SMRT Student Scope Submission

Title and Author(s)

Title **Breast Cancer and MRI**

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Introduction or Patient History

Having been recently diagnosed with invasive breast cancer, a premenopausal 49-year-old female arrived for her appointment for an MRI of the left breast. A palpable mass was found during a routine self-examination approximately 4 to 5 weeks prior to her having an ultrasound-guided breast biopsy. The biopsy would later prove to demonstrate invasive ductal carcinoma in situ and this appointment was recommended in hopes of helping to stage the cancer and decide a course of treatment.

Since the patient is premenopausal, it is imperative that she schedules her Breast MRI during the second week of her menstrual cycle because this is when the breast are less likely to illustrate benign hormonal effects which create “false positives”.

Patient Preparation and Scan Set up

Prior to the patient entering the “warm zone”, pertinent questions were asked regarding her medical history. Special attention was given to implanted devices and ferromagnetic metal that may be within her body. She was then provided with two gowns and requested to put the bottom gown on with the opening in the front and the top gown with the opening in the back. Her necklace and watch were removed and all other valuables were secured into a locker. The patient was then taken to into an area where the Radiology Nurse would place an IV so that towards the end of the imaging, 30 cc of Gadolinium followed by 20cc of saline flush could be administered via a power injector.

Upon entering the scan room, the patient became apprehensive. She was assured that an MRI tech would be in constant contact with her throughout the scan and that she could be removed from the scanner at any time by squeezing the ball that would be given to her. It was then explained to her that she would be injected with Gadolinium. This was proceeded by a discussion on the necessity of Gadolinium, the products safety and its mild side effects.

After being connected to the power injector, the patient was then placed prone onto the scan table with the both breast centered into a dedicated breast coil. Moderate compression was applied to limit the number of slices utilized, motion, and distortion. Headphones were provided and tuned to the patient’s favorite radio station. The importance of remaining still was then reiterated.

After being land marked using a 1.5 Siemens Symphony magnet, she was sent head first into the scanner. The following sequences were then performed: axial and sagittal T1 weighted spin-echo, T2 weighted fat saturated fast spin echo, dynamic sagittal pre and post gadolinium with fat suppression, and T1 gradient echo images, and subtracting images which demonstrated the phases of interstitial and arterial phases of enhancement.

MR Imaging Parameters

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Findings and Discussions

Evaluating breast disease using MRI has increased over the last five years. Its ability to provide excellent soft tissue contrast has proved to be very beneficial in the detection and treatment planning of breast cancer. When there is a tumor in question, it is important that the abnormal tissue appear different from the normal tissue. When contrast agents, such as Gadolinium are employed, abnormal tissue will enhance. Invasive breast cancer will most likely reveal a vascular increase, which causes enhancement within seconds. This will assist the Radiologist when determining the location, size, and the temporal resolution of the tumor. Location, size, and temporal resolution are major contributors when interpreting an abnormal breast MRI and will help determine the stage and treatment planning of the diseased breast.

Findings that were described by the radiologist revealed; "There is a moderate amount of fibroglandular tissue. There is a speculated enhancing mass at the 12 to 1 o'clock position of the left breast approximately 4.5 cm posterior to the nipple, which corresponds to the patient's known malignancy. The mass measures 2.5 x 2.1 cm. No other abnormal areas of enhancement, masses or areas of architectural distortion are identified." For the right breast: "There is no architectural distortion, suspect mass, or suspect enhancement identified to suggest malignancy."

This interpretation categorizes the patient as having Stage II breast cancer of the left breast. Which can be defined as, " The cancer being two to five centimeters, that may or may not have spread to the lymph nodes under the arm." More times than not, women that have been diagnosed with breast cancer will have breast surgery. The invasiveness of the surgery will depend on components such as: the stage of the cancer, the patient's age, and overall health of the patient. In the early stages, which include Stage II, a lumpectomy in conjunction with chemotherapy might be recommended. This type of surgery will remove the tumor and also preserve the breast. However, the patient may opt to have a mastectomy, removing the entire breast, for fear that the cancer might return.

The prognosis for women diagnosed with breast cancer at any stage is determined by a number of contributing factors. For instance:

- **The sizes of the tumor-** women with tumors less than 2.5 centimeters without any node involvement have a 96% survival rate after 5 years
- **Lymph node involvement**- 70 to 80 % of women will be at least ten years disease free without any node involvement.
- **Patient's age**- women diagnosed before the age of 50 with localized breast cancer will have an approximately 40-year survival rate.

Without being privy to the patient's course of treatment, I am unable to comment on the remission or progression of her breast cancer. However, according to statistics the possibility of her being a long time breast cancer survivor are strongly in her favor

Conclusions

If you are a woman, you are at risk for breast cancer. This disease has become the most prevalent form of cancer among women worldwide and accounts for at least 375, 000 deaths per year. However, if detected in its early stages the chances of survival are increased. Risk factors for breast cancer include but are not limited to: family history of breast cancer, obesity, late onset of menopause, or simply being a woman.

MRI has proved to be an excellent imaging modality to detect breast cancer, evaluate breast cancer, and to assess breast cancer's response to chemotherapy. It is not only noninvasive but it provides excellent soft tissue contrast. Soft tissue contrast is required to distinguish "good" tissue from "bad" tissue. Also, MRI allows dynamic images to be performed, this is extremely important for diagnosing and treatment planning because it allows you to see how fast Gadolinium "washes" in and out of a lesion. For example, if Gadolinium enters and exits a tumor fast, it can be hypothesized that chemotherapy drugs will enter and exit at the same speed. During chemotherapy treatment, it is ideal if the chemotherapy drugs are retained by the tumor. If the tumor is unable to retain the Gadolinium it is highly unlikely that it will retain the chemotherapy drugs.

This project has been both interesting and educational. It has given me a new outlook toward breast cancer awareness while simultaneously reinforcing the significance of proper patient preparation and technologist efficiency. In conclusion, I would like to stress the importance of monthly self-breast exams beginning at the age of twenty and monthly self-breast exams in conjunction with annual mammogram screenings beginning at forty. If at any time you notice abnormalities such as changes in the shape, color, or dimpling in your breast and/or a discharge from your nipple you should consult your doctor right away.

References

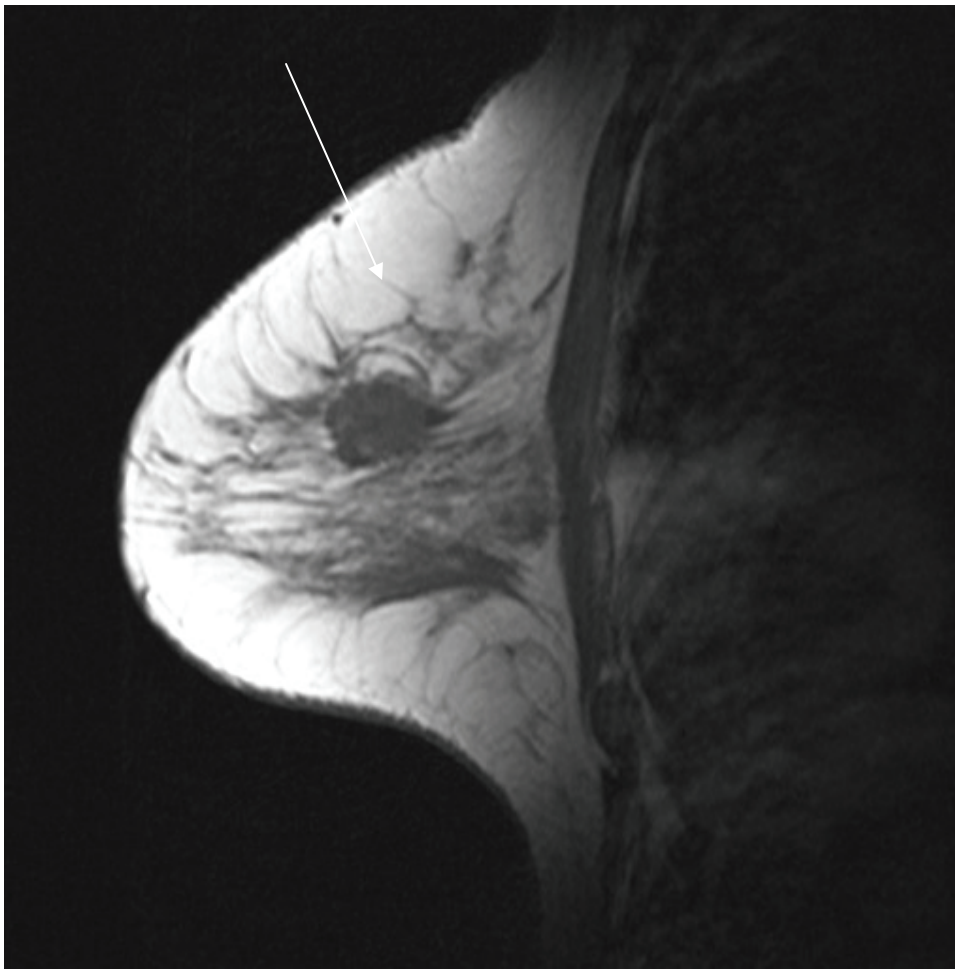
Staging of Symptomatic Primary Breast Cancer with MR Imaging. American Journal of Roentgen logy 1997; 169; 417-424

"Magnetic Resonance Image of the Breast" Quest Diagnostics. 2004. May 14, 2004 www.questdiagnostics.com

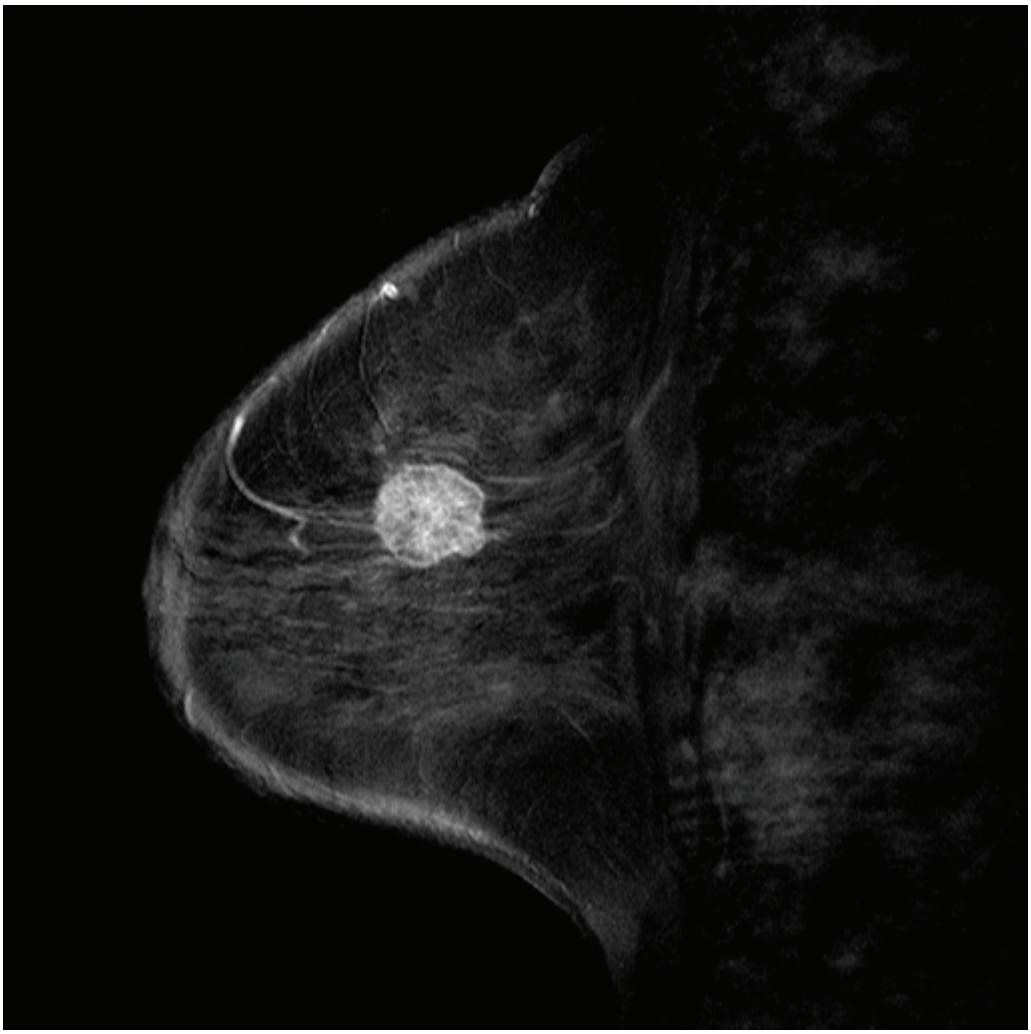
"MRI Proves useful in Assessment of Suspected Breast Cancer Patients" Jason Ocker/Eurekalert.2005. July 3, 2005 www.medicalnewstoday.com

Images

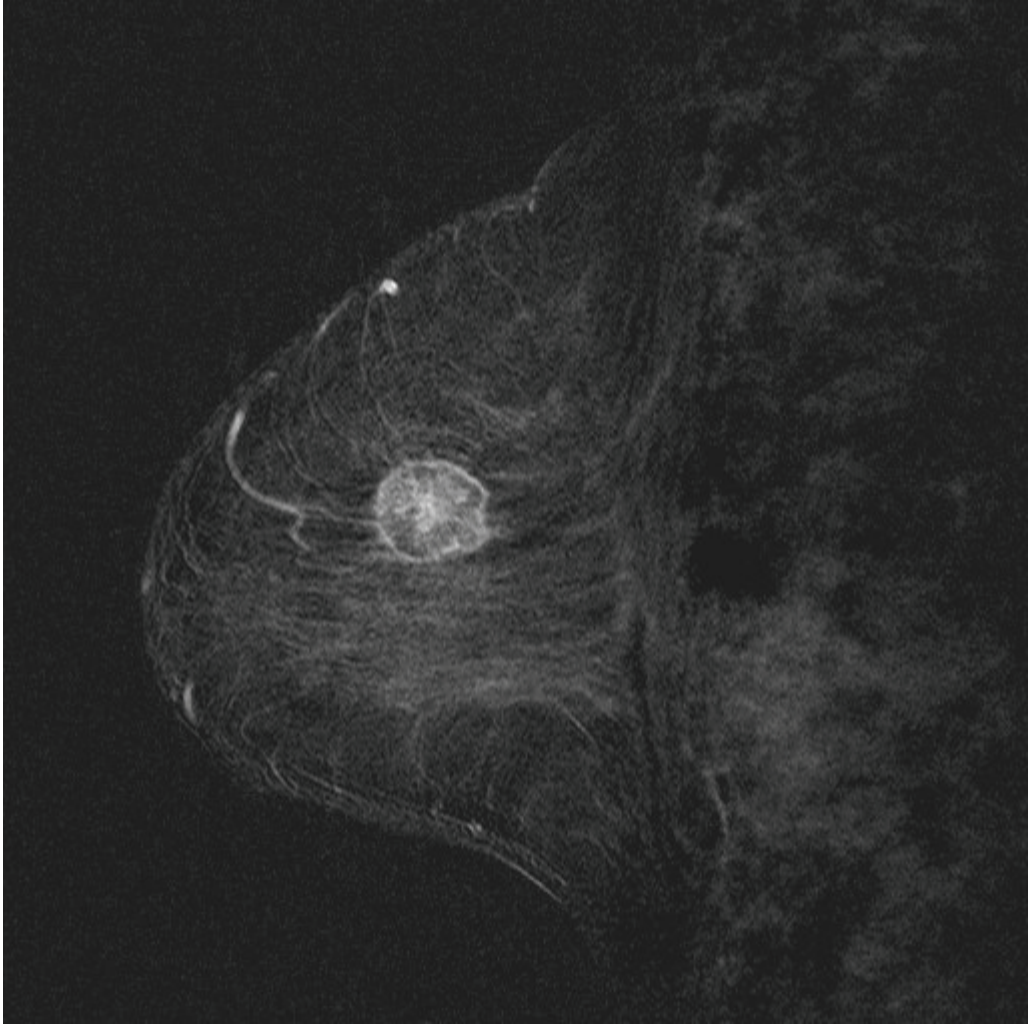
AXIAL T1
Demonstrating mass at the 12 to 1 o'clock position



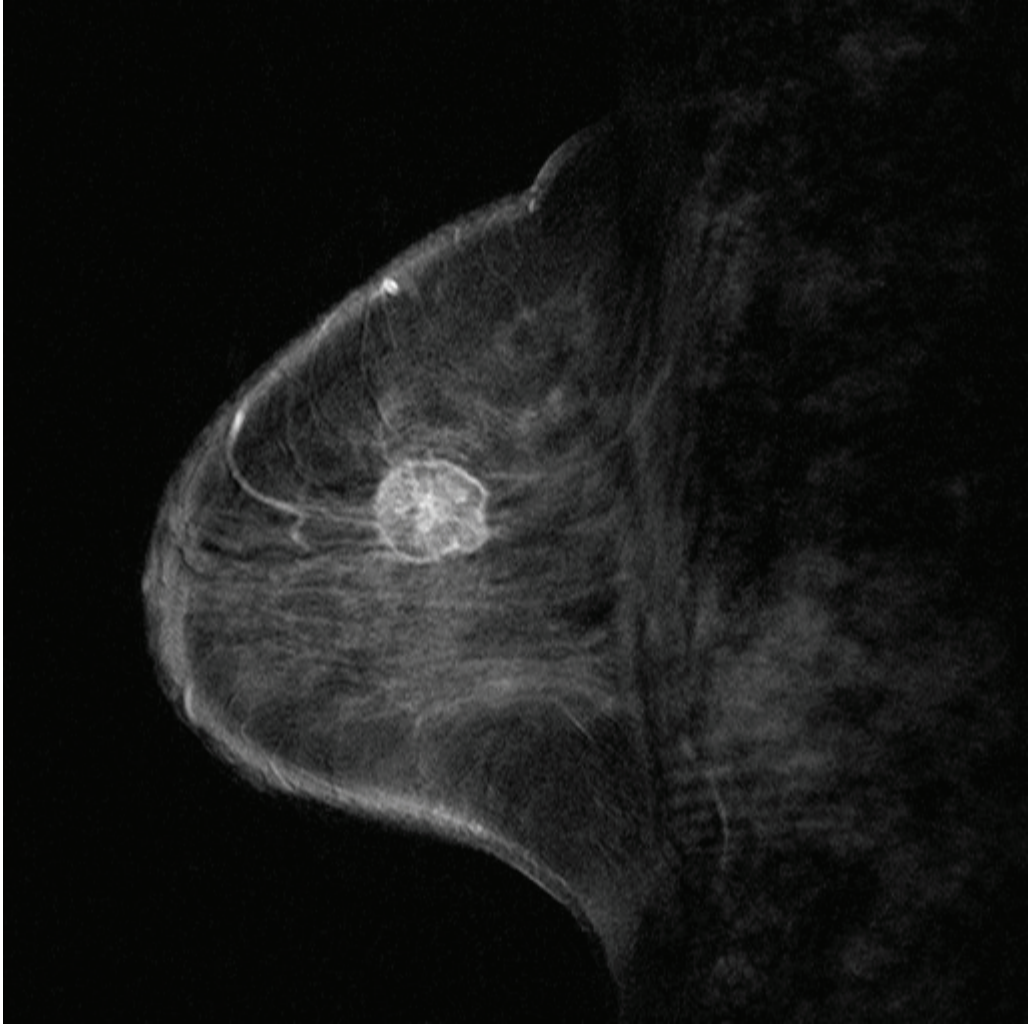
SAGITTAL T1
Abnormal tissue appears hypointense



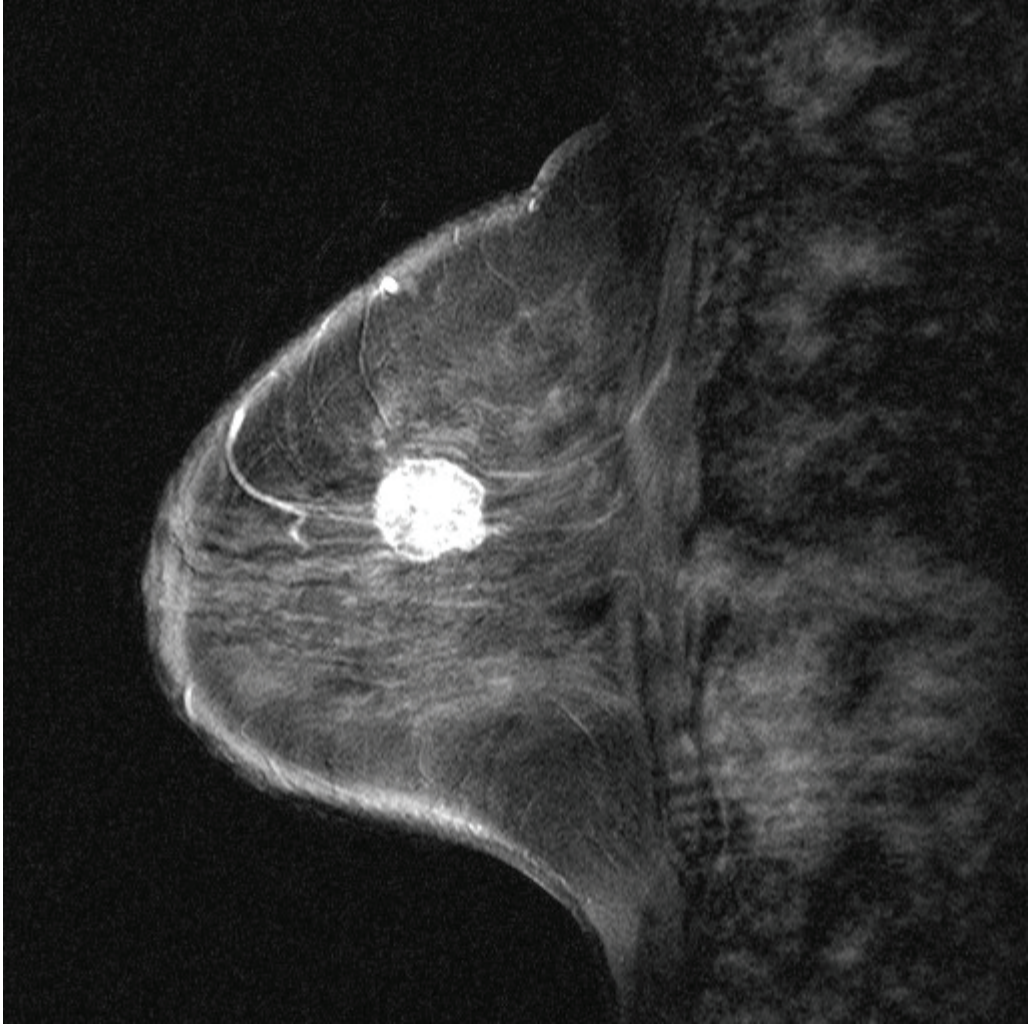
SAGITTAL T2 IMAGE
Abnormal tissue appears hyperintense



ARTERIAL PHASE OF ENHANCEMENT



VENOUS PHASE OF ENHANCEMENT



CONTRAST ENHANCED MASS