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Original Research Article

ROLE OF MAGNETIC RESONANCE IMAGING AND MAGNETIC RESONANCE SPECTROSCOPY IN EVALUATION OF INFLAMMATORY AND NEOPLASTIC LESIONS OF BRAIN

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ABSTRACT

Background: MRI and MRS have demonstrated remarkable utility in characterizing brain lesions and differentiating between inflammatory and neoplastic processes. The objective is to determine the role of magnetic resonance imaging and magnetic resonance spectroscopy in the assessment of inflammatory and neoplastic lesions of the brain.
Materials and Methods: This hospital based observational study was conducted among Subjects with clinical neurological symptoms and referred to the Department of Radiodiagnosis for MR brain imaging in PESIMSR, KUPPAM and found inflammatory and neoplastic lesions in MRI brain. Study period was 18 months (Sep 2022 – Feb 2024).
Results: MRI with MRS is the most sensitive modality in the characterization of intracranial neoplastic and inflammatory lesion and in differentiating neoplastic from neoplastic looking lesions–RELs. MRI alone has sensitivity of 74 % and 66 % in neoplastic and inflammatory lesion respectively when combined with MRS sensitivity is upto 81% and 86% in neoplastic and inflammatory lesion respectively. On T1 weighted sequence in 67% of cases the lesions were hypointense in both neoplastic and inflammatory lesions and the remaining (27.5%) shows iso/mixed/hyperintense signal. On T2 weighted sequence, 78%of neoplastic and 67% of inflammatory lesions are hyperintense. On DWI, restricted diffusion is seen in 74% of cases with neoplastic lesion. Expect NCC all other inflammatory lesions show diffusion restriction in upto 60 to 75 % of cases and NCC shows no diffusion restriction in all cases.
Conclusion: The integration of MRS with routine imaging, rather than relying solely on these studies, enhances diagnostic yield, eliminates the need for unnecessary biopsies, and aids clinicians in immediate management. This conclusion aligns with the findings of our research work.
Keywords: Magnetic Resonance Imaging, Magnetic Resonance Spectroscopy, Inflammatory, Neoplastic Lesions, Brain.

INTRODUCTION

Magnetic Resonance Imaging (MRI), with its exquisite anatomical detail and non- invasive nature, serves as a cornerstone in this diagnostic imaging of brain. However, the inherent limitations of conventional MRI in definitively differentiating between inflammatory and neoplastic lesions necessitate the exploration of complementary techniques that probe deeper into the biochemical fingerprints of these entities. This is where Magnetic Resonance Spectroscopy (MRS) emerges as a powerful ally, offering a unique window into the metabolic landscape of brain lesions, thereby enhancing diagnostic accuracy and paving the way for personalized patient management. Conventional

MRI, with its exquisite depiction of anatomical structures, provides invaluable information about the location, size, and morphology of brain lesions. T1-weighted, T2-weighted, and fluid-attenuated inversion recovery (FLAIR) sequences allow for visualization of edema, mass effect, and types of contrast enhancement that can offer clues about the underlying pathology. However, these features often overlap between inflammatory and neoplastic lesions, leading to diagnostic uncertainty. For instance, both high-grade gliomas and Brain abscesses may appear with ring enhancement on contrast-enhanced T1-weighted images, making differentiation based solely on conventional MRI features challenging.

Neoplastic lesions, characterized by uncontrolled cellular proliferation and increased membrane turnover, often exhibit elevated levels of choline-containing compounds. This elevation reflects the increased demand for phospholipid synthesis required for cell membrane production in rapidly dividing cells. Recent studies have repeatedly shown gliomas, meningiomas, and metastases are among the brain malignancies for which there is a correlation with higher choline levels.

Additionally, certain brain tumors may show increased levels of creatine, a marker of energy metabolism, as observed in studies published in "Cancer Research" and "Neuro-Oncology." Conversely, decreased levels of N-acetyl aspartate (NAA), a neuronal marker synthesized in healthy neurons, often indicate neuronal loss or dysfunction, a characteristic feature of neoplastic infiltration and destruction of brain tissue.[1,2]

Inflammatory lesions, in contrast, typically present with a distinct metabolic profile. Increased lactate levels, indicative of anaerobic metabolism associated with inflammation and hypoxia, are a hallmark of these lesions.

The integration of MRS with conventional MRI creates a powerful synergistic approach, providing a comprehensive picture that encompasses both anatomical detail and metabolic information. This multimodal approach significantly enhances diagnostic accuracy, particularly in cases where conventional MRI findings are inconclusive or ambiguous. For instance, differentiating between radiation necrosis, a potential complication of radiotherapy for brain tumors, and tumor recurrence can be challenging based on conventional MRI alone. However, MRS can aid in this differentiation by evaluating metabolite levels, with radiation necrosis typically exhibiting lower choline levels and higher lipid and lactate levels compared to tumor recurrence.[3]

In conclusion, the combined power of MRI and MRS offers a comprehensive approach to deciphering the complexities of brain lesions. While conventional MRI provides essential anatomical information, MRS unveils the metabolic fingerprints of these lesions, allowing for more accurate differentiation between inflammatory and neoplastic processes. This synergistic approach, supported by a wealth of research evidence, possesses the capacity to greatly influence patient care by facilitating accurate diagnoses, guiding treatment decisions, and monitoring treatment response, ultimately leading to improved neurological outcomes and enhanced quality of life for patients facing the challenges of brain lesions. As research in this field continues to evolve, we can anticipate further refinements and advancements in MRI and MRS techniques, paving the way for a more individualized and successful strategy to brain lesion management.[4,5]

MATERIALS AND METHODS

This hospital based observational study was conducted among Subjects with clinical neurological symptoms and referred to the Department of Radiodiagnosis for MR brain imaging in PESIMSR, KUPPAM and found inflammatory and neoplastic lesions in MRI brain. Study period was 18 months (Sep 2022 – Feb 2024)

Sampling Method: Purposive sampling

Sample Size: From total number of patients underwent MRI Brain with Inflammatory and neoplastic lesions during the study period of Sep 2022 – Feb 2024 sample size has been elected as 42 with precision of 10%.

Inclusion Criteria

-Patients undergoing MRI Brain with Inflammatory and neoplastic lesions.

- All age groups.

Exclusion Criteria

Patients underwent neurosurgery recently.

Patients with history of surgical metallic implants, pacemaker placement, aneurysm clipping and prosthetic valve implantation.

Patients with history of claustrophobia

Tools used in the study

- A proforma containing a set questionnaire.
- GE explore 1.5 Tesla MRI scanning machine used.
- Gadolinium contrast material and noninvasive Magnetic Resonance Spectroscopy sequence.

RESULTS

In our study, eleven cases (26 %) were less than 20 years old, four cases (10 %) were between 21 and 30 years old, eleven cases (26 %) were between 31 and 40 years old, five cases (12%) were between 41 and 50 years old, and six cases (14 %) were between 51 and 60 years old.

Among the 42 cases, a higher proportion were females, accounting for 22 cases (52%), while the remaining 20 cases (48%) were males.

In the present study, headache (79 %) and seizures (62%) are commonly seen symptoms, followed by vomiting (45%), fever (21%), ataxia (7%), altered sensorium (5%).

"In our study, we observed that 31% of the cases were located on the right side of the brain, while 36% were on the left side. Additionally, 19% of the cases were present on both sides, and a smaller proportion (5%) were found in the midline."

"In our study, 69% of the cases exhibited a single lesion, while 24% had between two and four lesions. A smaller proportion (7%) presented with more than four lesions."

In our study, we found that 17% of the lesions were smaller than 2 cm in size. Additionally, 52% of the lesions fell within the 2-4 cm range, while 31% were larger than 4 cm."

Table 1: Distribution of neoplastic and inflammatory brain lesions as per age separately:

Neoplastic brain lesions		
Age in years	**No of cases**	**Percentage**
>10	2	7
10-20	2	7
21-30	2	7
31-40	7	26
41-50	5	19
51-60	4	15
61-70	3	11
>70	2	7
Inflammatory brain lesions		
Age in years	**No of cases**	**Percentage**
>10	2	13
10-20	5	33
21-30	2	13
31-40	4	27
41-50	0	0
51-60	2	13
>61	0	0

Table 2: Number of lesions in a patient:

Lesion size	**No of lesions**	**Percentage**
<2 cm	7	17
02-04 cm	22	52
>4 cm	13	31

Distribution of cases according to T1w morphology

In our current study, when examining T1 -weighted imaging, we observed the following Patterns:80 % of tuberculomas appeared hypointense, while 20% were isointense.

For neurocysticercosis (NCC), 67% of cases exhibited hypo intensity, and 33% were isointense. Abscesses showed a balanced distribution, with 50% being hypointense and 50% isointense. Metastatic lesions leaned toward hypo intensity, with 60% displaying this characteristic, while 40% were isointense. Primary brain tumors were predominantly hypointense, accounting for 68% of cases. A smaller proportion (28 %) exhibited mixed or hyperintense signal.

Table 3: Distribution of cases according to T1w morphology

Pathology	**Total cases**	**Hypo Intense**		**ISO Intense**		**Mixed**		**Hyper intense**	
		No.	**%**	**No.**	**%**	**No.**	**%**	**No.**	**%**
Brain tumor	22	15	68	5	23	1	5	1	5
Neuro cysticercosis	6	4	67	2	33	0	0	0	0
Tuberculosis	5	4	80	1	20	0	0	0	0
Metastasis	5	3	60	2	40	0	0	0	0
Abscess	4	2	50	2	50	0	0	0	0
Neoplastic	27	18	67	7	26	0	0	0	0
Inflammatory	15	10	67	5	33	0	0	0	0

In our current study, when analyzing T2-weighted imaging, we made the following observations: Tuberculomas: 60% of cases appeared hypointense, while 40% exhibited hyperintensity.

Neurocysticercosis (NCC): 83% of cases showed hyperintensity, whereas 17% had mixed intensity. Abscesses: 75% of cases were hyperintense, and 25% displayed mixed intensity. Metastatic lesions: 40% were hyperintense, 40% had mixed intensity, and 20% were isointense.

Brain tumors: 86% of cases were hyperintense, 5% were isointense, 5% were hypointense, and 5% exhibited mixed intensity.

Table 4: Distribution of cases according to T2W

Pathology	Total Cases	Hypo Intense		Iso Intense		Mixed		Hyper Intense	
		No.	%	No.	%	No.	%	No.	%
Brain tumor	22	1	5	1	5	1	5	19	86
Neuro cysticercosis	6	0	0	0	0	1	17	5	83
Tuberculoma	5	3	60	0	0	0	0	2	40
Metastasis	5	0	0	1	20	2	40	2	40
Abscess	4	0	0	0	0	1	25	3	75
Neoplastic	27	1	4	2	7	3	11	21	78
Inflam matory	15	3	20	0	0	2	13	10	67

In the current study, diffusion-weighted imaging (DWI) revealed that 60% (3) of tuberculomas exhibited diffusion restriction, while 40% (2) did not show any restriction. Among the 6 cases of neurocysticercosis (NCC), none displayed diffusion restriction. For abscesses, 3 cases demonstrated true diffusion restriction, while one case did not exhibit restricted diffusion. Among metastatic lesions, 75% (3) showed restriction, whereas 25% (1) did not. Notably, 77% (17) of primary brain tumors exhibited diffusion restriction, while 23% (5) did not demonstrate restricted diffusion.

Table 5: Distribution of cases according to DWI

Pathology	Total	Restricted diffusion		No restricted diffusion	
		Number	Percentage	Number	Percentage
Brain tumor	22	17	77	5	23
Neuro cysticercosis	6	0	0	6	100
Tuberculosis	5	3	60	2	40
Metastasis	5	3	60	2	40
Abscess	4	3	75	1	25
Neoplastic	27	20	74	7	26
Inflammatory	15	6	40	9	60

In a study by Sachin L et al. (2018), out of 50 patients, 27(54%) of patients show diffusion restricting lesions (partial/complete) and 23(46%) of cases shows no diffusion restriction.

In a study by Patil et al. (2021), out of 50 patients, 26 patients (52%) showed diffusion restriction whereas 24 patients (48%) did not show any diffusion restriction on DWI.

List of metabolite peaks noted in various lesions

1. In the present study, Abscesses consistently exhibited a Lipid lactate peak.
2. Metastatic lesions demonstrated a Lip-lac peak in 60% of cases.
3. Tuberculoma patients universally displayed Lipid peaks.
4. Both primary neoplasms (68%) and metastatic lesions (60%) exhibited the Lip-lac peak.
5. Choline peaks and reduced NAA peaks were observed in all cases of primary brain tumors and metastatic lesions.
6. Notably, 83% of NCC cases and 60% of tuberculoma cases showed prominent choline peaks.

Table 6: List of metabolite peaksin various lesions

Pathology	Total	Choline		Reduced naa		Lip lac	
		No.	%	No.	%	No.	%
Brain tumor	22	22	100	15	68	15	68
Neuro cysticercosis	6	5	83	2	33	1	17
Tuberculosis	5	3	60	2	40	5	100
Metastasis	5	5	100	3	60	3	60
Abscess	4	0	0	1	25	4	100
Neoplastic lesions (primary brain tumors + metastasis	27	27	100	18	67	18	67

Metabolite Ratios in various Neoplastic and Inflammatory Lesion on MR spectroscopy: In the study, the average Cho/Cr and Cho/NAA ratios were higher in neoplastic lesions compared to abscesses and granulomas. However, the NAA/Cr ratio did not exhibit a consistent pattern between neoplastic and non-neoplastic lesions. Keep in mind that precise ratio values can vary based on factors like magnet strength, acquisition method, and echo time. Therefore, specific cutoff thresholds.

Table 7: Metabolite Ratios in various Neoplastic and Inflammatory Lesion on MR spectroscopy

Pathology	Total	Choline / CR		Cholin / naa		Naa / CR	
		MEAN	SD	MEAN	SD	MEAN	SD
Brain tumor	22	3.25	0.43	2.9	0.36	1.9	0.25
Neuro cysticercosis	6	1.05	0.18	1.2	0.2	1.08	0.16
Tuberculosis	5	1.34	0.17	1.14	0.22	1.6	0.3
Metastasis	5	2.98	0.36	1.96	0.15	1.38	0.28
Abscess	4	1.75	0.18	1.5	0.07	1.37	0.25

Comparision of MRI and MRI+ MRS: When evaluating various inflammatory and neoplastic lesions, combining magnetic resonance imaging (MRI) with MR spectroscopy (MRS) yields superior diagnostic efficacy compared to using MRI alone. This multimodal approach allows accurate assessment of brain changes and facilitates prompt diagnosis and treatment.

Table 8: Comparision of MRI and MRI+ MRS

Pathology	Total	MRI		MRI + MRS	
		Number	Percentage	Number	Percentage
Brain tumor	22	16	73	18	82
Neuro cysticercosis	6	4	67	5	83
Tuberculosis	5	3	60	4	80
Metastasis	5	4	80	4	80
Abscess	4	3	75	4	100

DISCUSSION

We delved into the conventional MRI attributes, such as lesion structure, accompanying edema, diffusion characteristics and juxtaposed these with MR spectroscopy data. Histopathological confirmation and the ultimate clinical diagnosis served as the benchmarks for our investigation. Out of 22 neoplastic lesions of brain, 8 cases were operated and sent for histopathology in our college in that 7 histopathological reports correlated with MRI and MR Spectroscopy reports. Remaining cases were referred to higher centers for further management.

Neurocysticercosis cases were started on Albendazole for 14 days and steroids for 3 days. Follow up MRI brain was done for one case after 2 months in which there is decrease in size of the lesion, perilesional edema and enhancement of the lesion. Clinically, there is improvement in symptoms. Follow up CT brain for one patient was done after one year which showed complete resolution of perilesional edema with calcified cysts. Tuberculoma cases were started on ATT for 9 months. Following treatment patients showed significant improvement in clinical symptoms.

Cerebral abscess cases were started on high grade antibiotics. Follow up CT brain was done in 3 cases in which there is reduction in size of the abscess and perilesional edema. Patients with metastatic lesions in brain were referred to higher centers for chemotherapy and radiotherapy.

Standalone MRI demonstrated limitations in distinguishing between primary cerebral malignancies and metastatic involvements, with a noted ambiguity in differentiating some neoplastic from non-neoplastic entities based solely on conventional MR imagery. MR spectroscopy, particularly proton MR spectroscopy (1H-MRS), emerged as a non-intrusive diagnostic modality capable of detecting and quantifying diverse cerebral metabolites. The metabolite levels, specifically the choline-to- creatine (Cho/Cr) and choline-to-N-acetyl aspartate (Cho/NAA) ratios, were pivotal in clarifying diagnoses that remained elusive with basic MR imaging.

The highest incidence of 26% is observed in 31 to 40 years and in less than 20 years age group. Majority of the lesions are seen below 40 years of age. Lowest incidence is seen in 41-50 years age group and above 60 years age group.

Headache (33 cases which make 79%) is the most common complaint followed by seizures (26 cases which make 62%) for the patients presenting to the study. Headache is most commonly complaint seen in 23 out of 27 patients i.e., 85% of patients with neoplastic lesion and 10 out of 15 patients (67%) with non-neoplastic lesions. Seizures are present in presenting with seizures are 19 out of 27 patients. (i.e., 70%) with neoplastic lesions and in 7 out of 15 patients (i.e., 43 %) with non- neoplastic lesions.

Next common complaint among the patients of the study is vomiting seen in 45% of patients. Fever is seen in 21% of patients and ataxia and altered sensorium noted in 7% and 5% of patients respectively. Seizures along with head ache is seen in 16 patients which accounts for 38% of patients presenting to the study. Out of 9 fever cases 2 cases are from neoplastic lesions and 7 patients are from inflammatory lesions.

In primary brain tumors 11 out of 22 lesions are in size group of 2 to 4 cm.10 (45%) lesions are > 4cms in size and 1 (5%) lesion is <2 cm size.

Pathologies: Out of 42 patients presenting to the study primary brain tumors consisting 22 which makes 8 1 % of study population followed by neurocysticercosis 6 cases (22%), tuberculoma 5 c a s e s (18%), Metastasis 5 cases (18%), and abscess 4 cases (14%). Totally 27 (64%) are neoplastic and 15 (37%) are inflammatory lesions.

MR Spectroscopy: Maximum high Cho/NAA, Cho/Cr, NAA/Cr at intermediate TE 144 msec in the lesion and in the perilesional areas away from bone recorded.

Out of 27 cases of neoplasm choline peak seen in all neoplastic lesions- 27 cases (100%), Reduced NAA is seen in 18 (67%). Lipid -Lactate peak seen in 18 cases (15 brain tumors and 3 metastatic lesions).

Out of 6 patients with NCC choline peak is seen in 5 patients which is 83%. Lipid lactate peak is seen in 1(16%) patients of NCC and Reduced NAA is seen in 2(33%) patients.

Out of 5 patients with tuberculoma, 3 (60%) shows choline peak, 5 (100%) show lipid lactate peak and 2 (40%) show Reduced NAA peak.

Out of patients with abscess none of them shown choline peak and lipid lactate peak is seen in all 4 (100%) of them. Reduced NAA is seen in 1 (25%) patient.

It is observed that choline peak is seen in seen in almost all neoplastic lesions and most of the lesions of NCC and tuberculoma. Choline peak is not seen in brain abscess patients.

Lipid lactate is observed in all cases of tuberculoma and brain abscess patients.

Reduced NAA peak is observed in most of the cases of neoplastic lesions and some cases of tuberculoma but in very less cases of NCC and brain brain abscess.

The primary objective of an MRI is usually to differentiate between cysticercal granuloma and tuberculoma. MRS, a non-invasive technique for tissue characterization, serves as a valuable adjunct to MRI. In the case of brain tuberculomas, MRS typically identifies lipid peaks, which are linked to substantial lipid components in the tuberculosis bacillus.

Comparing tuberculoma and abscess of brain. Necrotic brain abscess will show mild to moderate grade increase in lipid lactate. Our study showed increase in lipid lactate in all patients with brain abscess which indicates all of them are brain abscess with necrosis. But the difference form tuberculoma to brain abscess in MR spectroscopy is obtained by choline peak which is seen in most of the cases of tuberculoma. These results are in concordance with Shetty et al. and santy et al.[6]

In all tuberculoma lesions where spectra were captured within the voxel, including varying parts of the wall, an increased normalized choline/creatinine ratio was observed, ranging from 1.1 to 1.4, with a mean±SD of 1.34±0.17. Similar findings were reported by Jayasunder R and colleagues, where lipids were identified as markers for distinguishing tuberculoma from nonspecific inflammatory granuloma and NCC. Large lesions with a necrotic center can also produce lipid peaks, so cases that exclusively show lipid peaks should be interpreted with caution. T2 imaging can also identify caseous or non-caseous tuberculoma on MRI. In this study, two cases showed T2 hyperintensity, indicating the presence of central caseating material.

In the evaluation of forty-two patients, neurocysticercosis was identified in six instances. Among these, 4 patients had a single lesion, while the other 2 had multiple lesions. The majority of the cases exhibited intraparenchymal forms, and intraventricular cysticercosis was observed in one instance. In 2 cases, a scolex was detected using the 3D FIESTA sequence.

MRS revealed a decline in the NAA peak and an increase in the choline peak. Gradient echo imaging proved to be effective in identifying calcified lesions, which were found in 5 out of 6 cases, accounting for 83% of the total. As per the study by George U. et al., most lesions were hypo to isointense on T1 and hyperintense on T2. In instances that indicated active lesions, a strong ring enhancement was noted. Our study found that the parenchymal forms of NCC had features that were consistent with the study conducted by Amaral LL et al.[7]

MRI characteristics of neurocysticercosis primarily include thin-walled, ring- enhancing lesions. Lesions can develop in various parts of the brain parenchyma, especially the grey-white junction, the subarachnoid space, and the ventricles. Early-stage ring- enhancing lesions may exhibit enhancing nodules. However, the final nodular calcified stage of neurocysticercosis is marked by multiple calcified nodules without significant edema. In our study, 9 out of 11 lesions showed FLAIR inversions, suggesting that their contents are similar to CSF.

All the lesions identified as NCC in our study were hypointense on DWI, indicating no restricted diffusion. This finding aligns with the results of a study by Raffin LS et al,[8] which concluded that all diagnosed NCC lesions had a hypointense signal on DW and ADC values similar to CSF.

In NCC cases, no lipid peak was observed, whereas all but two tuberculoma lesions showed dominant lipid-lactate peaks. Both types of lesions exhibited reduced N- acetyl aspartate (NAA) levels. The Cho/creatinine ratio was normal in all NCC cases.

Tuberculoma lesions, on the other hand, displayed an increased Cho/creatinine ratio (greater than 1.1), indicating heightened membrane damage and cellularity. All tuberculoma lesions, except for five, showed restricted diffusion, while none of the NCC lesions did. The Cho/Cr ratio was less than 1.1 in all NCC cases and more than 1.1 in all tuberculoma cases, which is consistent with studies conducted by Kumar et al and Jayasunder et al.[9]

In this study of 42 patients, abscesses were identified in 4 cases. MRI revealed these abscesses as hypointense to isointense on T1 with a hyperintense rim, and hyperintense on T2 with a surrounding hypointense rim. The abscess capsule was well-defined, smooth, and complete, displaying a layered appearance that was hypointense on FLAIR/T2 and hyperintense on T1 images. Of these 4 cases, 3 showed complete diffusion restriction, while one case did not show restricted diffusion. This aligns with a study by J Kim et al,[10] which found brain abscess cases with no restricted diffusion due to ongoing empirical antibiotic therapy.

In terms of age and MR spectroscopy, lesions diagnosed as abscesses correlated with clinical improvement after antibiotic therapy. MRS revealed a lipid-lactate peak in all 4 cases, with reduced NAA in one case. This is consistent with the findings of Halmes et al,[11] who demonstrated the appearance of abscesses on MR imaging.

In a group of 40 patients, metastasis was detected in 5 cases, with 4 males and 1 female. Multiple lesions were found in all these 5 cases. All the cases exhibited high Cho/Cr and Cho/NAA levels. The majority displayed high signal intensity on T2. The primary lesion was identified in four cases, one being breast and three being lung lesions. Our findings align with the study conducted by Vieth RG et al.[12]

Although some studies report statistically significant differences in Cho/Cr ratios between them, the values are often invariable and overlapping, making this ratio alone unreliable for distinguishing between the two entities. There is disagreement among studies regarding whether metastases have a higher or lower choline/creatine ratio than high-grade glial neoplasms.

Two cases of glioblastomas exhibited a thick, irregular ring enhancement with extensive central necrosis that did not enhance. One case of pilocytic astrocytoma presented a thick, irregularly enhancing cyst wall with a mural nodule.

Most of the lesions were hypointense on T1-weighted images (15-68%) and hyperintense on T2-weighted images (19-86%). Out of the 22 cases, 17 (or 77%) showed complete or partial diffusion restriction in the solid part of the lesion.

On Magnetic Resonance Spectroscopy (MRS), all 22 cases displayed high Cho/Cr and Cho/NAA ratios, and 15 cases (or 68%) showed elevated Lip-lac levels. The Cho/Cr and Cho/NAA ratios were significantly higher than those seen in infectious diseases, but only mildly increased when compared with metastasis.

Headache (79%) is the most common complaint followed by seizures (26%) for the patients presenting to the study. Headache is most commonly complaint seen in 23 out of 27 patients i.e., 85% of patients with neoplastic lesion and 10 out of 15 patients (67%) with non neoplastic lesions. Seizures are present in presenting with seizures are 19 out of 27 patients (i.e., 70%) with neoplastic lesions and in 7 out of 15 patients (i.e., 43 %) with non-neoplastic lesions.

CONCLUSION

MRI, being a non-invasive technique, is an optimal imaging modality that aids in the diagnosis of inflammatory and neoplastic lesions of brain. MR spectroscopy, which displays the resonance frequencies of various metabolites, assists in distinguishing between different lesions, as certain metabolites are exclusive to specific conditions. Therefore, MR spectroscopy should be routinely incorporated in the evaluation of various neoplastic and inflammatory lesions

However, it's important to note that no lesion can be diagnosed solely based on MRS findings. The sequences T1WI, T2WI, FLAIR, and DWI play a significant role, in conjunction with MR spectroscopy findings, in differentiating various non-neoplastic lesions and distinguishing non-neoplastic lesions from neoplastic ones. This comprehensive approach facilitates better patient management and treatment.

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