

ORIGINAL ARTICLE

A STUDY ON ROLE OF MAGNETIC RESONANCE IMAGING (MRI) IN INTRACRANIAL SPACE OCCUPYING LESIONS

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ABSTRACT

Background: The high morbidity and mortality associated with Intracranial Space Occupying Lesions necessitates their early diagnosis so as to plan the intervention that is required. In the present study cases of either clinically suspected brain space occupying lesions or already diagnosed cases of brain space occupying lesions were studied by cross sectional imaging of MRI.

Methodology: The present cross-sectional study was conducted presented with symptoms of raised ICT of sub acute onset & had lateralizing sign. A semi-structured questionnaire was prepared and demographic and clinical data like age, sex, symptoms and various morphological characters of Supratentorial SOLs were studied. A clinico-radiological correlation and confirmation of Radiological diagnosis was done by biopsy/surgery/MRI whenever possible to minimize patient follow up.

Results: Majority of the patients were in the fourth decade (28.5%). Metastases were the most common single group of intracranial space occupying lesion (27%), Gliomas were the most common brain tumors (31.4%). Of the Gliomas, astrocytomas accounted for (81.8%). Most common hemisphere to be involved was the parietal lobe (31.4%). Intra-axial involvement (78.58 %) was most common localization in present study. Edema was the most common associated MRI finding (74.3%).

Conclusion: The diagnostic accuracy of MRI in evaluation of intracranial space occupying lesion was 98.57 %. MRI remains the first line investigation for diagnosing and evaluation Intracranial space occupying lesion with a reasonable degree of diagnostic accuracy and with the advent of newer modifications of MRI such as MR Spectroscopy, 3-Tesla MRI, and newer techniques like MR Perfusion.

Keywords: MRI, Intracranial space occupying lesion, tumour

INTRODUCTION

Intracranial space occupying lesions comprise of a diverse group of lesions. The high morbidity and mortality associated with them necessitates their early diagnosis so as to plan the intervention that is required.¹ With the introduction of CT & MRI scanning, imaging of intracranial space occupying lesion has acquired a new dimension whereby excellent anatomical detail in axial, sagittal & coronal planes as well as tumoral tissue characterization has become possible. The advent of MR Angiography has helped to create a virtual 3- dimensional vascular map of tumoral blood supply noninva-

sively. These modalities have helped in the early diagnosis & localization of the SOL & in complement to advanced neurosurgical techniques, have brightened the prognosis of mass lesions.²

Coupled with MR angiography, these modalities can give the neurosurgeon a virtual roadmap by which he can decide the feasibility and approach to surgery.³ CT is less expensive modality. It is readily available, better for acute bleed, better to know calcification or bone destruction.¹

Advantages of MRI over CT are L: to know exact nature of lesion, to know whether diffuse or focal, to know residual tumor or recurrence, to locate

multiple lesions, relation to spine or extent to spine, to exactly differentiated doubtful CT tumors. MRI is also useful by virtue of multiplanar imaging & MR angiography.⁴

The term space occupying lesions of brain is conveniently applied to localized intracranial lesions whether of neoplastic, vascular or chronic/ acute inflammatory origin, which by virtue of occupying space within the skull tends to cause raised intracranial tension. As it has a capacity to accommodate a fixed amount of tissue, anything extra within it will produce symptoms of raised intra cranial tension. In the present study cases of either clinically suspected brain space occupying lesions or already diagnosed cases of brain space occupying lesions were studied by cross sectional imaging of MRI.

MATERIALS AND METHODS

The present cross-sectional study was conducted on 70 cases with intracranial space occupying lesion. The study was conducted during the period July 2008 to September 2010. We included all the cases which presented with symptoms of raised ICT of sub acute onset & had lateralizing sign. The cases were investigated by imaging to determine the relative frequency of various mass lesions. The cases who are acutely ill with raised ICT & fever and who were suspected of having intracranial abscess were also studied. The patient with nasopharyngeal carcinoma & neoplasm near the brain which are suspected to invade the brain were also studied. Few of the patients had symptoms or signs pertaining to the posterior fossa lesions.

The imaging was performed on MAGNETOM Essenza 1.5 Tesla MRI Scanner from SIEMENS at Aatma Jyoti MRI Centre, New Civil Hospital, Surat. The MRI centre is of public-private partnership type. MRI scans were taken in an axial plane with a 15 degree angulation of the gantry to the canthometal line, after selecting proper FOV (Field Of View) & localizer. Slices were taken without overlapping cuts. Slice thickness varied from 3 mm to 5 mm, according to lesion. Coronal & sagittal sections were also taken in all cases to determine the anatomical location and lesion extent.

Routine MRI brain sequences included FSE (Fast Spin Echo) T1 weighted images T2 weighted images, FLAIR, GRE & CISS. MR angiography, MR spectroscopy, MR angiography & MR venography were performed on requirement bases. Injection Dexamethasone 2 mg IV and Diazepam 0.3 mg/kg was given in children and uncooperative

patients respectively by attending clinicians. Plain & contrast studies were performed in all patients, 10 cc of injection Gadopentate Dimeglumine was given for contrast enhancement on T1WI. The imaging characteristics were recorded in all patients. The management decision, outcome and follow-up whenever possible was recorded in each case. Imaging findings were correlated with histopathological diagnosis and also with surgical findings whenever surgery was done.

A semi-structured questionnaire was prepared and demographic and clinical data like age, sex were noted. Symptoms and various morphological characters of Supratentorial SOLs were studied. A clinical-radiological correlation and confirmation of Radiological diagnosis was done by biopsy/surgery/MRI whenever possible to minimize patient follow up.

RESULTS

A total of 70 cases were included in the study during the stipulated time frame. Male to female ratio in present study was 1.7: 1. Most predominant age of involvement was the fourth decade 28.5 % patients, followed by fifth 18.5 %.

Table 1: Age and gender-wise distribution of cases

Age group (years)	Frequency (%)
0-10	6 (8.5)
21-30	12 (17.2)
31-40	20 (28.5)
41-50	13 (18.5)
51-60	11 (15.7)
61-70	5 (7.1)
>70	1 (1.4)
Gender	
Male	44 (62.9)
Female	26 (37.2)

Table 2: Clinical presentation of cases

Presentation	Frequency (%)
Headache	36 (51.42)
Seizures	23 (32.85)
Altered mentation	16 (22.85)
Focal neurological deficit	11 (15.71)
Visual disturbances	3 (4.34)
Speech disturbances	3 (4.34)
Smell disturbances	3 (4.34)
Symptoms of raised ICT	6 (8.57)
Others	21 (30)

In present study, Headache was the most frequent symptom (51.42%) followed by Seizures (32.85%). However, visual, speech & smell disturbances were seen in 12.85 % and symptoms of raised intracranial tension in 8.57 %; other symptoms like anorexia, weight loss, ear discharge, and pyrexia were seen in 30 %. Symptoms/signs of raised intracranial tension included projectile vomiting, bulging anterior fontanalle & widely separated sutures in infants, bradycardia on clinical examination and papiloedema on fundoscopy in adults.

Parietal lobe was most commonly involved in 31.42 %, followed by multiple lobes/regions in 21.42 %. Intraventricular tumours were seen in 2.85 % cases.

Edema was the most common MRI finding, seen in 74.28 % cases, followed by mass effect in 48.57 %. Haemorrhage was seen in only 5.71 % cases.

Table 3: Hemispheric/regional involvement of Intracranial Space occupying lesion

Lobe/Region involved	Frequency (%)
Frontal lobe/Region	11 (15.71)
Temporal lobe/Region	9 (12.85)
Parietal lobe/Region	22 (31.42)
Occipital lobe/Region	4 (5.71)
Multiple lobes/Region	15 (21.42)
Midline	7 (10)
Intraventricular	2 (2.85)

Table 4: MRI findings of the cases

MRI Findings	Frequency (%)
Edema	52 (74.28)
Mass effect	34 (48.57)
Calcification	20 (28.57)
Necrosis	13 (18.57)
Haemorrhage	4 (5.71)
Hydrocephalus	8 (11.42)
Subfalcian herniation	18 (25.71)
Skull vault/ Sellar erosion	8 (11.42)

Table 5: Correlation of various MRI findings associated with Intracranial space occupying lesion

Space occupying lesion type	Edema	Mass effect	Calcification	Necrosis	Hemorrhage
Astrocytoma	17	11	2	5	0
Oligodendroglioma	3	1	3	0	0
Choroid plexus papilloma		1	1	0	0
Meningioma	4	2	1	1	0
Craniopharyngiomas	2	1	3	0	0
Pituitary macroadenomas	0	0	0	0	0
Tuberculoma	4	1	4	4	0
Metastases	17	9	4	0	4
Cyst	0	1	0	0	0
Arteriovenous malformation	1	1	2	0	0
Ependymoma	1	1	1	1	0
Medulloblastoma	1	1	0	0	0

Aggressive tumours like astrocytomas showed almost all of these findings in the majority of cases while lesser aggressive tumours like cyst were associated with these findings in a very few cases.

Edema was most commonly seen with astrocytomas and metastases while mass effect was most common with astrocytomas. Similarly calcification was commonly seen in Oligodendrogliomas, craniopharyngiomas & metastases. Necrosis was most common with astrocytomas and hemorrhage was only seen in metastases.

DISCUSSION

The maximum number of patient in the present study was in the 4th decade (28.5 %), followed by 5th decade (18.5 %), while in a similar study by B.

Shah et al⁵, maximum number of patient were in 1st decade (21 %) followed by 4th decade (18 %). Our results can be compared to the studies of Derek C. Harwood et al⁶, Donald Kirks⁷ and Anne G. Osborn¹. Correlation of age with tumors subtypes in our study was in accordance with the previously published data. Certain tumors like high grade Gliomas and metastasis involved predominantly the 5th and 6th decade. Others tumors like craniopharyngiomas, Oligodendrogliomas, meningiomas, abscesses etc. predominantly involved 2nd, 3rd, and 4th decade while choroid plexus papillomas, cysts etc. were more commonly found in first and second decades.

The sex ratio of the present study was found to be quite comparable with study conducted by B. Shah et al.⁵ Number of male patients were more in both

the studies. However, an important point to note that the meningiomas were the only tumors having a definite female preponderance in both the studies 1:3 ratio in the study by B. Shah et al⁵ and 1:5 M:F ratio in the present study. The sensitivity and specificity correlates well with study conducted by Hiller L. Baker et al.⁸

In the present study, edema was the most common MRI finding in 74.2% patients followed by mass effect in 48.5%. However B Shah et al⁵ found mass effect as most common MRI findings in 72% patients, while edema was found in 49% patients. The incidence of brain tumors with necrosis in the present study was found to be only 18.5% as compared to 33% by B. Shah et al.⁵ probable reason being the lesser number of aggressive lesions such as high grade Gliomas in the present study.

Edema, mass effect and necrosis were found more commonly in aggressive tumors like astrocytomas. There were less common with slow growing tumors like meningiomas, Oligodendrogliomas, craniopharyngiomas. Only 20% of cysts present with mass effect. No other MRI findings were evident, while in the study by B. Shah et al⁵ was evident in 50% cases of cysts. Here too, no other MRI findings were found in cysts. Calcification was found in 100% cases of Oligodendrogliomas both in present study and in the study by B. Shah et al.⁵ Craniopharyngiomas showed calcification in 100% cases in the present study and 80% in the study by B. Shah et al.⁵

Hemorrhage was seen in 7.95 % of astrocytomas by B.Shah et al⁵ in the present study none of the astrocytomas showed hemorrhage. In the present study, high grade Gliomas was the most common subtypes (51%), followed by low grade Gliomas (27 %). In the study by B.Shah et al⁵ low grade Gliomas were more common (54.5 %) followed by high grade Gliomas (27.3 %). Two cases of Ependymoma were detected in the present study, and

there was a single case of choroid plexus papilloma.

CONCLUSION

The diagnostic accuracy of MRI in evaluation of intracranial space occupying lesion was 98.57 %. Most common presenting symptom was headache. Edema was the most common associated MRI finding. The most common hemisphere to be involved was the parietal lobe. Metastases were the most common single group of intracranial space occupying lesion while among primary brain tumors, Gliomas were the most common. Of the Gliomas, astrocytomas was commonest.

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