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Parotid neoplasms: diagnosis, treatment, and intraparotid facial nerve anatomy

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Abstract

The demographics of parotid neoplasms in different populations have been reported by various centres. In this investigation, we reviewed retrospectively all the in-patient and out-patient charts and records of 108 patients who were diagnosed with parotid neoplasms and received parotidectomies in our department from 1 January 1993 to 15 April 2000. Patient age, gender, tumour pathology, fine-needle aspiration cytology results, and the intraparotid anatomy of the facial nerve were noted. We showed that despite the difference between our Taiwanese and previously studied patient populations, both populations had a similar distribution, diagnosis and treatment of parotid neoplasms, although the incidence of parotid tuberculosis was higher in our patient group. In addition, the facial nerve anatomy within the parotid gland had three main branching patterns in the upper and lower division.

Key words: Parotid Neoplasms; Diagnosis; Treatment Outcome; Facial Nerve Anatomy

Introduction

Comprising less than three per cent of all head and neck neoplasms, salivary gland tumours present a myriad of morphological variations.[1] This is reflected in the second revision of the World Health Organization (WHO) classification of salivary gland tumours, in which the number of histological types of epithelial salivary gland tumours has been increased to more than 30.[2] The demographics of different parotid neoplasms have been reported recently in various populations.[3–5] We present a series of 108 patients with parotid tumours who had partial or total parotidectomies performed at our department. To our knowledge, this is the first series of parotid tumours to be reported in an Asian population. In the recent literature, Chung *et al.* reported on the epidemiology of Warthin's tumour of the parotid gland in an Asian population, but their survey did not include other parotid tumours.[4] Chung's results paralleled the findings of other centres. In this investigation, we compare and contrast the diagnosis and distribution of parotid tumours in a Taiwanese population.

In addition, for pre-operative evaluation purposes, we routinely performed fine-needle aspiration biopsy and cytology (FNAC) at our out-patient clinic to aid in our management of parotid tumours. In this study, we also evaluated the effectiveness of FNAC as a diagnostic tool. Other investigators have reported that FNAC has a sensitivity as high as 82 per cent.[6] Generally, it is recognized that FNAC is not used to make a definite histological diagnosis but merely to determine whether a parotid lesion is benign or malignant.[6,7] In the series reported by Raab *et al.*, 70 per cent of patients with a non-neoplastic lesion and 79 per cent of patients with a metastasis avoided surgery as a result of FNAC screening.[7]

Finally, we summarize our findings on intraparotid facial nerve branching patterns in this homogenous population of Asian patients. Because the integrity of the intraparotid facial nerve after its exit from the stylomastoid foramen is a major surgical concern in superficial or deep parotidectomies, head and neck surgeons in our department have undertaken the documentation of facial nerve branching patterns within the parotid gland. Such documentation has only been reported previously in cadaver dissections,[8,9] and in a few sporadic cases.[10] The course of the facial nerve is of interest particularly when the parotid tumour involves the facial nerve or a branch of the facial nerve. With advances in technology, more and more head and neck surgeons advocate the use of electrophysiological monitoring during parotid surgery to safeguard against iatrogenic facial nerve injuries.[11–13] A more thorough understanding of intraparotid facial nerve anatomy aids in intraoperative decision-making and smooth surgical dissection.

In this retrospective study of all parotidectomies performed in the department, we investigated the diagnosis and distribution of parotid tumours, the

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TABLE I
HISTOPATHOLOGICAL DIAGNOSIS

Diagnosis	Number of patients (n = 108)
Benign	
Pleomorphic adenoma	48
Warthin's tumour	24
Monomorphic adenoma	6
Benign lymphoepithelial lesion	7
Chronic sialadenitis	3
TB	3
Lipoma	1
Neurilemmoma	1
Schwannoma	1
Oncocytoma	1
Basal cell adenoma	1
Kimura's disease	1
Interstitial fibrosis	1
Lymphoid hyperplasia	1
Malignant	
Adenoid cystic carcinoma	2
Acinic cell carcinoma	1
Adenocarcinoma	2
Lymphoma	1
Epithelial-myoepithelial carcinoma	1
Squamous cell carcinoma	1
Sarcoma, unclassified	1
Total	108

results of FNAC, and the course of the facial nerve within the parotid gland.

Materials and methods

A total of 108 patients with benign and malignant parotid gland tumours were treated in the Department of Otolaryngology, Shin Kong Wu Ho-Su Memorial Hospital between 1 January 1993 and 15 April 2000. Treatment in all cases consisted of superficial or total parotidectomy. Patients' charts were reviewed for age, gender, tumour pathology, fine-needle aspiration biopsy and cytology results, imaging results, and the anatomy of the facial nerve within the parotid gland. Of the 108 patients, 55 were female and 53 were male. The ages of patients ranged from 13 to 81 years, with a mean age of 45.8 years. Pre-operative imaging evaluations included computed tomography (CT) scans in 105 patients and magnetic resonance imaging (MRI) in two patients. Forty patients received pre-operative FNAC evaluations. Careful documentation of the facial nerve anatomy with its branching pattern was found in the charts of 81 people. One patient received surgery twice separated by a two-year period. The first tumour was a pleomorphic adenoma, and the second tumour was a monomorphic adenoma with focal malignant change. Two patients with benign pleomorphic adenoma received post-operative radiation therapy. One of them exhibited malignant transformation detected in the histopathological evaluation, while the other had shown tumour recurrence twice in the past 10 years prior to the present surgery.

Results

Diagnosis and distribution

The lesions were histopathologically diagnosed as benign in 99 (91.7 per cent) cases, and malignant in nine (8.3 per cent) (Table I). The benign lesions included mostly pleomorphic adenomas (48 cases or 44.4 per cent), Warthin's tumours (24 cases or 22.2 per cent), benign lymphoepithelial lesions (seven cases or 6.5 per cent), and monomorphic adenomas (six cases or 5.6 per cent). There were six infection cases, (three of chronic sialoadenitis and three of parotid tuberculosis). Of the nine malignant cases, seven were carcinomas, one a sarcoma and one a lymphoma. The sarcoma was unclassified after special immuno-staining, while the lymphoma was of the mixed large and small nodular type. Pleomorphic adenoma occurred predominantly in younger female patients; who ranged in age from 13 to 71 years, with a mean age of 36.0 years (Table II). The male to female ratio was 19:29. Warthin's tumour occurred predominantly in older male patients; the male population ranged in age from 37 to 81 years, and had a mean age of 48.2 years (Table II). The male-to-female ratio was 11:1.

Fine needle aspiration cytology (FNAC)

In this series of 108 cases, 40 patients received pre-operative FNAC, by which 37 (94.9 per cent) cases were correctly diagnosed as benign or malignant; of the three incorrectly diagnosed, one was a false positive and two were false negatives. Of the five cases of malignancy, three (60 per cent) were

TABLE II
PATIENT DEMOGRAPHICS

Diagnosis	Mean age	Age range	Male–Female ratio
Benign			
Pleomorphic adenoma	36.0	13–71	19:29
Warthin's tumour	48.2	37–81	22:2
Monomorphic adenoma	48.2	24–60	3:3
Malignant			
Adenoid cystic carcinoma	30.5	15–46	0:2
Acinic cell carcinoma	38.0	38	0:1
Adenocarcinoma	61.5	61–62	1:1
Lymphoma	65.0	65	1:0
Epithelial-myoepithelial carcinoma	41.0	41	0:1
Squamous cell carcinoma	66.0	66	0:1
Sarcoma, unclassified	71.0	71	1:0

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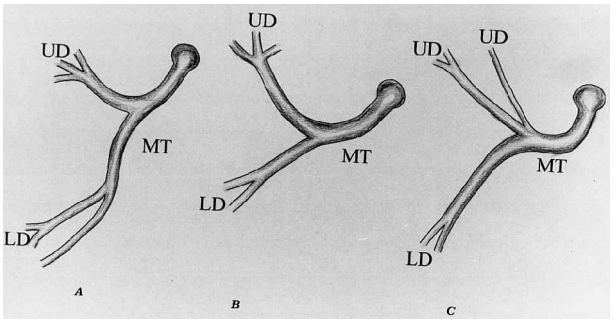

FIG. 1

The facial nerve anatomy in the parotid gland. MT, Main trunk; UD, upper division; LD, lower division.

correctly diagnosed. In the case of benign lesions, 97.1 per cent were diagnosed correctly by FNAC.

Intraparotid facial nerve anatomy

Eighty-one cases had careful chart documentation of the intraparotid facial nerve branching pattern. Some also had documentation of the relationship of the facial nerve anatomy to the retromandibular vein. These facial nerve branching patterns could be subdivided into three main categories (Figure 1(a)–(c)). Twenty cases (24.7 per cent) displayed the pattern seen in Figure 1(a), where the upper and lower trunks of the facial nerve divide, closely followed by the bifurcation of the marginal and cervical branches. The largest group (34 cases or 42 per cent) showed the pattern illustrated in Figure 1(b), where the upper and lower trunks divide, then branch into their respective divisions. Twenty-seven (33.3 per cent) cases had branching of the upper division immediately after the bifurcation of the upper and lower divisions (Figure 1(c)).

Discussion

In terms of histological diagnosis and distribution, our study results were similar to those reported in recent literature.[4,12–14] Chung *et al.* and Rea in two separate studies showed that pleomorphic adenoma was the commonest parotid tumour with ratios of 1.9:1 and 2:1, respectively, to Warthin's tumour.[4,13] Our study also showed a predominance of pleomorphic adenoma with a ratio of 2:1 to Warthin's tumour. These results taken together show that the distribution of pleomorphic adenoma and Warthin's tumour is no different in Asian and western populations.

However, the occurrence of parotid infectious and inflammatory lesions appeared lower than that from other comparable studies: an overall 8.3 per cent compared to the published 14.9 per cent and 16 per cent.[13] Among these infectious and inflammatory lesions, parotid tuberculosis was higher in our subject population, 2.7 per cent compared with 1.4 per cent in a predominantly Caucasian population.[12] Even though tuberculosis is a rampant disease in some developing countries, parotid tuberculosis was still a rare entity that warranted a case report.[15] With the resurgence of tuberculosis, we believe that more and more recent reports will reflect a corresponding rise in extrapulmonary manifestations of tuberculosis.

In our series, 8.3 per cent of parotid tumours were malignant. This closely approximated the 8.5 per cent of malignant tumour reported in Rea's series.[13] In contrast, the Singaporean and the Swiss series both reported a higher incidence of parotid malignancy of 15 per cent and 11.4 per cent respectively.[4,13] Our lower incidence of parotid malignancy may be due to early detection, the general awareness of the symptoms of this illness in the population, and the inclination especially of those presenting with a painless swelling in the parotid area to seek medical help early in their disease.

In our pre-operative evaluation of a parotid tumour, we routinely ordered an imaging study such as a CT scan or an MRI. In addition, we also performed FNAC to determine whether the tumour was benign or a malignant in nature. Our overall yield of 94.9 per cent correct diagnoses of a benign or a malignant lesion should encourage the continuation of such a procedure as a diagnostic tool. The two false negatives consisted of a case of sarcoma and a case of epithelial-myoepithelial carcinoma. Both cases later required special staining procedures for definitive diagnosis. Investigators have reported an overall diagnostic accuracy of 84 per cent, in which 84 per cent of the malignant tumours and 92 per cent of the benign tumours were classified accurately with regard to tumour type.[6] Other series have reported a sensitivity and specificity of FNAC in conjunction with other modalities to be greater than 95 per cent.[7] Therefore our result is in keeping with previous studies. As a relatively safe and fast, yet reliable procedure, FNAC has become a standard of practice in the evaluation of a parotid mass in recent years.

One of the major concerns of patients undergoing parotidectomies is that of post-operative facial palsy. Some recent studies have evaluated the outcomes of parotidectomy performed with the aid of electrophysiological monitoring, and reported the reduction in skin-to-skin surgery time and the risk of iatrogenic facial nerve injuries.[11–13] Scant literature was found on the actual anatomy of the intraparotid facial nerve.[8–10] Our attempt to delineate the facial nerve branching pattern showed that one pattern depicted in Figure 1(b) was predominant. Unfortunately, not all charts recorded the relationship of the facial nerve and the retromandibular vein, which serves as an important landmark in differentiating between the superficial and the deep lobe of the parotid gland. However, our effort should give a better understanding of the facial nerve anatomy within the parotid gland to assist in surgical dissection in parotidectomies, especially for educational purposes in teaching hospitals.

Conclusion

In this retrospective study on Asian patients who had undergone partial and total parotidectomies, the overall distribution and diagnosis of parotid tumours

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were similar to those shown in other studies. The FNAC yielded a diagnostic accuracy of 94.9 per cent, compatible with the results of other centres reported in the literature. Therefore, FNAC should be performed in all patients presenting with a parotid tumour. The investigation of intraparotid facial nerve anatomy showed three main branching patterns for the upper and lower division.

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