Choosing MRI Wisely: Part 3

BREAST MRI: How to determine if it will help patients in a community-based primary care practice

EFW Radiology Medical Brief

Bobbie Docktor, MD, FRCPC
Director of Breast Imaging – EFW Radiology
Clinical Assistant Professor
Department of Radiology
Faculty of Medicine
University of Calgary

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This is the third in a series of medical briefs attempting to share evidence-based guidelines in appropriate use of MRI. The goal is to provide concise, easy to follow information to assist busy community based primary care physicians in choosing MRI for their patients and as a tool to assist physicians when they are faced with potentially challenging scenarios where patients request an MRI and the physician believes the MRI is not indicated.

Breast cancer will affect one out of nine (1 in 9) Canadian women in their lifetime.[1]

Breast MRI can detect breast cancer with very high sensitivity (estimated to be 95%) and moderate specificity (67%).[2] With these characteristics, MRI for detection of breast cancer has a risk of false positive findings, and subsequent tissue diagnosis and workup could result in more harm than good. Conversely, MRI as an adjunct to screening mammography in patient populations who have an a priori high risk of having breast cancer, has been shown to increase detection of early breast cancer compared to screening mammography alone.[3]

How does one determine if Breast MRI is an appropriate test to detect breast cancer? The current evidence suggests that the use of Breast MRI is appropriate in four broad categories of patients: 1) Those with a confirmed biopsy diagnosis of invasive lobular cancer, 2) Those receiving neoadjuvant chemotherapy, 3) Those who have malignant adenopathy in the axilla or supraclavicular regions, and 4) Women considered at “High Risk” of developing breast cancer.[2]

The remainder of this paper will focus only on category 4 as categories 1, 2, and 3 are usually under the care of breast cancer oncology and surgery groups.

Women’s risk for developing breast cancer are typically reported as “average” (less than 15% lifetime risk of developing breast cancer), “intermediate” (15-20% lifetime risk of developing breast cancer), and “high risk” (20% or greater lifetime risk of breast cancer).[3]

The evidence clearly shows that it is inappropriate to use MRI as a screening tool in women who fall into the average risk group.

There is insufficient evidence to either recommend or discourage MRI in the intermediate risk group and these women include those with a personal history of breast cancer, lobular neoplasia and/or atypical ductal hyperplasia on biopsy specimens.

High-risk women are further stratified into those who have well established and known reasons for being high risk and those who are deemed high risk based on mathematical predictive models. Known factors that place a woman in the high-risk category include a personal history of chest irradiation between the ages of 10-30, known BRCA gene mutations, or syndromes caused by mutations in the TP53 and PTEN genes.[2]

In high-risk women, current evidence suggests that the use of annual Breast MRI, as an adjunct to screening mammography, is an appropriate screening strategy.[3]

A number of mathematical models for predicting risk of breast cancer have been developed. One of the earliest, and perhaps the most widely used model, was published by Gail et al. in 1989.[4] The "Gail model" as it has come to be known, was developed jointly by the United States' National Cancer Institute and the National Surgical Adjuvant Breast and Bowel Project . This model estimates a woman's risk of developing invasive breast cancer over a 5-year time period and over her lifetime. The Tyrer-Cuzick[5] model is another predictive tool used to calculate a person's likelihood of carrying the BRCA 1 or 2 mutations, which are associated with increased breast cancer risk. It estimates the likelihood of a woman developing breast cancer in 10 years and over the course of her lifetime. The Breast and Ovarian Analysis of Disease Incidence and Carrier Estimation Algorithm (BOADICEA) model is used to calculate the risks of breast and ovarian cancer in women.[6] It calculates the probability that a woman is a carrier of any cancer-associated mutations in the BRCA 1 or BRCA 2 gene and estimates the likelihood of a woman developing breast cancer in 5 years, and over the course of her lifetime.

Each of these models has limitations that physicians and patients should be aware of. As an example, the Gail model does not consider some breast cancer specific risk factors or lifestyle factors. One retrospective study suggests that the combination of breast density and mathematical models will improve cancer detection rates, but there is currently insufficient evidence to support this approach.[7]

These models, despite limitations, are useful tools when trying to decide if a woman is a candidate for breast MRI. The US National Cancer Institute and the Government of Australia both have online "calculators" that estimate lifetime risk using the Gail model (available at http://www.cancer.gov/bcrisktool/ and http://canceraustralia.gov.au/affected-cancer/cancer-types/breast-cancer/your-risk/calculate). The Canadian Breast Cancer Foundation has links to multiple tools (http://www.cbcf.org/central/aboutbreasthealth/preventionriskreduction/evaluatingbreastcancerrisk/pages/using-risk-assessment-tools.aspx) and apps are available for smartphones. These tools are all meant for health professionals and intended as an adjunct to comprehensive clinical assessment rather than tools to be used in isolation.

In summary, the current evidence suggests that Breast MRI as a screening tool for breast cancer is appropriate in women deemed to be high risk for developing breast cancer. This risk could be on the basis of personal medical history such as history of chest irradiation, or specific genetic mutation, or the risk could be high based on a mathematical predictive model of choice. Even in these high-risk women, screening mammography is the recommended first line test and Breast MRI should be used as an adjunct.

The following table summarizes an approach that can be used quickly in a busy office setting in determining if MRI is appropriate as an adjunct to Mammography:

	BREAST MRI APPROPRIATE	BREAST MRI INAPPROPRIATE
History of chest irradiation between 10-30 years of age	Yes	No
BRCA mutation and/or syndrome associated with breast cancer	Yes	No
Risk Profile based on mathematical predictive model	High Risk (20% or greater)	Low Risk (<15%)
Intermediate Risk (15-20%) based on mathematical model	Insufficient evidence to recommend or discourage MRI	Insufficient evidence to recommend or discourage MRI

Reference Articles:

1. Canadian Cancer Society. Canadian Cancer Statistics 2014. Can Accessed October 3, 2014.
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5. Tyrer J, Duffy SW, Cuzick. A breast cancer prediction model incorporating familial and personal risk factors. *J.Stat Med.* 004 Apr 15;23(7):1111-30. Erratum in: Stat Med. 2005 Jan 15;24(1):156.
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MRI

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Should you feel your patient would benefit from a Breast MRI at EFW Radiology, and would like to book an appointment please call **(403) 541-1200**.