

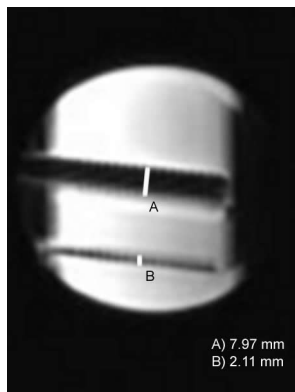
# MRI-guided breast biopsy at 3T using a dedicated large core biopsy set; feasibility and initial results

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**Background:** The increasing importance of breast MRI in the diagnostic processes concerning breast cancer yield often lesions that are visible on MRI only. To assess the nature of these lesions, pathologic analysis is indispensable. Therefore, MR-guided biopsy should be offered by any institute that performs breast MRI, either at their own practice or in a larger center that can perform these biopsies for them.

**Purpose:** Some studies have shown advantage of 3T breast MRI over 1.5T breast MRI in lesion detection and classification<sup>1</sup>. It is undoubtedly true that imaging at 3T allows a higher spatial resolution and consequently smaller lesions can be detected. Moreover, breast MRS is only clinically feasible at higher field strengths<sup>2</sup>. Unfortunately, the current equipment for MR-guided biopsy is better suited for intervention at 1.5T due to the danger of heating titanium co-axial sleeves and the large susceptibility artifact that results from the use of these coaxials. We evaluated a dedicated 3T breast biopsy set that uses plastic coaxial needles to overcome these problems.



**Fig 1:** phantom at 3T, with 2 coaxial needles of equal size. A is a titanium coaxial dedicated for biopsy at 1.5 T. B is the plastic coaxial used in this study

**Materials and Methods:** We performed MRI-guided breast biopsy in women with MRI only visible breast lesions at 3T. All lesions were at least 5 mm in size and were classified as BI-RADS 3 or BI-RADS 4 on earlier MRI evaluations. We used a four channel breast coil (inVivo, Germany) with a dedicated add-on device for breast biopsy (Noras, Germany) that allows lateral access, positioning of the needle-guide in the x and y plane and angulation up to 30° around the x axis. After positioning of the patient in the breast coil, the breast to be investigated was compressed to obtain optimal fixation.

We obtained a sagittal image of the biopsy device to detect the fiducial markers within the device and subsequently obtained 4 high resolution FLASH 3D acquisitions of the whole breast, one prior to and three after the administration of 0.2 mmol/kg contrast agent (DOTAREM, Guerbet, France). We used a dedicated workstation (DynaCAD, Invivo, Germany) to locate the lesions and obtain the coordinates for needle positioning. Subsequently the breast was disinfected and anaesthetized. A small incision was made in the skin and the 12G coaxial needle was placed using a titanium trocar. The trocar was replaced by a plastic rod and with this in situ one more FLASH 3D acquisition was obtained. The position of the coaxial needle was compared to the position of the lesion and in case of good correlation up to eight biopsies were taken clockwise, using a disposable 14G semi-automatic MRI compatible biopsy gun.



**Fig 2:** biopsy procedure of a small lesion (arrow), with the coaxial needle in place (black line)

**Results:** We performed biopsies of 14 lesions in 13 women. The shortest procedure was completed within 35 minutes, the longest took one hour (mean: 43 minutes). The difficulty of the procedure, scored on a five point scale ranging from easy to difficult, was judged moderately easy in eight and normal in six cases. No procedures were judged moderately difficult or difficult. Ten lesions were classified as BI-RADS 4, 4 as BI-RADS 3. Median lesion size was 11\*12,5\*15,5 millimeter. The width of the needle artifact was 2 mm in all cases, which allowed perfect evaluation of the placement of the coaxial needle. The coaxial needle was placed directly in front of the lesion immediately in 12 of 14 cases, in two cases one further manipulation was needed. The mean number of biopsies taken was 4.6 (range 2 to 7).

Eleven biopsies yielded pathologic results that could explain the visible lesion. In 3 patients only normal breast tissue was found (Table 1).

**Conclusion:** MRI-guided breast biopsy at 3T is a fast and accurate procedure. The plastic coaxial needles reduce the susceptibility artifact largely and do not increase the difficulty of the procedure. The diagnostic yield is at least equal to the diagnostic yield of the same procedure at 1.5T<sup>3</sup>. Therefore, this technique can be safely used for lesions only visible at 3T MRI or in conjunction with other techniques that benefit even more from higher field strengths, such as breast MRS.

Diagnosis	Number
Unrepresentative	3
Fibrosis	3
Fibro-Adenoma	1
Chronic Inflammation	2
Scar Lesion	1
Pseudo-angiomatous stromal hyperplasia	1
ADH	1
DCIS	2

**Table 1:** Pathologic diagnoses of all 14 biopsies

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