Feasibility of MRI-guided preoperative needle localization of breast lesions after MRI-guided vacuum-assisted core needle biopsy (VACNB) without clip placement

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Purpose
To determine the feasibility of MRI-guided preoperative needle localization of breast lesions after MRI-guided vacuum assisted core needle biopsy (VACNB) without clip placement.

Materials and Methods
We reviewed our records of 117 MRI-guided preoperative needle localizations from 7/03-9/04 for women who had previously undergone MRI-guided VACNB for breast lesions detectable only by MRI. Preoperative MRI studies were performed using 3DSSMT[1] and spiral dynamic imaging[2] in all cases. VACNB was performed on an open 0.5T GE Signa SP (Milwaukee, WI) unit using a 9-gauge ATEC (Suros Surigical Inc., Indianapolis, IN) device and freehand method previously described [3], taking 3-9 core biopsies/procedure. Preoperative needle localization was performed 2 –78 days (average 31) after VACNB using freehand methods previously described[4]. VACNB and needle localization procedures were rated for lesion visibility, need for axial and/or sagittal imaging for lesion localization, hematoma formation, and problems encountered. Each lesion was measured and categorized according to MRI BI-RADS terminology[5] for morphology[5] and kinetics[2]. Finally, pathology results from VACNB and needle localization procedures were compared for each lesion.

Results
Fifteen women with 16 lesions fulfilled inclusion criteria. The mean age was 49 years (range 36-68 years). Reasons for referral included evaluation for contralateral breast cancer (4), staging for ipsilateral breast cancer (4), high-risk screening (2), abnormal mammogram (4), or abnormal MRI (2). Lesions were an average of 16 mm in size (range 4-50 mm). The lesions were composed of foci (1), masses (6), and non-mass areas of enhancement (9). Kinetics showed initial rapid enhancement in 15 lesions with late persistent enhancement (5), plateau (7), or washout (2), and no late curves were obtained in 1 due to technical problems. The 16th lesion showed gradual initial enhancement with a late plateau. Core biopsy showed 5 cancers [2 ductal carcinomas in situ (DCIS), 1 invasive tubular carcinoma (ITC), 2 invasive ductal carcinomas (IDC)] and 5 high-risk lesions [1 flat epithelial atypia, 1 atypical ductal hyperplasia (ADH), 3 papillomas]. Six benign findings were also seen [1 adenosis, 2 nonproliferative fibrocystic change (NPFCC), 1 proliferative fibrocystic change (PFCC), 2 benign adipose tissue] and were recommended for excisional biopsy because of discordance with MRI findings. In 2 of these cases, technical issues at the time of core biopsy led to concern that the lesion might have been missed. Eight hematomas were seen immediately following VACNB with an average size of 13 mm (range 8 to 19 mm).

Preoperative needle localization took place 2 to 78 days following core needle biopsy (average 31 days). On T1 axial images, initial needle placement was directed by visualization of the lesion in 2 cases, hematoma at the site of prior biopsy in 4 cases, and surrounding breast architecture in the remaining 10 cases. Eight cases required both axial and sagittal imaging for needle localization placement. Wire placement was successful in all 16 lesions. Final pathology showed 6 cancers (1 DCIS, 1 ITC, 4 IDC), 5 high-risk lesions (1 focal atypia, 1 atypical lobular hyperplasia, 3 papillomas), and 5 benign findings (2 PFCC, 1 adenosis with lactational change, 1 fibroadenoma, 1 lipoma with NPFCC) at surgery.

Discussion
Our study shows that preoperative needle localization under MRI guidance is both feasible and successful in removing lesions that have previously undergone VACNB without clip placement, and that correlation of VACNB pathology and MRI is important to avoid missed cancers. Prior to contrast enhancement, breast architecture in axial and sagittal views can guide needle localization, and a clip placed following core biopsy is not necessary when the localization is guided by MRI. Although 50% (8/16) of cases formed hematomas or ecchymosis after VACNB, only 4/8 hematomas persisted by the time of needle localization and these did not pose a problem during preoperative needle localization, sometimes serving as markers of the prior biopsy site. Thus, needle localization guidance with MRI should be adequate even when a clip has not been placed by VACNB.

References
1. Agoston AT, Daniel BL, Herfkens RJ. Intensity-modulated parametric mapping for simultaneous display of rapid dynamic and high-spatial-resolution breast MR imaging data. Radiographics 2001; 21: 217-226.
2. Daniel, BL, Yen YF, Glover GH et al. Breast disease: dynamic spiral MR imaging. Radiology 1998; 209(2): 449-509.
3. Hwang GL, Ikeda EM, Birdwell RL, Daniel BL. Vacuum-assisted MRI-guided percutaneous core biopsy of small breast lesions: First procedure with a vertically open 0.5T scanner in the prone or supine position. AJR 2004; 182(4)(supplement): 47.
4. Daniel BL, Birdwell RL, Ikeda DM et al. Breast lesion localization: a freehand, interactive MR imaging-guided technique. Radiology 1998 May; 207(2): 455-63.
5. American College of Radiology: ACR BI-RADS—MRI, 4th ed. *In* ACR Breast Imaging Reporting and Database System, Breast Imaging Atlas. Reston, VA, American College of Radiology, 2003.