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Second-Opinion Review of Breast Imaging at a Cancer Center: Is It Worthwhile?

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Abstract

OBJECTIVE—Second-opinion review of breast imaging studies can be a time-consuming and labor-intensive process. The purpose of this investigation was to determine whether reinterpretation of studies obtained at institutions outside a cancer center influences clinical management, specifically by revealing additional cancer and preventing unnecessary biopsy.

MATERIALS AND METHODS—A review was conducted of breast imaging studies of 200 patients who underwent ultrasound and MRI at community facilities and had the images submitted for second opinions at a cancer center between January and April 2014. Each case was evaluated for concordance between the original report and the second-opinion interpretation. Second-opinion review resulting in the recommendation and performance of new biopsies was further subdivided into benign, high-risk, and malignant categories based on the histopathologic results obtained at the cancer center.

RESULTS—Second-opinion review of the 200 cases showed a change in interpretation in 55 cases (28%; 95% CI, 21–34%). Overall, 26 recommendations (13%; 95% CI, 9–18%) led to a major change in management. Twenty new biopsies were performed, yielding 10 malignancies (5%; 95% CI, 2–9%) and four high-risk lesions (2%; 95% CI, 1–5%). Surgical management was changed to mastectomy for 6 of 10 patients (60%) with new sites of biopsy-proven malignancy. Eight biopsies were averted (4%; 95% CI, 2–8%) on the basis of benign interpretation of the imaging findings, and no disease was found at 1-year follow-up evaluation.

CONCLUSION—Reinterpretation of studies obtained outside a cancer center resulted in a change in interpretation in more than one-fourth of submitted studies. Additional cancer was detected in 5% of patients, and biopsy was averted for 4%. The practice of second-opinion review influences clinical management and adds value to patient care.

Keywords

breast cancer; multimodality; second-opinion readings; second-opinion reinterpretation; subspecialization

Breast cancer is the most common noncutaneous cancer in women in the United States. The American Cancer Society estimated 246,660 new breast cancer cases would be diagnosed in

2016 [1]. Often, patients with suspicious findings detected at breast imaging performed in community medical facilities are referred by their physicians to a specialized cancer center for consultation and potential initiation of treatment, or they seek the second opinion themselves.

Most specialized cancer centers have adopted a multidisciplinary approach to the care of cancer patients, emphasizing collaboration among specialists in surgery, radiology, medical oncology, radiation oncology, and pathology. In the case of breast cancer, integrated multidisciplinary review of breast cancer pathologic results and mammograms has been found to alter treatment strategy in a statistically significant manner [2]. Approximately 3000 patients underwent breast surgery at our institution in 2015, and 2700 of those patients had newly diagnosed malignancies. At our cancer center, specialized breast radiologists offer a consultation service to new patients of breast surgeons at the center by providing second-opinion review of all imaging studies obtained at outside facilities, because clinically significant changes in radiologic interpretation are believed to influence surgical management. Reinterpretation of imaging studies by a specialized breast radiologist has the potential to reveal new cancers and to reduce the number of unnecessary interventions, such as biopsy, which might otherwise lead to patient anxiety and psychologic distress. A review of the psychologic consequences of false-positive screening mammographic findings [3] showed that women who undergo breast biopsy are at greater risk of psychologic distress than are women who receive normal mammographic findings.

However, the process of second-opinion review of imaging studies obtained outside the cancer center can be time-consuming and labor intensive. Second opinion review at our institution involves coordination of multiple steps, beginning with the patient's retrieving and submitting imaging studies and pathology reports from the outside institution to a surgical nurse coordinator and radiology clerk, each of whom is integral in assuring that the submitted studies are compatible for upload and radiologic interpretation. A single patient may submit multimodality imaging studies obtained on different dates and at different institutions. The radiologist reviewing the case must organize the studies for interpretation, correlate the findings with any available pathologic results, consult with the referring breast surgeon, and issue a formal radiology report. The reviewing radiologist may recommend additional imaging or biopsy, which is often incorporated into the existing schedule that day. These additional procedures and consultation with the surgeon can be time-consuming and interrupt work flow. Evaluating the clinical impact of second-opinion review on surgical management is therefore important to determine efficient ways to optimize patient care.

The primary aim of our study was to evaluate the rate of overall concordance between the second-opinion review at our cancer center and the initial report of outside studies. Our second objective was to determine how our reinterpretation of outside studies affects clinical management. Specifically, we hypothesized that second-opinion review would lead to the detection of new cancers and prevention of unnecessary biopsies.

Materials and Methods

This retrospective study received institutional review board approval, was issued a waiver of informed consent, and was compliant with HIPAA.

Eligibility

A retrospective search of our institutional clinical database was performed to identify all patients fulfilling the following inclusion criteria: submitted mammogram, breast ultrasound image, or breast MR images obtained and initially interpreted at an outside institution, and official second-opinion report signed by a breast radiologist at our institution from January through April 2014. This initial search yielded 1092 patients. The outside studies originated from private practices, community hospitals, and academic institutions, and were initially interpreted by radiologists with varying experience and specialization in breast imaging. Studies submitted to our institution were interpreted by 1 of 12 radiologists on the breast imaging service. All 12 interpreting board-certified radiologists were specialized in breast imaging and had a range of 1–25 years of experience at our institution. Approximately one-half of the submitted cases were interpreted by the attending breast imaging radiologist alone; the other half were read with a fellow training in breast imaging. To maximize the number and diversity of interpreting radiologists, the first consecutively registered 50 patients from each month were selected, for a total of 200 patients.

Data Analysis and Interpretation

Each patient was assigned the condition either change or no change, which reflected concordance or lack thereof between the initial and second-opinion interpretations. Because BI-RADS scores are not issued in second-opinion reports, a change was defined as any second-opinion report that called for a new biopsy or additional imaging or disagreed with the initial recommendation of biopsy or additional imaging. Any second-opinion report that resulted in a new biopsy or additional imaging was further categorized as benign, high risk, or malignant on the basis of available histopathologic and radiologic follow-up at 1 year. Exact 95% CIs are presented.

Results

Second-opinion review for 200 patients included 184 mammographic, 149 ultrasound, and 63 MRI studies for a total of 396 studies (Fig. 1). Of these, 98 patients (49.0%) submitted mammographic and ultrasound images for review; 44 patients (22.0%) submitted images obtained with all three modalities; 33 (16.5%) submitted only mammograms; nine (4.5%) submitted mammograms and MR images; nine (4.5%) submitted only MR images; six (3.0%) submitted only ultrasound images; and one patient (0.5%) submitted MR and ultrasound images. When they submitted the images, 123 patients (61.5%) had a diagnosis of breast cancer from the outside institution.

Of the 200 patients who underwent second-opinion review, a change in interpretation was found in 55 patients (27.5%; 95% CI, 21–34%) (Fig. 2). Twenty-five new biopsies were recommended on the basis of the breast radiologist review of submitted images, and subsequent additional imaging was performed. Eight biopsies (4%; 95% CI, 2–8%) were

averted owing to benign interpretation of the imaging findings during second-opinion review. Of the eight patients who were spared a biopsy, all had stable imaging or clinical follow-up findings at 1 year. All but three patients were lost to follow-up at 2 years. Two of the three patients had stable imaging findings, and one patient had stable clinical follow-up findings.

Second-opinion review recommendations led to a major change in clinical management for 26 patients (13.0%; 95% CI, 9.0–18.0%) (Fig. 3). This included changes for 12 patients for whom either biopsy or additional imaging was averted on the basis of benign imaging findings and for 14 patients with new biopsy-proven malignant and high-risk lesions (Tables 1 and 2).

Of the 25 new biopsies recommended on second-opinion review, 20 biopsies were performed, and five were not performed, either because the patient decided to follow up at another institution or chose mastectomy. Of the 20 biopsies performed, 10 were stereotactic, seven were ultrasound guided, two were MRI guided, and one was surgical excision with preoperative needle localization. Pathologic analysis yielded malignancy in 10 patients (5.0%; 95% CI, 2.0–9.0%), high-risk lesions in four patients (2.0%; 95% CI, 1.0–5.0%), and benign findings in six patients (3.0%; 95% CI, 1.0–6.0%). The positive predictive value of biopsies performed as a result of second-opinion review was 50% (10/20).

The four high-risk lesions detected at biopsy included lobular carcinoma in situ, atypical lobular hyperplasia, and radial scar. Two of the four patients did not have a current breast cancer diagnosis at second-opinion review. Three of the four patients underwent surgical excision with concordant histopathologic findings, and the fourth patient underwent follow-up MRI with no disease found at 1 year. Of note, two additional high-risk lesions were detected at histopathologic examination in patients who chose mastectomy instead of further imaging or sampling.

Surgical management was converted to mastectomy for 6 of 10 (60.0%) patients for whom malignancy was detected at additional biopsy (Figs. 4–6). This included three cases of multicentric disease, one case of nodal metastasis, one case of a new primary breast cancer diagnosis, and one case of residual cancer found at the surgical margin. Five patients underwent mastectomy at our institution, and one patient at an outside hospital. Breast-conserving surgery was performed for the other four patients in whom malignancy was detected at additional biopsy. This included one case of multifocal cancer, one case of a new primary breast cancer diagnosis, and two cases of residual cancer found at the surgical margin. One of the three patients with malignancy detected at lumpectomy margins underwent mastectomy. The other two underwent preoperative localization, and the surgical margins were negative at reexcision.

Discussion

Breast abnormalities are often initially detected by radiologists in the community setting with varying levels of specialization and experience interpreting breast images. Previous studies have shown, however, that breast imaging specialists have a higher cancer detection

rate on mammograms than do general radiologists [4, 5]. One of these studies [5] showed that breast imaging specialists detect earlier-stage cancers, have lower recall rates, and recommend biopsies more often. As part of the surgical consultation service provided at our cancer center, all new patients receive a reinterpretation of their outside imaging studies by a specialized breast radiologist before or at the time of consultation with the surgeon.

Our research revealed disagreement between the outside radiology report and second-opinion review in 28% of breast imaging studies submitted to our cancer center. This finding is in keeping with the 19–42% disagreement rates reported in studies performed in other radiology subspecialties, including neuroradiology, pediatric imaging, gynecologic and genitourinary oncologic radiology, and musculoskeletal radiology [6–11]. Collectively, our findings support the assertion that there is a variance in radiologic impression between general and subspecialty-trained radiologists.

Review of the literature revealed three studies [12–14]—conducted at Rush University, University of Michigan, and Dana-Farber Brigham and Women’s Cancer Center—in which second-opinion review of breast-imaging studies similar to ours was conducted. Although our overall disagreement rate of 28% is lower than the 45–57% rate reported in those studies, our cancer detection rate of 5% was similar (2.1–5.3%). Likewise, we found that new recommendations resulting from second-opinion review led to a major change in management for 13% of patients, which is consistent with the 10.7–27.1% range in the other studies. Differences among our studies include the length of the study period, cancer status of the patients, and inclusion of MRI studies. The three previous studies were conducted over a time frame greater than the 4-month period of our study. Sixty-two percent of our study population was patients with a breast cancer diagnosis from an outside institution at the time of second-opinion review, compared with 100% of patients included in the studies by Mallory et al. [14] and Newman et al. [13]. Last, our study included MRI for diagnostic interpretation and for biopsy guidance. Neither Spivey et al. [12] nor Newman et al. included MRI in their second-opinion reviews, whereas MRI comprised 32% of our reviewed studies and 10% of our performed biopsies. Although Mallory et al. recommended further evaluation with MRI, the percentage of MRI studies submitted for initial review was not reported.

In our cohort, reinterpretation of outside imaging studies by a specialty-trained breast radiologist prevented 4% of patients from undergoing a biopsy that was initially recommended in the outside report. Reinterpretation of imaging studies spared the patient not only an unnecessary intervention but also potential anxiety and other psychologic distress. To our knowledge, this is a new finding not previously reported in the literature.

Studies of second-opinion review of the pathology reports of breast cancer patients have shown results similar to those in radiology. Changes in pathologic diagnoses are reported for 17–25.4% of submitted biopsy specimens. They ultimately affect prognosis in 40% and alter surgical management in 7.8–11.47% of cases [15–18].

Limitations of our retrospective study include the small sample size of 200 patients and short study period of 4 months. The study was observational and had no control arm. Variability in

the specialization and experience of the radiologists who initially interpreted the breast images at the outside hospital and inherent interobserver variability between breast-imaging specialists in our practice may have contributed to some of the observed differences in interpretation. Likewise, second-opinion review performed with fellows in training potentially provided an advantage of a double reading. The outside reports were available to the interpreting radiologists during the process of second-opinion review, which may also have introduced bias. Not all of the patients who were spared biopsy owing to benign interpretation of the outside images underwent 2-year follow-up, which is an additional limitation. Our study focused on the impact of second-opinion review on patient care and clinical management and did not explore issues related to cost, which is an important area for future investigation.

Reinterpretation of outside studies at our cancer center resulted in a change in interpretation in 28% of submitted studies and change in clinical management in 13%; revealed additional cancer in 5% of cases, for a positive predictive value of 50%; and successfully averted biopsy in 4% of cases. The practice of second-opinion review is therefore a valuable aspect of patient care.

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Fig. 1.
Diagram shows breakdown of 396 imaging studies reinterpreted during second-opinion review for 200 patients.

Fig. 2.
Chart shows results of second-opinion review.

Fig. 3.
Chart shows outcome of second-opinion review. Whiskers indicate 95% CI.

Fig. 4.

47-year-old woman with invasive ductal carcinoma of right breast.

A, MR image obtained at outside facility shows enhancing mass in upper inner region of right breast that corresponds to proven invasive ductal carcinoma.

B and **C**, Second-opinion review of MR images revealed areas of linear nonmass enhancement in ipsilateral upper inner (*oval*, **B**) and central lower (*oval*, **C**) regions of breast. Subsequent biopsy revealed multifocal and multicentric disease.

Fig. 5.

48-year-old woman with invasive ductal carcinoma of left breast.

A and B, Craniocaudal (**A**) and mediolateral oblique (**B**) mammograms show biopsy-proven invasive ductal carcinoma in 10-o'clock axis of left breast.

C, Magnification view mammogram used for second-opinion review shows additional area of asymmetry and calcification in central middle third depth (*circle, A–C*). Subsequent biopsy revealed multifocal disease.

Fig. 6.
62-year-old woman with invasive ductal carcinoma of right breast.
A, Craniocaudal mammogram shows biopsy-proven invasive ductal carcinoma in posterior 9-o'clock axis of right breast.
B and **C**, Additional mass and calcifications noted on second-opinion review in anterior 6-o'clock axis of ipsilateral breast (*circle*, **A**) were further evaluated with ultrasound (**B**) and found to be FDG avid at PET/CT (**C**). Subsequent biopsy revealed multicentric disease.

TABLE 1

Malignancies Detected at Biopsy After Second-Opinion Review

Current Cancer Diagnosis	Cancer Detected	Management
IDC	Multifocal and multicentric IDC	Mastectomy
None	Two sites of IDC-DCIS primary breast cancer	Mastectomy
IDC	IDC at lumpectomy margin	Mastectomy
Malignant axillary node	IDC primary breast cancer	Lumpectomy with ALND
IDC	Multicentric IDC and axillary node	Mastectomy with ALND
IDC	Ipsilateral axillary node	Mastectomy with ALND
DCIS	IDC-DCIS at lumpectomy margin	Reexcision lumpectomy
IDC	Multicentric IDC	Recommended mastectomy; surgery performed at outside hospital
IDC-ILC	Multifocal IDC-ILC	Lumpectomy
IDC-ILC	DCIS at lumpectomy margin	Reexcision lumpectomy

Note—IDC = invasive ductal carcinoma, DCIS = ductal carcinoma in situ, ALND = axillary lymph node dissection, ILC = invasive lobular carcinoma.

TABLE 2

High-Risk Lesions Detected at Biopsy After Second-Opinion Review

Current Cancer Diagnosis	High-Risk Lesion	Management
None	Fibroadenoma with LCIS	Lumpectomy
IDC-DCIS	Contralateral radial scar	Lumpectomy
None	LCIS and ALH	No surgery; MRI follow-up
IDC	Ipsilateral ALH	Needle localization with surgical excision during lumpectomy

Note—LCIS = lobular carcinoma in situ, IDC = invasive ductal carcinoma, DCIS = ductal carcinoma in situ, ALH = atypical lobular hyperplasia.