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ROLE OF MR SPECTROSCOPY IN EVALUATION OF INTRAAXIAL BRAIN TUMORS

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ABSTRACT

AIMS AND OBJECTIVES: To determine biochemical markers of intraaxial brain tumors using MR spectroscopy.To evaluate role of MR spectroscopy in diagnosing and grading of intraaxial brain with histopathological correlation.To evaluate role of MR spectroscopy in determining the infiltrative nature of the intra axial brain tumor.

MATERIALS AND METHODS: A total of 30 patients with intraaxial brain tumors referred to department of Radiodiagnosis were imaged with 1.5 Tesla MRI Scanner , Siemens magnetomavantoSyngo (MR D-13) 16 channel machine in the department of Radiodiagnosis.Its study of observation cross sectional study & a total of 30 patients fulfilling the selection criteria were studied.

RESULTS: Out of 30 patients with intraaxial brain tumors 11 patients are diagnosed with GBM,2 with anaplastic astrocytoma,3 with diffuse infiltrative astrocytoma,2 with oligodendroma,2 with gliomatosis cerebri,2 with ependymoma,2 with mediulloblastoma,1 with metastasis,1 with choroid plexus papilloma and one with lymphoma.

CONCLUSION: MR spectroscopy is a reliable method for glioma grading.It is useful in discrimination between WHO grade II and grade III ,IV astrocytomas as well as other intraaxial brain tumors.The spectroscopic MR measurements in the peritumoral region can be used to demonstrate differences in solitary metastases and high grade gliomas and also peritumoral infiltrative nature of certain intraaxial brain tumor.

Keywords:glioblastomamultiforme,oligodendroglioma,medulloblastoma,astrocytoma,choline,NAA

INTRODUCTION:-

Intra axial brain masses are a significant health problem and present several imaging challenges. These lesions include primary neoplasm (high and low grade), secondary (metastatic) neoplasm, lymphoma, tumefactive demyelinating lesions, abscesses and encephalitis. We are witnessing a shift in imaging from merely providing anatomical information towards providing information about tumor physiology. Imaging plays an integral role in intracranial tumor management. Magnetic resonance (MR) imaging in particular has emerged as the imaging modality most frequently used to evaluate intracranial tumors, and it continues to have an ever expanding, multifaceted role. In general, the role of MR imaging in the workup of intraaxial tumors can be broadly divided into tumor diagnosis and classification, treatment planning, and post treatment surveillance. In addition to conventional MR imaging techniques, a variety of advanced techniques have found their place in clinical practice or are the subject of intense research. These advanced techniques offer more than the anatomic information provided by the conventional MR imaging sequences. They generate physiologic data and information on chemical composition. The current advanced techniques include perfusion imaging, diffusion-weighted imaging (including diffusion tensor imaging), MR spectroscopy, blood oxygen level–dependent (BOLD) imaging, and the largely experimental molecular imaging.

Magnetic resonance spectroscopy allows the non-invasive measurement of selected biological compounds in vivo. Proton spectroscopy has been recognized as a safe and noninvasive diagnostic method that, coupled with magnetic resonance imaging techniques, allows for the correlation of anatomical and physiological changes in the metabolic and biochemical processes occurring within previously determined volumes in the brain. Magnetic resonance spectroscopy (MRS) provides information about the possible extent and nature of changes on a routine MRI scan by analyzing the presence and/or ratio of tissue metabolites such as NAA, creatine, choline, and lactate etc.

MATERIALS AND METHODS :-

An An analytical cross-sectional study was performed in the department of Radiodiagnosis and imaging, ASRAM Medical college, Eluru in co-ordination with departments of Neurosurgery and Pathology of the same institute, during the period of May 2022 to March 2023. Total 30 patients of the age range 20 to 80 years, who were referred to the department with clinical suspicion of intraaxialtumors were included in the study. Patients with previously treated and post -operative history of intraaxialtumors, with recurrence and claustrophobia individuals were excluded from the study. Proper procedure was followed while obtaining consent from respondents. All the 30 respondents underwent MRI imaging of brain and required data has been collected in appropriate data sheets, including the histopathological result after follow up and the results were correlated. All data was kept confidential.

IMAGING TECHNIQUE AND PROCEDURE:

The MRI scan was performed using 1.5 Tesla MRI Scanner , Siemens magnetomavantoSyngo (MR D-13) 16 channel machine.It possesses a ultracompact,superconducting,active shielded superconducting magnet with a magnetic field strength of 1.5 T.

Sense coils was used for acquisition of images

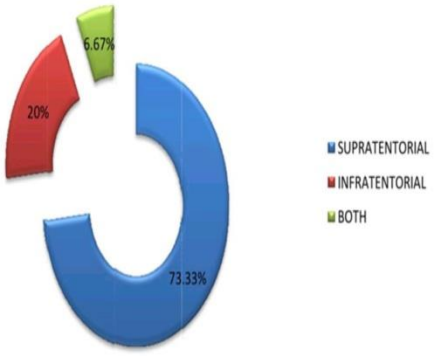
.Conventional spin echo sequences, axial T1, T2, FLAIR, Coronal T2; Sagittal T1; Post contrast T1 FFE axial, coronal and sagittal; DWI; T2 FFE; SV PRESS 144, SV PRESS 31 Single voxel spectroscopy; 2D PRESS 144 multi voxel spectroscopy was performed at TE of 144ms and 31ms, TR was at 2000 ms. In single voxel studies the voxel is placed on the lesion so that it covers the maximum area of the solid tumoral area. In multivoxel spectroscopy, the voxel was extended to cover perilesional area in selective cases of high gradetumors, avoiding areas of cysts or necrosis and with minimal contamination from the surrounding non-tumoral tissue. Volume of interest size ranged between 1.5X1.5X1.5 cm3 (3.4ml) and 2X2X2 cm3 (8ml). We used PRESS and T1 FFE post contrast sequence as localization sequence with 5 mm thickness. Spectroscopy was avoided in small lesions close to bones and tissues.

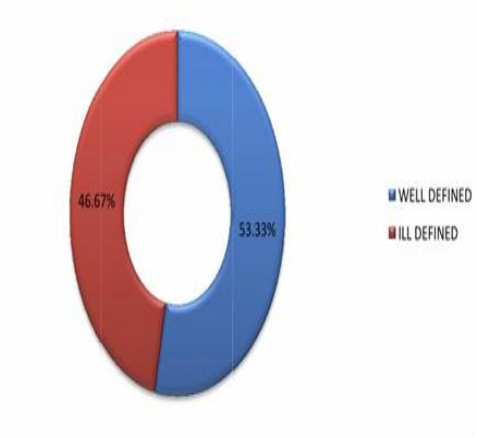
RESULTS AND DISCUSSION:

Distribution of sample based on location

	NO.OF CASES	PERCENTAGE
SUPRATENTORIAL	22	73.33%
INFRATENTORIAL	6	20%
BOTH	2	6.67%
TOTAL	**30**	**100%**

	NO .OF CASES	PERCENTAGE
WELL DEFINED	16	53%
ILL DEFINED	14	47%
TOTAL	30	100%





DISTRIBUTION BASED ON MR SPECTROSCOPY

CHOLINE	NO .OF CASES	PERCENTAGE
INCREASED	30	100%
REDUCED	-	
TOTAL	30	

NAA AND CREAT	NO .OF CASES	PERCENTAGE
INCREASED	**-**	
REDUCED	**30**	**100%**
TOTAL	**30**	

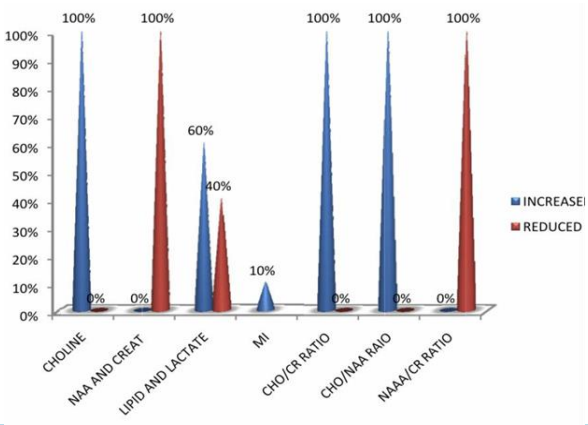
LIPID AND LACTATE	NO .OF CASES	PERCENTAGE
INCREASED	**18**	**60%**
ABSENT	**12**	**40%**

CHO/CR RATIO	NO .OF CASES	PERCENTAGE
INCREASED	30	100%
REDUCED	-	
TOTAL	30	

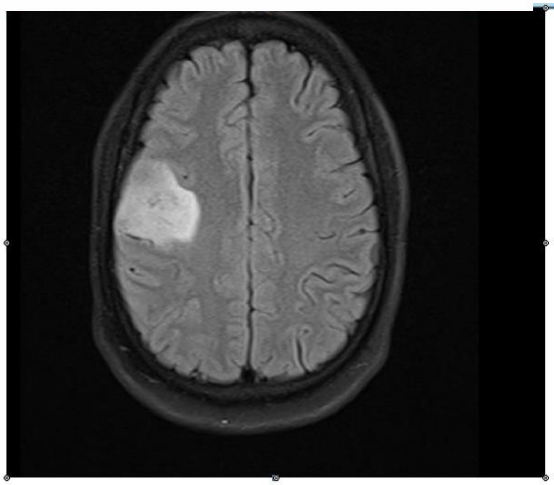
CHOLINE	NO .OF CASES	PERCENTAGE
INCREASED	30	100%
REDUCED	-	
TOTAL	30	

NAA AND CREAT	NO .OF CASES	PERCENTAGE
INCREASED	-	
REDUCED	30	100%
TOTAL	30	

SPECTROSCOPY FINDINGS



CASE1



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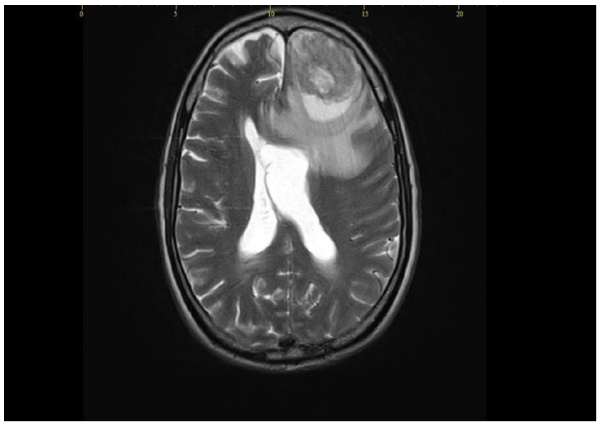

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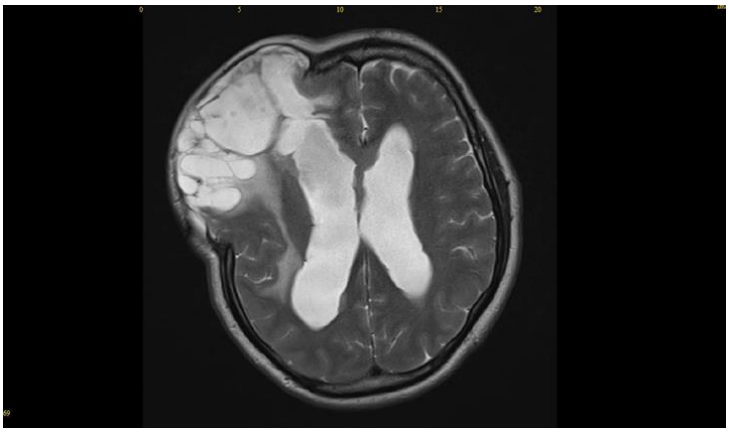

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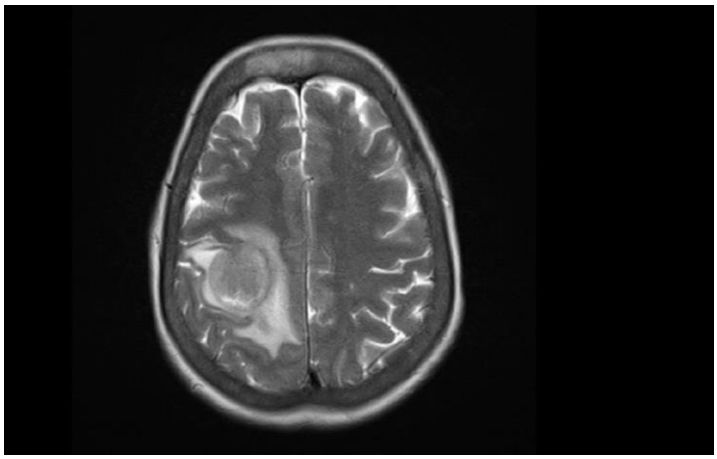

DISCUSSION:-

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CONCLUSION:-

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