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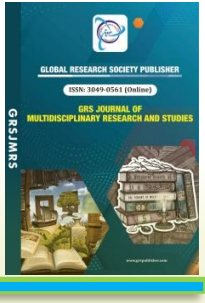

Utility of Diffusion-Weighted Imaging and ADC Mapping on 3T MRI in Characterization of Intracranial Lesions

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Abstract: Background- Intracranial lesions encompass a wide spectrum of neoplastic, infective, inflammatory, ischemic, and cystic pathologies. Conventional magnetic resonance imaging (MRI) sequences often demonstrate overlapping imaging appearances, making accurate diagnosis challenging. Diffusion-weighted imaging (DWI) and apparent diffusion coefficient (ADC) mapping provide additional physiological and microstructural information that can improve lesion characterization.

Aim- To evaluate the role of diffusion-weighted imaging and ADC values obtained from 3T MRI in the assessment and differentiation of intracranial lesions.

Materials and Methods- A prospective observational study was conducted in patients presenting with suspected intracranial lesions who underwent MRI brain examination using a 3T MRI scanner. Conventional MRI sequences including T1-weighted, T2-weighted, FLAIR, and post-contrast imaging were performed along with DWI and ADC mapping. Lesions were analyzed for diffusion restriction patterns and quantitative ADC values. Histopathology, clinical follow-up, and radiological correlation were used for final diagnosis.

Results- High-grade tumors, pyogenic abscesses, epidermoid cysts, and acute infarcts demonstrated restricted diffusion with low ADC values. Low-grade gliomas, arachnoid cysts, and cystic lesions with free water diffusion showed elevated ADC values. DWI proved particularly useful in differentiating pyogenic abscesses from necrotic tumors and epidermoid cysts from arachnoid cysts. Quantitative ADC analysis showed significant correlation with lesion cellularity and histopathological grade.

Conclusion- DWI and ADC mapping significantly improve the diagnostic accuracy of MRI in intracranial lesions. These techniques provide valuable non-invasive information regarding tissue cellularity, viscosity, and microstructural integrity, thereby aiding lesion characterization, tumor grading, and early diagnosis.

***Keywords**: Diffusion-weighted imaging, Apparent diffusion coefficient, MRI brain, Intracranial lesions, Glioma, Brain abscess, 3T MRI.*

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Introduction

Magnetic resonance imaging (MRI) has become the cornerstone in the evaluation of intracranial pathologies because of its excellent soft tissue contrast and multiplanar imaging capability. Conventional MRI sequences such as T1-weighted imaging (T1WI), T2-weighted imaging (T2WI), fluid-attenuated inversion recovery (FLAIR), and contrast-enhanced imaging provide detailed anatomical information; however, many intracranial lesions demonstrate overlapping imaging characteristics, limiting diagnostic specificity.

Diffusion-weighted imaging (DWI) is an advanced MRI technique that evaluates the random Brownian motion of water molecules within tissues. The degree of water diffusion restriction reflects tissue cellularity, membrane integrity, viscosity, and extracellular space. Apparent diffusion coefficient (ADC) maps provide quantitative assessment of diffusion characteristics and help differentiate true restricted diffusion from T2 shine-through effects.

DWI has emerged as a critical imaging tool in neuroradiology, particularly in the early diagnosis of acute ischemic stroke. Its utility has further expanded into characterization of brain tumors, differentiation of abscesses from necrotic tumors, evaluation of demyelinating lesions, and assessment of infectious and inflammatory conditions. High-grade tumors generally demonstrate reduced ADC values due to increased cellularity, while benign cystic lesions and necrotic regions often exhibit elevated ADC values.

The introduction of 3 Tesla MRI systems has improved signal-to-noise ratio and spatial resolution, enabling more accurate ADC measurements and better lesion characterization. Despite widespread use, standardized ADC thresholds for various intracranial lesions remain variable across studies.

This study aims to evaluate the diagnostic role of DWI and ADC values in differentiating intracranial lesions using 3T MRI and to assess the advantages of DWI over conventional MRI sequences.

Aim and Objectives

Diagnostic Value and Differentiation

The primary objective is to determine how effectively DWI can distinguish between various intracranial pathologies. In clinical practice, "bright" signals on DWI (diffusion restriction) are hallmark indicators of specific conditions. For example, DWI is the gold standard for identifying **hyperacute ischemic stroke**, where cytotoxic edema restricts water movement. However, it is equally vital in differentiating **pyogenic abscesses** (which typically show central restriction) from **necrotic tumors** (which usually do not). By establishing standardized ADC thresholds, this study aims to transform DWI from a visual aid into a quantitative diagnostic tool.

Comparison with Conventional MRI

Conventional sequences ($T1$, $T2$, and FLAIR) provide the "where" and "what size," but they often lack the "what is it" at a cellular level. This objective focuses on the incremental value added by DWI. For instance, a ring-enhancing lesion on $T1$ contrast-enhanced imaging could be a metastasis, a primary glioma, or an inflammatory process. By comparing these traditional findings with DWI/ADC maps, the research seeks to prove that functional data significantly reduces diagnostic ambiguity and improves the "confidence score" of the radiologist's report.

Utility as a Non-Invasive Tool for Early Diagnosis

Time is of the essence in neuroimaging. DWI is exceptionally sensitive to early pathophysiological changes that precede visible changes on $T2$ or FLAIR sequences. This objective evaluates the "speed to diagnosis." By utilizing the higher signal-to-noise ratio of a **3T magnet**, the study assesses whether DWI can detect lesions—such as early-stage encephalitis or tiny embolic infarcts—faster and more accurately than other non-invasive methods, potentially bypassing the need for immediate, high-risk invasive procedures like biopsies in unstable patients.

Correlation with Pathology and Tumor Grading

One of the most critical applications of ADC values is their inverse correlation with **tissue cellularity**. In oncology, highly malignant tumors (like Glioblastoma Multiforme or Medulloblastoma) have densely packed cells, which significantly restricts water diffusion, resulting in low ADC values.

$$ADC \propto \frac{1}{\text{Cellular Density}}$$

This objective aims to correlate these numerical ADC values with histopathological findings. If a reliable correlation is established, 3T MRI could serve as a "virtual biopsy," allowing clinicians to predict tumor grade (low-grade vs. high-grade) and plan surgical margins or radiotherapy fields with much higher precision.

Conclusion

By fulfilling these objectives, the study provides a comprehensive validation of 3T DWI as a cornerstone of modern neuroradiology. It moves the field toward **precision medicine**, where imaging does not just describe a lesion but characterizes its biological behavior, ultimately leading to better patient outcomes and more tailored therapeutic interventions.

Review of Literature: The Evolution and Clinical Impact of DWI and ADC at 3T

The landscape of neuroimaging was fundamentally altered in the mid-1980s with the introduction of **Diffusion-Weighted Imaging (DWI)**. While initially utilized as a specialized sequence, it has evolved into a cornerstone of clinical MRI protocols. The transition from 1.5T to **3T MRI systems** has further amplified its utility, offering a superior signal-to-noise ratio (SNR) and enhanced spatial resolution, which allow for more precise mapping of water molecular kinetics in the human brain.

The Biophysical Basis of DWI and ADC

At its core, DWI is a functional imaging technique that measures the **Brownian motion** of water molecules within the tissue microenvironment. In a free medium, water moves randomly; however, in biological tissues, this motion is impeded by cell membranes, organelles, and the extracellular matrix.

The **Apparent Diffusion Coefficient (ADC)** is the quantitative counterpart to the qualitative DWI sequence. By calculating ADC values, clinicians can eliminate the "T2 shine-through" effect—a common pitfall where high T2 signal intensity mimics diffusion restriction. The relationship is typically inverse: tissues with high cellularity or edema restrict water movement (appearing bright on DWI and dark on ADC maps), while tissues with disrupted membranes or sparse cellularity allow "facilitated" diffusion.

Neuro-Oncology: Tumor Grading and Cellularity

One of the most robust applications of DWI is in the assessment of intracranial neoplasms. Literature consistently demonstrates that **ADC values inversely correlate with tumor cellularity**.

- **High-Grade Malignancies:** Tumors such as **Glioblastoma Multiforme (GBM)**, **Lymphoma**, and **Medulloblastoma** are characterized by dense clusters of cells and a high nuclear-to-cytoplasmic ratio. This crowded environment significantly restricts the movement of water, resulting in markedly low ADC values.
- **Low-Grade Gliomas:** These typically exhibit higher ADC values due to lower cell density and a more lax extracellular matrix.

Research suggests that 3T MRI allows for the creation of "ADC histograms," which help surgeons identify the most aggressive areas of a heterogeneous tumor for biopsy, potentially reducing the rate of under-grading.

Differentiation of Ring-Enhancing Lesions

A classic diagnostic dilemma in neuroradiology is distinguishing a **pyogenic brain abscess** from a **necrotic tumor** (such as a

metastasis or high-grade glioma). Both can appear nearly identical on conventional T1-weighted contrast-enhanced sequences.

The literature highlights DWI as the "tie-breaker" in these scenarios. A pyogenic abscess contains pus—a viscous mixture of inflammatory cells, bacteria, and macromolecules. This extreme viscosity causes **marked diffusion restriction** (bright DWI, dark ADC). Conversely, the necrotic center of a tumor consists of serous fluid and cellular debris that does not effectively restrict water, leading to facilitated diffusion and high ADC values.

Cystic Lesions: Epidermoid vs. Arachnoid

The differentiation between **Epidermoid cysts** and **Arachnoid cysts** is another triumph of DWI. On standard T1 and T2 sequences, both lesions often follow the signal of Cerebrospinal Fluid (CSF), making them difficult to distinguish when they occur in the cerebellopontine angle. However, because epidermoid cysts contain solid flakes of keratin and cholesterol, they show intense restriction on DWI. Arachnoid cysts, being filled with simple fluid, show no restriction, allowing for an immediate and non-invasive diagnosis.

Stroke and Acute Ischemia

While this review covers various lesions, the role of DWI in **acute ischemic stroke** remains the benchmark for its sensitivity. Within minutes of an arterial occlusion, the failure of the sodium-potassium pump leads to **cytotoxic edema**. Water shifts from the extracellular to the intracellular space, where its motion is restricted. DWI can detect these changes within 30 minutes of onset—hours before they become visible on CT or conventional MRI—enabling the rapid administration of thrombolytic therapy.

Beyond Tumors: Inflammatory and Demyelinating Processes

Recent literature has expanded the scope of DWI to include **Encephalitis** and **Demyelinating diseases** like Multiple Sclerosis (MS). In the acute phase of an MS plaque, diffusion restriction may be observed, reflecting the inflammatory cell infiltration. In cases of viral encephalitis, such as Herpes Simplex, DWI can identify cortical involvement much earlier than T2-weighted imaging, which is critical for starting antiviral treatment.

The 3T Advantage

The shift to **3T MRI systems** has mitigated several traditional limitations of DWI. The higher field strength allows for thinner slices and reduced acquisition times. This is particularly beneficial in evaluating small lesions in the posterior fossa or near the skull base, where susceptibility artifacts often plague lower-field magnets.

Materials and Methods

Study Design and Population

The research utilizes a prospective observational design, which allows for a real-time assessment of patients as they present with symptoms. This design is superior for diagnostic accuracy studies as it minimizes recall bias and ensures that the MRI sequences—specifically the Diffusion-Weighted Imaging (DWI) and Apparent Diffusion Coefficient (ADC) mapping—are performed under controlled, standardized parameters.

The study population comprises individuals referred to the radiology department with clinical indications of intracranial pathology, such as new-onset seizures, focal neurological deficits, or chronic headaches. By focusing on this "real-world" referral base, the study ensures that the findings are applicable to daily clinical practice.

Inclusion and Exclusion Criteria

To maintain the integrity of the data, strict criteria are applied:

- Inclusion: Any patient with clinical suspicion or prior low-resolution imaging (like CT) suggestive of a space-occupying lesion. Crucially, informed consent is a prerequisite, upholding ethical standards.
- Exclusion: The study excludes patients with MRI-incompatible implants (e.g., non-compatible pacemakers or metallic fragments) and those suffering from severe claustrophobia. Furthermore, because DWI is highly sensitive to motion, patients who cannot remain still—thereby producing motion artifacts that "blur" the microscopic water movement data—are excluded to prevent inaccurate ADC calculations.

MRI Protocol at 3-Tesla

The use of a 3T MRI scanner is a critical component of this methodology. Compared to standard 1.5T units, the 3T field strength provides a significant increase in the Signal-to-Noise Ratio (SNR). This allows for higher spatial resolution and faster scan times, which is particularly beneficial for DWI, a sequence traditionally prone to susceptibility artifacts.

The comprehensive protocol includes:

- Anatomical Sequences: $T1$, $T2$, and FLAIR (Fluid-Attenuated Inversion Recovery). $T2$ and FLAIR are essential for identifying perilesional edema, while $T1$ provides the baseline for anatomy.
- Functional Sequences: DWI is the core of the study. It is acquired using Single-Shot Echo Planar Imaging (SS-EPI).
- Contrast-Enhanced Imaging: When indicated, Gadolinium-based agents are used to evaluate blood-brain barrier disruption, providing a morphological "map" to compare against the functional ADC map.

DWI Parameters and ADC Mapping

The study employs specific b-values (0 and 1000 s/mm^2). The $b=0$ image acts as a baseline (similar to a $T2$ image), while the $b=1000$ image provides the diffusion-weighted information.

The scanner’s software automatically generates the ADC map, which is a pixel-by-pixel calculation of the magnitude of diffusion. This map is vital because it removes the "T2 shine-through" effect, ensuring that the "darkness" seen on an ADC map truly represents restricted diffusion rather than just a very bright $T2$ signal.

Image Analysis and ROI Placement

The analysis phase involves both qualitative and quantitative assessments. Radiologists evaluate the lesion's morphology, borders, and signal intensity across all sequences. However, the most critical step is the Quantitative ADC Measurement.

To ensure accuracy, Regions of Interest (ROI) are manually placed on the ADC maps. The methodology dictates that ROIs must be

placed over the solid, most representative portion of the lesion. Researchers must carefully avoid:

1. Haemorrhage: Blood products can artificially lower ADC values.
2. Calcification: Solid bone-like density lacks water molecules, skewing results.
3. Cystic/Necrotic Areas: These areas show "facilitated" diffusion (high ADC), which would dilute the reading of the active, cellular tumour component.

By averaging multiple ROI measurements, the study generates a "Mean ADC" for each lesion, providing a numerical value that can be compared across different patients.

Statistical Analysis and Gold Standard Correlation

The final step is the correlation of imaging data with the "Gold Standard"—usually histopathological diagnosis from a biopsy or surgical resection.

Statistical tools, such as the student's t-test or ANOVA, are used to compare the mean ADC values of different lesion types (e.g., comparing the mean ADC of a Grade II Glioma vs. a Grade IV Glioblastoma). Furthermore, Receiver Operating Characteristic (ROC) curves may be utilized to determine the "cutoff" ADC value that best differentiates benign from malignant lesions. This statistical rigor transforms subjective visual interpretation into an objective, evidence-based diagnostic tool.

Results

The results of this study underscore the transformative impact of 3T MRI technology on neuro-radiological assessment. By synthesizing demographic data, conventional imaging, and quantitative diffusion metrics, the findings provide a clear blueprint for differentiating complex intracranial pathologies that often appear identical on standard anatomical scans.

Demographic and Conventional Baseline

The patient cohort reflected a classic clinical distribution, with a **middle-aged demographic** and a slight **male predominance**, aligning with the global epidemiological trends for primary brain tumors and cerebrovascular events. On conventional sequences ($T1$, $T2$, and FLAIR), most lesions followed a non-specific pattern: hypointense on $T1$ and hyperintense on $T2$. While ring enhancement was a frequent finding, it proved to be a diagnostic "bottleneck," appearing in abscesses, metastases, and high-grade gliomas alike. This confirmed the necessity for the functional data provided by DWI.

The Diagnostic Power of Diffusion Restriction

The most significant results emerged from the **Diffusion-Weighted Imaging (DWI)** and **ADC mapping**. The study successfully quantified the "cellular packing" of lesions:

- **Acute Infarcts:** These displayed the most dramatic diffusion restriction. The rapid shift of water into cells (cytotoxic edema) served as a physiological marker, allowing for definitive diagnosis even when $T2$ weighted images appeared normal.
- **The Abscess vs. Tumor Paradox:** One of the most critical results was the differentiation of ring-enhancing masses. **Pyogenic abscesses** consistently showed central restricted diffusion with very low ADC values ($<0.9 \times 10^{-3} mm^2/s$) due to the viscosity of pus. Conversely, the necrotic cores of **High-Grade Gliomas (HGG)** and metastases showed facilitated diffusion (high ADC), as the liquefied tissue allowed for free water movement.

Quantitative Grading and Tissue Characterization

The study found a statistically significant inverse correlation between **tumor grade and ADC values**.

- **High-Grade Gliomas and Lymphomas:** Due to their high nuclear-to-cytoplasmic ratio and dense cellularity, these lesions significantly impeded water movement, resulting in low ADC values.
- **Low-Grade Gliomas:** These exhibited higher ADC values, reflecting a less "crowded" microenvironment.

This suggests that ADC values can serve as a reliable non-invasive surrogate for histopathological grading, helping clinicians distinguish between a Grade II and a Grade IV glioma before the patient ever reaches the operating table.

Differentiating Cystic Lesions

The results also provided a definitive solution for extra-axial cystic lesions. **Epidermoid cysts**, despite appearing fluid-filled on $T2$, showed intense restriction on DWI (low ADC) due to their solid keratinaceous content. This stood in stark contrast to **Arachnoid cysts**, which followed CSF signal characteristics and showed completely free diffusion (high ADC).

Comparative ADC Patterns

Lesion Type	DWI Signal	ADC Value Trend	Clinical Interpretation
Acute Infarct	Hyperintense	Very Low	Cytotoxic Edema
Pyogenic Abscess	Hyperintense	Low	Viscous Pus/Inflammation
HGG / Lymphoma	Hyperintense	Low	High Cellularity

Lesion Type	DWI Signal	ADC Value Trend	Clinical Interpretation
Low-Grade Glioma	Iso/Hypointense	High	Low Cellularity
Epidermoid Cyst	Hyperintense	Low	Solid Keratin
Arachnoid Cyst	Hypointense	Very High	Simple Fluid (CSF)

Ultimately, the results demonstrate that 3T DWI/ADC mapping provides a level of specificity that conventional MRI cannot match. By adding a quantitative layer to visual inspection, the study confirms that ADC values are essential for the accurate, non-invasive characterization of intracranial lesions.

Discussion- The Clinical Impact of 3T Diffusion-Weighted Imaging

The results of this study reinforce the paradigm shift in neuroradiology from purely morphological assessment to **functional tissue characterization**. While conventional 3T MRI sequences provide exquisite anatomical detail, they often fail to capture the underlying pathophysiology of a lesion. The inclusion of **Diffusion-Weighted Imaging (DWI)** and **Apparent Diffusion Coefficient (ADC)** mapping addresses this limitation by providing a window into the microscopic movement of water molecules, which serves as a proxy for tissue microstructure.

The Pathophysiology of Diffusion Restriction

The core of the discussion revolves around why certain lesions "restrict" diffusion. In the case of **acute ischemic stroke**, the study confirmed that DWI is the most sensitive sequence for early detection. The mechanism is rooted in the failure of the ATP-dependent sodium-potassium pump, leading to an influx of water into the intracellular compartment (**cytotoxic edema**). Because water movement is more restricted inside the cell than in the extracellular space, the ADC value drops precipitously. This change occurs within minutes, long before vasogenic edema makes the stroke visible on $T2$ or FLAIR sequences.

Differentiation of Ring-Enhancing Lesions: A Diagnostic Milestone

One of the most clinically significant findings in this study is the ability of DWI to differentiate **pyogenic abscesses** from **necrotic tumors**. In conventional imaging, both appear as mass lesions with peripheral enhancement. However, the internal milieu of an abscess is composed of a "thick" cocktail of inflammatory cells, bacteria, and proteinaceous debris. This high viscosity severely hinders water diffusion, leading to a "bright" signal on DWI and a "dark" signal on ADC.

In contrast, the necrotic center of a high-grade glioma or a metastasis represents liquefied tissue where cell membranes have broken down, allowing water to move relatively freely (**facilitated diffusion**). By utilizing quantitative ADC thresholds, the radiologist can move beyond a differential list and provide a definitive diagnosis, which is critical because the treatment for an abscess (drainage and antibiotics) differs fundamentally from that of a tumor (resection and oncology).

Tumor Grading: The "Virtual Biopsy"

The inverse correlation between **ADC values and tumor cellularity** remains one of the most robust findings in neuro-oncology. As tumor grade increases—from a low-grade pilocytic astrocytoma to a high-grade Glioblastoma—the cells become more densely packed, the nuclear-to-cytoplasmic ratio increases, and the extracellular space shrinks.

This study demonstrated that ADC values can act as a **non-invasive biomarker** for tumor grading. High-grade gliomas and lymphomas consistently showed lower mean ADC values compared to low-grade gliomas. This has profound implications for surgical planning; by identifying "hotspots" of low ADC within a heterogeneous tumor, surgeons can target the most aggressive areas for biopsy, ensuring that the pathological grade is not underestimated due to sampling error.

Clarifying Cystic and Extra-axial Lesions

The study also highlights the utility of DWI in clarifying the nature of cystic lesions. **Epidermoid cysts** and **arachnoid cysts** often appear identical on $T1$ and $T2$ weighted images. However, the keratinaceous content of an epidermoid cyst acts as a physical barrier to water diffusion, causing it to "light up" on DWI. Arachnoid cysts, which contain simple cerebrospinal fluid (CSF), show no such restriction. This distinction is vital for surgical planning, as epidermoid cysts are adherent to cranial nerves and vessels, requiring a different surgical approach than the simple fenestration used for arachnoid cysts.

The 3T Advantage and Inherent Limitations

The transition to **3-Tesla (3T) MRI** systems played a pivotal role in these findings. The higher magnetic field strength provides a higher signal-to-noise ratio (SNR), which allows for:

- Thinner slices and higher spatial resolution.
- Better visualization of small lesions in the posterior fossa.
- More accurate ROI (Region of Interest) placement for ADC quantification.

However, the discussion must also acknowledge the limitations. **Susceptibility artifacts**—distortions caused by the interface of bone, air, and tissue—are more pronounced at 3T. This can occasionally "mask" lesions near the skull base or paranasal sinuses. Additionally, while ADC values are a powerful tool, there

is an **overlap** in values between certain tumor subtypes (e.g., some metastases may mimic high-grade gliomas). Therefore, ADC values should never be interpreted in isolation but rather as part of a multiparametric approach including perfusion imaging and MR spectroscopy.

Conclusion

Diffusion-weighted imaging and ADC mapping provide significant additional diagnostic information in the evaluation of intracranial lesions.

Key conclusions include:

1. DWI is highly sensitive in detecting acute ischemic infarcts.
2. ADC values correlate inversely with lesion cellularity and tumor grade.
3. DWI effectively differentiates pyogenic abscesses from necrotic tumors.
4. Epidermoid cysts can be reliably distinguished from arachnoid cysts using DWI.
5. DWI serves as a valuable non-invasive adjunct to conventional MRI sequences.
6. Integration of DWI and ADC mapping into routine MRI brain protocols improves diagnostic confidence and patient management.

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Conflict of Interest

The authors declare no conflict of interest.

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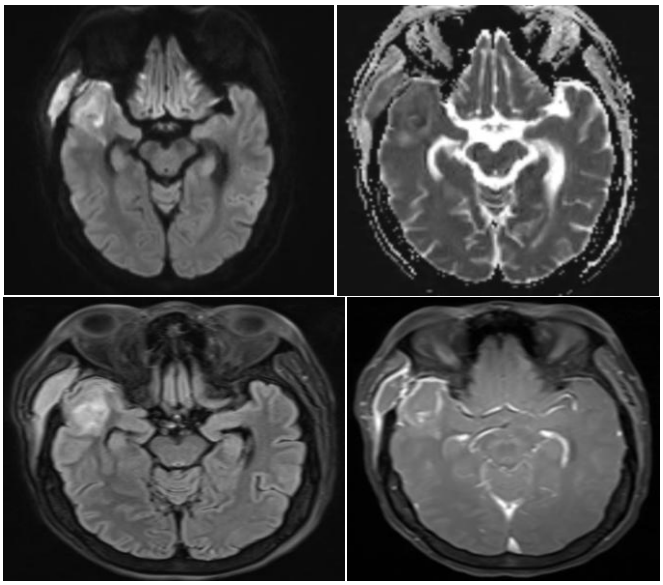
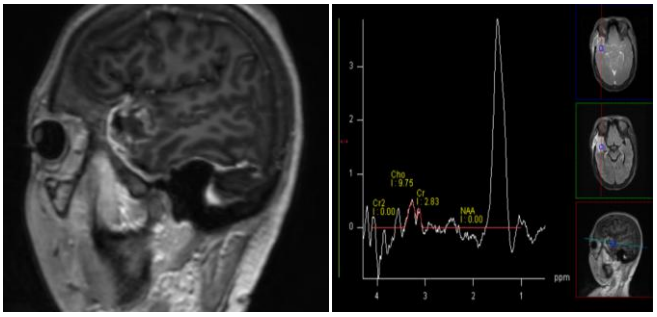
Representative Cases

Pyogenic Abscess

CASE 1) 35 Year female with h/o altered sensorium and fever for 1 day, h/o cough in the past 15 days. No h/o head injury, seizures. Patient is Koc HTN and DM, on medication. Koc hyperthyroidism.



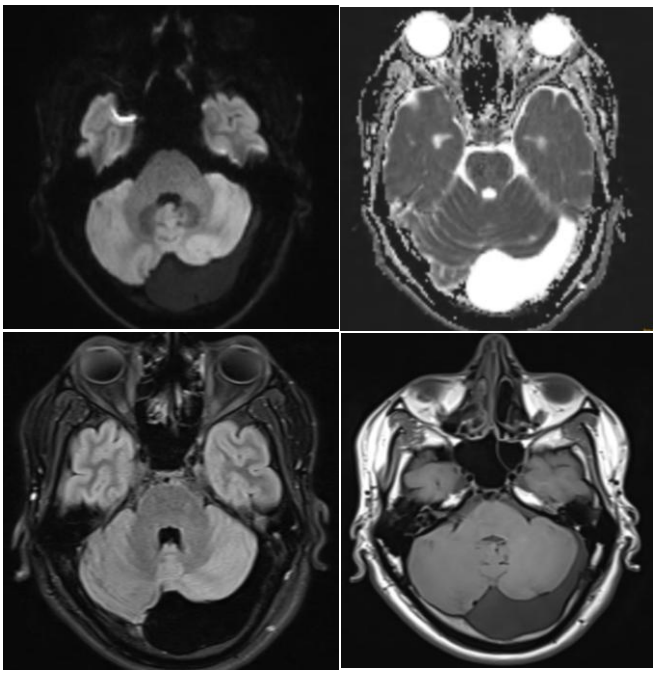


- intraxial ill-defined lesion of noted in right temporal lobe which shows central T1 hypointensity, T2/FLAIR hyperintensity, restricted diffusion, and peripheral ring-like contrast enhancement.
- Surrounding vasogenic edema with mild mass effect and sulcal effacement.

1. MR Spectroscopy: Demonstrates markedly reduced normal metabolites (NAA, Cho, Cr) with a prominent lipid-lactate peak (1–2 ppm), consistent with a pyogenic abscess spectrum.

Arachnoid Cyst

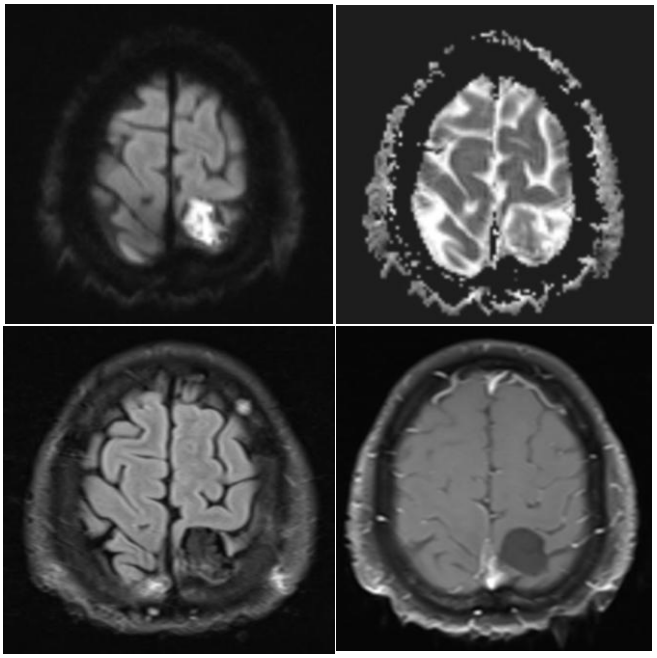
CASE 2) C/o Headache for 3 years. Character: Diffuse, non-localized. Not a/w dizziness, weakness, vomiting, or fever. No h/o trauma or falls. No h/o TB, COVID, HTN, or DM. Social Hx: No h/o addiction.



- A well-defined extra-axial thin-walled CSF intensity cystic lesion of approx. size 3.3x7.7x3.7 cm noted in left retro-cerebellar region displacing cerebellum anteriorly and causing scalloping of occipital bone. No diffusion restriction on DWI. No e/o blooming on SWI. These features likely suggestive of arachnoid cyst.

Epidermoid Cyst

CASE 3) C/o headache in the last 3 months. No h/o head trauma/fever/giddiness/neck stiffness. No h/o convulsions/weakness. No h/o blurring of vision. No h/o DM/HTN/TB/thyroid disorders. Sr creatinine – 1.12 mg/dl. Previous MRI (6/12/2024) – Benign lesion in left high parietal region likely epidermoid cyst.

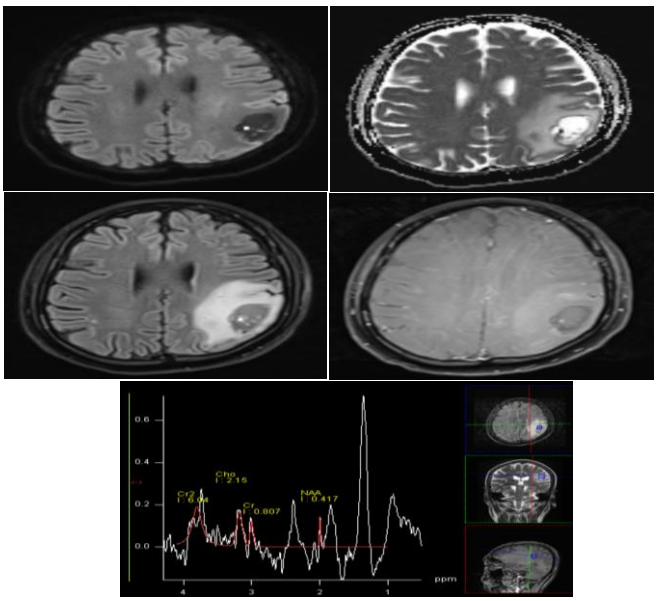


- A well-defined broad based extra-axial altered signal intensity lesion noted in left high parietal lobe.
  - It appears hypointense on T1, hyperintense on T2, shows incomplete suppression on FLAIR, shows diffusion restriction on DWI with corresponding intermediate signal on ADC, does not show blooming on SWI.
  - Medially the lesion is seen abutting the superior sagittal sinus, however there is no filling defect noted within the sinus in current scan.
  - No enhancement is seen on post-contrast study.
  - No perilesional oedema / adjacent sulco-gyral effacement noted.

<u>These imaging features suggestive of benign lesion – likely epidermoid cyst.</u>

Glioma

CASE 4) K/c/o seizure disorder/CLD/portal HTN/old CVE. Seizure disorder for 1.5 months on treatment. Patient has history of altered sensorium,2 episodes of facial twitching over right side on 29/12/25 and weakness of body.

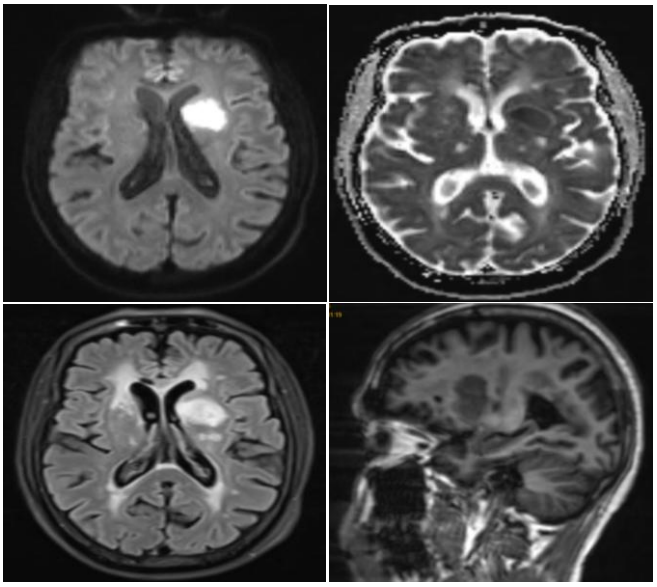


- There is well-defined intraxial altered signal intensity lesion noted involving cortex-subcortical white matter of left parietal lobe. It shows mass effect in the form of effacement of adjacent sulcal spaces, effacement of body of left lateral ventricle and significant adjoining perilesional edema. No evidence of any midline shift noted.
    - This lesion appears hypointense on T1WI, hyperintense of T2 WI, with incomplete signal suppression on FLAIR (T2FLAIR mismatch sign). There are few foci of diffusion restriction on DWI seen within the lesion. Lesion does not show postcontrast enhancement. There is peripheral blooming on SWI with corresponding PHASE hyperintensity suggesting hemosiderin staining.
    - On single and multivoxel MR spectroscopy, there is lipid-lactate peak at 1.3 ppm, decreased NAA value and increased Choline/Creatinine ratio (1.2).

These imaging features suggestive of primary CNS neoplastic etiology, - Glioma/ astrocytoma (high grade).

Acute Infract

CASE 5) h /o weakness in Rt Lower Limb since 7–8 yrs, difficulty walking & lifting leg since 9–10 yrs, pain in Left Upper limb. No h/o HTN/DM/TB/COVID. h/o alcohol intake ×9–10 yrs (stopped now**).** History of fall at home 1 week back.



- There is an altered signal intensity area noted involving head of left caudate nucleus, putamen, globus pallidus and anterior limb of left internal capsule.
    - Which appears hypointense on T1WI, hyperintense on T2WI/FLAIR.
    - Showing diffusion restriction in DWI with corresponding low values on ADC.

Above imaging features suggestive of acute non-haemorrhagic infarct most likely in the territory of the lenticulostriate arteries (branch of the MCA).