signs, radiological investigations, surgical approach (transcervical)and histological examination. The location of the salivary gland was prestyloid while that of the neurogenic tumour was post-styloid. A common complication in parotid tumours of prestyloid space was facial nerve palsy while that in the neurogenic tumour was palsy of the nerve of tumour origin. It was observed that there is no local recurrence during the follow-up period. Approach to parapharyngeal space tumours should be preferably transcervical except for malignant or recurrent tumours because of its direct access to neoplasm. Adequate control of neurovascular structures from the neck and adequate aesthetic results as mandibular continuity is preserved with minimal morbidity and hospitalization time.

INTRODUCTION

The Parapharyngeal space (PPS) is an inverted triangular deep space located in the suprahyoid neck between the skull base and hyoid bone. The posterior belly of the digastric muscle and hyoid bone forms the apex of the pyramid and the base is formed by temporal bone. PPS is divided into pre-styloid and post-styloid compartments by fascia stretching from the styloid process to the tensor velipalatine muscle.

The medial and lateral pterygoid muscles, fibro adipose tissue, lymph nodes, the internal maxillary artery and vein, the lingual, inferior alveolar, and auriculotemporal nerves, as well as the deep lobe of the parotid gland, make up the pre-styloid space. The post-styloid compartment is home to several important structures, including the internal carotid artery, internal jugular vein, cranial nerves IX, X, and XI, sympathetic nerve chain, and lymph nodes. PPS are as uncommon as 0.5% of head and neck tumours[1], of which 80% are benign[2]. The most prevalent PPS are neoplasms of the salivary gland. The most common neoplasms in pre-styloid space are pleomorphic adenoma while in post-styloid PPS are paraganglioma and schwannomas[3].

The surgery for PPS can be done in a variety of ways. These methods are categorised into four groups: transmandibular, transcervical, transcarotid, and transoral. Surgery on PPS tumours is carried out using a single or mixed technique according on the tumor's features.[4-7]

Pre-styloid tumours should be treated by the transcervical route, whereas post-styloid tumours or tumours coming from the parotid should be treated using a mixed transparotid-transcervical route[2,3]. A combined transcervical and mandibulotomy technique is required for malignant tumours, tumours with vascular origins, and recurring tumours. A combined transcervical and mandibulotomy technique is required for malignant tumours, tumours with vascular origins, and recurring tumours. The mandibulectomy technique has the risk of damaging the inferior alveolar nerve, malocclusion, non-union, malunion abnormalities, and loss of dentition[8]. Due to the intricate anatomy of PPS, several surgical approach approaches have been used and are producing undesirable side effects. The effectiveness, outcomes, and complications of the transcervical technique are reviewed here for the evaluation of PPS in the context of a primary benign tumour.

MATERIALS AND METHODS:

Patients who had treatment for PPS tumours were retrospectively evaluated by the department of otorhinolaryngology. Only tumours coming from the PPS were included in the research; any tumours spreading to the PPS from other head and neck regions or metastatic lesions were not. Patient age, gender, clinical signs, symptoms, neurological assessment of the cranial nerves, preoperative investigations (CT and MRI), tumour location—pre or post-styloid—surgical techniques, histopathologic results, and operational complications were among the preoperative information gathered.

Every patient who signed up for the trial underwent surgery. Depending on the tumor's location, histopathologic results, and proximity to anatomical structures, the surgical method was chosen. Since all tumours were shown to be benign by histological analysis, clinical evaluation was deemed sufficient for follow-up periods of 1, 2, and 6 months. An MRI of the head and neck was done to look for potential recurrence at 12th month and every year.

RESULTS:

Study Population

The study included several patients (13 Men &12 women) with a mean age of 50 +/- 5 years and mean follow-up duration.

Pathologically cases were classified as salivary gland tumour and as neurogenic tumour. Clinically, most common clinical findings were neck mass (14), oropharyngeal mass (8), hoarseness (2) and dysphagia (1).

Table 1: Clinical findings of parapharyngeal space tumours

SYMPTOMS	NO. OF PATIENTS	PERCENTAGE
Neck Mass	14	56
Oropharyngeal mass	8	32
Hoarseness	2	8
Dysphagia	1	4

Radiological Examination:

The location of each tumour was evaluated by CT or MRI imaging. Prestyloid space had salivary gland tumours and neurogenic tumours were located in the post-styloid space.

Histopathological Examination:

In the histopathologic examination,10 cases of schwannoma,16 cases of vagal paraganglioma and 13 cases of pleomorphic adenoma were confirmed.

All the schwannomas were from unidentified origin except one originated from hypoglossal nerve. Rare tumours encountered while study was giant cell inflammatory granulation tissue(n=2), lipoma(n=1), haemangiopericytoma (n=1) and neurofibroma(n=1).

Radiological findings were identical to histopathological examination. Tumours reported benign radiologically found benign histopathologically as well.

Table 2:

HISTOLOGY	No.Of cases	Percentage
Paraganglioma	**2**	**3.33**
Pleomorphic adenoma	**16**	46.66
Schwannoma	**2**	**6.66**

Post-operative complications: The pre-styloid space cases were found to have facial nerve palsy in salivary gland tumours, the common location being under the lip. Out of which, 2 cases had total facial nerve paralysis but one resolved after months as it was a benign tumour. No case reported with Frey's syndrome,5 cases(38.5%)suffered First Bite Syndrome and 3 cases resolved.

Intra-capsular enucleation was performed to preserve the original nerve in neurogenic tumours. Neurogenic palsy is exhibited in patients. In 4 patients, paralysis in 12-18 months while the remaining continued to have paralysis.

Table 3: Salivary Gland tumours post-operative complication incidence

Symptoms	n (%)
First bite syndrome	6 (46.2)
Lower lip palsy	4 (30.8)
Total facial nerve palsy	1 (7.7)
Abnormal feeling of neck	1 (7.7)
Pharyngeal pain	1 (7.7)

Transient XII nerve palsy occurred in a case of paraganglioma which resolved after 3 months. Necessary resection of the nerve caused VII nerve palsy. Palsy of mandibular nerve branch of facial nerve observed in lower cheek flap.

Table 4: Post-operative symptom-Incidence of nerve deficiency

Origin	Symptoms of nerve deficiency	Frequency(%)	Symptom continuation
Sympathetic nerve, n=10	Horner syndrome Tongue palsy	1(50.0) 1 (10.0)	3 (40.0) 1 (10.0)
Hypoglossal nerve, n=3	Tongue palsy Vocal cord palsy	1 (10.0) 2 (66.7)	2 (66.7) 2 (33.3)
Carotid body tumour, n=1	Tongue palsy Pharyngoparalysis	1 (100.0) 1 (100.0)	0 (0.0) 0 (0.0)

2 patients required a tracheostomy. The first patient had an 11cm pleomorphic adenoma, pre-operative elective tracheostomy was performed due to the risk of difficult intubation. The second patient had a cerebral infarct caused by arterial embolism and hence was monitored in the intensive care unit for a long period.

The follow-up period ranged from 3 months to 150 months with a median of 61 months (SD+/-33.10), adequate to evaluate local recurrence and possible late complications. There was no local recurrence.

DISCUSSION:

Due to the PPS tumours' deep neck position, surgical diagnosis and treatment are challenging. The purpose of this study was to assess the features of the PPS treatment pathway from diagnosis through surgical intervention. It was also determined whether functional preservation surgery was useful for monitoring lower cranial nerves. According to the establishment's prior findings, between 70 and 90 percent of PPS tumours are benign[2,9,10,11-15],. Pleomorphic adenoma coming from the deep lobe of the parotid gland is the most prevalent kind, according to earlier investigations [3,9]. According to Carrau et al., 57% of PPS neoplasms had neurogenic tumours[10].

In this study, sympathetic schwannomas made up the majority of schwannomas, and schwannomas most frequently originated from the vagus nerve. Liu et al. made a contribution by stating that the sympathetic and vagus nerves were responsible for the majority of Schwannomas in the head and neck[16]. Schwannomas are caused by nerves having sensory components and their interaction with sensory ganglia, according to Tryggvason et al. Most sympathetic chain schwannomas are connected to sensory ganglia that can develop into schwannomas. The fact that the superior cervical ganglion is associated with the bulk of sympathetic chain schwannomas proves that the nerves are where PPS schwannomas originate[17].

The transcervical method, which is the most often used surgical technique for resecting PPS tumours, was first reported by Morfit in 1955[3,10,18]. In order to split the lip if mandibulotomy is required, a transcervical incision is made at the level of the hyoid bone and may extend to the submental region. For bigger tumours coming from the deep lobe of the parotid with a retro styloid site, partial parotidectomy was required. In the parotidectomy extension, the facial nerve's main trunk and marginal branch are separated, and the lower half of the superficial lobe of the parotid is removed. Transecting the stylohyoid muscle, digastric belly, and stylomandibuar ligament results in anterior dislocation of the jaw. Identification of the sympathetic chain, internal jugular vein, external and internal carotid arteries, and CN IX, X, and XII. Mylohyoid muscle contraction and submandibular gland displacement are done in order to access the

parapharyngeal space. Blunt dissection is performed on the tissue around it. The transcervical approach's main drawback is its restricted exposure to the parapharyngeal space[10]. Because of this problem, the study results are impacted by the debate and contention.

To study the parapharyngeal tumours literature, two case series were discovered. Chang & al. reported 51 instances with a maximum tumour size of 6.8 cm[19], whereas Pressutti et al. reported 18 cases with a maximum tumour size of 8 cm[20]. The biggest tumour in our research, which included patients, was a pleomorphic adenoma with a horizontal diameter of 11 cm. Vertical diameter should be taken into account rather than horizontal diameter for determining the appropriate size excision through the transcervical route. If a tumor's vertical expansion raises concerns about an intracervical extension, the transcervical approach is prescribed. It may be exceedingly challenging to separate the neurogenic tumours from the surrounding tissue, especially close to the skull base..This study uses the hypoglossal nerve schwannoma as an example. When a tumour extended to the level of the internal carotid artery and the hypoglossal canal, the pressure from the mass weakened both structures, and the latter was torn during blunt dissection. As a result, the transcervical approach is not advised for tumours with lengthy vertical dimensions and those that may be cranial foramina invading.

Mandibulotomy is indicated for malignant neoplasms, big benign neoplasms, recurring neoplasms, and highly vascular neoplasms that require greater vascular management[21]. In this study, hemangiopericytoma and vagal paragangliomas were safely removed using the transcervical technique. The enormous pleomorphic adenoma with a diameter of 11 cm is removed without the need for a mandibulotomy, according to a fact.

In addition to transcervical and transmandibular procedures, transoral routes should be taken into account for carefully chosen situations. After the tumor's size has been determined, this procedure is used. The drawbacks of this method are the tumour risk and inadequate surgical exposure. After tumour rupture and recurrence become unavailable, it is quite difficult to clean up spilled tumour cells. Inadequate management of neurovascular systems leads to significant intraoperative blood loss and cranial nerve impairments. MRI outperforms CT at demonstrating the size of the tumour and surrounding tissues. Well-defined, smoothly lobulated tumour outlines observed on MRI and dystrophic calcifications shown on CT are the greatest indicators of pleomorphic adenoma. The second most frequent PPS tumour in the literature, vagal

paraganglioma, is accurately identified on MRI[14]. The most distinguishing feature of a paraganglioma is a serpentine or punctate low signal intensity zone with a "salt and pepper" look brought on by excessive vascularity[22]. Other radiological observations include the internal carotid artery being anteriorly displaced and the tumor's margins being well delineated. The second most frequent tumour form in our situation is a nerve sheet tumour, which has radiological symptoms as well as clearly defined tumour boundaries and a homogenous look[23]. Nerve sheet tumours can be considered in the differential diagnosis of PPS paragangliomas since they have CN paralysis without the salt-and-pepper look on MRI. Radiological examinations can be used to determine if a tumour is malignant because of its infiltration into the soft tissues around it and any regional metastases, which are difficult to distinguish clinically from benign masses[24-26]. CN palsies and discomfort are important malignancy-related symptoms.

Radiological signs of malignancy include irregular tumour margins that have expanded into neighbouring tissues and fat planes on CT or MRI, as well as indications of enlarged necrotic lymph nodes in the retropharyngeal and cervical regions. In our investigation, post-operative pathological testing revealed no evidence of malignancy in any of the patients with benign tumours. Therefore, pre-operative radiological assessment is sufficient to differentiate between malignant and benign tumours.

PPS are a unique target for FNAB due to their rarity, tumour leakage, access challenges, and requirement for a skilled cytologist. In PPS tumours, transcervical FNAB, which is frequently utilised in the head and neck with or without ultrasound guidance, is insufficient. In an outpatient setting or with CT guidance, the transoral route is preferred over the transcervical route for FNAB. Because of its questionable diagnostic accuracy, the FNAB is not widely regarded as reliable[27]. The paraganglioma is diagnosed with radiological assistance.

The third most frequent form of tumour is a schwannoma. Because of the existence of hypocellular (AntoniB)areas and cystic formation in this type, FNAB is effective[28].

Because FNAB must be performed by a multidisciplinary team of head and neck surgeons, radiologists, and cytopathologists, it is technically challenging and time-consuming. The difference between benign and malignant or hypo-hypervascular tumours may be made radiologically, hence preoperative FNAB will not alter treatment plans.

The PPS is predicted to have a wide variety of PPS due to its complicated content. Shahab's analysis of 114 cases found that 96 (84%) of them had benign disease, of which 34 (including carotid paragangliomas) were paragangliomas, 11 were schwannomas, and 3 were neurofibromas. Cohen detected 145 benign PPS tumours, 34 tumours arising from the salivary gland, 65 paragangliomas, 16 Schwannomas, and 7 neurofibromas in a second investigation that included 166 individuals[2].

All of the cases included in the research had their histology determined to be benign, including 10 (22.7%) schwannomas, 13 (29.5%) pleomorphic adenomas, and 16 (36.4%) paragangliomas. The most prevalent neoplasm in the PPS, tumours of glandular origin, had the highest frequency of neurogenic tumours in our research. Our results agree with Cohen's research[3].

Dr Ulhas Patil Medical College and Hospital isa tertiary referral centre. Due to the difficulty of surgical excision and high rates of preoperative and postoperative complications in comparison with glandular tumours, the proportion of neurogenic tumours is high.

Neurogenic tumours have recently sparked debate on whether to remove them or keep them under observation. Our approach to treating these tumours is based on the following principles: After receiving informed permission, surgical therapy is preferable for young patients since they have a long expected lifespan. Early excision reduces complications because of greater tolerance and improved physical capacity, which makes rehabilitation simpler in the event of complications such nerve deficiency. Older individuals, however, have benign neurogenic tumours that are asymptomatic tracked radiographically. Radiotherapy and stereotactic radiosurgery are options for symptomatic situations.

The most severe side effect of PPS surgery is the paralysis of the cranial nerves CN VII, IX, X, XI, and XII[20]. In our analysis, there were 19 cases (43.2%) where patients had persistent CN palsy after surgery. Three individuals who had paralysis prior to surgery were disqualified. In contrast to the 2 Schwannomas that were removed during the vagal paraganglioma surgery, 15 vagal paragangliomas were sacrificed. Therefore, a high rate of CN paralysis makes sense. In comparison to other PPS, neurogenic tumours like paragangliomas are acknowledged to carry the highest risk of neurological consequences[3]. Since patients with CN IX and XI paralysis require speech and swallowing treatment, having knowledge of potential neurological

consequences can help patients adhere to the rehabilitation programme. Without taking into account the morbidity associated with CN sacrifice and the fact that the majority of these cancers are benign and slow-growing, surgical therapy should not be chosen. It is important to remember the idea of "primum non-nocere."

61-month follow-up revealed no recurrence. The majority of patients had neurogenic tumours that were well-capsulated, which may have been connected to the successful transcervical approach shown in our study.

CONCLUSION:

The optimum surgical strategy for PPS should not harm nearby significant structures. The transcervical method should be used because it provides the benefits of direct access to PPS and control of neurovascular systems from the neck, preventing potential perioperative vascular and postoperative neurological morbidities. With advancements and a mix of video-assisted and image-guided minimally invasive surgical methods, this way will be increasingly beneficial in the future. Since the majority of tumours are benign, en-bloc excision with safe margins is sufficient. It is not required to do mandibulotomies or other extremely invasive operations, and doing so increases postoperative morbidity.

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