Surgical Management of Parapharyngeal Space Tumours in a Single Tertiary Care Center

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Abstract Because of the inaccessibility and overcrowding of the vital neurovascular structures, management of the parapharyngeal space (PPS) tumour is always a challenge to the surgeons. Here we have discussed the clinical findings and management of the PPS tumours with special concern to the surgical approaches. It is a retrospective study containing 14 patients of PPS tumour from June 2015 to January 2018 in the department of Otorhinolaryngology and Head Neck Surgery in a tertiary care referral hospital. 14 consecutive patients with PPS tumours were included in the study. The retrospective clinical data, diagnostic procedures, surgical approaches and the complications were analyzed after 12 months of surgery. Of 14 patients included in the study, 10 patients were males and 4 were females. Prestyloid and poststyloid spaces were involved in 28.57% and 71.42% cases respectively. Transcervical excision of the tumours were performed in 10 patients, 2 patients had undergone transcervical-transoral approach. Transcervical transmandibular and transcervical transparotid excision of tumours were performed in one patient each. Facial nerve injury was detected in 3(21.42%) patients. Injury to the internal carotid artery and wound infection were detected in one patient each. Radiological imaging, especially the MRI helps by narrowing the spectrum of the differential diagnosis distinguishing the benign from malignant lesions, especially in cases where FNAC is contraindicated. Although the transcervical approach is commonly practiced, the combined surgical

approach can be effectively applied specially for extensive PPS tumours associated with satisfactory clinical outcomes.

Keywords Parapharyngeal space tumour · Surgical management · Outcomes

Introduction

The parapharyngeal space (PPS) is a three dimensional fat filled compartment extending from the skull base to the greater cornue of hyoid bone. The styloid process and the tensor veli palatine muscle again divide it further into prestyloid and poststyloid compartment according to the anatomical location. The prestyloid compartment is closely related to the deep lobe of the parotid and the post styloid space predominantly harbors the neurovascular bundles i.e. IX, X, XI and XII cranial nerves, the cervical sympathetic chain, the internal jugular vein, the internal carotid artery. Due to the wide structural variation, a wide range of tumours have been found in the PPS [1, 2] and later accounts for approximately 0.5–1.5% of all head and neck tumors [3, 4]. The majority (80%) of them are benign in nature [3–9]. In order of frequency, pleomorphic adenoma of salivary gland is the most common, followed by neurogenic tumour [4, 5, 8, 10]. Prestyloid tumours mostly arise from the deep lobe of the parotid and the post styloid tumours mostly originate from the neurovascular tissue. Patients presentation usually depend upon the size and extension of the tumour in the PPS and sometimes these tumours gets unnoticed because of their small size. The patients get symptomatic after the size of the lesions becomes more than 2.5–3 cm [6, 8]. Being a soft tissue lesion, contrast enhanced Magnetic resonance imaging (MRI) is considered as the primary radiological imaging

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advised to each patient suspicion of PPS tumour. It provides valuable information regarding the size and extension of the tumour also distinguishes the malignant from a benign lesion and their spatial relation to the vital neurovascular structures for a proper preoperative planning [6]. Fine needle aspiration cytology (FNAC) is the definite investigation advised for PPS tumours towards the diagnosis which can be undertaken through a transcervical or intraoral route except for the vascular tumours. Treatment is primarily by surgical excision of the tumour with preservation of the neurovascular structure. It can be undertaken by a simple transcervical or combined transcervical transparotid approach in majority of the cases. Transcervical transmandibular or transcervical transoral approaches can be utilized in few selected cases of larger tumours where adequate exposure is required for complete excision of the tumour [1, 4, 6]. In the present study, we have shared our experience in the management of the PPS tumours and discussed their respective surgical approach and the complications.

Materials and Methods

It is a retrospective study containing 14 patients of parapharyngeal space tumours from June 2015 to January 2018 in the department of Otorhinolaryngology and Head Neck Surgery at All India Institute of Medical Sciences, Bhubaneswar, a tertiary care apex hospital in the eastern zone of India. All consecutive patients with PPS tumours were included in the study. The medical record was reviewed and the clinical, radiological, and pathological data were analyzed retrogradely. In the clinical data, the symptoms, signs, diagnostic procedures, surgical approaches, and significant intraoperative/postoperative complications were analyzed. The preoperative CT/MRI findings were assessed for the size, location, vascularity, and the extension of the tumour. Data obtained were statistically analyzed with SPSS statistics 22 (IBM, Chicago, USA). The average follow-up period was 12 months (range 11–18 months). Patients were reviewed in the tumour clinic at the end of 3, 6, and 12 months period after surgery where the clinical and radiological assessment were undertaken to rule out the disease recurrence.

Results

Total 14 patients were included in the study of which 10 were males and 4 were females. The age of the patients was varied from 22 to 66 years (mean 39 ± 14.50). The demographic data and the patients clinical profile have been demonstrated in the Table 1. Painless neck swelling

was the predominant complaint which was observed in 8(57.14%) patients and 4(28.57%) patients presented with swelling over the parotid gland. Of the 8 cervical swelling, 3 of them were pulsatile in nature and later diagnosed as the carotid body tumour. One patient presented with dysphagia and one had a painless oropharyngeal mass. All the patients were subjected for contrast-enhanced MRI and angiography was advised in 3(21.42%) cases because of the suspicion of vascular tumour. Of the 14 cases of PPS tumour, prestyloid space was involved in 4(28.57%) cases and 10(71.42%) patients had tumours in the post styloid space. Of the 3 patients with carotid body tumour, 2 patients had Shamblin type I tumour and one patient was Shamblin type III. Cross cerebral circulation was assessed in one patient of Shamblin type III carotid body tumour and it was found adequate. None of the patients had undergone embolization in the preoperative period. Of the 14 cases, FNAC was advised in 11 cases as rest 3 cases were clinically diagnosed as carotid body tumour. Again of the 11 patients subjected for FNAC, the confirmed tissue diagnosis was achieved in 9 cases when it was compared with the final histopathological report. In 2 cases, the preoperative FNAC was suggestive of neurofibroma came out as schwannoma in the final tissue diagnosis (Table 2). Of 14 patients, 10 patients had undergone transcervical excision of the tumour and 4 patients required the combined approach for excision of the tumour. Again out of the 4 patients, 2 patients had undergone transcervical-transoral approach through mandibulotomy, one had undergone transcervical transmandibular approach and one had undergone transcervical transparotid approach for the excision of the tumour (Fig. 1).

An overview of a transcervical transmandibular approach for a PPS pleomorphic adenoma extending to the infratemporal fossa has been demonstrated in Figs. 2, 3 and 4. Facial nerve injury (marginal mandibular branch) was detected in 3(21.42%) patients. The internal carotid injury was detected in one patient during the surgery of a carotid body tumour (Table 3). One patient had a wound infection and salivary leakage in the postoperative period, which had led for a longer hospital stay and it was successfully managed with conservative treatment with aseptic pressure dressing.

Discussion

Because of the difficulty in the exposure and overcrowding of the vital neurovascular structures, excision of the PPS tumours are always a challenge to the operating surgeons. Here we have discussed the clinical findings, diagnosis, and treatment of the parapharyngeal space tumours along with the different surgical approaches and their complications.

Table 1 Demographic profile of the patients in the study

S. no.	Age/sex	C/F	Site of origin	FNAC
1.	55/M	Parotid swelling	Lt parotid	Pleomorphic adenoma
2.	33/M	Neck swelling	Lt carotid	Not done
3.	22/M	Neck swelling	Lt carotid	Not done
4.	66/F	Neck swelling	Rt carotid	Not done
5.	40/M	Neck swelling	Lt vagus	Neurofibroma
6.	23/F	Neck swelling	Rt vagus	Schwannoma
7.	48/M	Dysphagia	Lt parotid	Pleomorphic adenoma
8.	20/M	parotid swelling	Lt parotid	Pleomorphic adenoma
9.	31/F	parotid swelling	Rt vagus	Schwannoma
10.	18/M	parotid swelling	Rt parotid	Pleomorphic adenoma
11.	37/M	Neck swelling	Lt vagus	Schwannoma
12.	47/M	Neck swelling	Rt vagus	Schwannoma
13.	52/M	Oropharyngeal mass	Lt parotid	Schwannoma
14.	28/F	Neck swelling	Lt vagus	Neurofibroma

Table 2 Demonstration of the surgical approaches and the final pathology in the study population

S. no.	Tumour size (cm)	Surgical approach	Final diagnosis	Complications
1.	5.2 × 2.5 × 3.5 cm	Transparotid transmandibular	Pleomorphic adenoma	Grade III facial palsy
2.	3.0 × 2.0 × 2.0 cm	Transcervical	Carotid body tumour	Marginal mandibular palsy
3.	5.0 × 3.0 × 5.0 cm	Transcervical	Carotid body tumour	Vagus and internal carotid injury
4.	4.3 × 2.7 × 2.1 cm	Transcervical	Carotid body tumour	None
5.	4.5 × 3.4 × 3.5 cm	Transcervical	Schwannoma	None
6.	3.5 × 2.7 × 3.0 cm	Transcervical	Schwannoma	None
7.	5.1 × 2.9 × 5.3 cm	Transparotid with transoral	Pleomorphic adenoma	Marginal mandibular palsy
8.	6.0 × 4.5 × 5.2 cm	Transcervical	Pleomorphic adenoma	None
9.	4.9 × 3.0 × 6.0 cm	Transcervical with transoral	Schwannoma	Wound infection
10.	4.4 × 3.4 × 5.0 cm	Transcervical	Pleomorphic adenoma	None
11.	5.2 × 7.0 × 7.9 cm	Transcervical	Schwannoma	Marginal mandibular palsy
12.	4.7 × 3.0 × 4.2 cm	Transcervical	Schwannoma	None
13.	5.2 × 4.2 × 3.1 cm	Transcervical	Schwannoma	None
14.	4.7 × 3.3 × 4.2 cm	Transcervical transparotid	Schwannoma	None

Tumours affecting the PPS are mostly benign in nature (benign: malignant 4:1) as described in the previous literature [4, 8, 9]. Again, based on the sites of origin, salivary tumours are the most common, followed by the neurogenic tumour followed by the paragangliomas affecting the PPS [11, 12]. Salivary gland tumours are predominantly found in the prestyloid compartment and the neurogenic tumours are in the poststyloid compartment respectively, and later arise mostly from the vagus nerve [3, 10].

But in the present study, 71.42% of the tumours were affecting the poststyloid compartment and in 28.57% cases, the tumours were found in the prestyloid space. This variation in the site could be due to the retrospective data

of the consecutive patients attending the outpatient department with relatively a small sample size. Being benign, these are very slow growing and painless tumours and often get unnoticed by the patients unless it causes significant dysphagia or hoarseness. Although neck swelling is the most common clinical presentation in PPS tumours [13], patients can have wide range of symptoms including swelling in the oral cavity, dysphagia, and stridor. When it is compared between the prestyloid and post styloid tumours, dysphagia is the primary complaint of the prestyloid tumours and the post styloid tumours usually become symptomatic unless these causes functional impairment in one or more of the cranial nerves. Although

Fig. 1 Shows the clinical presentations of the patients of the parapharyngeal space tumours

Fig. 2 Contrast enhanced MRI (T2-weighted) axial and sagittal cuts of an parapharyngeal space pleomorphic adenoma extending to the infratemporal fossa and the skull base

Fig. 3 **a** Shows a parapharyngeal space pleomorphic adenoma extending to the infratemporal fossa and **b** shows the infratemporal fossa after complete excision of the tumour through transmandibular approach

Fig. 4 **a** Histopathological section shows a well encapsulated tumour comprising of myoepithelial cells in chondromyxoid background (H&E 40 ×). **b** Shows myoepithelial cells forming small tubules

containing eosinophilic secretion with vacuolated cytoplasm and bland nuclear chromatin (H&E 400 ×)

Table 3 Complications of surgery according to Clavien–Dindo classification

Postoperative		
Grade I	Facial nerve palsy	3 (21.42%)
Grade II	Wound infection	2 (14.28%)
Grade III	Hemorrhage	1 (7.14%)

both CT and MRI are the standard radiological investigation recommended for a PPS lesion, we had preferred MRI in all cases because of it defines superior tissue abnormality and provides adequate information regarding the extension, invasion, and regional metastasis for the proper surgical planning for complete excision of the tumour [2, 14]. Angiography may be required in specific cases of vascular tumours, especially for the carotid body and glomus tumours where there is the higher chance of neurovascular damage. In the present study, only 3 patients with suspected carotid body tumours were subjected for MR angiography to look for the predominant vascular involvement and the spatial relationship of the tumour to the great vessels. FNAC was the foremost and most definitive investigation advised for all the patients of parapharyngeal space lesions for the primary diagnosis either through an intraoral route or through the transcervical route except the vascular tumours with a diagnostic accuracy of about 73.1% [15].

In the present study, the diagnostic accuracy of FNAC was found to be 81.81% which could be due to the small size of the sample and atypical distribution of the disease in the PPS. Although FNAC plays a major role for the initial tissue diagnosis of the parapharyngeal tumours, still a complete clinical and radiological correlation is always required, especially for the highly vascular tumours where FNAC is absolutely contraindicated because of the higher

chance of hemorrhage. Surgery is the primary modality of treatment for the symptomatic parapharyngeal space tumours although few patients may be require active surveillance in view of the inadvertent injury of the neurovascular structure, especially in asymptomatic patients with a small tumour size. Surgical approach mostly depends upon the size and extension of the tumour in the PPS and its anatomical relation to the neurovascular structures, especially tumours in the poststyloid compartment. Most of the PPS tumours are removed through the transcervical approach as was evident in the present study where complete excision of the tumours were achieved in 10(71.42%) cases. This approach was very much suitable for the tumours with limited medial extension with a submandibular extension.

Transcervical transparotid approach can be used for the tumours, especially in the prestyloid compartment arising from the deep lobe of the parotid. Other combined surgical options like the transcervical transoral or transcervical mandibular approach can be utilised depending upon the medial extension of the PPS tumour. In the present study, one patient had undergone transcervical transparotid excision the tumour and two had undergone transcervical transoral excision through a paramedian mandibulectomy and mandibular swing. One patient had undergone transcervical transmandibular approach due to the extensive infratemporal extension of the tumour. Although combined surgical approach is very rarely performed in the routine surgical practice, still these are adopted for extensive and recurrent tumours where greater range of exposure is required than the standard transcervical/transcervical transparotid approach [16–18]. Each of the surgical approach has its own complications and the most common being the marginal mandibular injury which can happen to all the surgical procedure irrespective of the type of the

tumour. In the present study, of the 14 patients undergoing transcervical excision, 3(21%) had the marginal mandibular palsy in the immediate postoperative period although one patient gets recovered after 48 h of conservative treatment. It could be because of the surgical manipulation of the deep fascia during the excision of the submandibular gland, which was performed in almost all the cases as a primary step to assess the PPS. Of the 4 patients undergoing combined transcervical approach, one patient had grade III facial palsy in the immediate postoperative period, which could be due to the overstretching in the and later gets improved to grade I after 6 weeks with the conservative management. There were no other significant complications found in these patients. With the recent advancement of endoscopic transoral Robotic surgery as described by Duek et al. [19] tumours of PPS can be well managed as an adjunct procedure to the standard external approach. All the tumours were benign in nature as confirmed by the final pathological examination and there were no features suggestive of any malignancy. The average follow-up period was 12 months (range 11–18 months) and there was no tumour recurrence as confirmed by radiological examination and there was no death of any patient detected during the 12 months of follow-up period. One patient operated for a carotid body tumour had injury during the surgery due to the advanced stage of the disease (Shamblin type III) which was effectively managed by the cardiothoracic team with saphenous venous grafting and there was no motor neuron palsy detected in the postoperative period, although patient had mild dysphagia, which was adequately taken care by swallowing rehabilitation. This is a single centered a small population study of the PPS tumour where the primary diagnosis was obtained mostly by the FNAC and the radiological findings and all the patients had undergone surgical excision after complete localization of the tumour in PPS by radiology. Although FNAC is very much helpful in the diagnostic work-up of the PPS tumours, one should keep in mind the discrepancy in the cytological and pathological findings. Radiological imaging, especially the MR helps by narrowing the spectrum of the differential diagnosis distinguishing the benign from a malignant lesion.

Limitations of the Study

It is a retrospective study with small sample size with a short follow-up period. The purpose of the study was to highlight the management of the parapharyngeal space tumours with special concern to the surgical approaches and their respective complications.

Conclusion

Because of the inaccessibility and overcrowding of the vital neurovascular structures, excision of the PPS tumours is a challenge to the surgeons. Although FNAC is very much helpful in the diagnostic workup of the PPS tumours, one should keep in mind the discrepancy in the cytological and pathological findings. Radiological imaging especially the MR helps by narrowing the spectrum of the differential diagnosis distinguishing the benign from a malignant lesion. Although the transcervical approach is the standard surgical procedure practiced, patients may require the combined approach excision of the tumour, especially for extensive PPS tumours with satisfactory outcomes.

Compliance with Ethical Standards

Conflict of interest The authors declare that they have no conflict of interest.

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Ethical Standards All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards.

Informed Consent Written informed consent has been taken from each patient prior to the surgery and same has been informed to the institute reviewer board. No part of the body has been demonstrated in the case report without the permission of the concerned patient.

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