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Ultrasound-guided Breast Biopsy: Evaluation of the Correlation Between Radiologic and Histopathologic Findings

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What is known on this subject?

Image-guided breast biopsy is commonly used for diagnosis of breast lesions. Breast ultrasound (US), which is also used for screening purposes, is an important tool for guiding biopsies.

What this study adds?

Our findings demonstrate a high radiologic-histopathologic correlation rate in US-guided breast biopsy samples. We observed the highest discordance in Breast Imaging Reporting and Data System (BI-RADS) 4 lesions. Therefore, histopathological verification is necessary in patients with BI-RADS 4 lesions to exclude malignancy.

ABSTRACT

Objective: Image-guided breast biopsy is commonly used for diagnosis of breast lesions. Breast ultrasound (US), which is also used for screening purposes, is an important tool to guide biopsies. In this study, we evaluated the radiologic-histopathologic correlation in patients who underwent US-guided breast biopsy.

Material and Methods: A total of 126 biopsies from 116 consecutive cases were included. Patients' US and histopathological findings were retrospectively reviewed.

Results: All patients were female. Median age was 44±12 (range; 16-66 years old). Two patients (2%) had bilateral, 8 (7%) had multifocal lesions. Breast Imaging Reporting and Data System (BI-RADS) was used for 115 lesions (91%). Three cases (2%) were BI-RADS 2, 27% (n=34) BI-RADS 3, 35% (n=44) BI-RADS 4, 25% (n=32) BI-RADS 5 and 2% (n=2) BI-RADS 6. Eight biopsies composed of normal breast tissue, which had been scored as BI-RADS 3 or 4, were considered inadequate. More than one-third (37%; n=47) were malignant as 28% (n=35) were consistent with fibroepithelial lesions and 11% (n=14) with inflammatory lesions. Major radiologic-histopathologic discordance was observed in only 2 cases, while there was minor discordance in 14. Ten of the 14 cases (11%) with minor discordance were BI-RADS 4 lesions and minor discordance was more common for benign lesions (p=0.013).

Conclusion: Our findings demonstrate a high radiologic-histopathologic correlation rate in US-guided breast biopsy samples. We observed the highest discordance in BI-RADS 4 lesions, suggesting that histopathological verification is necessary in patients with BI-RADS 4 lesions to exclude malignancy.

Keywords: Biopsy, breast, histopathology, radiology, ultrasonography

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Introduction

Image-guided breast biopsy is commonly used for the diagnosis of breast lesions, especially for evaluation of lesions suspicious for malignancy. Breast ultrasound (US), which is also used for screening purposes, is an important tool for guiding biopsies. Although findings on imaging usually provide good insight into the breast masses, definitive diagnosis is made via histopathological examination, and inconsistencies between radiological and histopathological examination may occasionally occur (1,2,3,4).

In this study, we evaluated the radiologic-histopathologic correlation in patients who underwent US-guided breast biopsy.

Material and Methods

University of Health Sciences Turkey, Basaksehir Cam and Sakura City Hospital Ethics Committee (no: KAEK/2021.11.262) approved the study protocol. Informed consent was unsought because of the retrospective nature of the study. A total of 126 biopsies of 116 consecutive cases whose biopsy samples had been evaluated in the Department of Pathology between June 1, 2020 and December 1, 2020, were included. Patients' US and histopathologic findings were retrospectively reviewed using the hospital information system.

Statistical Analysis

Statistical analysis was performed using the software SPSS Statistics, version 24.0 (Armonk, NY, IBM Corp.). In addition to descriptive analyses, χ^2 test was used to compare frequencies. $P<0.05$ was considered as statistically significant.

Results

All patients were female. Median age was 44±12 (range; 16-66 years old). Two patients (2%) had bilateral, 8 (7%) had multifocal lesions. Of the 126 biopsies that were evaluated, 63 (50%) were located in the right breast and 59 (47%) in the left.

Breast Imaging Reporting and Data System (BI-RADS) was used for the radiological evaluation of 115 lesions (91%). Eight biopsies scored as BI-RADS 3 or 4 on imaging were considered inadequate because they involved only normal breast tissue, i.e., failure rate was 6.3%. Three cases (2%) were BI-RADS 2, 27% (n=34) BI-RADS 3, 35% (n=44) BI-RADS 4, 25% (n=32) BI-RADS 5 and 2% (n=2) was BI-RADS 6. More than one-third (37%; n=47) were malignant as 28% (n=35) were consistent with fibroepithelial lesions and 11% (n=14) with inflammatory lesions (Table 1, Figure 1).

Major radiologic-histopathologic discordance was observed in only 2 cases, while there was minor discordance in 14. In two cases (2%) with major discordance, US findings had been interpreted in favor of fibroepithelial lesions, but the biopsy revealed invasive carcinoma (Figure 2). However, these cases had also been classified as BI-RADS 4, indicating a suspicion of malignancy. Ten of the 14 cases (11%) with minor discordance were BI-RADS 4 lesions and minor discordance was more common for benign lesions (p=0.013) (Table 2, Figure 3).

Discussion

Image-guided biopsy has become a major method in evaluation of the breast masses in the last two decades, and our findings demonstrate a high radiologic-histopathologic correlation rate in US-guided breast biopsy samples. As expected, several studies have shown that the use of classification systems such as BI-RADS increases the radiologic-histopathologic agreement in adult patients, although its utility in pediatric cases has still not been proven (5,6,7,8). Image-guided breast biopsy is particularly important in the early diagnosis of breast cancer. Currently, many institutions use BI-RADS classification system in the radiological evaluation of breast masses. However, although small, there is always a possibility of misdiagnose the patient based on radiological findings only, and this is the main reason for the multidisciplinary approach that combines the clinical, radiological and histopathological findings still being the gold standard for definitive diagnosis (1,2,3,4).

We observed major radiologic-histopathologic discordance in only 2 patients (2%), which is similar to previously reported. False negativity rates have been reported to be between 0.1% and 3.7% (1,9,10,11,12,13). The biopsy revealed invasive carcinoma in these two patients whose US findings had been interpreted in favor of fibroepithelial lesions. On the other hand, these cases had also been classified as BI-RADS 4 (suspicious for malignancy), supporting the high predictive value of BI-RADS classification.

There was minor discordance in 14 patients and 10 of these 14 cases had BI-RADS 4 lesions. Moreover, minor discordance was more common for benign lesions, especially for sclerosing adenosis. These findings indicate the tricky aspects of BI-RADS4 lesions, i.e., although the risk of malignancy is high for BI-RADS 4 lesions (14,15), lesions such as adenosis, intraductal papilloma, ductal hyperplasia may also demonstrate radiological characteristics that qualify for the BI-RADS 4 category. In such cases, magnetic resonance imaging may be helpful in the differential diagnosis (16).

Table 1. Detailed comparison of the radiologic and histopathological diagnoses given per the number of the biopsies

BI-RADS category (115 lesions; 91%)		Histopathologic diagnosis
BI-RADS 2 (benign)	2% (n=3)	Granulomatous mastitis (n=2) Periductulitis (n=1)
BI-RADS 3 (probably benign)	27% (n=34)	Fibroepithelial lesion (n=18) Mastitis (n=9) Fibrocystic changes (n=2) Inadequate (n=5)
BI-RADS 4 (suspicious)	35% (n=44)	Fibroepithelial lesion (n=12) Invasive breast carcinoma (n=9) Adenosis (n=7) Fibrocystic changes (n=4) Papillary neoplasia (n=3) Preneoplastic lesions (n=2) Plasmablastic lymphoma (n=1) Granulomatous mastitis (n=1) Fat necrosis (n=1) Microcalcification (n=1) Inadequate (n=3)
BI-RADS 5 (highly suggestive of malignancy)	25% (n=32)	Invasive breast carcinoma (n=31) Metastatic carcinoma of the lungs (n=1)
BI-RADS 6 (known biopsy-proven malignancy)	2% (n=2)	Invasive breast carcinoma (n=2)

BI-RADS: Breast Imaging Reporting and Data System

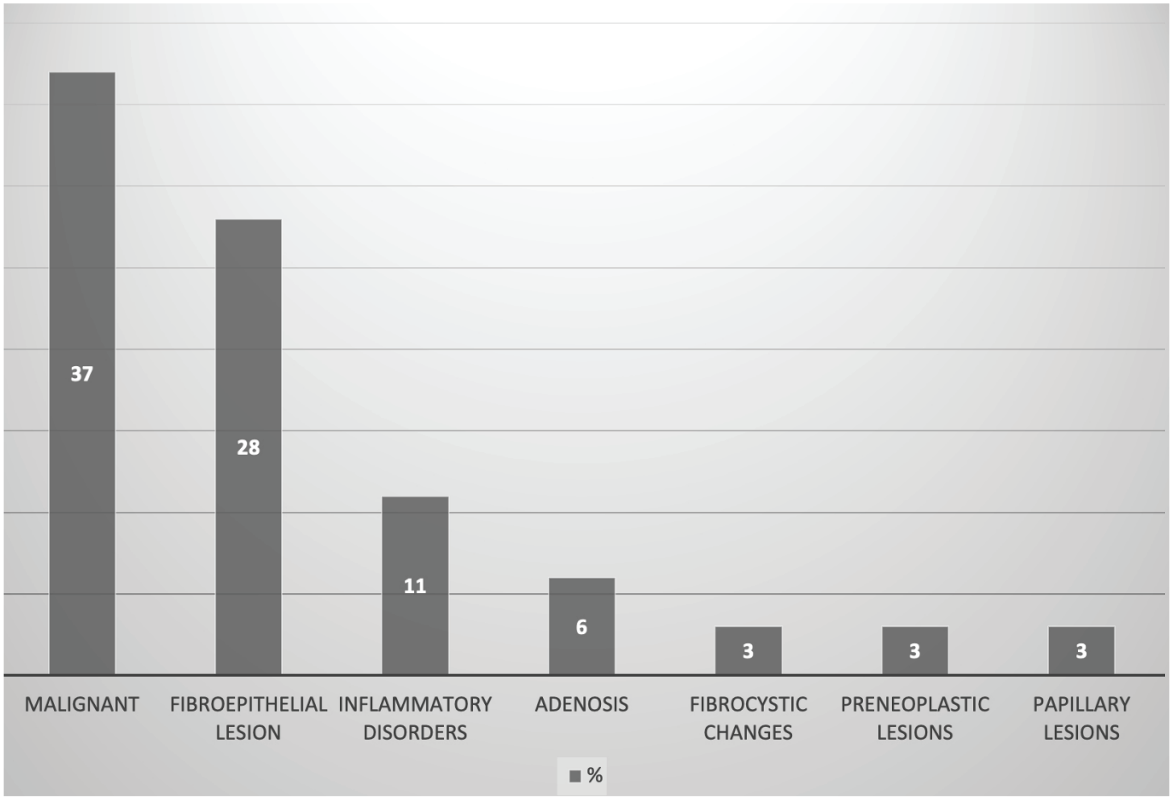

Figure 1. Distribution of the cases in the study group

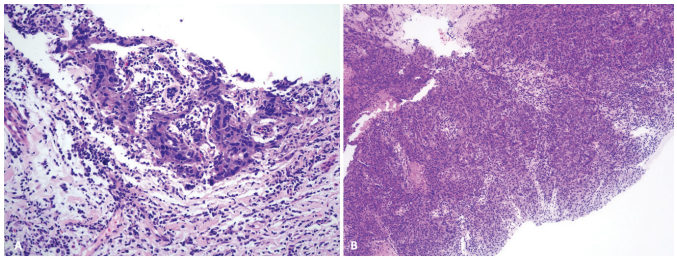

Figure 2. Two cases with major discordance. Biopsy revealed invasive carcinoma in these two patients. A) Invasive neoplastic glands with prominent nuclear atypia and B) a more cellular invasive breast carcinoma composed of sheets of tumor cells

Table 2. Histopathological findings in 14 patients with minor radiologic-histopathological discordance

BI-RADS category	Histopathological findings
3	Fibrocystic changes
3	Breast parenchyma fragments showing intraductal, periductal and stromal foamy histiocytic infiltration
3	Fibrocystic changes
4a	Ductal hyperplasia
4a	Fibrocystic changes
4	Granulomatous mastitis and abscess
4a	Adenosis and fibrocystic changes
4	Microcalcification in breast acini
4	Fibroepithelial lesion
4	Fibroepithelial lesion (consistent with benign Phillodes tumor)
4a	Adenosis and fibrocystic changes
4a	Fibroadenomatoid changes
4c	Adenosis
5	Intraductal papilloma with a focus of ductal carcinoma in situ

BI-RADS: Breast Imaging Reporting and Data System

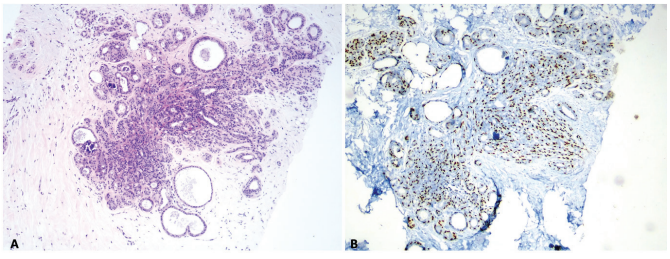

Figure 3. Sclerosing adenosis, which may be frequently mistaken for malignancy. A) Small tubules without significant cellular atypia embedded in a sclerotic stroma. Note the microcalcification in some of the tubules. B) P63 was positive in the myoepithelial cells of these tubules (immunohistochemistry)

Conclusion

In conclusion, considering that patient management will be carried out according to radiologic-histopathologic concordance, a multidisciplinary approach that combines the radiological and histopathological findings is of utmost importance in the management of patients with breast mass. Histopathological verification is necessary especially in patients with BI-RADS 4 lesions, to exclude malignancy or to avoid unnecessary surgery in patients with adenosis. Further investigation may be required in patients with radiologic-histopathologic discordance to adopt the optimal treatment strategy.

Ethics

Ethics Committee Approval: University of Health Sciences Turkey, Basaksehir Cam and Sakura City Hospital Ethics Committee (no: KAEK/2021.11.262) approved the study protocol.

Informed Consent: Informed consent was unsought because of the retrospective nature of the study.

Peer-review: Internally peer-reviewed.

Authorship Contributions

Surgical and Medical Practices: M.A.N., E.S., S.A., Concept: H.E., T.S.A., H.I.O., B.P., Design: H.E., T.S.A., H.I.O., B.P., Data Collection or Processing: H.E., T.S.A., H.I.O., B.P., Analysis or Interpretation: H.E., T.S.A., H.I.O., B.P., Literature Search: H.E., T.S.A., H.I.O., B.P., Writing: H.E., T.S.A., H.I.O., B.P.

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