ROLE OF IMAGING IN SALIVARY GLAND TUMOURS

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ABSTRACT

BACKGROUND

Salivary gland neoplasms account for <3% of all tumours. Most of them are benign in nature. Parotid gland is the commonest site for salivary gland tumour. Ultrasound is an ideal tool for initial screening of tumour. If deep tissue extension is present, MRI or CT is done to evaluate tumour extent, local invasion, and perineural spread.

METHODS

About 50 patients who came for evaluation of suspicious salivary gland tumour were included in the study from August 2018 to September 2018. All patients underwent USG, CT and MRI examination for radiological confirmation of salivary gland tumour and its extension. All patients underwent biopsy for histopathological confirmation of radiological diagnosis.

RESULTS

Observations were made according to age, sex, site, symptoms, USG, CT and MRI appearance of the tumours and the study data was analysed. It was found that most of the benign tumours were observed in age range of 31-40 years (42.85%) and most of the malignant tumours were observed in the age range of 41-50 years (45.45%). Benign tumours were more commonly observed in female patients (57.14%) and most of malignant tumours were observed in male patients (63.63%). The sensitivity, specificity, positive predictive value, negative predictive value and accuracy of ultrasound for diagnosis of salivary gland tumours is 78.57%, 81.82%, 84.62%, 75.00% and 80.00%, respectively. The sensitivity, specificity, positive predictive value, negative predictive value and accuracy of CT for diagnosis of salivary gland tumours is 75.00%, 94.44%, 90.00%, 85.00% and 86.67% respectively. The sensitivity, specificity, positive predictive value, negative predictive value and accuracy of MRI for diagnosis of salivary gland tumours is 87.50%, 85.71%, 87.50%, 85.71% and 86.67% respectively.

CONCLUSIONS

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.

BACKGROUND

Salivary gland neoplasms account for <3% of all tumours. The role of imaging in assessment of salivary gland tumour 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.

Each parotid gland is divided by the facial nerve into a superficial lobe and a deep lobe.[1]

Pleomorphic adenomas account for 70-80% of benign salivary gland tumours and are especially common in the parotid gland.[2,3]

Aims and Objectives

- To study the age and sex incidence of various salivary gland tumours.
- To evaluate the role of imaging in diagnosis of various salivary gland tumours and study its characteristics on different imaging modalities.
- Role of imaging in staging of salivary gland tumours to determine surgical resectability and their prognosis.

METHODS

During the period from August 2016 to November 2018 prospective study of 50 patients of various age was carried out. All patients with salivary gland mass lesions were included in my study. Relevant h/o illness & significant clinical finding of any patient were recorded. Previous investigations were reviewed. Most of patients taken for examination without any premedication. In case of

uncooperative patient, sedatives were used under supervision of anaesthetists. USG, CT and MR characteristics of different lesions were noted and recorded. The histopathological diagnosis was followed up and recorded. Patients were followed up for the history of treatment and to check residual/recurrent lesion. The results of this study were analysed and compared with other studies available in literature.

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.

RESULTS
The present study included 50 cases of salivary gland tumours, which were carried out at the Gujarat Cancer and research institute, Ahmedabad.

Malignant salivary gland tumours staging:
Malignant salivary gland tumours are staged using the TNM staging system:

T: Tumour
- Tx: primary tumour cannot be assessed
- T0: no evidence of primary tumour
- T1
  - Less than or equal to 2 cm in maximal diameter
  - No extra-parenchymal extension
- T2
  - 2-4 cm in maximal diameter
  - No extra-parenchymal extension
- T3
  - Greater than 4 cm in maximal diameter OR
  - Any size with extra-parenchymal extension
- T4A: Direct extension into skin, mandible, ear canal, facial nerve
- T4B: Direct extension into base of skull, pterygoid plates, or encases carotid artery

N: Nodes
- Nx: nodes cannot be assessed
- N0: no evidence of nodal involvement
- N1
  - single ipsilateral node
  - <3 cm in maximal diameter
- N2A
  - Single ipsilateral node
  - 3-6 cm in maximal diameter
- N2B
  - Multiple ipsilateral nodes
  - Less than 6 cm in maximal diameter
- N2C
  - Contralateral or bilateral nodes
  - Less than 6 cm in maximal diameter
- N3: >6 cm in maximal diameter

M: Metastases
- Mx: presence of metastases cannot be assessed
- M0: no evidence of metastases
- M1: distant metastases present

Anatomic Stage/ Prognostic Groups

Stage I	T1	N0
Stage II	T2	N0
Stage III	T3	N0
	T1	N1
	T2	N1
	T3	N1
Stage IV A	T4a	N0
	T4a	N1
	T1	N2
	T2	N2
	T3	N2
	T4a	N2
Stage IV B	T4b	Any N
	Any T	N3
Stage IV C	Any T	Any N

Site Distribution

No.	Site of Involvement	Total Number of Patients	Percentage of Tumours
1	Parotid gland	42	84%
2	Submandibular Gland	6	12%
3	Sublingual Gland	2	4%

Table 1. Site Distribution of Salivary Gland Tumours in 50 Patients with Percentage Distribution

Graph 1
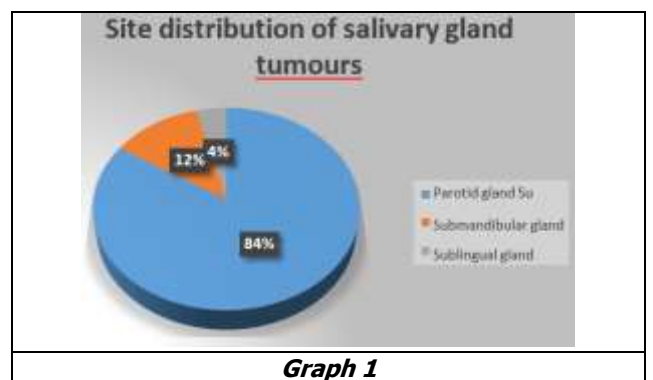
Most of the salivary gland tumours arise from parotid gland.

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.

**Frequency of Histopathologic Distribution**

No.	Final Diagnosis	Total Number of Patients (50)	Percentage of Tumours
1	Pleomorphic adenoma	24	48%
2	Warthin's tumour	4	8%
3	Mucoepidermoid carcinoma	7	14%
4	Adenoid cystic carcinoma	5	10%
5	Adenocarcinoma (not otherwise specified)	3	6%
6	Acinic cell carcinoma	3	6%
7	Mixed malignant salivary gland tumours	1	2%
8	Salivary duct carcinoma	1	2%
9	Metastatic squamous cell carcinoma	1	2%
10	Lymphoma	1	2%

Table 2. Frequency of Histopathological Distribution in 50 Patients Included in This Study

In this study, out of 50 patients 28 were diagnosed as benign lesions on subsequent Histopathological 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%).
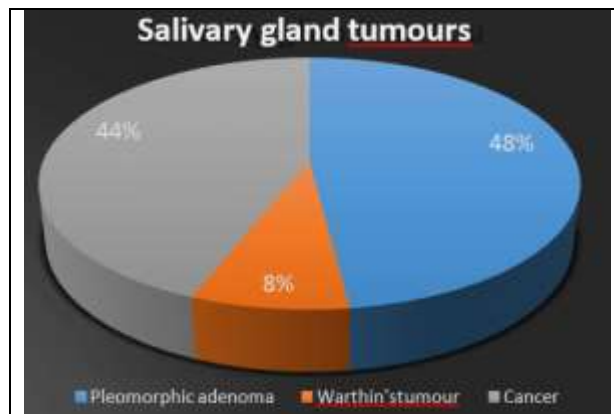
Graph 2
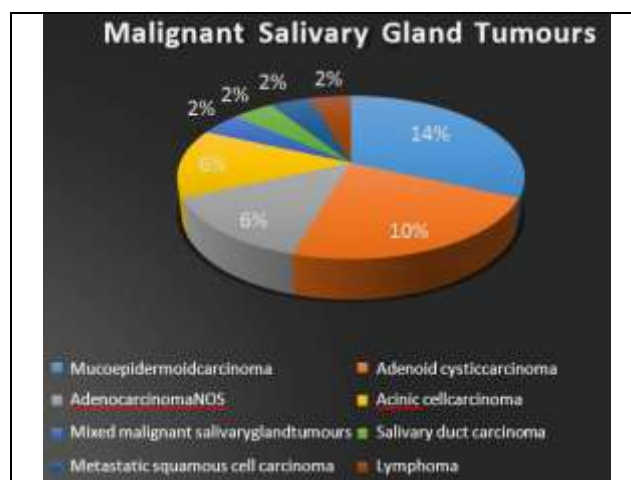
Graph 3

Age Distribution

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%)

Table 3. Age Wise Distribution of Benign and Malignant Salivary Gland Tumours

No.	Type of Salivary Gland Tumours	Age (in Years)								
		1-10	10-20	20-30	30-40	40-50	50-60	60-70	70-80	>80
1.	Pleomorphic adenoma	-	-	-	9	6	5	3	1	-
2.	Warthin's tumour	-	-	-	3	1	-	-	-	-
3.	Mucoepidermoid carcinoma	-	-	-	1	3	1	1	1	-
4.	Adenoid cystic carcinoma	-	-	-	1	3	1	-	-	-
5.	Adenocarcinoma (not otherwise specified)	-	-	-	1	1	1	-	-	-
6.	Acinic cell carcinoma	-	-	-	-	1	1	1	-	-
7.	Malignant mixed salivary gland tumour	-	-	-	-	-	1	-	-	-
8.	Salivary duct carcinoma	-	-	-	-	1	-	-	-	-
9.	Metastases	-	-	-	-	1	-	-	-	-
10.	Lymphoma	-	-	-	1	-	-	-	-	-

Table 4. Age Wise Tumours Distribution in Different Histological Grades of Tumour

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Sex Distribution

Sex	Benign	Malignant	Total
Male	12 (42.85%)	14 (63.63%)	26 (52%)
Female	16 (57.14%)	8 (36.36%)	24 (48%)
Total	28 (56%)	22 (44%)	50 (100%)

Table 5. Sex Wise Distribution of Benign and Malignant Salivary Gland Tumours

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

Symptoms Distribution

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%

Table 6. Symptom Wise Distribution of Salivary Gland Tumours

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.

Ultrasound Role in Differentiating Benign and Malignant Salivary Gland Tumours

50 patients who underwent ultrasound at our institute were followed up with histopathological finding on FNAC.

Of the 50 patients, the final pathological diagnosis included 28 benign tumours and 22 malignant tumours.

The presumed sonographic diagnosis showed as 26 benign tumours while 24 cases were diagnosed as malignant tumours.

Number of benign lesions correctly diagnosed on ultrasound 22 (TP) and diagnosed as malignant 6 (FN).

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

True Positive	False Positive	True Negative	False Negative
22	4	18	6

Table 7. Statistical Data of Salivary Gland Tumours Observed on Ultrasound

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

Table 8. Statistical Data of Salivary Gland Tumours Observed on Ultrasound

Shape	Benign	Malignant	Total
Ovoid	18 (64.28%)	1 (4.54%)	19 (38%)
Lobulated	6 (21.42%)	4 (18.18%)	10 (20%)
Irregular	4 (14.28%)	17 (77.27%)	21 (42%)
Total	28 (56%)	22 (44%)	50 (100%)

Table 9. Shape Wise Distribution of Pathological Confirmed Salivary Gland Masses Observed on Ultrasound

Margin	Benign	Malignant	Total
Circumscribed	17 (60.71%)	2 (9.09%)	19 (38%)
Speculated	5 (17.85%)	4 (18.18%)	9 (18%)
Ill-defined	6 (21.42%)	16 (72.72%)	22 (44%)
Total	28 (56%)	22 (44%)	50 (100%)

Table 10. Margin Wise Distribution of Pathological Confirmed Salivary Gland Masses Observed on Ultrasound

Echotexture	Benign	Malignant	Total
Homogeneous	12 (42.85%)	4 (18.18%)	16 (32%)
Heterogeneous	16 (57.14%)	18 (81.81%)	34 (68%)
Total	28 (56%)	22 (44%)	50 (100%)

Table 11. Echotexture Wise Distribution of Salivary Gland Masses Observed on Ultrasound

Vascularisation	Benign	Malignant	Total
0	2 (7.14%)	1 (4.54%)	3 (6%)
+	12 (42.85%)	2 (9.09%)	14 (28%)
++	10 (35.71%)	4 (18.18%)	14 (28%)
+++	4 (14.28%)	15 (68.18%)	19 (38%)
Total	28 (56%)	22 (44%)	50 (100%)

Table 12. Vascularisation Wise Distribution of Salivary Gland Masses Observed on Ultrasound

In the present study benign and malignant tumours showed significant difference in vascularity on CDFI. Benign tumours showed Grade 2 or 3 vascularisation whereas 15 (68.18%) cases of malignant tumours showed Grade 4 vascularisation.

Role of CT in Differentiating Benign and Malignant Salivary Gland Tumours

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

Of the 30 patients, the final pathological diagnosis included 12 benign tumours and 18 malignant tumours.

The presumed CT diagnosis showed as 10 benign tumours while 20 cases were diagnosed as malignant tumours.

Number of benign lesions correctly diagnosed on CT was 9 (TP) and diagnosed as malignant was 3 (FN).

Number of malignant lesions correctly diagnosed was 17 (TN) and diagnosed as benign was 1 (FP).

True Positive	False Positive	True Negative	False Negative
9	1	17	3

Table 13. 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%

Table 14. Statistical Data of Salivary Gland Tumours Observed on CT Scan

Size	Benign	Malignant	Total
Small <3 cm	3 (25%)	4 (22.22%)	7 (23.33%)
Intermediate 3-5 cm	7 (58.33%)	9 (50%)	16 (53.33%)
Large >5 cm	2 (16.66%)	5 (27.77%)	7 (23.33%)
Total	12 (40%)	18 (60%)	30 (100%)

Table 15. Size wise Distribution of Pathological Confirmed Salivary Gland Masses Observed on CT

In this study most of the benign tumours were of intermediate size ranging from 3-5 cm. 7 (58.33%) out of 12 benign tumours were in size between 3-5 cm. Similarly, most number of malignant tumours were also in size between 3-5 cm. 9 (50%) out of 18 malignant tumours ranged between 3-5 cm.

Margin	Benign	Malignant	Total
Well defined	10 (83.33%)	3 (16.66%)	13 (43.33%)
Ill-defined	2 (16.66%)	15 (83.33%)	17 (56.66%)
Total	12 (40%)	18 (60%)	30 (100%)

Table 16. Margin Wise Distribution of Pathological Confirmed Salivary Gland Masses Observed on CT

Location of Lesion in Parotid Gland	Benign	Malignant	Total
Superficial Lobe	8 (66.66%)	5 (31.25%)	13 (46.42%)
Deep Lobe	1 (8.33%)	1 (6.25%)	2 (7.14%)
Both Lobes	3 (25%)	10 (62.5%)	13 (46.42%)
Total	12 (42.85%)	16 (57.14%)	28 (100%)

Table 17. Lesion Location Wise Distribution of Pathological Confirmed Parotid Gland Masses

In this study, it was found that most parotid tumours which involved both lobes were malignant 10 (62.5%) cases out of 16. Most of parotid lesions that involved the superficial lobe were benign which was found in 8 (66.6%).

Enhancement Pattern	Benign	Malignant	Total
No enhancement	0	0	0
Homogeneous	7 (58.33%)	3 (16.66%)	10 (33.33%)
Heterogeneous	3 (25%)	15 (83.33%)	18 (60%)
Peripheral	2 (16.66%)	0	2 (6.66%)
Total	12 (40%)	18 (60%)	30 (100%)

Table 18. Enhancement Wise Distribution of Pathological Confirmed Salivary Gland Masses

In this study it was found that the most common enhancement pattern in the benign tumours were homogeneous pattern, as it was determined in 7 (58.33%) out of 12 patients. Most of the malignant tumours exhibited heterogeneous pattern, as it was determined in 15 (83.33%) out of 18 patients.

Other Findings Characteristics	Benign	Malignant
Central Necrosis	2 (16.66%)	7 (38.88%)
Para Pharyngeal Fat Extension	2 (16.66%)	10 (55.55%)
Calcification	1 (8.33%)	2 (11.11%)
Associated LN Enlargement	2 (16.66%)	11 (61.11%)

Table 19. Other Finding Characteristics of Pathological Confirmed Salivary Gland Masses on CT Imaging

Central necrosis was present in 2 (16.66%) benign lesions and in 7 (38.88%) malignant lesions. Another significant CT criterion was the extension of the lesion to the para-pharyngeal fat space which was determined in 10 (55.55%) out of 18 malignant lesions and 2 (16.66%) out of 12 benign lesions.

Calcifications were detected in 1 benign and 2 malignant lesions. The last evaluated CT criterion was the associated lymph node enlargement which were detected in 2 (16.66%) benign and 11 (61.11%) malignant lesions.

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

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

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 tumours.

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 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%

Table 20. Statistical Data of Salivary Gland Tumours Observed on MRI

Size	Benign	Malignant	Total
Small <3 cm	2 (25%)	1 (14.28%)	3 (20%)
Intermediate 3-5 cm	4 (50%)	4 (57.14%)	8 (53.33%)
Large >5 cm	2 (25%)	2 (28.57%)	4 (26.66%)
Total	8 (53.33%)	7 (46.66%)	15 (100%)

Table 22. Size Wise Distribution of Pathological Confirmed Salivary Gland Masses

In this study most of the benign tumours were of intermediate size ranging from 3-5 cm. 4 (50.00%) out of 8 benign tumours were in size between 3-5 cm. Similarly, most number of malignant tumours were also in size between 3-5 cm. 4 (57.14%) out of 7 malignant tumours ranged between 3-5 cm.

Margin	Benign	Malignant	Total
Well defined	6 (75%)	2 (28.57%)	8 (53.33%)
Ill-defined	2 (25%)	5 (71.42%)	7 (46.66%)
Total	8 (53.33%)	7 (46.66%)	15 (100%)

Table 23. Margin Wise Distribution of Pathological Confirmed Salivary Gland Masses

In my study out of 15 patients, 8 patients had well defined margins out of which 6 cases were benign tumours (75%). Most of malignant tumours had ill- defined margins which accounted for 5 cases (71.42%).

Enhancement Pattern	Benign	Malignant	Total
Homogeneous	5 (62.5%)	2 (28.57%)	7 (46.66%)
Heterogeneous	3 (37.5%)	5 (71.42%)	8 (53.33%)
Total	8 (53.33%)	7 (46.66%)	15 (100%)

Table 24. Enhancement Wise Distribution of Pathological Confirmed Salivary Gland Masses

In this study it was found that the most common enhancement pattern in the benign tumours were homogeneous pattern, as it was determined in 5 (62.5%) out of 8 patients. Most of the malignant tumours exhibited heterogeneous pattern, as it was determined in 5 (71.42%) out of 7 patients.

Other Findings Characteristics	Benign	Malignant
Central Necrosis	1 (12.5%)	3 (42.85%)
Para Pharyngeal Fat Extension	1 (12.5%)	4 (57.14%)
Associated LN enlargement	2 (25%)	6 (85.71%)

Table 25. Other Findings Characteristic of Histopathologically Confirmed Salivary Gland Masses on MRI Imaging

Central necrosis was present in 1 (12.5%) benign lesions and in 3 (42.85%) malignant lesions. Another significant MR criterion was the extension of the lesion to the para-pharyngeal fat space which was determined in 4 (57.14%) out of 7 malignant lesions and 1 (12.5%) out of 8 benign lesions. Lymph node enlargement was detected in 2 (25%) benign and 6 (85.71%) malignant lesions.

Comparison of Statistical Data Obtained from Ultrasound, CT and MRI in Patients with Salivary Gland Tumours-

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%

Table 26. Comparative Analysis of Statistical Data Obtained in Salivary Gland Masses Observed on USG, CT and MRI

DISCUSSION

In my study the highest incidence was in 3rd to 4th decade in benign and 4th to 5th decade for malignant lesions. This is similar to the result obtained by Shafkat et al.[4]

These results are also in concordance with Rastogi et al,[5] who reported that in patients older than 40 years, the most causes of enlarged parotid gland are neoplastic lesions either benign or malignant.

In our study pleomorphic adenoma was found to be the commonest benign tumour which accounted for (48%) followed by Warthin's tumour (8%). This result is similar to S Shrestha et al.[6]

In this study mucoepidermoid carcinoma is the most common malignant salivary gland tumour followed by adenoid cystic carcinoma which accounted for 7 cases and 5 cases respectively. This result is comparable to the results of study conducted by Madabushi et al[7] in which mucoepidermoid carcinoma was most common salivary gland tumour.

In our study it was found that most of benign tumours had ovoid shape (64.28%) on ultrasound while in malignant tumours most common shape observed was irregular (77.27%). This result was similar to the results of study carried out by S Wu et al.[8]

C Martinoli et al[9] reported that in salivary glands the extension of intra-tumoural flow is more relevant in malignant than in benign tumours. In their study benign lesions showed grade II and III vascularity in 44.89% and 32.65% tumours respectively which was similar to this study in which benign lesions showed grade II and III vascularity in 42.85% and 35.71% of tumours respectively.
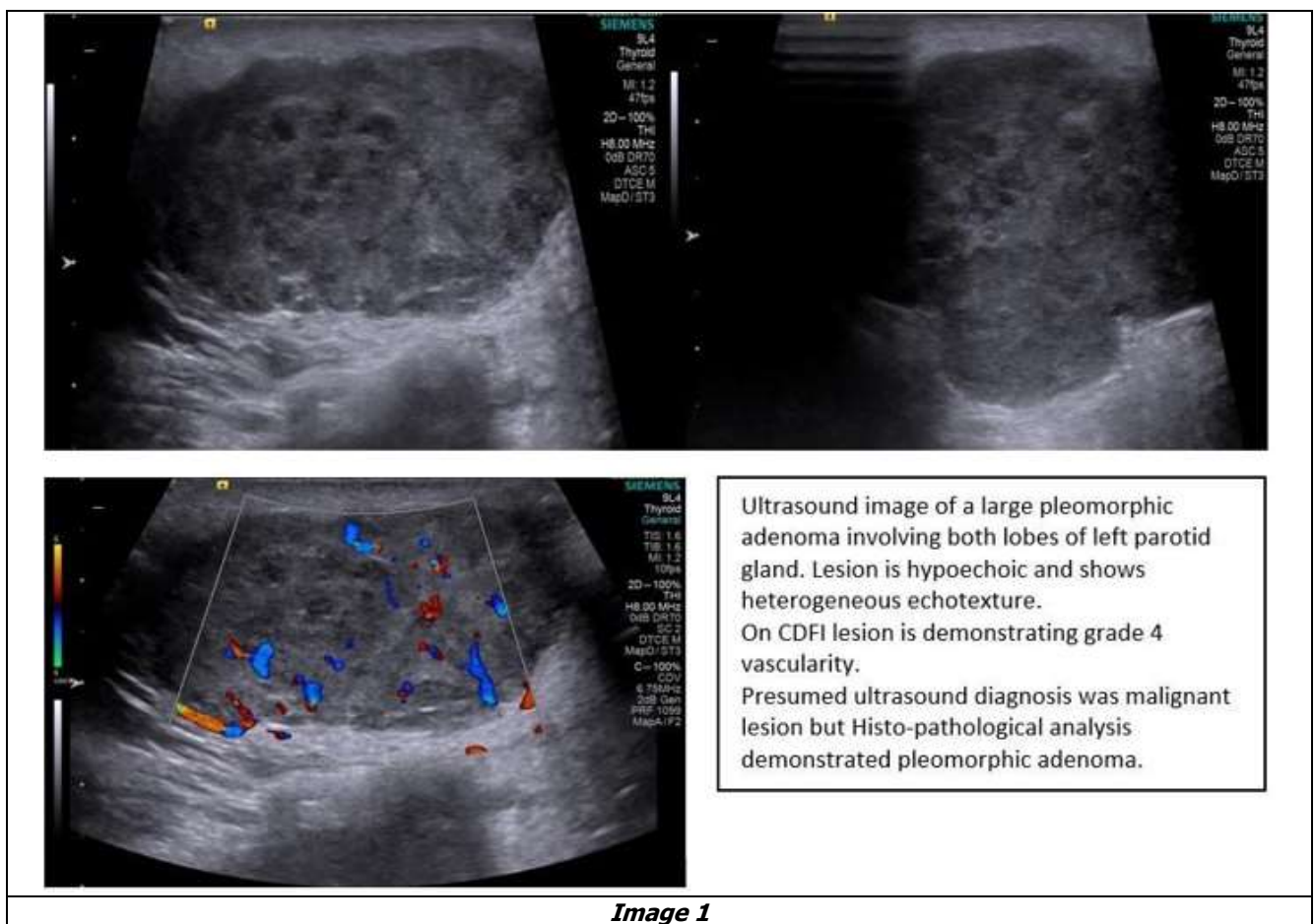
Swetha et al[10] also reported that more and more internal inhomogeneity was identified when high-resolution transducers were used which was also reflected in our study which demonstrated echotexture wise 57.14% of benign tumours and 81.81% of malignant tumours were heterogeneous accounting for 68% of total.

Study reported by Enas at el[11] using MDCT in salivary gland tumours demonstrated that size of the lesion did not have any statistical significance in differentiating benign from malignant salivary gland tumours. In our study also size of the lesion did not have significant effect on deciding nature of the tumour as 16 out of 30 lesions which underwent MDCT had size in between 3 to 5 cm.
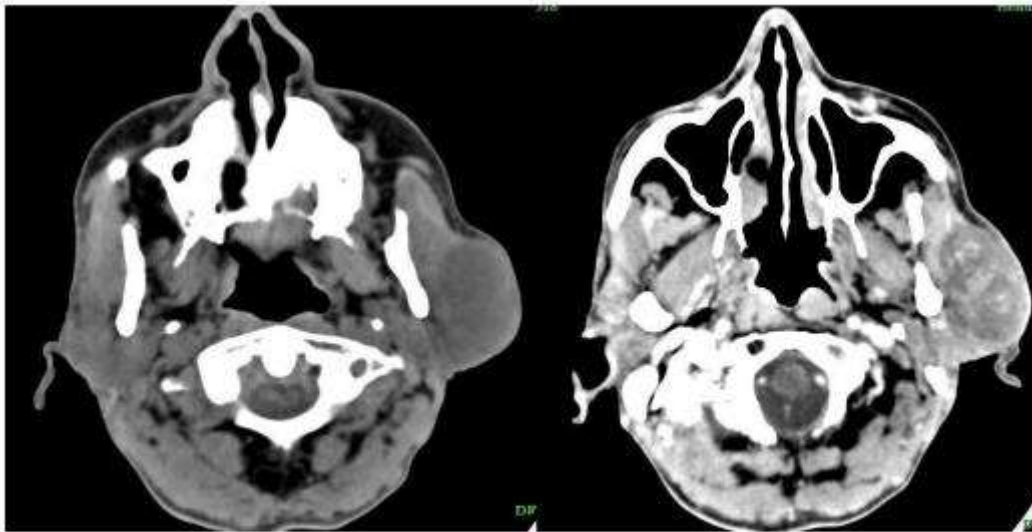
CONCLUSIONS

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 becomes important. It has been known that the cost of MRI is nearly three times that of CT. Therefore, this difference should be taken into account while choosing diagnostic method for use in salivary gland tumours. If patient underwent either CT or MRI, there would be no need for another diagnostic imaging because this second imaging would not change treatment plan.

Case 1. Pleomorphic Adenoma

Ultrasound image of a large pleomorphic adenoma involving both lobes of left parotid gland. Lesion is hypoechoic and shows heterogeneous echotexture.
On CDFI lesion is demonstrating grade 4 vascularity.
Presumed ultrasound diagnosis was malignant lesion but Histo-pathological analysis demonstrated pleomorphic adenoma.

Image 1

Axial plain and post contrast CT at the level of parotid in same patient demonstrates large hypodense lesion with heterogeneous post contrast enhancement involving both lobes of parotid gland.

Image 2
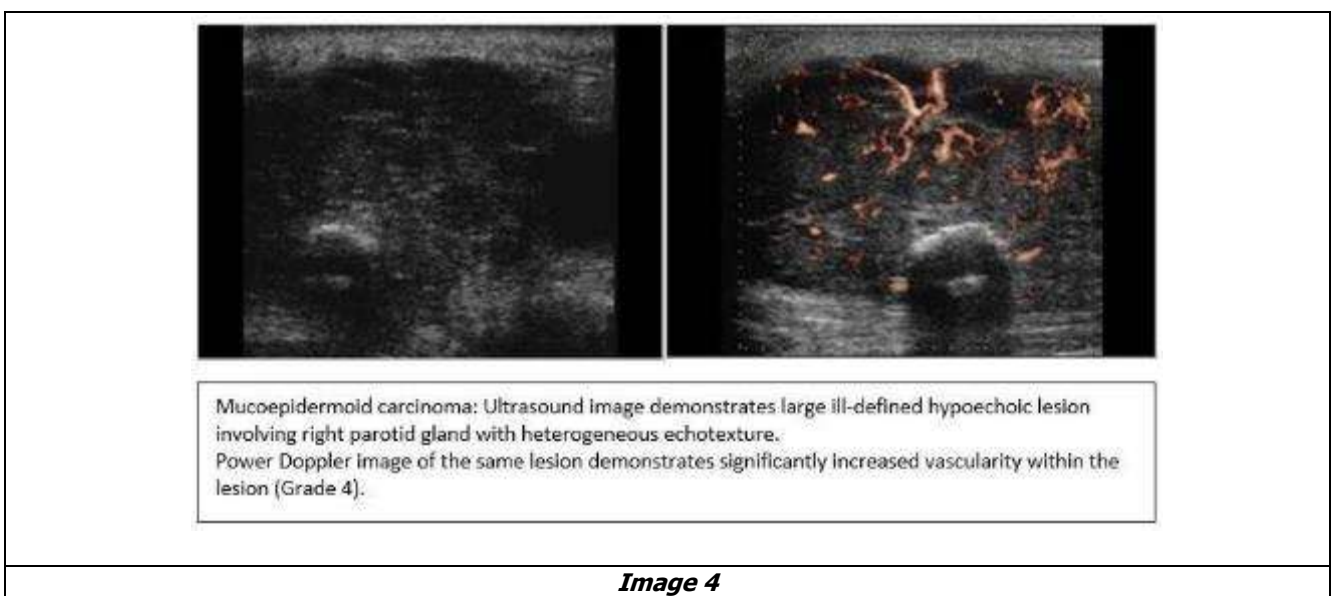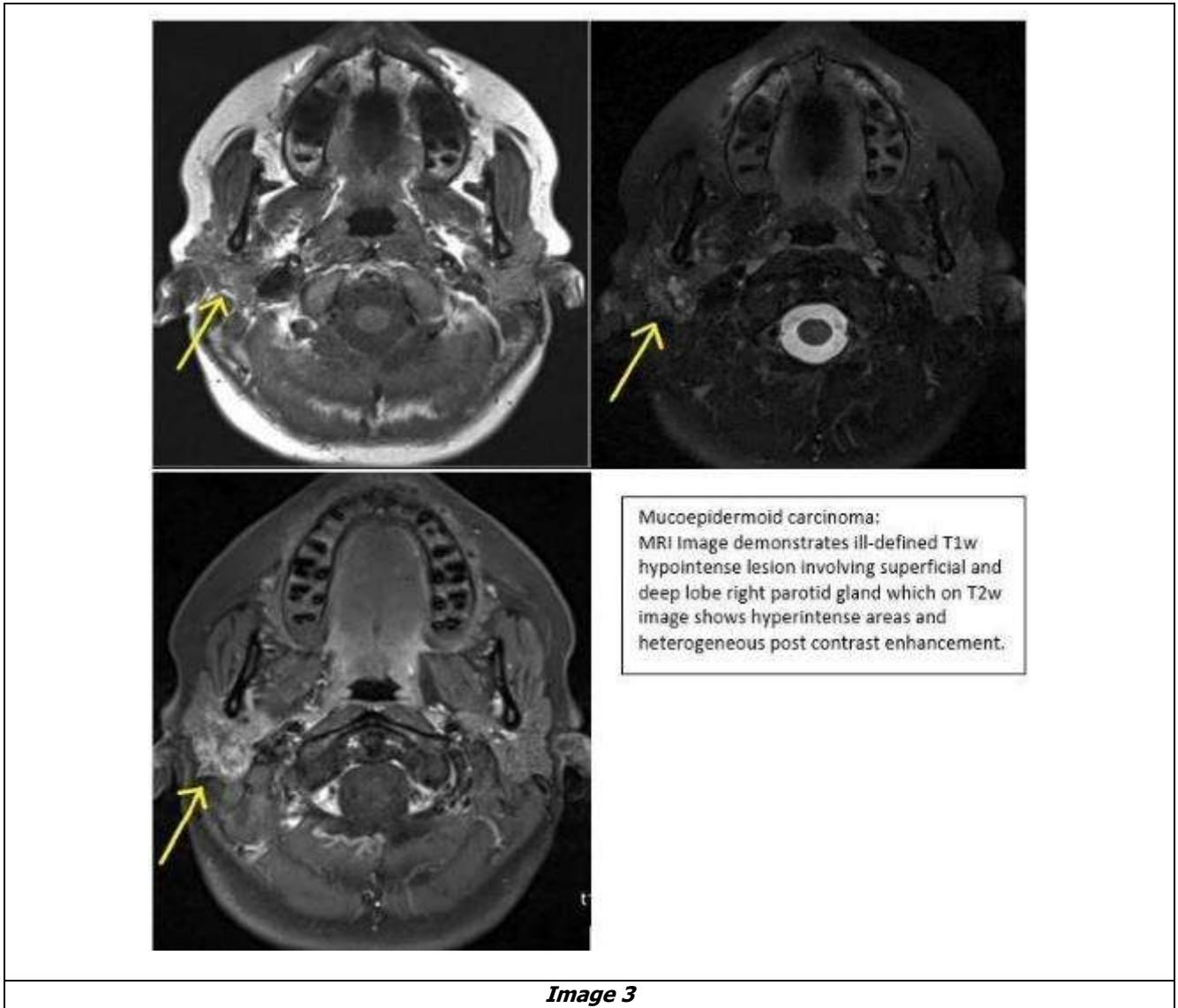
Case 2. Warthin's Tumour
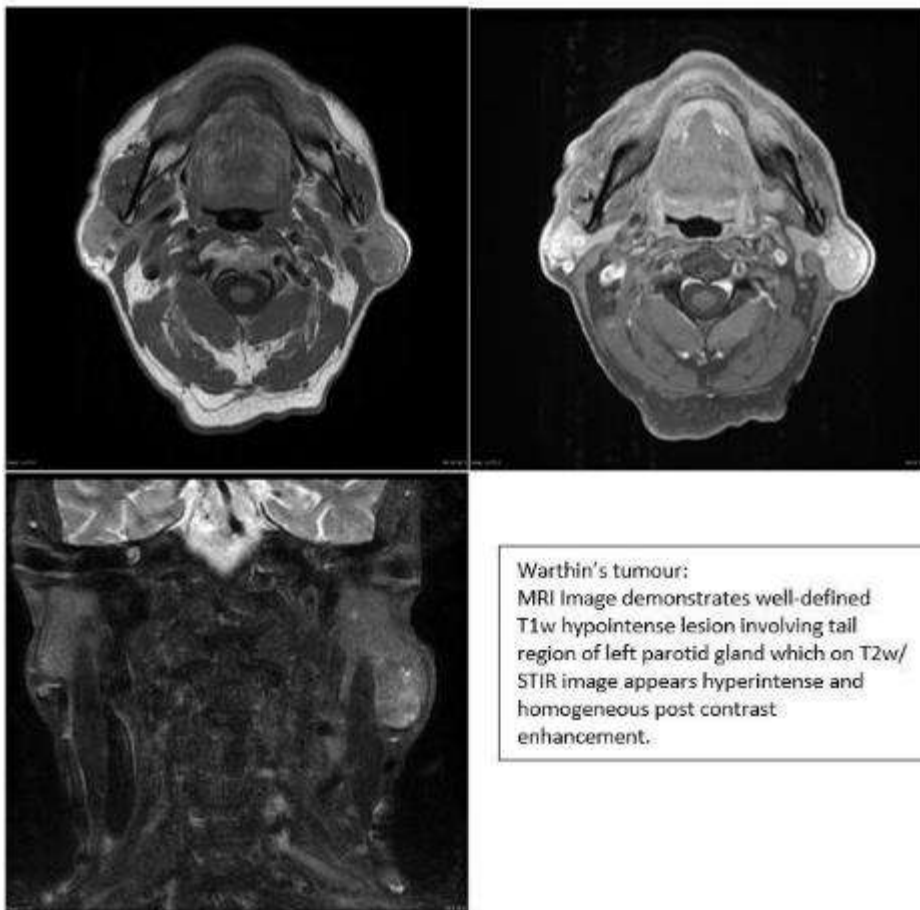
Warthin's tumour:
MRI Image demonstrates well-defined T1w hypointense lesion involving tail region of left parotid gland which on T2w/STIR image appears hyperintense and homogeneous post contrast enhancement.
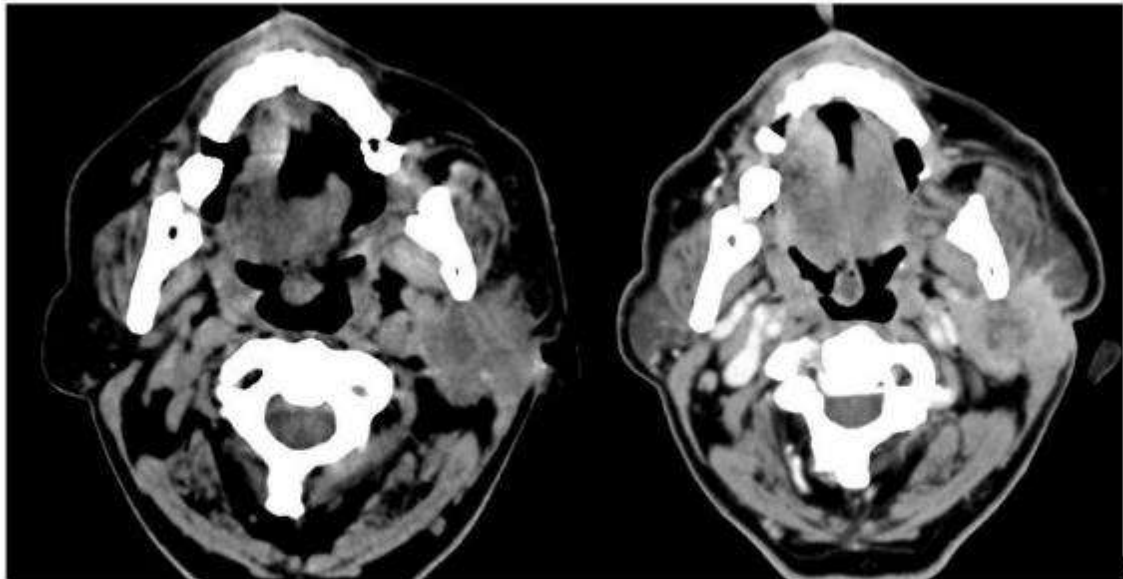
Image 2

Case 3. Mucoepidermoid Carcinoma

Mucoepidermoid carcinoma:
MRI Image demonstrates ill-defined T1w hypointense lesion involving superficial and deep lobe right parotid gland which on T2w image shows hyperintense areas and heterogeneous post contrast enhancement.

Image 3

Mucoepidermoid carcinoma: Ultrasound Image demonstrates large ill-defined hypoechoic lesion involving right parotid gland with heterogeneous echotexture.
Power Doppler image of the same lesion demonstrates significantly increased vascularity within the lesion (Grade 4).

Image 4

Case 4. Adenoid Cystic Carcinoma

Adenoid cystic carcinoma:
A) Axial plain image of parotid region shows ill-defined hypodense lesion involving both lobes of left parotid gland.
B) On post contrast image, lesion shows heterogeneous enhancement, para-pharyngeal fat extension, involvement of left sternocleidomastoid muscle and central necrosis.
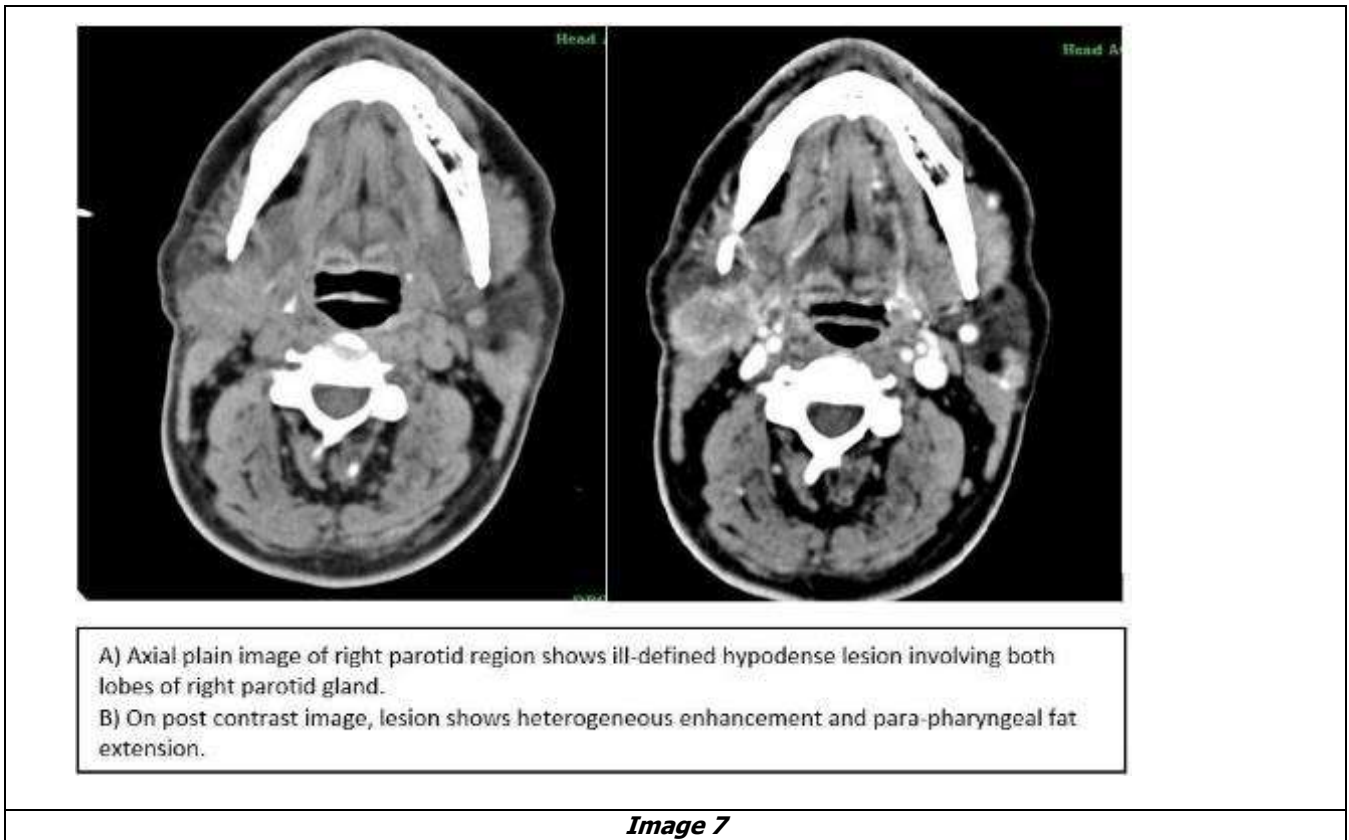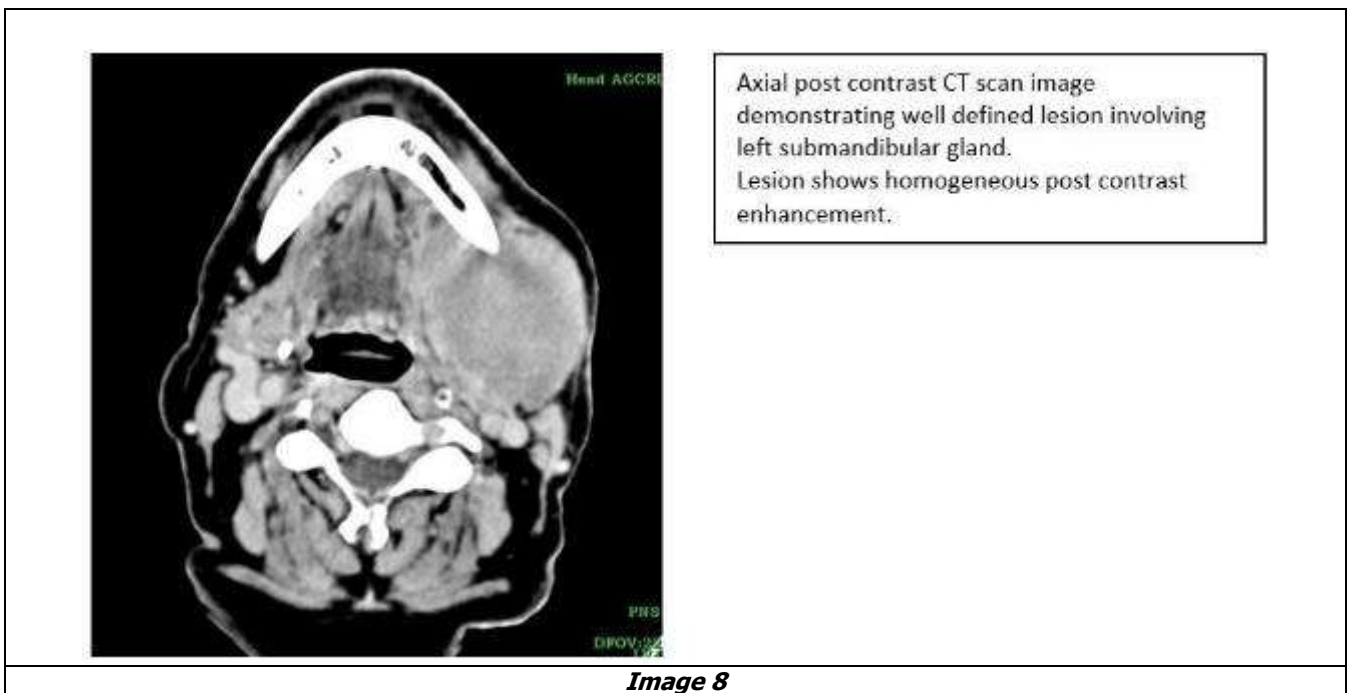
Image 5

Case 5. Acinic Cell Carcinoma

Acinic cell carcinoma: Axial post contrast CT image demonstrates heterogeneously enhancing lesion involving both lobes of left parotid gland. Lesion involves overlying skin and shows extension to the carotid sheath.

Image 6

Case 6. Adenocarcinoma NOS

A) Axial plain image of right parotid region shows ill-defined hypodense lesion involving both lobes of right parotid gland.

B) On post contrast image, lesion shows heterogeneous enhancement and para-pharyngeal fat extension.

Image 7

Case 7. Lymphoma

Axial post contrast CT scan image demonstrating well defined lesion involving left submandibular gland.

Lesion shows homogeneous post contrast enhancement.

Image 8

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