**Audit of Proper Patient Positioning in Magnetic Resonance Imaging of Breast**

**Descriptor:**

Proper patient positioning during magnetic resonance imaging (MRI) of breast to minimise artefacts.

**Background:**

Breast MRI is known to have the highest sensitivity in detecting breast cancers. It is important in detection and evaluation of breast cancer, assessment of augmented breasts and as a problem-solving tool for inconclusive conventional breast imaging findings [1]. Poor positioning of the breasts in the breast coil can result in local distortion of the magnetic field with inhomogeneous fat suppression of the breast, and any breast compression against the coil can cause non-uniform contrast enhancement of the breast, potentially causing a cancer to be missed or creating pseudo-lesions [2].

The American College of Radiology (ACR) has published practice parameters defining optimal positioning in MRI breast. Ideally, the breasts should be positioned in the centre of coil with the field-of-view including the entire bilateral breasts and nipples pointing down to the ground symmetrically, and skin folds should be minimised [1]. Yeh et al. suggested similar goals of proper positioning, including imaging the maximum area of breast tissue, minimising skin folds, and achieving homogeneous fat suppression of the breasts and non-deformed breast parenchyma [2].

Static images from picture archiving computer system (PACS) demonstrating suboptimal breast positioning and its related artefacts arising from inhomogeneous fat suppression or non-uniform breast enhancement can provide evidence for audit.

**The cycle**

**The standard:**

The ACR practice parameter for the performance of contrast-enhanced magnetic resonance imaging of the breast and suggestions from Yel et al. are adopted:

1. Free-hanging of the breasts in the centre of the dedicated breast coil.
2. The field-of-view should include the entire breasts, from the axillae to the inframammary folds.
3. Skin folds and artificial breast deformity should be minimised.
4. The nipples should be positioned in profile from lateral view and should symmetrically point down to the ground.

**Target:**

A prior study including 630 breast MRI showed that 8.7% of artefacts in breast MRI are related to improper positioning [3]. Since limitations from patient’s body habitus, physical conditions and equipment (only one fixed size of the breast coil and magnet bore for any breast size) may not allow achievement of perfect images in all patients [2], an arbitrary target of 95% is set for MRI breasts to achieve the standard.

**Assess local practice**

**Indicators:**

Percentage of cases that fulfill all of the following criteria:

1. Entire breasts included within field of view.
2. Free-hanging non-deformed breasts within the centre of the breast coil.
3. No skin fold.
4. Nipples in profile and pointing down to the ground symmetrically.

**Data items to be collected:**

All breast MRI images will be reviewed on PACS by two independent breast radiologists to determine if the patient positioning is optimal and free from positioning-related artefacts. Any discrepancy will be settled by consensus.

**Suggested number:**

We suggest all the eligible MRI breasts within a specified period e.g. 3-6 months with approximately 30-50 cases to be audited, depending on the caseload of the centre.

**Suggestions for change if target not met:**

1. The importance of good positioning in breast MRI and the results of this audit will be presented to all radiologists, MRI radiographers and nurses during in-person departmental meeting.
2. Educational talk will be held with the target audience being MRI radiographers and nurses engaged in breast MRI to reinforce the following:
(a) The goals of proper positioning including imaging the maximum area of breast tissue, minimising skin folds, nipples in profile, and achieving homogeneous fat suppression and non-deformed breast parenchyma.
(b) Images and videos demonstrations for appropriate steps in patient positioning with visual check and scrutinising the triplane localizer images for any improper positioning, as well as when to consider repositioning.
(c) Regular review of prior images can help guide the positioning and anticipating potential challenges.
(d) Placement of a pad on the coil anterior to the patient's sternum for patients with big breast size to ensure free-hanging of the breasts without compression of the anterior breast tissue and nipples against the coil.
(e) The application of fat saturation pad around the breast can be considered in difficult cases, such as patients with prior breast surgery, as it can help smoothing the breast contour and make fat suppression more homogeneous.
3. Visual guide and checklist will be placed in the MRI suite serving as a quick reference for MRI radiographers and nurses during patient positioning.
4. Re-audit in 6 months after the intervention will be performed to assess for improvement in practice. The audit cycle will be continued to ensure sustained compliance with the standards.

**Resources:**

1. Access to radiology information system (RIS) to review administrative details and list of examination performed.
2. Access to picture archiving computer system (PACS) to review the MRI breast images.

**References:**

1. American College of Radiologists (ACR) practice parameter for the performance of contrast-enhanced magnetic resonance imaging (MRI) of the breast. Revised 2023 (Resolution 8).
2. Yeh ED, Georgian-Smith D, Raza S, Bussolari L, Pawlisz-Hoff J, Birdwell RL. Positioning in breast MR imaging to optimize image quality. Radiographics. 2014 Jan-Feb;34(1):E1-17.
3. Fiaschetti V, Pistolese CA, Funel V, Rascioni M, Claroni G, Della Gatta F, Cossu E, Perretta T, Simonetti G. Breast MRI artefacts: evaluation and solutions in 630 consecutive patients. Clin Radiol. 2013 Nov;68(11):e601-8.

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**Published Date:**

22 January 2025

**Last Reviewed:**

22 January 2025