Incidental Breast Lesions Detected on Computed Thorax Tomography

Necdet Poyraz, Ganime Dilek Emlik, Suat Keskin, Havva Kalkan

Department of Radiology, Necmettin Erbakan University Meram Faculty of Medicine, Konya, Turkey

ABSTRACT

Objective: Although mammography is the primary imaging method of the breast, incidental benign and malignant breast lesions are increasingly being detected on computed tomographies (CTs) performed to detect different pathologies. Therefore, the detection and accurate identification of these lesions is important. In this study, we aimed to evaluate the frequency, morphological features, and results of incidental breast lesions on CTs performed for the detection of extramammary pathologies.

Materials and Methods: Incidental breast lesions on CTs performed in our department between 2011 and 2013 were evaluated. Patients who had previously diagnosed breast lesions were excluded from the study. The inclusion criteria were histopathologic diagnose and being followed-up for at least 2 years.

Results: The study population consisted of 33 women whose mean age was 55 ± 1.38 (37–78) years. Of the 33 women, 12 (36%) had malignant and 21 (64%) had benign or normal findings. The most common malignant lesion was invasive ductal carcinoma, and the most common benign lesion was fibroadenoma. Ill-defined contour and lymphadenopathy in malignant lesions and well-defined contour in benign lesions were the most important CT findings.

Conclusion: Breast must be carefully evaluated if it is included in the scans. An accurate report of breast lesions gives an opportunity for early diagnosis and treatment.

Keywords: Computed tomography, thorax, breast, incidental findings

Introduction

Currently, mammography, ultrasound and magnetic resonance imaging (MRI) are the basic radiologic methods to diagnose breast diseases. However, the widespread use of multislice computed tomography (CT) in the last decade increased the rate of incidentally detected breast lesions in return, although, it is not a primary breast imaging method. Especially new generation multi-slice CTs with high spatial resolution reveal structures and pathologies that could not be previously viewed in detail. With the widespread use of multislice CT scans and higher resolution, the rate of detecting incidental findings unrelated to the main disease is increasing. These incidental findings sometimes lead to unnecessary further investigations and follow-up that result in higher cost and anxiety (1). Another problem related to this issue is radiologists' being specialized according to the field of pathology. That is why, they may fail to identify pathologies outside this area. For example, when a radiologist specialized in chest CT evaluates the breast tissue within the cross-sectional area, she/he can misinterpret or overlook some abnormalities (2).

It has previously been shown that CT may detect incidental breast lesions during pulmonary and cardiac imaging. There are studies describing the characteristics of breast lesions incidentally detected on CT. However, these studies are limited in number (3-8).

The aim of this study was to assess the frequency, CT features and results of breast lesions that were referred to our clinic after being detected by CT scans obtained to investigate other pathologies.

Materials and Methods

Chest CT scans obtained for various indications at Necmettin Erbakan University Meram Medical Faculty Hospital between August 2011 and November 2013, and contained the keyword "breast" within the final report were extracted. Patient information and radiologic imag-

es were obtained through the local hospital information management system (Hastane Bilgi Yönetim Sistemi-HBYS) and PACS (Enlil) software. Breast related pathologies were reviewed within 1872 chest CT reports. Patients who received a diagnosis of breast lesion with previous mammography, ultrasound and MRI were excluded from the study. Patients who had breast surgery at least 5 years ago, with no known recurrences were enrolled. Lesions with typical benign characteristics (reactive lymph nodes, coarse calcifications, etc.) were not taken into account. Files of the remaining patients who applied to the breast clinics for further evaluation of the breast lesions that were incidentally detected on CT were reviewed. Imaging methods (mammography, ultrasound, MRI), biopsy, surgery, pathology and follow-up results of these patients were evaluated. Patients with a histopathologic diagnosis and with a follow-up in our breast unit for at least two-years were included.

Two radiologists, together, who were blinded to the pathology and follow-up results, evaluated the breast lesions (masses, asymmetries or calcification) in the initial CTs. The morphology of lesions and structure of breast parenchyma were recorded. The breast parenchyma structure was classified according to the classification defined by the American College of Radiology (ACR) for mammography, based on the amount of stromal and glandular structure. Accordingly, breast structure was classified as mostly fatty type a, scattered fibroglandular (FGD) type b, heterogeneously dense type C and extremely dense type d (9).

Axillary lymph nodes within the study area were evaluated, and were considered abnormal if the ratio of long-short axis was <2 or had irregular cortical thickening.

Siemens Somatom Sensation 64-section CT (Erlangen, Germany) was used for multidetector CT examination of the thorax. The parameters used in this study: 3 mm slice thickness, 3 mm distance, 120 kV and 135 mAs, 0.5 s gantry rotation (tube/detector return) time. All images were obtained with patient lying in supine position, after initial scanning of the area from the apex to the diaphragm, with breath-hold after deep inspiration, either with or without contrast material according to clinical indication.

Statistical analysis

SPSS for Windows 21 (SPSS Inc, Chicago, Illinois, USA) software package was used for statistical analysis. Descriptive values were presented as numbers and percentages for categorical data, and as arithmetic mean $\pm$ standard deviation for qualitative data. The features of malignant and benign lesions were compared with "Student t test" and "Fisher's exact test". Significance was set as 0.05.

Ethical board review was obtained from the institutional review board to publish the findings outlined in this study. Written informed consent was not obtained from patients, since this was a retrospective study.

Results

1872 CT examinations were examined that included the keyword "breast" in the final report. In these reports, incidental breast lesions were identified in 59 patients without a previously known breast disease. Eighteen patients with no clinical information and follow-up result in the HBYS system, and eight patients with coarse calcifications and reactive lymph nodes were excluded from the study. The study group consisted of 33 women with a mean age of 55 ± 13.8 years (range 37-78 years). Malignant findings were observed in 12 of 33 women (36%), and 21 (64%) had benign or normal findings (Table 1, 2).

Table 1. Malignant lesions

Diagnosis	Number (n=12)
Invasive ductal carcinoma	7
Invasive lobular carcinoma	1
Mucinous carcinoma	2
Metastasis	2

Table 2. Benign lesions

Diagnosis	Number (n=21)
Normal breast tissue	5
Fibroadenoma	9
Cyst	4
Fat necrosis	2
Papilloma	1

Table 3. Malignant and benign breast lesion features

	Malignant	Benign	p-value*
Lesion number	12 (%36)	21 (%64)	0.16
Mean patient age (year)	55.1	55.4	0.46
Mean lesion diameter (mm)	21.2	17.3	0.06
Well-defined borders	2/12 (%17)	17/21 (%81)	0.001
Ill-defined borders	10/12 (%83)	4/21 (%19)	
Calcification	0/12 (%0)	4/21 (%19)	0.14
Axillary Lymphadenopathy	4/12 (%33)	0/21 (%0)	0.01
Mammography density			
ACR a-b	7/12	12/21	0.16
ACR c-d	5/12	9/21	

ACR: American College of Radiology

*p<0.05 statistically significant

The most common pathology within 12 malignant patients were invasive ductal carcinoma (IDC) (9 patients, 58%) (Table 3). Histopathologic diagnosis was made by ultrasound guided tru-cut biopsy in 12 patients. Two patients had bone metastases on CT at the time of diagnosis (Figure 1). In four patients, malignant appearing lymphadenopathies were detected on the same side (Figure 2). Eight of the 12 patients were treated with surgery and four received chemoradiotherapy.

The most common pathology in 21 patients with benign disease was fibroadenoma (9 patients, 43%) (Table 3). The asymmetric density increase seen on 5 CTs was evaluated as normal breast tissue with ultrasound and mammography (Figure 3, 4). When these five normal breast tissues were excluded, the sizes of benign lesions ranged between 9-34 mm (mean 17 mm). Four patients with BIRADS 3 and 4 lesions underwent biopsy (Figure 5). Biopsy results showed two fibroadenoma, one fibrocystic change and one papilloma. The papilloma was

surgically excised due to malignant potential. On five patient's follow-up, chest CT scans obtained for unrelated reasons were evaluated and lesions were seen to be stable over a 2-year period. In the remaining seven patients, the lesions remained stable for at least 2 years on mammography and/or ultrasound.

The most important indicators for malignancy on CT were the presence of lesions with ill-defined borders and lymphadenopathy. The sizes of malignant lesions were between 9-31 mm (mean, 21 mm). There were no statistically significant differences in calcification, lesion size and mammographic density between malignant and benign groups. Well-defined lesions on CT usually corresponded to benign lesions, while only two patients with malignancy had regular borders (Table 3).

Discussion and Conclusions

The detection rate of incidental lesions on imaging, other than pathologies intended for is increasing with the widespread use of imaging modalities. Similarly, incidental breast lesions are frequently encountered in CT scans that are obtained for other reasons. The interpretation, reporting and management of these lesions add important responsibilities. Swensen et al. (1) reported three breast cancer patients out of 735 women with low-dose chest CT obtained for lung cancer screening (0.4%). Shojaku et al. (4) reported 4 patients with incidental breast cancer or metastatic breast cancer within 1008 (0.4%) non-contrast chest CT scans. Monzawa et al. (8) identified 10 breast cancer patients out of 2945 patients (0.34%). In our series, 12 histologically verified malignant breast pathology were diagnosed out of 1872 multi-slice chest CT examinations. Ten of them had primary breast cancer, and two had metastatic breast cancer with the primer being the lungs. In our study group, primary breast cancer detection rate of 0.53% was consistent with the results reported in the literature.

Diagnostic criteria are needed to distinguish benign and malignant breast lesions on chest CT. In the literature, although some authors reported irregular spiculated/stellate contour structure, rim-style enhancement and axillary lymphadenopathy as the most specific features for diagnosis of breast cancer on CT (5, 10), findings that does not meet these criteria and resemble benign breast tumors have also been reported (11, 12). Invasive ductal carcinoma presents with dense, spiculated lesions with early-phase contrast enhancement, while lobular carcinoma presents with asymmetric increased density that is occasionally accompanied by skin thickening or irregular bordered lesions. Additional assessment was required for nonspecific breast lesions (13).

83% of malignant pathologies in our study had irregular borders. Irregular spiculated contour features were detected significantly more in lesions that were detected on a fatty background. Only two patients with malignancy (a mucinous carcinoma and a metastasis) had lesions with regular borders on CT. However, the metastatic breast lesion from the lung displayed sparse irregular microlobulation on mammography. Therefore, as highlighted in previous studies, it is suggested that incidentally detected well-defined breast lesions should also be directed to further evaluation (10).

There were four irregular contour structures detected in benign lesions on CT. Two cases with focal asymmetric density increase were detected to belong to fibroglandular tissue on subsequent control ultrasound examination. One patient had fat necrosis, and the other had a cluster of cysts within fibrocystic background. In general, the most prominent feature in malignant lesions is ill defined and spiculated contours, while the most prominent feature in benign lesions were well-defined borders.

Figure 1. a, b. Spiculated contoured left breast mass and lytic lesions compatible with vertebral metastases in the chest CT of a 64-year-old woman (a), the same patient's mammography image (b). Biopsy showing invasive ductal carcinoma

Figure 2. a, b. Chest CT showing ill-defined bordered mass compatible with malignancy in the right breast and accompanying axillary lymphadenopathy (a), ultrasound examination with irregular bordered hypoechoic solitary mass (b). Tru-cut biopsy diagnosis is invasive ductal carcinoma

Figure 3. a-c. CT, mammography and ultrasound images of regular bordered, oval, solid lesion in the right upper outer quadrant of the left breast (a-c). Histopathology result is fibroadenoma

On unenhanced CT, breast parenchyma and breast cancer usually have the same density. Therefore, it may be difficult to distinguish them. When borders can be clearly identified on CT, breast lesions can be distinguished from normal parenchyma. However, especially when they coincide with breast tissue, identification of a mass or non-mass lesion is more challenging. Ultrasound is usually sufficient in the detection of mass lesions formed by clusters of focal fibroglandular islands. In addition, solid cystic lesions cannot be distinguished on CT by density measurements, in which case ultrasound is a problem solver. On CT, fat content of the lesion and coarse calcifications can be easily seen, but there were no density and homogeneity differences

Figure 4. Chest CT revealing focal asymmetric density increase in the upper outer quadrant of the left breast. The lesion arouses suspicion of malignancy with irregular contour and soft tissue density. Control ultrasound examination revealed normal glandular tissue

Figure 5. a-c. A spiculated contoured irregular mass draws attention in the breast CT and mammography of a 37-year-old patient (a, c). (b) Ultrasound examination of the lesion revealed clusters of many large and small cysts. Biopsy showed fibrocystic changes

between benign and malignant lesions (5). In the study of Surov et al. (11) it was reported that there is a density difference between benign and malignant lesions. However, we think that this difference is due to denser enhancement of malignant lesions 60-90 seconds after contrast injection on delayed CT images.

In our study, coarse calcifications were seen in four cases while none of the patients had malignant microcalcifications. Similarly, in situ cancer was not detected in our series. This situation suggests that together with our low number of patients, spatial resolution of CT is insufficient in demonstrating the features of microcalcifications detected in mammography.

One of the possible concerns on reporting incidental breast lesions is if this situation will lead to an increase in biopsy rates in return. In our study group, the ratio of benign biopsies over malignant biopsies was 4:12 or 0.33:1. This rate is consistent with the rates reported in the literature (5).

The most important limitations of our study are the low number of patients and its low power due to retrospective analysis. In addition, since most of our contrast enhanced CT scans were obtained in the early arterial phase where pulmonary artery and the aorta shows enhancement, and we did not obtain pre-contrast images, we could not evaluate the lesion's contrast enhancement pattern. Lack of examination of the lesion's contrast enhancement due to this technical detail

is another limitation of this study. Multicenter prospective studies are required to reveal the prevalence of incidental lesions and to detect diagnostic criteria for malignant breast lesions.

The breast must be evaluated carefully on chest CT examinations, and it should be noted that occasionally severe breast abnormalities can be detected. Radiologists should be familiar with the CT images of benign and malignant breast lesions. Identifying the CT features of breast lesions, and reporting these lesions appropriately will facilitate the diagnosis and treatment of such patients.

Ethics Committee Approval: Ethics committee approval was received for this study.

Informed Consent: Written informed consent was not obtained due to retrospective nature of the study.

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