Original Research Article

Magnetic resonance imaging in extracranial head and neck lesions

Sudhir Navale[1], Amol Bandgar[2*], Prathamesh Bongale[3], Sahil Kulkarni[4]

[1,2]Associate Professor, [3,4]Resident, Department of Radiology, Bharati Vidyapeeth Medical College Pune, Maharashtra, INDIA.
Email: drmangalmahajan@gmail.com

Abstract

Objective: The objective of our study was to evaluate the role of MRI imaging of extracranial head and neck lesion and to detect and characterize the lesions of different etiologies.**Materials And Methods:** In the present study 50 patients of all age group and sex with suspected extracranial head and neck lesions (detected by clinical history, USG or CT scan) presenting to the Department of Radio diagnosis and Imaging, Bharati Vidyapeeth Deemed University Medical College, Pune were imaged using Philips MRI System – "Philips Achieva", 1.5 tesla super conducting system. A detailed history was taken before conducting a MRI scan for the patient. **Results:** Head and neck pathologies were seen predominantly in 4th to 6th decade of life. Male preponderance was seen. Out of 50 patients 37 patients had a neoplastic etiology while 13 had a benign disease. Oral cavity was the commonest locations for head neck neoplastic etiologies. **Conclusion:** Magnetic resonance imaging (MRI) is highly sensitive imaging modality in the evaluation of extracranial head and neck lesions, because of its excellent soft tissue contrast resolution and lack of ionizing radiation. It helps in determining the site of origin of the lesion and its characterization and extension / spread into the adjacent structures. It can also detect early bone involvement. MR imaging can be safely done in pregnant women and patients with deranged renal function tests. However, time of examination, patient co-operation and cost are limitations of MR imaging. Furthermore MR imaging cannot be performed in patients with dental implants and surgical clips.

Key Word: extracranial head, neck lesions.

[*]**Address for Correspondence:**
Dr. Amol Bandgar, Associate Professor, Department of Radiology, Bharati Vidyapeeth Medical College Pune, Maharashtra, INDIA.
Email: drmangalmahajan@gmail.com

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INTRODUCTION

The expanding interest in the neck is majorly due to technical development and availability of cross-sectional imaging. imaging has become an indispensable tool in the characterization and staging head and neck pathologies. MR scans gives excellent tissue characterization over CT and hence helps in the exact delineation of tumor margins in the nasopharynx, oropharynx, and skull base regions[5]. MRI also depicts cross-sectional anatomy and pathology in three planes without intravenous contrast administration, patient manipulation, or ionizing irradiation. However, High quality MRI examinations of the head and neck consume more time than CT imaging and necessitates patient cooperation for a longer period of time.

MATERIALS AND METHODS

This was a Prospective, observational study. A total of 50 patients of all age group and sex with suspected extracranial head and neck lesions (detected by clinical history, USG or CT scan) presenting to the Department of Radio diagnosis and Imaging, Bharati Vidyapeeth Deemed University Medical College, Pune were included in the study. These patients underwent MR imaging of the extracranial All intracranial skull base and cervical spine lesions on a Philips MRI System – "Philips Achieva", 1.5 tesla super conducting system.

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RESULTS

50 patients with suspected extracranial head and neck lesions were evaluated in this study.

Age distribution:

In our study maximum number of patients were in the age group of 41-60 years, followed by age group of 21-40 years and 61-80 years. According to the study done by Bhurgari Y *et al*[61], mean age of the patients was 53.0 years and peak incidence was at 64-69 years. Our results are consistent with the literature.

Table 1: AGE WISE DISTRIBUTION (IN YEARS).

Age (years)	No. of patients	Total (Percentage)
0-20	5	10 %
21-40	15	30 %
41-60	19	38 %
61-80	9	18 %
81-100	2	4 %
Total	50	100 %

In the present study 30 out of the 50 patients were males. Hence, a male preponderance was seen. Adeyami BF *et al*[1] reported male predominance in head and neck cancers with ratio being 1.8:1. Mahrotra R *et al*[2] reported 144 malignant lesions with 114 in males and 30 in females. According to Siddiqui MS *et al*[3], malignant cases more commoner in males than in females with Male:Female ration being 3.1:1. The male predominance correlates well with our study.

Table 2: GENDER WISE DISTRIBUTION.

Gender	Number of patients	Percentage (%)
Male	30	60 %
Female	20	40 %
Total	50	100 %

In our study there was male predominance (60 %) when compared to females (40 %).Female: Male ratio is - 3:2

Characterization of pathologies into benign and malignant:

Neoplastic lesions preponderance was seen in our study. Out of the 50 cases studied 37 patients had a malignant/neoplastic pathology while the rest 13 had a benign disease. Both the benign and neoplastic lesions were commoner in the age group of 41-60 years. Otto RA *et al*[4] reported that neck lesions in children are most likely to be inflammatory or congenital. In older patients (>40 years) neoplastic lesions are more likely. Siddiqui MS *et al*[3] studied 455 head and neck neoplasms with 241 being benign and 214 being malignant. This does not correlate with our study and this variation may be due to a larger older age patient sample size.

Distribution of neoplastic lesions

The table below shows the spectrum of neoplastic findings seen in our study. The most common of all these was tongue carcinoma (27.02 %) (10 cases) followed by buccal mucosal carcinoma (13.51 %) (5 cases),mandibular alveolar carcinoma (8.10 %) (3 cases) and malignant lymphadenopathy (8.10%) (3 cases). The Commonest site for neoplastic lesions was oral cavity with 23 (46%) lesions. Andisheh Tadbir A *et al*[7], found that the tongue was the most commonly affected site (53%) which correlates with our study.

Table 3: DISTRIBUTION OF NEOPLASTIC LESIONS

Neoplastic lesion	No. of lesion	Percentage (%)
Laryngeal carcinoma	1	2.70 %
Buccal mucosal carcinoma	5	13.51 %
Gingivo-buccal mucosal carcinoma	1	2.70 %
Mandibular alveolar carcinoma	3	8.10 %
Retromolar trigone carcinoma	1	2.70 %
Tongue carcinoma	10	27.02 %
Lip carcinoma	1	2.70 %
Mandibular carcinoma	1	2.70 %
Palatal carcinoma	1	2.70 %
Dentigerous cyst	1	2.70 %

Maxillary alveolar carcinoma	1	2.70 %
Sinonasal carcinoma	2	5.40 %
Thyroid carcinoma	1	2.70 %
Parotid carcinoma	1	2.70 %
Orbital dermoid	1	2.70 %
Orbital hemangioma	1	2.70 %
Cystic Hygroma	1	2.70 %
Malignant Lymphadenopathy	3	8.10 %
Etxracranial dermoid	1	2.70 %
Total	37	100 %

Distribution of non-neoplastic lesions

In the present study of the 13 benign lesions, multinodular goiter, parotitis, thyroid ophthalmopathy and lymphadenopathy was the commonest benign pathology seen with 2 cases each (14.28 %).

Table 4: DISTRIBUTION OF NON-NEOPLASTIC LESIONS (INFECTIVE / INFLAMMATORY AND OTHER LESIONS).

Non-Neoplastic Lesions	No. of lesions	Percentage (%)
Pyocele	1	7.14 %
Multinodular goitre	2	14.28 %
Parotitis	2	14.28 %
Submandibular sialadenitis	1	7.14 %
Thyroid ophthalmopathy	2	14.28 %
Orbital pseudotumour	1	7.14 %
Orbital cellulitis	1	7.14 %
Lymphadenopathy	2	14.28 %
Adenoids	1	7.14 %
Edema	1	7.14 %
Total	13	100 %

Morphological characterization:

In our study it was observed that majority of malignant lesions were solid and majority of infective/ inflammatory lesions were other.

Table 5: DISTRIBUTION OF NEOPLASTIC and INFECTIVE/INFLAMMORY LESIONS ACCORDING TO MORPHOLOGY OF LESION

Morphology of lesion	No. of lesions (n=50)		Total (percentage)
	Neoplastic lesions (%)	Infective/ inflammatory lesions (%)	
Purely solid	6 (12 %)	1 (2 %)	7 (14 %)
Solid	27 (54 %)	0	27 (54 %)
Solid-cystic	2 (4 %)	2 (4 %)	4 (8 %)
Purely cystic	2 (4 %)	1 (2 %)	3 (6 %)
Other	0	9 (18 %)	9 (18 %)
Total	37 (74 %)	13 (26 %)	50 (100 %)

Signal intensity pattern of benign and malignant lesions:

It was observed that majority of as well as the malignant lesions were hypointense on T1W images and hyperintense on T2W and STIR images.

Table 6: DISTRIBUTION OF SIGNAL INTENSITY PATTERN OF BENIGN and MALIGNANT LESIONS

SIGNAL INTENSITY	BENIGN LESIONS			MALIGNANT LESIONS		
	T1W	T2W	STIR	T1W	T2W	STIR
Hypo	4		2	26		
Iso to hypo				2	1	1
Iso						
Iso to hyper	1	3	2	1	6	6
Hyper	2	4	3	1	23	23
Total	7	7	7	30	30	30

Table 7: DISTRIBUTION OF SIGNAL INTENSITY PATTERN OF INFECTIVE/ INFLAMMATORY LESIONS

SIGNAL INTENSITY	INFECTIVE/ INFLAMMATORY LESIONS		
	T1W	T2W	STIR
Hypo	6		
Iso to hypo	3	1	1
Iso	4	2	2
Iso to hyper		3	3
Hyper		7	7
Total	13	13	13

Post contrast enhancement pattern of neoplastic and infective/ inflammatory lesions:
It was observed that majority of benign lesions were showing either heterogeneous or rim type of enhancement. The majority of infective/ inflammatory lesions also illustrated heterogeneous enhancement pattern (4 cases) while only 1 case showed a rim enhancement. Almost all malignant lesions (26 out of 30 cases) were heterogeneously enhancing lesions.

Table 8: DISTRIBUTION OF POST CONTRAST ENHANCEMENT PATTERN OF NEOPLASTIC and INFECTIVE/ INFLAMMATORY LESIONS

Post contrast enhancement pattern	NEOPLASTIC		INFECTIVE/ INFLAMMATORY LESIONS
	Benign lesions	Malignant lesions	
Homogenous	1	4	2
Heterogeneous	2	26	4
Rim	2	-	1
No enhancement	1	-	1
Contrast not given	1	-	5
Total	7	30	13

Association of lymphadenopathy in neoplastic and infective/ inflammatory lesions:
In our study lymphadenopathy was the commonest associated pathology, which was seen in 33 (66%) cases out of 50. The majority of benign lesions as well as the infective/ inflammatory lesions did not show associated lymphadenopathy while the majority of malignant lesions had lymphadenopathy associated with them.Lymphadenopathy was seen in malignant lesions accounting for 26 (87%) cases followed by 6 (46%) cases of infective / inflammatory etiology. Lymphadenopathy was seen in only 1 (14%) case of benign lesions.

Table 9: ASSOCIATION OF LYMPHADENOPATHY IN NEOPLASTIC and INFECTIVE/ INFLAMMATORY LESIONS

LYMPHADENOPATHY	NEOPLASTIC LESIONS		INFECTIVE / INFLAMMATORY LESIONS (%)	TOTAL (%)
	BENIGN (%)	MALIGNANT (%)		
PRESENT	1 (14%)	26 (87%)	6 (46%)	33 (66%)
ABSENT	6 (86%)	4 (13%)	7 (54%)	17 (34%)
TOTAL	7	30	13	50 (100%)

DISCUSSION

This prospective observational study was performed on 50 patients with suspected extracranial head and neck lesions. We studied the role of MR imaging in various extracranial head and neck lesions. Maximum numbers of patients were seen in age group of 41 to 60 years (38%) followed by 21-40 years (30%).A slight male preponderance was seen in our study.

All extracranial head and neck lesions were divided into neoplastic and non-neoplastic lesions. Both neoplastic and non-neoplastic lesions were prevalent in 4^{th} to 6^{th} decades.Most common neoplastic lesions were tongue carcinoma followed by, buccal mucosal carcinoma, mandibular alveolar carcinoma and malignant lymphadenopathy. Most common non-neoplastic lesions were multinodular goiter, parotitis, thyroid ophthalmopathy and lymphadenopathy (2 cases each).Anatomically most common site involved was oral cavity. Most common morphology of the extracranial head and neck lesions was solid type of lesion. The commonest signal intensity pattern in all benign, infective / inflammatory and malignant lesions was hypointensity on T1W and hyperintensity on T2W and STIR images. Though signal intensity characteristics are similar in neoplastic and infective / inflammatory and benign lesions, it was observed that majority of neoplastic lesions

were heterogeneous in signal intensity while the majority of infective / inflammatory lesions were homogeneous in signal intensity.Most common enhancement pattern observed in neoplastic and infective / inflammatory lesions was heterogeneous enhancement. This was followed by homogenous and rim enhancement. Most common associated findings were lymphadenopathy accounting for 66% of all the lesions in this study. Morphologically lymph nodes in malignant lesions had irregular borders, heterogeneous T2W signal, areas of necrosis and heterogeneous contrast enhancement. Lymphadenopathy in benign and infective lesions showed homogenous T2W signal without necrosis and homogenous enhancement[6]. In cases of laryngeal carcinoma MR imaging was superior to depict invasions of paraglottic space, cartilage, vocal cords and preglottic space. Spread of tumor across midline was demonstrated with STIR images without need of gadolinium. Loss of normal high fatty marrow signal on T1W images implies early mandibular invasion. Erosion and remodeling of bones could be assessed on MRI but CT was better for evaluation of bones.MR can differentiate thickened mucosa and retained secretions from malignancy on the basis of enhancement pattern.MR imaging in thyroid can detect even small nodules with calcification and hemorrhage. T2W hyperintensity was characteristic for nodules. Pseudocapsule can be assessed in case of thyroid malignancy but dynamic contrast enhanced MR imaging is essential for diagnosis.Lesions with fat intensity on T1W and T2W images showing suppression on fat suppression sequences were pathognomonic of dermoid.Definitive diagnosis of type of hemangioma requires dynamic contrast enhanced MR imaging.

CONCLUSION

- Magnetic resonance imaging (MRI) is highly sensitive imaging modality in the evaluation of extracranial head and neck lesions, because of its excellent soft tissue contrast resolution and lack of ionizing radiation.
- MRI helps in determining the site of origin of the lesion and its characterization. MRI is superior to CT in assessing internal architecture of the lesion and extension / spread into the adjacent structures.
- MRI can detect perineural spread, which is helpful in patient management.
- Morphological characterization of lymph nodes and enhancement pattern can help differentiating benign and malignant lymphadenopathy.
- Replacement of normal fatty marrow with tumor tissue can be detected at a much earlier stage with MR imaging hence, changing surgical approach.
- MR imaging can be safely done in pregnant women and patients with deranged renal function tests.
- However, time of examination, patient co-operation and cost are limitations of MR imaging. Furthermore, MR imaging cannot be performed in patients with dental implants and surgical clips.
- In our initial experience, it is concluded that MRI imaging is an extremely useful tool in evaluating patients with extracranial head and neck lesions due to its superior soft tissue contrast resolution.

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