



Contents lists available at [ScienceDirect](#)

Auris Nasus Larynx

journal homepage: www.elsevier.com/locate/anl



Correlation between computed tomography imaging and histopathology in pleomorphic adenoma of parotid gland

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ARTICLE INFO

Article history:

Received 18 July 2016

Accepted 11 September 2017

Available online xxx

Keywords:

Pleomorphic adenoma

Histopathology

Parotid gland

Computed tomography

ABSTRACT

Objective: The purpose of this study was to correlate the CT imaging features and histopathological findings of pleomorphic adenomas (PA), and also try to identify its clinical significance.

Methods: Totally 262 PAs in the parotid gland including 18 recurrent cases were retrospectively reviewed with preoperative CT and pathologic slides. Each pathologic slide was reviewed by two pathologists to calculate mean value of epithelial/mesenchymal component, and the results were correlated with features of CT scans.

Results: PAs showing high contrast enhancement were correlated with high proportion of epithelial components in histopathologic findings. PAs with smooth border tend to have high proportion of epithelial components. The margin on CT imaging did not consist with pathologic margin of resected specimens. In recurrent PAs, there was a significant difference on CT contrast enhancement, not in proportion of epithelial component.

Conclusion: The histopathology and CT imaging features of PAs were variable, but we can find the correlation of epithelial component and CT contrast enhancement. Further large scale study would be expected to identify the clinical significance of CT imaging features and histopathologic findings of PAs.

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1. Introduction

Variant pathologic condition of the parotid gland can give rise to benign and malignant neoplasms, and they have similar clinical findings and image features. Furthermore, fine-needle

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<http://dx.doi.org/10.1016/j.anl.2017.09.013>

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aspiration cytology (FNAC) has a lower sensitivity for neoplastic parotid gland, though it has a high specificity. Therefore, the diagnostic process of parotid gland tumors is thought to be challenging. The gold standard of diagnosis is histopathologic examination after surgical excision.

Pleomorphic adenoma (PA) is one of the most common salivary gland neoplasm [1] and about half of them arise in the parotid gland [2]. PA is composed of varying proportions of epithelial and mesenchymal elements [3,4]. These marked variations in histologic pattern are responsible for the designation of the term, “pleomorphic”. Generally, PA is treated by a surgical excision with enough margins. For that reason, preoperative accurate diagnosis would play an important role in surgical planning.

There have been many studies about differential diagnosis of the salivary gland tumors by radiologic findings such as ultrasonography (US), computed tomography (CT), and magnetic resonance (MR), etc. Although US have some merits such as low cost, portability, and safety for ionizing radiation, it is not able to completely characterize a parotid mass in some cases. CT and MR can show the superficial and deep lobe, but they also have limitation in distinguishing parotid benign tumors [5,6]. Especially, CT is a valuable method for examining parotid tumors, in terms of fast and its higher resolution. However, the characteristics of PA on CT scan can be also “pleomorphic”, since we have experienced a variety of presentation on CT scans for salivary gland tumors which turned out to be PA on the final histopathologic examination. The CT scans of PA has been reported to be either smoothly marginated tumor, spherical small tumor or lobulated large tumor [7,8]. After contrast medium administration, PA tends to show variable enhancement on CT scan. In recent study, authors suggested that two phase helical CT can be useful to diagnose salivary gland tumors [8]. They found that PA showed a pattern of delayed enhancement, whereas Warthin tumor showed a pattern of strong enhancement at early phase. On the other hand, others reported that increased enhancement through all phases might be an indicator for diagnosing PA [9].

There was a study about correlation of histopathologic analysis and dynamic MRI assessments with salivary gland tumors [10]. However, there have been few studies concerned with relationship between CT findings and histopathologic components. The purpose of this study is to identify the association between CT findings and histopathologic characteristics in PAs of the parotid gland, and to investigate its clinical impact.

2. Materials and methods

2.1. Subjects

Between January 2001 and April 2012, 685 patients underwent parotidectomy for parotid mass at our institution. Among them, 340 (49.6%) was diagnosed to PA, and 262 cases of CT imagings and histopathologic slides were retrospectively reviewed. The subjects included 84 males and 178 females,

Table 1
Demographic data of the patients who underwent parotidectomy.

	N = 685	
Male:Female	361:324	
Mean age	51.7 ± 16.2 (15–83 years old)	
Types of tumor	Pleomorphic adenoma (PA)	340 (49.6%)
	Carcinoma ex PA	17 (2.5%)
	Warthin's tumor	92 (13.4%)
	Basal cell adenoma	28 (4.1%)
	Others	208 (30.4%)
Follow-up period	37.5 months (12–146 months)	
Recurrence	18 cases (2.5%)	
	1 case — malignant transformation	

ranging in age from 15 to 83 years (median 47.9 years of age). The characteristics of the patients are listed in Table 1. Of them, eighteen were revision cases for recurred PA.

2.2. CT findings

CT scans were performed preoperatively for diagnosis in all patients, and each scan was taken using settings of 2.5-mm slice thickness. Iodinated contrast material was injected into the antecubital vein within 30 s. A complete post-contrast neck study was performed at 55 s after completion of contrast injection.

The following features were evaluated on the CT images without the knowledge of tumor location and size: signal intensity of the lesion, enhancement of contrast medium, tumor margin, border of the lesion, size of the lesion, pattern of the lesion after injection of contrast medium, and location of the lesion. Signal intensity of the lesion was evaluated in relation to the temporalis muscle, and classified into three groups: high, intermediate and low. Enhancement of contrast medium was calculated in Hounsfield units (HU) using a region of interest (ROI) that included only solid portion of the tumor. Cystic, necrotic, and hemorrhagic components, as well as calcifications of the parotid gland masses, were excluded if they were present. A standardized ROI was used in all cases. The tumor margin was described as either well-defined or ill-defined. Border of the lesion was described as either smooth or lobulated. Pattern of the lesion after injection of contrast medium was classified into homogeneous, heterogeneous, or enhancing in the periphery only. Location of the tumor was classified as either superficial or deep [11]. Fig. 1 shows the representative CT scans of PA.

2.3. Histopathologic analysis

All specimens were fixed in 10% formalin, and the specimens were cut into slices. Then, they were dehydrated and embedded in paraffin. Sections were stained with H&E Stain and all pathology slides were reviewed twice by two pathologists (Ko JM, Park MJ) without knowledge of the CT findings. They measured epithelial/mesenchymal component by 5% unit in a quadri-section of cross-section, and then

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