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Clinical Analysis and Surgical Management of 30 Cases with Parapharyngeal Space Tumor

Parafarengeal Boşluk Tümörlü 30 Vakanın Klinik Analizi ve Cerrahi Yönetimi

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ABSTRACT Objective: The aim of this study was to evaluate our 10-year experience in the treatment of parapharyngeal space (PPS) tumors in our clinic using current diagnosis and treatment methods, present our surgical approaches, and compare our findings with the literature. **Material and Methods:** We retrospectively analyzed the medical records of all patients in a single clinic who had a mass in the PPS between 2008 and 2018. We recorded and analyzed PPS mass histologic features, surgical approaches, complications that occurred before and after surgery, and surgical outcomes. **Results:** Thirty patients were included in the study; 50% of the patients were female, and 50% were male. In the diagnosis phase, contrasted computed tomography and magnetic resonance imaging were used. Fine needle aspiration cytology was performed in all patients, and all patients underwent surgery in this series. The transparotid approach was the most commonly used surgical technique, followed by the transcervical-submandibular, transcervical-transparotid, and transparotid-transmastoid combined approaches. Complications were seen in 17 of 30 (53%) patients. The mean follow-up period was 32 months, with a range of 24-54 months. Four patients were lost to follow-up, and the tumors of 26 patients did not relapse. **Conclusion:** PPS tumors are rare, but a good strategy for their management must be formed before surgery. By performing surgery with the most appropriate surgical technique and imaging tests, surgeons can minimize potential complications.

Keywords: Parapharyngeal space; pleomorphic adenoma; salivary gland neoplasms; schwannoma

ÖZET Amaç: Bu çalışmanın amacı, kliniğimizde parafarengeal boşluk (PFB) tümörlerinin tedavisinde 10 yıllık tecrübemizi güncel tanı ve tedavi yöntemleri ile değerlendirmek, cerrahi yaklaşımlarımızı sunmak ve literatürle karşılaştırmaktır. **Gereç ve Yöntemler:** 2008-2018 yılları arasında, PFB'de kitle bulunan tüm hastaların tıbbi kayıtları tek bir klinikte retrospektif olarak incelendi. PFB kitlelerinin; histolojik özellikleri, bölgeye cerrahi yaklaşımlar, ameliyat öncesi ve sonrası oluşan komplikasyonlar ve cerrahi sonuçlar kaydedilerek analiz edildi. **Bulgular:** Çalışmaya 30 hasta dâhil edildi, hastaların %50'si kadın %50'si erkekti. Tanı aşamasında, kontrastlı bilgisayarlı tomografi ve manyetik rezonans görüntüleme kullanıldı. Tüm hastalara ince iğne aspirasyon sitolojisi uygulandı. Bu seride, tüm hastalar ameliyat edildi. En sık kullanılan cerrahi teknik transparotid yaklaşımdı, ardından sırasıyla; transservikal-submandibuler, transservikal-transparotid ve transparotid-transmastoid kombine yaklaşım geldi. Otuz hastanın 17 (%53)'sinde komplikasyon görüldü. Takip süresi 24-52 ay arasında değişirken, ortalama 32 ay olarak saptanırken, 4 hastanın takibine devam edilemedi ve 26 hastada ise nüks gözlenmedi. **Sonuç:** PFB tümörleri nadir olmakla birlikte, ameliyattan önce iyi bir planlama yapılmalıdır. Görüntüleme testleri ve sonuçları ile olası komplikasyonları en aza indirecek uygun cerrahi teknik ile tedavi sağlanır.

Anahtar Kelimeler: Parafarengeal boşluk; pleomorfik adenom; tükrük bezi tümörleri; schwannoma

The parapharyngeal space (PPS) is a potential inverted pyramid-shaped cavity that extends from the base of the skull to the hyoid bone. The space can be divided by styloid process into the prestyloid and poststyloid regions.[1] These regions are crucial when planning the evaluation and treatment of PPS tumors according to the structures they contain.

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PPS tumors account for 0.5% to 1% of all head and neck masses. In the prestyloid region, there are deep lobes of the parotid gland, minor salivary glands, lymph nodes, and parapharyngeal adipose tissue. Tumors of this region are mostly salivary gland lesions and lymphomas, but lipomas can form in rare cases. The poststyloid region is composed of the carotid artery, jugular vein, ninth and tenth cranial nerves, lymph nodes, and the cervical sympathetic chain. Neurogenic tumors such as paragangliomas and schwannomas are frequently seen in this region.[2]

Various surgical approaches to remove PPS tumors have been reported, such as the transcervical, transparotid, and transoral approaches, which can be performed alone or in combination.[3]

The aim of this study was to evaluate our 10-year experience with the treatment of PPS tumors in our clinic using current diagnosis and treatment methods. Our surgical approaches are presented below along with a comparison of the literature.

MATERIAL AND METHODS

The medical records of all patients with a mass in the PPS who were treated in our clinic between 2008 and 2018 were retrospectively analyzed. Data on age, sex, PPS mass histologic features, surgical approaches, complications that occurred before and after surgery, and surgical outcomes were recorded and analyzed. This study was approved by the institutional review board local ethics committee (decision no:1138) and conducted in accordance with the Helsinki Declaration 2018 principles. Given that only medical files were obtained, the institutional review board approved this study without the written consent of the patients as long as all personal data, including facial features and disclosure features, remained confidential.

The medical history and detailed physical examinations of the patients were reviewed. In addition to preoperative examinations that included electrocardiography, chest radiography, and hematologic laboratory tests, we also examined spiral computed tomography (CT) and neck magnetic resonance imaging (MRI), which were performed on all patients. According to the characteristics of the tumor, which were determined by location, size, relationship with the anatomic structures of the carotid artery, jugular vein, and cranial nerves, and the possibility of malignancy as a result of fine needle aspiration cytology (FNAC), the appropriate surgical method was chosen. In all patients, the masses were removed macroscopically using the selected surgical approach and then sent for histopathological examination.

In accordance with the tumor stage, radiotherapy (RT) was performed after surgery in malignant cases. The follow-up data were obtained from the outpatient clinical follow-up files or by phone calls to the patients and family members. SPSS 17.0 software was used to analyze the data statistically.

RESULTS

Thirty patients were included in the study; 50% of the patients were female, and 50% were male. The mean age of the patients was 49±13.1 years. The main symptoms experienced by the patients were swelling in the neck (26.6%), swelling in the parotid region (73.3%), and pain (60%) (Table 1). The period from initial diagnosis to treatment was between 4 and 28 months. Contrasted neck CT and neck MRI were used for diagnosis. FNAC was performed in all patients and was determined to be benign in 21 and suspected malignant in 9. As a result of postoperative cytology, 11 of the total samples were reported as malignant. Accordingly, the FNAC sensitivity was 72%, the specificity was 88%, the positive predictive value was 88%, and the negative predictive value was 85%.

Twenty-nine (96.6%) patients underwent surgery due to primary PPS tumor and one (3.3%) due to thyroid papillary carcinoma metastasis (Figure 1). A total of 12 different tumor types were diagnosed, in-

TABLE 1: Frequency of preoperative symptoms.

Symptoms and signs	n= 30 (%100)
Mass on the neck	8 (26.6%)
Mass in the parotid region	22 (73.3%)
Stuck feeling in the pharynx	4 (13.3%)
Pain	18 (60%)
Dysphagia	4 (13.3%)
Mass in the parotid	14 (46.7%)
Snore	3 (10%)
Hoarseness	1 (3.3%)

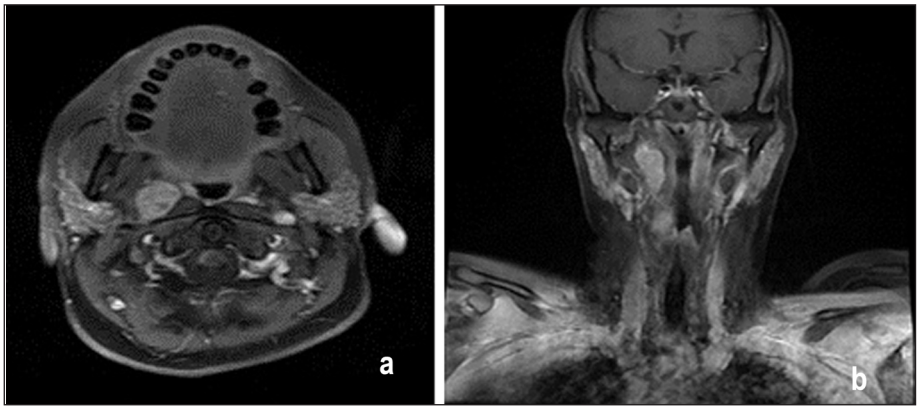

FIGURE 1: Magnetic resonance imaging scans in axial **(a),** coronal **(b)** planes demonstrating papillary thyroid carcinoma metastasis laid in the prestyloid compartment.

cluding 8 types of benign tumors and 4 types of malignant tumors. The average follow-up was 4.5 years. Salivary gland and neurogenic tumors were the most common benign tumors, the majority of malignant tumors were also found to be salivary gland tumors. Among the benign tumors, the most common was pleomorphic adenoma (43.3%). The most common type of malignant tumor was acinic cell carcinoma (13.3%) (Table 2).

The most commonly used surgical technique was the transparotid approach, followed by the transcervical-submandibular, transcervical-transparotid, and transparotid-transmastoid combined approaches (Table 3). Selective supraomohyoid neck dissection was performed in four malignant tumor cases, and lateral neck dissection was performed in one patient with squamous cell carcinoma. Postoperative RT was added to the treatment of patients with malignant tumors with postoperative histopathological findings of perineural invasion, lymphovascular invasion, and surgical margin positivity.

Complications were seen in 17 of 30 (53%) patients. Among the patients who underwent the transparotid approach, one patient's seventh nerve neurofibroma was excised, and the facial nerve was intraoperatively repaired with the auricularis magnus nerve graft in the immediate postoperative period. Six months after the initial operation, a patient with postoperative facial nerve paralysis (House-Brackmann [HB] grade VI) underwent augmentation with buccal muscle and was implanted with a gold eyelid prothesis to enable the closing of the eyelid on the affected side. One year later, the patient was evaluated as HB Grade III. The buccal branch cut in three other patients was repaired with an end-to-end anastomosis using the same procedure. Patients with HB III were

TABLE 2: Histopathological results of parapharyngeal space masses.

Pathology	n=30	%
Salivary gland tumors		
Benign tumors		
Pleomorphic adenoma	13	43.3
Others[a]	3	10
Malignant tumors		
Acinic cell carcinoma	4	13.3
Adenocystic carcinoma	3	10
Squamous cell carcinoma	1	3.3
Neurogenic tumors		
Schwannoma	2	6.6
Neurofibroma	1	3.3
Other benign tumors[b]	2	6.6
Metastatic tumors		
Thyroid papillary carcinoma	1	3.3

[a]Warthin's tumor and chronic sialadenitis, myoepithelioma.
[b]Lipoma and branchial cleft cyst.

TABLE 3: Surgical approaches performed.

Surgical approaches	Number of patients (n=30)	%
1. Transparotid	16	53.3
2. Transcervical + submandibular	8	26.7
3. Transparotid + transmastoid	1	3.3
4. Transcervical+ transparotid	5	16.7

TABLE 4: Postoperative complications.

Complications	n=17	(100%)
Facial paresis/paralysis	4	(23.5%)
Hematoma	1	(5.9%)
Residual tumor (surgical margin positivity)	3	(17.6%)
Recurrence	0	(0%)
Frey syndrome	2	(11.8%)
Deformity in the parotid lobe	4	(23.5%)
Horner syndrome	1	(5.9%)
Flap necrosis	2	(11.8%)

evaluated as HB II after two years of follow-up (Table 4). Horner syndrome was observed in a patient with neurofibroma, and this complication did not improve after two years of follow-up. In a patient with local bleeding, the hematoma was cleared and bleeding was controlled. Necrosis in the incision site (11.8%) and Frey's syndrome (11.8%) were seen in two patients (Table 4).

The mean follow-up period was 32 months with a range of 24-54 months. Four patients (13.3%) were lost to follow-up, and 26 patients (66.7%) had no relapse. One patient died due to cardiac causes.

DISCUSSION

In PPS, 45.6% of tumors have been reported as originating in the salivary gland, 23.3% as neurogenic, 15.1% as lymph node, and 16.1% as various types of mass. Tumors of this region must reach 2.5-3.0 cm in size for clinical presentation. Vascular lesions should be considered in pulsating masses.[4,5] In tumors larger than 2.5 cm, the first sign is swelling in the neck. These tumors, which can grow towards the oropharynx, may cause medial pushing and difficulty in swallowing, affecting the soft palate or tonsillar region.[3-6] Similar to the literature, the mean PPS tumor size at the time of diagnosis in our series was 3.11 cm, and the largest tumor was 4.5 cm (Figure 2). The patients' symptoms were mostly swelling and pain that caused asymmetry or mass appearance on the neck and face. Four patients with a tumor size of 4.0-4.5 cm had pain symptoms and signs of pushing towards the tonsil on the medial side with pain.

Chen et al. analyzed 22 cases of PPS and reported the most common benign tumor to be pleomorphic adenoma (35.6%). They performed the transmandibular approach (35.7%) and the transcervical approach (28.6%) most often.[7] Similar to the literature, 43.3% of the patients we followed had pleomorphic adenoma. Moreover, 9.9% of our patients had neurogenic tumors, and 26.6% were malignant tumors originating from the salivary gland.

Due to the complexity of the anatomic structures involved and the difficulty of approach to the affected region, the treatment of PPS tumors, which is most commonly surgical excision, is very difficult.[4,8,9] A patient's suitability for surgery can be determined according to tumor type, width, and relation to vital anatomic structures.[9]

Various approaches have been described to reach the PPS.[10] In tumor resection, all approaches can be performed alone or in combination. In the sur-

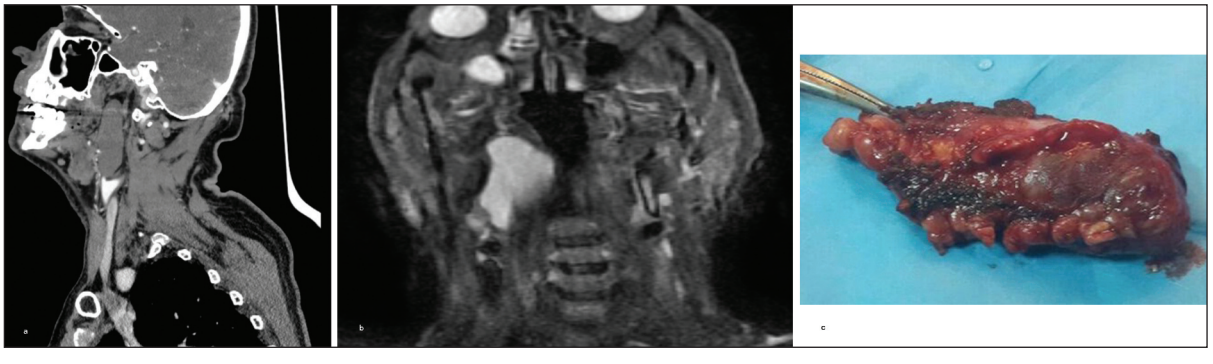

FIGURE 2: Magnetic resonance imaging scans in sagittal **(a),** coronal **(b)** planes demonstrating brankial kleft cyst laid in the prestyloid compartment. The branchial cyst (c) was completely resected.

gical approach, the location, size, histopathology, vascularity of the tumor, and its relationship with critical anatomic structures and the skull base are important. The best approach for a patient achieves complete excision of the tumor and is planned to minimize the risk of possible complications and aesthetic morbidity.[11] In addition, removing the tumor en bloc is necessary to prevent the spread of the tumor. Prasad et al. proposed an algorithm that demonstrated the selection of the appropriate surgical approach for the treatment of PPS tumors.[12] The vast majority of benign tumors of the prestyloid space can be excised using the transcervical or transparotid approaches or a combined approach.[13] In some studies in the literature, the transcervical approach was the most common surgical approach to PPS tumors.[9] Riffat et al. reported that they used the transcervical approach in 329 of 686 patients (48%) patients who underwent surgery.[14] In our 30-case study, the transparotid approach was the most frequently used approach, with a rate of 53.3%; the transcervical + submandibular approach was the second most common at 26.7% (Figure 3). The transparotid approach is the most commonly used method for the exposure of the facial nerve and removal of the deep lobe of the parotid lobe in parotid tumors. The transparotid approach is a safe option when trying to protect the facial nerve; however, its most important disadvantage is that the probability of facial paresis increases due to the full exposure of the facial nerve. In two different studies of Chen et al, and Ijichi et al, facial paralysis was seen with the transparotid approach in 21.1% and 38.5% of patients, respectively.[7,15] In our series, facial paralysis was inevitable in six cases because the tumor was invading the facial nerve. Although excellent exposure of the mass can be provided with the transmandibular approach, malocclusion is a disadvantage, leading to cosmetic and other functional problems. The frequency of performing the transmandibular combined approach has been reported to be less than 10%.[13] In our case series, we were able to extract all masses en bloc without the need for the transmandibular approach.

Transoral surgery has been developed as a technique that provides direct access to oropharyngeal tumors; however, there is a considerable risk for major vascular injuries.[15,16] This approach may be useful for benign avascular tumors smaller than ~25 mm in the oropharynx that do not extend into the styloid process. A low Mallampati score should be adequate for the use of the transoral approach.[17] Due to the improvements of minimally invasive techniques, transrobotic surgery has also been used transorally.[18] However, the use of the transrobotic approach is limited because of restricted vision, a limited capacity to maneuver, inadequate hemostatic control, and the risk of opening the tumor capsule, and this approach should not be used in the presence of any neurovascular defects.[17] In the last ten years, we have not used the transoral approach to treat any patients with PPS tumors.

FIGURE 3: Submandibular approach was applied to achieve direct access to the lesion PPS.

CONCLUSION

Although PPS tumors are rare, adequate planning must be undertaken before surgery for the best results. The transparotid and transcervical-submandibular approaches provide the best access to PPS tumors originating from the parotid gland. By performing surgery using the most appropriate surgical technique and relying on preoperative imaging and test results, treatment can be provided that will minimize possible complications.

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Conflict of Interest

No conflicts of interest between the authors and / or family members of the scientific and medical committee members or members of the potential conflicts of interest, counseling, expertise, working conditions, share holding and similar situations in any firm.

Authorship Contributions

Idea/Concept: *Ayşe Enise Göker;* ***Design:*** *Güler Berkiten, Kamil Akdağ;* ***Control/Supervision:*** *Yavuz Uyar;* ***Data Collection and/or Processing:*** *Semih Karaketir, Sitare Saricam;* ***Analysis and/or Interpretation:*** *Tolgar Lütfi Kumral, Hüseyin Sarı;* ***Literature Review:*** *Ayça Başkadem Yılmazer, Belgin Tutar;* ***Writing the Article:*** *Ayşe Enise Göker, Ayça Başkadem Yılmazer;* ***Critical Review:*** *Yavuz Uyar.*

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