

# Diagnostic Value Of Mammography And Ultrasonography For Differentiation Of Benign And Malignant Breast Masses

*Meme Kitlelerinde Benign-Malign Ayırımında Mammografi Ve Ultrasonografinin Tanı Değeri*

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**Aim:** The aim of this study is to determine the diagnostic value of mammography and ultrasonography for differentiating benign and malignant breast masses.

**Material and Methods:** Fifty-one patients who had palpable breast masses were evaluated with both mammography and US. The detected lesions were classified as benign or malignant according to their imaging features and these results were evaluated according to the histopathological reports.

**Results:** Histopathologically, 28 of the 51 breast masses (54.9%) were reported as benign and 23 (45.1%) as malignant. The sensitivity and specificity of mammography were 81.4% and 90.4% for benign masses. The sensitivity and specificity of US for benign masses were 85.7% and 82.6%. The sensitivity and specificity of mammography for malign masses were 90.9% and 81.4%. The sensitivity and specificity of US for malignant masses were 78.2% and 85.7%.

**Conclusion:** Although ultrasonography is a valuable imaging method for the differentiation of solid – cystic breast masses, mammography is superior to ultrasonography for benign-malignant differentiation.

**Key Words:** *Mammography, Ultrasonography, Breast mass*

**Amaç:** Mammografi ve ultrasonografinin, meme kitlelerinde benign- malign ayrımı yapmaktaki değerini belirlemektir.

**Gereç ve Yöntem:** Palpabl meme kitlesi olan ve bu nedenle ultrasonografi ve mammografi incelemesi yapılan 51 olgu çalışmaya dahil edilmiştir. İzlenen kitleler özelliklerine göre benign-malign olarak ayrılmış, bu sonuçlar histopatoloji raporları ile karşılaştırılmıştır.

**Bulgular:** Histopatoloji sonuçlarında 51 meme kitlesinin 28'i (%54.9) benign, 23'ü (%45.1) malign olarak raporlanmıştır. Benign kitlelerde mamografinin sensitivite ve spesifitesi %81.4 ve %90.4 olarak belirlenmiştir. Benign kitlelerde US'nin sensitivite ve spesifitesi ise %85.7 ve %82.6 olarak hesaplanmıştır. Malign kitlelerde mamografinin sensitivite ve spesifitesi %90.9 ve %81.4 olarak belirlenmiştir. Malign kitlelerde US'nin sensitivite ve spesifitesi ise %78.2 ve %85.7 olarak hesaplanmıştır.

**Sonuç:** Meme kitlelerinde, kistik –solid ayırımında ultrasonografi değerli bir görüntüleme yöntemidir. Ancak benign-malign ayırımında mammografi ultrasonografiden üstündür.

**Anahtar Sözcükler:** *Mammografi, Ultrasonografi, Meme Kitlesi*

Breast cancer is one of the leading causes of cancer deaths among women. Each year, nearly 40.000 deaths in the United States are attributed to this disease (1). The mortality of breast cancer is reported to be 25-35 in 100.000 people (2). The prognosis of breast cancer depends on the histological subtype and the dimension of the tumor, and spread at the time of the diagnosis. In an attempt to reduce this mortality, breast self-

examinations and periodic screening is recommended. Periodic screening is performed by mammographic examinations.

If a lesion is detected at mammography; ultrasonography (US), spot mammography, core needle biopsy or magnetic resonance imaging (MRI) can be used for the differential diagnosis. In this study, we have evaluated breast masses. With

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mammography and US in a series of patients with palpable breast masses, and sought to establish the diagnostic accuracy of mammography and US for differentiating benign and malignant breast masses.

## MATERIALS AND METHODS

Fifty-one patients who palpable breast masses and were evaluated with both mammography and US, were retrospectively included to the study. After a physical examination and a finding of a palpable breast mass, the patients were referred by a clinician to the radiology department for mammography and US examinations.

Mammography was performed with a 800 Miliamper Siemens-Mammomat (Siemens- Germany) and, craniocaudal and mediolateral radiographs of the both breasts were taken. When needed, spot radiographs with magnification technique were also taken. When a mass lesion was detected by mammography; the dimensions, margin characteristics (circumscribed or irregular), spiculations and density of the lesion were evaluated and any associated microcalcifications were noted. Any lesion with contour microlobulation, ill defined margins, spiculation, ill defined posterior margin and intratumoral microcalcifications were defined as potentially malignant. Other lesions were defined as potentially benign.

Breast US was performed with a General Electric RT-X 400 (GE-Milwakue- USA) ultrasonography equipment, using 7.5 Mhz linear transducer. When a lesion was detected by US; the dimensions, margins, echogenicity, internal echo pattern (homogenicity), posterior acoustic attenuation and

enhancement of the lesion were evaluated. Any lesion with contour microlobulation, ill defined margins, spiculated margins, posterior acoustic attenuation were defined as potentially malignant. Other solid lesions and anechoic cysts with none or thin linear septations were defined as potentially benign. All US examinations were performed by a single radiologist (E.Ö).

All patients with solid or suspicious complicated cystic masses had undergone core needle biopsy or excisional biopsy, and the mammography and US results were compared with histopathological diagnosis. The sensitivity and specificity of mammography and US were calculated for benign and malignant breast tumours. Groups were statistically compared for proportions using chi-square tests, for means using one sample t test and one way Anova where appropriate.  $p < 0.05$  was considered as statistically significant.

## RESULTS

Our results show that; of the 51 breast masses 28 masses (54.9%) were benign and 23 masses (45.1%) were malignant histopathologically. The histopathology of benign and malignant masses listed in Table 1. Patient ages ranged between 19 and 70 years. The mean age was 45.3.

The patients with malignant diagnosis (mean age 51.2 years) were significantly ( $p < 0.001$ ) older than those with benign diagnosis (mean age 38.6 years). The size of the benign masses varied between 4 mm and 3 cm (mean 1.5 cm) and malignant tumors varied in size between 6 mm and 1.8 cm and there was not a statistically significant difference ( $p = 0.53$ ) between the mean dimensions.

Mammographic evaluation revealed that, 22 (78.5%) of the benign masses were diagnosed as benign and six (21.5%) of the benign masses were diagnosed falsely as malignant. Sonographically, 24 (85.7%) of the benign masses were diagnosed as benign and four (14.3%) of the benign masses were diagnosed falsely as malignant.

As for malignant tumors; with mammography, 20 (87%) were diagnosed as malignant and three (13%) were diagnosed falsely as benign. Sonographically, 18 (78%) of the malignant masses were diagnosed as malignant and five (22%) of the malignant masses were diagnosed falsely as benign.

The sensitivity and specificity of mammography and US for benign masses were 81.4%, 90.4%, 85.7% and 82.6, respectively. The sensitivity and specificity of mammography and US for malignant masses were 90.9%, 81.4%, 78.2% and 85.7, respectively.

**Table 1:** Histopathological diagnosis of breast masses

	Histopathological diagnosis	Number of cases
<b>Benign</b>	Cyst	14
	Fibroadenoma	11
	Complicated cyst	1
	Lipoma	1
	Abscess	1
	<b>Total</b>	
<b>Malignant</b>	Invasive ductal carcinoma	21
	Invasive lobular carcinoma	1
	Mucinous carcinoma	1
	<b>Total</b>	

## DISCUSSION

Mammography and US are the most frequently used imaging methods for evaluating palpable breast masses. Mammography is accepted as the primary screening method, and it gives valuable information for differentiating benign and malignant lesions. When a mass lesion is detected at mammography, the lesion is first evaluated for the regularity of its margins. High density, irregular margins and spiculations are important findings for a malignant lesion (3, 4). Also, microcalcifications in a mass lesion should be evaluated carefully. But, some solid breast lesions, especially mucinous and medullary carcinomas are reported to have regular margins (3, 5). These lesions may be diagnosed as benign with mammography. In our series, 17 of the 23 malignant masses had irregular margins and spiculations. The only tumor in our series which was histopathologically diagnosed as mucinous carcinoma had regular margins at mammography and simulated a benign lesion. This finding is in accordance with the literature (3, 5, 6). The detection of microcalcifications in a mass lesion is another suspicious finding for malignancy (3, 7). In the literature, intratumoral microcalcifications have been reported in 25-60% of the malignant breast tumors (3, 6, 7). In our study group, microcalcifications were detected in six (26%) of the malignant masses. In our series, three tumors with regular margins were diagnosed as potentially malignant because of the existence of intratumoral microcalcifications. None of the benign lesions in this series had intratumoral microcalcifications. These findings show the significance of presence of intratumoral microcalcifications. Based on the demonstration of irregular margins, spiculated contours and intratumoral microcalcifications,

we determined a 90.9% sensitivity for the malignant masses using mammography. In our study, we had six false positive malignant diagnosis with mammography. Three of these cases were microcysts or complicated cysts with irregular margins and 3 of them were fibroadenomas with slight contour lobulation and irregularity. Some authors have also reported that some fibroadenomas may have irregular margins at mammography (8, 9). In our series, three of the 11 fibroadenomas (27%) were diagnosed as potentially malignant because of these features. This can be secondary to dense fibrous paranchyma surrounding the tumor which effects the evaluation of the margins. We determined a 81.4% sensitivity for the diagnosis of benign tumors with mammography.

Although mammography is a very effective imaging method for detecting breast tumors, US is more valuable in screening patients with mammographically dense breasts (4, 10). When a potentially benign lesion is detected with mammography, US is the best method for solid-cystic differentiation (11). Authors have reported a 95-100% accuracy for the differentiation of solid and cystic lesions with US (12-14). Anechoic lesions with regular margins, smooth walls, spheric or ovoid shape and posterior acoustic enhancement are regarded as simple cysts (3, 12). In some cysts with internal echogenicity, it may be difficult to differentiate the lesion from benign solid lesions such as fibroadenomas (15). In our study population, all cysts were thin walled and anechoic and US had a 100% sensitivity for differentiating cysts from solid lesions. This rate is statistically higher ( $p < 0.001$ ) than that of mammography (81.4%). The smallest cyst we have detected was 3 mm. Although US is very effective for differentiating cysts

from solid lesions, it is not such effective for the differentiation of benign-malign solid masses (16, 17). When a solid lesion is detected at US; the dimensions, shape, margins, echogenicity, homogeneity and posterior acoustic properties of the lesion must be evaluated. The most important diagnostic criteria for determining a malignant lesion by US is contour irregularity. Homogenous internal echogenicity and posterior acoustic shadowing are also valuable for differentiating benign and malign solid masses (18, 19). However, it has been reported that, 10-15% of malignant breast masses may also have regular margins and homogenous internal echogenicity at US (13). In addition, it is stated that 25-50% of fibroadenomas may have irregular margins (8). The other important criterion, acoustic attenuation caused by the dens internal structure of carcinomas, is also not very sensitive. Some authors have reported that the acoustic shadowing noted at the posterior aspect of the malignant masses is only detected at 20% of the malignant lesions, and added that, nearly 9-30% of benign solid breast masses can have posterior attenuation sign (8, 20). In our series, we had the correct benign diagnosis by US for nine of the 11 fibroadenomas. The other two lesions were reported as malignant because of the existence of irregular margins and posterior acoustic attenuation. US also could not make the correct diagnosis for one abscess and one complicated cyst in our series because of their heterogenous internal echogenicity and irregular margins, and these lesions were reported as suspicious for malignancy. In our study, we calculated a sensitivity rate of 85.7% by US for benign masses. On the other hand, 18 of the 23 malignant masses were diagnosed correctly by US. Other lesions were reported as benign because of their regular margins and homogenous echo texture. One of

these masses was diagnosed as mucinous carcinoma, and the others were reported as invasive ductal carcinoma histopathologically. In accordance with the literature, the sensitivity of US for the diagnosis of malignant masses is low (78.2%) in our series.

In conclusion, US is a very effective imaging method for the differentiation of solid breast masses from simple cysts. But its diagnostic value is not satisfactory for the differentiation of benign-malignant solid masses. Mammography, which is a effective imaging method for

screening breast cancers, can not differentiate cysts from solid lesions appropriately but has a higher sensitivity than US for the differentiation of benign and malignant breast masses.

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