# DIFFUSION WEIGHTED VERSUS CONVENTIONAL MRI IN DIAGNOSIS AND CHARACTERISATION OF INTRACRANIAL SPACE OCCUPYING LESIONS

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## Abstract

**Background information -**Non-invasive and accurate differentiation of brain mass lesions are important for determining the correct treatment plan and in some cases, may avoid the necessity of performing a biopsy. Now MRI is being currently used to determine the tumor nature and extent that is helpful in planning surgery and radiotherapy, even for post therapy monitoring for tumor recurrence or progression. 30-90% MRI can correctly diagnose intracranial space occupying lesions of various types. It is clinically very important to differentiate brain infections from brain tumors, as their plan of management is completely different.

**Materials and Methods -** All clinically suspected patients of intracranial space occupying lesions and already diagnosed patients with intracranial space occupying lesions, who were referred to the department of Diagnostic Radiology in VIMS and RC underwent MRI. The images of MRI were evaluated to characterize the space occupying lesions by conventional and diffusion weighted sequences. Further the study was reviewed by the experienced radiologist, only after which the data was analyzed and recorded.

**Results -** All cases (100%) of epidermoid and neuroblastoma showed true diffusion restriction. 100% GBM cases showed true restricted diffusion while none of the low- grade tumours showed diffusion restriction. All cases of arachnoid cysts showed low signal on DWI. And none of benign meningioma and schwannoma showed restriction diffusion. Positive correlation was found in the comparison of mean ADC values for high-grade gliomas (1.02×10-3 mm2/s±0.2) and metastasis (0.881×10-3 mm2/s±0.2), low-grade gliomas (1.20 × 10-3 mm2/s ± 0.2), and medulloblastomas (2.09×10-3 mm2/s ± 0.075).

**Conclusion -** Presence of diffusion restriction is a useful method of differentiating abscesses from necrotic or cystic neoplasms. Highly cellular tumors may show restricted diffusion. Arachnoid cysts can be differentiated from epidermoid cysts by presence of low signal on DWI. ADC is useful in the differentiation of various brain mass lesions and in grading brain tumours. The combination of routine image interpretation and ADC had a higher diagnostic predictive value in characterizing brain lesions.

**Keywords - DW imaging; Diffusion weighted imaging; ADC; Conventional MRI; Intracranial SOL**

## INTRODUCTION

Intracranial space occupying lesions (ICSOLs) can be defined as any lesion that occupies space within the intracranial fossa and causes raised intracranial pressure. An intracranial space occupying lesion can be a malignancy or infective, inflammatory, vascular, and traumatic. The lesion can cause general symptoms due to raised intracranial pressure such as seizures or false localizing signs, focal brain damage or obstruction of cerebrospinal fluid flow. Because of their high morbidity and mortality, it is necessary to diagnose them early and plan an intervention as soon as possible [1].

Now MRI is being currently used to determine the tumor nature and extent that is helpful in planning surgery and radiotherapy, even for post therapy monitoring for tumor recurrence or progression. In 30-90% of the cases, MRI is able to correctly diagnose intracranial space occupying lesions of various types. It is very important to differentiate brain infections from brain tumors, as their plan of management is completely different [2].

With the advent of MRI techniques such as perfusion, diffusion, and spectroscopy, it is now possible to diagnose various intracranial space occupying lesions. There may be substantial alteration in diffusion properties of water molecules present inside tissues due to diseases which is easily assessed by Diffusion-weighted imaging. Diffusion weighted imaging (DWI) is a specialized magnetic resonance imaging technique [3]. It depends on the random movement of water molecules within and between the intracellular and extracellular spaces. Regions with restricted mobility of water molecules yield a greater Diffusion-weighted magnetic resonance (DW-MRI) signal and appear bright. In apparent diffusion coefficient (ADC) maps, regions that contain high water mobility appear bright [4].

Diffusion-weighted magnetic resonance (DW MR) imaging also provides unique information on the brain tissue viability. It also provides image contrast that is dependent on the molecular motion of water, which may be substantially altered by disease [5]. The primary application of Diffusion-weighted magnetic resonance (DW MR) imaging has been to brain imaging, mainly because of its sensitivity for ischemic stroke, a common condition that appears in the differential diagnosis in virtually all patients who present with a neurologic complaint [6].

Diffusion magnetic resonance imaging (MR) derives images using the Brownian motion of molecules. In acute stroke, Diffusion weighted imaging (DWI) demonstrates decreased diffusion in a vascular territory affected by ischemia. Similarly, decreased diffusion is present in the centre of pyogenic abscesses and this helps in the MR diagnosis of a ring-enhancing cerebral mass. In addition, tumors such as lymphoma and primitive neuroectodermal tumor (PNET) also demonstrate decreasing diffusion, thereby aiding the radiologist when formulating a differential diagnosis of a cerebral mass lesion. It also has growing applications in differentiating tumors such as glioblastoma primary cerebral lymphoma, and metastasis [7].

## MATERIALS AND METHODS

The study was conducted after approval from the ethics committee.

### Source of data

Patients with clinical suspicion of intracranial space occupying lesions or patients already diagnosed with intracranial space occupying lesions and referred to the Department of Radiodiagnosis for MRI from other departments [8].

Method of collection of data

**Duration of study** – January 2020- June 2021

a) Sample size – The study population includes 71 patients, irrespective of age or sex, who are clinically suspected/proven cases of intracranial space occupying lesions or with clinical suspicion of intracranial space occupying lesions, which were referred to the Department of Diagnostic Radiology

**Inclusion criteria**

- Cases of all ages irrespective of sex.
- Patients with focal neural deficits.
- Patients with history of seizures.
- Incidental finding of space occupying lesion on MRI screening

**Exclusion criteria**

- Patients with history of claustrophobia.
- Patients having metallic implant insertion, cardiac pacemakers and metallic foreign body in situ.
- Cases where scanning is not possible due to poor general conditions and where MRI is contraindicated.
- Type of study: Prospective observational study.

**Statistical analysis**

The results were analyzed using descriptive statistics.

**Method of evaluation**

Patient undergone MRI scan, Conventional MRI findings noted. DWI and ADC values calculated Correlating and comparing the results of both the techniques. Multiplan and multisequential scan of the brain in a 1.5 tesla. The following are acquired on a conventional imaging sequences, pre-contrast: Axial, Sagittal and coronal T1 WI [550/15ms (TR/TE)] spin echo, axial and coronal T2 WI (3000/120ms) turbo spin-echo, and fast fluid attenuation inversion recovery (FLAIR) [8000/140/2800ms (TR/TE/TI)]. Post-contrast series included axial, coronal and sagittal T1 WI spin echo sequences. For diffusion-weighted imaging, following sequences are acquired: DWI will be performed in the axial plane using single shot echo-planar spin-echo sequence EPI [3435/89cms (TR/TE)], matrix 128 x 128, slice thickness 5 mm, gap 1 mm with duration of 30s, and b = 0 and b = 1000 applied in X and Y directions. Post processing of ADC maps will be done using the standard software supplied on the machine console to obtain the ADC value and map [9].

## MRI PROTOCOL

MRI protocol consisted of the following

- A head coil was used
- Axial diffusion weighted images of the brain
- Sagittal and axial T1W images of the brain
- Sagittal and axial T2W and FLAIR images of the brain
- Sagittal and axial post-GAD T1W images of the brain
- ADC images were reconstructed from the diffusion weighted image

## RESULTS

The present study was carried out to describe imaging characteristics of intracranial mass lesions on DWI and to compare them with ADC and T2 FLAIR images. Findings in the patients studied were tabulated using Microsoft Excel and has been given as Master Chart. Seventy-one cases of intracranial mass lesions were included in the study. The observations of these 71 patients were compiled and analyzed.

**Age wise distribution of intracranial lesion -** The age of the patients with intra cranial lesions studied ranged from 1 year to 72 years. The patients involved in the study were divided into 7 age groups viz. 1-10 years, 11-20 years, 21-30 years, 31-40 years, 41-50 years, 51-60 years and >61 years. There were eight patients (11%) in 1–10-year age group, seven (9%) in 11–20-year age group, nineteen patients (26%) in 21-30 year age group, ten (14%) in 31-40 year age group, eleven (15%) in 41-50 year age group, seven (9%) in 51-60 year age group, nine (12%) in >61 year age group.Out of 71 patients, 17 patients were diagnosed with infections, 50 were diagnosed with primary tumors and 4 with metastasis[10].

Out of 71 patients, there were lesions comprising of solid, cystic and solid- cystic component. 8 (11.3%) patients had predominantly cystic lesion, 52 (73.2%) had solid lesions and 11 (15.5%) had cystic lesions.Post contrast imaging revealed 58 (81.7%) lesions showed enhancement, while no enhancement was noted in 13 (18.3%) lesions.Only 7 (9.9%) lesions showed necrotic component, rest 64 (90.1%) did not have necrosis within the lesions.Perilesional edema was noted in 39 (54.9%) lesions, while 32 (45.1%) lesions showed no perilesional edema.Adjacent mass effect in form of effacement of the adjacent sulcal spaces, ventricles and midline shift was exhibited by 38 (53.5%) lesions, while 33 (46.5%) lesions showed no mass effect on the adjacent structures.

Of the total 71 cases included in this study, NCC and Tuberculoma were the majority which constituted 8 (11%) cases each. The cases of tumors of which 33 (43%) were intra axial and 17 (23%) were extra axial tumors, 17 (23%) infective and 4 (5%) cases of intracerebral metastases.There were 27 cases of intra axial tumours in this study. There were 10 females and 17 males. This included 6 cases of glioma, 2 cases of glioblastoma multiforme, 5 oligodendroglioma, 2 hemangioma, 3 porencephalic cyst, 1 neurocytoma, 1 medulloblastoma, 1 germ cell tumor, 1 hemangioblastoma, 1 anaplastic glioma, 1 pineoblastoma and 3 astrocytoma. 16 cases showed true diffusion restriction.

**Table 1 - Distribution of cases**

| | Number ofcases |
|---|---|
| **Sex** | |
| Males | 47 |
| Females | 24 |
| **Types of intracranial lesion** | |
| Infections | 17 |
| Tumours | 50 |
| **Typeoflesion** | |
| Intraaxial | 48 |
| Extraaxial | 23 |
| **Morphology of intracranial lesion** | |
| Cystic | 8 |
| Solid | 52 |
| Solid-cystic | 11 |
| **PostContrastenhancement** | |
| Yes | 58 |
| No | 13 |
| **Necrosis** | |
| Yes | 7 |
| No | 64 |
| **Surroundingedema** | |
| Yes | 39 |
| No | 32 |
| **Masseffect** | |
| Yes | 38 |
| No | 33 |

Of these were 6 were glioma, 4 were oligodendroglioma, 1 was neurocytoma, 1 anaplastic glioma,1 pineoblastoma, 2 glioblastoma and 1 was astrocytoma.23 cases of extra axial tumours were included in this study. Of these 10 were females and 13 were males. These were 6 cases of Meningioma, 4 cases Schwannoma, 2 Epidermoid, 4 Arachnoid cyst, 4 Pituitary macroadenoma, and 3 craniopharyngioma. True restricted diffusion was noted in 9 (39%) cases. This included the all the 2 (100%) cases of epidermoid cyst and 3 cases of meningioma (50%) and 4 (100%) cases of schwannoma. In rest 3 cases of meningiomas (50%) no change was noted. 4 (100%) cases of arachnoid cyst, 4 (100%) cases of pituitary macroadenoma and 4 (100%) cases of schwannoma showed no diffusion restriction.

**Table 2- ADC values of all lesions**

| Diagnosis | N | Mean | Std. Deviation | 95%ConfidenceIntervalforMean | |
|---|---|---|---|---|---|
| | | | | LowerBound | UpperBound |
| Glioma | 6 | 0.00111 | 85.742 | $1021.19 \times 10^{-6}$ | $1201.15 \times 10^{-6}$ |
| EpidermoidCyst | 2 | 0.000746 | 44.548 | $346.25 \times 10^{-6}$ | $1146.75 \times 10^{-6}$ |
| Meningioma | 6 | 0.001334 | 819.690 | $474.12 \times 10^{-6}$ | $2194.54 \times 10^{-6}$ |
| Arachnoidcyst | 4 | 0.003233 | 325.663 | $2715.55 \times 10^{-6}$ | $3751.95 \times 10^{-6}$ |
| Oligodendroglioma | 5 | 0.001013 | 287.808 | $655.64 \times 10^{-6}$ | $1370.36 \times 10^{-6}$ |
| Hydatidcyst | 1 | 0.003573 | . | . | . |
| Tuberculoma | 7 | 0.001064 | 517.447 | $586.16 \times 10^{-6}$ | $1543.27 \times 10^{-6}$ |
| NCC | 8 | 0.001283 | 339.813 | $998.91 \times 10^{-6}$ | $1567.09 \times 10^{-6}$ |
| Metastasis | 4 | 0.000881 | 50.757 | $800.98 \times 10^{-6}$ | $962.52 \times 10^{-6}$ |
| Porencephalic cyst | 3 | 0.003122 | 140.096 | $2773.98 \times 10^{-6}$ | $3470.02 \times 10^{-6}$ |
| Hemangioma | 2 | 0.001062 | 562.150 | $-3988.22 \times 10^{-6}$ | $6113.22 \times 10^{-6}$ |
| Neurocytoma | 1 | 0.000721 | . | . | . |
| Medulloblastoma | 1 | 0.002091 | . | . | . |
| Pituitary macroadenoma | 4 | 0.001627 | 653.325 | $587.91 \times 10^{-6}$ | $2667.09 \times 10^{-6}$ |
| Germcelltumor | 1 | 0.001434 | . | . | . |
| Hemangioblastoma | 1 | 0.001815 | . | . | . |
| Schwannoma | 4 | 0.001012 | 139.896 | $789.89 \times 10^{-6}$ | $1235.11 \times 10^{-6}$ |
| Anaplastic Glioma | 1 | 0.000801 | . | . | . |
| Pineoblastoma | 1 | 0.000698 | . | . | . |
| Glioblastoma | 2 | 0.000507 | 58.690 | $-19.81 \times 10^{-6}$ | $1034.81 \times 10^{-6}$ |
| Astrocytoma | 3 | 0.001384 | 596.813 | $-98.23 \times 10^{-6}$ | $2866.90 \times 10^{-6}$ |
| Craniopharyngioma | 3 | 0.001807 | 986.558 | $-643.41 \times 10^{-6}$ | $4258.08 \times 10^{-6}$ |

## Discussion

MR diffusion imaging is an important tool which is used to study water mobility in brain tissue which is helpful in characterizing the intracranial space occupying lesions. Preoperative differentiation of brain mass lesions is very important, due to different therapeutically approaches and prognosis [11].

In this study 71 patients with intracranial mass lesions detected on MRI of the brain were included. It was found that DW MRI provides adjunctive information for intracranial mass lesions including infections, intra axial and extra axial lesions in conjunction with conventional MRI [12].

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Out of 71 patients, 47 (66%) were males and 24 (33%) were females. The mean age among females was 42.6 years and the mean age among males was 46.4 years. Out of 71 patients, 48 (67.6%) were diagnosed to have intra axial lesions and 23 (32.4%) to have extra axial lesions.Of the 71 patients included in this study, 33 cases (46%) showed hyper intensity on DWI of which true restriction (hyperintense on DWI and hypointense on ADC). T2 shine through was noted in 16 patients (22%). 9 patients (12%) showed T2 washout (isointense on DWI). 13 patients (18%) showed no signal change on DWI or ADC images.The study included 17 infective conditions of which 8 (47%) were tubercular Granulomas, 8 (47%) were NCC granulomas and 1 (5%) was hydatid cyst. No true diffusion restriction noted. T2 shine through was seen in both Tubercular and NCC granuloma.MR imaging is the most sensitive method for detecting tumours of the brain. It is however not specific enough to determine the histological nature of most tumors [13].

DWI can differentiate between tumor and infection and can provide information about the cellularity of tumors thereby helping in characterization and grading of tumors. There were 27 cases of intra axial tumours in this study. There were 10 females and 17 males. This included 6 cases of glioma, 2 cases of glioblastoma multiforme, 5 oligodendroglioma, 2 hemangioma, 3 porencephalic cyst, 1 neurocytoma, 1medulloblastoma, 1 germ cell tumor, 1 hemangioblastoma, 1 anaplastic glioma, 1 pineoblastoma and 3 astrocytoma. 16 cases showed true diffusion restriction. Of these were 6 were glioma, 4 were oligodendroglioma, 1 was neurocytoma, 1 anaplastic glioma,1pineoblastoma, 2 glioblastoma and 1 was astrocytoma.Cruz CH et al showed that highly cellular tumors such as high-grade gliomas and lymphomas can have low ADC values and show restricted diffusion. It was also shown that medulloblastomas may be differentiated from other paediatricbrain tumors by presence of diffusion restriction [14].

The findings of our study were similar. In our study, 100% of GBM showed true diffusion restriction with mean ADC values (0.000507). Medulloblastoma did not show diffusion restriction in our study. None of the low-grade gliomas showed restricted diffusion.We found that ADC values cannot be used in individual cases to differentiate tumor types reliably. The combination of routine image interpretation and ADC had a higher predictive value. In our study Low grade glioma has higher ADC (Mean 0.00120) and High-grade glioma lower ADC (Mean 0.001021) values [15].

Yamasaki et alsuggested inverse relationships between mean ADC and the grades of astrocytic tumors [WHO grades II– IV]. The ADC of diffuse astrocytomas (WHO grade 2) was significantly higher than that of anaplastic astrocytomas (WHO grade 3) and glioblastomas ($P < .01$). The accuracy of logistic discriminant analysis was more than 90%. The ADC of anaplastic astrocytomas was higher than that of glioblastomas ($P < .01$). The higher the astrocytic tumor WHO grade, the lower the ADC.Niloufar Sadeghi et al reviewed 19 patients with gliomas and found that the mean ADC [0.93 x 10-3 mm2/s] of the high-grade glial tumors were significantly lower than the mean ADC [1.23 x 10-3 mm2/s] of the low-grade glial tumors. Our finding of decreasing ADC with increasing glioma grade [WHO grade II-IV gliomas correlates well with this study, but the mean ADC in our study and their study did not correlate [16].

23 cases of extra axial tumours were included in this study. Of these 10 were females and 13 were males. These were 6 cases of Meningioma, 4 cases Schwannoma, 2 Epidermoid, 4 Arachnoid cyst, 4 Pituitary macroadenoma, and 3 craniopharyngioma. True restricted diffusion was noted in 9 (39%) cases. This included the all the 2 (100%) cases of epidermoid cyst and 3 cases of meningioma (50%) and 4 (100%) cases of schwannoma. In rest 3 cases of meningiomas (50%) no change was noted. 4 (100%) cases of arachnoid cyst, 4 (100%) cases of pituitary macroadenoma and 4 (100%) cases of schwannoma showed no diffusion restriction.Diffusion weighted MR plays a key role in differentiating arachnoid from epidermoid cysts. Schaefer et al showed that conventional MR cannot be reliably used to differentiate these two lesions as both have CSF like signal intensity on conventional MR sequences. However, on DWI epidermoid cyst shows restricted diffusion while arachnoid cyst shows CSF like intensity [17].

This was also demonstrated in a study by Cruz et al, in which epidermoid cysts had ADC values similar to brain parenchyma while arachnoid cysts had ADC values similar to CSF.In our study arachnoid cyst had signal similar to CSF on DWI and ADC images. The epidermoid noted in this study had restricted diffusion. Correlation between ADC values and tumor cellularity in both gliomas and meningiomas as study conducted by Kono et al, 2001.46 In our study 6 cases of meningiomas, 3 cases showed areas of diffusion restriction within the lesion with lessmean ADC values (0.655 x 10-3) proved to be aggressive meningioma[18].

Schwannomas showed no restricted diffusion reflecting lack of high cellularity on comparison of vestibular Schwannomas and meningiomas, signal intensity on T2W is higher in vestibular Schwannomas than in meningiomas. Signal heterogenicity is common in vestibular Schwannomas than in meningiomas. On DWI vestibular Schwannomas were iso to hypointense to cortex with ADC values ranging from 1.0 -2.04 (mean 1.02 x $10^{-3}$) whereas meningiomas were iso to hyperintense to cortex with ADC values ranging from 0.6-2.4 (1.33x $10^{-3}$). Study comprised 4 cases of pituitary macroadenoma showed no diffusion restriction with mean ADC value 1.62 x 10-3. Study included 4 primary proved Metastases (3 cases of lung carcinoma and 1 cases of carcinoma breast) and showed true diffusion restriction with mean ADC value 0.88 x 10-3. However, we found that there is no correlation between the metastasis showing restricted diffusion and primary pathology [19].

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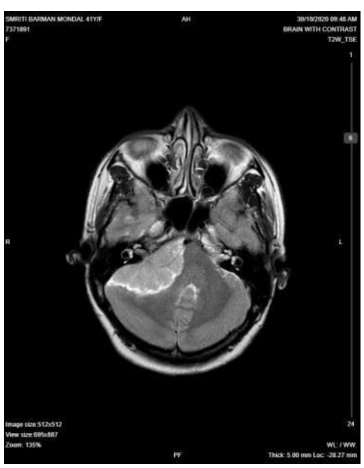
**Supporting Data**

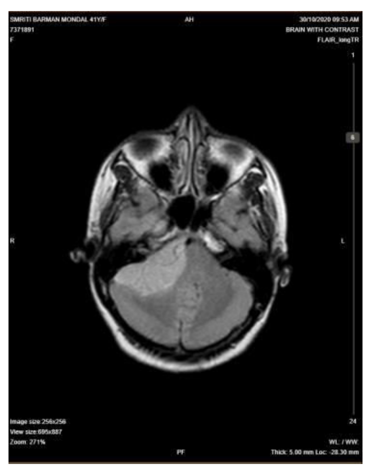
**RepresentativeCases**

**Case1**

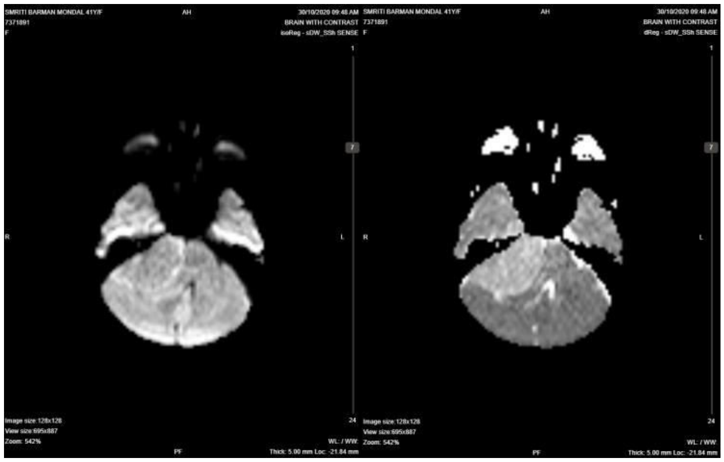
BarmanAge/Sex:41Y/Female

ClinicalDetails:
Headachesince1year.Unsteadinessofgaitsince8months.Decreased hearingand tinnitussince3months.





**T2wImage** **FLAIR Image**



**DWI** **ADC**

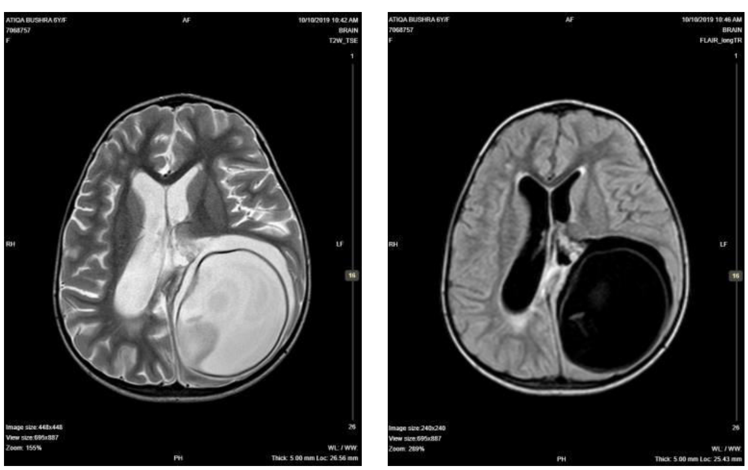
**Findings**

A well-defined broad dural based extra axial altered signal intensitylesionnotedintheposteriorfossaonright side(intheCPangle) .Thislesion appears iso-hypointense on T1W, hyperintense on T2W/FLAIRshowingno diffusion restriction on DWI. Mean ADC1.10x $10^{-3}$. MRIDiagnosis:Petroclivalmeningioma

**Case 2**

BushraAge/Sex:6Y/Female

Clinical Details: Headache since 1 year. Decreased vision since 8months.



**T2wImage** **FLAIR Image**

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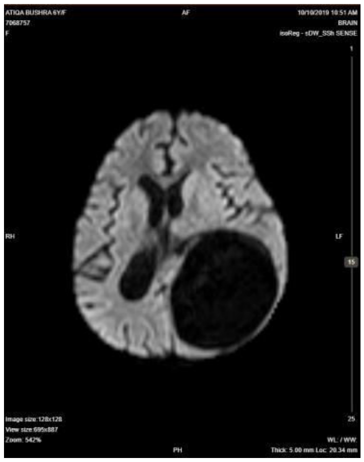
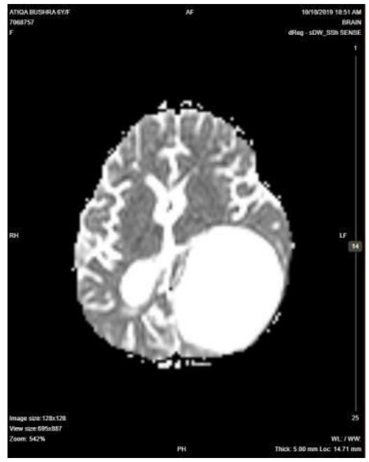


**DWI**



**ADC**

Findings:

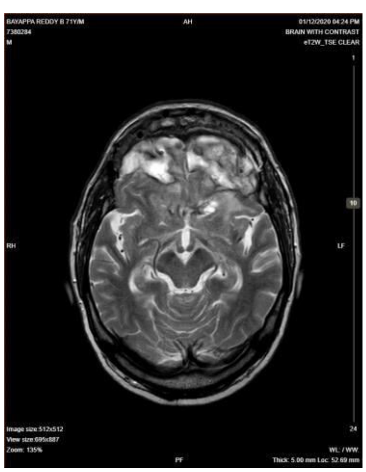
A well-defined intra axial cystic lesion with an undulating membranewithin, noted in the left occipital lobe, with minimal perilesional edema.The lesion appears T1W / FLAIR hypo, T2W hyperintense, not showingrestrictionon DWI. MeanADC3.57 x $10^{-3}$

MRIDiagnosis:Hydatidcyst

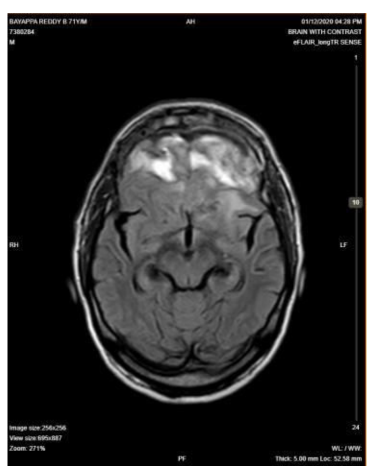
**Case 3**

ReddyAge/Sex: 71Y/Male

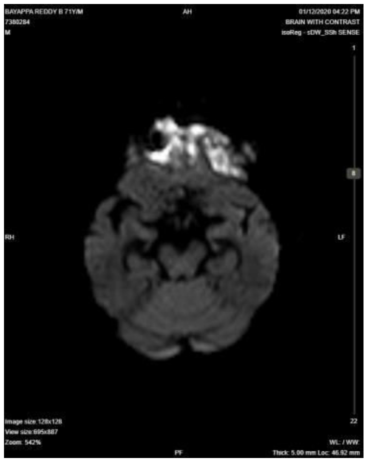
Clinical Details: HPE proven case of atypical meningioma of anteriorcranial fossa,postsurgicalstatus.



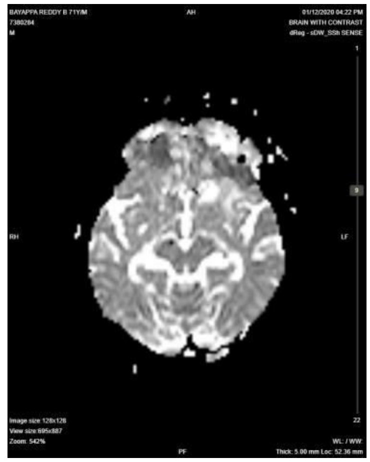
**T2wImage**



**FLAIR Image**



**DWI**



**ADC**

Findings:

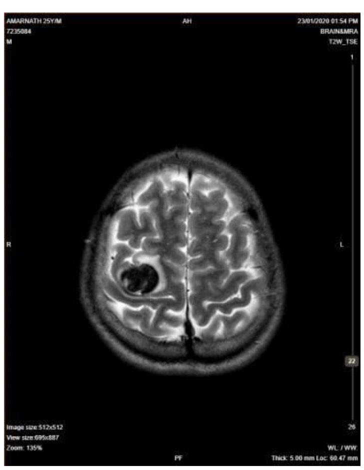
An ill-defined extra-axial dural based altered signal intensity lesion notedin anterior cranial fossa in basifrontal region appearing hyperintense withcentral hypointensity on T1W, hyperintense with peripheral rim ofhypointensity on T2W/FLAIR sequences showing diffusion restriction onDWI.Mean ADC0.655 x $10^{-3}$

MRIDiagnosis:AtypicalMeningioma

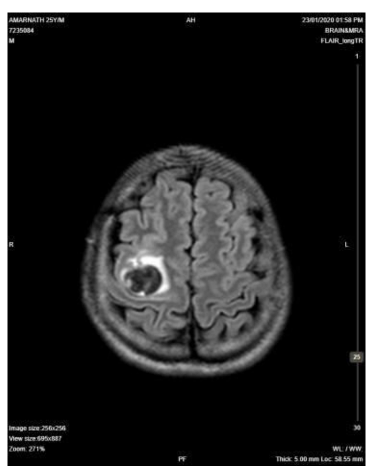
**Case 4**

Age/Sex:25Y/Mal

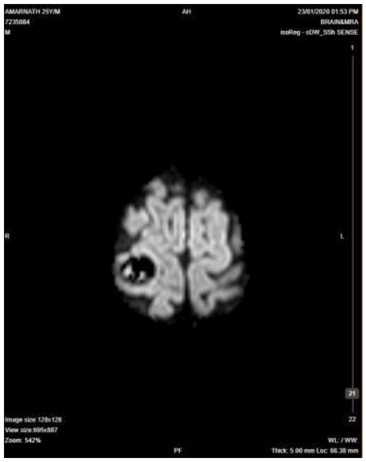
e

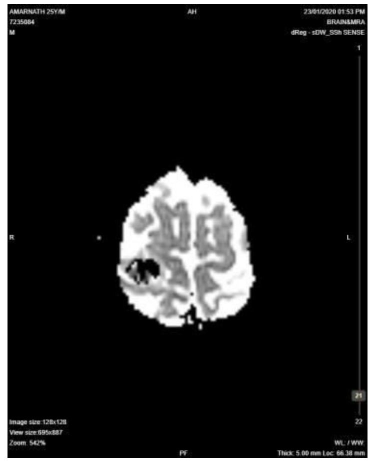


**T2wImage**



**FLAIR Image**





**DWI** **ADC**

Findings:

A well circumscribed rounded lesion noted in the right high parietal lobeas evidence by TI isointensity with areas of hyperintensities, T2/FLAIRhyperintensity with low. The lesion does not show restriction ondiffusion weighted images. There is evidence of perilesional edemasurrounding lesion measuring 6mm with effacement of adjacent sulcalspacesabuttingtheadjacentduramater..Mean ADC1.655 x$10^{-3}$

MRIDiagnosis: CavernousHemangioma

**Case 5**

Age/Sex:61Y/Fema

le

ClinicalDetails:K/C/OCentralneurocytoma,postoperativestatus.

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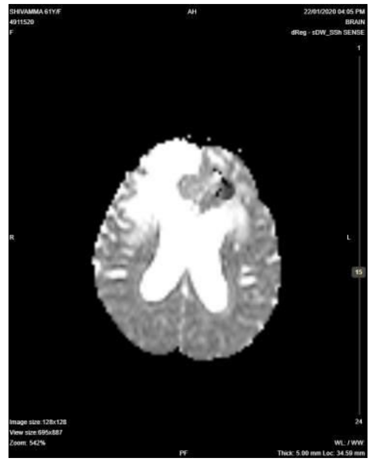
**T2wImage** **FLAIR Image**



**DWI** **ADC**

Findings:

A well-defined, lobulated, supratentorial,intra-axial mass lesion notedalong the anterior falx cerebri, in the left frontal lobe cortex, crossing themidline and extending into the parasagittal aspect of right frontal lobecortex with intraventricular extension showing iso-hypointense signal onT1w, iso-heterogeneously hyperintense signal on T2 & FLAIR andshowingrestriction on DWInoted. Mean ADC0.721x $10^{-3}$

MRIDiagnosis:Neurocytoma

**Case 6**

ReddyAge/Sex:

71Y/Male

Clinical Details: HPE proven case of atypical meningioma of anteriorcranial fossa,post-operativestatus.

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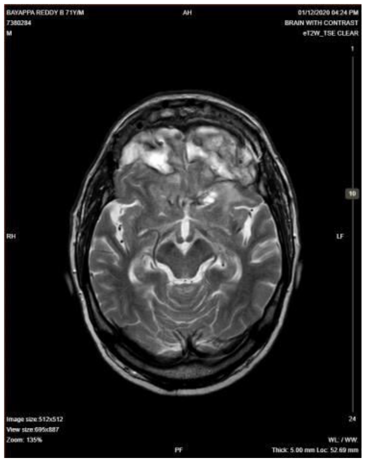
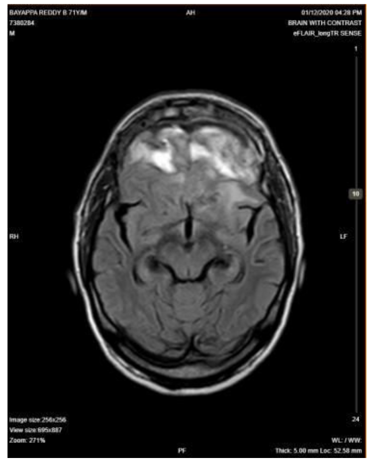
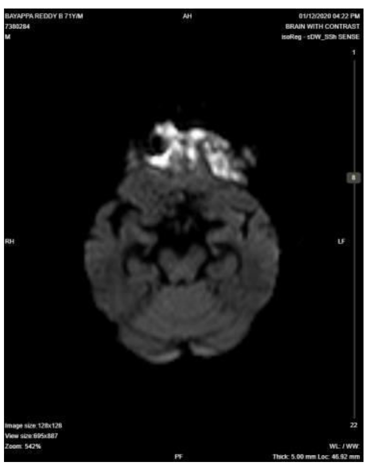
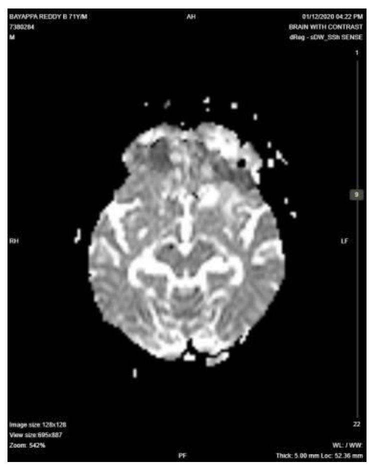



**T2wImage** **FLAIR Image**

**DWI** **ADC**

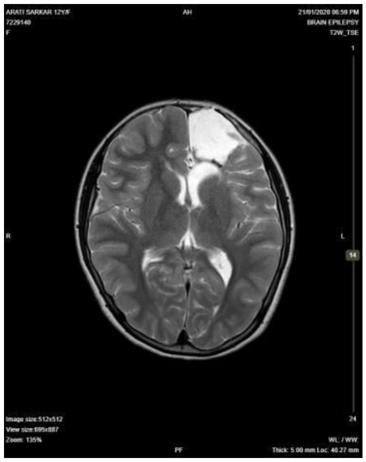
Findings:

An ill-defined extra-axial dural based altered signal intensity lesion notedin anterior cranial fossa in basifrontal region appearing hyperintense withcentral hypointensity on T1W, hyperintense with peripheral rim ofhypointensity on T2W/FLAIR sequences showing diffusion restriction onDWI.Mean ADC0.655 x $10^{-3}$

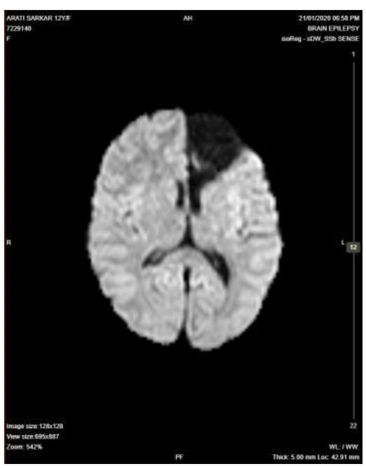
MRIDiagnosis:AtypicalMeningioma

**Case 7**

Age/Sex:12Y/Female



**T2wImage** **FLAIR Image**



**DWI** **ADC**

Findings:

Chronic encphalomalacic changes with adjacent minimal gliosis noted inthe left frontal lobe, causing mild ex-vacuo dilatation of frontal horn ofleft lateral ventricle, the cystic area. The lesion is seen paralleling CSFsignal intensity in all sequence as evidenced by T2 hyperintense, T1hypointense and suprressing on FLAIR sequences. No areas of restrictiononDWI. MeanADC3.102x $10^{-3}$

MRIDiagnosis: Porencephalic cyst

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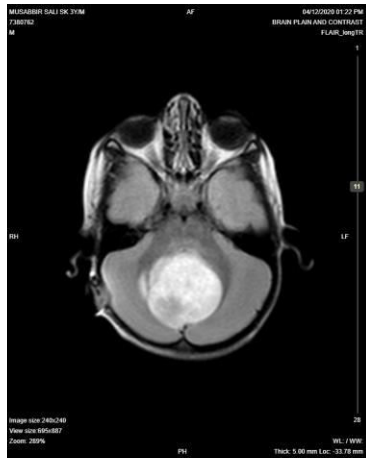
**Case 8**

Name: Musabbir AliAge/Sex:3Y/Male

ClinicalDetails:C/OHeadachex2months.Vomitingx2days.

**T2wImage**



**FLAIR Image**

**DWI**

**ADC**

Findings:

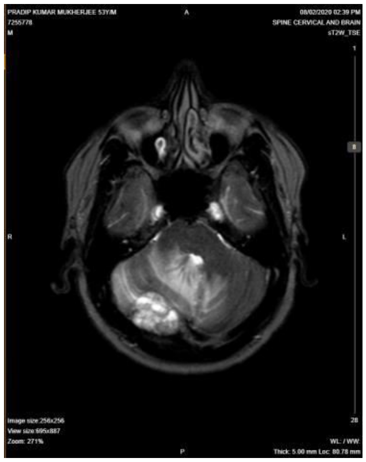
A well-defined, rounded heterogeneous solid-cystic mass lesion, seen inthe midline posterior fossa, arising from the region of the cerebellarvermis, causing significant effacement of the 4th ventricle. The lesionappears heterogeneously hyperintense on T2W/ FLAIR, iso-hypointenseonT1W,withnosignificantrestrictiononDWI.MeanADC$2.091x10^{-3}$

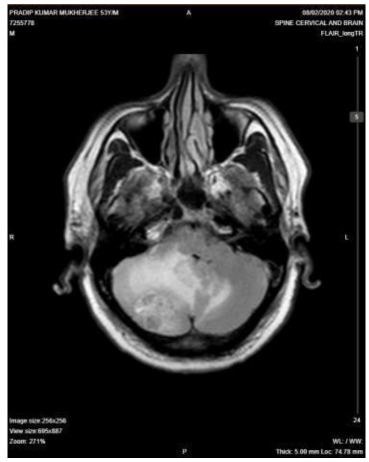
MRIDiagnosis:Medulloblastoma

**Case 9**

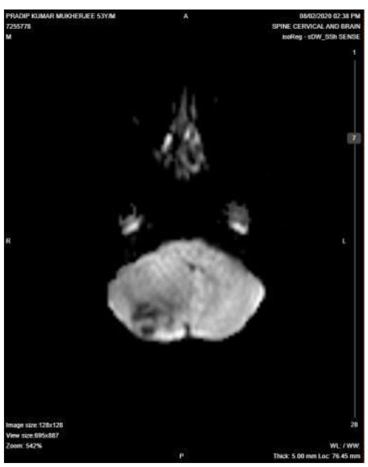
KumarAge/Sex:53Y/Male

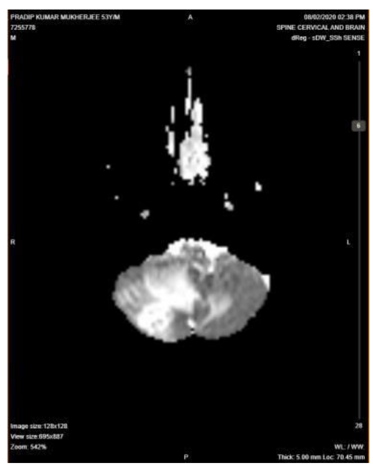
ClinicalDetails:C/ONeckpainsince4years.H/Oself-fall.





**T2wImage** **FLAIR Image**





**DWI** **ADC**

Findings

A well-defined intra-axial lesion appearing predominantlyT1W iso tohypointense, T2W/FLAIR iso to hyperintense, with few areas of flowvoidswithin,andsignificantperilesional edemaasevidencedbyT2W/FLAIR hyperintensity noted in the right cerebellar hemisphere with nosignificantrestrictionon DWI.Mean ADC1.815x $10^{-3}$

MRIDiagnosis:Hemangioblastomas

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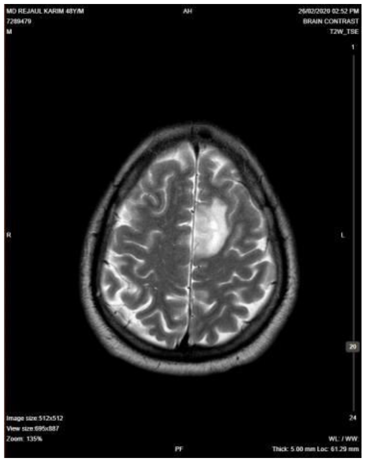
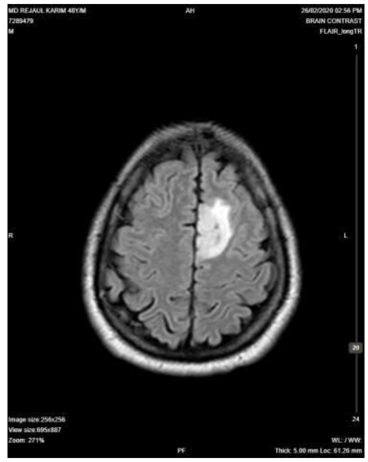
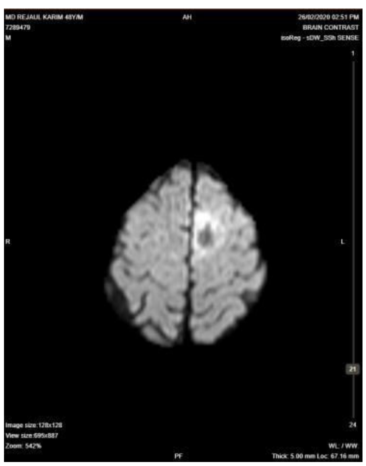
**Case10**

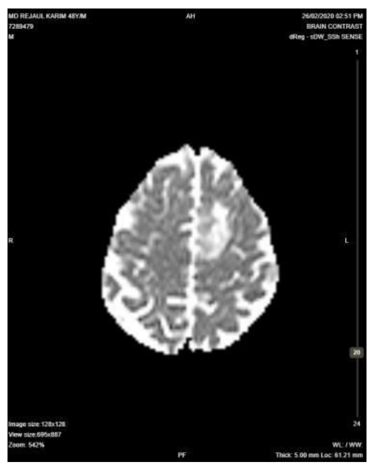
Age/Sex: 48Y/ Male





**T2wImage** **FLAIR Image**





**DWI** **ADC**

Findings:

A fairly well defined cortical based intra axial lesion appearing T1Whypointense,T2Whyperintense,FLAIRhyperintenselesionwithcentralhypointensity in the left frontal lobe. The lesion shows few areas ofdiffusionrestriction. MeanADC1.021 x $10^{-3}$. MRIDiagnosis: Lowgradeglioma