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ROLE OF IMAGING IN SALIVARY GLAND TUMORS- ORIGINAL ARTICLE.

Radiology

Dr Janki Jaradi Associate Professor, Department of radiology, Dr M.K SHAH medical college, Ahmedabad.

ABSTRACT

Aims And Objectives

- To study the age and sex incidence of various salivary gland tumors.
- To evaluate the role of imaging in diagnosis of various salivary gland tumors and study its characteristics on different imaging modalities and to determine surgical resectibility and their prognosis.
- To evaluate recurrent or residual lesions in treated patients.
- To guide surgeon/clinical oncologist in treatment planning & to determine prognosis

Materials and methods:

- During the period from December 2021 to December 2023 prospective study of 50 patients of various age was carried out.
- Study group comprised patients of Gujarat and some other state (Rajasthan, Madhya Pradesh) who came to our USG, CT and MRI centre, located in premises of our institute , at SMS hospital, Ahmedabad.
- USG, CT and MR characteristics of different lesions were noted and recorded. The histo-pathological diagnosis were followed up and recorded.

Results and Discussion:

MRI had the highest sensitivity in diagnosing salivary gland tumours. Sensitivity of Ultrasound and CT were 78.57% and 75.00% respectively. Specificity of CT imaging was the highest in diagnosis of salivary gland tumours which was 94.44% followed by MRI (85.71%). Forecasting the correct diagnosis of tumours of the salivary gland is difficult, however in the recent years increase in the number of CT and MRI scans has been very useful in making correct diagnosis as well as to define the disease extension. Accuracy of CT and MRI in this study is similar to each another 86.67%. **Conclusion** MRI is marginally superior to CT in differentiating benign from malignant salivary gland tumours. Ultrasound is the ideal initial investigation for evaluating submandibular masses and lesions in the superficial lobe of parotid, particularly as it can be readily combined with FNAC. CT and MRI are certainly morphologically equivalent studies and have the same diagnostic potential in salivary gland tumours.

KEYWORDS

INTRODUCTION

Salivary gland neoplasms account for <3% of all tumors. Most of them are benign and parotid gland is the commonest site. As a general rule, the smaller the involved salivary gland, the higher is the possibility of the tumor being malignant.

The role of imaging in assessment of salivary gland tumor is to define

1. Intra-glandular vs. extra-glandular location,
2. Detect malignant features,
3. Assess local extension and invasion,
4. Detect nodal metastases and systemic involvement.

For lesions in the superficial parotid and submandibular gland, ultrasound is an ideal tool for initial assessment. Nodal involvement can also be assessed.

If deep tissue extension is suspected or malignancy is confirmed on cytology, an MRI or CT is mandatory to evaluate tumor extent, local invasion and perineural spread. For all tumors in sublingual gland, MRI should be performed as risk of malignancy is high.

For lesions of the deep lobe of parotid gland and the minor salivary glands, MRI and CT are the modalities of choice.

AIMS AND OBJECTIVES

- To study the age and sex incidence of various salivary gland tumors.
- To evaluate the role of imaging in diagnosis of various salivary gland tumors and study its characteristics on different imaging modalities.
- Role of imaging in staging of salivary gland tumors to determine surgical resectibility and their prognosis.
- To evaluate recurrent or residual lesions in treated patients.
- To guide surgeon/clinical oncologist in treatment planning & to determine prognosis

MATERIALS AND METHODS:

- During the period from December 2021 to December 2023 prospective study of 50 patients of various age was carried out.
- Study group comprised patients of Gujarat and some other state (Rajasthan, Madhya Pradesh) who came to our USG, CT and MRI centre, located in premises of our institute, at SMS hospital, Ahmedabad.
- All patients with salivary gland mass lesions were included in my study. Informed Consent was taken prior to conducting the investigations in all patients.
- Relevant h/o illness & significant clinical finding of any patient were recorded. Previous investigations were reviewed.
- USG, CT and MR characteristics of different lesions were noted and recorded. The histo-pathological diagnosis were followed up and recorded.

Inclusion criteria:

- All patients diagnosed and suspicious of masses arising from salivary glands.
- Patients who have already received some treatment in the form of surgical or chemotherapy or radiotherapy.

Exclusion criteria:

- Patients having allergy from contrast material used in CT and MRI.
- The patients having contraindicated to MRI will be excluded from the study, such as patients with Aneurysmal clips, Cardiac pacemaker, implanted Cardiac defibrillator, Cochlear implant, Metallic stent, Insulin pump, IUCD, diaphragm, pessary, Wire mesh implant, Claustrophobia.

Pathological Classification And Features Of Salivary Gland Tumours

1. Benign Tumours of salivary gland:

Pleomorphic adenoma

Pleomorphic adenomas account for 70-80% of benign salivary gland tumours and are especially common in the parotid gland. Patients are typically middle aged, and prior head and neck irradiation is a risk factor for the development of these tumours.

On ultrasound, pleomorphic adenoma appears typically hypoechoic. It may show a lobulated distinct border. There may be posterior acoustic enhancement with through transmission present.

On CT, they have well defined margins and tend to demonstrate high, homogeneous enhancement following the administration of contrast.

Dystrophic internal calcifications may sometimes occur and are well demonstrated on CT.
On T1 weighted MRI, pleomorphic adenomas tend to have intermediate signal intensity and an inhomogeneous high signal intensity within a hypointense capsule on T2 weighted MRI.

They enhance following gadolinium administration - a useful feature to differentiate them from cystic spaces in benign tumours.

Pleomorphic adenomas are also known to seed during surgical resection and recurrence may occur after surgery.

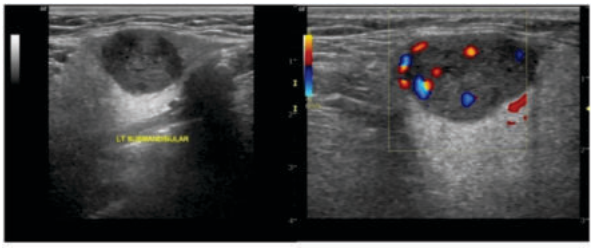


Image 2. Pleomorphic adenoma of left submandibular gland: Left submandibular gland shows presence of a well-defined hypoechoic lesion with posterior acoustic enhancement and internal vascularity without calcifications in its superficial lobe consistent with a pleomorphic adenoma. *(Image courtesy: Radiopaedia)*

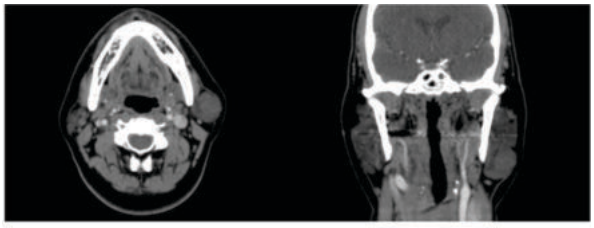


Image 3. Pleomorphic adenoma of left parotid gland: Axial and coronal CT image demonstrates well defined, homogenously enhancing rounded mass in left parotid gland with no necrosis, calcification or infiltration of the adjacent structures. *(Image courtesy: Radiopaedia)*

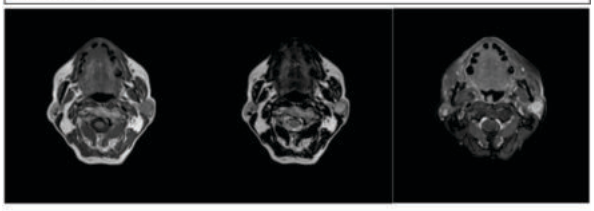


Image 4. Pleomorphic adenoma of left parotid gland: There is a well-defined mass involving the left parotid gland, hypointense on T1 and slightly hyperintense on T2, enhancing homogeneously after gadolinium administration.

Warthin's tumors:
Warthin tumours, also known as lymphomatous papillary cystadenomas, are benign, sharply demarcated tumours of the salivary gland. They are the commonest bilateral or multifocal benign parotid tumour. They typically occur in the elderly (6th decade) with male predilection. On CT, they commonly appear as smoothly bordered heterogeneous lesions due to cystic components.

On MRI, Warthin's tumours often have a heterogeneous signal intensity MRI - a low to intermediate signal intensity on T1 weighted imaging and intermediate to high signal intensity on T2 weighted imaging. They show none or only slight enhancement post gadolinium administration and this property has been regarded as a useful diagnostic feature.

They do not have the potential for malignant degeneration but can recur.

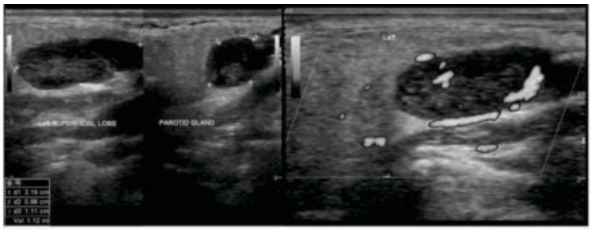


Image 5. Warthin's tumour of left parotid gland: Well-defined hypoechoic lesion is noted in superficial lobe of left parotid gland. No internal calcification or cystic changes are seen. Posterior acoustic enhancement is present. Central as well as peripheral vascularity is noted in the lesion.

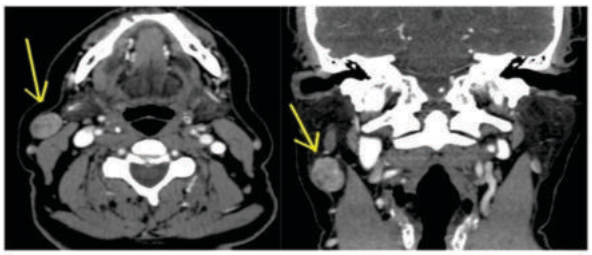


Image 6. Axial and coronal CT demonstrating a right Warthin's tumour - well circumscribed, slightly heterogeneous, no evidence of infiltration into surrounding tissues.

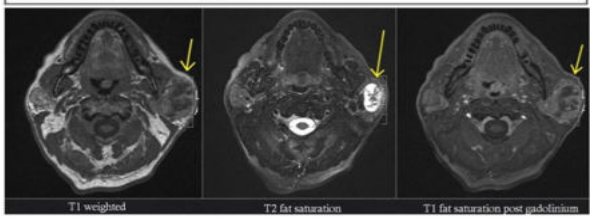


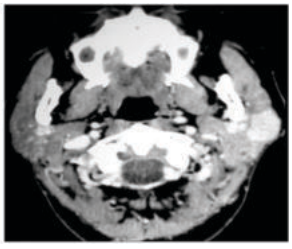
Image 7. MRI of Warthin's tumour - Complex lesion in left superficial parotid gland: T1 weighted imaging exhibiting intermediate and hypointense signal. T2 weighted imaging exhibiting hypointense, intermediate and hyperintense signals. There is mild enhancement after the administration of gadolinium, but with some non-enhancing regions.

Oncocytoma
Oncocytoma typically present in older individuals (6th to 8th decades of life) with female predilection.

While they can affect any of salivary glands. They most commonly in the parotid gland (around 80% of cases).

On CT imaging, they are often seen as a well-defined parotid mass showing homogeneous enhancement.

Image 9. A 49-year-old woman with a unilateral solitary parotid Oncocytoma. A well-defined tumor with a lobulated contour and homogeneous enhancement is identified on the CT scan in the superficial lobe of the left parotid gland (*white asterisk*).



Myoepithelioma:
They account for less than 1% of salivary gland tumours and rarely undergo malignant transformation

Age of representation ranges from 20-60 years of age and parotid gland is the main site of occurrence.

Imaging appearance is essentially the same as pleomorphic adenomas.

Haemangioma of salivary gland:
Parotid infantile haemangioma are the most common parotid tumour of childhood. They usually run a characteristically benign course.

The median age at diagnosis is 4 months. There is female preponderance with a male: female ratio of 1:3.

On ultrasound it appears as homogenous echogenic parotid mass.It has large internal vessels but rarely flow only seen on gray-scale as it is too low to be seen on Doppler.

On plain CT images, they appears as hypodense lesion which enhances strongly following contrast administration.

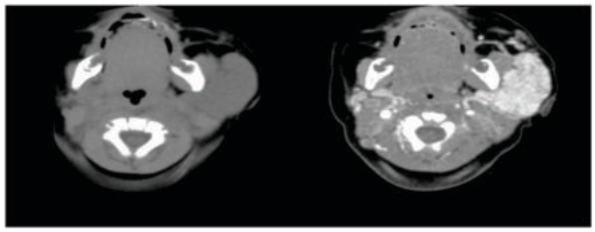


Image 10. Infantile haemangioma of left parotid gland: Swelling on the left side of the neck. It is occupies the left parotid gland. It appeared short time after birth. It progressively increased in size over the last 4 months. Diagnosis is vascular malformation most likely infantile haemangioma.

Lipoma of parotid gland

Parotid lipoma is a benign non-epithelial salivary gland tumour that is composed primary of mature adipose tissue.

Diagnosis is made by CT or MRI by identifying fat containing lesion.

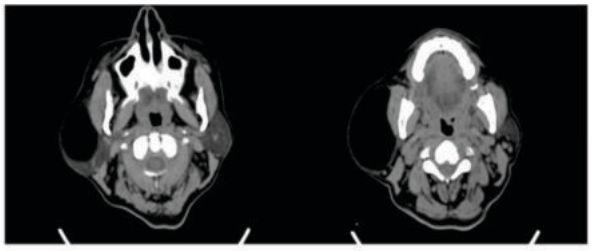


Image 11. Lipoma of parotid gland: Axial non-contrast CT image shows a large well defined regular fat density (-120HU) soft tissue lesion is seen arising from the superficial lobe of the right parotid gland.

2. Malignant Tumours of salivary gland:

Mucoepidermoid carcinoma:

Mucoepidermoid carcinoma is the most common malignant primary neoplasm of parotid gland.

Mucoepidermoid carcinomas are seen throughout all adult age groups but are most common in middle age (35-65 years of age). However, it is the most common malignant salivary gland tumors of childhood .

They present as painless swelling, with or without facial nerve involvement. Overall distribution across various glands is as follows:
On ultrasound, mucoepidermoid carcinoma appears as well-defined hypoechoic lesion, with partial or complete cystic appearance. The lesion stands out against relatively hyperechoic normal parotid gland.

On CT, low grade tumours appear as well defined lesions with cystic components. Solid components enhance and calcification is sometimes seen.

High grade tumours have poorly defined margins and infiltrate locally.
On MRI, Low grade tumours have similar appears to benign mixed tumors:
T1: Low to intermediate signal
T2: intermediate to high signal; cystic areas will be high signal
T1 post contrast: heterogeneous enhancement of solid components.
High grade tumours have lower T2 signal intensity and poorly defined margins. T1: low to intermediate signal
T2: intermediate to low signal

It is essential to image the cranial nerves with fat saturated post contrast T1 sequences to assess for perineural spread, and as such the base of skull should be imaged up to and including the cavernous sinus and inner ear.

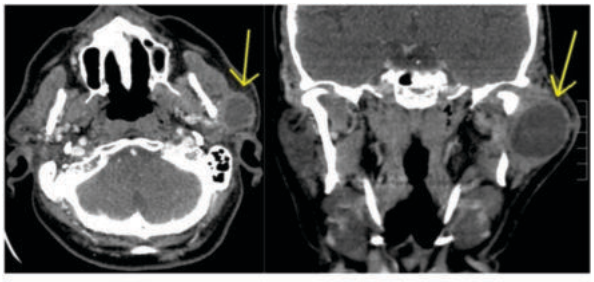


Image 12. Mucoepidermoid carcinoma: Axial and coronal CT of left parotid demonstrates a lesion with a large low density centre and a thin peripheral area of soft tissue density.

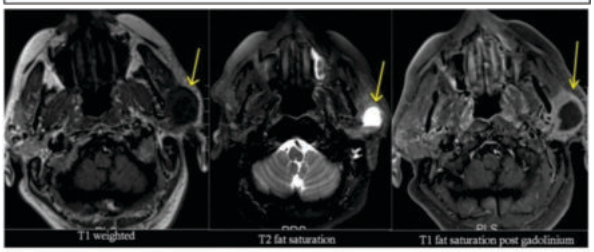


Image 13. MRI of mucoepidermoid carcinoma - Left superficial parotid gland lesion with a central, non-enhancing area and extensive surrounding enhancement.

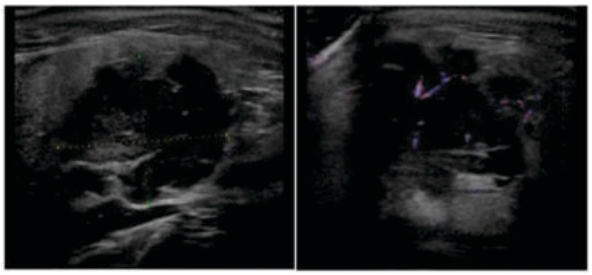


Image 14. Ultrasound image of left parotid gland demonstrates hypoechoic lesion with irregular margins and central vascularity on CDFI. On excision lesion proved to be mucoepidermoid carcinoma.

Treatment is dependent on grade and location:

- low grade (well circumscribed) can usually be treated with wide local excision and preservation of the facial nerve, without the need for neck dissection or adjuvant radiotherapy
- high grade (poorly circumscribed) usually requires complete parotidectomy, often with sacrifice of the facial nerve, neck dissection (as nodal metastases are common) and adjuvant radiotherapy

Prognosis is also very dependent on grade, with low grade tumours having a 90-98% survival and a low local recurrence rate, compared to 30-54% surviving, and a very high local recurrence rate for high grade tumours .

1) Adenoid cystic carcinoma

Adenoid cystic carcinoma of salivary glands is the most common malignancy involving minor salivary glands and second most common malignancy involving the parotid gland.

Adenoid cystic carcinomas are locally aggressive with propensity for perineural spread.

On CT, low grade tumours tend to be well defined whereas high grade tumours appear infiltrative. Both subtypes usually homogeneously enhance after contrast administration.

On MRI, they show following signal characteristics T1:hypo- to isointense

T2: slightly hyperintense

T1 post contrast: homogeneous enhancement.

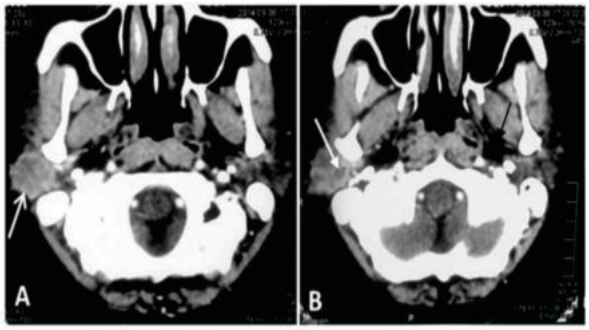


Image 15. 49 years old male patient with adenoid cystic carcinoma: axial contrast enhanced MDCT images at the region of the parotid gland showing ill-defined right parotid lesion involving its superficial part with irregular margins (white arrow in a). The lesion has non homogenous enhancement pattern with areas of central necrosis (white arrow in b).

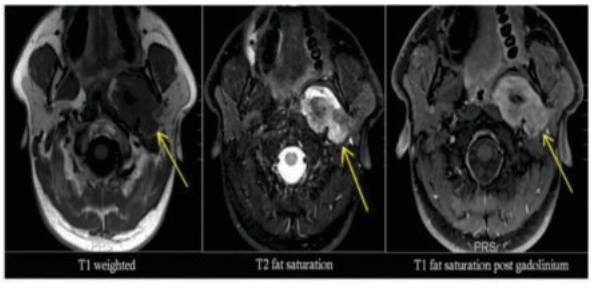


Image 16. MRI adenoid cystic carcinoma: Well defined, lobulated and calcified mass lesion arising from the deep lobe of the parotid on the left with extension into the left para pharyngeal space. Low signal intensity on T1 weighted images, heterogeneous hyperintensity on T2 and post contrast heterogeneous enhancement.

Acinic cell carcinoma

Acinic cell carcinomas of salivary glands are rare malignant neoplasms that account for 1-3% of all salivary gland tumours.

The majority of them arise in the parotid gland (81-98%) and they may be bilateral and multicentric.

Imaging findings in acinic cell carcinomas are non-specific and there is an overlap with benign tumours such as Warthin's tumour and pleomorphic adenoma.

On CT, acinic cell carcinomas have non-specific appearance. They appears as hypodense lesions with central necrosis and irregular enhancing solid component. On MR, it may show T2 hyperintense cystic/ necrotic component and irregularly enhancing solid component.

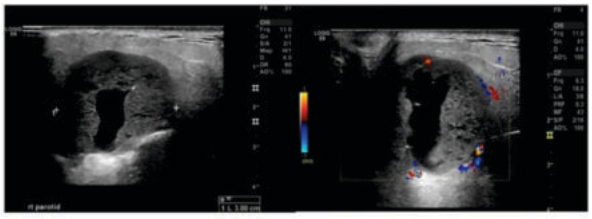


Image 17. Acinic cell carcinoma of right parotid gland: Ultrasound image of right parotid gland demonstrates solid cystic lesion in right parotid gland without significant vascularity on CDFI.

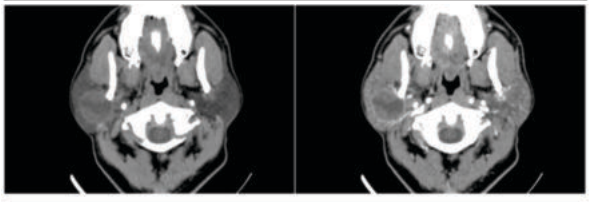


Image 18. Acinic cell carcinoma of right parotid gland: CT image of right parotid gland demonstrates solid cystic lesion in right parotid gland with heterogeneous enhancement and necrosis.

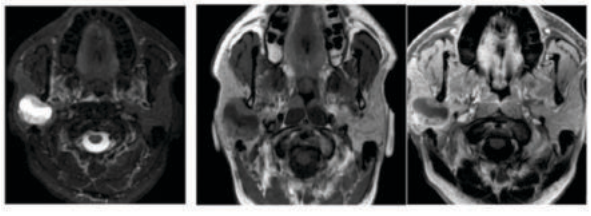


Image 19. Acinic cell carcinoma of right parotid gland: MR image of right parotid gland demonstrates solid cystic lesion in right parotid gland with heterogeneous enhancement and necrosis.

Surgical excision is considered the standard of care. Acinic cell carcinomas may recur in up to 35% of patients.

Malignant mixed tumours of salivary glands:

Malignant mixed tumours of salivary glands, according to the WHO classification, comprise three tumours:

1. carcinoma ex pleomorphic adenoma
   - arises from pre-existing pleomorphic adenoma
   - most common
2. carcinosarcoma (true mixed tumour of the salivary glands)
   - true malignant mixed tumour
   - 99% also arise from pre-existing pleomorphic adenoma
   - rare
3. metastasising pleomorphic adenoma
   - rare

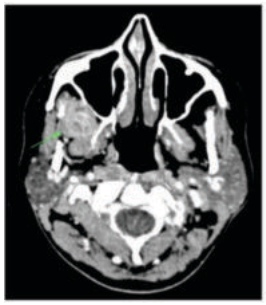


Image 20. Axial contrast-enhanced computed tomography (CT) shows a well-demarcated mass with heterogeneous enhancement in right infra-temporal fossa. Patient had previous history of surgical excision of pleomorphic adenoma 8 years before in right buccal space area. Histo-pathological examination after surgical excision revealed carcinoma ex pleomorphic adenoma arising from minor salivary gland.

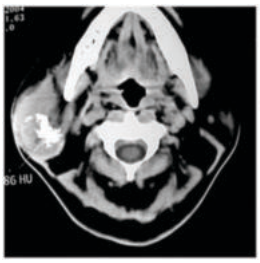


Image 21. Axial contrast-enhanced computed tomography (CT) shows a heterogeneously enhancing lesion with pop-corn calcification. Multiple histological sections showed a lesion comprised of a bimodal population of both epithelial and mesenchymal component. Final diagnosis of carcino-sarcoma was made.

Metastatic squamous cell carcinoma

Primary parotid squamous cell carcinoma (SCC), with an incidence of 0.3-1.5%, is rarely encountered. Therefore metastatic disease must be considered when a diagnosis of parotid SCC is made. Most patients present with a history of cutaneous SCC of the face or head.

On imaging, metastatic SCC may appear as a well-defined, homogeneous lesion, a cystic lesion or an invasive mass as imaging findings are dependent onthe degree of differentiation of the tumour. CT and MRI important in the assessment of local invasion, perineural invasion and for staging.

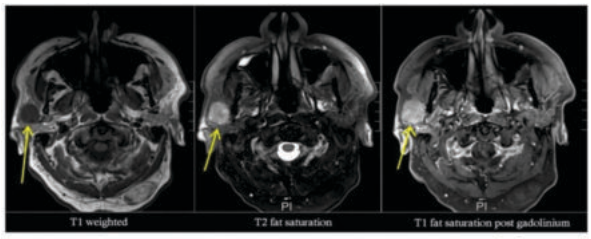


Image 22. MRI of metastatic SCC of a patient with a history of skin SCC of the head - well defined, homogeneous, focal lesion with a smooth outline in right superficial parotid gland with intermediate signal on T1 weighted imaging, moderately intense signal on T2 and moderate enhancement following contrast administration.

Salivary duct carcinoma

Salivary duct carcinomas are rare salivary gland tumours, accounting for 1-6% of malignant parotid gland tumours. It most commonly presents as a rapidly growing mass in elderly men, and is aggressive with extracranial facial nerve involvement, perineural spread and early metastatic disease.

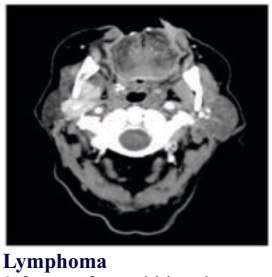


Image 23. Salivary duct carcinoma: Enhancing mass centred on the right deep lobe of parotid gland and bellies of right medial and lateral pterygoid muscles, wrapping posteriorly around the mandibular ramus to extend into the superficial parotid.

Lymphoma

3 forms of parotid involvement is associated with lymphoma. Nodal lymphoma

- Primary nodal lymphoma
- Systemic lymphoma involving parotid nodes

Primary parenchymal lymphoma, often mucosa-associated lymphoid tissue (MALT).

On imaging,

Nodal lymphoma appears as multiple well-defined, homogeneous parotid masses.

Primary parotid lymphoma appears as infiltrative or focal solid mass, uncommonly cystic

There is often periparotid & upper cervical lymphadenopathy associated.

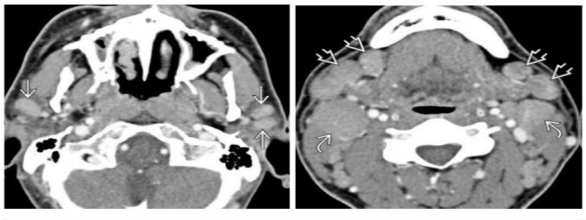


Image 24. Parotid node involvement with systemic lymphoma: Axial CECT image shows multiple well defined homogeneously enhancing intra-parotid masses. CECT image at cervical level shows extensive level IB and II lymphadenopathy.

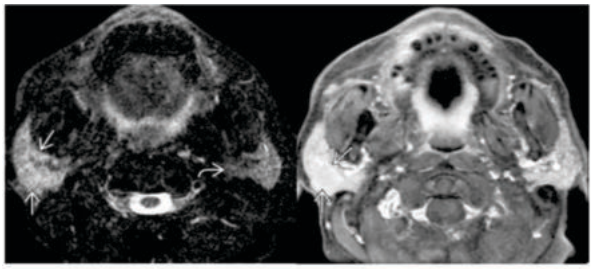
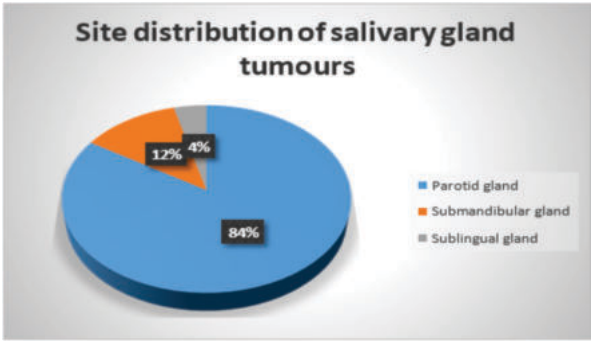


Image 25. Mucosa associated lymphoid tissue (MALT): Axial T2WI FS MR in a patient presenting with fullness of right cheek demonstrates subtle enlargement and diffuse hyperintensity of right parotid gland as compared to left side. (Right) Axial T1 C+ FS MR reveals diffuse enhancement of right parotid with more conspicuous ill-defined but homogeneous lesion in superficial lobe.

RESULTS AND DISCUSSION

The present study included 50 cases of salivary gland tumors, which were carried out at the SMS hopsital, Ahmedabad.

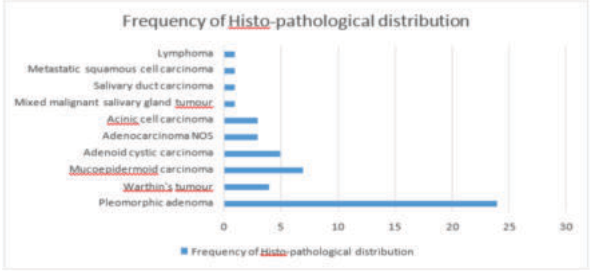
Following observations made according to age, sex, site, symptoms, USG, CT and MRI appearance of the tumors and the study data was analysed.



Most of the salivary gland tumors arise from parotid gland.

Salivary gland tumors arising from submandibular gland and sublingual gland is relatively uncommon.

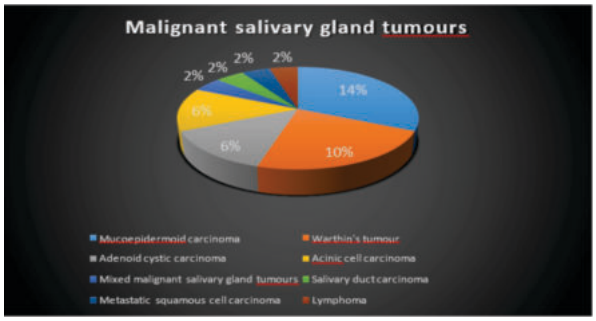
In my study 42 patients had masses arising from parotid gland, 6 patients had masses involving submandibular gland and 2 patients had mass involving sublingual gland.



In this study, out of 50 patients 28 were diagnosed as benign lesions on subsequent Histo-pathological examination and 22 patients were diagnosed as malignant tumours.

Out of 28 benign tumours, 24 cases were of pleomorphic adenoma which accounted for 48% of all cases. The next most common benign tumour was Warthin's tumour.

Mucoepidermoid carcinoma was most common malignant tumour accounting for 7 cases (14%) followed by adenoid cystic carcinoma (10%).



Age distribution

Table 3. Age wise distribution of benign and malignant salivary gland tumours.

AGE (YEARS)	BENIGN	MALIGNANT	TOTAL
31-40	12 (42.85%)	4 (18.18%)	16 (32%)
41-50	7 (25%)	10 (45.45%)	17 (34%)
51-60	5 (17.85%)	5 (22.72%)	10 (20%)
>60	4 (14.28%)	3 (13.63%)	7 (14%)
TOTAL	28 (56%)	22 (44%)	50 (100%)

In my study it was found that most of benign tumors were more commonly observed in female patients (57.14%) and most of malignant tumors were observed in male patients (63.63%).

Symptoms distribution

Table 5. Symptom wise distribution of salivary gland tumours.

Symptoms	Number of patients	Percentage
A lump or swelling on or near jaw or in neck or mouth	43	86%
Persistent pain in area of salivary gland	24	48%
Difficulty in swallowing	9	18%
Trouble opening mouth widely	8	16%

In this study it was found that majority of the patients (86%) with salivary gland tumours presented with lump or swelling in the region of jaw or neck.

Persistence of pain in the region of area of salivary gland was second most common present symptom accounting for 48% of the patients.

Difficulty in swallowing and in opening mouth were present in patients with large lesion.

Ultrasound role in differentiating benign and malignant salivary gland tumors:

50 patients who underwent ultrasound at our institute were followed up with Histo-pathological finding on FNAB.

Interpretation of ultrasound findings were dependant on lesion characteristics like shape, margins, echogenicity, echo texture, and vascularisation.

Vascularization was assessed in four grades: Grade 1 indicates no vessels visible in the mass in colour Doppler flow imaging (CDFI); Grade 2 indicates a few vessels segment of no more than three blood vessels visible in the whole mass; Grade 3 indicates up to five vessels visible in the mass; and Grade 4 indicates more than five vessels visible in the mass.

Sonographic characteristics suggesting probably malignant or malignant masses were irregular in shape, speculated or ill-defined margin, heterogeneous echo texture, punctate calcification and

vascularisation (Grade 3-4).

Sonographic characteristic suggesting probably benign or benign mass were round or ovoid shape, circumscribed margin, homogeneous texture and vascularisation (Grade 1-2).

Comparing the presumed sonographic diagnosis of salivary gland masses with the pathological results, the sensitivity, specificity, positive predictive value, negative predictive value and accuracy were determined.

Number of malignant lesions correctly diagnosed on ultrasound 18 (TN) and diagnosed as benign 4 (FP).

Table 6 and 7. Statistical data of salivary gland tumours observed on ultrasound.

True positive	False positive	True negative	False negative
22	4	18	6

The sensitivity, specificity, positive predictive value, negative predictive value and accuracy of ultrasound for diagnosis of salivary gland tumors is 78.57%, 81.82%, 84.62%, 75.00% and 80.00%, respectively.

Sensitivity	78.57%
Specificity	81.82%
Positive predictive value	84.62%
Negative predictive value	75.00%
Accuracy	80.00%

Role of CT in differentiating benign and malignant salivary gland tumors:

30 patients who underwent CT imaging at our institute were followed up with Histo-pathological finding on FNAB.

Interpretation of CT findings were dependant on lesion characteristics like size, margins, location, and enhancement pattern. Other CT criterion which were used to determine nature of lesion were central necrosis, calcification, para- pharyngeal fat extension, and associated LN enlargement.

CT characteristics suggesting malignant masses were intermediate (3-5 cm) in size, ill-defined margin, and associated with heterogeneous enhancement pattern.

CT characteristic suggesting benign mass were well defined margin and homogeneous enhancement pattern.

Comparing the presumed CT diagnosis of salivary gland masses with the pathological results, the sensitivity, specificity, positive predictive value, negative predictive value and accuracy were determined.

True positive	False positive	True negative	False negative
9	1	17	3

Table 14 and 15. Statistical data of salivary gland tumours observed on CT scan.

Sensitivity	75.00%
Specificity	94.44%
Positive predictive value	90.00%
Negative predictive value	85.00%
Accuracy	86.67%

The sensitivity, specificity, positive predictive value, negative predictive value and accuracy of ultrasound for diagnosis of salivary gland tumors is 75.00%, 94.44%, 90.00%, 85.00% and 86.67% respectively.

Role of MRI in differentiating benign and malignant salivary gland tumors:

15 patients who underwent MRI imaging at our institute were followed up with Histo-pathological finding on FNAB.

Interpretation of MRI findings were dependant on lesion characteristics like size, margins, location, and enhancement pattern. Other MRI criterion which were used to determine nature of lesion were central necrosis.

MRI characteristics suggesting malignant masses were ill-defined margin, heterogeneous enhancement pattern and central necrosis.

MRI characteristic suggesting benign mass were well defined margin and homogeneous enhancement pattern.

Comparing the presumed MRI diagnosis of salivary gland masses with the pathological results, the sensitivity, specificity, positive predictive value, negative predictive value and accuracy were determined.

Of the 15 patients, the final pathological diagnosis included 8 benign tumours and 7 malignant tumours.

The presumed MRI diagnosis showed as 8 benign tumours while 7 cases were diagnosed as malignant tumors.

Number of benign lesions correctly diagnosed on MRI was 7 (TP) and diagnosed as malignant was 1 (FN).

Number of malignant lesions correctly diagnosed was 6 (TN) and diagnosed as benign was 1 (FP).

True positive	False positive	True negative	False negative
7	1	6	1

Table 19 and 20. Statistical data of salivary gland tumours observed on MRI.

Sensitivity	87.50%
Specificity	85.71%
Positive predictive value	87.50%
Negative predictive value	85.71%
Accuracy	86.67%

The sensitivity, specificity, positive predictive value, negative predictive value and accuracy of MRI for diagnosis of salivary gland tumors is 87.50%, 85.71%, 87.50%, 85.71% and 86.67% respectively.

Comparison Of Statistical Data Obtained From Ultrasound, Ct And Mri In Patients With Salivary Gland Tumours:

Table 27. Comparative analysis of statistical data obtained in salivary gland masses observed on USG, CT and MRI.

Statistical data	Ultrasound	CT	MRI
Sensitivity	78.57%	75.00%	87.50%
Specificity	81.82%	94.44%	85.71%
Positive predictive value	84.62%	90.00%	87.50%
Negative predictive value	75.00%	85.00%	85.71%
accuracy	80.00%	86.67%	86.67%

From above provided data, it was noted that MRI had the highest sensitivity in diagnosing salivary gland tumours which was 87.50%.

Sensitivity of Ultrasound and CT were 78.57% and 75.00% respectively.

Specificity of CT imaging was the highest in diagnosis of salivary gland tumours which was 94.44% followed by MRI (85.71%).

Forecasting the correct diagnosis of tumours of the salivary gland is difficult, however in the recent years increase in the number of CT and MRI scans has been very useful in making correct diagnosis as well as to define the disease extension.

Accuracy of CT and MRI in this study is similar to each another 86.67%.

SUMMARY

A Hospital based Prospective study was done at our tertiary care centre to study the role of Ultrasound, CT and MRI in evaluation of salivary gland tumours. The following observations were noted:

- 50 patients were included in this study with age range of 30 to 80 years.
- Most common site for salivary gland tumour to occur was parotid gland accounting for 84% of the patients.
- In this study, out of 50 patients 28 had benign salivary gland tumour and 22 had malignant salivary gland tumour.
- Most common salivary gland tumour was Pleomorphic Adenoma accounting for 48% of all patients.
- Most common malignant salivary gland tumour was pleomorphic adenoma with 14% of all cases.

- Majority (42.85%) of benign tumours were reported in age range of 31-40 years.
- For malignant lesions most common age group was 41-50 years accounting for 45.45% of all tumours.
- Benign tumours were more commonly reported in female patients. Ratio for benign tumour in male to female was 0.75:1.
- Malignant tumours were more common in male patients. Ratio for malignant tumour in male to female was 1.7:1.
- Majority of patients (86%) with salivary gland tumours presented with complain of swelling in the region of jaw.
- On ultrasound 64.28% benign tumours had an oval shape whereas only 4.54% malignant tumour had an oval shape.
- 77.27% malignant tumour had irregular shape on ultrasound whereas 14.28% benign tumour had irregular shape.
- On ultrasound majority of benign tumours (60.71%) had circumscribed margins and majority of malignant tumours (72.72%) had ill-defined margins.Echogenicity wise benign and malignant lesions were hypoechoic accounting for 46.42% and 81.81% respectively.
- On ultrasound, most of salivary gland tumours (68%) showed heterogeneous echotexture whether malignant or benign.
- On colour Doppler, 42.85% of benign tumours had Grade 2 vascularity and 68.18% malignant tumours had Grade 4 vascularity on CDFI.
- Overall sensitivity of Ultrasound in differentiating benign from malignant salivary gland tumour was 78.57% and specificity was 81.82%.
- CT scan was performed in 30 patients, out of which 12 patients had benign tumours and 18 patients had malignant tumours.
- Size of most of the benign tumours (58.33%) was 3 to 5 cm and similarly majority (50%) of malignant tumours had also size of 3 to 5 cm.
- 8 out of 12 benign lesions involving parotid gland involved superficial lobe accounting for 66.66% while 10 out of 16 malignant tumours involved both lobes of parotid gland.
- Homogeneous enhancement pattern after intravenous contrast injection was more commonly seen in benign tumours. 58.33% benign tumours showed homogeneous enhancement.
- 83.33% of malignant tumours demonstrated heterogenous enhancement pattern on post contrast CT scan.
- Central necrosis and para-pharyngeal fat extension were very significant features in differentiating malignant tumours from benign. Central necrosis was present in 16.66% of benign tumours and 38.88% of malignant tumours.
- Para-pharyngeal fat extension was present in 16.66% of benign and 55.55% of malignant tumours.
- Sensitivity and specificity of CT scan was found to be 75.00% and 94.44% with positive predictive value 90.00% and negative predictive value 85.00%.
- MRI scan was performed in 15 patients, out of which 8 patients had benign tumours and 7 patients had malignant tumours.
- On MRI, 4 benign tumours (50%) and 4 malignant tumours (57.14%) had size of 3 to 5 cm.75% of benign tumours had well defined margins whereas 71.42% of malignant tumours had ill-defined margins.
- Enhancement pattern in benign and malignant lesions were found to be identical to CT scan imaging. 62.5% benign tumours had homogeneous enhancement and 71.42% malignant tumours had heterogeneous enhancement.
- Sensitivity and specificity of MRI scan was found to be 87.50% and 85.71% with positive predictive value 87.50% and negative predictive value 85.71%. MRI had an accuracy of 86.67% in this study.

CONCLUSION

MRI is marginally superior to CT in differentiating benign from malignant salivary gland tumours. Ultrasound is the ideal initial investigation for evaluating submandibular masses and lesions in the superficial lobe of parotid, particularly as it can be readily combined with FNAC. CT and MRI are certainly morphologically equivalent studies and have the same diagnostic potential in salivary gland tumours. Thus the cost of diagnostic method gains in importance. It has been known that the cost of MRI is nearly three times than CT.

Therefore, this difference should be taken in account while choosing diagnostic method for use in salivary gland tumours. If patient underwent either CT or MRI, there would be no deed for another diagnostic imaging because this second imaging would not change treatment plan.

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