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Role of MRI in the Evaluation of Space Occupying Lesions of the Brain

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Abstract

Role of Magnetic Resonance Imaging in space occupying lesions of brain

Background:

Space occupying lesions of the brain are a common occurrence. MRI helps us to narrow the differential diagnosis or to come to a specific diagnosis.

Aims and Objectives:

1. To study the characteristic imaging findings
2. To establish a differential diagnosis
3. To differentiate neoplastic from non-neoplastic brain

Materials and Methods:

50 patients of space occupying lesions of brain were examined using MRI (in some cases, MRS) and they were further evaluated by histopathology or correlated with CT.

Observations:

The space occupying lesions were divided into 4 main groups, namely congenital, infectious, tumors and vascular lesions. Congenital lesions were subdivided into arachnoid cyst, Subependymal giant astrocytoma and mega cisterna magna. The infectious lesions mainly consisted of tuberculoma, neurocysticercosis and abscess. Tumoral lesions were subdivided into choroid plexus papilloma, meningioma, astrocytoma, ependymoma, lymphoma, etc. The vascular lesions comprised of hemorrhages of various ages.

Conclusions:

MRI with contrast should be the investigation of choice for the evaluation of space occupying intracranial lesions.

Keywords: MRI, lesions of brain, Congenital lesions, intracranial lesions.

Introduction

The term intracranial space occupying lesion is generally used to identify any lesion inside the cranial cavity, which increases the volume of intracranial contents and leads to a rise in the intracranial pressure.[1]

It includes any neoplasm, benign or malignant, primary or secondary, as well as any acute or chronic inflammatory lesion, a parasitic mass lying within the cranial cavity, any hematomas, different types of cysts and vascular malformations.[2]

Different authors have reported that majority of patients of intracranial space occupying lesions had neoplasms followed by infective and traumatic etiology. Gliomas are more common followed by meningiomas, abscesses, pituitary tumors and tuberculoma. Pediatric brain tumors are most commonly located in the infratentorial region as compared to the supratentorial region, whereas in the adult population the supratentorial region is a commoner location. [3, 4, 5, 6]

Classification of intracranial space occupying lesions on basis of etiology:

I. Congenital:Dermoid, Epidermoid, Teratoma

II. Traumatic: Subdural and Extradural haematoma

III. Inflammatory: Abscess, Tuberculoma, Syphilitic gumma, Fungal granuloma

IV. Parasitic: Cysticercosis, Hydatid cyst, Amebic abscess, Schistosomajaponicum

V. Neoplasms:

a) Tumors arising from neuroepithelial structures:

I. Gliomas

1. Astrocytoma
2. Ependymoma
3. Oligodendroglioma
4. Choroid plexus tumors

II Nonglialtumors

1. Neuronal and mixed neuroglialtumors
- Ganglioglioma
- Gangliocytoma
- Central neurocytoma

2. Pineal tumors

3. Embryonaltumors- medulloblastoma

b) Tumors arising from meninges:
1. Meningioma
2. Melanocytic tumour
3. Hemangioblastoma

c) Tumors of cranial nerves:

1. Schwannoma
2. Neurofibroma
3. Malignant peripheral nerve sheath tumors

d) Tumors of hematopoietic origin:

1. Lymphomas
2. Granulocytic sarcoma

e) Pituitary lesions:

1. Pituitary adenoma
2. Craniopharyngioma

f) Germ cell tumors:

1. Germinoma
2. Teratoma

g) Secondary neoplasms.[8]

The Introduction of MRI has created many important advances in the detection and characterization of brain lesions and is considered to be the state of the art technology in the evaluation of the brain. The detection rate of most types of brain lesions by MRI exceeds 90%, compared to 77% for CT, that too without the invasiveness or risk of iodinated intravenous contrast agents or the inherent problem of the

radiation effect of x-rays. These safety features make MRI especially advantageous for the pediatric and elderly populations.[9]

In the last decade, the development and application of various advanced MRI techniques have increased such as diffusion weighted MRI (DWI), diffusion tensor MRI (DTI) and FiberTractography, perfusion and permeability MRI and proton MR spectroscopy (MRS)[10]. Diffusion is defined as the process of random molecular thermal motion occurring at a microscopic scale. The apparent diffusion coefficient (ADC) is a value that describes microscopic water diffusibility in the presence of factors that restrict diffusion within tissues.[11]

Aims and Objectives

1. To study the characteristic imaging findings of various space occupying lesions of brain on MRI.
2. To establish a differential diagnosis of the various space occupying lesions on MRI.
3. To differentiate neoplastic from non-neoplastic brain lesions using MR imaging techniques.

Materials and Methods

This was a single blind cross sectional study conducted in the Department of Radio diagnosis, GMC, Amritsar. The study was conducted after approval from institutional thesis and ethical committee.

The main source of data for the study is patients referred to MRI CENTRE, from different departments of Guru Nanak Dev Hospital, Amritsar. In all cases written informed consent was taken from patients or his/ her attendant before entering the study. All patients referred to the MRI CENTRE of Department of Radio diagnosis with clinical history or CT findings suggestive of intracranial space occupying lesions in a period of 3 years from June 2015 to June 2018 will be subjected for the study. 50 cases were selected from randomly referred patients to MRI centre of Guru Nanak Dev Hospital, Amritsar. Appropriate MRI sequences and multiplanar imaging was performed for every patient.

Inclusion Criteria:

- Cases of all age groups irrespective of sex.
- Patients with clinical suspicion of intra cranial space occupying lesions
- Incidental finding of intra cranial space occupying lesions.

Exclusion Criteria:

- The study will exclude patients having history of claustrophobia.
- Patients having metallic implants insertion, cardiac pacemakers and metallic foreign body in situ.
- The research team won't exert any pressure on the study participants.
- Cases where scanning is not possible due to poor general conditions and where MRI is contraindicated.

Examination technique and scanning protocols:

Imaging was done with SIEMENS MAGNETOM AERA 1.5 TESLA machine using head coils. The following sequences were selected as required:

- Localizer sequence conventional spin echo.
- Sagittal and axial T1W, T2W FSE
- Axial and sagittal T1W and FLAIR images
- Axial, sagittal and coronal T2W STIR images
- DWI and ADC map

Optional sequences:

- Intravenous contrast study (gadolinium)
- MR Spectroscopy

were included in the study as and when required.

Patients were informed about the procedures and written informed consent was taken according to the proforma attached. The patients' detailed case history was recorded and MRI examination was carried out.

According to the MRI findings, the cases were divided into 4 groups:

1. Congenital,
2. Infective,
3. Tumors and tumor like lesions and
4. Vascular

Routine investigations, laboratory investigations, ultrasonography and CT would be done as and when required.

Observations

The cases were divided into 4 groups, according to the aetiology, as follows:

1. Congenital
2. Infectious
3. Tumours and tumour like lesion
4. Vascular

TABLE I
CLASSIFICATION OF LESIONS (n=50)

TYPE	LESION	NO. OF PATIENTS (n)	PERCENTAGE (%)
CONGENITAL	ARACHNOID CYST	02	04
	SUBEPENDYMAL GIANT ASTROCYTOMA	01	02
	MEGA CISTERNA MAGNA	01	02
INFCTIOUS	TUBERCULOMA	06	12
	NEUROCYSTCERCOSIS	10	20
	ABSCESS	02	04
TUMORS AND TUMOR LIKE LESIONS	CHOROID PLEXUS PAPPILOMA	01	02
	MENINGIOMA	04	08
	ASTROCYTOMA	06	12
	OLIGODENDROGLIOMA	01	02
	LYMPHOMA	01	02
	EPENDYMOMA	01	02
	SELLAR TUMORS	02	04
	METASTASIS	04	08
	COLLOID CYST	01	02
VASCULAR LESIONS	HEMORRHAGES	07	14
TOTAL		50	100

TABLE II

MRI CHARACTERISTICS OF CONGENITAL LESIONS (n=04)

MRI FEATURES		ARACHNOID CYST (n=02)	SUBEPENDYMAL GIANT ASTROCYTOMA (n=01)	MEGA CISTERNA MAGNA (n=01)
LOCATION	SUPRATENTORIAL	02	01	-
	INFRATENTORIAL	-	-	01
T1W	ISOINTENSE	-	01	-
	HYPOINTENSE	02	-	01
	HYPERINTENSE	-	-	-
T2W	ISOINTENSE	-	-	-
	HYPOINTENSE	-	-	-
	HYPERINTENSE	02	01	01
FLAIR	HYPOINTENSE	02	-	01
	HYPERINTENSE	-	01	01
DWI	RESTRICTION	-	-	-
	NO RESTRICTION	02	01	01
SWI	BLOOMING	-	-	-
	NO BLOOMING	02	01	01
POST CONTRAST T1W	ENHANCEMENT	-	01	-
	NO ENHANCEMENT	02	-	01

Arachnoid cyst: They presented as well defined extra axial masses of fluid intensity compressing the brain parenchyma and causing buckling of gray white matter junction. They were hypointense on T1W, hyperintense on T2W and showed suppression of fluid intensity on FLAIR images. They did not communicate with other CSF spaces.

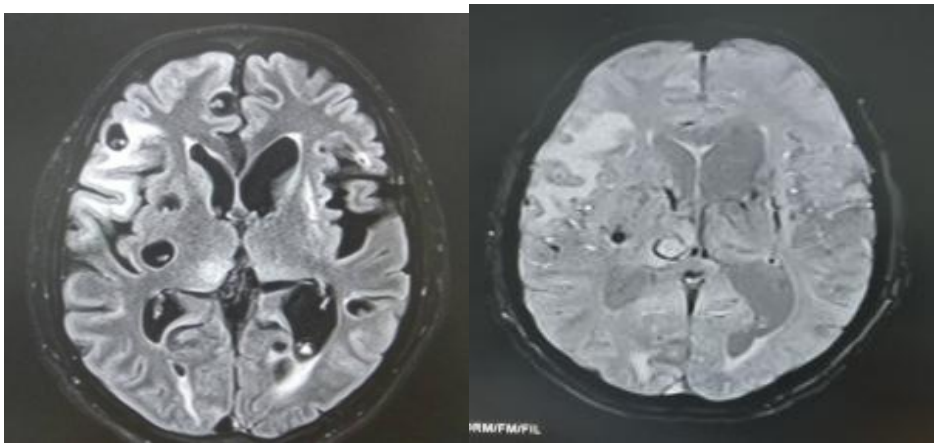
Subependymal Giant Cell Astrocytoma: A 10 days old male infant presented with seizures having stigmata of tuberous sclerosis like adenoma sebaceum and cardiac rhabdomyomas underwent MRI scan, which showed the presence of well-defined T1W hypointense and T2W and FLAIR hyperintense bilateral masses near the foramen of Monro in the third ventricle and small round masses along the lateral margins of third ventricle showing the same signal intensities. Solid homogenous contrast enhancement was noted in these masses.

Mega Cisterna Magna: A male child presented with seizures and altered sensorium showed the presence of a well-defined fluid intensity mass lesion in the posterior fossa, which was hypointense on T1W, hyperintense on T2W images and showed suppression of fluid intensity on FLAIR images. The mass showed communication with the fourth ventricle by an opening in the vermis part of cerebllum as well as evidence of hypoplasia of the cerebellar vermis. Scalloping of the occipital bone was associated.

TABLE III
MRI CHARACTERISTICS OF INFECTIVE LESIONS (n=18)

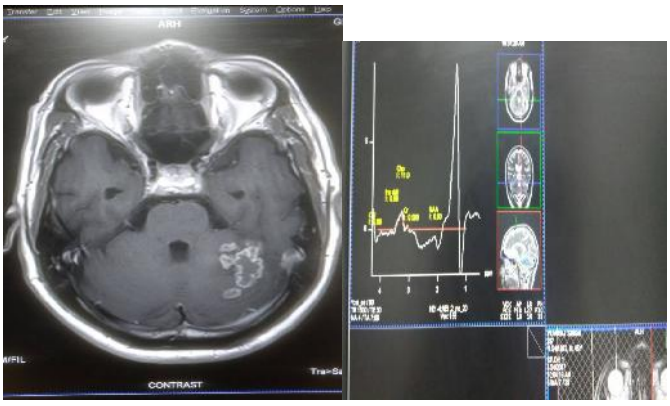
MRI FEATURES		TUBERCULOMA (n=06)	NEURO-CYSTICERCOSIS (n=10)	ABSCESS (n=02)
LOCATION	SUPRATENTORIAL	04	07	02
	INFRATENTORIAL	01	02	-
	BOTH	01	01	-
MULTIPLICITY	SINGLE	-	03	02
	MULTIPLE	06	07	-
T1W	ISOINTENSE	05	05	01
	HYPOINTENSE	01	05	01
	HYPERINTENSE	-	-	-
T2W	ISOINTENSE	-	-	-
	HYPOINTENSE	05	01	-
	HYPERINTENSE	01	09	02
FLAIR	HYPOINTENSE	05	01	02
	HYPERINTENSE	01	09	-
DWI	RESTRICTION	-	-	02
	NO RESTRICTION	06	10	-
SWI	BLOOMING	-	02	-
	NO BLOOMING	06	08	02
POST CONTRAST T1W	ENHANCEMENT	06	08	02
	NO ENHANCEMENT	-	02	-

Neurocysticercosis: 3 patients presented with single lesions whereas 7 patients had multiple lesions. Scolex was identified in 6 cases as a small solid nodule in the cystic lesions. On contrast administration, 8 cases (80%) showed enhancement which was of peripheral ring enhancing type in all of them, with surrounding perilesionaledema, suggestive of active lesions.MRS shows choline peak in 6 cases along with reduced NAA in 4 of them. Reduction in levels of all metabolites were seen in 2 cases and the 2 calcified lesions showed no significant MRS findings.Gradient echo imaging played a significant role in identifying calcified lesions which were seen in 2 cases (25%). All the lesions were hypo to isointense on T1W images and 9 were hyperintense on T2W. Out of these 10 lesions, 1 lesion showed inversion on FLAIR suggesting that its contents are similar to that of CSF.



On MRI, multiple ring enhancing cystic lesions were seen with small nodule in them on FLAIR(a). Few of them showed perilesionaledema s/o acute lesions. On SWI, few foci of blooming were seen s/o chronic calcified lesions(b). thus s/o NCC lesions in different stage

Tuberculoma: All of them showed multiple lesions in the form of conglomerate formation in some of them. Out of the 6 cases studied, 5 of them were isointense on T1W, hypointense on T2W and FLAIR and 1 case was hypointense on T1W and hyperintense on T2W and FLAIR. On T1W images they showiso to hyperintense ring which was seen in 4 cases in our study, which showed irregular ring like enhancement on contrast study.Significant amount of perilesionaledema was seen surrounding all of these lesions with evidence of mass effect.MRS showed a lipid peak in 5 cases (83.33%) cases and it plays an important role in identification of tuberculomas from other infective granulomas. Lipid lactate peak was seen in 2 cases. The stage of the tuberculoma whether it is caseous or non caseous can also be identified on MRI with the help of T2W images with caseous lesions giving fluid intensity as seen in 1 of our cases.

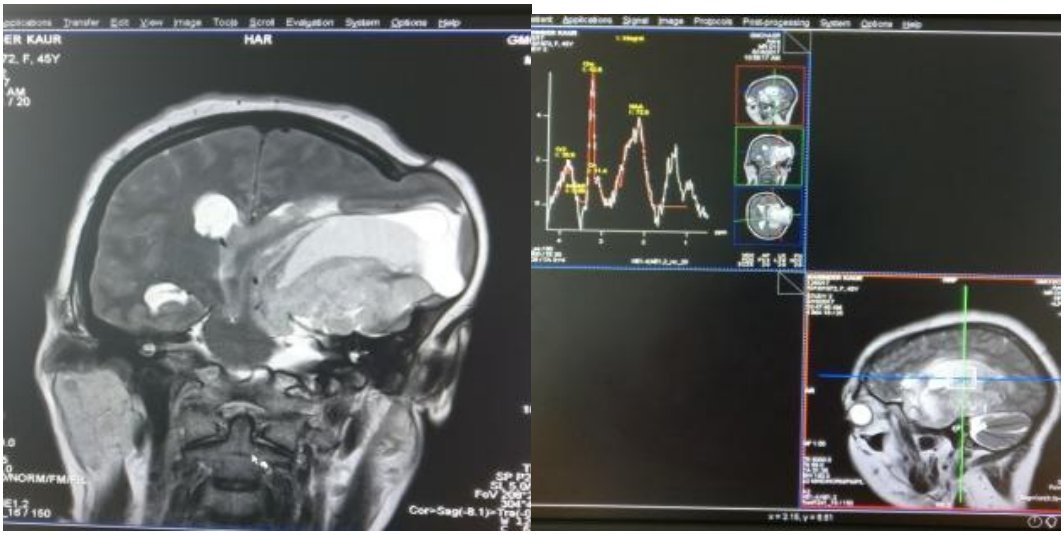


On MRI, multiple conglomerate like lesions were seen with hyperintense rims which enhanced peripherally on contrast study and showed perilesionaledema .On MRS, NAA was reduced a high lipid peak was observed (b), s/o tuberculous lesions

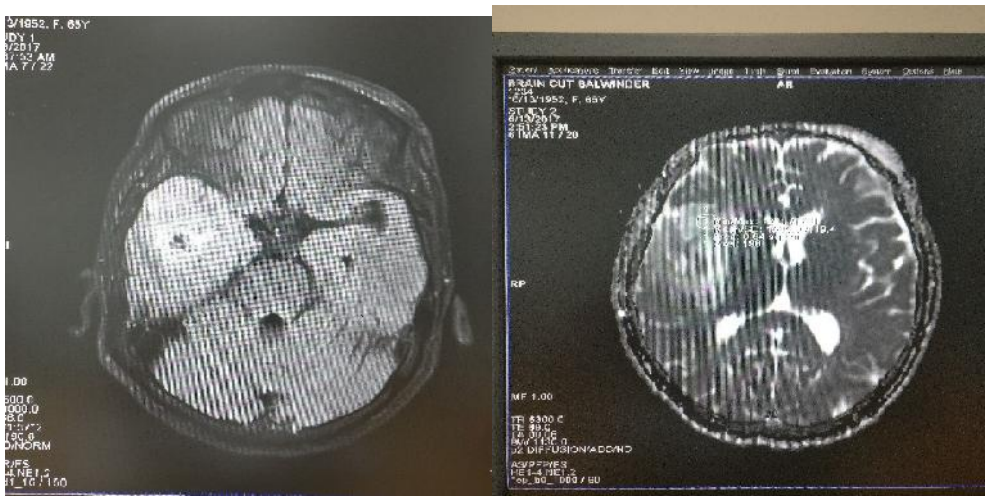
Abscess: Out of the 18 patients, abscess were found in 2 patients. Both of them were solitary and showed sizes more than 3 cm. All were iso to hypointense on T1W images with a thick irregular hyperintense rim and were hyperintense on T2W images with a surrounding hypointense rim. They showed complete diffusion restriction on DWI. MRS showed lactate peak in both cases suggesting anaerobic glycolysis with amino acids like glutamine seen in 1 case.

TABLE IV
MRI CHARACTERISTICS OF TUMORS AND TUMOUR LIKE LESIONS (n=21)

MRI FEATURES		CHORID PLEXUS PAPPILOMA (n=01)	MENINGIOMA (n=04)	ASTROCYTOMAS (n=06)	OLIGODENDROGLIOMA (n=1)	LYMPHOMA (n=01)	EPENDYMOMA (n=01)	SELLAR TUMOURS (n=02)	METS (n=04)	COLLOID CYST (n=01)
LOCATION	SUPRATENTORIAL	01	04	04	01	01	-	02	03	01
	INFRATENTORIAL	-	-	02	-	-	01		01	-
MULTIPLICITY	SINGLE	01	04	06	01	01	01	02	03	01
	MULTIPLE	-	-	-		-	-		01	-
T1W	ISO	01	01	01	01	-	-	01	02	01
	HYPO	-	03	05		01	01	01	02	-
	HYPER	-	-			-	-			-
T2W	ISO	-	01	-		-	-			-
	HYPO	-	01	-		-	-			-
	HYPER	01	02	06	01	01	01	02	04	01
FLAIR	HYPO	-	01	01		-	-			01
	HYPER	01	03	05	01	01	01	02	04	-
DWI	RESTRICTION	-	-	02		01	-			-
	NO RESTRICTION	01	03	04	01	-	01	02	04	01
SWI	BLOOMING	-	02	01	01	-	-	01	01	-
	NO BLOMING	01	02	05		01	01	01	03	01
POST CONTRAST T1W	ENHANCEMENT	01	04	05		01	01	02	04	-
	NO ENHANCEMENT	-	-	01	01	-	-			01



GBM- A midline crossing mass with heterogeneous appearance on both T1 and T2 was noted(a) with significant surrounding edema and mass effect. The mass was more than 4cm in size and was causing calvarialerosion.on contrast study, heterogenous enhancement was seen. On MRS, lactate peak was seen indicating the anaerobic glycolysis. Choline peak was also seen with reduced NAA(b).Restriction was seen on DWI with lowered ADC values s/o high cellularity.



OLIGODENDROGLIOMA- An ill-defined mas lesion is seen in the right temporal lobe, heterogeneous in appearance with hypointense signal on T1 and hyperintense on T2 and FLAIR (a,c) with areas of calcification seen as clusters of blooming artifact on SWI(b). No significant edema or mass effect is noted.On DWI, no restriction with high ADC values were observed suggestive of low grade tumour (d).

Astrocytomas: In our study there were 6 cases of astrocytomas which represents 66% of gliomas, out of which 3 cases were low-grade astrocytomas, 3 were high-grade including 1 GBM.

Low grade astrocytomas: On MRI, all cases were relatively well defined, and 2 of them showed nodule within cyst appearance. 2 cases were hypointense and 1 was isointense on T1W and all were hyperintense on T2W. On FLAIR, hyperintensitiy was seen in 2 of them while 1 showed hypointense signal in its cystic part. They were less than 4 cm in size with very little surrounding edema and mass effect. Both cases of pilocytic astrocytoma were located infratentorially in the cerebellum. Only 1 case had intratumoral calcification on SWI.

On post-contrast studies, 1 case of low grade astrocytoma was non-enhancing and others demonstrated mild homogenous enhancement. None of the cases had areas of hemorrhage. On DWI, the low grade astrocytomas showed normal to high ADC values with no restriction. On MRS, choline peak with reduced levels of NAA was seen in all 3 cases suggestive of tumoraletiology.

High grade astrocytomas: On MRI, they were mostly ill defined heterogenous lesions with significant perilesionaledema and mass effect, 1 of them also causing calvarial destruction. All 3 tumours were hypointense on T1W and hyperintense on T2W and FLAIR. On post contrast study, all 3 cases showed solid heterogenous enhancement with mild enhancement of the surrounding areas as well.2 out of 3 (66.66%) of high grade tumours including the GBM showed restricted diffusion with lowered ADC values signifying restricted molecular movement due to high tumour cellularity.On MRS, choline peak was seen in all 3 cases and 2 cases show lactate peak indicating the anaerobic glycolysis in the tumour due to high cellularity and necrosis.

Oligodendroglioma: The lesion was in the right temporal lobe, heterogeneous in appearance with hypointense signal on T1W and hyperintense on T2W and FLAIR, with areas of calcification seen as clusters of blooming artifact on SWI. No significant edema or mass effect is noted, as the lesion only causes slight gyral expansion with effacement of sulcal spaces. On CT scan, this mass appeared hypodense with significant areas of calcification and mild patchy contrast enhancement. On DWI, no restriction with high ADC values were observed suggestive of low grade tumour. On MRS, a choline peak was noted with reduced levels of NAA.

Ependymoma: The tumour was infratentorial, located in the fourth ventricle in relation to its right lateral wall and its floor with irregular shape.The tumour was hypointense on T1W and hyperintense on T2W and FLAIR, showing mild heterogenous enhancement on contrast and shows areas of calcification with no evidence of hemorrhage. On DWI, no restriction was seen. Mild hydrocephalus was noted in the form of dilatation of lateral and third ventricles.

Choroid plexus papilloma: 1 case of choroid plexus tumour was seen in a 12 year old female child presenting with seizures and headache. It was located in within the right occipital horn of lateral ventricle adhering to its walls, centered on the choroid plexus. It appeared as a well-defined, rounded, solitary lesion with linear branching flow voids traversing it secondary to its high vascularity. It showed intense homogenous enhancement on contrast administration. It appeared isointense on T1W and hyperintense on T2W with no restriction on DWI. No areas of calcification were seen within it.

Meningiomas: Various locations of meningiomas were sellar region, sphenoid wing tentorium and temporal lobe. All patients had only solitary lesions.In this study, 75% of cases were hypointense on T1W and 25% were isointense. On T2W, variable findings were observed with 50% cases showing hyperintensity. Calcification was seen as areas of low signal intensity in all sequences, and confirmed on SWI as blooming in 50% of cases. On contrast administration, solid homogenous type of enhancement was demonstrated in all our cases.A small extension of the mass into the adjacent dura called the ‘dural tail’ was seen in 50% of cases with a broad base of the mass towards the dural surface. Additional features, such as hyperostosis of adjacent calvaria was seen in 50% cases.On MRS, 2 out of 4 lesions showed reduced NAA and 2 showed no significant findings.

Lymphoma: 1 case of lymphoma was included in this study. A 56 year old HIV patient presenting with HIV encephalopathy. The tumour was seen in the right frontal lobe in periventricular white matter. Case demonstrated dense and homogeneous contrast enhancement. In our study, the mass was hypointense on T1W and hyperintense on T2W with mass effect. It was hyperintense on FLAIR and showed some restriction on DWI with lowered ADC values suggestive of decreased molecular movement which is a characteristic of high grade tumours

with high cellularity. On MRS study, a choline peak was observed with reduced NAA.

Sellar tumours: In this study, 3 cases of sellar lesions (6%) were evaluated by MRI, out of which 1 was a pituitary macroadenoma and 1 case of was a craniopharyngioma .

Pituitary adenoma was seen in a 36 year old male patient who presented with visual disturbance. On MRI it was hypointense on T1W and hyperintense on T2W and had the characteristic 'snowman' appearance, protruding out of the sella and causing local bone remodelling in the form of enlarge sella, with evidence of slight infundibular stalk. No areas of necrosis or haemorrhage was seen. On post contrast study, adenoma showed solid homogenous enhancement.

Craniopharyngioma was seen in a 10 year old female child who presented with headache and visual problems. On MRI, it appears as partly cystic with a solid component in the sellar region, with few areas of calcifications seen as hypointensities on SWI. Cystic component appears hyperintense on T2W and FLAIR images while the solid areas were heterogeneously isointense to hypointense.

On T1W, both components showed isointensity. On contrast study, peripheral enhancement was seen in the solid parts of the lesion.

Colloid cyst: 1 case of colloid cyst was evaluated in a 21 year old female, which was located at foramen of Monro in the third ventricle. It appeared well defined cystic lesion, spherical in shape with central hyperintensity and peripheral hypointense signal on T1W and central hypointensity and peripheral hyperintense signal on T2W with the signal getting attenuated on FLAIR sequences suggestive of its fluid content. It was associated with dilatation of the lateral ventricles due to obstructive hydrocephalus.

Metastasis: Out of the 18 tumorous lesions studied, 4 cases of brain metastasis was observed (22.22%), with known primaries under treatment. 75% of cases were seen in the elderly aged 60 years above. The male: female ratio was 3:1. Supratentorial location was seen in 75% lesions with only 1 case showing infratentorial location (25%) in the cerebellum. Most cases had multiple lesions (75%). 50% of the cases had lesions with a predilection for the grey- white matter junction. Perilesionaledema was seen in 3 cases but no significant mass effect was seen.On MRI, these lesions were mostly ill defined and varied in sizes all of them being less than 4 cm. On T1W, 2 of them were isointense and 2 were hypointense, all lesions were hyperintense on T2W and FLAIR. On SWI, patchy areas of blooming was seen in 1 of the lesions suggestive of hemorrhage. On contrast study, all cases show avid enhancement with solid heterogenous pattern seen in 75% cases and 25% showing irregular peripheral enhancement. On DWI, metastases demonstrated facilitated diffusion in the form of elevated ADC values. On MRS, 2 cases showed lipid peaks, and 2 had choline peaks , all cases showed reduced NAA suggestive of loss neurons in the region. All cases had a choline/ NAA ratio of more than 1. MRS findings in the immediate surrounding areas were comparatively normal with NAA peaks seen in them.

TABLE V
MRI CHARACTERISTICS OF VASCULAR LESIONS

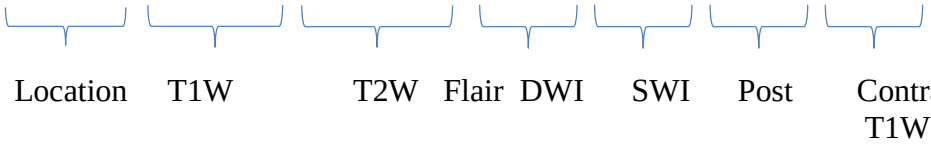
MRI FEATURES		HYPERACUTE HEMORRHAGE (n=02)	ACUTE HEMORRHAGE (n=04)	SUBACUTE HEMORRHAGE (n=01)
LOCATION	SUPRATENTORIAL	-	04	01
	INFRATENTORIAL	02	-	-
T1W	ISOINTENSE	02	04	-
	HYPOINTENSE	-	-	-
	HYPERINTENSE	-	-	01
T2W	ISOINTENSE	-	-	-
	HYPOINTENSE	-	04	01
	HYPERINTENSE	02	-	-
FLAIR	HYPOINTENSE	-	04	01
	HYPERINTENSE	02	-	-
DWI	RESTRICTION	02	04	-
	NO RESTRICTION	-	-	01
SWI	BLOOMING	02	04	01
	NO BLOOMING	-	-	-
POST CONTRAST T1W	ENHANCEMENT	-	-	-
	NO ENHANCEMENT	02	04	01

There were total 7 cases of vascular lesions, all of them were hemorrhages, with varying size, shape and ages. The age range varied from 35 to 82 years. 6 patients were males and only 1 patient was a female. These lesions were more common in the supratentorial region. All of them showed blooming on SWI images, however, diffusion restriction was found in 6 cases (hyperacute and acute hemorrhages) and no diffusion restriction was noted in subacutehemorrhage. The patients having hyperacutehemorrhage showed isointensity on T1W images and hyperintensity on T2W images. The patients who had acute hemorrahages showed isointenisty on T1W images and hypointenisty on T2W images. The patient with subacutehemorrhage showed hyperintenisty on T1W images and hypointensity on T2W images

Summary and Conclusion

1. In our study, gliomas were found in 18% cases, 9 cases of gliomas were reported out of 21 tumours lesions (42%), out of which 7 were supratentorial and 2 were infratentorial. The age of the patients ranged from 2nd to 6th decade with maximum incidence in fifth decade; out of 7 of them 5 were males and 2 of them were females.

2. 6 cases of astrocytomas were seen which represent 66% of gliomas, out of which 3 cases were low-grade astrocytomas, 3 were high-grade including 1 GBM.Low grade pilocyticastrocytomas mostly gave cyst with nodule apearance, with mild or no contrast enhancement and with no restriction on DWI. The high grade astrocytomas were hypointense on T1W and hyperintense on T2W and FLAIR, showed solid heterogenous contrast enhancement and 2 out of 3 of them showed restricted diffusion with lowered ADC values.



3. The incidence of meningiomas was 8%, and accounts for 19% of tumorous lesions in the study. 3 out of 4 cases were seen in females, mean age being 40. Various locations of meningiomas were sellar region, sphenoid wing tentorium and temporal lobe. Solid enhancement with dural tail and broad dural base were also seen in them.

4. 3 cases of sellar lesions (6%) were noted, out of which 1 was a pituitary macroadenoma and 1 case of was a craniopharyngioma.

Pituitary adenoma, was hypointense on T1W,hyperintense on T2W with significant enhancement and had the characteristic 'snowman' appearance, protruding out of the sella.

Craniopharyngioma was partly cystic with a solid component, with few areas of calcifications seen on SWI. Cystic component appears hyperintense on T2W and FLAIR images while the solid areas were isointense to hypointense.On contrast study, peripheral enhancement was seen.

5. 4 cases of brain metastasis was observed (22.22%).75% of them were aged 60 above with male :female ratio of about 3:1. Supratentorial location seen in 75% lesions. 50% of the cases had lesions with a predilection for the grey- white matter junction. On DWI, elevated ADC values were seen, with comparatively normal values in surrounding areas, thus distinguishing it from high-grade gliomas. On MRS, all cases had a choline/NAA ratio of more than 1. MRS findings in the immediate surrounding areas were comparatively normal.this differentiates them from primary lesions.

6. Out of the 50 patients who were evaluated, infective lesions were seen in 18 cases, out of which NCC was the most prevalent (55.55%), followed bytuberculomas(33.33%)and pyogenic abscess was the least common with 11.11% incidence. The age of the patients varied from 9 years to 61 years. With 4th decade being the commonest, seen in 22.22% cases.

7. NCC appeared as multiple cystic lesions of variable sizes with well-defined walls and scolexwasidentifiedin6cases as a small solid nodule in the cystic lesions. On contrast, 8 cases (80%) showed enhancement which was of peripheral ring enhancing type in all of them, with surrounding perilesional edema, suggestive of active lesions.

8. Outof18 cases of infective lesions evaluated, 6 weretuberculomas (33.33%).They presented as multiple lesions with conglomerate formation in most of them. Most common age group affected was 20-30 years with 50% prevalence. Male: female ratio was 2:1. Most of the lesions were supratentorial 66.66%, with parietal lobe involvement in 50% cases.

9. 7 cases of hemorrhages, with varying size, shape and ages were seen. The age range varied from 35 to 82 years, commonly in supratentorial region. The most common location was basal ganglia region. Most common lesions were acute haemorrhages. All of them showed blooming on SWI images, however, diffusion restriction was found in 6 cases (hyperacute and acute haemorrhages) and no diffusion restriction was noted in subacutehaemorrhage. The patients having hyperacutehaemorrhage showed isointensity on T1W images and hyperintensity on T2W images. Acute haemorrhages showed isointenisty on T1W images and hypointenisty on T2W images and subacute stage showed hyperintenisty on T1W images and hypointensity on T2W images.

Thus, concluding that conventional MRI, armed with DWI, SWI, MR spectroscopy and post-gadolinium contrast studies is the best modality for evaluation and characterization of space occupying lesions of brain.

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