Characteristics of Pathologically Benign Breast Lesions Found To Be Suspicious on MRI

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Problem

What magnetic resonance imaging characteristics do pathologically proven benign lesions demonstrate after categorization on "suspicious" on MRI?

Purpose

Standard diagnosis of breast cancer with mammography and ultrasound is being increasingly augmented by enhanced magnetic resonance of the breast. The interpreting physician encounters many challenges in deciding which lesions may be characterized as benign and which require further investigation, while considering patient morbidity and delay of care. The purpose of this study is to evaluate the MRI characteristics of pathologically benign lesions which were found to be suspicious on MRI.

Rationale

Breast cancer is associated with significant morbidity and mortality if left untreated. The sensitivity of MR imaging for breast cancer is approximately 90% however specificity continues to be in the range of 57-70%. Many patients who undergo MRI breast to evaluate abnormalities not well-characterized on ultrasound or mammography, integrity of breast implants, or multilocality/multicentricity or recurrence/therapy response of previously diagnosed breast cancer. It is also commonly utilized as a screening tool for patients who are at a high risk of developing breast cancer. Benign lesions that can often appear suspiciously enhancing on MRI include fibroadenomas, sebaceous adenomas, intraductal papillomas. To further confuse the issue, normal breast parenchyma may also enhance focally. Lesions that are categorized as BI-RADS 0, 4, or 5 on MRI at our facility typically go on to biopsy which can delay care and cause significant patient discomfort, both physically and emotionally. In one study of patients with known breast cancer undergoing pre-therapy staging, MRI breast alone delayed care an average of 22.4 days. However, in our center, benefits cannot be argued. Here, an assessment of MRI characteristics of pathologically proven benign lesions which were categorized as suspicious and biopsied is provided and compared to those which were pathologically proven to be malignant.

Hypothesis

Enhancement pattern of a lesion is the most important characteristic which can be employed to differentiate between benign and malignant lesions on breast MRI.

Participants

• 456 consecutive MRI breast studies (no exclusionary criteria) from June 30, 2010 to December 31, 2012 were retrospectively reviewed.
• Patients included those with known breast cancer undergoing therapy planning or post-therapy follow-up, a strong family history of breast cancer, a need for evaluation of breast implants, or abnormalities not well-characterized with ultrasound or mammography.
• A total of 41 suspicious lesions were biopsied from this cohort, with 26 benign and 15 malignant lesions identified on pathology.
• Patient confidentiality was maintained; no identifying descriptors were used.
• Imaging was performed at Huron Valley-Sinai Hospital, Detroit Medical Center, Commerce, Michigan.

Methods and Analysis

Procedure – Magnetic Resonance Breast Imaging
• Utilized a 1.5T Siemens (Munich, Germany) MR scanner with a bilateral breast surface coil
• MRI breast protocol at our facility
• Axial T1-weighted images with and without fat saturation, as well as multiple delayed post-contrast T1-weighted fat saturated images are obtained.
• Axial inversion recovery, T2 sagittal, and multiple intensity projection dynamic flow images are also obtained.
• 0.2 mL/kg of intravenous Magnesit contrast solution is administered.

Studies are evaluated by an AOOR board certified/ACR qualified interpreting attending physician

Tool – CADstream (Confirma, Bellevue, Washington)
• Uses an adaptive motion correction algorithm (2D/3D) that was developed specifically for breast MRI incorporating cardiac artifact detection and optimizing registration.
• Simultaneously utilized to render suspicious lesion renderings and data calculations, including kinetic characteristics, dimensions, volume and location within the breast.

Results

26 benign and 15 malignant lesions were found on biopsy of lesions found suspicious on MRI breast.

Of the benign lesions, 16 (62%) were BI-RADS 4, two were BI-RADS 5 (8%), five (19%) were BI-RADS 0, and three (12%) were additional lesions in a breast with known cancer which were not given a separate BI-RADS identifier from BI-RADS 6.

Of the malignant lesions, ten (67%) were BI-RADS 4, four (27%) were BI-RADS 7, and one (7%) was an additional lesion in a breast with known cancer which was not given a separate BI-RADS identifier from BI-RADS 6.

Relevant

3. AOOR, Official Journal of the American Optometric Association (AOA), American Optometric Association, 1874 L Street, N.W. Washington, DC 20036-5305
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Discussion

The kinetic enhancement pattern, while very helpful, cannot be used alone to determine lesion benignity. In this cohort, lesion size and shape were found to be essential correlates. However, significant overlap of imaging characteristics still exists among lesions found to be benign or malignant.

Of note, all (five) of the lesions categorized as BI-RADS 0 that were biopsied were benign. Two of these went straight to MR biopsy, while three went to ultrasound and were further categorized as BI-RADS 4.

Clinical Implications:
Classifying pathologically benign lesions as BI-RADS 1-3 on MRI would lead to decreased patient morbidity however continues to prove difficult in practice. No one characteristic should be used alone, as pathologic and enhancement patterns both prove vitaly important.

Limitations:
• Retrospective analysis
• Dependent on interpreting physician classifications
• Some suspicious lesions lost to follow up

Future Research:
Correlation with molecular imaging prior to lesion biopsy 1-3

Conclusion

While kinetic enhancement patterns on MRI breast are essential in interpretation, lesion size and shape must also be taken into consideration when assigning a BI-RADS classification. Further, in striving to decrease unnecessary biopsies, one must not forget the importance of avoiding false negatives.

References