Original Study

Specialized Second Opinion Interpretations of Breast Imaging: Impact on Additional Workup and Management

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Abstract

This study examines the impact of second opinion breast imaging on clinical management. The study evaluated 504 second opinion breast imaging interpretations, the largest study of its kind to date. Second opinion breast imaging interpretation yielded additional cancer detection in 8% of patients and altered surgical management in 13%.

Background: Women with breast imaging often seek second opinions at tertiary care centers. Our study measures the frequency of discrepancy between initial and second opinion breast imaging recommendations and evaluates the impact on patient management. **Materials and Methods:** A retrospective chart review was conducted on 504 consecutive patients with second opinion breast radiology interpretations performed by 6 sub-specialized breast radiologists at a dedicated cancer center from January 1, 2014 through September 1, 2014. Outside imaging reports were compared with second opinion reports to categorize discrepancies. Interpretations were considered discrepant in cases with Breast Imaging Reporting and Data System (BI-RADS) category changes, recommendation for additional imaging, or identification of previously undiagnosed additional extent of disease greater than 5 cm. The frequencies of discrepancy, alterations in surgical management, and incremental cancer detection were measured. Statistical analysis of associated factors was performed with the Fisher exact test, with a P-value $< .05$ considered significant. **Results:** Second opinion evaluation discrepancies were seen in 287 (57%) patients and resulted in percutaneous image-guided biopsies in 92 (18%). Forty-five additional sites of cancer were biopsy-detected in 41 (8%) patients, including 20 breast malignancies and 25 axillary metastases. Another 9 biopsies yielded high-risk pathology. Second opinion interpretations altered surgical management in 66 (13%) patients. Factors associated with increased discrepancy frequency were cancer diagnosis at presentation ($P = .004$), dense breasts ($P = .005$), and the absence of prior studies for comparison ($P = .007$). **Conclusion:** Although additional imaging and resources are required, second opinion radiology review by subspecialized breast radiologists increases cancer detection and results in clinically relevant changes in patient management.

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Introduction

Radiologic evaluation of breast cancer involves a number of modalities including mammography, ultrasound, and magnetic resonance imaging (MRI). However, interpretation of breast imaging is subject to inter-observer variability, as documented in a number of studies.[1-5] Additionally, radiologists with specialty training in breast imaging detect more cancers than general radiologists.[6,7] Given the interobserver variability in breast imaging interpretation, a number of women with newly diagnosed breast abnormalities, including breast cancer, seek second opinions at tertiary care centers.[8] However, little data exists in the literature regarding the results of these second opinions.

A study by Spivey et al in 2015 showed that breast imaging second opinions changed surgical outcomes in 27% of the patients, with additional cancers detected in 2%.[8] More recently, a study by Coffey et al, of 200 second opinion interpretations at a cancer

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center, demonstrated 27% discordant interpretations, resulting in additional cancer detection in 5% and changes in clinical management in 13%.[5]

At our dedicated cancer center, all new breast surgeon patients with outside imaging are offered second opinion interpretation by subspecialized breast imaging radiologists. The goal of our study is to measure the frequency of discrepancies between the initial and second opinion breast imaging recommendations and evaluate the impact on patient management. A secondary aim of our study is to determine factors associated with increased second opinion discrepancies.

Materials and Methods

This retrospective study received institutional review board approval. It was conducted as a single institution chart review on consecutive patients from January 1, 2014 through September 1, 2014 who underwent second opinion breast imaging interpretation at our dedicated cancer center. Patients who had already received definitive surgery for the presenting chief abnormality at the time of second opinion review were excluded from the study.

Outside imaging studies and reports originated from private practices as well as academic institutions. Second opinion radiology interpretations were performed by 6 sub-specialized breast radiologists with a range of 1 to 10 years of experience. The majority of the cases were interpreted by the attending radiologist alone with a minority of cases read first by the breast imaging fellow-in-training.

Second opinion interpretations with clinically relevant Breast Imaging Reporting and Data System (BI-RADS) category change, newly identified additional extent of disease greater than 5 cm, or recommendation for additional imaging that was not recommended on the original reports, were categorized as discrepant. If additional imaging was recommended on the original reports but not yet performed, this was not considered discrepant unless the second opinion interpretation specifically recommended against the additional workup. At our institution, axillary ultrasound is performed in patients with suspected invasive breast cancer where the mass is greater than 2 cm, based on the paper by Lee and colleagues, as well as in cases where there is suspected invasive skin or nipple involvement.[9] Finally, histologic reports, surgical/oncologic clinic reports, and demographic data were evaluated for complete review.

The frequencies of recommendation discrepancy, incremental cancer detection, and altered clinical/surgical management were calculated. Patients were categorized as having altered management resulting from a discrepant interpretation in cases where new malignancy or high-risk lesion was detected by biopsy of a discrepant finding resulting in surgical removal, patients with new diagnosis of disease extent >5 cm resulting in mastectomy, patients with new diagnosis of stage 4 disease from additional recommended imaging, and patients with pathology or biopsy recommendation downgrade and benign findings at 6- or 12-month follow-up. Patient factors, including cancer status at the time of interpretation, breast density, and status of prior imaging, were statistically analyzed for association with discordant interpretation. Statistical analysis was performed with the Fisher exact test, with a P-value $< .05$ considered statistically significant.

Results

A total of 504 patients met the inclusion criteria for the study. The most common indication for a second opinion review was to evaluate the extent of disease in women with a current diagnosis of invasive or in situ breast cancer (n = 434; 86%). Additional indications are listed in Table 1. Among the 504 patients who underwent second opinion review, 287 (57%) interpretations resulted in a discrepancy (Figure 1). Of these, 227 interpretations had specific imaging finding discrepancies (n = 227; 45%). The remaining patients (n = 61; 12%) had recommendation discrepancies that had not been recommended on the original reports, including MRI (n = 41) or axillary ultrasound staging studies (n = 14), repeat ultrasound for better lesion characterization (n = 6), mammogram or ultrasound for clip evaluation (n = 5), and a mammogram update for a study older than 6 months (n = 10). Statistically significant factors associated with interpretation discrepancy included patients with presenting diagnosis of invasive or in situ malignancy ($P = .004$), dense breasts ($P = .005$), and the absence of prior studies for comparison ($P = .007$). A history of prior treated breast cancer was not associated with increased discrepancy frequency (Table 2).

Of the 287 patients for whom there was an interpretation discrepancy, additional evaluation was not performed on 65 patients. Reasons included follow-up at another institution, mastectomy, or the recommended MRI was not performed. Additional imaging was performed on 222 (n = 222/287; 77%) patients, with subsequent benign or probably benign findings in 113. Additional imaging demonstrated disease extent greater than 5 cm in 15 (n = 15/504; 3%) patients, all of which proceeded to mastectomy. Additional imaging demonstrated stage 4 disease in 3 (n = 3/504; 1%) patients on MRI (bone or liver lesions), later confirmed on biopsy. Two of these patients presented with multicentric disease at the time of interpretation, whereas the other patient presented with a 6-cm mass and subsequent discovery of contralateral multicentric disease after second opinion workup.

Among the patients with additional workup, 92 (n = 92/504; 18%) underwent percutaneous image-guided biopsy as a result of the discrepant recommendations. Pathologic analysis yielded malignancy at 45 sites in 41 (n = 41/504; 8%) patients, high-risk

Table 1 Initial Diagnosis on Presentation for Second Opinion Review

Patient Initial Diagnosis on Presentation	No. Patients (%)
Invasive carcinoma (includes invasive ductal carcinoma, invasive mammary carcinoma, invasive lobular carcinoma, malignant phyllodes tumor, angiosarcoma, leiomyosarcoma, lymphoma)	356 (71)
Ductal carcinoma in situ	78 (15)
High-risk lesion (FEA, ADH, ALH, LCIS)	16 (3)
Suspicious finding (BI-RADS 4)	21 (4)
Probably benign finding (BI-RADS 3)	4 (<1)
Finding requires additional evaluation (BI-RADS 0)	1 (<1)
Negative or benign finding (BI-RADS 1 or BI-RADS 2)	28 (5)

Abbreviations: ADH = atypical ductal hyperplasia; ALH = atypical lobular hyperplasia; BI-RADS = Breast Imaging Reporting and Data System; FEA = flat epithelial atypia; LCIS = lobular carcinoma in situ.