

# ADULTS WITH SWOLLEN CHEEK; HOW TO APPROACH PAROTID TUMORS?

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# DISCLOSURE

▶ None

# OUTLINE

- ▶ Teaching Points
- ▶ Introduction
- ▶ Case Examples
- ▶ Discussion
- ▶ References

## Teaching Points

- Explaining the typical imaging characteristics of parotid tumors
- Discussing the shared features observed in both benign and malignant tumors
- Providing an overview of the essential imaging modalities and their advantages
- Understanding the significance of advanced imaging techniques in the diagnostic process

## Introduction

Parotid gland;

\*the largest salivary gland and contains lymphatic tissue.

\*superficial and deep lobes divided by facial nerve.

Rule: The larger the salivary gland, the lower the rate of malignancy.  
~80% of parotid tumors are benign.

Clinical scenario: usually with painless palpable mass.

Imaging algorithm depends on the clinical scenario.

US; local or diffuse involvement, adjacent vessels, cystic or solid.

CT; calculus, ductal enlargement and abscess.

MRI; supreme power of imaging; tumor extension, perineural spread, meningeal or bony invasion and its connections with vascular and neural structures in parotid tumors.

Imaging findings may exhibit overlapping characteristics for both benign and malignant lesions, however, malignant tumors are typically distinguished by the presence of parapharyngeal infiltration and perineural spread.

In recent years, advanced MRI techniques have become more prevalent in evaluating parotid tumors, providing additional insights into the lesion's characteristics beyond what conventional sequences offer.

Techniques like diffusion MRI and perfusion MRI enable the evaluation of various aspects such as cellularity, microstructural features, and vascularity of tumors. These advanced techniques aid in distinguishing between benign and malignant tumors by providing valuable information about the nature of the lesion.

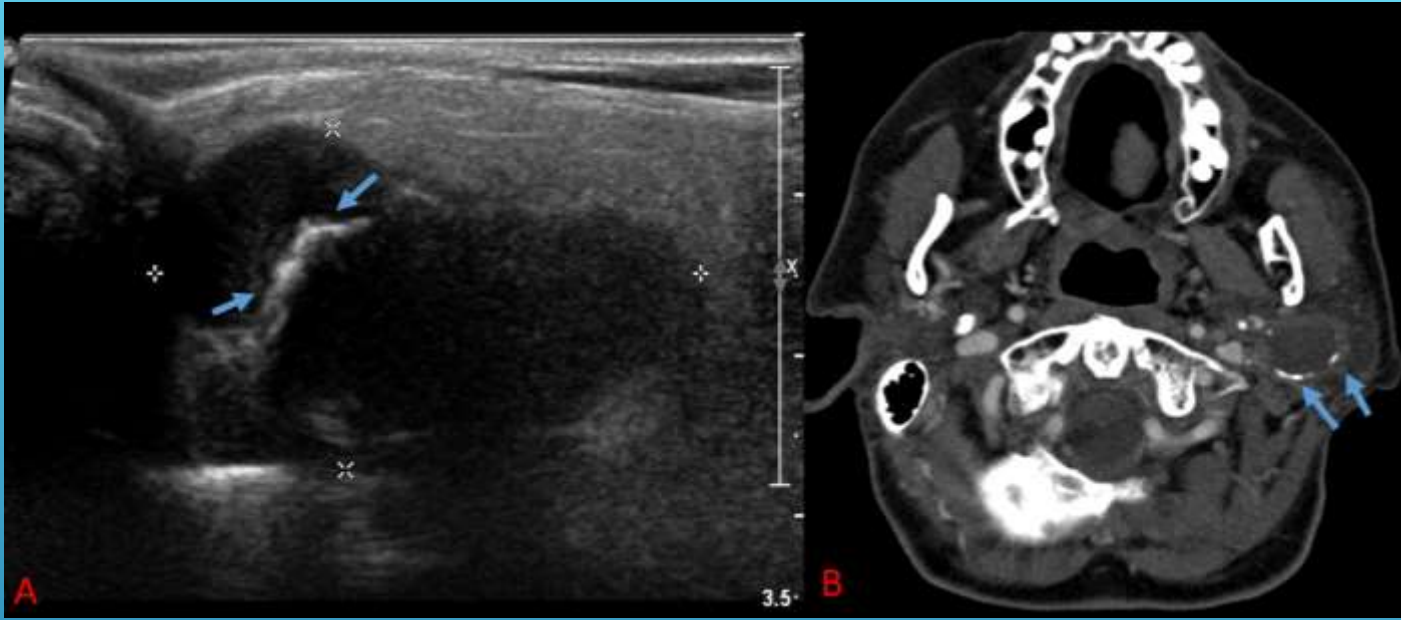
Diagnosis: percutaneous biopsy or surgical histopathological verification.

Treatment:

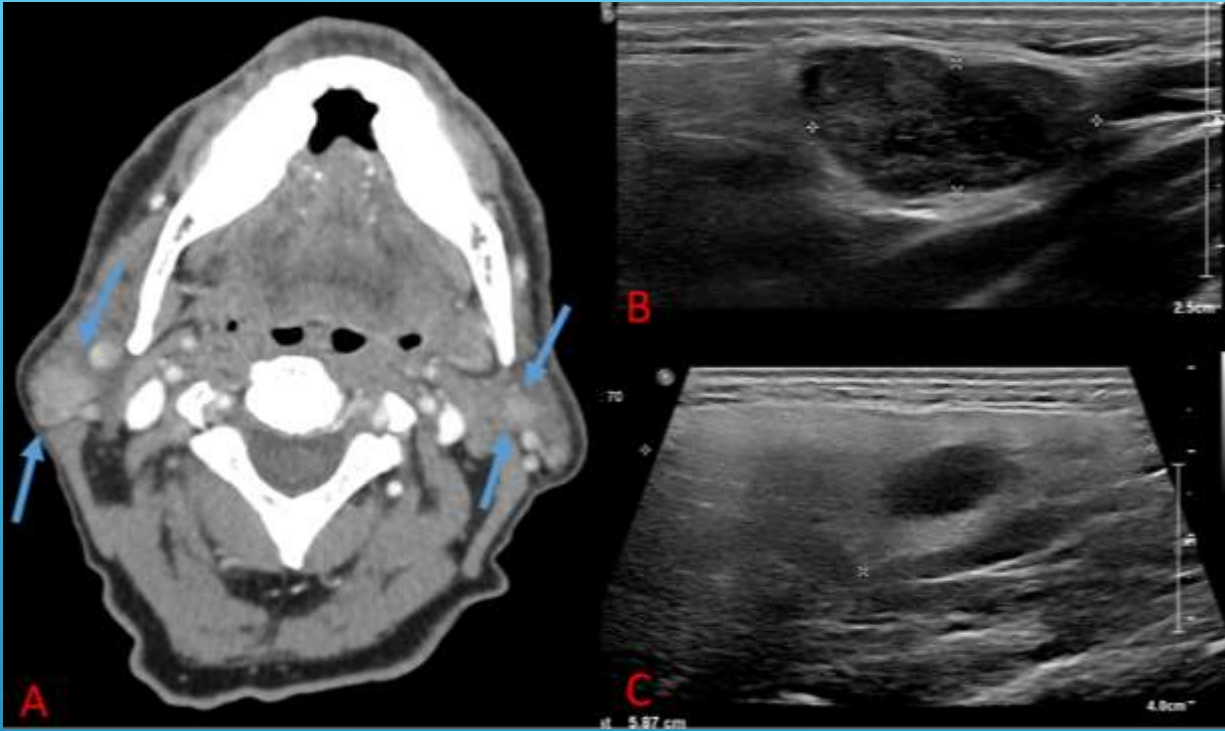
benign lesions in the superficial lobe: superficial parotidectomy.

malignant lesions: radical parotidectomy + lymph node dissection.

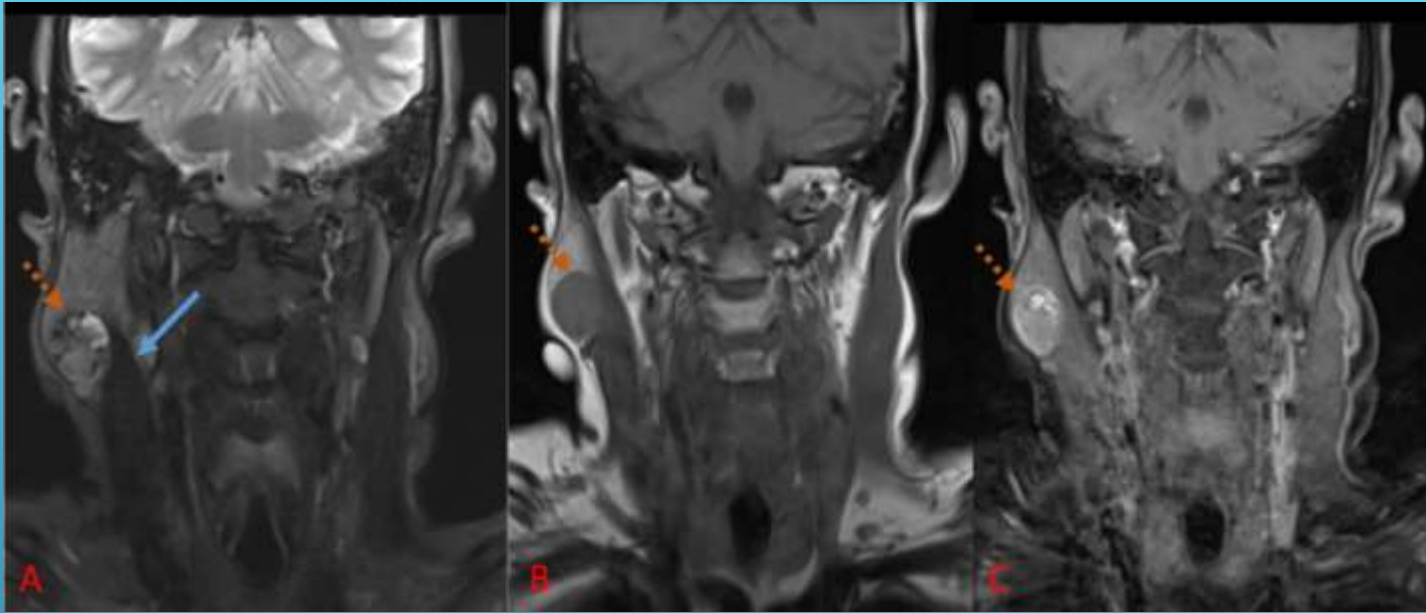




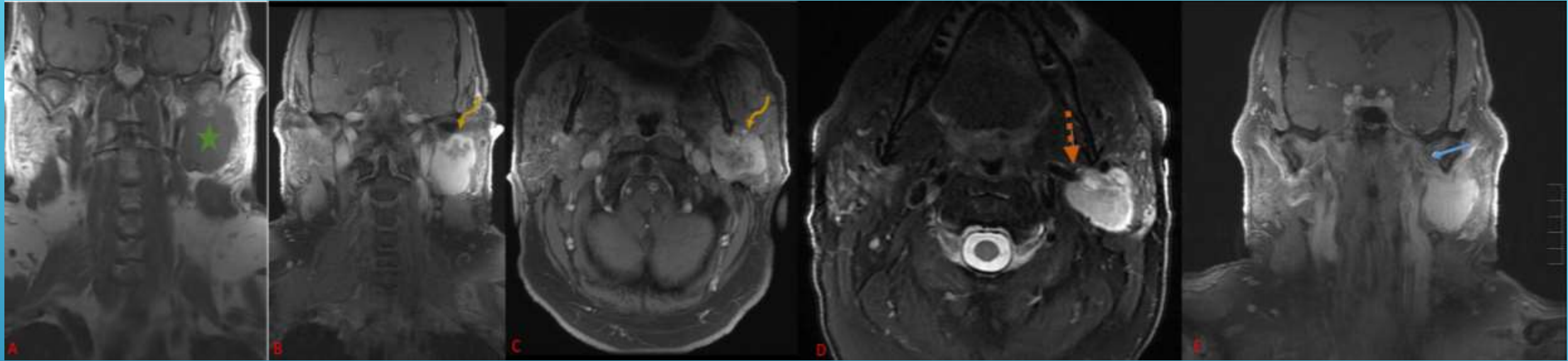
(A) US shows a complex hypoechoic/cystic mass lesion with internal calcifications (arrows) in the parotid gland.  
(B) The lesion was identified with similar features on the CT 7 years ago, representing a cystic mass with shell-like calcification (arrows). These findings are compatible with a nonaggressive lesion. Pathology verifies the lesion as pleomorphic adenoma.



Bilateral Warthin tumors of parotid gland. (A) Axial CT demonstrates enhancing lesions (arrows) at the tail of parotid glands bilaterally. (B), (C) US images show corresponding oval-shaped hypoechoic solid lesions at the inferior pole of right and left parotid glands, respectively.

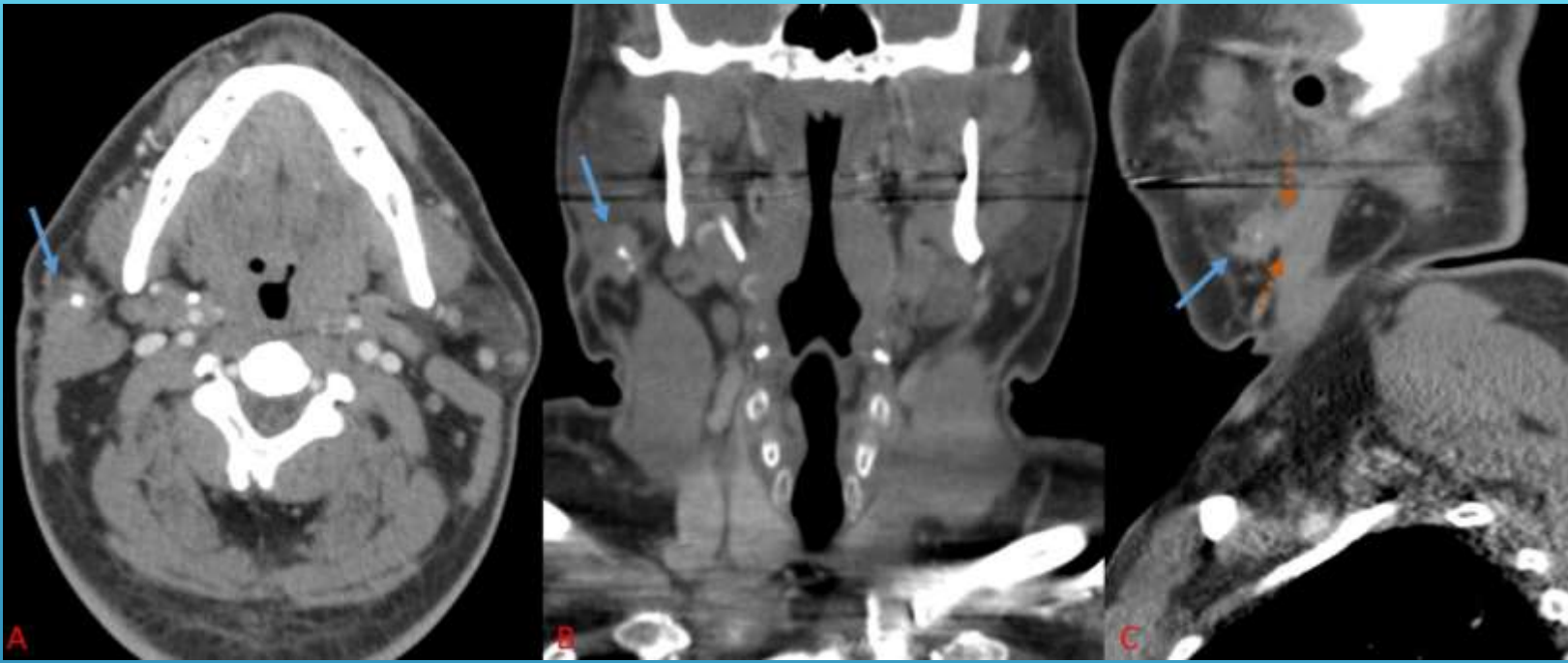


Unilateral Warthin tumor (dashed arrows). There is a well-circumscribed (A) STIR heterogeneous (B) T1 homogeneously hypointense lesion involving the superficial lobe of the right parotid gland which demonstrates (C) diffuse enhancement on postcontrast imaging. The lesion abuts and slightly displaces the right sternocleidomastoid muscle (arrow) without intramuscular signal abnormality to suggest direct invasion.

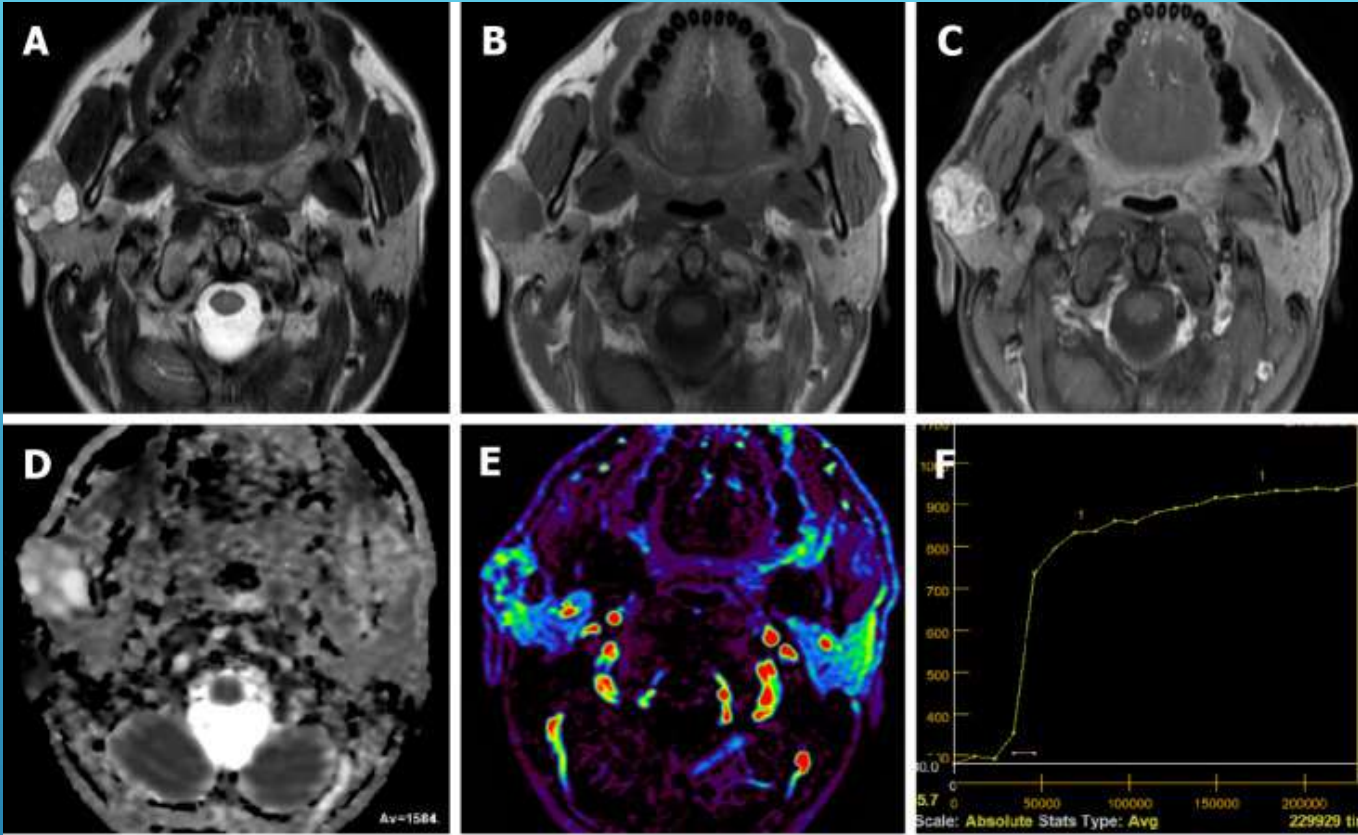


Adenoid cystic carcinoma. (A) T1 hypointense lesion (star) centered within the deep lobe of the left parotid gland and demonstrates (B), (C) heterogeneous contrast enhancement (curved arrows). Areas of hypo-enhancement suggest of intralesional necrosis. (D) Notice abutment of the left external carotid artery (dashed arrows) and mass effect encroaching to the left carotid and parapharyngeal spaces. (E) There is also abnormal enhancement (arrow) of the V3 segment of the left trigeminal nerve.





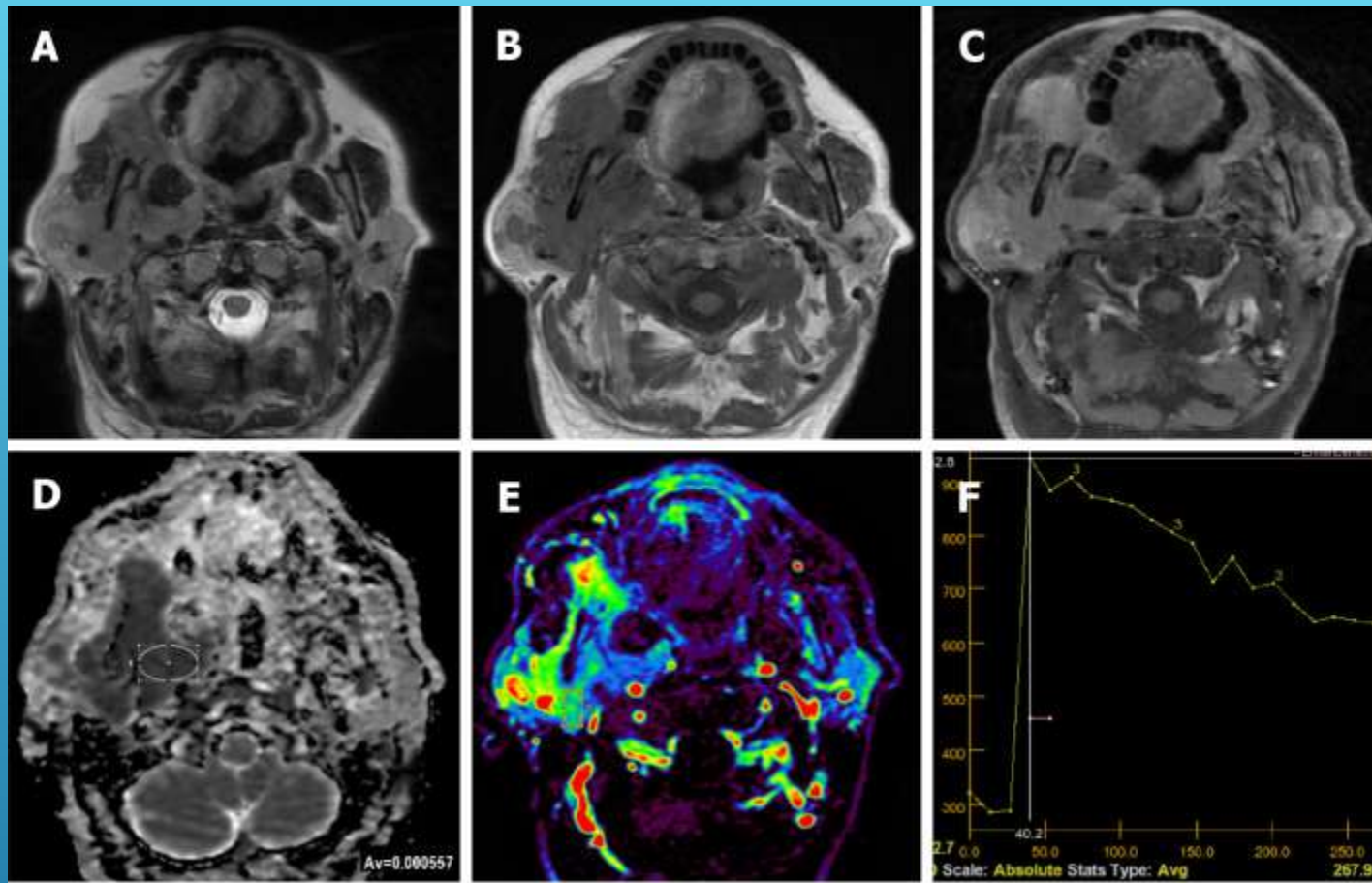
Mucoepidermoid carcinoma. (A) Axial and (B) coronal CT images demonstrate an irregular nodular lesion (arrows) with internal coarse calcification along the inferior aspect of the right parotid gland. The margins of the ill-defined lesion are spiculated and the lesion (C) abuts the sternocleidomastoid muscle (dashed arrows). Notice partial loss of fat planes and skin thickening/tethering.



29 yo male patient with smooth lobule contoured pleomorphic adenoma located on the superficial lobe of right parotid gland.

Gökçe E, Beyhan M. Advanced magnetic resonance imaging findings in salivary gland tumors. World J Radiol. 2022 Aug 28;14(8):256-271.

**A:** The lesion contains prominent hyperintense components and mixed signals on T2-weighted image; **B:** The lesion contains heterogeneous hypointense signal on T1-weighted image; **C:** The lesion appears to have marked heterogeneous enhancement on the contrast-enhanced image; **D:** The apparent diffusion coefficient (ADC) value of mass was  $1.58 \times 10^{-3} \text{ mm}^2/\text{s}$  on ADC map; **E:** Hypo-hyper perfused areas on perfusion magnetic resonance imaging color map; **F:** The time intensity curve of mass is seen increasing contrast-enhancement towards late phases.

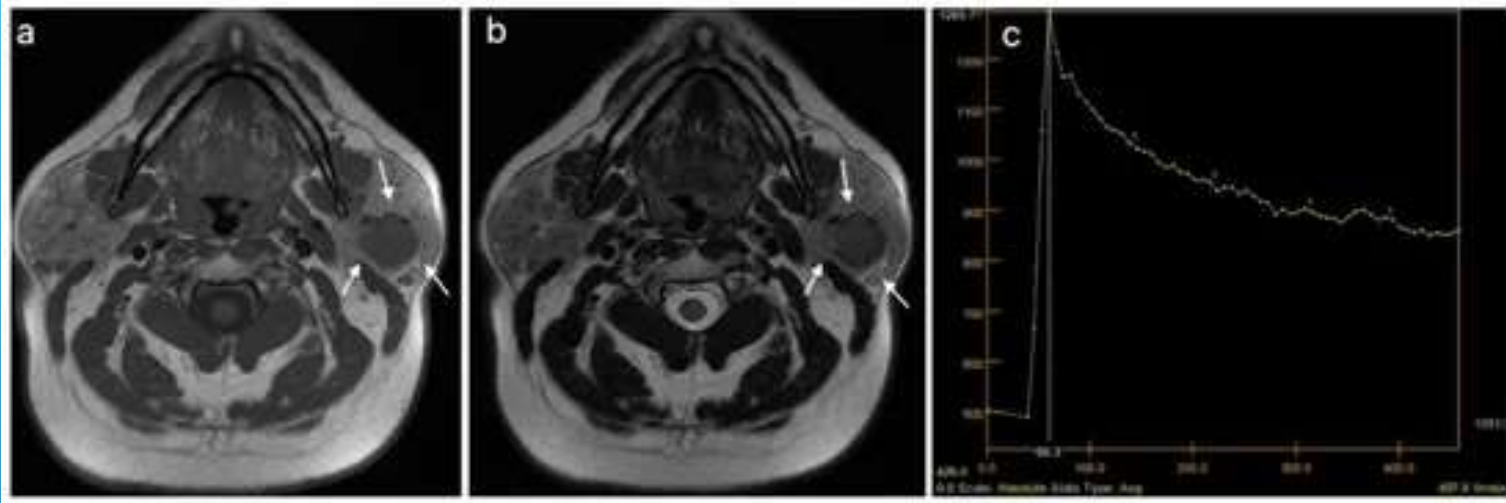


61 yo male patient with non-Hodgkin lymphoma infiltrating into the right parotid gland.

Gökçe E, Beyhan M. Advanced magnetic resonance imaging findings in salivary gland tumors. World J Radiol. 2022 Aug 28;14(8):256-271.

A and B: Hypointense signal of the lesion compared to the gland on T2-weighted image and T1-weighted image; C: Contrast enhancement components of different intensities are seen on contrast-enhanced image in the lesion; D: The apparent diffusion coefficient (ADC) value of mass was  $0.55 \times 10^{-3} \text{ mm}^2/\text{s}$  on the ADC map; E: The mass is hyperperfused on the color-coded perfusion image; F: The time intensity curve of mass has a wash-out ratio of 43%.

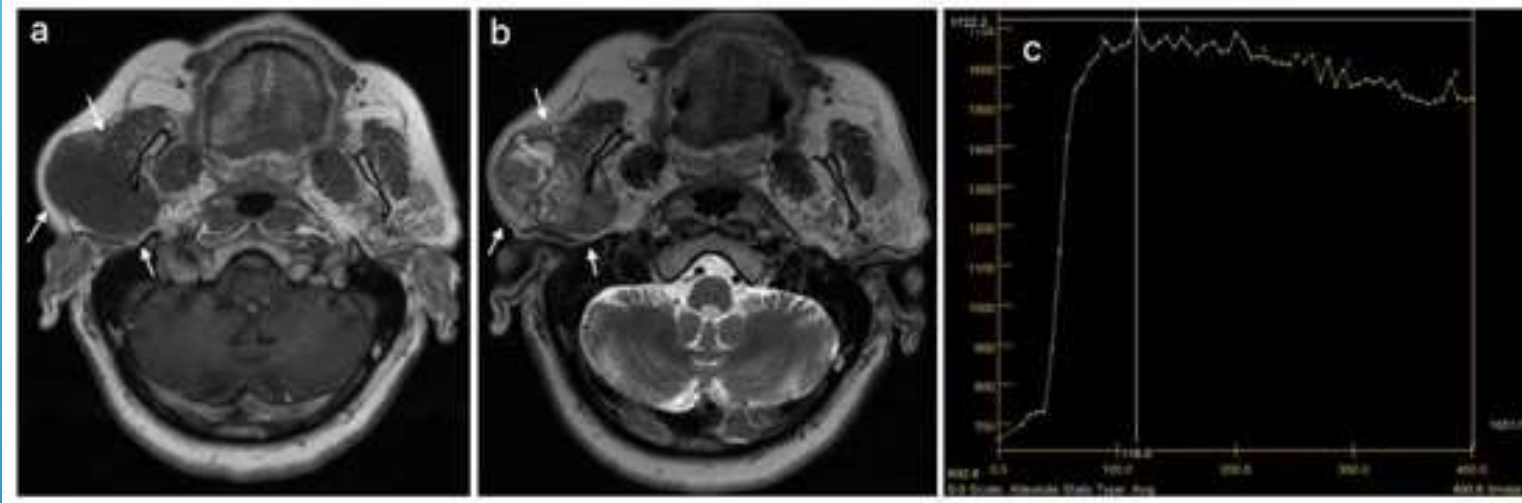




Stoia S et al. The Value of Multiparametric Magnetic Resonance Imaging in the Preoperative Differential Diagnosis of Parotid Gland Tumors. *Cancers (Basel)*. 2023 Feb 19;15(4):1325.

Warthin tumor of the left parotid gland (white arrows): (a) T1WI sequence showing a hypointense signal in the tumor, well delineated, with slightly irregular borders; (b) T2WI sequence showing a predominantly hypointense signal in the lesion, with peripheral cystic area; (c) DCE-MRI showing a type B TIC curve.





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Malignant tumor of the right parotid gland (white arrows): (a) T1WI sequence showing an inhomogeneous hypointense signal in the tumor, with infiltrative borders; (b) T2WI sequence also showing an inhomogeneous signal, with central necrotic areas; (c) DCE-MRI showing a type C TIC curve.

## Typical MRI features of the most frequent parotid gland tumours

Parotid tumours	Defined border	Necrotic/cystic	T1-signal intensity	T2-signal intensity	Enhancement
Pleomorphic adenoma	+	-/+	↓	↑↑↑	↑↑
Wharton's tumour	+	++	↓	↓	(↑)
Mucoepidermoid carcinoma	+/-	-	↓(↑)	↓(↑)	↑
Adenoid-cystic carcinoma	-	+	↓	↑	↑↑
Acinic cell carcinoma	-/+	+	↓	↑(↓)	(↑)

Thoeny HC. Imaging of salivary gland tumours. Cancer Imaging. 2007 Apr 30;7(1):52-62.

## Discussion

The rate of malignancy of the parotid gland tumors is ~20% which is relatively low when compared to other salivary gland tumors.

The radiological algorithm is typically guided by clinical findings, with initial imaging modalities often consisting of US or CT.

In cases where there exists a strong clinical suspicion for neoplastic growth, MRI is preferred over alternative imaging options, as it allows for a more accurate assessment of tumor extent, invasion into adjacent structures, perineural spread and lymph node staging.

The exact diagnosis of parotid gland tumors is always challenging. Although imaging features depend on the histological type there is a broad overlap on imaging findings between benign and malignant lesions.

The presence of low signal intensity on T2-weighted images, along with postcontrast ill-defined margins are strong indicators for the likelihood of malignancy.

Advanced MRI techniques such as dynamic imaging, diffusion imaging and spectroscopy may be performed for further characterization.

Despite advances in imaging technologies, biopsy and/or surgical removal continue to be considered the gold standard for exact diagnosis of parotid tumors.

Treatment options depend on the type and location of the lesion. For benign parotid gland lesions located in the superficial lobe, a superficial parotidectomy may be recommended. On the other hand, for malignant lesions, a radical parotidectomy may be considered as the treatment choice.

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