ORIGINAL RESEARCH PAPER

Radio-Diagnosis

"A STUDY TO ASSESS THE EFFICACY OF MAGNETIZATION TRANSFER RATIO IN DIFFERENTIATING TUBERCULOMA FROM NEUROCYSTICERCOSIS"

KEY WORDS: MTR, Tuberculoma, NCC.

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ABSTRACT

Precise imaging differentiation of intracranial tuberculoma and Neurocysticercosis (NCC) is essential for their effective treatment. Conventional Magnetic Resonance Imaging (MRI) is an effective modality in its evaluation. However, certain stages of both the diseases show significant simulation in their imaging features paving need for additional sequences like Magnetisation Transfer Contrast (MTC) for their precise differentiation.

INTRODUCTION

Ring enhancing lesions are the most common imaging abnormality in contrast enhanced CT and MRI brain in Indian patients with sudden onset seizures. In the 1980s, all ring-enhancing lesions were thought to be tuberculoma and were treated with anti tuberculosis drugs.Chandyet al (1989), followed by Rajasekhar et al (1993), discovered that Neurocysticercosis is the most common aetiology of ring enhancing lesion on contrast enhanced CT brain based on sterescopic biopsy and histological research.Tuberculoma is the second most common cause of these CT-detected lesions. Despite being the gold standard, biopsy and tissue culture from the abnormal regions are too challenging and inconvenient, particularly in underdeveloped nations with inadequate resources.

In many cases, there will be dilemma for the physician in terms of accurately Identifying the pathologies as the two pathologies are frequently encountered and have similar signs, Making radiological identification fundamental for the determination.The most remarkable Aspect of these pathologies is that ,they resolve with specific treatment with no permanent neurological impairments. As a result, succesful distinction and therapy become critical. Rapid radiological identification and therapy are critical in lowering morbidity.

CT and MRI are two frequently used imaging modalities to diagnose it.The lesions radiographic presentation is determined by the pathogenic stage. In post-contrast studies, both Tuberculomas which are caseating and degenerative stages of neurocysticercosis show pheripheral smooth enhancement. While caseating tuberculomas present as hypointense core with iso/ hyperintense rim.similarly degenerative stages of neurocysticercosis present as hypointense lesions or hyperintense lesions with eccentric scolex on T2w images.

Aims & Objectives of the Study

1. To prospectively assess if Magnetization Transfer Ratio, obtained by using axialdynamic Magnetization transfer imaging can help to differentiate Tuberculoma from Neurocysticercosis.

METHODOLOGY

In our study there are 50 patients included who were referred to our radiology department GGH , kurnool for evaluation of seizures .Patients were evaluated by MRI brain and Dynamic contrast enhanced MRI with MTR.MTR ratios were calculated for all ring enhancing lesions.

Inclusion criteria:

1.patients clinically suspected of having intracranial granuloma who had active lesions suspected to have granuloma in Computed Tomograph(CT) or Magnetization Resonance Imaging of Brain.

Exclusion criteria:

1. All patients with calcified granuloma.
2. Patients with known primary malignancy.
3. Patients with claustrophobia.
4. Patients with other contraindications –pacemaker implants, cochlearimplantsetc

Imaging Techniques

The study was performed in PHILIPS INGENIA 1.5 TESLA MRI MACHINE with D-STREAM TECHNOLOGY .

Study place: GOVERNMENT GENERAL HOSPITAL, KURNOOL MEDICAL COLLEGE.

Study period: Nov 2019 – Oct 2021.

Sequences used:

Conventional spin echo T1-Weighted (TR 1000, TE 14) axial MR images without off - resonance saturation pulse.

Conventional spin echo T1-Weighted(TR 1000, TE 14) nonaxial MR images with an off - resonance saturation pulse.

MTR = (M0 - Mt)/M0 x 100 Where, Mo - the signal intensity with saturation pulse off Mt - the signal intensity with saturation pulse on, respectively.

Consistency and reliability of the measurements were confirmed by obtaining thevalues repeatedly.

RESULTS

A total of 50 patients were included in my study.The age of the patients ranges from 8 years to 75 years . Majority of the Patients are in the age of 31-45 years accounting for 32 percentage. Most of them are males.

Intracranial tuberculoma was seen in 22 of the individuals and Neurocysticercosis in 28 people. Tuberculosis and NCC were diagnosed depending on imaging charecteristics, MTR values and MRS .The confirmation of tuberculomas based usual CSF characteristics (cellularity and biochemistry) and treatment response. Similarly nuerocysticersosi by the presence of scolex and improvement to specific medication.

The lesions are analysed in 50 patients who were suspected of granulomatous disease. About 26 patients had multiple ring

enhancing lesions in which most them were Neurocysticercosis. About 24 patients had single enhancing lesions in which tuberculomas constitute the most .In present study Ncc mostly presented as multiple granulomatous lesions wheareas tuberculosis mostly presented as solitary lesion.

A total of 96 granulomas from 50 patients were analysed in which 42 were tuberculomas 34 were degenerative stages of Ncc which includes colloidal and grandular nodular stages,20 were vesicular stage of neurocysticercosis .The present study includes study of 50female patients with breast masses. Benign lesions are 32 in number and malignant lesions are 18 in number constituting 64% and 36% respectively.

Table:-1 Descriptives

					95% Confidence Interval for Mean			
	N	Mean	Std. Deviation	Std. Error Mean	Lower Bound	Upper Bound	Minimum	Maximum
NCC Vesicular	20	10.44	1.39	.312	9.70	11.09	7.56	12.46
NCC-Degenerative	34	27.42	1.89	.33	26.76	28.07	24.54	32.4
tuberculosis granuloma	42	16.90	1.60	.25	16.42	17.40	13.26	20.4

Table: - 2 ANOVA

Null hypothesis All means are equal
Alternative hypothesis At least one mean is different
Significance level $\alpha = 0.05$

Equal variances were assumed for the analysis.

	Sum of Squares	df	Mean Square	F-Value	Sig.
Between Groups	2076.7	1	2076.71	689.76	0.000
Within Groups	222.8	74	3.01		
Total	2299.5	75			

ANOVA tests Showing difference in values between tuberculosis & Degenerative is statistically significant P value <0 .05

CONCLUSIONS

42 tuberculoma cases from 22 patients were studied.Multiple tuberculoma was found in eight of the cases. In conventional MRI, 14 individuals exhibited single lesions in the brain with classic tuberculoma characteristics. Tuberculous meningitis was seen in 8 patients and infracts due to tuberculous vasculitis seen in 3 patients .Postcontrast MTSE images showed nodular or rim enhancement in all lesions .in 10 patients there were conglomerate lesions. Most of the these lesions were located in the cortex and subcortical white matter .

54 neurocysticercus granulomas were studied from 28 patients . 34 were degenerative stages of Ncc which includes colloidal and grandular nodular stages,20 were vesicular stage of neurocysticercosis. The size of ncc granuloma range from 1mm to 8mm .Most of the people have multiple ring enhancing lesions on imaging . Most of these lesions were located at grey and white matter junction . All cystic stage of granulomas are hyper intense on T2 weighted images with completely suppression on FLAIR images noted .these lesions are hypointense on T1 weighted images.

In the present study the mean MTR value of twenty benign cystic lesions representing the vesicular stage of NCC was 10.44+/ -1.39. In studies done by Rajapandian GD et al,VasudevMK et al. and Naveen et al the mean MTR values are consistent with the present study respectively But there exists difference in the MT ratios derived by KathuriaM et al., where cystic NCC show MT values of (MTR=5.1±1.2). lower MTR values in cystic stages of NCC are due to lower levels of macromolecules and high water content so there is less exchange of energy between the water protons and protons in macromolecules .This results in lower MTR values . Thirty two lesions with imaging features suggestive of degenerative NCC cysts showed MTR of 27.38±1.22 . These values are also consistent with values obtained by j.naveen et al 23.38±1.2 , KathuriaM et al. 26.4±2.7 Vasudev MK et al.,23.4±2.7 these values are consistent with our study .However the MTR value obtained in our study is slightly high as compared to previous studies .In study done by Rajapandian GD et al the mean MTR value obtained was 20.8±3.5. There is inconsistency in value obtained in different studies .These differences are due to machine parameters which are different in various machines.

Limitations

1. The magnetization transfer ratios shows variations when we compared different studies. This is most likely due to technical and machine limitations. As a result, MTR must be standardised for each machine, and MTR from two trials cannot be compared.As a result, MTR must be standardize for each machine, and MTR from two trials cannot be compared.
2. No histopathological data are available.
3. An increase in the study population could narrow the MTR values' confidence interval.This could explain narrow confidence interval as compared to previous studies.

Summary

Our study aimed to analyse the efficacy of magnetisation transfer imaging in differentiating tuberculoma and NCC

1. Total 104 granulomas in 50 patients were analysed in which 42 are tuberculomas, 34 are degenerative neurocysticercosis and 20 are cystic NCC.
2. The study's average MTR for 42 tuberculoma samples was16.90+/-1.39.The mean MTR of thirteen benign cystic lesions representing the vesicular stage of NCC was 10.44+/ -1.39 .MTR of 27.42+/ -1.89 was found in twenty-one lesions with imaging characteristics suggestive of degenerative cysts.

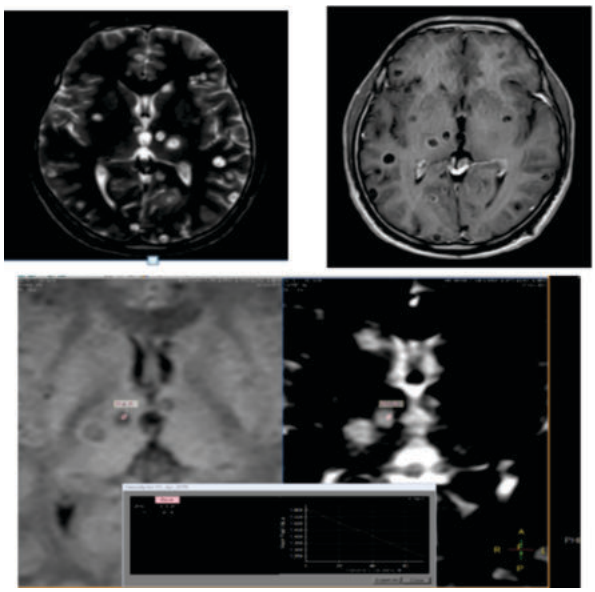

Fig1: MRI axial images of brain A)post contrst B)T2W C) MTR IMAGES **WITH** AND WITH OFF RESONANCE PULSE Showing multiple T2 hyper intense lesions inbilateral cerebral hemispheres ,basal ganglia and bilateral thalamus.On pst contrast the lesions showing smooth pheripheral ring enhancement representing vesicular stageof NCC .The MTR ratio calculated from the lesion was 11

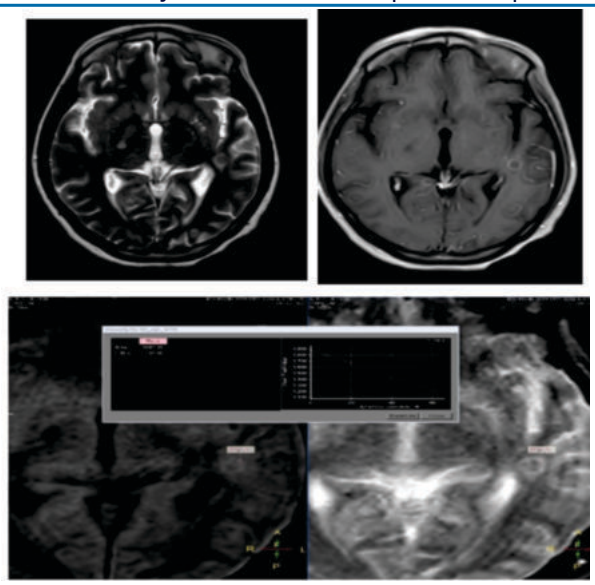

Fig2: MRI axial images of brain A)T2W B)T1 POST CONTRAST C)MTR IMAGES WITH AND WITH OFF RESONANCE PULSE Showing multiple well defined T2 hypo intense lesions with minimal surrounding odema noted in bilateral fronto parietal lobes .On post contrast the lesions showing smooth pheripheral ring enhancement representing colloidal stage .The MTR ratio calculated from the lesion was

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