



Screening Mammography Findings in Women With Chronic Kidney Disease on a Renal Transplant Waiting List

Nuray Voyvoda,¹ Bekir Voyvoda,² Tülay Özer¹

Abstract

Kidney transplant candidates are placed on a waiting list. Because of their concomitant disease, their systematic assessment is important. Screening mammography must be a part of the examination.

Background: The incidence of breast cancer has been reported to be increased in people with chronic kidney disease (CKD). Thus, breast cancer screening is stated to be mandatory. However, it is as yet unclear what age group or what type of breast structure indicate a need for mammography. This study aimed to evaluate the effects of age and breast parenchymal density on mammography findings. The rate of detection of calcification from mammographies increased in dialysis patients with CKD. The associations of calcifications with comorbid pathologies were also evaluated.

Patients and Methods: Patients were divided into the two age groups of 40 to 49.9 years and ≥ 50 years. The patients were asked about smoking habits, hypertension, diabetes mellitus, the pathology that caused CKD, state of hemodialysis, and, if relevant, the type and duration of dialysis. **Results:** The mean age of the 55 patients included in this study was 54.8 years, and 78.2% ($n = 43$) were ≥ 50 years old. The rate of malignancy across the entire group was 3.6%. No association was found between breast arterial calcification and cigarette smoking, hypertension, diabetes mellitus, state of dialysis, duration of dialysis, and breast parenchymal density in any age group. **Conclusion:** A pretransplantation evaluation of CKD patients may include a breast screening program for patients aged 40 to 49.9 and for the patients aged ≥ 50 . Breast parenchymal density was demonstrated to have no effect on the findings, and no association was found between calcifications and comorbid pathologies.

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Introduction

Breast cancer is a common cause of morbidity and mortality in women, and mammograms are commonly performed to detect early-stage cancer and plan treatment.¹ Annual screening mammographies are recommended by the American Cancer Society (ACS) from the age of 40 years onward, while the United States Preventative Services Task Force recommends biannual checks starting at the age of 50.²⁻⁴ Yearly mammographies have been carried out on patients aged 40 years and older who are on the active

waiting list in the context of pre-kidney transplantation evaluation in most transplant centers, in line with ACS recommendation.⁵

Although the incidence of breast cancer has been reported to be similar in those with chronic kidney disease (CKD) and the general population, there have also been reports that demonstrate increased breast cancer incidence in CKD.^{6,7} This increase has been associated with increased breast parenchymal density in reports recording an increased rate of breast cancer.⁷ Even if the incidence of breast cancer is accepted to be similar in both the CKD and the general population, mortalities associated with breast cancer have been reported to be higher in CKD patients than in the general population, and this has been demonstrated to be correlated with decreased glomerular filtration.⁸ In this regard, breast screening has been reported to be necessary, not just a recommendation. We should note that it is yet unclear which age group or which type of breast structure indicates a need for mammography. The first aim of this study was to evaluate the effects of age and breast parenchymal density on mammogram findings.

¹Department of Radiology

²Kidney Transplantation Center, Department of Urology, Health Sciences University, Kocaeli Derince Training and Research Hospital, Kocaeli, Turkey

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Address for correspondence: Nuray Voyvoda, MD, Department of Radiology, Health Sciences University, Kocaeli Derince Training and Research Hospital, İbni Sina M. Sopalı Mevki Lojman, S. Derince, 41000 Kocaeli, TR, Turkey
Fax: +90 2623178000; e-mail contact: nuraykad@gmail.com

Screening Mammography Findings

The detection rate of calcifications during mammographies has been shown in some reports to be increased in women with CKD and in those undergoing dialysis.⁹ Thus, it is important to differentiate between benign and malignant calcifications to prevent unnecessary interventions. The second aim of this study was to evaluate the associations of benign and malignant calcifications and comorbid pathologies.

Patients and Methods

Approval of the local ethics committee was obtained for this study, which was conducted in accordance with the principles of the Declaration of Helsinki.

Patient Selection

In this retrospective study, patients who sought care at our hospital as renal transplant recipient candidates between September 2016 and February 2018 were included. Male patients and female patients who did not undergo mammography were excluded from this study.

Among the 125 patients on the waiting list of the organ transplant center, 64 were female; 9 were evaluated only with breast ultrasound (US) because they were younger than 40 years old, and they were excluded from this study.

Age, body weight, and height of all included patients were recorded. Patients were then divided into the 2 age groups: 40 to 49.9 years and ≥ 50 years. The patients' body mass index (BMI) was calculated. Patients were asked about cigarette smoking habits, hypertension (HT), diabetes mellitus (DM), pathology causing CKD, and, if relevant, state, type, and duration of dialysis. Serum calcium (Ca) and parathormone (Pth) levels were recorded.

Mammography Examination

All mammography examinations were performed using the same device (Giotto Tomo; IMS Internazionale Medico Scientifica, Bologna, Italy). Mammographies were classified in line with the American College of Radiology (ACR) Breast Imaging Report and Data Systems (BI-RADS) 5th edition, which defines breast parenchymal density as type A (almost entirely fat), B (scattered fibroglandular tissue), C (heterogeneous fibroglandular tissue), and D (extreme fibroglandular tissue).¹⁰ Types A and B are referred to as fatty breast patterns, and types C and D as dense breast parenchyma.

The mammography examinations began with bilateral craniocaudal images. Mediolateral oblique images were obtained subsequently from patients in whom a fatty breast pattern (types A and B) was detected through craniocaudal images. Mediolateral oblique images and tomosynthesis (combo mode) in mediolateral oblique position were performed in patients found to have a dense breast pattern (types C and D). US of the breasts was performed for the patients who were identified as having a fatty breast pattern and detection of any pathology in mammography; US was also performed for all patients with a dense breast pattern on the same day as the mammography. All the data were recorded on the hospital's picture-archiving and communication system.

All mammography images were evaluated retrospectively by the same radiologist, who had 12 years' experience on breast imaging, using a medical monitor (RadioForce GS220, Monochrome LCD

Table 1 Patient Characteristics and Descriptive Statistics

Characteristic	Value
Age (Years)	
Min-max (median)	42-73 (54)
Mean \pm SD	54.82 \pm 7.41
BMI (kg/m²)	
Min-max (median)	20-44 (29)
Mean \pm SD	29.51 \pm 5.50
Serum Ca	
Min-max (median)	7-11 (8)
Mean \pm SD	8.56 \pm 0.86
Serum Pth	
Min-max (median)	38-1900 (389)
Mean \pm SD	594.98 \pm 497.63
Smoker	11 (20.0)
HT	38 (69.1)
DM	27 (49.1)
Dialysis	
None	6 (10.9)
HD	39 (70.9)
PD	9 (16.4)
HD + PD	1 (1.8)
Dialysis Time (Months) (N = 49)	
Min-max (median)	1-240 (60)
Mean \pm SD	69.41 \pm 60.71
Reason for CKD	
HT	16 (29.1)
DM	10 (18.2)
HT + DM	14 (25.5)
Idiopathic	6 (10.9)
Membranous GN	1 (1.8)
Nephrotic syndrome	1 (1.8)
Nephrolithiasis	2 (3.6)
Polycystic kidney disease	4 (7.3)
Hydronephrosis	1 (1.8)
Breast Density	
A + B	25 (45.5)
A	7 (12.7)
B	18 (32.7)
C + D	30 (54.5)
C	23 (41.8)
D	7 (12.7)

Data are presented as n (%) unless otherwise indicated.

Abbreviations: BMI = body mass index; Ca = calcium; CKD = chronic kidney disease; DM = diabetes mellitus; GN = glomerulonephritis; HD = hemodialysis; HT = hypertension; PD = peritoneal dialysis; Pth = parathormone; SD = standard deviation.

Monitor; Eizo, Ishikawa, Japan). Calcifications detected in the mammographies were defined according to ACR BI-RADS as benign or suspicious.¹⁰

Breast arterial calcifications (BACs) and skin calcifications in the benign calcifications group were classified as significant, intermediate, and mild. Obvious BAC and skin calcifications observed in the

Table 2 Assessment of Findings Between Ages

Characteristic	Age 40-49.9 Years (N = 12)	Age ≥ 50 Years (N = 43)	P
BMI (kg/m²)			
Min-max (median)	22-43 (26)	20-44 (29)	.408 ^a
Mean ± SD	28.33 ± 6.27	29.84 ± 5.3	
Dialysis Time (Months) (N = 49)			
Min-max (median)	1-156 (36)	1-240 (60)	.279 ^b
Mean ± SD	49.90 ± 49.35	74.41 ± 62.87	
Serum Calcium			
Min-max (median)	8-11 (9)	7-10 (8)	.319 ^b
Mean ± SD	8.83 ± 0.94	8.49 ± 0.83	
Serum Pth			
Min-max (median)	99-1638 (490)	38-1900 (326)	.684 ^b
Mean ± SD	583.17 ± 441.96	598.28 ± 516.89	
Smoker	2 (16.7)	9 (20.9)	1.000 ^c
HT	8 (66.7)	30 (69.8)	1.000 ^c
DM	5 (41.7)	22 (51.2)	.561 ^c
Dialysis			
None	2 (16.7)	4 (9.3)	.853 ^d
HD	8 (66.6)	31 (72.1)	
PD	2 (16.7)	7 (16.3)	
HD + PD	0	1 (2.3)	
Breast Density			
A + B	3 (25.0)	22 (51.2)	.108 ^e
C + D	9 (75.0)	21 (48.8)	
BAC	1 (8.3)	7 (16.3)	.670 ^c
Skin C	4 (33.3)	15 (34.9)	1.000 ^c
Benign Linear C	0	2 (4.7)	1.000 ^c
Suspicious C	0	2 (4.7)	1.000 ^c
Other MG findings	3 (25.0)	12 (27.9)	1.000 ^c
US findings	5 (55.6)	16 (59.3)	1.000 ^c
BI-RADS 4 + 5	0	2 (4.7)	1.000 ^c

Data are presented as n (%) unless otherwise indicated.

Abbreviations: BI-RADS = Breast Imaging Reporting and Data System; BMI = body mass index; C = calcification; Ca = calcium; DM = diabetes mellitus; HD = hemodialysis; HT = hypertension; PD = peritoneal dialysis; Pth = parathormone; SD = standard deviation; US = ultrasound.

Statistical tests were as follows: ^aStudent *t* test, ^bMann-Whitney *U* test, ^cFisher exact test, ^dFisher-Freeman-Halton test, and ^ePearson chi-square test.

evaluation without magnification were defined as significant; calcifications observed without magnification but that were not obvious were defined as intermediate; and calcifications that could be detected only with magnification were defined as mild. BAC was further classified as follows, according to the grading system devised by Mostafavi et al¹¹ for the grading of extensiveness and severity: 1, no vascular calcifications; 2, few punctate vascular calcifications, no areas of tram track or ring calcification; 3, coarse vascular calcifications of definitive tram track or ring appearance in fewer than 3 vessels; and 4, severe coarse vascular calcifications that affect 3 or more vessels. The number of vessels with observations of BAC was recorded.

Findings other than calcification on mammography (eg, mass, asymmetrical density, and lymph nodes) were defined. Findings from the US in patients who underwent US as well as final BI-RADS and biopsy results were recorded, if any.

Statistical Analysis

Statistical analyses were performed by Number Cruncher Statistical System 2007 software (NCSS, Kaysville, Kaysville, UT), and mean, standard deviation, median, frequency, and ratio were used for descriptive statistical methods. The Student *t* test and Mann-Whitney *U* test were used to compare variables between groups with normal distribution and nonnormal distribution, respectively. Qualitative data were compared by Pearson chi-square test, Fisher exact test, and Fisher-Freeman-Halton test. The results were evaluated using 95% confidence intervals; the level of statistical significance was set at $P < .05$.

Results

The mean age of the remaining 55 patients included in this study was 54.8 years, and the ratio of patients ≥ 50 years was found to be 78.2%

Screening Mammography Findings

Table 3 Distribution of Calcifications

Characteristic	N (%)
BAC According to Our Classification	
None	34 (61.8)
Mild	12 (21.8)
Medium	5 (9.1)
Prominent	4 (7.3)
BAC According to Mostafavi et al¹¹	
Grade 1	34 (61.8)
Grade 2	13 (23.6)
Grade 3	5 (9.1)
Grade 4	3 (5.5)
BAC	
Positive	8 (14.5)
Negative	47 (85.5)
BAC Vessel Number	
None	34 (61.8)
1	4 (7.3)
2	6 (10.9)
3	7 (12.7)
4	1 (1.8)
6	2 (3.6)
7	1 (1.8)
Skin C	19 (34.5)
Mass C	—
Benign linear C	2 (3.6)
Suspicious C	2 (3.6)

Abbreviations: BAC = breast arterial calcification; C = calcification.

(n = 43). The mean BMI, serum Ca level and serum Pth level were 29.5 ± 5.5, 8.5 ± 0.8 mg/dL and 594 ± 497.6 pg/mL, respectively. Among the patients, 20% (n = 11) were cigarette smokers, 69.1% (n = 38) were hypertensive and 49.1% (n = 27) had DM (Table 1).

Patients who did not undergo dialysis accounted for 10.9% (n = 6) of the total; 70.9% (n = 39) received hemodialysis, and 16.4% (n = 9) received peritoneal dialysis. One patient had begun peritoneal dialysis but was then followed up with hemodialysis (1.8%). The duration of dialysis ranged between 1 and 240 months (mean ± standard deviation, 69.41 ± 60 months). The most frequent cause of CKD was HT (29.1%), followed by an association of HT and DM (25.5%) (Table 1).

When the distribution according to BI-RADS breast parenchymal density breast types were evaluated, 7 patients (12.7%) were found to have type A, 18 patients (32.7%) type B, 23 patients (41.8%) type C, and 7 patients (12.7%) type D (Table 1) breasts.

Patients aged 40 to 49.9 years and ≥ 50 years were similar regarding BMI, cigarette smoking, HT, DM, serum Ca and Pth levels, and type and duration of dialysis. Breast parenchymal density, BAC, skin calcification, suspicious calcification, and malignancy rate were compared in the 2 groups, and no statistically significant difference was found between them (P > .05) (Table 2).

Table 4 Demographic and Clinical Characteristics of Patients With and Without BAC

Characteristic	With BAC (N = 8)	Without BAC (N = 47)	P
Age (Years)			
Min-max (median)	43-65 (57)	42-73 (54)	.534 ^a
Mean ± SD	56.13 ± 7.42	54.60 ± 7.47	
BMI (kg/m²)			
Min-max (median)	21-36 (27)	20-44 (29)	.404 ^a
Mean ± SD	27.75 ± 5.09	29.81 ± 5.56	
Dialysis Time (Months) (N = 49)			
Min-max (median)	12-120 (72)	1-240 (48)	.740 ^a
Mean ± SD	66.75 ± 42.23	69.93 ± 64.10	
Serum Ca			
Min-max (median)	8-10 (9)	7-11 (8)	.215 ^a
Mean ± SD	8.87 ± 0.64	8.51 ± 0.88	
Serum Pth			
Min-max (median)	72-1333 (393.5)	38-1900 (389)	.474 ^a
Mean ± SD	486.88 ± 435.54	613.38 ± 509.36	
Smoker	1 (12.5)	10 (21.3)	1.000 ^b
HT	6 (75.0)	32 (68.1)	1.000 ^b
DM	6 (75.0)	21 (44.7)	.143 ^b
Dialysis			
None	0	6 (12.8)	.634 ^c
HD	6 (75.0)	33 (70.2)	
PD	2 (25.0)	7 (14.9)	
HD + PD	0	1 (2.1)	
Breast Density			
A + B	1 (12.5)	24 (51.1)	.059 ^b
C + D	7 (87.5)	23 (48.9)	
Skin C	5 (62.5)	14 (29.8)	.109 ^b
Benign linear C	0	2 (4.3)	1.000 ^b
Suspicious C	0	2 (4.3)	1.000 ^b
Mammography findings	2 (25.0)	13 (27.7)	1.000 ^b
US findings	4 (57.1)	17 (58.6)	1.000 ^b
BI-RADS 4	0	2 (4.3)	1.000 ^b

Data are presented as n (%) unless otherwise indicated.

Abbreviations: BAC = breast arterial calcification; BI-RADS = Breast Imaging Reporting and Data System; BMI = body mass index; C = calcification; Ca = calcium; DM = diabetes mellitus; HD = hemodialysis; HT = hypertension; PD = peritoneal dialysis; Pth = parathormone; SD = standard deviation; US = ultrasound.

Statistical tests were as follows: ^aMann-Whitney U test, ^bFisher exact test, and ^cFisher-Freeman-Halton test.

According to our classification, 21.8% of the patients had mild, 9.1% had intermediate, and 7.3% had significant BAC. The percentage of the patients with no calcification was 61.8%. When evaluated according to Mostafavi classification, 61.8%, 23.6%, 9.1%, and 5.5% of BACs were grade 1, 2, 3, and 4 calcifications, respectively, and according to this classification, 14.6% (n = 8) of the patients had calcifications (Table 3).

No associations were found among BAC and cigarette smoking, presence of HT, presence of DM, status or duration of dialysis, and breast parenchymal density in all age groups (Table 4).

Table 5 Evaluation of Patients According to Skin Calcification

Characteristic	Skin Calcification (N = 19)	No Skin Calcification (N = 36)	P
Age (Years)			
Min-max (median)	43-65 (53)	42-73 (57)	.747 ^a
Mean ± SD	54.37 ± 6.5	55.06 ± 7.93	
BMI (kg/m²)			
Min-max (median)	26-44 (32)	20-40 (28.5)	.016 ^{a,*}
Mean ± SD	31.95 ± 5.56	28.22 ± 5.09	
Dialysis Time (Months) (N = 49)			
Min-max (median)	3-216 (720)	1-240 (48)	.632 ^b
Mean ± SD	72.33 ± 56.10	67.71 ± 64.07	
Serum Ca			
Min-max (median)	8-11 (9)	7-10 (8)	.010 ^{b,*}
Mean ± SD	9 ± 0.88	8.33 ± 0.76	
Serum Pth			
Min-max (median)	38-1900 (326)	72-1900 (404)	.818 ^b
Mean ± SD	619.05 ± 559.49	582.28 ± 469.68	
Smoker	3 (15.8)	8 (22.2)	.730 ^c
HT	11 (57.9)	27 (75.0)	.229 ^c
DM	13 (68.4)	14 (38.9)	.037 ^{d,*}
Dialysis			
None	1 (5.3)	5 (13.9)	.528 ^e
HD	14 (73.7)	25 (69.4)	
PD	3 (15.8)	6 (16.7)	
HD + PD	1 (5.3)	0	
Breast Density			
A + B	10 (52.6)	15 (41.7)	.437 ^d
C + D	9 (47.4)	21 (58.3)	
Benign linear C	1 (5.3)	1 (2.8)	1.000 ^c
Suspicious C	0	2 (5.6)	.539 ^c
Mammography findings	6 (31.6)	9 (25.0)	.752 ^c
US findings	7 (63.6)	14 (56.0)	.729 ^c
BI-RADS 4	0	2 (5.6)	.539 ^c

Data are presented as n (%) unless otherwise indicated. Abbreviations: BI-RADS = Breast Imaging Reporting and Data System; BMI = body mass index; C = calcification; Ca = calcium; DM = diabetes mellitus; HD = hemodialysis; HT = hypertension; PD = peritoneal dialysis; Pth = parathormone; SD = standard deviation; US = ultrasound. Statistical tests were as follows: ^aStudent *t* test, ^bMann-Whitney *U* test, ^cFisher exact test, ^dPearson chi-square test, and ^eFisher-Freeman-Halton test. **P* < .05.

Skin calcifications, benign linear calcifications, and suspicious calcifications were seen in 34.5% (n = 19), 3.6% (n = 2), and 3.6% (n = 2) of patients, respectively (Table 3).

Increased BMI and serum Ca levels as well as the presence of DM were found to be associated with an increase in skin calcification (*P* = .016, .010, and .037, respectively). No statistically significant associations were found among age, cigarette smoking, presence of HT, duration of dialysis, Pth levels, or skin calcification (*P* > .05) (Table 5).

Findings other than calcifications from mammography, US findings, and BI-RADS values are presented in Table 6. There were 2 patients (3.6%) with final BI-RADS 4. One of the two patients

Table 6 Mammogram, US Findings, and Final BI-RADS Category

Modality	Variable	N (%)	
Mammogram findings except calcification	Accessory breast	2 (3.6)	
	Asymmetric density	3 (5.5)	
	Benign intramammary lymph node	2 (3.6)	
	Mass	7 (12.6)	
	Cortical thickening lymph node	1 (1.8)	
US findings	Normal	40 (72.7)	
	Calcification + hypoechoic area	1 (1.8)	
	Cyst	7 (12.7)	
	Complex cyst	1 (1.8)	
	Cortical thickening lymph node	1 (1.8)	
	Ductal dilatation	6 (10.9)	
	Solid mass	4 (7.3)	
	Solid mass + edema	1 (1.8)	
	BI-RADS	1 + 2 + 3 (benign)	53 (96.4)
		1	3 (5.5)
2		43 (78.2)	
3		7 (12.7)	
	4 (suspicious)	2 (3.6)	

Abbreviations: BI-RADS = Breast Imaging Reporting and Data System; US = ultrasound.

was diagnosed with high-grade ductal carcinoma-in-situ and the other with invasive ductal carcinoma (Figure 1).

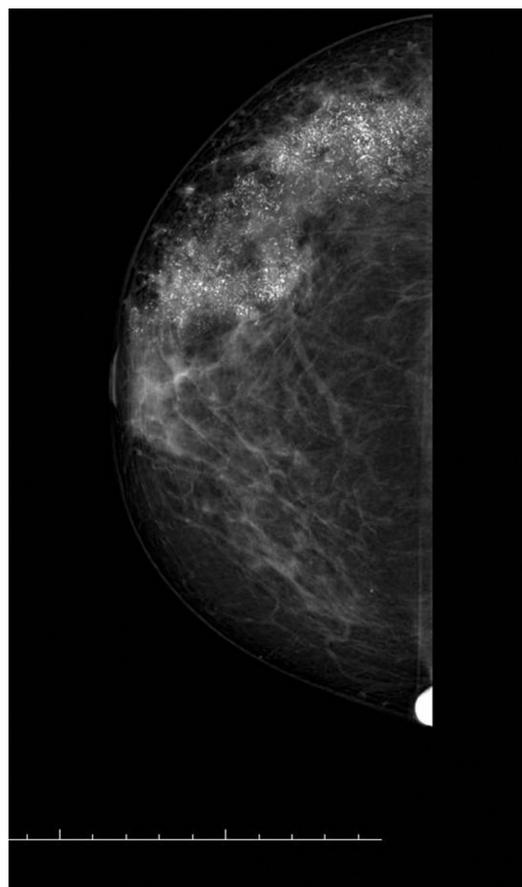
Discussion

Kidney transplant candidates are placed on a waiting list. Because of their concomitant disease, their systematic assessment is important. Screening mammography must be a part of the examination.

Mammographic screening is a method of diagnosis with high sensitivity and specificity in breast cancer, and incidences of breast cancer (the ratio of ductal carcinoma-in-situ) have been demonstrated to be increased in the CKD population.¹² The rate of malignancy was found to be 3.6% in pretransplantation CKD patients in the present study, which is higher than the rate found in the normal population (0.4%).^{6,13-15} Studies that demonstrate no increase in the incidence of breast cancer showed that mortality from breast cancer was higher in the CKD patient group. Stoecker et al⁷ found that the breast malignancy rate was higher in patients with CKD compared to the normal population, as was the case in our study. However, in contrast to our study, they reported an association between increased breast cancer and breast density, and an increase in the cancer rate in dense breasts. Stoecker et al, similar to our study, found no association among age, BMI, race, history of cigarette smoking, history of renal disease and dialysis, and detection of breast cancer. Rates of breast biopsy and rates of detection of breast cancer were similar in patients aged 40 to 49.9 and those ≥ 50 years, as was the case in our study.

Screening Mammography Findings

Figure 1 Mammogram Showing Pleomorphic Calcifications in Patient With Invasive Ductal Carcinoma



The rates of benign and malignant calcifications detected in the breast were found to be increased in CKD patients receiving dialysis.^{9,16} BAC is a form of medial arterial calcification (MAC), which is different from the neointimal calcification seen in atherosclerosis, and which can be seen without the presence of atherosclerosis.^{17,18} Atherosclerosis provides a basis for ischemic heart disease, while MAC affects vascular compliance and establishes a ground for pathologies, such as congestive heart failure. The association between MAC and ischemic heart disease is unclear. BAC affects small- to intermediate-size vessels in the breast and can be easily detected by mammography.¹⁹ Thus, BAC has been used as a marker of MAC in previous studies.^{16,20} The detection rate of BAC in mammographies is reported to be between 1% and 49% in various studies, although this rate was found to be 14.5% in the present study.²¹

The association between BAC and coronary artery calcification has been demonstrated in previous studies.¹¹ Topal et al²² reported an increase in BAC with age and found that an increased BAC rate in patients with severe coronary artery disease may also be associated with age. Similarly, Yildız et al²³ identified associations among age, HT, metabolic syndrome, and BAC, while Hendriks et al,²⁴ in a meta-analysis evaluating the association between BAC and

cardiovascular events, detected a positive correlation between BAC and age, as well as a negative correlation between BAC and a history of cigarette smoking. The authors concluded that BAC was associated only with some known cardiovascular risk factors.

No association between BAC and age was identified in the present study, although previous studies have demonstrated a powerful positive correlation in this regard.²⁰⁻²² Similar to the findings of Ronzani et al,²⁵ Zafar et al,²⁶ and Akinola et al,²⁷ no correlation was found between BMI and BAC, and like in the findings of Iribarren and Molloy,²¹ no correlation was found between cigarette smoking and BAC in the present study.

There is a lack of consensus in the literature on the existence of an association between BAC and DM, with Taşkin et al²⁸ and Kemmeren et al²⁹ reporting an association while Hassan and Topal²² found no such association—which is consistent with the findings in the present study.²⁰

Reports have identified calcification in tissues such as the cornea, conjunctiva, para-articular soft tissue, and skin, as well as in subcutaneous tissue and organs (eg, lung and heart). It has been demonstrated that an impaired calcium phosphate metabolism contributes to the production of this metastatic calcification. Sivakumar et al³⁰ detected a 60% rate of calcification in hemodialysis patients in their study, while in the present study, no association was found between skin calcifications or BAC and the type or duration of dialysis. The only positive correlation was found between skin calcification and Ca level.

The main limitation of this study was the small number of cases: because the organ transplant center is newly established in this hospital, the number of patients on the waiting list is small. This study needs to be verified using a larger sample size. In addition, the required follow-up of at least 2 years in patients in the BI-RADS 3 group has not yet been completed. However, malignancy was detected in 2 of our patients at the time of this writing.

Conclusion

In conclusion, it may be logical to establish a uniform breast screening program as part of the pretransplantation evaluation of CKD patients, as recommended by the ACR, because similar oncologic findings were observed in patients in the 40 to 49.9 age range and those aged ≥ 50 . Breast density in the CKD group did not increase cancer or calcification rates. Benign vascular calcifications detected in mammography may not reveal comorbid pathologies. However, our results should be supported with further studies with larger sample sizes.

Clinical Practice Points

- It is important that patients on the transplant waiting list be screened because of their concomitant disease. Screening mammography must be a part of their examination.
- The rate of malignancy is higher in pretransplantation CKD patients than in the normal population. Patient screening should begin at age 40.

Disclosure

The authors have stated that they have no conflict of interest.

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