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ORIGINAL ARTICLE

The Accuracy of Magnetic Resonance Imaging in Diagnosing Malignant Breast Lesions

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ABSTRACT

Objective: The present research seeks to examine the diagnostic accuracy of magnetic resonance spectroscopy in the diagnosis of malignant breast lesions using histopathology as the gold standard.
Study Design: Cross-sectional
Place and Duration: Sadiq Abassi Hospital Bahawalpur. July-21 to Dec-21
Methods: There were 110 females were presented in this study. Patients had with suspicious palpable lesions for malignancy were included. Before any patient data was collected, they signed a permission form acknowledging they understood the risks. The kinetics and morphology of magnetic resonance spectroscopy (MRS) dynamically enhanced pictures acquired with contrast on 1.5 Tesla MRI equipment were evaluated. The choline peak (Cho) permitted by MRS was used to determine a malignancy biomarker.. Single-voxel approach was used to examine MRS' diagnostic performance in breast lesions malignancy. Comparing MRS and biopsy results was done. This version of SPSS 22.0 was used to analyse all the data.
Results: Majority of the patients 50 (45.5%) were from age group 41-60years, 35 (31.8%) patients had age > 60 years and 25 (22.7%) were from age group 20-40 years. Frequency of malignant lesion by MRS was found among 92 (83.6%) cases and by histopathological results its frequency was 81 (73.6%). Ductal enhancement and peripheral enhancement were the most common morphology among patients of malignant lesion by MRS. According to MRS findings, 75% specificity,86.7% accuracy, 91%sensitivty, 79% negative predictive value (NPV) and 92.3% positive predictive value were found.
Conclusion: As a main imaging tool for the diagnosis of breast lesion malignancy, MRS must be used because of its superior specificity, sensitivity, and accuracy in the characterisation of breast lumps. It has been discovered that MRS is a very specific, sensitive, and reliable diagnostic tool for detecting malignant breast cancers.
Keywords: Malignant breast lesion, Histopathology, Magnetic resonance spectroscopy (MRS)

INTRODUCTION

Magnetic resonance imaging (MRI) using a dynamic contrast material is the most sensitive way to find breast cancer. [1,2] For breast cancer, this approach relies on T1-weighted studies that can quantify the distribution of paramagnetic contrast agents extracellularly. There has been considerable overlap between the enhancing features of benign and malignant breast tumours in the early stages of development. [3,4] A combination of both morphological criteria and dynamic enhancing pattern analysis is used in clinical practise for lesion categorization. [5] Morphology evaluation is a subjective process that is vulnerable to both individual observer bias and variance due to prior experience. Diagnostic criteria utilised in dynamic contrast-enhanced MR imaging have inadequate diagnostic efficacy for nonmass and tiny lesions, which commonly leads to false-positive results. [6,7] Adding a diagnostic approach with a high level of specificity would thus be beneficial.

In their research, Baltzer PA et al. found that 65% of individuals with breast lesions had breast cancer. [8] Noninvasive breast cancer detection is still an important clinical issue." It is possible to employ imaging examinations to detect non-palpable lumps in other parts of the breast or on the contralateral side if there is a suspicion of cancer. These results might have a significant impact on treatment, particularly in terms of the kind of local therapy that is used. [9] Mammograms and sonograms are the two most often utilised methods for detecting breast cancer. [10] Even though mammograms and sonograms have their limits, aggressive biopsy is common because of the goal not to miss a malignant tumour in the early stages of illness. This indicates that 70% to 90% of breast biopsies are conducted for benign conditions, resulting in needless patient pain and worry, as well as an increase in the patient's medical expenses. [11]

When it comes to diagnosing breast cancer, magnetic resonance imaging (MRI) is more accurate and less radiation-intensive than mammograms and ultrasounds. MRI is also more sensitive than mammograms. As an addition to MRI exams, proton magnetic resonance spectroscopy (1H MRS) of the breast has been suggested to increase the specificity of identifying malignant from benign tumours in the area [12]. [13] As part of a research investigation, magnetic resonance spectroscopy (MRS) was shown to be 89.5 percent and 92.3 percent accurate in distinguishing between malignant and benign breast tumours, respectively. [14] To fill in the gaps in previous studies, we conducted this investigation to see whether magnetic resonance spectroscopy (MRS) could reliably detect malignant breast lesions in a community sample. A noninvasive preoperative diagnostic technique for accurate diagnosis would be made available to the general public should its diagnostic accuracy be found to be high, allowing clinicians to better manage these patients and thus reduce their mortality and morbidity. This would be beneficial to both the patients themselves and society as a whole. [15] Additionally, it would assist to minimise pure diagnostic biopsies in breast lesions, which would not only reduce consequences of this invasive surgery but also lessen unneeded patient suffering, worry, and rising expenses to the patient.

MATERIAL AND METHODS

This cross-sectional study was conducted at Sadiq Abassi Hospital Bahawalpur and comprised of 110 females. Informed written consent was taken from all the patients for detailed demographics. Patients < 20 years of age,had history of chemotherapy or surgery were excluded from this study.

The kinetics and morphology of magnetic resonance spectroscopy (MRS) dynamic enhanced pictures acquired with contrast on 1.5 Tesla MRI equipment were examined. By using choline peak (Cho) permitted by MRS, the biomarker for malignancy was identified and quantified. The Single-voxel approach was used to examine the diagnostic performance of MRS in breast lesions malignancy.

All patients were scanned using a double breast coil with mild compression applied to both breasts in order to minimise the impact of patient movements in the prone position. With a three-

way stopcock on the 20-22 canola gauges used to secure the intervention line, it is possible to optimise contrast injection. MIP (maximum intensity projection) three-dimensional fat suppression and subtraction using multi-planar reconstruction with narrow slices. Another 0.2 ml per kg of intravenous dosage was administered with saline of 20ml flush for contrast-enhanced pictures by MRS after the contrast injection was completed in 20 seconds. It took four dynamic postcontrast scans 7 minutes and 35 seconds to complete the procedure dynamically. MRS was used to diagnose cancer using kinetic curve types II and III with spiculated borders and ductal patterns or peripheral rims.

In order to analyze the data, SPSS version 22 was used For malignant breast lesions, frequency and percentage were determined using their kinetic characteristics and morphology. Histopathology results were compared, and MRS diagnostic metrics including specificity, accuracy, sensitivity, NPV, and PPV were computed.

RESULTS

Majority of the patients 50 (45.5%) were from age group 41-60years, 35 (31.8%) patients had age > 60 years and 25 (22.7%) were from age group 20-40 years.(fig 1)

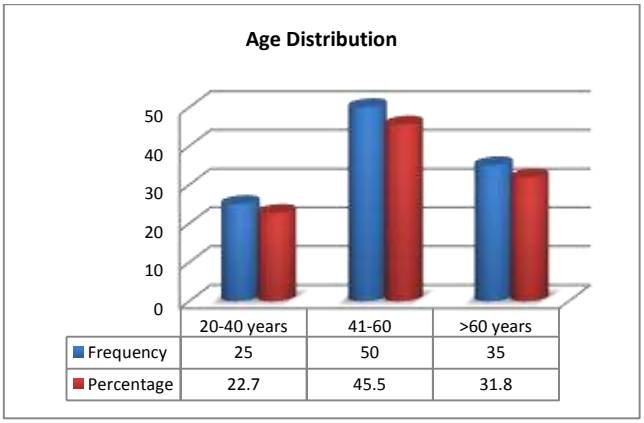

Figure 1: Age distribution among all cases

Frequency of malignant lesion by MRS was found among 92 (83.6%) cases and by histopathological results its frequency was 81 (73.6%).(table 1)

Table 1: Frequency of malignant lesion MRS and histopathological results

Variables	MRS	Histopathological
Malignant Lesion		
Yes	92 (83.6%)	81 (73.6%)
No	18 (16.4%)	29 (26.4%)

Ductal enhancement and peripheral enhancement were the most common morphology among patients of malignant lesion by MRS.(fig 2)

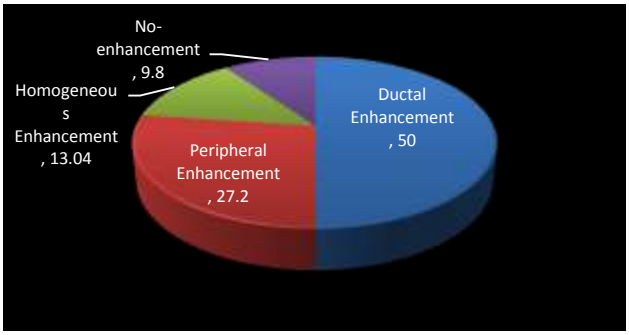

Figure 2: Morphology features of MRS

According to MRS findings, 75% specificity,86.7% accuracy, 91%sensitivty, 79% negative predictive value (NPV) and 92.3% positive predictive value were found and histopathology was taken as standard method.(table 2)

Table-2: Results of malignant breast lesion by MRS

MRS Results	Percentage
positive predictive value	92.3%
negative predictive value (NPV)	79%
sensitivity	91%
accuracy	86.7%
specificity	75%

DISCUSSION

As far as instances of breast cancer are concerned, Pakistan comes in second place in Asia. There are several ways to detect breast cancer, including multimodality and radiological imaging approaches. Compared to traditional mammography, which has limitations in thick breasts, MRS is the preferable radiological evaluation method for the detection and diagnosis of breast lesions [16]. In the field of radiology, MRS of the breast is a prominent imaging technique. The vascular features of breast lesions were used to give functional and structural information [17]. Peripheral/ductal augmentation and a type III kinetic curve suggest the presence of malignant lesions, as seen in the figure.

In current study 110 females were presented. Majority of the patients 50 (45.5%) were from age group 41-60years, 35 (31.8%) patients had age > 60 years and 25 (22.7%) were from age group 20-40 years. Frequency of malignant lesion by MRS was found among 92 (83.6%) cases and by histopathological results its frequency was 81 (73.6%).These results were comparable to the previous studies.[20,21] Ductal enhancement and peripheral enhancement were the most common morphology among patients of malignant lesion by MRS.[22] A study by Bartellaet al [23] compared the diagnostic performance of MRS and MRI in 56 individuals with 57 different abnormalities (level III-2 diagnostic evidence). Only 17 lesions were found to be malignant by biopsy of the 57 lesions investigated in the research; 40 of the lesions were recommended for further examination. Using biopsy as the gold standard, 31 and 26 of the 57 lesions were confirmed to be malignant and benign, respectively. More than half (23 of 26) of the 26 benign lesions had no choline peak, but all 31 biopsy-proven malignant ones had a significant peak (100%) (88 percent specificity).

In our study,according to MRS findings, 75% specificity,86.7% accuracy, 91%sensitivty, 79% negative predictive value (NPV) and 92.3% positive predictive value were found and histopathology was taken as standard method. MRS sensitivity, specificity, negative predictive value (NPV) and positive predictive value (PPV) have been reported to range from 94% to 98% in earlier research [24]. A p-value of 0.001 was deemed significant by the researchers.. The diagnosis of malignant breast lesions was shown to have an overall diagnostic accuracy of roughly 89.3 percent. The MRS guideline for preoperative features of disease and good diagnostic accuracy was based on statistical research. More than half of the lesions in Brennan S et al[25] that were BI-RADS 4 would have been saved from biopsy had MRS been employed, without missing any malignancies, according to the authors of the study. MRS has been shown to be 89.5 percent and 92.3 percent accurate in distinguishing malignant breast tumours from those that are benign. [26]

CONCLUSION

As a main imaging tool for the diagnosis of breast lesion malignancy, MRS must be used because of its superior specificity, sensitivity, and accuracy in the characterization of breast lumps. It has been discovered that MRS is a very specific, sensitive, and reliable diagnostic tool for detecting malignant breast cancers.

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