Original Investigation

Canceled MRI-guided Breast Biopsies Due to Nonvisualization: Follow-up and Outcomes

Niveditha Pinnamaneni, MD, Linda Moy, MD, Yiming Gao, MD, Amy N. Melsaether, MD, James S. Babb, PhD, Hildegard K. Toth, MD, Samantha L. Heller, MD, PhD

Rationale and Objective: The objective of this study was to evaluate breast lesion outcomes in patients after canceled MRI-guided breast biopsy due to lesion nonvisualization.

Materials and Methods: Electronic medical records (January 2007–December 2014) were searched for patients with canceled magnetic resonance imaging (MRI)-guided breast biopsies due to lesion nonvisualization. A total of 1403 MRI-detected lesions were scheduled for MRI-guided biopsy and 89 were canceled because of nonvisualization. Imaging studies and medical records were reviewed for patient demographics, lesion characteristics, and subsequent malignancy. Patients without adequate MRI follow-up imaging were excluded. Statistical analysis was employed to determine if patient demographics or lesion characteristics were predictive of lesion resolution or lesion biopsy after subsequent follow-up.

Results: Eighty-nine (6.3% [89/1403]; 95% confidence interval, 5.2%–7.7%) biopsies in 89 women were canceled because of nonvisualization. Follow-up MRIs greater than 5.5 months were available for 60.7% (54/89) of women. In 74.1% (40/54) of these patients, the lesions completely resolved on follow-up. In 25.9% (14/54) of the patients, the lesion persisted on follow-up; 42.9% (6/14) of these patients underwent biopsy. One case (1.9% [1/54]) yielded ductal carcinoma in situ with microinvasion at the 6-month follow-up. No patient demographics or lesion features were associated with lesion resolution or lesion biopsy.

Conclusions: The majority of canceled MRI-guided biopsy lesions resolved on later follow-up; however, because of the small possibility of a missed malignancy, follow-up MRI imaging at 6 months is recommended.

Key Words: Breast MRI; breast biopsy; MRI-guided breast intervention.

INTRODUCTION

Numerous studies have demonstrated the diagnostic utility of magnetic resonance imaging (MRI) breast cancer detection compared to mammography and ultrasound, particularly in high-risk patient populations (1–10). Additionally, the advent of MRI-guided vacuum-assisted biopsy has provided a relatively quick and safe method of sampling tissue, sparing patients the time and invasiveness of a surgical biopsy (11–14). In some instances, however, MRI-guided biopsies may be canceled; reported rates of biopsy cancellation have ranged from 8% to 13%, most often because of nonvisualization of the initial biopsy target on the scheduled day of biopsy (15–22). Lesions may not be visualized because the lesion has resolved at the time of biopsy and may have only been due to background parenchymal enhancement (BPE), now no longer seen. In other cases, however, lesions may be canceled for technical reasons such as poor patient positioning or compression, which may impede contrast delivery to the breast. These canceled biopsies can thus be a source of confusion and frustration for both clinicians and patients. Only a few studies have specifically investigated the clinical course of these nonvisualized lesions; the reported frequency of subsequent malignancy has ranged from 0% to 10% (15–22).

A better understanding of the longer term outcomes after nonvisualization of an MRI-guided biopsy target is warranted to help guide decisions regarding appropriate follow-up and treatment. The purpose of the present study, therefore, was to evaluate outcomes—including subsequent development of ipsilateral quadrant malignancy—in patients who had a canceled MRI-guided breast biopsy due to nonvisualization of the lesion on the day of biopsy. A secondary purpose was to determine if any patient demographics or lesion characteristics were predictive of lesion resolution or lesion biopsy after subsequent follow-up.

Acad Radiol 2018; ■:■■–■■

From the Laura and Isaac Perlmutter Center for Biomedical Imaging, Department of Radiology, New York University School of Medicine, 160 East 34th Street, 3rd Floor, New York, NY 10016 (N.P., L.M., Y.G., A.N.M., J.S.B., H.K.T., S.L.H.); Department of Radiology, Center for Advanced Imaging Innovation and Research (CAI²R), New York University School of Medicine, New York, New York (L.M., A.N.M.). Received July 18, 2017; revised December 2, 2017; accepted January 13, 2018. **Address correspondence to:** S.L.H. e-mail: Samantha.Heller@nyumc.org

https://doi.org/10.1016/j.acra.2018.01.016

MATERIALS AND METHODS

The present study was Health Insurance Portability and Accountability Act compliant and institutional review board waived. One breast fellowship-trained breast imager with 15 years of experience retrospectively reviewed our institution's MRI-guided biopsies from January 2007 to December 2014 (1403 MRI-guided biopsies) to identify all patients who had a canceled MRI-guided breast biopsy due to nonvisualization. Our search yielded 97 canceled biopsies in 97 women (6.9% [97/1403]). Of these 97 biopsies, 8 (8.2%) were canceled for reasons other than nonvisualization and were excluded from the present study; 7 (7.2%) were canceled because the biopsies were not amenable to MRI-guided biopsy, given their location; and 1 (1.0%) was canceled because of patient discomfort before any tissue sampling. Excluding these cases resulted in 89 (6.3% [89/1403]) biopsies in 89 women, which were canceled because of nonvisualization. We also excluded 35 of the 89 patients (39.3%) because of a lack of breast MRI imaging follow-up greater than 5.5 months. Although the majority of these excluded patients did have a mammography or an ultrasound follow-up greater than 5.5 months, we chose to exclude them, given that the index lesion was mammographically or sonographically occult, and follow-up results on conventional imaging alone would have been inconclusive regarding lesion outcomes. Our study thus included 54 lesions in 54 patients (3.8% [54/1403]) with canceled MRI-guided biopsies due to nonvisualization of the lesion on the day of biopsy (Fig 1).

MRI Technique

All diagnostic MRI examinations were performed on a 3.0-T (TIM Trio, Siemens Medical Solutions) with the patient in prone positioning using a dedicated surface breast coil (7-Channel Breast Biopsy Array, InVivo Research, Gainesville, FL). Our standard imaging protocol covers the breasts bilaterally and includes a localizing sequence followed by a sagittal T2-weighted sequence (repetition time, 7220; echo time, 84) and a sagittal T1-weighted non–fat-suppressed three-dimensional fast spoiled gradient-recalled echo sequence (repetition time, 4.01; echo time, 1.52; flip angle, 12°; matrix, 384 × 384; field of view, 270 mm; and section thickness, 1 mm). This procedure was followed by the same sagittal T1-weighted fat-suppressed three-dimensional fast spoiled gradient-recalled echo sequence performed before and four times after a rapid bolus injection of 0.1 mmol/kg of gadopentetate dimeglumine (Magnevist, Bayer Healthcare Pharmaceuticals) per kilogram of body weight at an injection rate of 2.0 mL/s via an intravenous catheter, followed by a saline flush. The first contrast-enhanced dynamic image corresponded to 100 seconds after injection. The total duration of the dynamic study was approximately 7 minutes. After the examination,

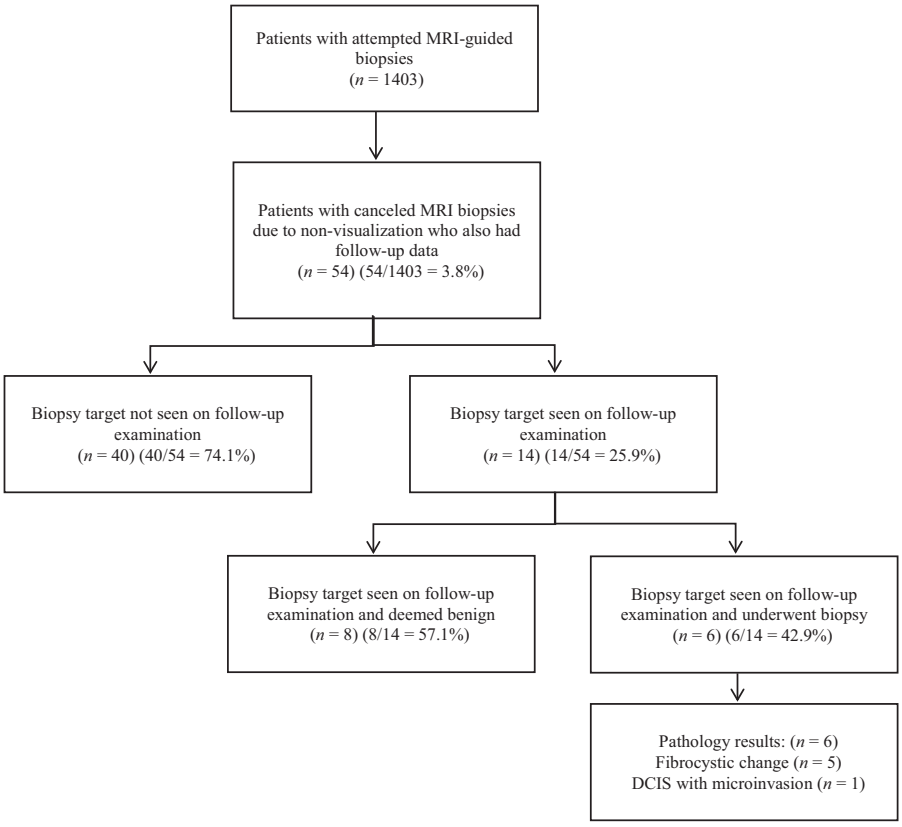

Figure 1. Patient outcomes after canceled MRI-guided biopsy. DCIS, ductal carcinoma in situ; MRI, magnetic resonance imaging.