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Evaluation of Imaging Findings, Histopathological Results, and Surgical Methods in Patients Undergoing Breast Biopsy

Original Article

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ABSTRACT

"Background: Breast cancer is one of the most common cancers among women. Detecting breast cancer at the earliest possible stage is the most important step in treatment. The early detection of breast cancer relies heavily on imaging methods.

Purpose: In this study, imaging methods used in the diagnosis of breast cancer were compared with histopathological results. Additionally, the therapeutic surgical interventions performed on patients diagnosed with breast cancer based on biopsy results and the pathological staging outcomes of these cases were analyzed.

Material and Methods: In our study, we retrospectively analyzed 370 cases from January 1, 2004, to December 31, 2005, within this scope, we examined the imaging modalities (mammography, ultrasonography) used for palpable and non-palpable breast lesions, the results of the biopsy procedures performed (core needle biopsy, frozen section, image-guided wire-localization excisional biopsy, excisional biopsy), the histopathological findings of the lesions, and the therapeutic surgical methods and pathological stages associated with cases diagnosed with breast cancer.

Results: In our study, the malignancy rates for BI-RADS categories 3, 4, and 5 were 5.6%, 43.4%, and 100%, respectively. The rate of benign lesions was 37.3%. Based on biopsy results, the benign-to-malignant ratio of the lesions was 0.59. The rate of lymph node-negative tumors was 49.7%. Axillary involvement was detected in half of the cases. Among the surgical procedures performed, the rate of breast-conserving surgery was 22.7%. However, it was determined that patients with stage 1 and 2 disease constituted approximately three-quarters of the operated cases.

Conclusion: Detecting breast cancer before the development of axillary lymph node metastasis has a highly positive impact on survival rates. Therefore, imaging modalities are among the most critical parameters for early diagnosis. We believe that increasing the rate of core needle biopsy while decreasing the rate of excisional biopsies will both increase the frequency of breast-conserving surgery and reduce the rate of re-excision procedures necessitated by positive surgical margins."

Keywords: breast biopsy, scanning methods, histopathological findings, breast conservative surgery

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Introduction

Breast cancer is a serious public health issue that accounts for 26% of all cancers in women (excluding in situ lesions and non-melanoma skin cancers) and 18% of cancer-related deaths (1). In breast cancer, the widespread use of screening mammography combined with physical examination reduces the overall mortality rate by one-third (2, 3). If cancer is detected at the preclinical stage (before axillary lymph node metastasis occurs), the 10-year survival rate is 74%, whereas it drops to 39% if lymph node metastasis develops. (4).

Over the past decade, the systematic and widespread use of screening mammography has led to a significant increase in the detection of early-stage, non-palpable lesions during the preclinical phase (before the appearance of clinical signs) and a consequent reduction in breast cancer mortality rates (2). However, establishing a definitive diagnosis for BI-RADS (Breast Imaging Reporting and Data System) category 3 and 4 lesions (where a clear distinction between benign and malignant disease cannot be made) remains a challenge for clinicians. This study aims to compare conventional imaging methods and histopathological findings used in breast cancer diagnosis, and to evaluate the surgical treatment approaches implemented based on breast biopsy results at our clinic, as well as the pathological staging outcomes of the cases.

Materials and Methods

The study included 370 cases who presented to the Department of General Surgery at Akdeniz University Faculty of Medicine between January 1, 2004, and December 31, 2005, due to palpable or non-palpable breast lesions and underwent surgical or percutaneous biopsy. The mammography and ultrasonography (US) findings, types of biopsies performed (core needle biopsy, frozen section, wire-guided excisional biopsy, open excisional biopsy), definitive histopathological diagnoses, and pathological stages of patients who underwent surgical treatment were retrospectively analyzed.

Mammographic examination findings were defined as R1 (negative/benign), R2 (benign lesion), R3 (suspicious lesion), R4 (suspicion of malignancy), and R5 (malignant features). Ultrasound findings were classified as U1 (negative/benign), U2 (benign lesion), U3 (suspicious lesion), U4 (suspicion of malignancy), and U5 (malignant features).

Ultrasound-guided core needle biopsy was performed in the general surgery outpatient

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clinic for palpable masses and in the radiology clinic for non-palpable masses. Wire localization for non-palpable lesions was performed under mammographic or ultrasound guidance. A stereotactic unit was used for mammography-guided localization. Following the procedure, two-view follow-up mammograms were obtained. To determine the length of the wire within the breast tissue, the wire's entry point into the tissue was marked with a metal marker during the follow-up mammograms. Control radiographs were taken of all specimens following excision to assess whether the lesion had been completely removed. In ultrasound-guided localization procedures, the wire tip projection onto the skin was marked after the procedure to determine its location relative to the incision site. The distance between the skin entry point and the wire tip, as well as the depth of the lesion from the skin surface, was measured.

Pathological diagnoses were classified as benign, in situ, microinvasive, invasive, non-epithelial, and others. Fibrocystic changes, sclerosing adenosis, fibroadenoma, intraductal papilloma, phyllodes tumor, ductal ectasia, fibroadenomatous hyperplasia, tubular adenoma, microglandular adenosis, hamartoma, lipoma, and abscess were classified as benign lesions. Ductal, lobular, tubular, cribriform, medullary, mucinous, mixed ductal/lobular, microinvasive papillary, papillary, apocrine, neuroendocrine, and others were defined as invasive lesions. All data were analyzed using SPSS 10.0.

Results

The age range of the 370 cases included in the study was 22–87 years, with a mean age of 54.5 years. Of the 220 cases diagnosed with cancer, 167 underwent therapeutic surgical intervention. Seven of the cases (4.1%) were male. Among the 167 patients who underwent surgery, 129 (77.2%) underwent modified radical mastectomy, and 38 (22.8%) underwent breast-conserving surgery.

Table 1 presents a comparison between histopathological diagnoses and combined mammography and ultrasound findings for 107 patients. All cases in Categories 1 and 2 were found to be benign upon pathological examination. Although 97.4% of cases in Category 3 were benign, one of the 19 cases proved to be invasive cancer. This indicates that Category 3 lesions require close monitoring or biopsy when suspicion arises. In Category 4, 52.8% of the 53 cases were benign, while 47.2% were diagnosed as cancer. It is observed that as the category

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grade increases, the rate of lesions proving to be malignant (in situ, microinvasive, and invasive) rises significantly. This finding supports the accuracy and reliability of the categorization used in mammography and ultrasound imaging.

The most preferred method in our clinic was the excisional (non-guided) biopsy (57.8%). Malignant cases were detected by excisional (non-guided) biopsy in 56.0% of cases and by wire-guided excisional biopsy in 18.5%. All 21 biopsies subjected to frozen section analysis yielded malignant results. Table 2 shows the distribution of biopsy methods applied to the 370 cases, as well as the distribution of methods used for the 232 cases found to have malignant pathology.

In our study, 138 of the 370 cases (37.3%) consisted of benign lesions. The remaining 232 cases (62.7%) comprised cancer cases of various stages and types. Invasive cancer was the most common type, accounting for 57.8% of the cases. In situ lesions (3%), microinvasive cancer (1.6%), and non-epithelial cancer (0.3%) were the other types.

In our study, fibroadenoma was the most common benign pathology, accounting for 30.8% of benign cases (41 instances). Sclerosing adenosis, a benign condition that can sometimes be radiologically confused with cancer, was the second most common type. Together, fibroadenoma and sclerosing adenosis constituted more than half (56.4%) of all benign cases, making them the most frequently encountered benign pathologies in our study.

Invasive ductal carcinoma, the most common type of breast cancer in the literature, accounts for 60.7% of the total cancer cases in our study. The mixed type, exhibiting both ductal and lobular features, is the second most frequently identified type. Invasive lobular carcinoma is the third most common type. In our study, these three groups (ductal, mixed, and lobular) account for 90.1% of all cancer cases. The distribution of histopathological results is presented in Table 3; the subgroup distributions of benign lesions are shown in Table 4, and the subgroup distributions of malignant lesions are shown in Table 5.

Our study revealed that patients in stages 0, I, and II collectively accounted for 73.9% of the entire patient cohort. This indicates that approximately three-quarters of the patients presenting to the center were diagnosed at an early stage. Notably, the high number of patients diagnosed at stages I and IIA meant that these individuals were identified. At the same time, the disease was still localized, thereby increasing their chances of

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successful treatment. The distribution of pathological stages according to the TNM system among operated patients is shown in Table 6.

Table 1. The relationship between the category of mammography and ultrasonography findings and the pathological diagnosis

Mammography and Ultrasound Findings Category	**Benign n (%)**	**In Situ n (%)**	**Microinvasive n (%)**	**Invasive n (%)**	**Total n (%)**
1	1 (100)	0	0	0	1 (100)
2	5 (100)	0	0	0	5 (100)
3	18 (97.4)	0	0	1 (5.3)	19 (100)
4	28(52.8)	2 (3.8)	1 (1.9)	22 (41.5)	53 (100)
5	0	0	1 (3.4)	28 (96.6)	29 (100)
Total	**52 (48.6)**	**2 (1.9)**	**2 (1.9)**	**51 (47.7)**	**107 (100)**

Table 2. Comparison of Biopsy Types Performed in All Cases and Malignant Cases

Biopsy Method	**All Cases (n)**	**All Cases (%)**	**Malign Cases (n)**	**Malign Cases (%)**
Excisional (Unmarked)	214	57,8	130	56,0
Wire-localized excisional biopsy	90	24,3	43	18,5
Core needle	45	12,2	38	16,4
Frozen	21	5,7	21	9,1
Total	**370**	**100,0**	**232**	**100,0**

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Table 3. Distribution of Histopathological Results

Pathological Diagnosis	**Frequency (n)**	**Percent (%)**
Benign	138	37,3
Invasive cancer	214	57,8
In situ lesion	11	3,0
Microinvasive cancer	6	1,6
Non-epithelial cancer	1	0,3
Total	**370**	**100,0**

Table 4. Distribution of Benign Pathologies

Benign Pathological Type	**Frequency (n)**	**Percent (%)**
Fibroadenoma	41	30,8
Sclerosing Adenosis	34	25,6
Fibrocystic Change	17	12,8
Proliferative Lesion Only	14	10,5
Fibroadenomatous hyperplasia	8	6,0
Intraductal Papilloma	9	6,8
Ductal Ectasia	3	2,3
Phyllodes Tumor	2	1,5
Other (Tubular adenoma, lipoma, abscess, etc.)	5	3,7
Total	**133**	**100,0**

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Table 5. Distribution of Malignant Pathologies

Cancer Group and Histological Type	**Frequency (n)**	**Percent (%)**
Microinvasive - Ductal	3	1,4
Microinvasive - Lobular	1	0,5
Microinvasive - Papillary	2	0,9
Invasive - Ductal	130	60,7
Invasive - Mixed Ductal/Lobular	33	15,4
Invasive - Lobular	30	14,0
Invasive - Mucinous	5	2,3
Invasive - Papillary	4	1,9
Invasive - Apocrine	3	1,4
Invasive - Tubular	2	0,9
Invasive - Neuroendocrine	2	0,9
Invasive - Cribriform	1	0,5
Invasive - Medullary	1	0,5
Invasive - Other types	3	1,4
Total	**220**	**100,0**

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Table 6. Pathological TNM Classifications of Operated Patients

TNM Stage	Frequency (n)	Percent (%)
Stage 0	8	4,7
Stage I	56	33,1
Stage IIA	36	21,3
Stage IIB	25	14,8
Stage IIIA	29	17,2
Stage IIIB	4	2,4
Stage IIIC	11	6,5
Total	**169**	**100,0**

Discussions

In our study, 232 (62.7%) of the 370 cases were diagnosed with breast cancer. Among the 220 pathologically malignant lesions, six were identified as microinvasive cancer and 214 as invasive cancer. Of the cases diagnosed with breast cancer, 167 underwent surgery at our center. Modified radical mastectomy was performed on 129 (77.2%) of these patients, and breast-conserving surgery on 38 (22.8%).

The BI-RADS system, developed to standardize mammography and ultrasound in the preoperative evaluation of breast diseases, is the most valuable guide for preventing unnecessary surgical interventions and estimating the risk of malignancy (5). The literature reports the probability of malignancy in BI-RADS category 3 lesions to be in the very low range, 0.3%–2%. It is reported that the majority of these cancers are small in size and present without lymph node involvement or distant metastases (6).

In our study, all cases in categories 1 and 2 were found to be benign. In category 3, 94.7% of cases were benign, and 1 case was invasive cancer. Of the 53 cases in Category 4, 52.8% were benign, and the remaining 47.2% were malignant. In their study, Bilgen et al. (7) found the rate of benign

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lesions to be 63.8%. Among benign lesions, they reported that fibrocystic changes were the most frequently detected (31%), followed by fibroadenomas. Weaver et al. (8) determined the frequency of fibroadenomas among biopsied benign lesions to be 18.5%. In our study, the benign-to-malignant ratio was 0.59, and the rate of benign lesions was 37.3%. Fibroadenoma was the most common benign pathology, accounting for 30.8% of our cases, while sclerosing adenosis was identified as the second most common type. The rate of fibrocystic changes in our study was 12.8%.

The histopathological classification of breast carcinoma is based on the diversity of tumor morphological characteristics. In the version published by the World Health Organization (WHO) in 2003, approximately 70–80% of all breast cancers belong to one of two main histopathological classes: invasive ductal carcinoma or invasive lobular carcinoma (9). Ductal carcinomas are tumors that arise from the breast ductal epithelium. Ductal carcinoma in situ (DCIS) is being detected more frequently with the increased use of mammography. It is generally stated that, apart from nonspecific calcifications, they do not produce mammographically detectable changes. It is known that the calcifications predominantly present as BI-RADS-4 microcalcifications (10). Lobular carcinomas may not show any findings on mammography or ultrasound. They do not contain microcalcifications. Therefore, they lead to a delay in diagnosis. In the literature, the rate of invasive lobular carcinoma ranges from 2% to 15%. (11). In the 107 cases retrospectively analyzed in our study, the rate of invasive cancer was found to be 5.3% for combined Category 3 lesions. The rate of invasive cancer for BI-RADS Category 4 lesions was found to be 43.4%. The malignancy rate for BI-RADS category 5 lesions was 100%, consistent with the literature. These data demonstrate that the combined ultrasound and mammography approach in our clinic achieves high diagnostic sensitivity and accuracy in distinguishing malignancy.

In our study, among cases diagnosed with breast cancer, 60.7% were identified as isolated ductal, 14% as isolated lobular, and 15.7% as mixed ductal-lobular carcinoma. The rate of in situ carcinoma was 3%. In the literature, the rate of ductal carcinoma in situ is reported to be approximately 40–50% (12).

Breast cancer in men is a rare disease worldwide. Many studies have indicated that the incidence of invasive ductal carcinoma in men approaches 90%. A study

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by Anderson et al. (14) indicates that breast cancer in men peaks at the age of 71. In our study, however, all seven male patients diagnosed with breast cancer were found to have invasive ductal carcinoma, and the mean age of these patients was 49.

The most common sites of regional spread for breast cancer are the axillary, internal mammary, and supraclavicular lymph node groups. Accurately identifying and characterizing involvement in these regions is of great importance for both staging and treatment planning. The axillary nodes are the primary drainage site for the breast. It has been histologically determined that approximately 50% of cases with breast tumors large enough to be palpable on physical examination exhibit axillary lymph node involvement. The probability of axillary metastasis is directly related to the size of the primary tumor. The relationship between tumor size, axillary node involvement, and 5-year survival was examined in 24,740 breast cancer patients within the U.S. National Cancer Institute's "Surveillance, Epidemiology and End Results (SEER)" program. It has been reported that the likelihood of axillary node involvement increases with primary tumor size, and that the risk of axillary involvement is approximately 20% even in tumors smaller than 0.5 cm (15). In their study, Weaver et al. (8) found that the rate of lymph node-negative tumors was 78.2%. In our study, however, the rate of lymph node-negative tumors was 49.7%. The number of axilla-negative cases in our study is quite low compared to the literature. We believe the reason for this is the delayed presentation of patients to our hospital.

In breast cancer, stages 1 and 2 represent the earliest stages of invasive cancer. These two stages are referred to as "operable" stages. In our study, stage 1 and stage 2 cases account for 74% of the entire series. In cases where breast-conserving surgery is to be performed, the decision regarding the procedure should be made only after evaluating several factors: whether the patient can undergo postoperative radiotherapy, the relative sizes of the tumor and the breast, the presence of the tumor in multiple quadrants of the breast, the patient's underlying conditions (such as connective tissue diseases), and most importantly, the patient's preference regarding breast-conserving surgery. According to the results of prospective randomized clinical trials conducted and monitored over the past 30 years, there is no significant difference in survival times between patients with early-stage breast carcinoma treated with modified radical mastectomy and those treated with breast-

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conserving surgery and radiotherapy (16). Randomized clinical trials conducted in recent years have demonstrated that tumors up to 5 cm in diameter can be removed via breast-conserving surgery, and that a selected subset of high-stage tumors can be downstaged through neoadjuvant systemic therapies, thereby becoming candidates for breast-conserving surgery (17). Breast-conserving surgery was performed on 22.7% of the patients at our clinic. The American Society of Breast Surgeons recommends reducing rates of open surgical excision for breast masses, maintaining preoperative core needle biopsy utilization above 90%, and limiting the rate of intraoperative frozen section analysis, which is both costly and time-consuming, to below 10%. In our study, while the rate of open excisional biopsy without prior localization during the diagnostic process was high at 57.8%, the rate of preoperative core biopsy, which should be the gold standard, remained quite low at 12.2%. This situation reflects the fact that, at the time the study was conducted, the capabilities and practice of percutaneous core-needle biopsy had not yet become part of routine clinical practice, and surgical exploration was prioritized.

Conclusion

Detecting breast cancer before the development of axillary lymph node metastasis has a highly positive impact on survival rates. Therefore, imaging modalities are among the most critical parameters for early diagnosis. We believe that increasing the rate of core biopsies while reducing that of excisional biopsies will both increase the frequency of breast-conserving surgery and lower the rate of re-excision procedures necessitated by positive surgical margins.

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