Positive Predictive Value (PPV) of Magnetic Resonance Spectroscopy (MRS) in Diagnosing Neoplastic Brain Lesions Taking Histopathology as Gold Standard

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ABSTRACT

Aim: Positive predictive value of magnetic resonance spectroscopy in diagnosis of malignant brain lesions taking histopathology as gold standard.

Methodology: A total of 98 subjects with diagnosis of neoplastic brain lesion with 20-70 years of age with either sex were included. Subjects with H/o past brain surgery, claustrophobia and contraindication to MRS were excluded. All the subjects were underwent MRS for choline peak and findings were correlated with histopathology.

Results: Out of 98 patients, 61 (62.2%) were males and 37 (37.8%) were females with male to female ratio of 1.6:1. Magnatic resonance spectroscopy favors the diagnosis of malignant brain diseases in all 98 subjects. On histopathological results, there is malignant brain lesion in 93 i.e. true positive subjects and only 05 subjects i.e. false positive were without malignant lesion on histopathological examination. Positive predictive value (PPV) of magnetic resonance spectroscopy (MRS) in the diagnosis of malignant brain lesions was 94.9%.

Conclusion: Magnetic resonance spectroscopy is non-invasive procedure with high positive predictive value in the diagnosis of malignant brain lesions. .

Keywords: Brain lesions, neoplastic, spectroscopy, diagnostic accuracy.

INTRODUCTION

MRS i.e., magnetic resonance spectroscopy is one of the modality to see the molecular structures of compounds. Differentiation of lesions can be done i.e. malignant and benign by certain criteria which include Choline/Cr and Choline/ NAA ratio and choline and NAA peak on MR Spectrum[1]. MRS also gives information about metabolism in living brain. MRS can help in differentiating malignant from benign diseases.[2] MRS was done from the focal brain lesion when voxel was placed properly.[3]

METHODOLOGY

This cross-sectional study was conducted in the Radiology department, BVH, Bahawalpur from 17-5- 2013 to 16-11-2013. Ninty eight subjects were selected for the study. Percentage of positive predictive value i.e. 95% of MRS for diagnosing neoplastic brain diseases in subjects of focal brain lesions taking histopathology as gold standard is calculated. Subjects presenting with malignant brain tumors on MRS with ages of 20-70 years of either sex were included in the study. Patients with H/O past brain surgery, with H/O claustrophobia and have contraindication to MRS or pacemaker holders in the heart were excluded from this study. After approval from ethical review committee, 98 subjects were selected from emergency, OPD and admitted patients of BVH, Bahawalpur to the radiology department who fulfil the inclusion/exclusion criteria. Informed consent was taken. Magnetic resonance spectroscopy was done in each subject. Choline peak was

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specially seen. Each MRS study was reported by senior radiologist. Data was analyzed statistically with SPSS version 16.0. Mean ± SD was calculated for quantitative variables and frequency and percentage was calculated for qualitative variables e.g. gender, malignant or benign brain tumors. 2×2 contingency table was used to calculate the sensitivity, specificity, positive predictive value, negative predictive value and diagnostic accuracy of MRS to differentiate benign and malignant brain tumors using histopathology as gold standard.

RESULTS

The detail of results is given in tables I, 2, 3, 4,

Fig 1: Gender distribution (n=98).
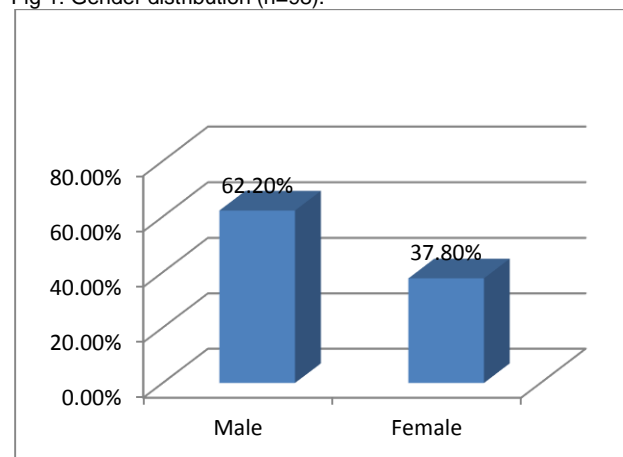
Table 1: Age distribution (n=98).

Age (years)	n	%age
20-30	06	6.1
31-40	11	11.2
41-50	21	21.4
51-60	27	27.6
61-70	33	33.7

Mean ± SD = 58.7 ± 7.3 years

Table 2: Summary of Results.

	Positive result on MRS	PPV of MRS
Positive results on Histopathology	93 (TP)	94.9%
Negative results on Histopathology	05 (FP)	

TP=True positive FP=False positive
PPV= TP/TP+FP x 100

Table 3: Age distribution in respect of PPV

Age	True Positive	False Positive	P-Value
20-50 years (n=38)	34	04	
51-70 years (n=60)	59	01	0.052

PPV for age 20-50 years= 89.5%
PPV for age 51-70 years= 98.33%

Table 4: Patients with respect to Gender

	True Positive	False Positive	P-Value
Male (n=61)	58	03	
Female (n=37)	35	02	0.915

PPV for Male= 95.1%
PPV for Female= 94.6%

DISCUSSION

Magnetic resonance spectroscopy (MRS) is a non-invasive diagnostic test to analyze the chemical composition of human tissues. MRS depends on the chemicals in the body. With strong magnetic field, these chemicals emit radiofrequency signals. MRS has the capability to give necessary knowledge which can help in diagnosis of abnormal condition by analyzing the chemicals in an abnormal tissue area (e.g., in the brain) .[4,5]
In present study, PPV of MRS was 84.9%. These results are consistent with the study of Delorme and Weber[1].

In another study, MRS has the sensitivity 79%--100% and specificity from 74%--100%. The PPV from 92% to 100%, while the negative predictive values 60% to 100%[6].
In a study, MRS was performed in a total of 103 patients and showed infective brain disease in 26 patients i.e. 25.2% and malignant brain tumors in 77 patients i.e.

74.8%.[7] In one study, MRS has a sensitivity, specificity, PPV, NPV and diagnostic accuracy as 93.02%, 70%, 70.5%, 93.02%, 70.05%, 88.7% respectively in differentiating malignant and benign brain lesions.[2] In another study, sensitivity, specificity, PPV and NPV of MRS as 76%, 48%, 81% and 40% respectively[1].

MRS can help in diagnosing malignant tumors from benign lesions.[4] Lesions can be divided into malignant and benign on the basis of certain criteria i.e. Cho/Cr and Cho/NAA ratio and choline and NAA peak on MRS.[7] MRS has high positive predictive value for malignant brain tumors and is method of choice for the diagnosis of brain diseases.

CONCLUSION

Magnetic resonance spectroscopy (MRS) is the non-invasive modality of choice with high PPV in diagnosing malignant brain lesions.

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