TOMOGRAFİ VE MAMOGRAFİNİN KARŞILAŞTIRILMASI, BİLGİSAYARLI TOMOGRAFİDE MEME KANSERİNİN TANISAL ÖZELLİKLERİ

Features of Breast Cancer on Computerized Tomography with the Comparison of Mammography to Tomography

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ÖZET

Amaç: Bu çalışmanın amacı, meme kanserinin bilgisayarlı tomografi (BT)'de tanısal özelliklerini belirlemek ve meme kanserinin tomografi görülebilirlik derecesini araştırmaktır.

Gereç ve Yöntem: Mayıs 2010-Ocak 2016 tarihleri arasında histopatolojik tanısı bulunan 1000 meme lezyonu değerlendirildi. Bu lezyonların 604 (% 60,4)'ünde meme kanseri tanısı vardı. 604 meme kanseri olgusunun 161 (% 16.1)'inin mamografi ve toraks BT görüntüleri vardı. Çalışmaya dahil edilen bu 161 lezyonun BT ve mamografi (MG)'de lezyonların tanısal özellikleri, görülebilirlik oranları, malign ek odak ve patolojik LAP varlığı lezyonların tipi, boyutu ve lokalizasyonundan haberi olmayan iki radyolog tarafından değerlendirildi.

Bulgular: Lezyon boyutları BT'de 7-110 (25.82) mm ve MG'de 6-92 (24.97) mm arasında değişmekteydi. BT ve MG'de kitle şekilleri ve kontürleri büyük oranda düzensiz idi. İki görüntüleme yöntemi arasında istatistiksel olarak anlamlı bir fark bulunmadı (p <0,001). Cerrahi patolojisi mevcut olan 133 hastanın 38'inde (% 28) tümörden ayrı malign ek odak saptanmış olup, MG'de lezyonların 18'i (% 47), BT'de ise 32'si (% 84) tespit edildi. Cerrahi patolojide 133 hastanın 55'inde (%41) patolojik lenfadenopati (LAP) tespit edilmiş olup MG'de 17 (% 30,1), BT'de ise 45 (% 81,9) patolojik LAP tespit edildi. Lezyonların yaklaşık % 70'inde hem BT hem de MG'de oldukça iyi görülebilirlik oranları vardı. İki gözlemci arasında, gözlemciler arası uyum anlamlıydı.

Sonuç: Tomografi kullanımındaki artıştan dolayı, toraks BT'de meme dokusuna dikkat edilmesi ve meme kitlelerinin BT görüntüleme özellikleri bilinmesi meme kanserinin erken teşhisinde hayati öneme sahiptir.

Anahtar Kelimeler: *Bilgisayarlı tomografi; Meme kanseri; Meme tomografisi*

ABSTRACT

Aim: The main purpose of present study was to determine the diagnostic features of breast cancer on tomography (CT) and investigating the degree of tomographic visibility of breast cancer.

Methods: A total amount of 1000 breast lesions with histopathologic diagnose evaluated between may 2010 and january 2016. 604 (60.4%) of these lesions were diagnosed as breast cancer. Of these, 161 (16.1%) patients were evaluated with chest CT. These 161 patient included to study and lesion's diagnostic features in mammography (MG) and CT, tomographic visibility rates, presence of malignant additional focus and pathological LAP were evaluated by two specialist blinded to lesions type, size and location, independently.

Results: The lesion sizes ranged from 7 to 110 (25.82) mm in the CT and from 6 to 92 (24.97) mm in the MG. Most of the mass shapes and margins were irregular on CT and MG. No statistically significant difference was found between the two imaging modalities (p < 0.001). Of the 133 patients, 38 (28%) lesions had additional focuses on surgical pathology. MG could detect 18 (47%), CT could detect of these 32 (84%), additional focus. Of the 133 patients, 55 (41%) lesions had pathological LAP on surgical pathology. MG could detect 17 (30,1%), CT could detect of these 45 (81.9%), pathological LAP. Nearly 70% of the lesion was clearly identified on both CT and MG. There were significant interobserver reliability rates between the two observers.

Conclusions: Due to the increase in the use of tomography, attention to the breasts in the study area and knowledge of CT imaging features of breast masses is of vital importance in the early diagnosis of breast cancer.

Keywords: Computerized tomography; Breast cancer; Breast tomography

INTRODUCTION

Mammography (MG), sonography and magnetic resonance imaging (MRI) are standard imaging modalities used to diagnose breast cancer worldwide (1). However, the increased use of multidetector computed tomography (MDCT) in the last two decades increased the proportion of incidentally detected breast lesions, even if MDCT is not the primary breast cancer screening method. New generation MDCTs have especially high resolution and enable imaging of previously undetectable lesions (2).

Thorax computerized tomography (CT) is routinely used in the imaging of lung, mediastinum, pleura, diaphragm and chest wall pathologies, rather than breast tissue. However, breast tissue is generally included in the area of thoracic CT imaging. Increased use of thorax CT for many different reasons such as pulmonary embolism, infections, trauma, cardiac imaging or for staging any type of cancer in clinics, increases the chance of encountering random breast masses. In some cases, CT may be the first imaging method to show breast lesions (3, 4) (4-7) (6-9).

Furthermore, some types of breast cancer can be better visualised by CT than by MG such as inflammatory breast cancer. Also, for patients with ulcerated breast lesions, CT is much easier to apply. Additionally, in the detection of breast cancers that are located close to the chest wall, located in the axillary region or hidden in dense breast types, CT also provides better visualisation than MG.
Studies are describing the characteristics of breast lesions detected by CT incidentally (4, 8-12).
According to our current literature, there is also little information assessing the characteristics and features of known breast cancer in tomography. Existing studies are used to investigate incidental lesions, and none of them mentions the presence of known breast cancer cases in tomography.

Our main purpose is in this study is rather then evaluating the usefulness of tomography in breast masses as a screening method, is determinating the tomographic features of breast masses on CT by evaluating the breasts on CT scans with different clinical indications of CT and by this, comparing the ability of CT by accepting mammography as the gold standard breast imaging modality.

In this context, our study has the only and the largest series in the current literature.

MATERIALS AND METHODS

Study population

This retrospective study was conducted to investigate the imaging features of breast cancer on CT. We searched our institution's Pathology department database to identify pathology reports of breast lesions. All patients were evaluated with breast sonography and MG before sonographically-guided core-needle biopsy or surgery. Breast cancer cases were identified from the pathology department database for patients screened from 2010 to 2016.

For our study, 1000 breast lesions with histopathologic diagnoses were evaluated. Of these lesions, 604 (60.4%) were diagnosed with breast cancer. After searching the Radiology picture archiving and communication system (PACS) database, we detected 161 (16.1%) of these patients with malignant lesions were also evaluated with chest CT for any reason other than breast pathologies such as pulmonary embolism, infections, trauma, cardiac imaging or for staging any type of cancer in clinics within one or two month before mammographic examination.

Patients who underwent tomographic examination for different clinical endications were included in our study at most two months prior to ultrasound and mammography examinations.

In our radiology department, all patients who are considered to have pathological evaluation due to the mammograpic findings are used to taken to ultrasound examination on the same day. CT examinations were performed all the study populition within one or two month before sonographic and mammographic examination.

Patients without available CT images were excluded from our study.

The study was approved by the local ethics committee of our institution, and all participants provided written informed consent. This prospective, single-institution study was conducted in compliance with the Helsinki Declaration and good clinical practice guidelines of our country.

All examinations were retrospectively performed by two radiologists with a combined experience of more than ten years in breast imaging. The reviewers knew of the presence of breast lesions on thorax CT; however, they were blinded to the locations and final diagnosis of patients.

CT technique

The thorax CT was performed in the supine position, using a 16-detector MDCT scanner (Somatom Sensation, Siemens Medical Systems, Erlangen Germany Wizard; Siemens, Germany). Intravenous contrast-enhanced scans were performed. Standard protocol at our hospital: a pitch of 2, 0.5 s scanner rotation, 120 kV, 160 mAs, 38 cm field of view and 1 mm slice thickness. Subsequently, a contrast-enhanced helical CT was performed with intravenous administration of non-ionic contrast material Iopromide (Ultravist®, Shering, Berlin, Germany), 300 mg/mL, was injected as a 2 mL/kg dose at a speed of 4–6 mL/min using an automatic injector system. Scanning was performed 50 seconds after injection of the contrast medium. Imaging parameters were similar to those used for unenhanced CT.

Image analysis

Breast density was evaluated on MG according to BI-RADS classification system. The breast density patterns of these patients on MG was classified as follows: type 1, almost entirely fat, scattered fibroglandular tissue; type 2, heterogeneously dense parenchyma; type 3, ranging from 51%–75% of the breast tissue and finally type 4, the breast contains greater than 75% glandular and fibrous tissue patterns according to the American College of Radiology classification Breast Imaging Reporting and Data System (BI-RADS) (13).

Our gold standard imaging modality method for determining CT diagnostic features of breast cancer was specified by MG. Tomography findings were compared with MG findings.

Lesion distribution patterns, positive imaging findings such as margins, shape, lesion dimensions, enhancement patterns, calcifications and related lymph nodes of these malignant breast lesions were also evaluated. Margins of masses were described as well-circumscribed, irregular and speculated (Fig 1). Shapes of lesions were divided into three subgroups: oval, round or irregular.

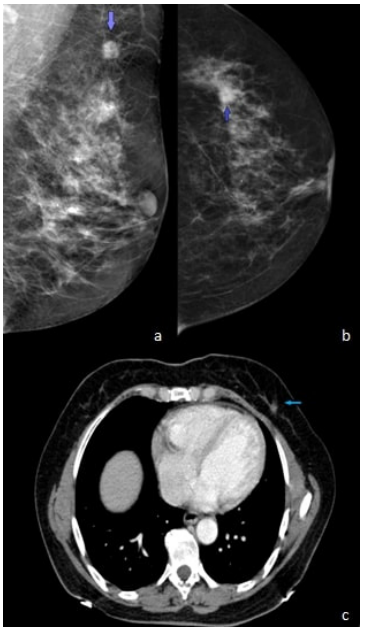

Figure 1. Left CC projection (a), MLO projection (b) MG images and axial CT image (c) were demonstrated spiculated margin mass apperance in the lower inner quadran of left breast (arrows).

Enhancement patterns of the masses were divided into three subgroups: homogenous enhancement, heterogeneous enhancement and round enhancement. These breast cancers were arranged in classes or categories as either mass or non-mass enhancing lesions (Fig 2).

Our second group, non-mass-like enhancement lesions, refers to lesions that could only be detected on contrast-enhanced CT, which was defined as regional enhancement of the breast. The enhancement area did not reflect a mass-like effect. The distribution region of enhancement (therefore >25% of a quadrant) was divided into three subgroups: focal, segmental and regional enhancement.

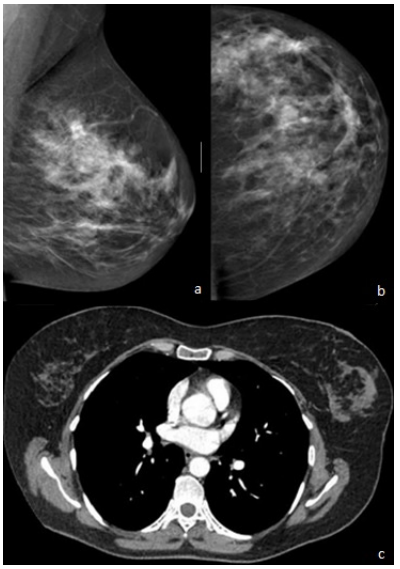

Figure 2. Left CC projection (a) MG image and Aksial CT image (b) were demonstrated, increased fibroglandular tissue density in the upper outher quadran on MG and axial CT image was shown asymmetric enhancement.

If CT detected any accompanying calcifications, they were noted and compared with their visibility on MG (Fig 3).

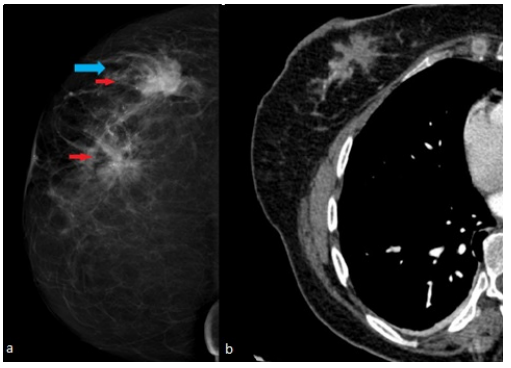

Figure 3. Right MLO projection (a) MG image and axial CT image (b) was shown two spiculated neigbouring lesion with calsifications and axial CT image (b) was demonstrated spiculated margin mass apperance in the upper outer quadran of left breast with calsifications.

Lesion's multifocality and multicentricity have also been evaluated.

Any lesion that occurred as a mass density other than breast cancer was also considered as an additional focus (Fig 4).

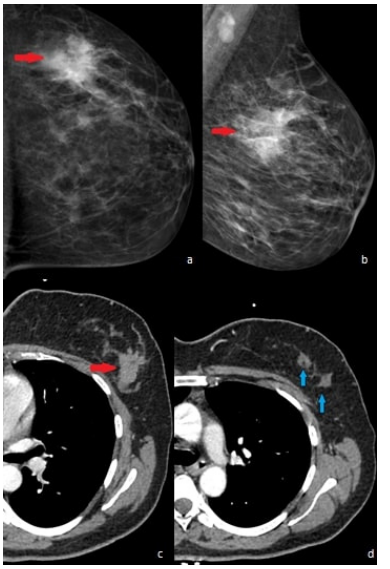

Figure 4. Left MLO projection (a) and CC projection (b) MG images. (c) Aksial CT image were demonstrated well defined, spiculated countered mass apperance in the upper outer quadran of left breast (red arrows). (d) Axial CT image show additional focuses were also demonstrated on CT (blue arrows).

Axillary lymph nodes were defined as pathologic if the ratio of the long-short axis was under two or cortical irregular thickening was detected (Fig 5).

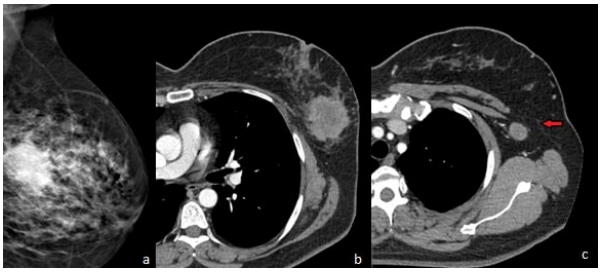

Figure 5. MLO projected left ammography image (a) and axial CT images (b) were demonstrated well defined, spiculated countered mass apperance in the outher centeral quadran of left breast. CT image (c) axial region LAP's also demonstrated on CT (red arrow) which was not seen on MG secondary to macrosomic breast structure.

Multicentric cancer was accepted as the occuarance of at least two masses in two different quadrants of the breast or in the same quadrant but at least 50mm apart. Multifocal cancer was accepted as the occuarance of multiple masses in the ipsilaterally

quadrant of the breast or in different quadrants is the measurement between focus is at least 50 mm. Since CT has not a standard lexicon for describing breast masses, MRI lexicon was used in this study because of it's nature of contrast enchanced and cross-sectional imaging modality.

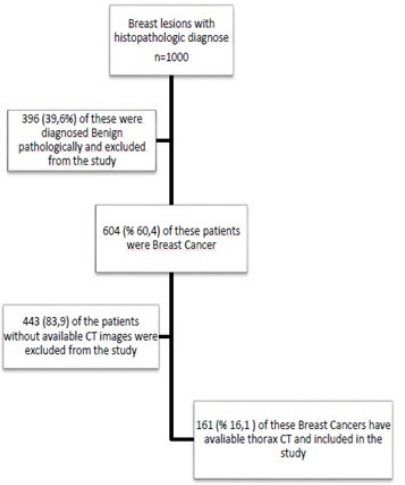

Figure 6 . Flow diagram of the participants

CT breast cancer analysis

Reviewers retrospectively evaluated both MG and CT images without any knowledge about the locations of the lesions and the final differential diagnosis of the pathologic subtypes of these malignant lesions.

The degree of being able to distinguish the lesions on the CT by radiologist was called as lesion visiability. Lesion visiability was classified into four groups; no visibility, low visibility, moderate visibility, high visibility. Our gold standard for the investigating the tomographic features of breast masses on CT and comparing the ability of CT and mammography for detecting breast cancer, was pathologic data.Both reviewers were blinded to each other's findings and decisions. We compared the results of both researchers statistically.

Statistical analysis

Continuous variables are expressed as the mean ± standard deviation and categorical variables are expressed as percentages.

Normal distributitions were verified using the Kolmogorov-Smirnov test. Imaging features of breast cancer on CT and MG were analyzed by Chi-Square test, and the correlation between variables was analyzed by the Pearson correlation coefficients. P< 0.05 was considered to be statistically significant.

Interobserver agreement between the radiologists was evaluated with Cohen kappa statistics. A kappa value of 0.20 or less was regarded as poor agreement; 0.21-0.40, fair; 0.41-0.60, moderate; 0,61-0,80, good; and greater than 0.80, excellent. The Wilcoxon sign test was used to assess variability among mass measurements with different imaging modalities.

P values less than 0.05 were considered statistically significant. Statistical analysis was conducted using SPSS 22.0 statistical software.

Results

Image analyses results

The flow charts of participants are shown in (Fig 6). The mean age was 52.14 years (range, 29–91 years).

Breast density of patients according to the BI-RADS classification system and pathologic results of lesions are summarised in Table 1.

Table 1. Types of breast density according to BI-RADS and pathologic results of the lesions

BreastDensity	
Type 1. Entirely Fatty	29 (18)
Type 2. Scattered areas of fibroglandular density	80 (49,7)
Type 3. Heterogenously dense	42 (26,1)
Type 4. Extremely Dense	10 (6,2)
Pathology	**Number (n%)**
İnvasive ductal cancer	113 (70,2)
İnvasive lobular cancer	24 (14,9)
İnvasive carsinoma	4 (2,5)
İnvasive mucinous cancer	6 (3,7)
Ductal carsinoma in situ	6 (3,7)
Mix cancer	4 (2,5)
İntraductal papiller cancer	4 (2,5)

BI-RADS, breast imaging reporting and data system

According to our study results, the most prevalent type of breast type was type 2. Invasive ductal cancer (IDC) constitutes the largest proportions of all lesions (113, 70%) whereas all the other types account for 30%.

The lesion sizes ranged from 7 to 110 (25.82) mm in the tomography and from 6 to 92 (24.97) mm in the MG. Imaging features of breast masses on MG and CT were shown in Table 2.

Table 2. Lesions imaging findings and visibility according to imaging modality

LesionFindings	**CT**	**MG**
Measurement	7-110 (25,82) mm	6-92 (24,97) mm
Findings		
Assymetry		5 (3,1)
Mass-Density	138 (85,7)	113 (70,2)
Calsification		11 (6,8)
Mass-Density+Calsification	9 (5,6)	29 (18)
Distortion		3 (1,9)
Non-mass effect Enchancement	8 (5)	
No findings	6 (3,7)	
lesion visiability		
No	6 (3,7)	
Low (%25)	22 (13,7)	12 (7,5)
Moderate (%25-50)	24 (14,9)	35 (21,7)
Hıgh (%50-100)	109 (67,7)	114 (70,8)
All lesions	161 (100)	161 (100)

CT; Computer tomography, MG: Mammography

Asymmetry, calcification and distortion were not determined on CT without the appearance of a mass forming. On CT, 138 (85.7%) of the lesions evaluated as mass-density, 9 (5.6%) of the lesions evaluated as mass and calcification, 8 (5%) of the lesions evaluated as non-mass enhancement and 6 (3.7 %) of the lesions had no findings.

Findings of the lesions on MG were 113 (70.2%) mass-density, 11 (6.8%) calcification, 29 (18%) mass and calcification and 3 (1.9%) were distortion.

Morphological findings were also evaluated by CT and MG (Table 3). Most of the mass shapes and margins were irregular on CT and MG. There was no statistical difference between MG and CT in Pearson correlation test ($p < 0.001$).

Table 3. Lesions morphology according to imaging modality

Morphological Findings	**CT**	**MG**
Shape		
Oval	15 (10,2)	10 (7)
Round	10 (6,8)	8 (5,7)
Irregular	122 (83)	124 (87,3)
Margin		
Sharp	3 (2)	3 (2,1)
Irregular	99 (67,3)	89 (65,7)
Spiculated	45 (30,6)	50 (35,2)
Internal Enchancement		
Homogenous	69 (46,9)	28 (19,7)
Heterogeneous	45 (30,6)	25 (17,6)
Rim enchancement	33 (22,4)	9 (6,3)
Calsifications	10 (6,8)	45(81,9)
Multifocality	43 (29,3)	142 (100)
Multicentricity	15 (10,2)	
Pathologic LAP	17 (30,1)	
All lesions	147 (100)	

CT, Computer tomography; LAP, lymphadenopathy "MG: Mammography

For masses, enhancement patterns on CT, homogeneous, heterogeneous and rim were 69 (46. 9), 45 (30.6) and 33 (22.4), respectively. On tomography, non mass enchancement patterns were mostly focal altered segmental patern 4 (50), regional 3 (37.5%) and focal 1 (12.5%) contrast pattern.

Moreover, compared with MG, masses appeared more multifocal and multicentered on CT (table 3). Pathology was accepted as the gold standard in comparison with both examinations. Of the 161 lesions, 133 had a surgical pathology result, because some of the lesions diagnosed with sonography guided tru-cut biyopsy. Of the 133 patients, 38 lesions had additional focuses on surgical pathology. MG could detect 18 of these 38 additional focus. However, false positively,

four lesions were diagnosed as additional focus on the mammogram. Tomography was able to detect 32 lesions of these 38 additional focuses. But false positively ten lesions were diagnosed as additional focus on the tomography. Of the 133 patients, 55 were diagnosed surgically as pathological LAP. MG diagnosed 17 (30,1) of them. No false positives were detected. Tomography diagnosed 45 (81, 9) of them. But, false positively four LAPs were evaluated as malignant.

CT reports of patients who underwent thorax CT for breast cancer staging were retrospectively reviewed by our researchers. Of these, 75 lesions were noted in the radiologic reports and 30 of them were found to be suspicious in terms of malignancy.

Lesion visiability rates were shown in Table 2. Nearly 70% of the lesion was clearly identified on both CT and MG. Six lesions were not detected on CT. Four of them had malignancies characterised as calcification on MG that could not be distinguished on tomography, and two of them was the dense breast type pattern. According to Wilcoxon test to assess variability among mass measurements with CT and MG, the p-value of examiner 1 was calculated 0.092, and the p-value of examiner 2 was 0.705. No statistically differences was detected between mass measurements among both techniques. Cohen kappa statistics in interobserver variability were excellent compatible; for visibility, shape and margin, internal enchancement, calsification, pathologic LAP and single focus in CT and MG (95%CI) 0.82- 0.99. Good agreement was found internal enchancement in CT (95%CI) 0.67 - 0.75 (Table 4).

Table 4 . Inter observer variability among all radiologist

95% Confidence Interval		
Parameters	**CT**	**MG**
Findings	0,95 (0,89-0,99)**	0,95 (0,89-0,99)**
Shape	0,87 (0,82-0,88)*	0,90 (0,89-0,99)**
Margin	0,85 (0,82-0,88)*	0,83 (0,82-0,88)*
Internal Enchancement	0,72 (0,67-0,75)	
Calsifications	0,99 (0,89-0,99)**	1 (0,89-0,99)**
Single Focus	0,96 (0,89-0,99)**	0,97 (0,89-0,99)**
Pathologic LAP	0,93 (0,89-0,99)**	0,95 (0,89-0,99)**
LesionVisibility	0,82 (0,82-0,88)*	0,82 (0,82-0,88)*

CT, Computer tomography ; LAP, lymphadenopathy

DISCUSSION

In our current literature review, only a few researchers identified the CT features of incidental breast lesions (7, 8, 11, 14, 15). Very limitted researchers investigate breast lesion's imaging features with CT and have attempted to compare other imaging modalities (3, 16, 17).

A few investigators have reviewed tomographic imaging features and pathology results of breast lesions incidentally detected on tomography (7, 8).

Swensen and colleagues found breast cancer in three (4%) of 735 female patients who underwent treatment for lung cancer (2). Shojaku et al. identified four (0.4%) cases of incidental and metastatic breast cancer of 1008 patients by non-contrast thorax CT [1]. Lin and et al. included only incidental enhancing breast lesions in their study, which amounted to 16 (0.7%) patients of 2250 who underwent routine contrast-enhanced chest CT (11). Consequently, none of these studies is sufficient to quantify the adequacy of breast cancer diagnosis of CT because their study designs include only incidental breast lesions with low rates of malignant lesions.

Furthermore, our study includes the largest group number (161 malignant lesions) of known breast cancer cases that studied on this topic in the literature. Lin et al. have shown that primary breast cancer has a higher association with irregularity. Also in our study, the irregular border was the most common breast cancer finding. According to our study in 128 of the 140 patients, there was consistency of irregularity between MG and CT (91%). No statistically significant difference was found between the two imaging modalities.

Furthermore, in addition to indistinct margins, breast cancer features were also reported as rim enhancement and axillary lymphadenopathy on thorax CT (6, 9, 18). The results of our study were also compatible with the literature except for the rim enhancement pattern. According to our study results, malignant masses could show high proportion of homogenous enhancement pattern other than heterogenous and rim enhancement patterns. This result may be due to our study design that included not only incidentally detected lesions but also well-known pathologically confirmed breast cancers. We also showed that the enhancement

pattern has no significance in the differential diagnosis of the subtypes of breast cancer.

In addition to the current literature, we have shown that breast cancer can also be recognised by CT using focal, segmental and regional non mass effect enhancement patterns.

There was a decrease in breast mass detection on tomography with an increase in breast density.

Six lesions those detected by only MG were may be the result of insufficient diagnostic value of CT to show microcalcifications, structural distortion and focal asymmetry secondary to low spatial resolution of CT .

Four breast cancer cases that were difficult to detect on MG but could be visualised well and moderately on CT. The reason for this was the use of contrast material in tomography and the higher contrast resolution of tomography.

According to our results, the rate of detection of pathological LAP on CT is superior to MG, probably because the evaluation area included the axillary region, supraclavicular region and the deep pectoral muscle region completely and high contrast resolution of CT.

CT was superior on detecting additional focuses. This result can be explained by the high contrast resolution of the tomography.

Our results showed that tomography provide lower accuracy than mammograms in detection of microcalcifications. The most probable cause of this difference is that the spatial resolution properties of a CT are lower than those of mamogram.

According to our study, only we recognized that 75 of the 155 patients those which we could detect on retrospective evalution of CT images were noted in the Picture Archiving and Communication System DATA torax CT reports.

Even though CT scans were performed for breast cancer staging, breast cancer was omitted in 86 cases, as the examiner was not focused on the breast.

Our study had several limitations. First, the researchers were aware of the patient's lesion, second, we did not evaluate the venous contrast enhancement pattern of the lesions because the thorax tomography was conducted in only one phase (arterial phase) and non-contrast CTs were excluded from the study, this could be a selection bias as all patients with cancer have not been enrolled in the study, and finally, the granular appearance due to the signal/noise ratio in overweight patients reduced the sensitivity of the examiner.

With the increased use of thorax CT, CT may be the first imaging modality to be applied to a patient with breast cancer for different reasons such as pulmonary embolism, infections, trauma or for staging of any kind of cancer. Some types of breast cancer can be better visualised by CT than MG and for some patients, such as those with ulcerated and inflamed breast lesions, CT is much easier to both perform and evaluate.

Additionally, in the detection of breast cancers that are located close to the chest wall, located in the axillary region or hidden in dense breast types, CT also provides better visualisation than MG.

According to our study results, no statistically significant difference was found for the diagnosis of breast cancer between CT and MG ($p < 0.001$).

However, even thorax CTs performed for breast cancer staging; many lesions were omitted because the CT was not focused on the breast.

The main CT criteria for the diagnosis of breast cancer include irregular border, high-density masses and dense tissue spicules radiating to adjacent breast tissue.

Today, due to the increase in the use of tomography, knowledge of CT imaging properties of breast masses is of vital importance in the early diagnosis of breast cancer.

For all of these reasons, it is essential to be able to both understand and interpret the imaging findings of breast cancer correctly in tomography.

REFERENCES

1. Orel SG, Troupin RH. Nonmammographic imaging of the breast: Current issues and future prospects. In:Seminars in roentgenology: Elsevier, 1993; 231-241.

2. Swensen SJ, Jett JR, Hartman TE, Midthun DE, Sloan JA, Sykes A-M et al. Lung cancer screening with ct: Mayo clinic experience 1. Radiology 2003;226:756-761

3. Kim SM, Park JM. Computed tomography of the breast: Abnormal findings with mammographic and sonographic correlation. Journal of computer assisted tomography 2003;27:761-770

4. Shojaku H, Seto H, Iwai H, Kitazawa S, Fukushima W, Saito K. Detection of incidental breast tumors by noncontrast spiral computed tomography of the chest. Radiation medicine 2008;26:362-367

5. Yi JG, Kim SJ, Marom EM, Park JH, Jung SI, Lee MW. Chest ct of incidental breast lesions. Journal of thoracic imaging 2008;23:148-155

6. Harish MG, Konda SD, MacMahon H, Newstead GM. Breast lesions incidentally detected with ct: What the general radiologist needs to know 1. Radiographics 2007;27:S37-S51
7. Hussain A, Gordon-Dixon A, Almusawy H, Sinha P, Desai A. The incidence and outcome of incidental breast lesions detected by computed tomography. The Annals of The Royal College of Surgeons of England 2010;92:124-126
8. Moyle P, Sonoda L, Britton P, Sinnatamby R. Incidental breast lesions detected on ct: What is their significance? The British journal of radiology 2014
9. Porter G, Steel J, Paisley K, Watkins R, Holgate C. Incidental breast masses detected by computed tomography: Are any imaging features predictive of malignancy? Clinical radiology 2009;64:529-533
10. Meller MT, Cox JE, Callanan KW. Incidental detection of breast lesions with computed tomography. Clinical breast cancer 2007;7:634-637
11. Lin W-C, Hsu H-H, Li C-S, Yu J-C, Hsu G-C, Yu C-P et al. Incidentally detected enhancing breast lesions on chest computed tomography. Korean journal of radiology 2011;12:44-51
12. Monzawa S, Washio T, Yasuoka R, Mitsuo M, Kadotani Y, Hanioka K. Incidental detection of clinically unexpected breast lesions by computed tomography. Acta Radiologica 2013;54:374-379
13. Liberman L, Menell JH. Breast imaging reporting and data system (bi-rads). Radiologic Clinics of North America 2002;40:409-430
14. Poyraz N, Emlik GD, Keskin S, Kalkan H. Incidental breast lesions detected on computed thorax tomography. The Journal of Breast Health 2015;11:163
15. Son JH, Jung HK, Song JW, Baek HJ, Doo KW, Kim W et al. Incidentally detected breast lesions on chest ct with us correlation: A pictorial essay. Diagnostic and Interventional Radiology 2016;22:514
16. Inoue M, Sano T, Watai R, Ashikaga R, Ueda K, Watatani M et al. Dynamic multidetector ct of breast tumors: Diagnostic features and comparison with conventional techniques. American Journal of Roentgenology 2003;181:679-686
17. Krug KB, Houbois C, Grinstein O, Borggrefe J, Puesken M, Hanstein B et al. Focal breast lesions in clinical ct examinations of the chest: A retrospective analysis. In:RöFo-Fortschritte auf dem Gebiet der Röntgenstrahlen und der bildgebenden Verfahren: © Georg Thieme Verlag KG, 2010; 142-148.
18. Moyle P, Sonoda L, Britton P, Sinnatamby R. Incidental breast lesions detected on ct: What is their significance? The British journal of radiology 2010;83:233-240