

## MR IMAGING DETECTED BREAST LESIONS- HISTOPATHOLOGICAL CORRELATION OF QUALITATIVE LESION CHARACTERISTICS

Juvaina Puthiyakam<sup>1</sup>, Gomathy Subramaniam<sup>2</sup>, V. R. Rajendran<sup>3</sup>, Rajan P<sup>4</sup>, Naufal P<sup>5</sup>, Saanida M. P.<sup>6</sup>, Jineesh T<sup>7</sup>, Soumya Hareendranath<sup>8</sup>

<sup>1</sup>Assistant Professor, Department of Radiodiagnosis, Government Medical College, Kozhikode.

<sup>2</sup>Professor, Department of Radiodiagnosis, Government Medical College, Kozhikode.

<sup>3</sup>Professor and HOD, Department of Radiodiagnosis, Government Medical College, Kozhikode.

<sup>4</sup>Professor, Department of Radiodiagnosis, Government Medical College, Kozhikode.

<sup>5</sup>Associate Professor, Department of Radiodiagnosis, Government Medical College, Kozhikode.

<sup>6</sup>Assistant Professor, Department of Radiodiagnosis, Government Medical College, Kozhikode.

<sup>7</sup>Assistant Professor, Department of Radiodiagnosis, Government Medical College, Kozhikode.

<sup>8</sup>Assistant Professor, Department of Radiodiagnosis, Government Medical College, Kozhikode.

### ABSTRACT

#### BACKGROUND

Contrast-enhanced MR imaging of breast characterises the lesion more accurately than mammography or sonography. This contributes to the distinction between benign and malignant lesions. Multifocal and contralateral lesions can also be better detected by MR imaging.

Aims- To differentiate benign from malignant breast lesions that have been detected on MRI by analysing qualitative lesion characteristics. To compare and correlate the radiological diagnosis with the final histopathological diagnosis.

#### MATERIALS AND METHODS

A prospective study on 41 cases was conducted in the Department of Radiodiagnosis, Govt. Medical College, Kozhikode during the period of Aug. 2009 to July 2010 who were undergoing MR imaging of breast for characterisation of lesions. Morphological parameters of the lesions were correlated with the final histopathological diagnosis.

#### RESULTS

66.6% of benign lesions showed well-defined (Oval, round, lobulated) shape while none of the malignant lesions demonstrated this. Irregular shape was observed in all the malignancies. Smooth margin was observed in 66.7% of benign lesions while ill-defined margin like irregular & spiculated constituted 70% and 25% respectively in malignancies. None of the malignant lesions showed smooth margin.

#### CONCLUSION

Well-defined shape and smooth margin were characteristic of benign lesions. Spiculated margin was highly specific for malignancy. Both irregular and spiculated margin had a high predictive value for malignancy.

#### KEYWORDS

MRI, Breast Lesion, Shape, Margin, Benign, Malignant.

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#### BACKGROUND

Contrast-enhanced MR imaging of breast characterises the lesions more accurately than mammography or sonography. This contributes to the distinction between benign and malignant lesions. Multifocal and contralateral lesions can also be better detected by MRI.

#### Aims and Objectives

1. To differentiate benign from malignant breast lesions that have been detected on MR imaging by analysing qualitative lesion characteristics.

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*Corresponding Author:*

Juvaina Puthiyakam,

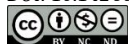
Assistant Professor,

Department Radiodiagnosis,

Government Medical College, Kozhikode.

E-mail: juvaina.faiz@gmail.com

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2. To compare and correlate the radiological diagnosis with the final histopathological diagnosis.

#### MATERIALS AND METHODS

##### Study Design

Descriptive study; Diagnostic test evaluation.

##### Study Setting

All patients undergoing MR imaging of breast at Dept. of Radiodiagnosis, Govt. Medical College, Kozhikode for characterisation of breast lesions detected clinically, by x-ray mammography or by ultrasonography.

##### Study Period

August 2009 to July 2010

##### Study Method

41 cases of breast lesions were evaluated with MRI. Morphologic parameters like shape and margin were studied. Final histopathological report of all the lesions were compared and correlated with MRI findings.

**The Following Criteria were evaluated-**

1. Shape - well defined (Round, oval, lobulated).
  - Irregular (Linear, branching, stellate)
2. Margin - Smooth/irregular/spiculated.

Histopathological diagnosis - Fibroadenoma/papilloma/atypical duct hyperplasia/invasive carcinoma with DCIS /Recurrent mass/inflammatory changes/sclerosing adenosis with no atypia.

**Sample Size**

41.

**Inclusion Criteria**

1. Patients with inconclusive study by mammogram or ultrasound.
2. Those which have biopsy proven malignancy.
3. Those which have cytology proven malignancy with benign appearance of lesion by mammogram or ultrasound.
4. Post-operative or post-chemotherapy patients to know residual disease.
5. Those with occult carcinoma with breast primary in axillary lymph node.

**Exclusion Criteria-**

1. Patients under hormone therapy.
2. Patients in luteal phase of menstrual cycle.
3. Patients with contraindication for MRI.

**MRI Protocols and Imaging**

MRI was performed on a 1.5 T commercial available system (Signa HDxT, General Electric Healthcare), bilateral 8-channel phased-array breast coil. Images were acquired with the patient in prone position and with both breasts imaged simultaneously & the following sequences were performed-

- (a) T1 W axial.
- (b) T2 W axial & sagittal with fat suppression.
- (c) Post contrast T1 W axial dynamic study.

**Statistical Analysis**

Statistical analysis was performed using computerised statistics software (Epi- Info, Centres for Disease Control and Prevention, Atlanta, GA) with the Chi-square and Fisher's exact tests. Sensitivity, specificity and associated statistics were worked out and provided.

**Ethics**

The study was approved by the institutional research committee and ethics committee of Government Medical College, Kozhikode, Kerala, India.

**RESULTS**

1. Shape- 66.6% of benign lesions showed well-defined (oval, round, lobulated) shape while none of the malignant lesions demonstrated this. However, irregular shape was observed in all the malignancies.

	Malignant	Benign	TOTAL
<b>Oval</b>	0	5	5
	0%	23.8%	12.2%
<b>Round</b>	0	4	4
	0%	19%	9.8%
<b>Lobulated</b>	0	5	5
	0%	23.8%	12.2%
<b>Irregular</b>	20	7	27
	100%	33.3%	65.9%

**Table 1. Distribution According to Shape**

Sensitivity	0%
Specificity	76%
Positive predictive value	0%
Negative predictive value	44%

**Table 2. Statistical Indices of Oval Shape**

Sensitivity	0%
Specificity	81%
Positive predictive value	0%
Negative predictive value	46%

**Table 3. Statistical Indices of Round Shape**

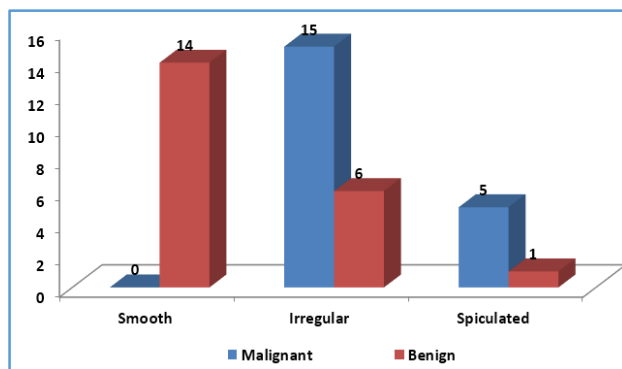
Sensitivity	0%
Specificity	76%
Positive predictive value	0%
Negative predictive value	44%

**Table 4. Statistical Indices of Lobulated Shape**

Sensitivity	100%
Specificity	67%
Positive predictive value	74%
Negative predictive value	100%

**Table 5. Statistical Indices of Irregular Shape**

2. Margin- Smooth margin was observed in 66.7% of benign lesions while ill-defined margin like irregular & spiculated constituted 70% and 25% respectively in malignancies with none of them showing smooth margin.



**Figure 1. Distribution According to Margin**

Sensitivity	0%
Specificity	33%
Positive predictive value	0%
Negative predictive value	26%

**Table 6. Statistical Indices of Smooth Margin**

Sensitivity	75%
Specificity	71%
Positive predictive value	71%
Negative predictive value	75%

**Table 7. Statistical Indices of Irregular Margin**

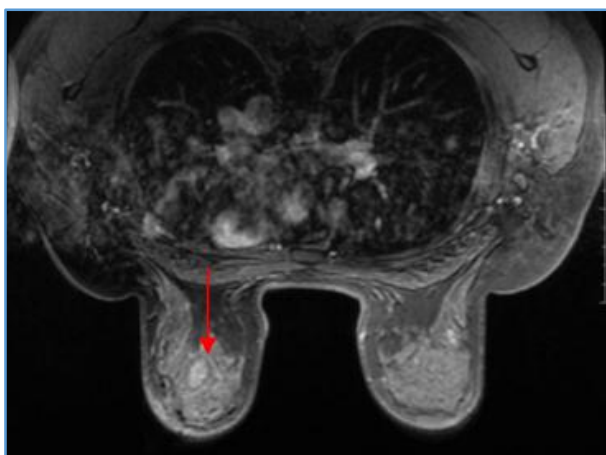
Sensitivity	25%
Specificity	95%
Positive predictive value	83%
Negative predictive value	57%

**Table 8. Statistical Indices of Spiculated Margin**

- All the six fibroadenomas were having well defined (oval, round or lobulated) shape with smooth margin.
- Of the four atypical duct hyperplasia, except one showing irregular shape and margin, rest were having round / lobulated shape with smooth margin.
- All the papillomas were having smooth margin with lobulated / oval shape.
- Of the two sclerosing adenosis without atypia, irregular and smooth margin as well as irregular and round shape was having equal distribution.

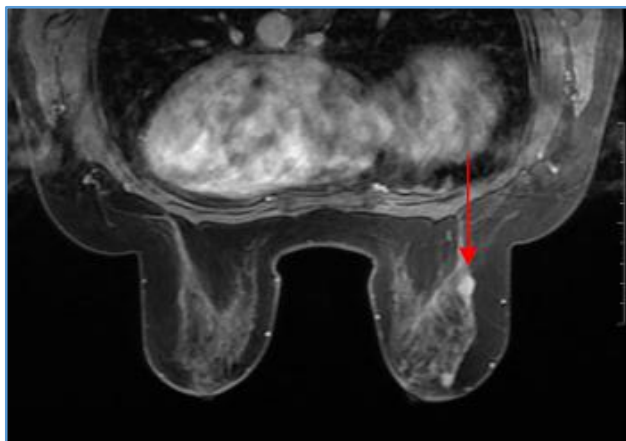
**Case 1**

Contrast-enhanced fat suppressed 3D FSPGR image showing well defined oval lesion with smooth margin in left breast. HPR-Fibroadenoma.



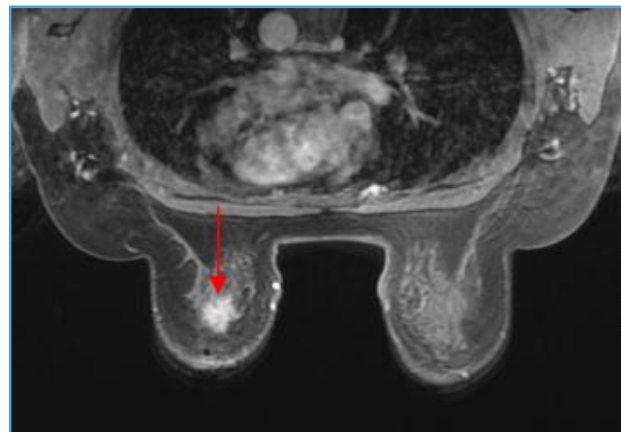
**Case 2**

Contrast-enhanced fat suppressed 3D FSPGR image showing well defined lobulated lesion with smooth margin in right breast. HPR-atypical ductal hyperplasia.



**Case 3**

Contrast-enhanced fat suppressed 3D FSPGR image showing irregular lesion with spiculated margin in left breast; HPR-invasive ductal carcinoma with ductal carcinoma in situ.



**DISCUSSION**

In this study, well-defined shape had a specificity of 75-80% in predicting benignity while irregular shape had a sensitivity and specificity of 100% and 67% for diagnosing malignancy respectively. Present study revealed a comparatively lower negative predictive value (NPV) for smooth margin since more of post-treatment cases with irregular margin were included. Also, this study categorised well-defined shape into oval, round and lobulated. So considering them as one group in previous studies might have increased the negative predictive values.

According to Nunes et al,<sup>1</sup> a typical benign feature for masses is a smooth margin (NPV of 95%). If a mass is lobulated and shows no enhancement or only minimal enhancement, it is likely to be benign (NPV of 100%).

Orel, Gilles, Hams et al<sup>2,3</sup> concluded from their study that one of the architectural features suggestive of benign process include a mass with smooth or lobulated borders.

	Nunes et al <sup>4</sup>	Schnall et al <sup>5</sup>	Liberman et al <sup>6</sup>	Present Study
Irregular margin	81%	84%	-	71%
Spiculated margin	88%	91%	80%	83%

**Table 9. Positive Predictive value**

In this study, ill-defined margin had a high positive predictive value for malignancy [71% for irregular & 83% for spiculated margin] which is well correlating with the study by Nunes et al.<sup>1</sup> They reported that irregular margin has a positive predictive value of 81% and spiculated margin has a positive predictive value of 88% for diagnosing malignancy.

Nunes, Schnall and Orel et al<sup>4</sup> also concluded that architectural features highly predictive of malignancy include spiculated borders (PPV for malignancy of 91%) and irregular borders (PPV for malignancy of 84%). This also correlates with the present study.

Liberman et al<sup>6</sup> concluded that the features with higher PPV were spiculated margins (80% of carcinoma) and irregular shape (32% carcinoma) for mass lesions which is well correlating with the present study.

Orel, Gilles, Hams et al<sup>2,3</sup> concluded from their study that one of the architectural features suggestive of malignancy include a mass with irregular or spiculated borders.

#### CONCLUSION

Well-defined shape and smooth margin were characteristic of benign lesions. Spiculated margin was highly specific for malignancy. Both irregular and spiculated margin had a high predictive value for malignancy.

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