

Improving the quality of breast MRI exams by training residents who guide the images acquisition

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PURPOSE

- **The aim of this study was to evaluate the residents' knowledge on breast MRI techniques before and after training, and how this training impacts in the quality of these studies.**

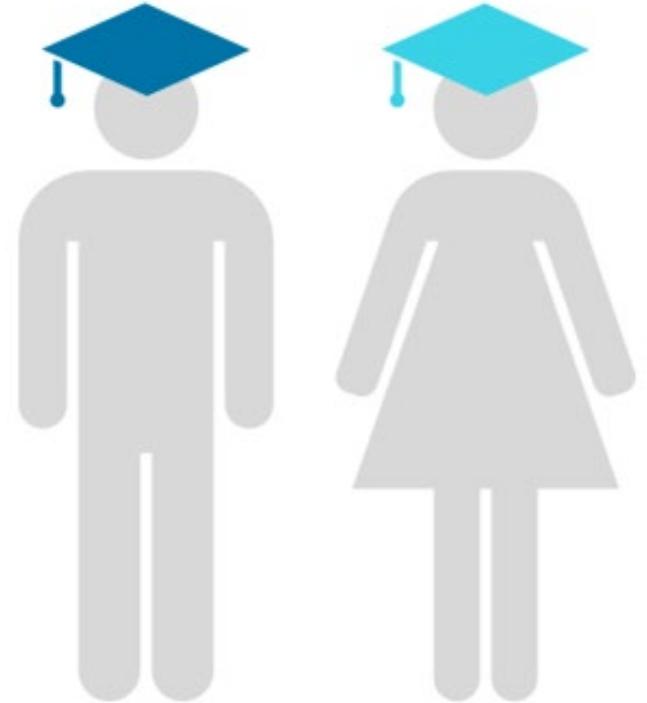


GOALS

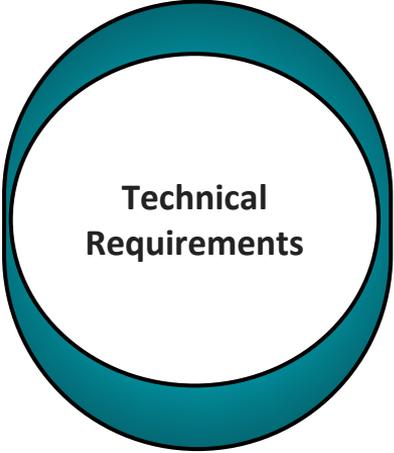
- **To reduce recall rates**
- **To improve the quality of breast MRI images for radiologists in charge of these reports.**
- **To provide insight on breast MRI technique and procedures to the residents who will be guiding the images acquisition.**

BACKGROUND

- The training received by radiology residents regarding the technical aspects of Breast Magnetic Resonance (MRI) varies in quality and content according to each institution.
- There are specific parameters regarding the requirements by the technical operators and the scanning protocols to perform breast MRI scans with contrast agents.
- From the recall exams due to technical flaws required by our Breast Imaging Department, arose the need for training the residents in charge of guiding these examinations.



NECESSARY REQUIREMENTS TO PERFORM BREAST MRI



**Technical
Requirements**

- High spatial resolution.
- Adequate temporal resolution
- Adequate signal-to-noise ratio (SNR).
- Magnetic fields with high field strength.

- Homogeneity of the images of both breasts.
- Breast coils.
- Proper fat suppression in both breasts.
- Correct positioning of the breasts.

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- This allows us to avoid technical artifacts which may lead to false images or even hide suspicious lesions.

METHODS

- In a retrospective study, approved by our institutional review board, we assessed 15 radiology residents who underwent multiple-choice questions for the evaluation of specific technical parameters on breast MRI exams.
- This evaluation was performed between January 2020 and February 2020. During this period, technical concepts and protocols for breast MRI were assessed, before and after training. The evaluation consisted of eight multiple-choice questions with a single correct answer.
- Following the results of the initial assessment, the residents received a 30-minute lecture carried out by a board-certified radiologist.
- Immediately after this lecture and 30 days later, the residents were re-evaluated using the same questionnaire.

In the initial phase, the number and percentages (%) of correct answers were analyzed in each of the three successive evaluations.

In a second phase, we generated two variables to represent the changes generated by this action: 1) changes between the percentage of correct answers between the exam performed after the lecture compared to the previous one (% T1 -% T0); 2) changes that were maintained 30 days after attending the lecture in regards to their knowledge before this intervention (% T2 -% T0).

The statistical significance of these differences was explored through a "T" test for paired data. The analysis was performed with STATA 13.0 software.

MULTIPLE CHOICE QUESTIONNAIRE AND CORRECT ANSWERS

1

During which part of the menstrual cycle is it recommended to perform breast MRI?

- Option 1:** At any point of the cycle.
Option 2: During the first week of the cycle.
Option 3: During the second week of the cycle.
Option 4: During the last week of the cycle.

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Who are considered high-risk patients?

- Option 1:** Patients with a personal history of breast cancer.
Option 2: Patients with a family history.
Option 3: Patients with confirmed mutation for BRCA 1 or BRCA 2 .
Option 4: Patients with genetic syndromes such as Li-Fraumeni or Cowden.
Option 5: Options 3 and 4 are correct.

3

Which sequences does the FAST protocol include?

- Option 1:** T1, T2 STIR, Silicone only and Dynamic contrast-enhanced sequence.
Option 2: T1, Dynamic with contrast-enhanced sequences at 1, 2, 3, 4, 5 and 6 minutes after injection.
Option 3: T1, Dynamic with contrast-enhanced sequences at 1 and 3 minutes after injection.
Option 4: T1, T2 fat sat, Dynamic with contrast-enhanced sequences at 1 and 5 minutes after injection.

4

What should implants look like in T2?

- Option 1:** black
Option 2: white
Option 3: gray
Option 4: it doesn't matter what they look like in T2, it only matters in silicone only sequence

5

What should I check before injecting IV contrast?

- Option 1:** That the positioning of the patient has been correct
Option 2: That the fat is suppressed in the T1 prior to contrast injection
Option 3: That there are no artifacts due to movements of the patient
Option 4: That the venous access has been checked prior to the injection
Option 5: All of the above are correct

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What should I consider when positioning the patient on the coil?

- Option 1:** That the nipples are aligned
Option 2: That there are no abdominal folds
Option 3: No breast contact with the edge of the coil
Option 4: That the arms are extended forward above the head
Option 5: All of the above are correct

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How do I make sure that the contrast injection was accurate?

- Option 1:** Check the heart chambers
Option 2: Check the internal mammary artery
Option 3: Check the contrast uptake by the breast parenchyma
Option 4: All of the above are correct

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In a patient who is on hormone replacement therapy (HRT), how long before the MRI scan should she cease treatment?

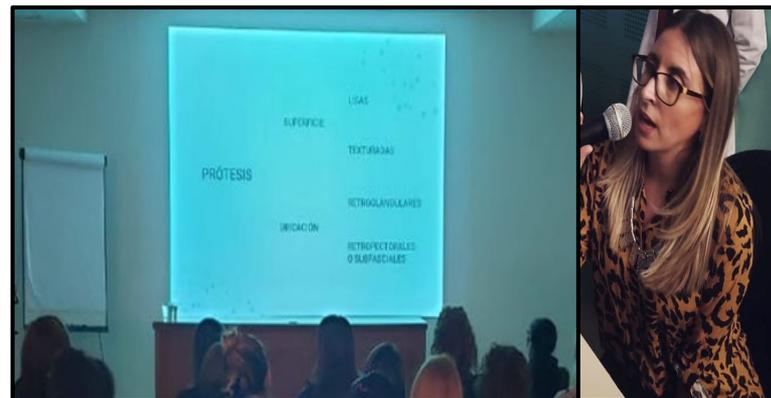
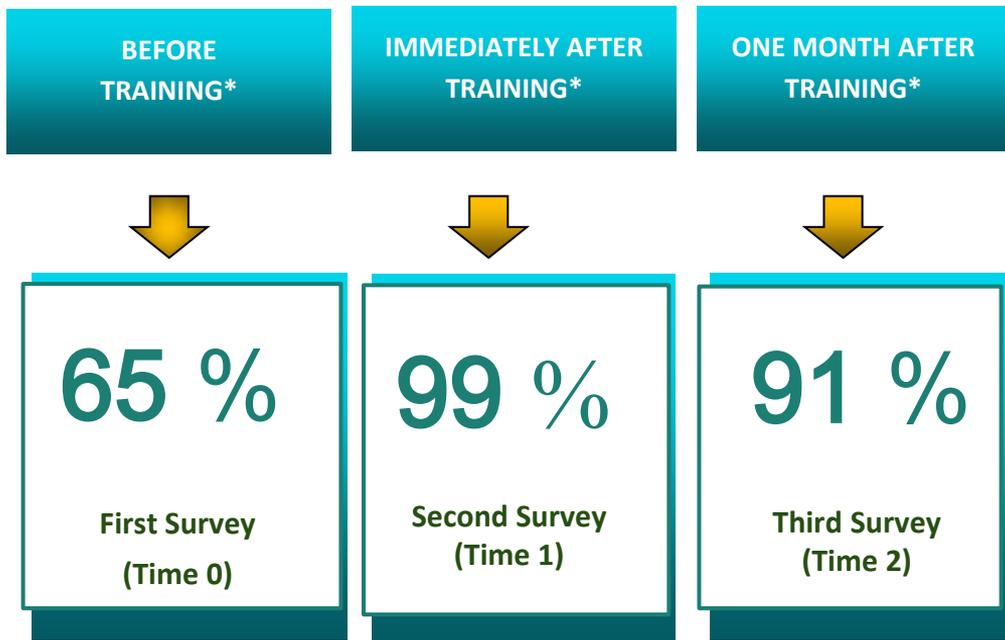
- Option 1:** 1 week before
Option 2: 12 weeks before
Option 3: 6 weeks before
Option 4: 8 weeks before

TABLE 1: PERCENTAGES AND NUMBER OF CORRECT ANSWER IN EACH STAGE

Questions Numbers	T0	T1	T2
1	10 (66 %)	14 (93%)	14 (93%)
2	14 (93%)	15 (100%)	13 (86%)
3	5 (33%)	15 (100%)	11 (73%)
4	4 (26%)	15 (100%)	14 (93%)
5	15 (100%)	15 (100%)	15 (100%)
6	15(100%)	15 (100%)	15 (100%)
7	11 (73%)	15 (100%)	15 (100%)
8	5 (33%)	15 (100%)	14 (93%)

References: T0: test taken before training; T1: test taken immediately after training; T2: test taken one month after training.

OUTCOME



*Training consisted of a 30-minute core lecture by a board certified radiologist.

TABLE 2: RESULT OF EACH OF THE EVALUATIONS AND PERCENTAGE OF KNOWLEDGE GAINED AFTER TRAINING.

Result of each of the evaluations	Before training (T0)	Immediately after training (T1)	One month after training (T2)
		65,8 % (12,9)	99,16 % (3,22)
Changes from baseline score		Immediately after training	One month after training
		+ 33,33 % (IC 95 % 26 a 40) p<0,0001	+ 25,8 % (IC95 % 18 a 33) p<0,0001

References: T0: test taken before training; T1: test taken immediately after training; T2: test taken one month after training.

CONCLUSIONS

- As many radiology residency programs, residents at our institution supervise imaging studies during their acquisition. For this reason, a proper educational opportunity which provides them with the basic knowledge on this subject is essential before performing the task.
- The need for continuous training for resident doctors is key in order to maintain the quality of breast MRI examinations.
- Diagnostic radiology residency programs should include educational activities for trainees on quality and patient safety topics so as to obtain high-quality care and to meet board requirements.

