Comparative analysis of benign and malignant parotid gland tumors: A retrospective study of 992 patients

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Research Article

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Abstract

OBJECTIVE: We analyzed and compared the clinical characteristics of benign and malignant parotid gland tumors.

PATIENTS and METHODS: A total of 992 patients who underwent surgical treatment for parotid gland tumors from January 2010 to December 2020 were included in this study. This study population was subdivided into benign (n = 812, 81.9%) and malignant parotid gland tumors (n = 180, 18.1%).

RESULTS: Pleomorphic adenoma is the most common benign tumor and mucoepidermoid carcinoma is the most common malignant tumor. The patients with malignant parotid gland tumors were older than the patients with benign lesions. The duration of symptoms was longer in patients with benign parotid gland tumors compared to those with malignant lesions. The size of the malignant tumors was larger than that of the benign lesions. Preoperative fine-needle aspiration cytology had a diagnostic sensitivity of 50.3%, diagnostic specificity of 98.7%, a positive predictive value of 89.5%, a negative predictive value of 89.9%, and accuracy of 89.9% for diagnosing malignant parotid gland tumors. For benign parotid gland tumors, superficial parotidectomy was most frequently performed, and for malignant parotid gland tumors, total parotidectomy was most frequently performed. Facial palsy was observed in 19.4% of the patients with malignant parotid gland tumors compared to 5.4% of those with benign tumors.

CONCLUSION: The clinical features of benign and malignant parotid gland tumors showed differences in age, symptoms, duration of symptoms, size and site of the parotid tumors, surgical procedures, and postoperative facial nerve palsy.

Introduction

Salivary gland tumors are rare, accounting for 2 – 3% of all head and neck tumors.[1-5] These tumors occur mainly in the parotid gland and 75 – 80% of all parotid gland tumors are benign.[1-3] Previous studies reported that pleomorphic adenoma was the most common benign parotid gland tumor and mucoepidermoid carcinoma was the most common malignant tumor.[1-5]

However, differences in the histopathological type and incidence of parotid gland tumors depending upon the region have been reported.[3] Therefore, to investigate these characteristics in Koreans, patients with parotid gland tumors who underwent surgical treatment for 11 years at this hospital were identified and classified into benign and malignant parotid gland tumors. We analyzed and compared the clinical characteristics of the two groups.

Patients And Methods

This study was performed after approval by the Institutional Review Board of Chonnam National University Hwasun Hospital (CNUHH-2021-246). A total of 992 patients who underwent surgical treatment

for parotid gland tumors from January 2010 to December 2020 were included in this study. This study population was subdivided into benign (n = 812) and malignant parotid gland tumors (n = 180).

The patients' clinical data were reviewed with respect to age, gender, symptoms, duration of symptoms, size and site of the parotid tumors, preoperative fine-needle aspiration cytology (FNAC), surgical procedures, histopathologic results, and postoperative complications. All patients underwent one or more radiological examinations including computed tomography (CT), magnetic resonance imaging (MRI), and ultrasound (US) prior to surgery to assess the extent of the lesion and assist with treatment planning.

The type and extent of surgery depended upon the location of the parotid gland tumor and the FNAC results. All patients underwent macroscopically complete oncologic resection. Partial superficial parotidectomy was performed if the parotid gland tumor was located in the tail of the parotid gland. Superficial parotidectomy was performed if the parotid gland tumor was located in the superficial lobe. Total parotidectomy was performed when the parotid gland tumor was located in the deep lobe, or the FNAC diagnosis indicated a malignancy. Radical parotidectomy was performed if the parotid gland tumor directly invaded the facial nerve and induced facial palsy. Intraoperative facial nerve monitoring was typically used. Drainage was performed and maintained via aspiration. All resected specimens were confirmed by histopathological examination.

Fisher's exact test was used to compare the differences between benign and malignant parotid gland tumors. SPSS version 27.0 was used for all statistical analyses. Statistical significance was defined at a *p*-value of < 0.05.

All research was performed in accordance with the relevant guidelines and regulations and all Institutional Review Board requirements. The requirement for informed consent was waived in view of the retrospective nature of the research and anonymity of the data.

Results

Of the 992 patients with parotid gland tumors, 812 (81.9%) had benign parotid gland tumors and 180 (18.1%) had malignant parotid gland tumors. The clinical findings of the benign and malignant parotid gland tumors are summarized in Table 1. Of the 812 patients with benign parotid gland tumors, 448 were male and 364 were female. The patients' mean age was 54.3 ± 15.3 years (range, 3 to 85 years). The most common symptoms were a mass in the parotid gland (n = 737, 90.8%), incidental diagnosis on imaging tests (n = 71, 8.7%), pain (n = 3, 0.4%), and facial palsy (n = 1, 0.1%). The duration of symptoms was 25.6 ± 51.5 months (range, 0.1 to 120 months). Of the 812 benign parotid gland tumors, 422 (52.0%) were located in the right parotid gland and 390 (48.0%) were located in the left side. The mean tumor size was 2.6 ± 1.2 cm (range, 0.5 to 10 cm). Preoperative FNAC was performed in 689 patients (84.8%). Based on the FNAC results, 680 patients were diagnosed with benign lesions and nine with malignancies. Of the 812 patients with benign parotid gland tumors, 571 lesions were removed by superficial parotidectomy (70.3%), 223 by partial superficial parotidectomy (27.5%), and 18 by total parotidectomy (2.2%). None of the patients underwent radical parotidectomy. The most common histopathological type of benign

parotid gland tumors was pleomorphic adenoma (n = 343, 42.2%), followed by Warthin tumor (n = 252, 31.0%), basal cell adenoma (n = 87, 10.7%), and others (Table 2). Postoperative temporary or permanent facial palsy occurred in 44 patients (5.4%).

Of the 180 patients with malignant parotid gland tumors, 102 were male and 78 were female. The patients' mean age was 60.0 ± 18.0 years (range, 11 to 92 years). The most common symptoms were a mass in the parotid gland (n = 156, 86.7%), incidental diagnosis on imaging tests (n = 18, 10.0%), pain (n = 5, 2.8%), and facial palsy (n = 1, 0.6%). The duration of symptoms was 12.5 ± 22.9 months (range, 0.1 to 120 months). Of the 180 patients with malignant parotid gland tumors, 78 (43.3%) were located in the right parotid gland and 102 (56.7%) were located in the left side. The mean tumor size was 3.1 ± 2.0 cm (range, 0.4 to 13.5 cm). Preoperative FNAC was performed in 153 patients (85.0%). Based on the FNAC results, 76 patients were diagnosed with benign lesions and 77 with malignancies. Of the 180 patients with malignant parotid gland tumors, 72 lesions were removed by total parotidectomy (40.0%), 66 by superficial parotidectomy (36.7%), 27 by partial superficial parotidectomy (15.0%), and 15 by radical parotidectomy (8.3%). The most common histopathological type of malignant parotid gland tumors was mucoepidermoid carcinoma (n = 34, 18.9%), followed by squamous cell carcinoma (n = 27, 15.0%), metastatic carcinoma (n = 25, 13.9%), and others (Table 3). Postoperative temporary or permanent facial palsy occurred in 35 patients (19.4%).

Discussion

In our study, 81.9% of the parotid gland tumors were benign tumors and 18.1% were malignant, consistent with previous reports.[1-7] Pleomorphic adenoma is the most common parotid gland benign tumor and mucoepidermoid carcinoma is the most common malignant tumor. The comparison of benign and malignant parotid gland tumors showed differences in age, symptoms, duration of symptoms, size and site of the parotid tumor, surgical procedures, and postoperative facial nerve palsy ($p < 0.05$).

The patients with malignant parotid gland tumors were older than the patients with benign lesions ($p < 0.001$). Both benign and malignant parotid tumors were more common in men, but there was no statistical difference between the two groups according to gender. A palpable mass in the parotid gland was the most common symptom in patients with benign and malignant parotid tumors in this study. There were statistically significant differences in the chief symptoms in patients with benign and malignant parotid tumors ($p < 0.05$). In addition, the duration of symptoms was longer in patients with benign parotid gland tumors compared to malignant lesions ($p < 0.001$). In this study, malignant parotid gland tumors occurred more frequently on the left side ($p < 0.05$), and the size of malignant tumors was larger than that of the benign lesions ($p < 0.001$). Therefore, when a large parotid mass is accompanied by sudden pain or facial palsy in an elderly person, the possibility of a malignant parotid gland tumor is high.[2,6,7]

The purpose of FNAC is not to make an accurate histopathological diagnosis, but to differentiate between benign and malignant parotid tumors.[2] We performed preoperative FNAC in 842 of 992 patients

(84.9%). FNAC had a diagnostic sensitivity of 50.3%, diagnostic specificity of 98.7%, a positive predictive value of 89.5%, a negative predictive value of 89.9%, and accuracy of 89.9% for diagnosing malignant parotid gland tumors. When the FNAC result indicated a malignancy, the probability of malignancy in the final diagnosis was 8.9 times higher than if the result of the FNAC was benign ($p < 0.001$).

The treatment of choice for a parotid gland tumor is complete tumor removal with clear margins, and various surgical methods including superficial parotidectomy, partial superficial parotidectomy, total parotidectomy, and radical parotidectomy are being used.[1-9] For benign parotid gland tumors, superficial parotidectomy was most frequently performed, and for malignant parotid gland tumors, total parotidectomy was most frequently performed in this study. In malignant parotid gland tumors, aggressive surgery such as total or radical parotidectomy was more commonly used ($p < 0.001$).

The most serious complication after parotid surgery is facial palsy.[2,6] Facial palsy was observed in 19.4% of the patients with malignant parotid gland tumors compared to 5.4% of the patients with benign tumors ($p < 0.001$). This is thought to be because there were many cases of facial nerve invasion in patients with malignant parotid gland tumors, and further resection was required to secure a safe margin.[1,2,7-9]

Conclusion

The clinical features of benign and malignant parotid gland tumors showed differences in age, symptoms, duration of symptoms, size and site of the parotid tumors, surgical procedures, and postoperative facial nerve palsy.

Declarations

DATA AVAILABILITY

All data described in the study has been presented in the manuscript. The datasets analyzed are available from the corresponding author on reasonable request.

References

1. Mashrah MA, Al-Sharani HM, Al-Aroomi MA, Abdelrehem A, Aldhohrah T, Wang L. Surgical interventions for management of benign parotid tumors: Systematic review and network meta-analysis. Head Neck. 2021;43(11):3631-45.
2. Maahs GS, Oppermann Pde O, Maahs LG, Machado Filho G, Ronchi AD. Parotid gland tumors: a retrospective study of 154 patients. Braz J Otorhinolaryngol. 2015;81(3):301-6.
3. Reinheimer A, Vieira DS, Cordeiro MM, Rivero ER. Retrospective study of 124 cases of salivary gland tumors and literature review. J Clin Exp Dent. 2019;11(11):e1025-32.
4. Tian Z, Li L, Wang L, Hu Y, Li J. Salivary gland neoplasms in oral and maxillofacial regions: a 23-year retrospective study of 6982 cases in an eastern Chinese population. Int J Oral Maxillofac Surg.

2010;39(3):235-42.
5. Bradley PJ, McGurk M. Incidence of salivary gland neoplasms in a defined UK population. Br J Oral Maxillofac Surg. 2013;51(5):399-403.
6. Inaka Y, Kawata R, Haginomori SI, Terada T, Higashino M, Omura S, Kikuoka Y. Symptoms and signs of parotid tumors and their value for diagnosis and prognosis: a 20-year review at a single institution. Int J Clin Oncol. 2021;26(7):1170-8.
7. Moore MG, Yueh B, Lin DT, Bradford CR, Smith RV, Khariwala SS. Controversies in the Workup and Surgical Management of Parotid Neoplasms. Otolaryngol Head Neck Surg. 2021;164(1):27-36.
8. Psychogios G, Bohr C, Constantinidis J, Canis M, Vander Poorten V, Plzak J, Knopf A, Betz C, Guntinas-Lichius O, Zenk J. Review of surgical techniques and guide for decision making in the treatment of benign parotid tumors. Eur Arch Otorhinolaryngol. 2021;278(1):15-29.
9. Lombardi D, McGurk M, Vander Poorten V, Guzzo M, Accorona R, Rampinelli V, Nicolai P. Surgical treatment of salivary malignant tumors. Oral Oncol. 2017 Feb;65:102-113.

Tables

Table 1. Clinical characteristics of benign and malignant parotid gland tumors

	Benign neoplasms (N = 812)	Malignant neoplasms (N = 180)	*p*-value
Age (years)	3 – 85 (54.3 ± 15.3)	11 – 92 (60.0 ± 18.0)	< 0.001
Sex (M : F)	448 : 364	102 : 78	0.716
Chief symptom			< 0.05
mass	737	156	
incidental	71	18	
pain	3	5	
facial palsy	1	1	
Duration of symptoms (months)	0.1 – 120 (25.6 ± 51.5)	0.1 – 120 (12.5 ± 22.9)	< 0.001
Location (R : L)	422 : 390	78 : 102	< 0.05
Tumor size (cm)	0.5 – 10.0 (2.6 ± 1.2)	0.4 – 13.5 (3.1 ± 2.0)	< 0.001
FNAC result	FNAC patients (N = 689)	FNAC patients (N = 153)	
benign	680	76	
malignant	9	77	
Surgical method			< 0.001
Partial parotidectomy	223	27	
Superficial parotidectomy	571	66	
Total parotidectomy	18	72	
Radical parotidectomy	0	15	
Postoperative facial palsy	44 (5.4%)	35 (19.4%)	< 0.001

M, male; F, female; R, right; L, left; FNAC, fine-needle aspiration cytology.

Table 2. Histopathological types of benign parotid gland tumors

Histopathology	Number of patients (N = 812)
Pleomorphic adenoma	343
Warthin tumor	252
Basal cell adenoma	87
Chronic sialadenitis	48
Lymphoepithelial cyst	37
Lipoma	8
Myoepithelioma	8
Oncocytoma	6
Schwannoma	5
Actinomycosis	3
Epidermal inclusion cyst	3
Hemangioma	2
Cystadenoma	2
Central giant cell tumor	2
Lymphadenoma, sarcoidosis, atheroma, histiocytoma, Kimura disease, inflammatory myofibroblastic tumor	1 each

Table 3. Histopathological types of malignant parotid gland tumors

Histopathology	Number of patients (N = 180)
Mucoepidermoid carcinoma	34
Squamous cell carcinoma	27
Metastatic carcinoma	25
Salivary duct carcinoma	21
Carcinoma ex pleomorphic adenoma	17
Acinic cell carcinoma	11
Adenoid cystic carcinoma	9
Adenocarcinoma	8
Epithelial-myoepithelial carcinoma	6
Basal cell carcinoma	4
Mammary analog secretory carcinoma	4
Lymphoma	3
Oncocytic carcinoma	3
Myoepithelial carcinoma	3
Carcinosarcoma	2
Malignant nerve sheath tumor, sebaceous carcinoma, Lymphoepithelial carcinoma	1 each