

3.0T MRI-guided breast interventions: first clinical experience

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Introduction: MRI of the breast is the most sensitive method for detection of invasive breast tumors with a sensitivity approaching 100% [1,2]. When suspicious enhancing breast lesions are detected with MRI solely, MRI-guided large core needle biopsy and MRI-guided hookwire localization followed by surgical excision are techniques that can be used for tissue sampling of these lesions [3,4]. Breast imaging at 3.0T offers several advantages, including more accurate staging and localization of occult breast lesions, due to the achievable high spatial and temporal resolution. Clinical experience with biopsy and localization techniques in a 3.0T closed bore magnet however are limited and literature on this topic is scarce. In this study we report our first clinical experience.

Materials and Methods: In 7 patients with 7 breast lesions solely detected on MRI underwent MRI-guided large core needle biopsy (n=4) or MRI-guided needle localization (n=3) for histopathologic evaluation of the lesions. All interventional procedures were performed in a 3.0 T MRI system (3.0T Achieva, Philips Medical Systems, Best, The Netherlands) with the patient in prone position and by using a dedicated phased array breast coil. We developed a high-resolution T1-FFE protocol (voxel 0.66x0.66x0.80) for optimal assessment of lesion morphology and monitoring of the needle during the biopsy procedures. MRI-guided large core needle biopsies were performed with a commercial available stereotactic biopsy device (MRI devices, USA) and MRI-guided needle localizations were performed by using a freehand technique as previously described by Daniel et al [5]. In our study, the high resolution scan allowed pre-procedural localization of all lesions without use of contrast enhancement. In all cases contrast-enhanced MR imaging was performed after insertion of the guiding needle or wire to confirm the tip of the needle or wire in direct contact with the enhancing lesion. In 5/7 patients biopsy results were compared with histopathologic findings after surgery, in 2/7 patients control MRI after 6 months is used to confirm the benign biopsy result.

Results: In total 4 patients underwent a MR-guided large core needle biopsy. Histopathologic analysis of these lesions showed 1 fibroadenoma, 1 case of fibrocystic change and 2 invasive ductal carcinomas. Lesion size varied from 5mm to 30mm. Mean duration time of each procedure was 45 minutes. Needle artifacts were reduced to a maximum of 5mm in diameter for the 13-gauge guiding needles. Needle localizations were performed in 3 patients. Histopathologic evaluation of tissue after surgery excision biopsy revealed 1 lymph node, 1 mucinous carcinoma and 1 invasive ductal carcinoma. Lesion size varied from 9mm to 16mm. Mean duration time was 25 minutes. No complications occurred during both intervention methods.

Conclusions: Compared with 1.5T imaging, breast imaging at 3.0T with a dedicated breast coil offers several advantages, including more accurate assessment of the breast lesion morphology on the high resolution non-contrast image. In our study, all lesions could be identified pre-procedural without contrast material enhancement. Despite of this advantage needle artefacts become stronger at 3.0T [6]. An adjustment in the scan protocol was necessary to produces minimal imaging artefacts, so the targeted lesion remains visible even at its tip.

References

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