MRI and MR-guided Biopsy In Breast Cancer Diagnosis.

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Learning objectives

To demonstrate the opportunities of MRI in detection and reliable differentiation of breast lesions. In this poster we will review the contribution of MRI in evaluation of breast disease extent, in sampling of suspicious areas and wire localization followed by surgical excision. We will describe the technique of MR-guided large-core-needle biopsy (LCNB) of breast lesions invisible for mammography (MG) and sonography (US).

The aim is to provide safe and reliable MR-guided biopsy for histological identification of breast lesions
Background

Early assessment, accurate spread evaluation and histological verification of breast tumors is vital especially for young women. Some breast lesions are occult at MG and US in about 44% of the cases [1, 2]. Contrast-enhanced MRI helps to reveal such tumors and MR-guided biopsy in this case is the method of choice. The demand for this technique is growing due to the increasing use of breast MRI in clinical practice. Contrast enhanced MRM accurately detects benign and malignant breast masses (including multifocal lesions), helps to find adenopathy, skin or nipple involvement and chest wall invasion. LCNB allows obtaining adequate sample of material for immunohistochemistry and hormone receptor assay, while fine needle aspiration gives a poor tissue sample of solid mass that suits only for cytology; alone it is not informative enough. LCNB is safer than vacuum-assisted biopsy when the mass is too close to the skin or to the chest wall. This presentation provides an overview of MR-mammography (MRM) capabilities and applications of MR-guided LCNB.
Findings and procedure details

All biopsies were performed on a Siemens Aera 4G system (1.5 T), using a dedicated 4-channel open breast coil, with an additional device for needle positioning. Our patients were positioned on the MRI table in the prone position. The breast was compressed between the plate and the grid with sufficient pressure to stabilize the breast tissue during the biopsy procedure and to cause an indentation of the grid on the skin. The grid itself is not visualized by MR. It is the impression caused by the grid on the skin that allows for identification of the grid. Care must be taken not to over-compress the breast, as this can affect contrast enhancement.

After localizing images, focused axial and sagittal T1-weighted, fat-saturated images are obtained before and after administration of intravenous contrast directed to the area of interest. Gadobenate dimeglumine contrast is administered based on weight (0.1 mmol/kg) with a power injector at a rate of 2 ml/ sec.

The biopsy site was determined using a grid system (Fig.1) and a needle guide. The axial image provides the depth of needle insertion. The depth from skin to the lesion is added to the 2-cm depth of the guide block for the total sum of needle-depth insertion (Fig.2).

Alternatively, the distance between the lesion location and the skin surface can be obtained by subtracting the slice location coordinates in the sagittal plane. The second step utilizes the sagittal images to identify where in the grid to place the needle. The fiducial placed on the grid guides identification of the opening in the grid. From that marked opening, rows and columns are counted to the lesion location.

LCNB was performed with biopsy gun and 14-gauge titanium coaxial biopsy needle through a sterile 14-gauge nonmagnetic needle introducer.

The skin was prepped with an appropriate cleaning solution. Lidocaine was infiltrated into the subcutaneous and deep tissues. A small skin incision was made to allow for smooth entrance of the trocar and guide sheath. The trocar was inserted into the sheath, and this unit was inserted into the appropriate opening in the guide block. The block was then placed on the grid with firm pressure; the trocar was advanced to the appropriate depth. The trocar was then removed and replaced by the obturator, a plastic, MR-compatible tube. Additional images can be obtained to confirm proper depth and location before samples are obtained (Fig.3). The obturator was removed and the biopsy device was introduced. Usually, 3 to 5 samples were obtained. Postbiopsy images then were obtained to confirm proper sampling of the lesion. The breast was then released from the grid and digital pressure applied to achieve hemostasis. The skin was cleaned, sterile surgical strips were applied. Both written and verbal instructions were given to the patient, along with ice packs to be applied to the biopsy site to help reduce swelling. The patient was also provided with an approximate time-frame in which to expect results as well as any follow-up instructions [3].
Images for this section:

Fig. 1: MR-biopsy Grid System

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Fig. 2: Needle guide with 14G tunnels.

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**Fig. 3:** Screenshot from a biopsy procedure, using a 14G large core needle to biopsy a mass enhancement in the upper inner quadrant of the left breast.

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Conclusion

MRM is a preferable method for visualization and characterization of neoplasms undetectable by conventional MG and US thus making biopsy of these tumors under MR-guidance possible. The technique for preparing and performing an MR-guided biopsy utilizing a grid system has been reviewed (Fig. 4). Our experience demonstrates that MR-guided LCNB is fast, safe, simple and versatile alternative to surgical biopsy for breast lesions detected by MRI only and is easily applicable in routine clinical settings.
Fig. 4: Mr-guided biopsy

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References

