Volume 10, Issue 3, March– 2025 International Journal of Innovative Science and Research Technology
ISSN No:-2456-2165 https://doi.org/10.38124/ijisrt/25mar478

Ring-Enhancing Cystic Lesions: Infectious Mimicry of High-Grade Brain Tumors – A Neuroradiological Perspective

Dr. Sahithy Kakkireni[1]; Dr. Pradeepgoud H Patil[2]; Dr. Virupaxi Hattiholi[3]

[1]Author, [2,3]Co Author

[1,2,3] KLES Dr. Prabhakar Kore Hospital & Medical Research Centre

Publication Date: 2025/03/21

Abstract: Ring-enhancing cystic brain lesions are often associated with infectious diseases such as neurocysticercosis (NCC) or fungal infections. However, in some cases, these lesions mimic high-grade neoplasms such as glioblastoma (GBM) or metastatic tumors. This article presents two cases in which patients were initially diagnosed with infectious brain lesions based on imaging findings, but histopathological analysis confirmed malignant tumors. Through a detailed discussion of advanced imaging techniques and diagnostic pitfalls, this study emphasizes the critical role of histopathological confirmation in differentiating infectious from neoplastic brain lesions.

Keywords: *Ring-Enhancing Lesions, Neurocysticercosis, Glioblastoma, Metastatic Adenocarcinoma, Advanced Neuroimaging, Histopathology, SWI, Spectroscopy, DSC Perfusion MRI, Arterial Spin Labeling.*

How to Cite: Dr. Sahithy Kakkireni Dr. Pradeepgoud H Patil; Dr. Virupaxi Hattiholi (2025). Ring-Enhancing Cystic Lesions: Infectious Mimicry of High-Grade Brain Tumors – A Neuroradiological Perspective. *International Journal of Innovative Science and Research Technology,* 10(3), 536-541. https://doi.org/10.38124/ijisrt/25mar478

I. INTRODUCTION

Ring-enhancing lesions are a common finding in neuroradiology and pose significant diagnostic challenges. While infections such as NCC and tuberculomas often present with similar imaging characteristics, neoplastic conditions, including GBM and metastatic lesions, must always be considered in the differential diagnosis. This article highlights two cases where neuroradiological imaging initially suggested an infectious process, leading to a diagnostic delay until histopathological confirmation of malignancy was obtained. The discussion underscores the importance of advanced imaging modalities such as MR spectroscopy (MRS), diffusion-weighted imaging (DWI), and susceptibility-weighted imaging (SWI) in guiding differential diagnoses.

➢ *Case 1: Metastatic Adenocarcinoma Mimicking Neurocysticercosis Clinical History:*

A 55-year-old male presented with a three-month history of left-sided hemiparesis and slurred speech. There was no history of seizures, fever, or loss of consciousness. The patient had no significant past medical or travel history.

➢ *MRI Findings:*

- Well-defined intra-axial cystic lesion in the right parietal region
- Peripheral rim enhancement with a T2 & FLAIR hyperintense center
- Thin, hypointense rim on T1 and T2-weighted images, resembling the capsule of an NCC lesion
- Significant surrounding vasogenic edema
- No restricted diffusion on DWI
- No peripheral calcifications, but the imaging appearance was highly suggestive of NCC

➢ *Magnetic Resonance Spectroscopy (MRS) Findings:*

- Amino acid peak at 0.9 ppm, often seen in degenerating cystic lesions, consistent with NCC
- Lactate peak at 1.3 ppm, which can be present in infections or tumors
- No increased relative cerebral blood volume (rCBV) on arterial spin labeling (ASL), reducing suspicion of high-grade tumor

- *Initial Diagnosis (Based on Imaging):*

- Primary Suspicion: Neurocysticercosis (NCC)
- Differentials Considered: Tuberculoma, metastasis

ISSN No:-2456-2165 https://doi.org/10.38124/ijisrt/25mar478

➢ *Histopathology & Final Diagnosis:*

- Malignant epithelial neoplasm with glandular and papillary differentiation
- Pleomorphic hyperchromatic nuclei with brisk mitotic activity and inflammatory infiltration
- Immunohistochemistry: CK7-positive, CK20-negative, TTF1 weakly positive
- Final Diagnosis: Metastatic adenocarcinoma, right parietal region

- *Mri Plain and Contrast Images*

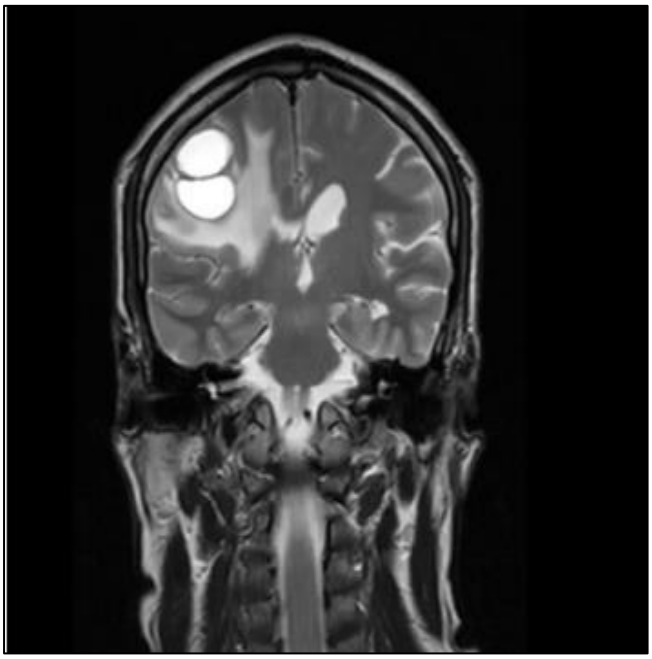

Fig 1 T2W Coronal

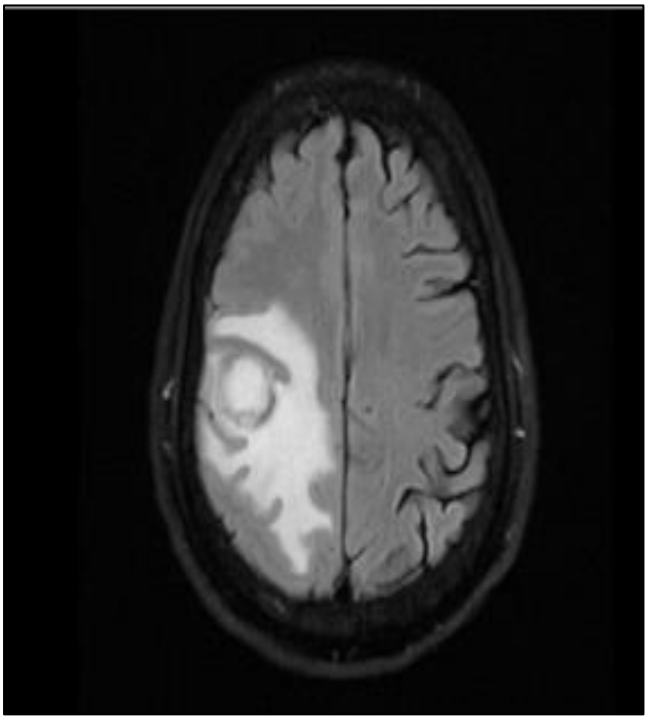

Fig 2 Flair Axial

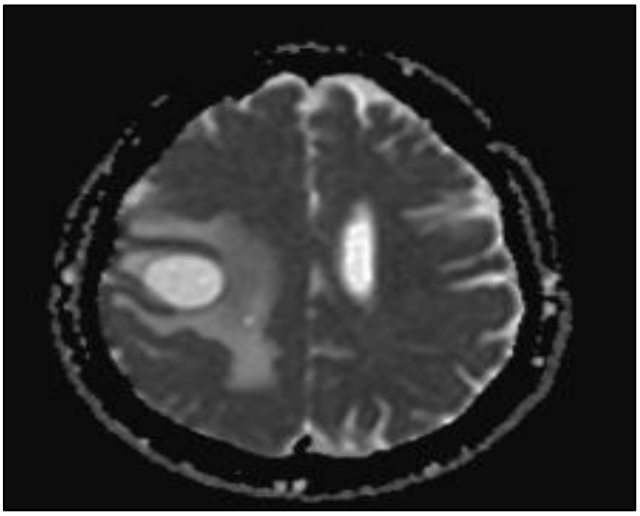

Fig 3 ADC

Intraaxial conglomerated peripherally enhancing T2 & FLAIR hyperintense and T1 hypointense cystic lesion with peripheral T1 & T2 hypointense rim in the right parietal region with significant adjacent vasogenic edema

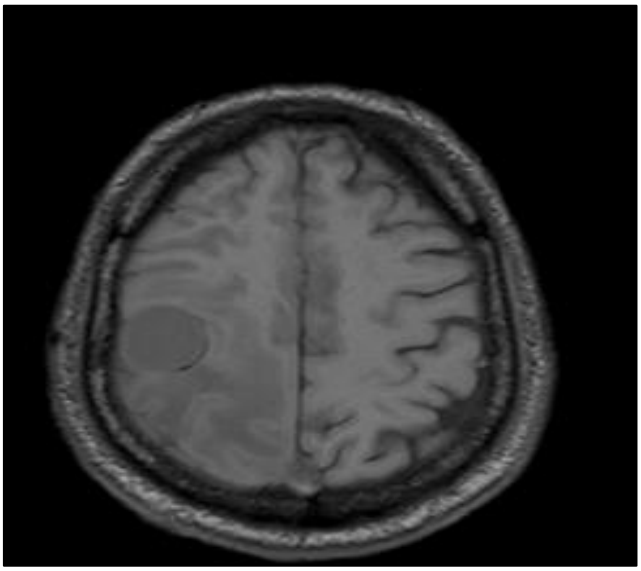

Fig 4 T1W Axial

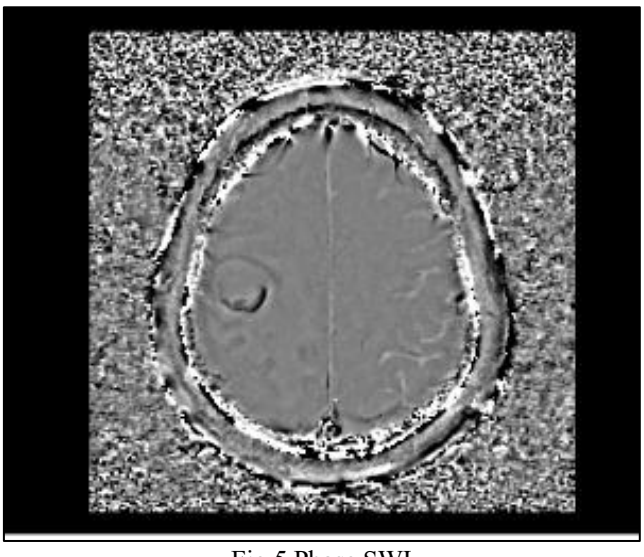

Fig 5 Phase SWI

ISSN No:-2456-2165 https://doi.org/10.38124/ijisrt/25mar478

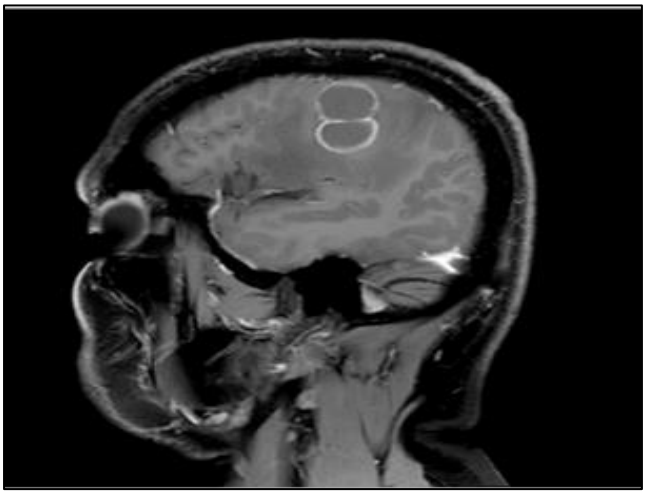

Fig 6 T1WPC

- *Case 2: Glioblastoma Initially Diagnosed as Neurocysticercosis Clinical History:*

A 50-year-old female, a known case of hypertension and diabetes mellitus, presented with sudden-onset left-sided weakness.

➢ *MRI FINDINGS:*

- T2 hyperintense, T1 & FLAIR hypointense conglomerated ring-enhancing lesion in the right high fronto-parietal region with significant perilesional edema
- No lipid-lactate peak on MR spectroscopy

➢ *Initial Diagnosis:*

- Neurocysticercosis (NCC)

➢ *Follow-Up Imaging (One Month Later):*

- Interval increase in perilesional edema
- Intralesional hemorrhage with blooming on SWI, suggestive of hemorrhage
- No choline peak noted in the periphery of the lesion

➢ *Histopathology & Final Diagnosis:*

- Diffusely infiltrating high-grade glial neoplasm with astrocytic differentiation
- Brisk mitosis, microvascular proliferation, and geographic necrosis
- Immunohistochemistry: OLIG2-positive, IDH1-negative, ATRX-retained, p53-positive, Ki-67 labeling index 20-22%
- Final Diagnosis: Glioblastoma, NOS, CNS WHO grade 4, right frontal region

➢ *First Scan :*

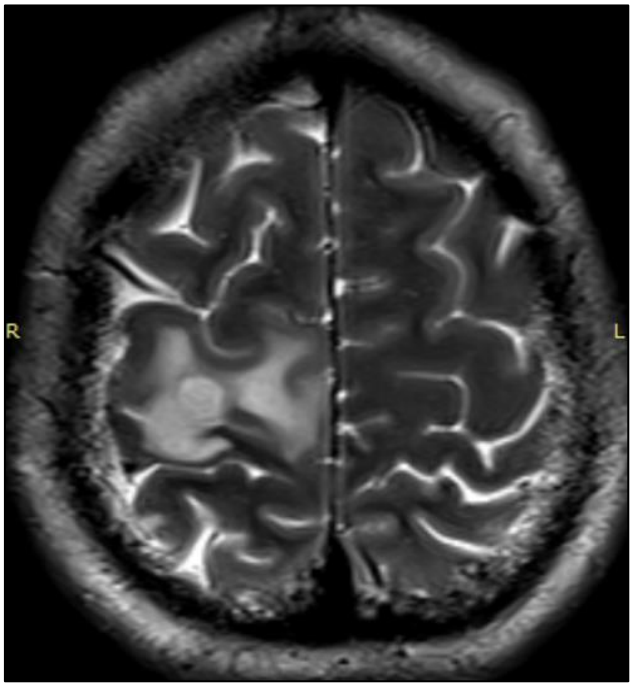

Fig 7 T2W Coronal

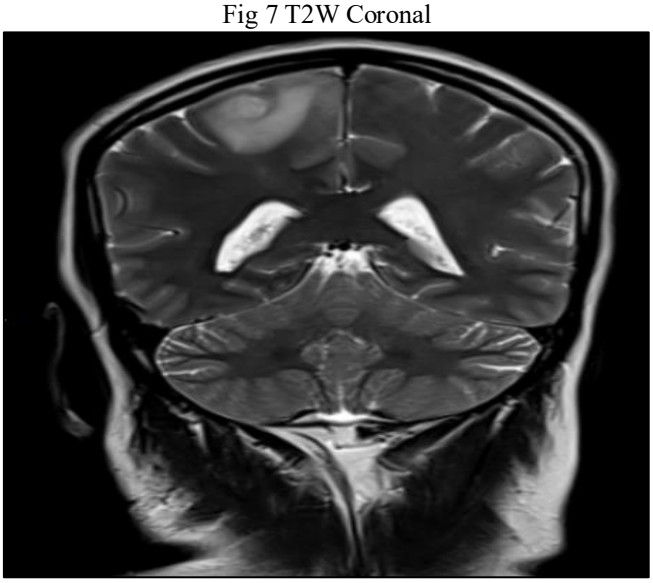

Fig 8 T2W Axial

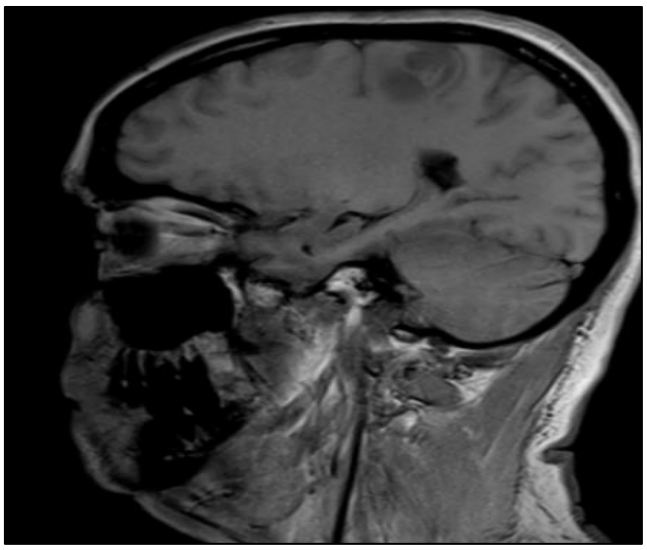

Fig 9 T1W Sagittal

ISSN No:-2456-2165 https://doi.org/10.38124/ijisrt/25mar478

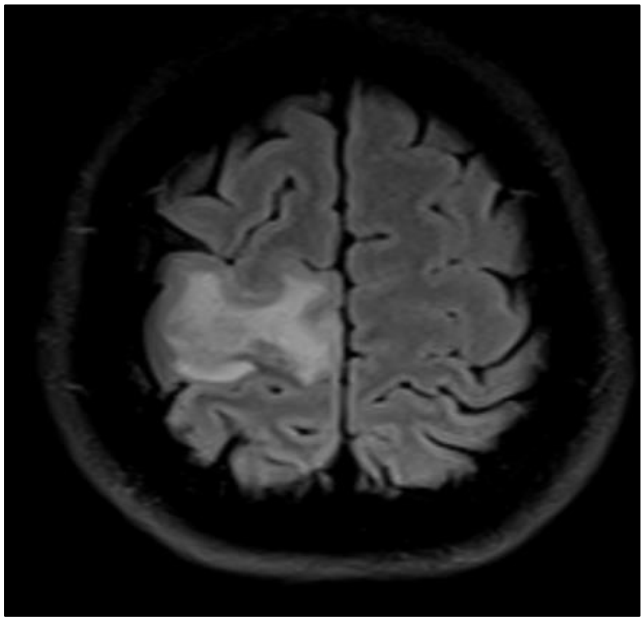

Fig 10 Flair Axial

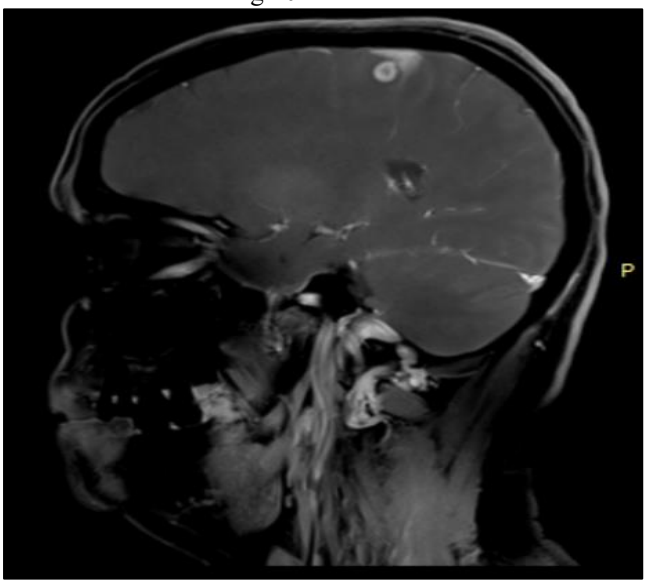

Fig 11 PCT1W Sagittal

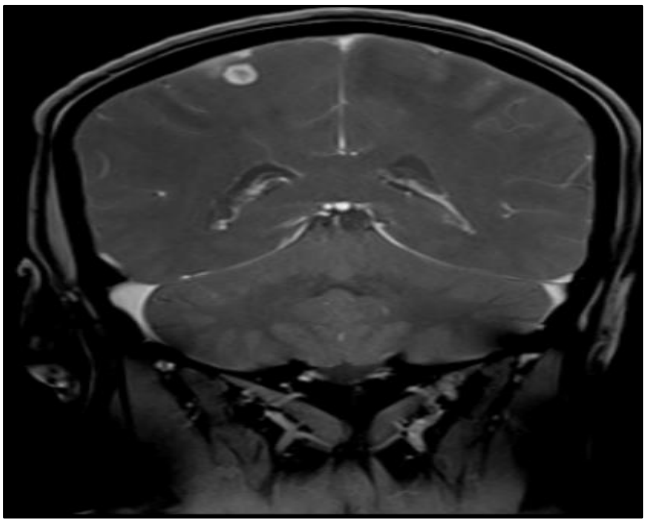

Fig 12 PCT1W Coronal

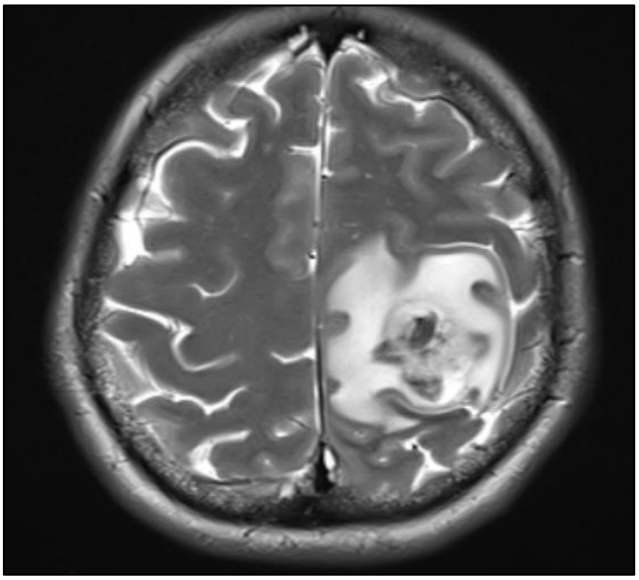

Fig 13 T2W Axial

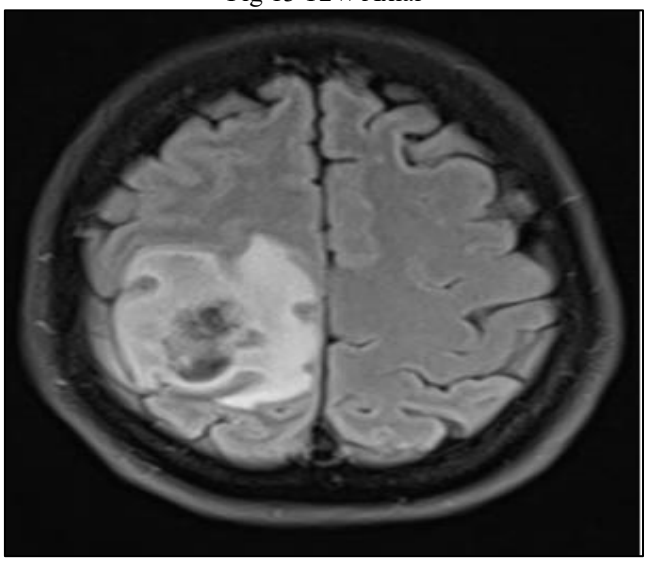

Fig 14 Flair Axial

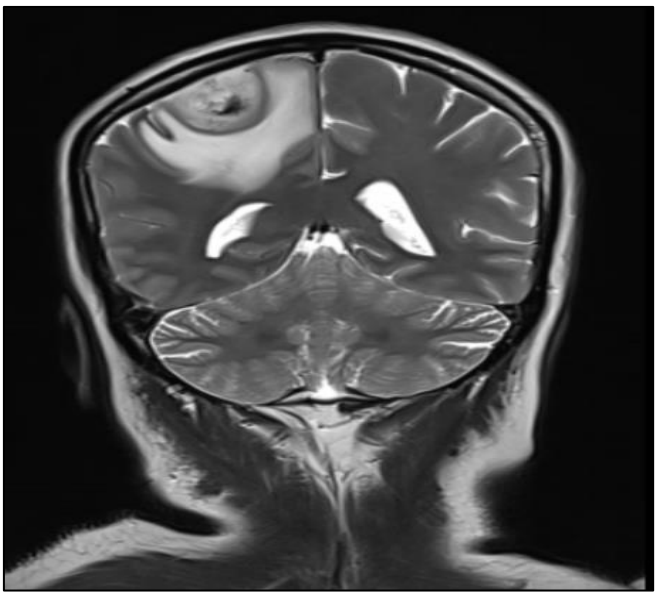

Fig 15 T2W Coronal

- *Same Patient After One Month ,*

ISSN No:-2456-2165 https://doi.org/10.38124/ijisrt/25mar478

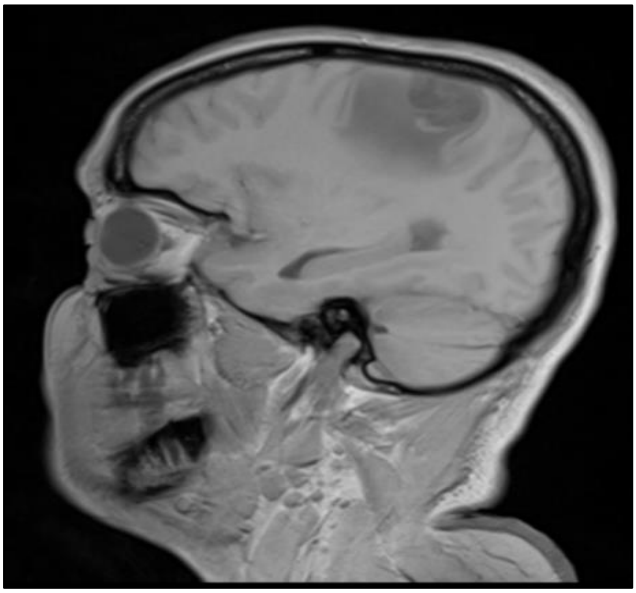
Fig 16 T1W Sagittal

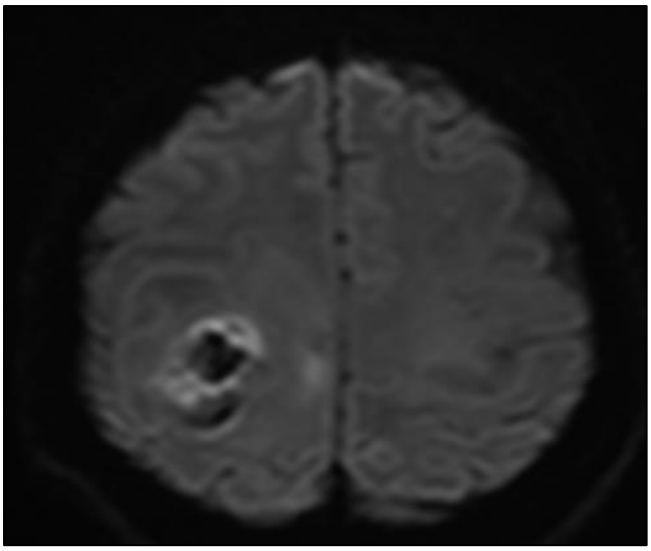
Fig 17 DWI

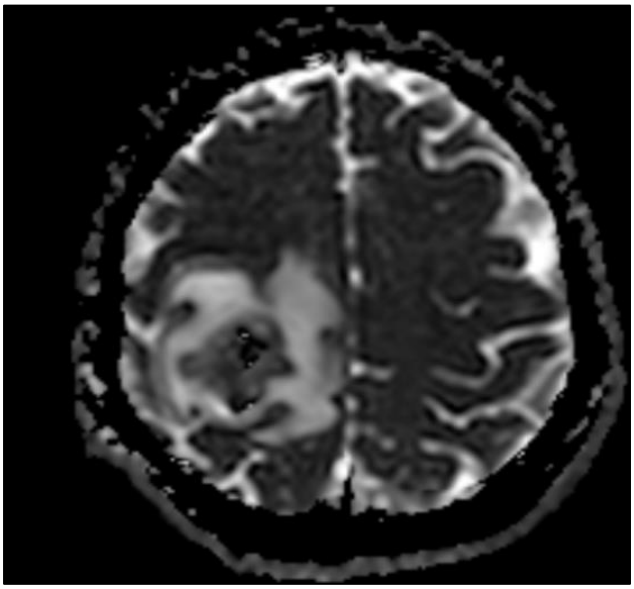
Fig 18 ADC

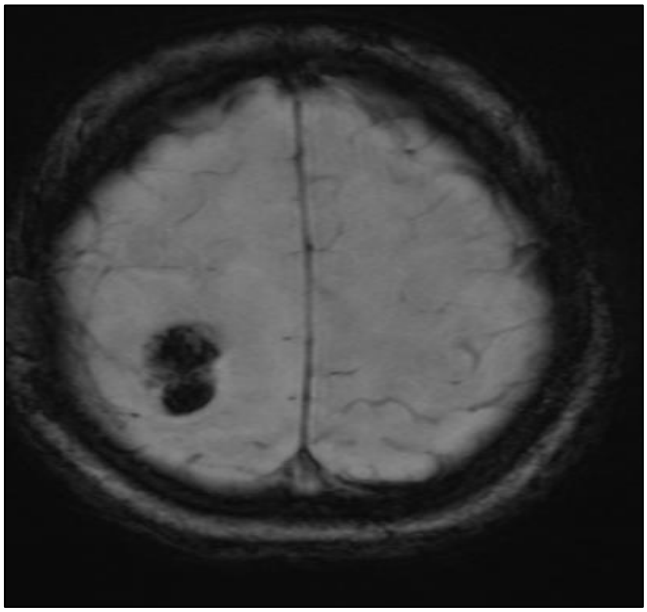
Fig 19 SWI

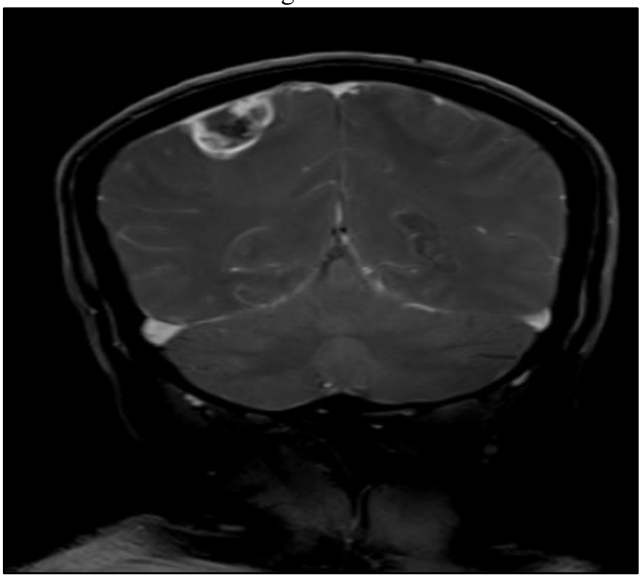
Fig 20 T1PC Coronal

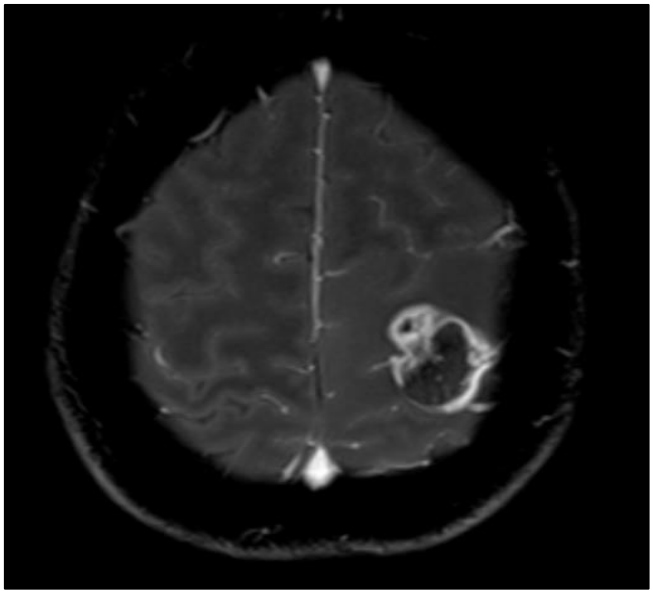
Fig 21 T1PC Axial

ISSN No:-2456-2165 https://doi.org/10.38124/ijisrt/25mar478

II. DISCUSSION

Differentiating between infectious and neoplastic ring-enhancing cystic brain lesions remains a diagnostic challenge for radiologists. While conventional MRI findings are helpful, they may not always be definitive, necessitating the use of advanced imaging techniques:

- Spectroscopy Considerations: The absence of a lipid-lactate peak initially suggested an infectious etiology, but it did not rule out malignancy. Conversely, lactate can be present in both infections and tumors, making differentiation difficult.
- Perfusion Imaging: Dynamic susceptibility contrast (DSC) perfusion MRI can help distinguish high-grade tumors from infections by assessing relative cerebral blood volume (rCBV). Higher rCBV suggests neoplastic angiogenesis, as seen in GBM.
- DWI and SWI Utility: Restricted diffusion is often associated with bacterial abscesses but may also be seen in necrotic tumors. The presence of intralesional hemorrhage on SWI, as noted in Case 2, should raise suspicion for malignancy.

Given the potential for misdiagnosis, radiologists must maintain a high index of suspicion in cases with atypical imaging features or when clinical deterioration occurs despite appropriate antimicrobial therapy.

III. CONCLUSION

Ring-enhancing cystic brain lesions can closely mimic infectious diseases, leading to potential misdiagnoses and delays in appropriate treatment. While advanced MRI techniques such as spectroscopy, perfusion imaging, and SWI can provide valuable diagnostic insights, they do not replace histopathological confirmation. Radiologists must carefully evaluate all available imaging modalities and advocate for biopsy in cases with uncertain etiology to ensure timely and accurate management.

REFERENCES

[1]. Osborn, A. G. (2017). Osborn's Brain: Imaging, Pathology, and Anatomy. Elsevier.
[2]. Kim, J. H., et al. (2018). Advanced MR imaging in the differentiation of brain abscesses and cystic or necrotic brain tumors. Neuroimaging Clinics of North America, 28(4), 567-582.
[3]. Hakyemez, B., et al. (2006). High-grade and low-grade gliomas: Differentiation by using perfusion MR imaging. Clinical Radiology, 61(11), 907-920.
[4]. Gupta, R. K., et al. (2001). Differentiation of tuberculomas from neurocysticercosis using proton MR spectroscopy. AJNR American Journal of Neuroradiology, 22(8), 1593-1599.
[5]. Lummel, N., et al. (2011). Diffusion-weighted MR imaging in ring-enhancing brain lesions: The role of ADC values and histopathologic findings. AJNR American Journal of Neuroradiology, 32(9), 1632-1638.