Surgical Approaches and Recurrences in Primary Parapharyngeal Space Malignancies: A Systematic Review

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Background

- Primary parapharyngeal space (PPS) malignancies, including deep lobe parotid (DLP) malignancies, are rare neoplasms that arise in an anatomically complex region of the head and neck, traditionally divided into prestyloid and poststyloid compartments. While approximately 80% of tumors in this space are benign, around 20% are malignant, with adenoid cystic carcinoma, mucoepidermoid carcinoma, carcinoma ex-pleomorphic adenoma, and squamous cell carcinoma being the most common malignant subtypes.[1-2]
- Malignant PPS tumors are relatively rare with limited data on how surgical techniques may affect long-term outcomes. Among the various surgical options for PPS malignancies, the transcervical (TC) approach is frequently used, as it offers reliable exposure to the deep lobe and surrounding parapharyngeal structures.[3]
- With the growing interest in minimally invasive technology, the transoral (TO) approach has seen expanded use in endoscopic and robotic techniques for PPS tumor excisions. However, its advantages compared to traditional approaches in malignant PPS tumor recurrence and long-term outcomes remain unclear.[4]

Objective:

- This systematic review is to review the association between surgical approaches and recurrence rate in primary PPS malignancies.
- Summarize associated characteristics and post-operative outcomes of primary PPS malignancies.

Methods and Materials

- **Systematic Review:** Following PRISMA guidelines, a literature was performed (PubMed, EMBASE, and SCOPUS) from inception up to January 2025.
- **Inclusion Criteria:** RCT, case-control, retrospective or prospective cohort studies, case reports/series evaluating recurrence rates of primary PPS malignancies in TC and TO approaches.
- **Exclusion Criteria:** Metastatic tumors to PPS, recurrent tumors, benign PPS tumors, did not specify surgical approach, and did not report recurrence rate.
- **Collected Variables:** Author name, publication year, country of study, sex, total malignant PPS tumors, follow-up duration, imaging used, average tumor size, invasion to nearby structures, number of tumor per TC or TO approach, tumor histopathology, recurrence rate, time to recurrence, post-op complications, adjuvant chemoradiation, local recurrence, and death.

Results

Table 1. Baseline Characteristics of Included Studies

Study Author	Year	Country	Total Malignant PPS Tumors	Female (%)	Follow-up Duration (months)	Imaging Used
Arshad	2012	USA	1	0	6.0	CT
Betka	2010	Czech Republic	2	61	77.0	MRI, CT
Hussain	2014	UK	1	60	72.0	MRI
Leverstein	1996	Netherlands	2	100	60.0	MRI
Shen	2020	China	1	0	51.0	MRI
Shin	2022	South Korea	1	80	46.5	MRI, CT
Luna-ortiz	2005	Mexico	5	62	141.0	CT
Lien	2019	Taiwan	3	64.2	60.6	MRI, CT
Chen	2013	China	2	25	17.0	MRI, CT
Meng	2018	China	1	33.3	11.2	MRI, CT
Chu	2017	Italy	25	42	28.6	CT, MRI, endoscopy
Chen	2017	China	2	34.8	15.9	MRI, CT
Liu	2022	China	3	50	24.0	MRI, CT
Pang	2002	Singapore	3	51	67.2	MRI, CT
Malone	2001	USA	6	64	24.0	None
Bozza	2009	Italy	2	40	120.0	MRI, CT

Table 2. Tumor Characteristics and Surgical Approach

Study Author	Year	Total PPS Tumors	Malignant (Cancer) PPS Tumors	Average Tumor Size (cm)	Invasion to Nearby Structure	Malignant PPS Tumors Surgical Approach		Malignant PPS Tumor Recurrence by Surgical Approach	
						TO[a] approach	TC[b] approach	TO[a] approach	TC[b] approach
Arshad	2012	3	1	2.6	No	1	0	0	0
Betka	2010	22	2	4.8	No	2	0	0	0
Hussain	2014	5	1	4	No	1	0	0	0
Leverstein	1996	12	2	7	No	0	2	0	0
Shen	2020	3	1	5	No	1	0	0	0
Shin	2022	15	1	8.5	No	0	1	0	0
Luna-ortiz	2005	21	5	9.6	Yes	0	5	0	1
Lien	2019	14	3	4.2	Yes	0	3	0	0
Chen	2013	8	2	5.5	No	0	2	0	0
Meng	2018	9	1	5	No	1	0	0	0
Chu	2017	53	25	5	Yes	2	23	1	6
Chen	2017	23	2	6.3	No	0	2	0	0
Liu	2022	13	3	5	No	3	0	1	0
Pang	2002	28	3	N/A	N/A	0	3	0	1
Malone	2001	30	6	N/A	Yes	0	6	0	3
Bozza	2009	10	2	4.6	Yes	0	2	0	2

[a]TO, transoral; [b]TC, transcervical

Table 3. Post-operative Complications in included studies

Study Author	Year	Adjuvant Chemoradiation	Post-op Complications	Time of Recurrence (months)	Local Recurrence	Death
Arshad	2012	No	None reported	-	-	
Betka	2010	Yes	None reported	-	-	
Hussain	2014	Yes	None reported	-	-	
Leverstein	1996	Yes	None reported	-	-	
Shen	2020	Yes	None reported	-	-	
Shin	2022	Yes	None reported	-	-	
Luna-ortiz	2005	Yes	1 CN XII palsy	132	1	0
Lien	2019	Yes	vocal cord paralysis, hypertrophic scar, facial palsy	-	-	
Chen	2013	Yes	facial nerve palsy	-	-	
Meng	2018	Yes	None reported		0	0
Chu	2017	Yes	4 tumor spillages, 2 bleedings, 5 facial n. impairments, 7 laryngeal palsies, 2 Claude Bernard Horner syndromes, 1 first bite syndrome and 1 ictus cerebri	82		1
Chen	2017	Yes	temporary facial palsy	0	0	0
Liu	2022	No	dehiscence of suture, mild oral tenderness	24	1	0
Pang	2002	Yes	facial nerve weakness	3	1	0
Malone	2001	Yes	dysphagia, trismus, hypoglossal nerve injury, vocal cord paralysis	24	2	2
Bozza	2009	Yes	Horner's syndrome	48	1	1

- Among the 16 included studies, a total of 60 malignant cases out of 269 PPS tumors were analyzed. Tumor sizes ranged from 2.6 cm to 9.6 cm in average dimension, with five studies reporting regional invasion.
- The transcervical approach was utilized more frequently, accounting for 49 out of 60 malignant tumor resections (81.6%) while the remaining 11 malignant tumors were resected via transoral route (18.4%).
- Recurrence rate occurred in 13 of 49 (26.5%) in the transcervical approach group while 2 of the 11 (18.2%) in the transoral approach group.
- Adjuvant chemoradiation was administered in 14 out of 16 studies. Most studies reported no postoperative complications, though several described notable events as described in Table 3. Some of the common and temporary post-operative complications are cranial nerve XII palsy, vocal cord paralysis, hypertrophic scar formation, and facial palsy. One study by Chen et al reported tumor spillage, intraoperative bleeding, facial nerve impairment, laryngeal palsy, Horner syndrome, first bite syndrome, and one case of ictus cerebri.
- Time to recurrence ranged from 0 to 132 months and tumor associated death was reported in three studies.

Conclusion

This systematic review explored recurrence outcomes in primary PPS malignancies by surgical approach. Due to limited data and recurrence in both transoral and transcervical groups, no consistent difference was observed. Although not conclusive, associated factors of recurrence include malignant tumors with larger size, locally invasion, associated with severe post-op complications. These findings suggest that surgical planning should be based on individual tumor characteristics rather than approach alone. More studies reporting consistent postoperative outcomes and treatment approach in primary PPS malignancies would further enhance our understanding and approach of these challenging malignancies.

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