



Magnetic Resonance Imaging in Evaluation of Intracranial Tumors: A Prospective Study in A Tertiary Hospital

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Abstract

Aims and Objectives: 1. Diagnosis of intra cranial neoplasm on MRI. 2. To accurately determine the lesion characteristics.

Summary: In the present study for a period of 2 years (2015 – 2017) 130 cases from age group of 5-65 years suspected to be intracranial mass lesion on CT brain were elevated with MRI using various sequences and showed various supra and infratentorial and extra / intra axial cranial tumors.

Conclusion:

1. Accuracy of predicting diagnosis of extra axial lesions is better than that of intra-axial lesion on MRI with 100% correlation with HPE in extra axial mass lesions
2. Most of MR diagnosis correlated with histopathological diagnosis.
3. MRI is better in interpreting certain pathologies like infarction /reactive gliosis which produce similar morphological appearance to primary brain neoplasm on CT.

Keywords: MRI, intra axial; extra axial neoplasm, supratentorial, infratentorial tumors.

Introduction

MRI represents major advance in diagnostic imaging of neurological disease due to its multi planar capacity and higher soft tissue contrast that result in excellent display of anatomy and pathology.

Establishing the diagnosis of brain tumor on imaging is always not easy as many non - neoplastic diseases such as tuberculoma, mimic these lesions and also all brain neoplasms present with similar clinical features resulting in diagnostic dilemma ^(1,2). MRI earned as optimal screening technique for detection of most intracranial neoplasm ^(3,4,5,6,7)

Our study using MRI with various sequences differentiates intra axial from extra axial neoplasms and help in diagnosing them. Certain pathologies have similar morphological appearances on MRI. So clinical features, recent advances in MRI like spectroscopy, perfusion and IV gadolinium contrast studies help to narrow down the diagnosis.

Compared with CT, MRI provides excellent contrast resolution between structural abnormalities, adjacent brain parenchyma and proved to be more sensitive in the detection of focal lesions of brain ⁽⁸⁾.

Material and Methods

The present study comprises of 130 cases referred for various neurological symptoms during a period of 2 year (2015 - 2017) were evaluated with MRI brain using 1.5 tesla Avanto Siemens machine and T1W, T2W, FLAIR, GRE, DWI,ADC, Spectroscopy and T1W fat suppressed contrast study sequences .

Most of the case were initially evaluated using CT and confirmed with MRI. Patients with history of trauma, pregnant patients and post operative patients with recurrence all were excluded from our study.

Observations and Results

It is a prospective study extended over a period of 2years from 2015 to 2017 on a sample volume of 130 cases from 5 to 65 yrs of age.

Age incidence: Majority of cases are in the age group of 30-45 years

Table : 1 Age incidence

AGE INCIDENCE			
Age in years	Intra axial neoplasm	Extra axial neoplasm	Total
5 -15	10	6	16
15 - 30	8	8	16
30-45	24	16	40
45-60	18	12	30
>60	20	8	28
Total	80	50	130

Incidence of brain tumors is more in males (60%) than females (40%)

Table : 2 Gender incidence.

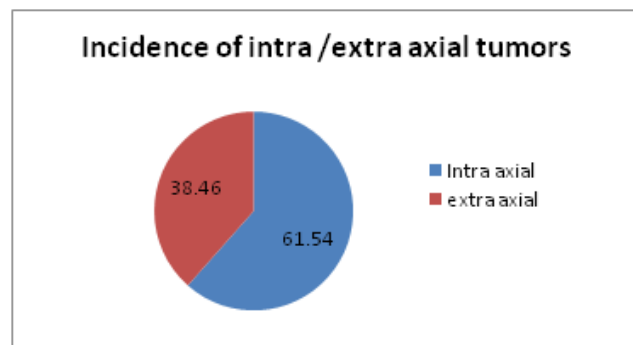
gender	Number	Percentage
Male	78	60%
Female	52	40%

Table: 3 Clinical Symptoms: Most common symptoms were head ache, seizures (n=130)

Head Ache	100	76%
Seizures	20	15%
Vomtings	8	6.2%
Weakness	20	15%
Altered Sensorium	10	7.6%
Memory	6	4.6%

Pie chart: 1 Incidence of Intra axial and Extra axial tumors

Intra axial 80 cases – (61.54%) Extraaxial 50 cases – (38.46 %)

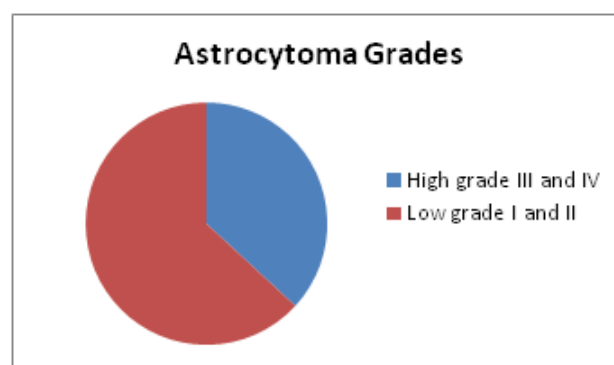


Incidence of both Intra axial and Extra axial tumors is more common in males than in females

Table: 4 showing gender incidence of intra/ extra axial tumors

	Intra Axial		Extra Axial	
	Male	Female	Male	Female
No.	64	16	30	20
Percentage	80%	20%	60%	40%

Pie chart :2



The incidence of Supratentorial tumors is more than Infratentorial tumors

Table: 5 Incidence of supra / infra tentorial tumors.

Supratentorial (80)		Infratentorial (50)	
Intra axial	Extra axial	Intra axial	Extra axial
56	24	28	22
70%	30%	56%	44%

Table: 6 The commonest neoplasm was Astrocytoma > Metastases > Meningioma

Astrocytoma	38	29.2%
Meningioma	16	12.3%
Acoustic schwannoma	10	7.6 %
Pituitary adenoma	8	6.1%
Metastasis	20	15.3%
Lymphoma	4	3.0%
Neurocytoma	2	1.5%
Cerebellar hemangioblastoma	2	1.5%
Rathke cleft cyst	2	1.5%
Epidermoid cyst	4	3%
Arachnoid cyst	4	3%
Medulloblastoma	10	7.6%
Ependymoma	6	4.6%
Craniopharyngioma	4	3.0%

The sensitivity of diagnosing extra axial neoplasm was higher than intra axial neoplasm. Among the intra axial neoplasm sensitivity of diagnosis of astrocytoma was found to be 100% as correlated with HPE. Among the extra axial neoplasm pituitary adenoma, meningioma, schwannoma have highest sensitivity and found to have 100% correlation with HPE. Solitary metastases was interpreted as high grade (GBM) on MRI and found to be metastasis on HPE.

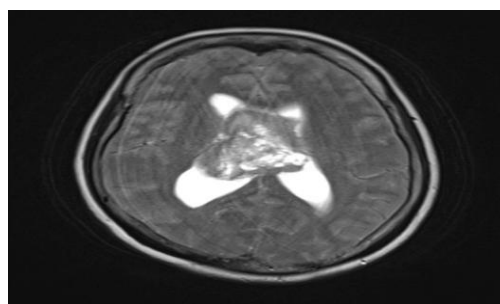
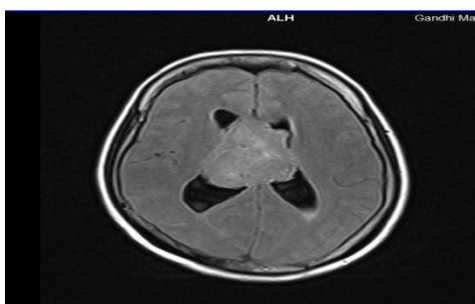


Fig-1 FLAIR (axial) and T₂W (axial) image showing hyperintense intraventricular lesion Central Neurocytoma

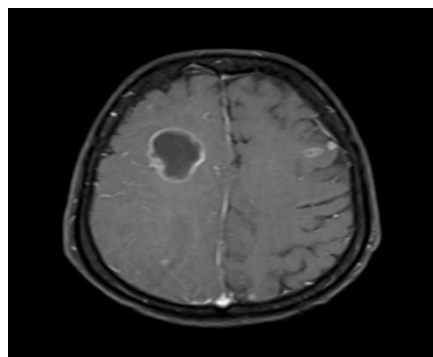
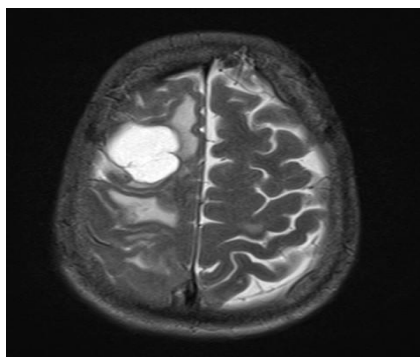


Fig -2 T₂W and Post contrast axial images showing cystic lesion showing rim enhancement with irregularity on contrast - Cystic Metastasis

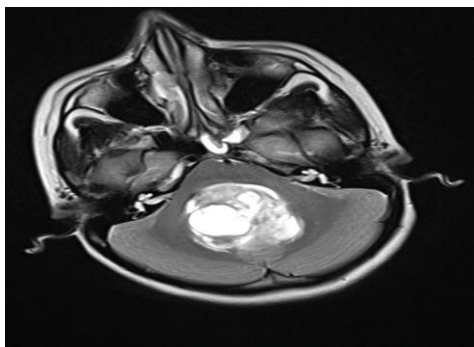


Fig -3 T₂W image showing posterior fossa mass lesion with cystic and solid components completely filling the fourth ventricle __Ependymoma

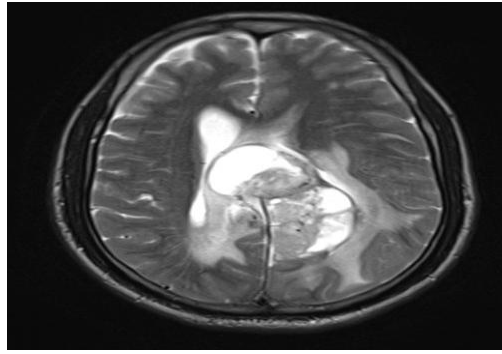


Fig -4 T₂W image showing mixed intensity solid and cystic mass lesion arising from splenium of corpus callosum- Glioblastoma Multiforme

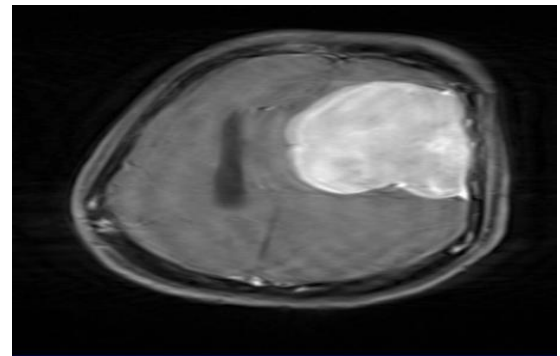
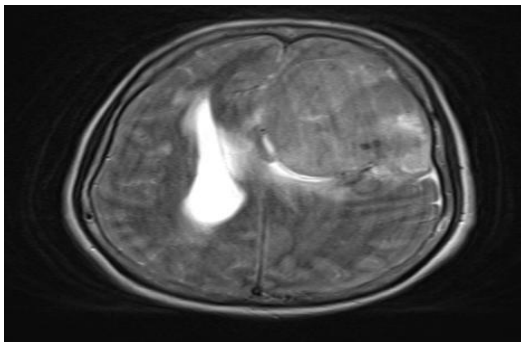


Fig -5 Axial T₂w ,post contrast T₁w images showing intensely enhancing extra axial T₂w isointense mass lesion with presence of CSF cleft -Meningioma

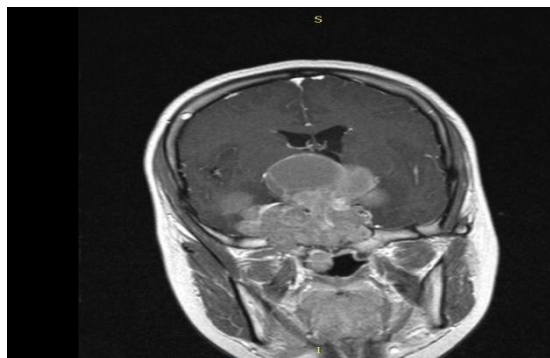


Fig -6 T₁W contrast coronal image showing isointense mass lesion in sella, suprasellar locations- Pituitary Macroadenoma

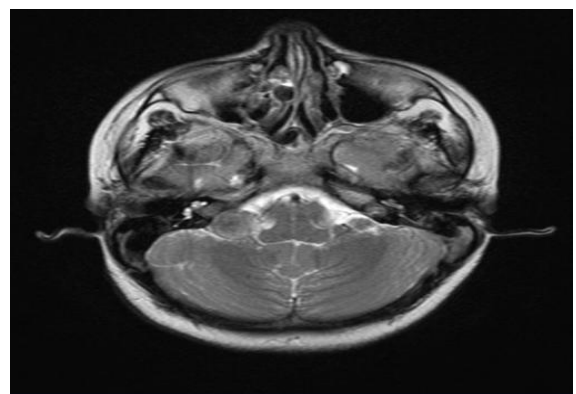
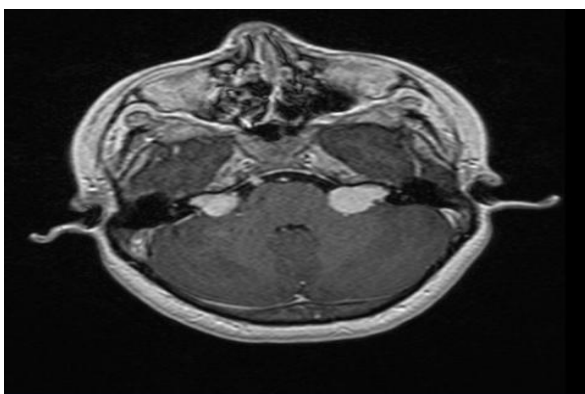


Fig -7 T₁W axial post contrast, T₂w axial images showing hypointense lesions in B/L CP angles showing contrast enhancement- Bilateral Acoustic Schwannoma

Discussion

In our study, involving 130 patients the commonest neoplasm encountered was astrocytoma (29.2%) and the next commonest was metastases (15.3%).

Astrocytomas are the most common primary intracranial neoplasm⁽⁹⁾. Most common age group of astrocytoma was middle age and elderly. In our study it was mean age of 36 years with male predominance. Male to female ratio is 3:2

Glioblastoma Multiforme (GBM) are more common in elderly (10). All GBM are associated with oedema, necrosis intralesional haemorrhage and tumor margin are indistinct and they stand out using IV contrast^(11,12,13). Butterfly GBM can extend across corpus callosum (fig -4)

Second common intra axial neoplasm was metastases (fig -2). MRI shows heterogenous lesion- hypointense on T₁W, hyperintense on T₂W image with thick and irregular peripheral enhancement on contrast. Even GBM which is a high grade glioma shows similar features. MRS helps to differentiate GBM from metastasis by detecting perilesional infiltration in GBM. The most helpful criteria which helps in differentiating metastasis from GBM is presence of extra cranial malignancy and multiplicity of the lesion. One of our case was diagnosed as GBM because of lack of history of extra cranial malignancy and the lesion was single. GBM and simple brain metastases are the two most common malignant brain tumor that can appear similar on anatomic imaging but require vastly different treatment strategy⁽¹⁴⁾ So they need to be differentiated before treatment.

Primary CNS lymphoma has increased incidence in immunocompromised individuals. In our study we have encountered four cases of lymphoma which showed slight hypointensity on T₁W, hyperintensity on T₂W, with heterogenous or ring enhancement (immunocompromised patients) and diffusion restriction. These ring enhancing lesions should be differentiated from Tuberculoma, Toxoplasmosis. MRS has a role in detecting

raised choline peak in lymphoma and presence of lipid lactate peak in tuberculoma.

Differentiation of peripherally located neoplasm as intra axial / extra axial lesion on CT is difficult. The presence of inward buckling of adjacent gray matter-white matter junction, CSF cleft and the dural tail sign on contrast indicate that the tumor is extra cerebral. (fig 5)

Ependymoma of fourth ventricle and medulloblastoma has close resemblance. Intratumoral calcification heterogenous signal intensity and propensity for tumor extension into fourth ventricle recesses is more in ependymoma than medulloblastoma. (fig 3)

Arachnoid cyst and epidermoid cyst have similar signal characteristics on MR but DWI helps in differentiating them (epidermoid cyst shows restriction on DWI).

The accuracy of diagnosis extra axial mass by MRI was found to the 100% as all the extra axial mass findings were confirmed with HPE.

Summary

During period of 2 year, 130 cases from age group of 5 to 65 years were evaluated with MRI using various sequences and contrast.

In our study maximum incidence seen in middle and elderly age and the mean age group was 36 years.

Most common symptom were headache and seizures. Most common tumor was astrocytoma followed by metastases.

MRI is found to be more useful in differentiating intra from extra axial neoplasm and it showed 100 % correlation with HPE in extra axial mass lesions. Metastases can produce similar morphological appearance to primary brain neoplasm leading to wrong interpretation and MRS is useful to detect perilesional infiltration in these cases.

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