

Imaging, clinical and pathological features of salivary gland adenolymphoma

C.-H. LIANG¹, W.-Y. DI², J.-P. REN³, F.-M. ZHOU¹, Y. HU¹, H.-J. MAO⁴, D.-M. HAN³

¹Department of Radiology, the First Affiliated Hospital of Xinxiang Medical University, Weihui, Henan, China

²Department of Pathology, the First Affiliated Hospital of Xinxiang Medical University, Weihui, Henan, China

³MRI Units of Radiology Department, the First Affiliated Hospital of Xinxiang Medical University, Weihui, Henan, China

⁴Department of Interventional Radiology, The First Affiliated Hospital of XinXiang Medical University, Weihui, Henan, China

Abstract. – OBJECTIVE: Adenolymphoma (Warthin's tumor) is a common salivary gland benign tumors with poor diagnosis and ranking second after the parotid tumors. Presently, a rising tendency of the incidence of adenolymphoma has been noted. The aim of this study was to investigate the clinical, pathological and imaging features of this tumor.

PATIENTS AND METHODS: 24 cases of confirmed adenolymphoma were retrospectively analyzed with clinical features, pathological data and CT imaging.

RESULTS: Among 24 cases, 22 (91.7%) patients were male, two patients were female, 23 (95.8%) patients were more than 50 years old; 38 lesions were found in 24 patients including isolated lesions in 16 patients (66.7%), and multiple lesions in 8 patients (33.3%). 81.6% adenolymphoma lesions (31/38) were located in the posterior and inferior quadrant. The shapes of the lesions were more oval or round, well-circumscribed, homogeneous (n=26) or inhomogeneous (n=12) with high density. 27 lesions were demonstrated with enhancement after contrast enhancement and 10 lesions showed small vessels penetrating through or surrounding the mass.

CONCLUSIONS: Adenolymphoma of the parotid (Warthin tumor) should be first considered by the clinical data including age, gender, location and imaging manifestations of the lesions.

Key Words:

Adenolymphoma, Parotid tumor, Tomography, X-ray computed.

ranking second after the parotid tumors. These are 5 to 10% among the parotid tumors. In recent years, a rising tendency of the incidence of adenolymphoma has been noted¹. It is often misdiagnosed as pleomorphic adenoma. Local excision or superficial parotidectomy is the surgical procedure of choice in patients with benign lesions. Fine needle aspiration cytology is not always conclusive. Therefore, pre-operative imaging has a major role in surgical planning.

We retrospectively analyzed the imaging CT information of 24 cases of confirmed adenolymphoma in the parotid gland. With all the documents and relevant reports, we observe their clinical, pathological features and imaging appearances, aiming to enrich our knowledge of adenolymphoma in parotid gland, especially in the way of clinical imaging.

Patients and Methods

Patients

Twenty four pathological proved adenolymphoma patients registered in our hospital from 2005 to 2011 were retrospectively analyzed. Among them, 22 patients were male (91.7%) and 2 patients were female (8.3%). Their average age was 56.5 years (age range 48 to 76 years), of whom 23 patients were > 50 years (95.8%) and one patient was < 50 years (4.2%). We had all patient's history from 2 weeks to 6 years, with an average history of 19 months; 14 cases with over 5 years of smoking history (63.6%) which were all male. All cases were confirmed as the parotid gland adenolymphoma patients which developed as a result of their careless treatment for the

Introduction

Adenolymphoma, also known as Warthin's tumor, are common salivary gland benign tumors of the parotid gland. Its incidence goes after the mixed parotid tumor (pleomorphic adenoma),

parotid gland masses in the neck earlobe. At the time of Warthin tumors diagnosis, their local skin was not red, and their skin temperature was not high with palpable nodular, soft texture and mild activity. Only 3 cases of mass were with pain or mild tenderness.

Patient's CT and Enhanced Scan

All patients underwent CT scan. Among them 20 cases underwent an enhanced scan in which 8 cases underwent dual-phase enhanced scan (scan in 30s and 90s after contrast agent injection). CT scan was carried out by the 16-row Lightspeed CT machine of GE Company, with the scan ranges from the external auditory canal under the edge to the level of the mandibular angle and disappearing until the parotid gland. If it was necessary to expand the scan range, we began to scan in the angle perpendicular to the longitudinal axis of the cervical spine and the scan thickness, layer pitch of 2.0 mm, with non-ionic contrast agent Ultravist or EuropeOmnipaque (300 mgI/ml), 1.5 ml/kg, in 30s after cubital vein by high pressure syringe injection with a flow rate of 3 ml/s.

Evaluation Methods and Contents of CT Result

In the sector between the mandibular vein and the sternocleidomastoid medial connection, the parotid was divided into the parotid deep lobe and superficial lobe; Before-and-after the boundary was the mandibular vein and up-and-down boundary was the parotid midpoint of the vertical diameter. With the boundary definition, the parotid gland was divided into front-up pole, front-down pole, behind-up pole and behind-lower pole. The record includes tumor size, shape, number, location, boundary, and tumor blood supply as well as its relationship with the mandibular vein. The grading standards for the degree of enhancement of the CT scan: 1. Level – mild (0-20 HU), 2. Level – moderate (21-40 HU), 3. Level – obviously (41HU and above).

Results

Lesions Distribution and Morphology

In 24 cases, we observed 31 incidences in the side parotid with 38 lesions. There were 16 cases of unilateral single lesion (66.7%) (Figure 2), 7 cases of bilateral multiple lesions (29.2%) (Figure 1), 1 case of unilateral multiple lesions

(4.1%), 3 cases of bilateral single lesion, and the case with the most lesions was the one with 5 lesions (2 on the left side, 3 on the right side). Moreover, we found 25 superficial lobes (65.8%), 12 inter-leaves (31.6%), and 1 deep lobe (2.6%). 31 lesion centers were located in the lower rear quadrant (81.6%), and 7 lesions located in the lower quadrant (18.4%) (Figure 2). The average diameter of the lesions was 2.4 ± 1.2 cm (range 0.9-7.9 cm). There were 37 lesions with clear boundaries (97%) and 1 with unclear boundary (3%). In addition, 36 lesions were oval or round shape and when they grew through crossing leaves, they had the shape like round, triangular or dumbbell shape with 2 significant features of sub-leaf.

Relationship Between Lesions and Mandibular Vein

Regarding lesion location with mandibular vein, we found 35 lesions located in the back mandibular vein and 3 lesions located in the front. With lesion diameter > 2 cm, mandibular vein was associated with the shift and most of them were in the lateral front shift.

CT Imaging Appearance

Among 38 plain lesions, 26 were of uniform density (68.4%), and 12 were of uneven density (31.6%). In 4 plain lesions, 34 lesions were enhanced. The degree of enhancement was classified as: 2 grade I (5.9%), 5 grade II (14.7%), and 27 grade III (79.4%) (Figure 1c, 2b, 3b). We also observed enhanced heterogeneous enhancement in 17 cases, and most of them were the lesions with diameter > 2 cm. 10 lesions in the arterial phase could be seen close to or surrounding to the small arteries (welt vascular symptoms, Figure 2b). 8 patients underwent dual-phase enhanced scan with 7 cases of arterial lesions significantly strengthening, while declining in the venous phase (Figures 1c, 1d, 2b, 2c). There was 1 patient with mildly strengthening arterial lesions, while midterm degree strengthening in the venous phase.

Lesion Pathology

Tumor morphology after surgical dissections showed that the tumors were gray or grayish yellow lumps and most had a clear boundary of the surrounding tissue without significant adhesions. Histological examination of the tumors revealed that the sections were grayish red or grayish yellow where the cysts of different sizes were seen

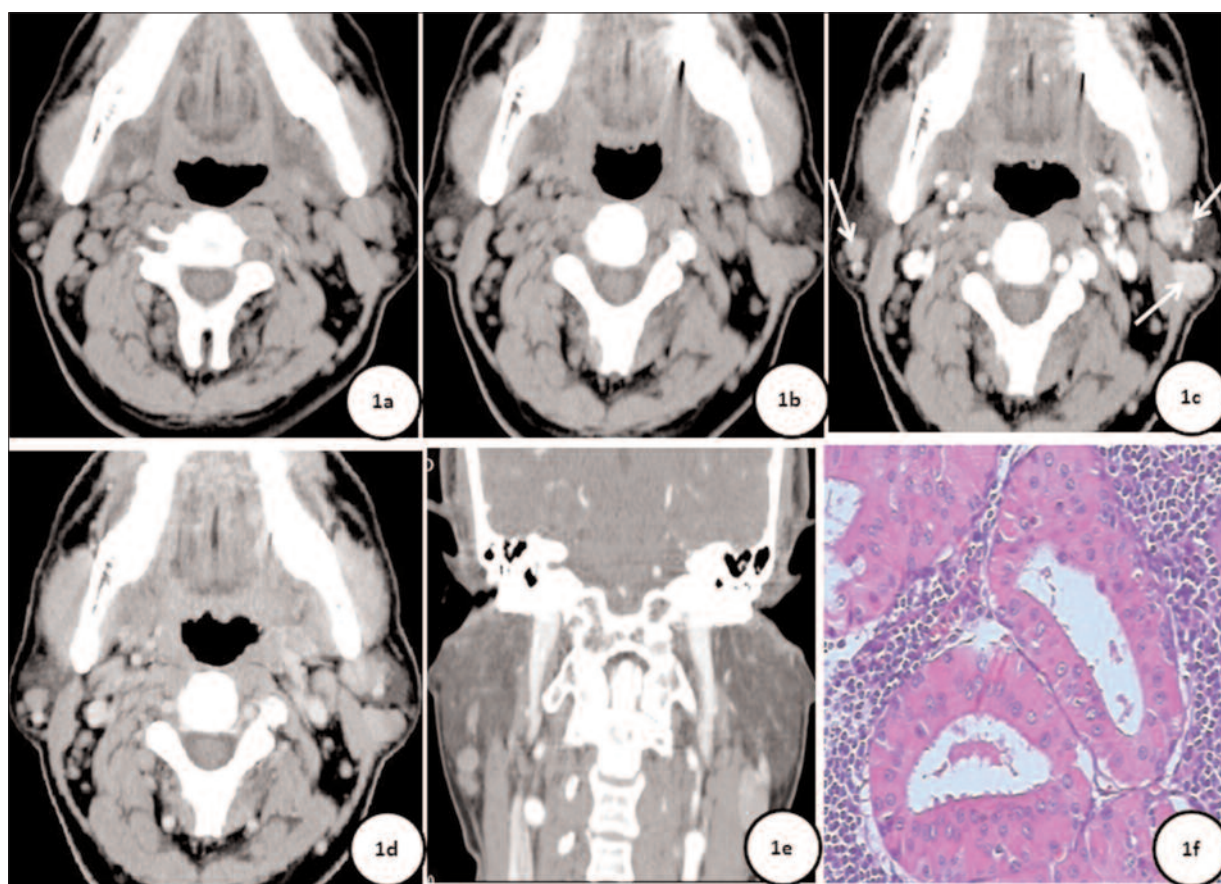


Figure 1. CT scan imaging of adenolymphoma (*case 1*). CT scan shows that it is the bilateral parotid with multiple high-density nodule (*arrow*), of which two are located in the lower lobe with intensity and homogeneity in the arterial phase and minimized intensity in the delaying phase (*1a-1e*). Pathological diagnosis of adenolymphoma (HE, $\times 200$) (*1f*).

with epithelial cells of the double columnar epithelium and the inner layer of red dyed cytoplasm. In the cysts, there were a large number of red-stained secretions and inflammatory cells. The epithelial cells were in large number with differentiated and matured small lymphocyte with visible lymphoid follicle, whereas, the plasma cells and eosinophilic infiltration were visible within the interstitials (Figures 1f, 2e, 3d).

Discussion

Adenolymphoma, also known as Warthin's tumor or lymph cystadenoma, is a slow-growing benign tumor which mostly occurs in the parotid gland and occasionally occurs in other parts such as the submandibular gland and nasopharynx²⁻⁵. In the parotid gland tumors, the incidence of adenolymphoma goes after the parotid pleomorphic adenoma, accounting for 6-10% in the salivary gland benign tumors. Adenolymphoma is more

common in middle-aged men and is closely related to long-term smoking^{1-5,7-9}. Our study group had a significantly higher ratio of male patients with Warthin's tumor, age higher than 50 years and among them 63.6% had over 5 years smoking history. Clinically the course of the adenolymphoma stays long up to 10 years. In our group, the adenolymphoma course stays from two weeks to six years with an average of 19 months. Most of the patients had confirmed adenolymphoma in parotid gland as a result of their careless treatment for the parotid gland masses in the neck earlobe. Patient lesions were oval or lobulated with smooth boundary and medium texture.

For the origin of the adenolymphoma, it is generally believed that the parotid Warthin's tumor comes from the epithelial and lymphoid tissue ectopically originated from the parotid while parotid lymph nodes are often located in the superficial lobe below. Therefore, the lesions often occur in the back and the lower pole. About 20%

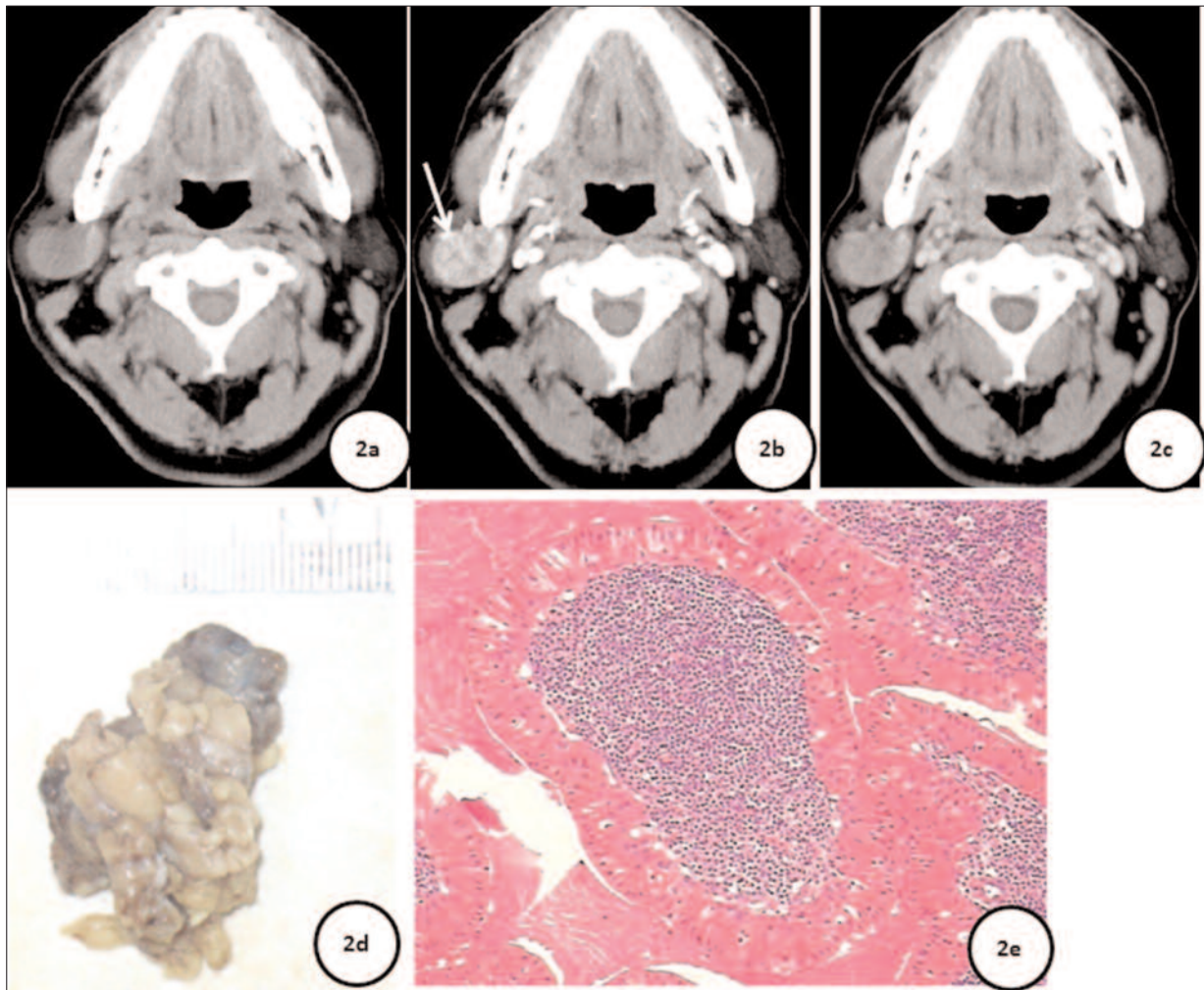


Figure 2. CT scan imaging of adenolymphoma (*case 2*). CT shows that it is a high-density nodule in the lower lobe of the right parotid with the uniform unenhanced density. It lacks of enhancement in the arterial phase with the lesion edge visibly strengthened blood vessels shadow (welt vascular symptoms, arrow). The degree of enhancement decreases in the delay phase and the submandibular vein is seen to be compressed to shift anterolaterally (*2a-2c*). The gross specimens (*2d*), and pathological diagnosis of adenolymphoma (HE, $\times 100$) (*2e*).

patients had the multiple lesions, unilateral or bilateral lesions at the same or different times¹⁰. When the lesions are multiple, they are generally located in the back lower pole of the parotid, while other small lesions are mostly located in the substantive organ of superficial parotid lobe. It is generally believed that the Warthin's tumor originates from the epithelial cells and lymphatic tissue with heterogeneous origins in the parotid gland. In our study, the lymphatic nodes were mostly located beneath and posterior of the superficial lobe. For this reason, the lesions were more likely to be manifested in the posterior lower pole. Approximately 20% of multiple lesions were manifested at the same time or at different

times, on a single side or on both sides. Upon the manifestation of multiple lesions, the lesion in the posterior lower pole was the most severe while the other ones were smaller (mostly located in the solid part of the superficial lobe). It was speculated that the other lesions were caused by the one in the posterior lower pole. This suggested that we should not omit any small lesions signs on the CT scan on the same side or on the opposite side.

The information about our group showed that 81.6% lesions occurred in the lower pole of the superficial parotidectomy and the largest lesions occurred in the back lower pole. As to the possible mechanism of the relation between smoking

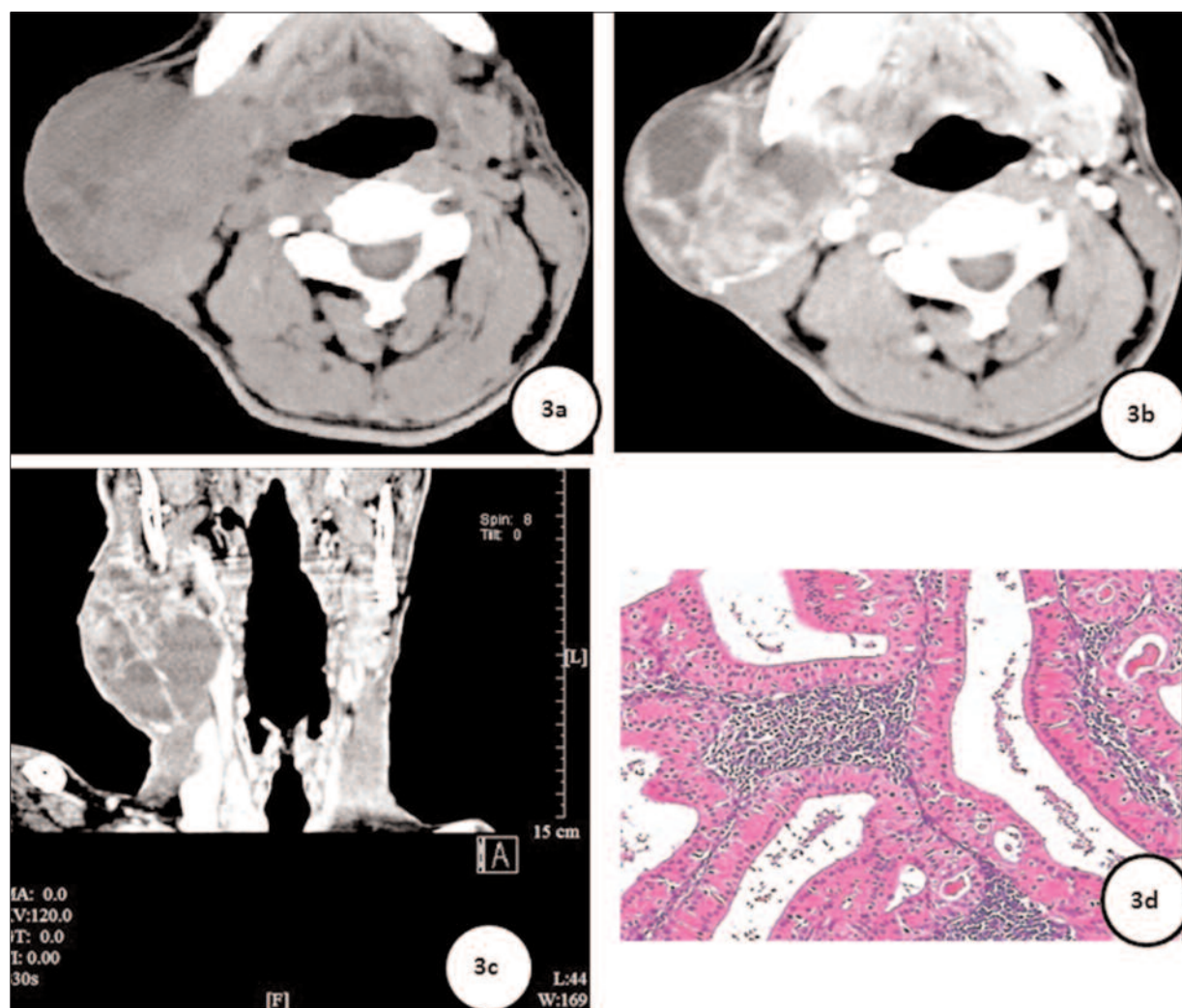


Figure 3. CT scan imaging of adenolymphoma (*case 3*). CT shows that there is a mass in the lower lobe of the right parotid gland. It grows to the side of the pharynx and submandibular space with uneven density and lower density inside. It has an obvious heterogeneous enhancement in the enhanced arterial phase of which no enhancement visible in the necrotic area (*3a-3c*). Pathological diagnosis of adenolymphoma (HE, $\times 40$) (*3d*).

and Warthin's tumor, the proliferation doctrine of atopic salivary tissues within the lymph nodes or lymphatic tissue is commonly favored. The lymphoid cells in Warthin's tumor are T cells with a small number of B cells, which is similar to the normal lymph nodes and the reactively enlarged lymph nodes. Some authors⁸ believe that, during smoking, the irritants go through the parotid duct and affect the parotid duct epithelium, causing metaplasia of the salivary gland tissue and proliferation of the glandular cells and lymphoid tissue. Others⁹ presume that the chemicals in tobacco may go through the lymphatic system of the parotid and reach to the ectopic salivary gland by parotid lymph nodes through the lymphatic

drainage, thus affecting the oral or oropharyngeal mucosa. In the literature, the mechanism of smoking causing Warthin's tumor is that benzo (a) pyrene in N-nitroso piperidine, arsenic and other chemical in tobacco tar are long-term irritants affecting the ectopic salivary gland of the parotid lymph nodes and leading to metaplasia. The general performance of Warthin's tumor benign lesions by CT plain scan on the parotid is that the lesions are oval or round with clear edge. Our results showed that 37/38 lesions were with clear edge. Only one lesion was with edge unclear and it was accompanied by the ipsilateral parotid higher density and subcutaneous fuzzy fat layer, which was confirmed to be the co-in-

fection by the surgery. Compared with the substantive parotid lesions, the plain scan parotid lesions showed a high density and uniformity. In our group, 68.4% lesions were with the average density and 31.6% lesions with uneven density. The uneven density may be due to the parotid Warthin's tumor made up with papillary, stratified & eosinophils epithelial and dense lymphoid interstitial. The lymphoid follicles are prone to cystic with a lesion of diameter $> 2 \text{ cm}^{11}$. In our group there were 10 lesions of uneven density with diameter $> 2 \text{ cm}$, 38 lesions without calcification, which were different from the pleomorphic adenoma^{6,10}.

It has been demonstrated that the Warthin's tumor is significantly enhanced in the enhanced CT scan^{2,3,6,10}, while Howlett reports that tumors have mild or no enhancement¹², which may be associated with vascular development of lesions in varying degrees². In our group of 34 enhanced lesions, there were 2 mildly enhanced (5.9%), 5 medium-degree enhanced (14.7%) and 25 significantly enhanced lesions (79.4%). This is consistent with the results of most literatures, showing the rich blood supply in lesions of which 10 lesions were significantly enhanced in the arterial phase, visibly close to the edge or the surrounding small arteries, which is called parotid welt vascular symptoms and defined as the characteristic CT imaging appearance of Warthin's tumor^{3,6}. Our study suggests that this is a corroboration of the rich blood supply in lesions. Yerli et al⁴, Chang et al¹³, and Hu et al¹⁴ reported that the Warthin's tumor is significantly enhanced early in the dual-phase or the multi-phase of the spiral CT scan but it quickly reduces after delay. In our group, 8 patients underwent the dual-phase enhanced scan, seven had significantly enhanced lesions in the arterial phase and its enhancement reduced in the venous phase. 1 patient had mildly enhanced lesions in the arterial phase and its enhancement increase to the medium degree in the venous phase. All these reports are consistent with the literature.

Pleomorphic adenoma is the most common benign tumors of the parotid gland, accounting for about 60-70% of parotid tumors. It occurs usually on one side of the parotid gland in the superficial facial nerve and it affects more women than men. Generally, it is single lesion. If the patient is middle-aged and had some other diseases at the same time, then pleomorphic adenoma slowly grows. The patient rarely feels pain and numbness. Pathologically, pleomorphic adenoma

is made up with glandular epithelial and myoepithelial cells. When plain scanned, it showed as equal density or high density which is usually uneven and calcified. Generally, it has a bigger volume than a Warthin's tumor. It lacks of the equal enhanced degree of mild-medium tumor, while it gradually enhances during the delayed scan. Conversely, Warthin's tumor significantly enhances in the early phase and it has no delayed enhancement.

Conclusions

In short, Warthin's tumor CT imaging appearance has the following characteristics: 1. The lesions are located in the lower pole of the parotid gland and it is usually single with the bilateral or Multifocal outbreak. 2. Tumors are round or oval-shaped with homogeneous or inhomogeneous high density, clear edge, and no calcification. 3. It is significantly enhanced in the arterial phase of enhanced scan and the welt vascular symptoms are visible. According the CT imaging appearance, most of Warthin's tumor can be diagnosed correctly by the patient's clinical history and their information of being middle-aged or old male.

Conflict of Interest

The Authors declare that there are no conflicts of interest.

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