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"Mri Evaluation of Primary Brain Tumors."

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Abstract
Introduction: *Intracranial tumors comprise of diverse group of lesions. The high morbidity and mortality associated with them necessitates their diagnosis so as to plan of management. MRI is crucial in making the diagnosis, determining the best course of management, monitoring response to therapy and increasingly in trying to predict prognosis.*
Aims and Objective: *To assess the contribution of multimodal MRI techniques and their diagnostic accuracy in brain tumors with histopathology as gold standard references. To estimate the concordance between the histopathological diagnosis and diagnosis provided by conventional MRI and multimodality MRI.*
Materials and Method: *Total of 50 patients who had attended the OPD or were admitted in Sir T Hospital and subsequently found brain tumor were included in study. The study was carried out at MRI centre in Sir T Hospital affiliated to Government Medical College, Bhavnagar.*
Result: *This Prospective study included 50 patients with suspected brain tumors. Their mean age was 45.7 years (SD+-19.2).Metastasis (n=13, 26%) and Glioblastoma multiforme (n=13 ,26%) were most commonly encountered diagnosis, followed by astrocytoma grade 1-3 (n=9,16%).Meningioma was in 3 patients. one patient had bilateral vestibular schwannoma. One had bilateral Schwannoma and multiple meningioma suggestive of Neurofibromatosis type 2. Other tumors were the final diagnosis in 7 patients (1 gliomatosis cerebri, 2 macroadenoma,1 dysembryoplastic neuroepithelial tumor,1 ependymoma, 1 hemangioblastoma, 1 pineal tumor).While tumor like lesions was final diagnosis in 3 lesions initially believed to be brain tumors on conventional MRI (1 Tuberculoma and 2 brain abscess).*
Conclusion: *MR imaging is ideal modality for evaluation of intracranial lesions as it provides excellent anatomic details as well as delineate pathological lesions discreetly. Combining with DWI and MRS with conventional MR imaging increases the diagnostic accuracy of MRI in the evaluation of brain tumors and tumors like lesions. In some tumors , this benefit might preclude brain biopsy , which is invasive procedure that would otherwise be required to establish the final diagnosis. It might also avoid delay in initiating tumor therapy. Although expensive and time consuming, multimodality MRI examination should wherever available, be performed in the work up of brain tumors.*

I. Introduction

Intracranial tumors comprise of diverse group of lesions. They know no barriers of age sex and other demographic factors and can involve almost any site in patient of any age. Diagnosis of intracranial tumors can be complicated by uncharacteristic clinical symptoms and ambiguous neurological findings. There are various imaging modalities to evaluate intracranial lesions including CT and MRI. MRI is ideal modality with number of different sequences and each sequence has its own significance and advantage for different tissues and lesions. along with conventional MRI , new functional MRI sequences , such as diffusion weighted and MR Spectroscopy can further significantly improved possibilities of better charactarisation and diagnostic accuracy in brain tumors.[1,2.3.4.]

II. Materials And Method

The present study was conducted after taking permission of institutional review board . The study was carried out at MRI centre (Wipro GE 1.5T MRI SCANNER) in sir t hospital , Bhavnagar , a tertiary care hospital affiliated to Government Medical College, Bhavnagar.

Type of study : Prospective type of study in which 50 patients with Brain tumor were selected.
Inclusion criteria:
1. Patients with intra and extra axial tumors.
2. Patients willing for review
3. Patients with no contraindication to MR imaging.

Exclusion criteria:

1. Patients with non neoplastic intra and extra brain masses with obvious imaging findings on conventional MR imaging.
2. Patients not willing for review.
3. patients with any contraindication to MR imaging.(Cardiac pace maker, metallic stent)

In our present study after selection of patients, each patient went through the scan , evaluation of all the images of were performed by two senior radiologists. A 2 step evaluation of images was performed. In first, they were asked to suggest diagnosis based on conventional MR and then they were asked to suggest single diagnosis based on conventional MR images along with DWI and MRS.

III. Result

This prospective study included 50 patients with suspected brain tumours, 35 (75%) male and 15 (25%) female. Their mean age was 45.7 (SD+19.2) years, and median and range were 50 and 03 – 85 years, respectively. The final diagnoses obtained by biopsy are shown in Table 6. Glioblastoma multiforme (n=13, 26% of the study population) and metastases (n=13, 26%) were the most commonly encountered diagnosis, followed by astrocytoma grade I – III (n=9, 16%). Meningioma was the final diagnosis in 3 patients. One patient had vestibular schwannoma. One patient had bilateral schwannoma and multiple meningiomas suggestive of Neurofibromatosis type 2. other tumours were the final diagnosis in 7 patient (1 gliomatosis cerebri, 2 macroadenoma, 1 dysembryoplastic neuroepithelial tumor, 1 ependymoma, 1 hemangioblastoma, 1 pineal germinoma) while 'tumour-like lesions' was the final diagnosis in 3 lesions initially believed to be brain tumours on conventional MRI (1 Tuberculoma and 2 brain abscess).

Table-1 Distribution of intracranial mss lesions according to age

Patient age (Age)	No. of patients	Percentage
0-10	4	8%
11-20	3	6%
21-30	3	6%
31-40	4	8%
41-50	16	32%
51-60	11	22%
61-70	6	12%
71-80	2	4%
80-90	1	2%

Highest incidence of patients in present study was found in 41-50 years group(32%).

Table-2 Distribution of intracranial mass lesions according to sex

Sex	No. of patients	Percentage
Male	35	70%
Female	15	30%
Total	50	100%

Present study shows more incidence in male patients (70%).

Table-3 Distribution of intracranial mass lesions according to location

Location	No. of patients	Percentage
Intraaxial	45	90%
Extraaxial	5	10%
Total	50	100%

Present study showed more incidence of intraaxial (90%) tumors as compared to extraaxial tumors (10%).

Table -4 Distribution of intracranial mass lesions according to location

Location	No. of patients	Percentage
Supratentorial	34	68%
Infratentorial	11	22%
Supra and infratentorial	5	10%
Total	50	100%

Present study showed more incidence of supratentorial tumors (68%).

Table 5 Distribution according to number of intracranial mass lesions

Number of lesions	No of patients	Percentage
Single	**41**	**82%**
Multiple	**9**	**18%**
Total	**50**	**100**

The study found more incidence of solitary (82%) as compared to multiple lesions (18%).

Table 6 Type of brain tumors

Type of brain tumor	No of patients	Percentage
Glioblastoma multiforme	**13**	**26%**
Metastasis	**13**	**26%**
Grade 2 Astrocytoma	**5**	**10%**
Grade 3 astrocytoma	**3**	**6%**
Meningioma	**3**	**6%**
Schwannoma	**2**	**4%**
Pituitary macroadenoma	**2**	**4%**
Tectal glioma	**2**	**4%**
DNET	**1**	**2%**
Pilocytic Astrocytoma	**1**	**2%**
Hemangioblastoma	**1**	**2%**
Ependymoma	**1**	**2%**
Pineal germinoma	**1**	**2%**

In present study, glioblastoma multiforme and metastasis had the highest incidence of 26% each.

Table-7

Diagnosis given by modality was same as histopathological diagnosis	Yes	No	(p<0.001)
Conventional MR with DWI and MRS	**31**	**19**	**50**
Conventional MR with DWI and MRS	**45**	**5**	**50**
Total	**78**	**22**	**100**

Compatibility of the diagnosis provided by conventional MRI sequences and multimodality MRI with the diagnosis obtained at biopsy.

The single suggested diagnosis obtained with multimodality MRI was compatible with the final diagnosis obtained at biopsy in 45 (90%) patients, compared with a lower rate in 31 (62%) patients with evaluation of the routing MR Sequences. This difference is statistically significant as per Chi square test ($p<0.001$) (Table 7).

IV. Discussion

In patients with brain lesions, an accurate diagnosis is fundamental for an accurate therapy choice, to avoid unnecessary brain surgery, and to prevent delay in initiating treatment. Studies on diagnostic accuracy have shown that MRI is superior to contrast enhanced CT in the diagnosis of brain metastases.[5] combining MRI and MRS has been shown to provide better diagnostic value than MRS alone, especially in contrast enhancing tumors.[6] Another study on the diagnostic accuracy, sensitivity and specificity of diagnostic imaging strategies to differentiate various intra-axial brain masses also showed a high accuracy for multimodal imaging. [7]

Similar to previous reports, our study showed that MRS can help to differentiate between primary brain tumours and metastases by demonstrating high Cho/cr and Cho/NAA in the tissue surrounding the area of contrast enhancement in primary brain tumours, compared with a normal ratio in the vasogenic oedema surrounding metastatic lesion.[8] Demonstrating the occurrence of lipid peak in metastases. [9] In common with other studies, MRS helped to suggest the diagnosis of a high-grade astrocytoma by showing a Cho/Cr ratio exceeding 2.5 in 2 tumours previously believed to be low-grade tumours (patients no. 9 and 13). However, 1 false-positive and 4 false-negative result occurred in our study. In one case, a high-grade astrocytoma was suggested by MRS in one patient with low-grade astrocytoma. Two patients considered to have low grade glioma on MRS were shown to have Grade III astrocytoma at biopsy, while other two patients (patient no. 10) considered to have low grade glioma on MRS were shown to have gliomatosis and glioblastoma multiforme at biopsy. Multiple lesions especially in an older age group suggest possibility of metastasis on conventional MR imaging. But marked diffusion restriction with low ADC values and raised amino acid peak on MRS suggest the diagnosis of brain abscess. One patient with such multiple lesions and one patient with a solitary lesion having features of metastasis on conventional imaging were correctly diagnosed as brain abscess on multimodal MR imaging with DWI and MRS. In case of multiple ring enhancing lesions MRS helps in differentiation of

metastasis and abscess by shown presence of amino acids, borderline increase in choline in pyogenic abscess and presence of lipid, lactate in tubercular abscess and highly raised Cho/Cr ratio in metastasis.

V. Conclusion

MR imaging is ideal modality for evaluation of intracranial lesions as it provides excellent anatomic details as well as delineate pathological lesions discreetly. Combining with DWI and MRS with conventional MR imaging increases the diagnostic accuracy of MRI in the evaluation of brain tumors and tumors like lesions. In some tumors , this benefit might preclude brain biopsy , which is invasive procedure that would otherwise be required to establish the final diagnosis. It might also avoid delay in initiating tumor therapy. Although expensive and time consuming, multimodality MRI examination should wherever available, be performed in the work up of brain tumors.

CASE 1:

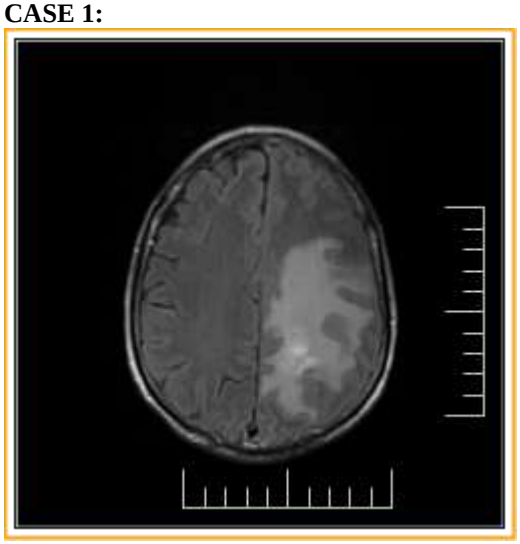

Fig 1 A

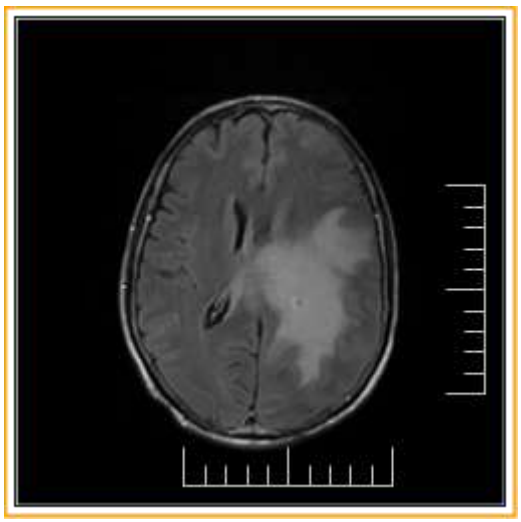

Fig 1B

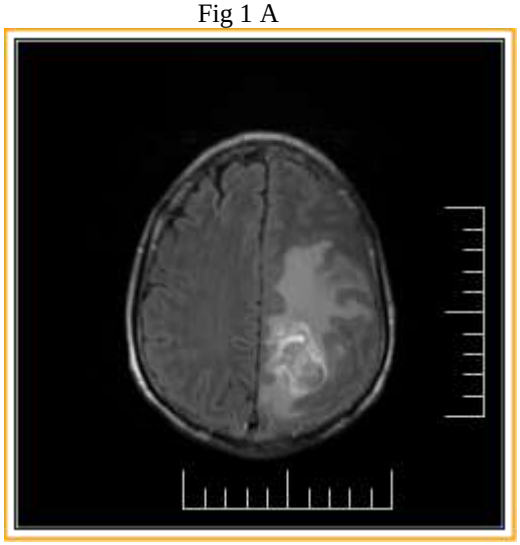

Fig.1C

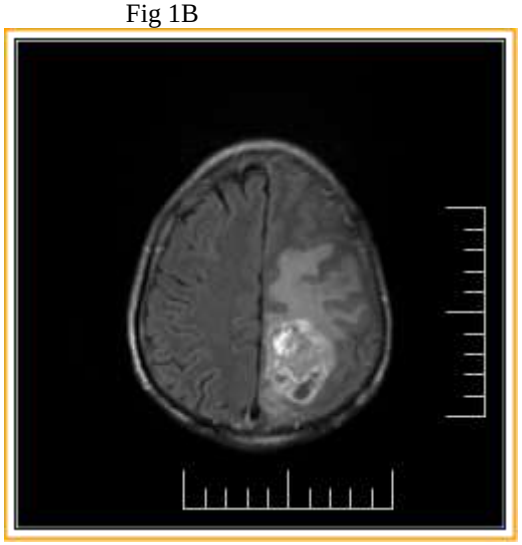

Fig.1D

Figure :1 Glioblastoma multiforme : Axial T2 /FLAIR heterogeneous enhancing hyperintense lesion with moderate perilesional edematous changes noted at left high parietal parafalcine region with metastatic lesion in left parietal lobe.

CASE 2:

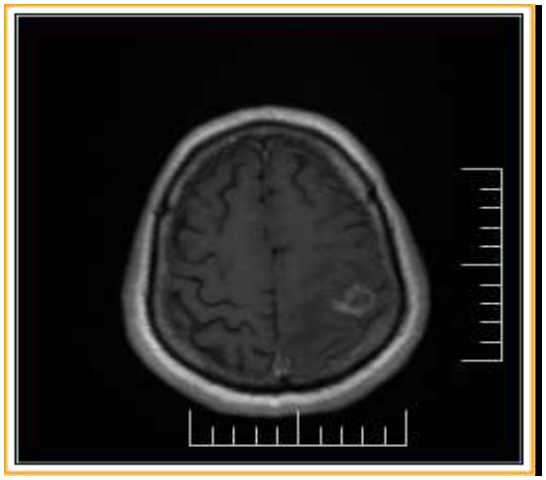

Fig.2A

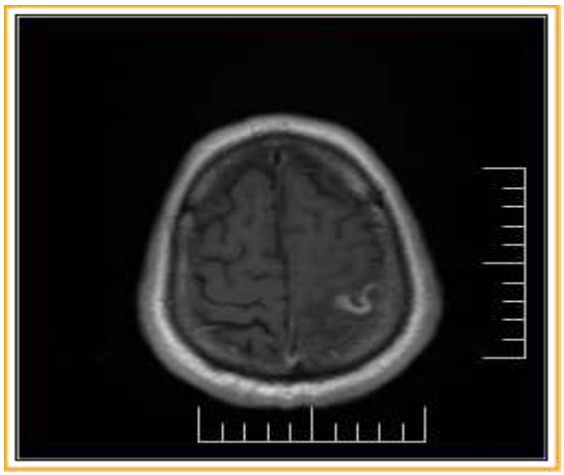

fig.2B

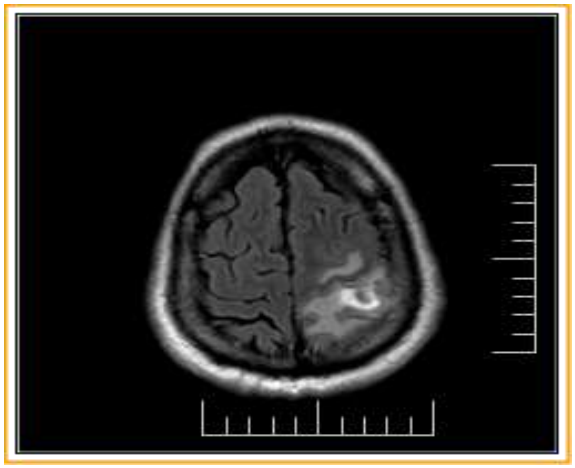

Fig.2C

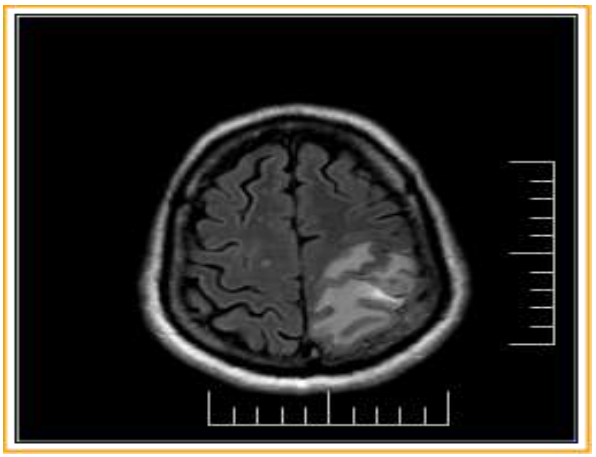

Fig.2D

Figure : 2 (A,B,C,D) Metastasis : Axial T2/ FLAIR images showing heterogenously hyperintense lesions in left frontoparietal lobes with perilesional oedema. Post contrast study shows significant enhancement of the lesions.

Case 3:

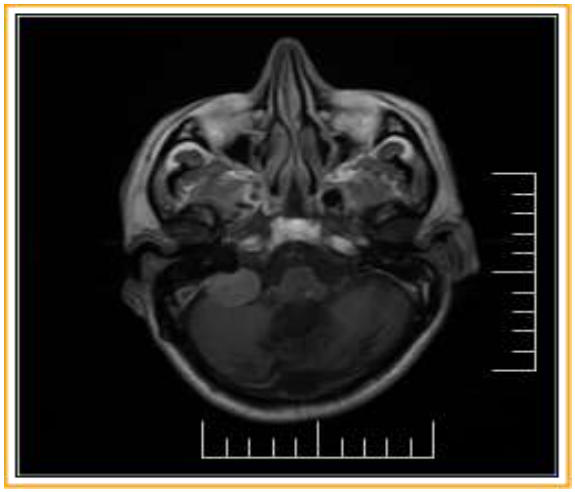

Figure 3A

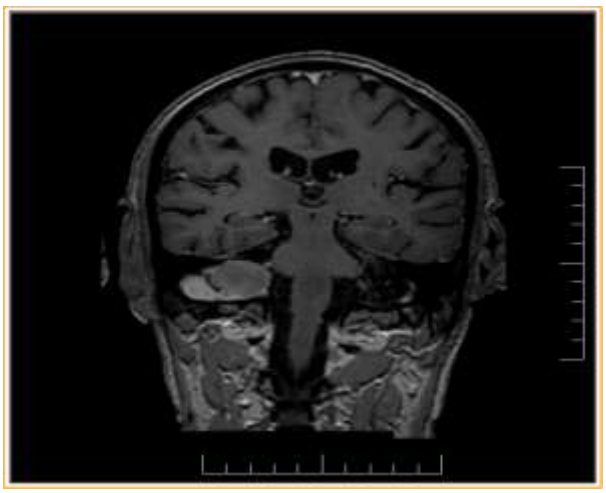

fig 3B

Figure 3 : Vestibular schawanoma: Axial (3A) and Coronal (3B) , T1, isointense, intensely enhancing extra-axial, dural based lesion is seen in right cerebello-pontine angle.

Case 4:

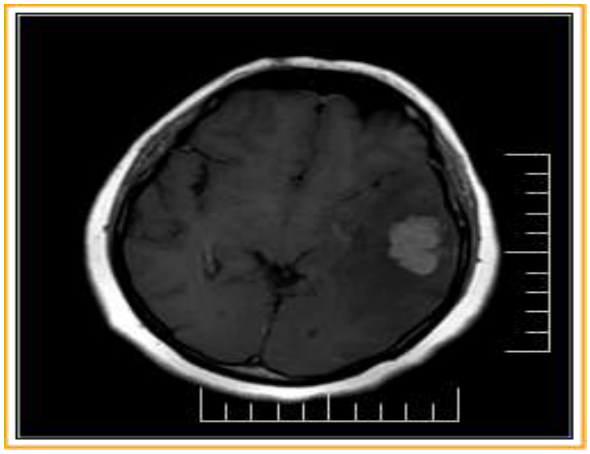

Fig. 4A

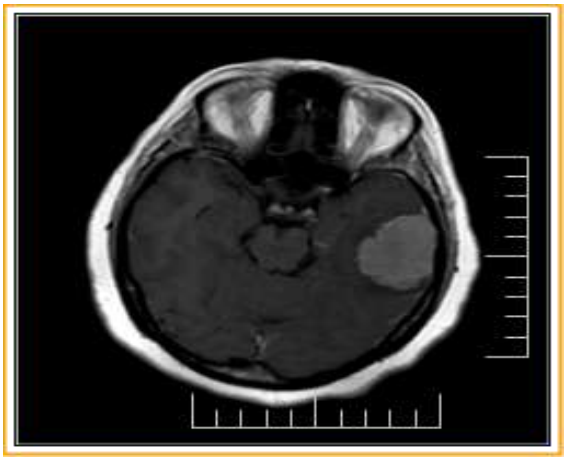

Fig. 4B

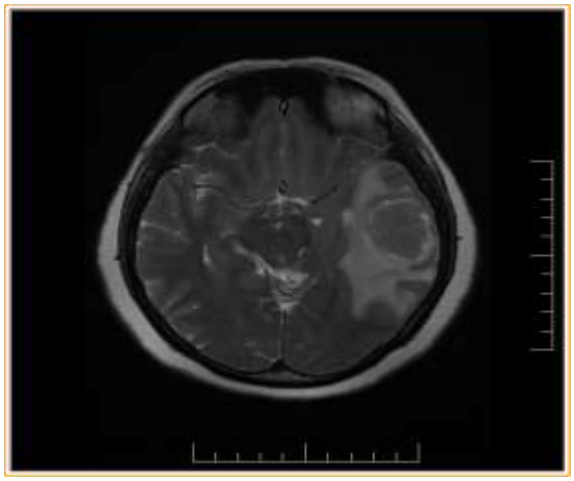

Fig. 4C

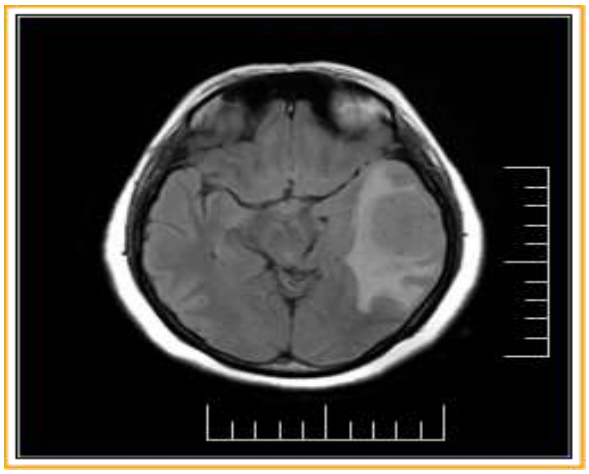

Fig. 4D

Figure 4 (A,B,C,D) Meningioma: Axial T1 and Axial T2/FLAIR images well defined altered signal intensity lesion in left temporal region and shows homogenous post contrast enhancement associated with perilesional oedema.

Case 5:

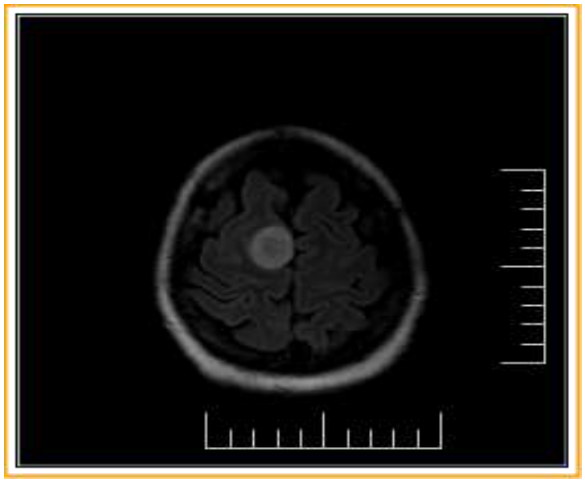

Fig .5A

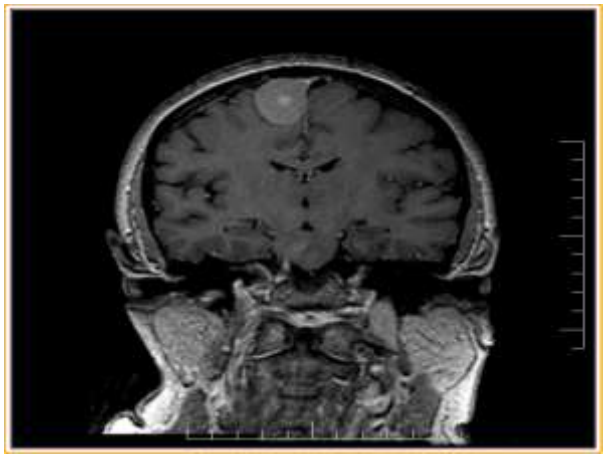

Fig. 5B

Figure 5 (A&B): Well defined altered signal intensity extra axial lesion in l noted at right high parietal parafalcine region causing mild indentation over adjacent cerebral parenchyma. The lesion shows almost homogeneous intense enhancement.

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