

Correlation between mammographic appearance of breast cancer and histopathological results

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SUMMARY

Now a day, Breast Cancer (BC) is the most common cancer over the world. GLOBOCAN reported more than 2.2 million new cases of BC in 2020. Radiological appearance including ultrasonography and mammography may provide prognostic and predictive useful data when correlate with the histopathological appearances which have significance potential values that could be influence the management of BC. The aimed to correlate radiologic appearance of ultrasonography and mammography of breast cancer to the histopathologic features. A retrospective study reviewed 103 Iraqi females which histologically confirmed and diagnosed with BC. This study conducted in period between January 2019 and January 2020. The demographic data, histopathologic features, and details of the primary tumor were recorded. The following variables were studied: age, staging, histopathology, grading, DCIS, ER, PR, HER2neu, extensive intraductal component, resection margin status, differentiation, lymphovascular invasion, and location of mass. All breast ultrasound and mammographic examinations were performed. Then the radiological presentations were correlated with histopathologic appearances. The mean age of patients was 51.53 ± 10.974 years and left side BC was mostly recorded. The mass in ultrasound tumor detected in 92.3%, with irregular shape, spiculated or indistinct margins. In relation to mammographic findings, the mass detected in 92(89.3%) with irregular figure, and spiculated or indistinct margins. The distortion architecture is found in 44.7%, and microcalcification presented in 40.8% of mammography. The most common histopathology was IDC, Grade II and moderately differentiation. DCIS was figured in 48(46.6%) of specimens. Lymph nodes were positive in 51.5%. ER and PR were positive in 78.6%, and HER2neu was negative in 63.1%. Free resectable surgical margins were recorded in 89(86.4%) of reports. The LV invasion documented in 39.8%. The ultrasound mass is mainly detect in middle age group of irregular shape and indistinct margin. While mammographic mass detect in younger age group with irregular shape and without specific margin. Women with right side tumor were more likely to have IDC, grade II, with moderately differentiation, and more expressed negative HER2neu ($p=0.043$). Also, right side BC was more likely to have DCIS and LN positive ($p=0.041$, $p=0.015$) than left side. Mass in mammography is more likely to be IDC ($p<0.0001$) that have CIS feature ($p=0.003$), with LN positive ($p=0.035$) and LV invasion ($p=0.047$). The irregular shape of IDC was more exhibit ($p=0.009$). The distortion sign is more evident in IDC, atypical lobular appearance, associated LCIS, and positive surgical margin. IDC and CIS of mammography were more likely to showed microcalcification ($p<0.0001$). To our knowledge, this is the first time study conduct in Iraq discusses the association between radiological features including breast ultrasonography and mammography with corresponding histopathologic appearances. The irregular mass, spiculated or indistinct margins are the most common radiologic presentations. Irregular and indistinct margin of masses are mostly presented in middle age groups. The right side tumor is more likely to detected with irregular shape mass, IDC, grade II, with moderately differentiation, and more expressed negative HER2neu than left side. Mass correlate to have CIS feature, with LN positive and LV invasion is malignant.

Key words: breast cancer, mammography, histopathologic features, lobular, mass micro calcification

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INTRODUCTION

Breast Cancer (BC) is the most prevalent cancer in women, represented about 24.5% of new cases of female cancers worldwide. GLOBOCAN reported 2,261,419 new cases of BC (Rank 1#) with 684,996 deaths from BC (Rank 4#) in 2020 [1]. It is the leading cancer among women in both Europe and US and becoming an emerging oncologic disease in developing countries. Every year about 5,00,000 female die from BC, representing it the second leading cause of cancer-related mortality after lung cancer [2]. In Iraq, there were 3,845 cases estimated at 2011, this number elevated to 4,542 in 2014 according to WHO report, whereas only the new cases of BC in 2020 were 7515 [3,4]. BC therapy requires a multidisciplinary team compose of surgeons, oncologists, radiotherapists, histopathologists, radiologists, plastic surgeons, and supportive care nursing. BC have a heterogeneous collection with various histopathologically subsets, clinical features, responses to treatment, and fades. The clinical and histological factors that have prognostic value are the presence and extent of LN metastasis, age, tumor grade and histology, tumor size, HR, and Her2neu status [5]. Screening mammography obviously increased BC number detected masses that non-palpable and non-invasive. These lead to small in the size and low stage of BC at diagnosis, end with improved the survival. Radiographically, BC may detect as masses, calcifications, or mixed or architectural distortion [6]. Older age, the biology of the cancers, the surrounding tissues differences, and BC clinical behaviour cause more readily apparent of radiologic findings, particularly for masses and architectural distortions and the radiographic findings of a non-palpable BC should predict the clinical course. Radiologist who performs screening mammography must be familiar with the wide BC findings range in the preclinical stage, because the tumor has intra-tumor heterogeneity with wide variations [7]. A correlation between age and histopathologic features of both palpable and non-palpable masses well noticed, whereas the differences in the mammographic appearance also studied [6-9]. Mammography plays an important role in screening and detection of lesions in relation to pathological diagnoses.

Generally, the findings of mammogram have a good association with subsequent histopathological findings. In term of radiology for example, micro-calcification is the hallmark of ductal carcinoma *in situ*, whereas speculation (or stellate) only is related to low histopathologic grade; and ill-defined masses plus micro-calcifications are characters of high-grade malignancies

in more than 90% [9-11]. While a mass with a circumscribed shape indicate a benign lesion [12].

Mammography has become the gold standard for diagnosis breast disorders, and interesting attention to high-quality intervention is needed for successful of a mammographic detection that resulted from establishment an accurate diagnostic system for mammography.

Here, we try to study any correlation between radiological ultrasound and mammographic appearance with pathological features of breast cancers in Iraqi female patients at different ages, stages, grades, histopathology, hormonal status, and lymphatic spreading to determine whether radiological findings could have a potential effect on management and prognosis.

MATERIALS AND METHODS

Study design and setting

A retrospective study reviewed 103 Iraqi females which histologically confirmed and diagnosed with breast cancer, whom were consecutively treated at our hospital. The study conducted in period between January 2019 to January 2020. The demographic data, the histopathologic features, and details of the primary tumor were documented. The accurate of the data was further validated using the medical record and/or surgical histopathology reports.

Data collection

Data were collected retrospectively with review of histopathology records. The following variables were studied: Age, staging, histopathology, grading, DCIS, ER, PR, HER2neu, extensive intraductal component, resection margin status (Margins involved if invasive or non-invasive DC or ILC was present. Close margins are 1 mm of the inked margin. Margins are clear when the distance between the tumor and the inked margin at least 1mm), differentiation, lymphovascular invasion, location of mass, and other.

Mammography and breast ultrasonography

All breast US and mammographic examinations were performed. These were including: shape irregularity, margin features, breast density, distortion and disfiguring, and micro-calcifications presentation. Then the histopathologic findings were correlated with radiological presentation.

ETHICAL CONSIDERATIONS

The College of Medicine Board Ethics Committee approved this study. Informed consents were obtained from all patients.

STATISTICAL ANALYSIS

All data analyses were conducted by using SPSS version 25.0 for Windows (SPSS Inc., Chicago, Illinois, USA). A two-sided P value of 0.05 or less was considered statistically significant for logistic regression. Descriptive statistics consist of numbers and percentages were measured. Liner regression analysis was performed to assess the relation between ultrasound and mammography with histopathological appearances. Multinomial logistic regression was carried out to show the correlation between patient age and BC side with other radiological and histopathological findings.

RESULTS

The mean age was 51.53 years ± 10.974 years and most of women belonged to age groups (36 years-45 years) and (46 years-55 years) in 24.1% and 39.2%, respectively. Left side BC was mostly recorded in 59.6% whereas right side presented in 39.4%, (Table 1).

Regarding ultrasound examination, the findings (Table 2). The mass of tumor detected in 93.2% of females. Irregular shape of mass was found in 77(80.2%) of patients which was the prevalent. Spiculated and indistinct margins was the most common seen in 43.8% and 38.6%, respectively. In addition, the 25-50 density was the common figured.

In relation to mammographic findings, the tumor mass detected in 96(93.2%) of women. Irregularity of mass figured in 80.2% of patients. Both spiculated and indistinct margins was the most common seen in 33.3% and 46.9%, respectively. The distortion of breast masses was found in 44.7%, while 55.3% of masses haven't. The microcalcification presented in 40.8% of mammography, besides, 59.2% were no such picture (Table 3).

The most common histopathology was IDC in 80(77.7%) of females, whereas ILC presented in 15.5%. Grade II and moderately differentiation was the common in 73.8% of patients. DCIS was figured in 48(46.6%) of specimens. Lymph nodes were positive in 51.5%. ER and PR were positive in 78.6%. HER2neu was negative in 63.1% and positive in 36.9%. Atypical lobular appearance documented in 6(5.8%) of masses only. Associated lobular CIS was figured in 13.6% of mammography only. Free resectable surgical margins were recorded in 89(86.4%) of histology reports. In addition, only 13.6% of reports showed positive surgical margin. The LV invasion was documented in 39.8%. The mass was centric in 5.8% and was focal located in 11.7% (Table 4).

In multinomial logistic regression analysis between age groups

Tab.1. Patients baseline characteristics of this study (n=103)

Characteristics		No (%)
Age (years)	<25	1 (1)
	25-35	6 (5.8)
	36-45	25 (24.1)
	46-55	37 (39.2)
	56-65	14 (13.4)
	>65	16 (15.4)
BC site	Right	41 (39.4)
	Left	62 (59.6)

Tab.2. Ultrasonography characteristics distribution of this study	Characteristics		No (%)
	Mass	Yes	
No			7 (6.8)
Total			103
Shape	Irregular		77 (80.2)
	Oval		5 (5.2)
	Round		14 (14.6)
	Total		96
Margin	Angular		1 (1)
	Ill-defined		1 (1)
	Indistinct		37 (38.6)
	Micro-lobulated		14 (14.6)
	Spiculated		42 (43.8)
	Well circumscribed		1 (1)
Density	Total		96
	<25		20 (19.4)
	25-50		60 (58.3)
	50-75		18 (17.5)
	75-100		5 (4.9)
	Total		103

Tab.3. Mammography characteristics distribution of this study	Characteristics		No (%)
	Mass (n=103)	Yes	
No			7 (6.8)
Total			103
Shape (n=96)	Irregular		77 (80.2)
	Oval		5 (5.2)
	Round		14 (14.6)
	Total		96
Margin (n=96)	Angular		1 (1)
	Ill-defined		2 (2.1)
	Indistinct		45 (46.9)
	Micro-lobulated		15 (15.6)
	Spiculated		32 (33.3)
	Well circumscribed		1 (1)
Distortion	Total		96
	Yes		46 (44.7)
	No		57 (55.3)
Micro-calcification	Total		103
	Yes		42 (40.8)
	No		61 (59.2)
	Total		103

and ultrasound was showed (Table 5). The group 36-45 years and 46-55 years were more likely to detected with ultrasound mass than other groups (p=0.04, 0.016). The age 46 to 55 years was more to have irregular masses in ultrasound of breast among other groups (p=0.04). Also, it was more likely to have indistinct marginal mass (p=0.028) with density of 25-50 (p=0.001). (Table 6) illustrated multinomial logistic regression analysis

between age groups and mammography. Both groups 36-45 years and 46-55 years have high affinity to showed mass in mammography. In addition, group 46-55 years was more likely to present with irregular mass.

Women aged from 46 to 55 years were more to have IDC, grade II, with moderately differentiation (p=0.04, p=0.01, p=0.05), and positive ER and PR (p=0.033, 0.01). Other age groups had

Tab.4. Histopathological characteristics of this study (n=103)	Characteristics		No (%)
		I	8 (7.8)
Grade	II	76 (73.8)	
	III	19 (18.4)	
	Total	103	
	Moderately	76 (73.8)	
Differentiation	Poorly	19 (18.4)	
	Well	8 (7.8)	
	Total	103	
	Yes	48 (46.6)	
DCIS	No	55 (53.4)	
	Total	103	
LN	Yes	53 (51.5)	
	No	50 (48.5)	
ER	Total	103	
	Positive	81 (78.6)	
	Negative	22 (21.4)	
PR	Total	103	
	Positive	81 (78.6)	
	Negative	22 (21.4)	
HER 2neu	Total	103	
	Positive	38 (36.9)	
	Negative	65 (63.1)	
Atypical lobular	Total	103	
	Yes	6 (5.8)	
	No	97 (94.2)	
As L CIS	Total	103	
	Yes	14 (13.6)	
	No	89 (86.4)	
Histopathology	IDC	80 (77.7)	
	ILC	16 (15.5)	
	Mixed	7 (6.8)	
	Total	103	
Resectable margin	Free	89 (86.4)	
	Positive	14 (13.6)	
	Total	103	
LV invasion	Yes	41 (39.8)	
	No	62 (60.2)	
	Total	103	
Mass centric	Yes	6 (5.8)	
	No	97 (94.2)	
	Total	103	
Mass focal	Yes	12 (11.7)	
	No	91 (88.3)	
	Total	103	

Tab.5. Age in relation to ultrasonography findings

Characteristics		Age (years)					
		25-35	36-45	46-55	56-65	>65	
		% (p value)					
	Mass	6.8 -0.055	19.4 (0.04)	35 (0.06)	16.5 (0.63)	14.6 (0.33)	
	Shape	Irregular	3.1 (0.3)	17.7 (0.06)	32.3 (0.04)	14.6 (1)	12.5 (0.52)
		Oval	NA	NA	3.1 (0.09)	NA	2.1 (0.97)
		Round	4.2 (0.08)	3.1 (0.97)	2.1 (0.06)	3.1 (0.99)	2.1 (0.07)
		Angular	1.93 (1)	1.16 (1)	1.4 (1)	1.8 (0.97)	0.94 (1)
		Ill-defined	1 (1)	2.1 (1)	5.2 (1)	3.1 (0.99)	3.1 (1)
		Indistinct	5.2 (0.47)	6.2 (0.059)	15.6 (0.028)	5.2 (0.97)	7.3 (1)
		Microlobulated	NA	NA	NA	1 (0.99)	NA
		Speculated	1 (0.48)	12.5 (0.59)	16.7 (0.052)	7.3 (0.28)	6.2 (0.51)
		Well circumscribed	NA	NA	NA	1 (0.1)	NA
Density		<25	NA	1 (1)	5.8 (0.51)	6.8 (0.6)	5.8 (0.55)
		25-50	1.9 (0.1)	11.7 (0.08)	27.2 (0.001)	8.7 (0.71)	8.7 (0.7)
		50-75	1.9 (0.1)	8.7 (0.1)	4.9 (0.6)	1 (0.99)	1 (0.98)
		75-100	2.9 (0.98)	1 (0.1)	1 (0.9)	NA	NA

Tab.6. Age in relation to mammography findings

Characteristics		Age (years)					
		25-35 %	36-45	46-55	56-65	>65	
		(p value)					
	Mass	5.9 (0.1)	18.6 (0.04)	33.3 (0.038)	16.7 (0.16)	15.7 (0.14)	
	Shape	Irregular	3 (0.5)	17 (0.055)	31 (0.049)	14 (0.08)	12 (0.08)
		Oval	NA	NA	3 (0.28)	NA	2 (0.2)
		Round	4 (0.6)	3 (0.29)	2 (0.2)	3 (0.28)	2 (0.27)
		Angular	NA	NA	NA	1 (1)	NA
		Ill-defined	NA	NA	NA	1 (0.9)	1 (0.9)
Margin		Indistinct	5.2 (0.66)	10.4 (0.08)	17.7 (0.06)	6.2 (0.57)	7.3 (0.09)
		Microlobulated	1 (0.98)	1 (0.97)	7.3 (0.093)	3.1 (0.8)	3.1 (0.7)
		Speculated	1 (0.1)	9.4 (0.056)	12.5 (0.052)	5.2 (0.66)	5.2 (0.67)
		Well circumscribed	NA	NA	NA	1 (1)	NA
Distortion		2.9 (0.53)	10.7 (0.51)	18.4 (0.52)	8.7 (0.38)	3.9 (0.195)	
Micro-calcification		3.9 (0.77)	10.7 (0.75)	13.6 (0.42)	6.8 (0.7)	5.8 (0.72)	

no regression on histopathological appearances of BC in this study (Table 7). (p=0.041, p=0.015) than left side (Table 10).

In multinomial logistic regression analysis between BC side and ultrasound was showed (Table 8). The right side more likely to detected with irregular mass than other groups (p=0.02). Further regression analysis figured no significant.

Table 9 showed multinomial logistic regression analysis between BC side and mammography findings. Right side cancer was more likely to presented with irregular mass (p=0.01, p=0.02). In addition, no regression observed among other features.

Women with right side tumor were more likely to have IDC, grade II, with moderately differentiation (p=0.02, p=0.05, p=0.02), and more expressed negative HER2neu (p=0.043). Also, right side BC was more likely to DCIS and LN positive

Furthermore, the liner regression analysis between ultrasound signs and histopathological appearances showed that the irregular mass was most like to be IDC with moderate differentiation (p<0.0001, p=0.016) (Table 11).

Finally, the liner regression between mammography signs and histopathological appearances showed Table 12. Mass detected was most likely to be IDC (p<0.0001) have CIS feature (p=0.003), with LN positive (p=0.035) and LV invasion (p=0.047). The irregular mass shape of IDC was more exhibited (p=0.009). The distortion of architecture was more evident in IDC (p=0.003), atypical lobular appearance (p=0.05), associated LCIS (p<0.0001), and positive margin of surgery (p=0.03). IDC and CIS of mammography were more likely to showed microcalcification (p<0.0001, p<0.0001).

Characteristics		Age (years)				
		25-35	36-45	46-55	56-65	>65
		% (p value)				
Histopathology	IDC	5.8 (0.49)	15.5 (0.38)	29.1 (0.04)	13.6 (0.28)	13.6 (0.45)
	ILC	1 (0.9)	2.9 (0.7)	6.8 (0.55)	2.9 (0.72)	1.9 (0.99)
	Mixed	NA	3.9 (0.64)	2.9 (0.49)	NA	NA
Grade	I	NA	1.9 (0.1)	4.9 (0.6)	NA	1 (0.9)
	II	5.8 (0.6)	15.5 (0.059)	27.2 (0.01)	12.6 (0.52)	12.6 (0.5)
	III	1 (0.97)	4.9 (0.85)	6.8 (0.93)	3.9 (0.9)	1.9 (1)
Differentiation	Moderately	5.8 (0.49)	15.5 (0.23)	27.2 (0.05)	12.6 (0.07)	13.4 (0.08)
	Poorly	1 (0.9)	4.8 (0.82)	6.9 (0.93)	4 (0.91)	2 (0.1)
	Well	NA	1.9 (0.2)	4.9 (0.88)	NA	1 (0.98)
DCIS		3.9 (0.61)	12.6 (0.33)	15.5 (0.33)	8.7 (0.6)	5.8 (0.61)
LN		2.2 (0.9)	13.5 (0.57)	20.2 (0.09)	9 (0.9)	10.1 (0.9)
ER		6.9 (0.36)	19.8 (0.06)	29.7 (0.033)	12.9 (0.09)	9.9 (0.39)
PR		5.9 (0.32)	20.6 (0.09)	30.4 (0.01)	10.8 (0.09)	10.8 (0.14)
HER2neu		3.9 (0.73)	6.8 (0.58)	15.5 (0.29)	5.8 (0.73)	4.9 (0.75)
Atypical lobular		NA	NA	2.9 (0.99)	1.9 (0.1)	1 (0.98)
As L CIS		1 (0.89)	3.9 (0.53)	4.9 (0.29)	2.9 (0.8)	1 (0.9)
Positive respectable margin		1 (1)	1 (0.89)	6.8 (0.4)	1 (0.98)	3.9 (0.5)
LV invasion		3.9 (0.3)	9.7 (0.1)	10.7 (0.09)	7.8 (0.32)	7.8 (0.31)
Mass centric		1 (0.85)	NA	2.9 (0.3)	1.9 (0.4)	NA
Mass focal		1 (0.6)	1.9 (0.5)	2.9 (0.49)	3.9 (0.28)	1.9 (0.39)

Characteristics	Side	
	Right	Left
% (p value)		
Mass	56.3 (0.054)	37 (0.081)
Shape	Irregular	27.1 (0.083)
	Oval	4.2 (0.07)
	Round	7.3 (0.06)
	Angular	NA
Margin	Ill-defined	9.4 (0.11)
	Indistinct	13.5 (0.1)
	Microlobulated	1 (0.9)
	Speculated	14.6 (0.098)
Density	Well circumscribed	NA
	<25	11.7 (0.19)
	25-50	21.4 (0.07)
	50-75	4.9 (0.096)
	75-100	1.9 (0.18)

Characteristics	Side	
	Right	Left
% (p value)		
Mass	55.9 (0.01)	34.3 (0.33)
Shape	Irregular	26 (0.058)
	Oval	4 (0.13)
	Round	7 (0.99)
	Angular	NA
Margin	Ill-defined	1 (0.9)
	Indistinct	20.8 (0.075)
	Microlobulated	8.3 (0.095)
	Speculated	7.3 (0.09)
	Well circumscribed	1 (1)
Distortion	23.3 (0.13)	21.4 (0.19)
Micro-calcification	28.2 (0.052)	12.6 (0.06)

Tab.10. Breast cancer side in relation to histopathological findings

Characteristics		Side	
		Right	Left
		% (p value)	
Histopathology	IDC	49.5 (0.02)	28.2 (0.09)
	ILC	6.8 (0.36)	8.7 (0.39)
	Mixed	3.9 (0.4)	2.9 (0.5)
Grade	I	5.8 (0.55)	1.9 (0.9)
	II	44.7 (0.05)	29.1 (0.058)
	III	9.7 (0.33)	8.7 (0.5)
Differentiation	Moderately	44.8 (0.02)	29.2 (0.07)
	Poorly	9.7 (0.5)	8.7 (0.67)
	Well	5.7 (0.06)	2 (0.98)
	DCIS	32 (0.041)	14.6 (0.09)
	LN	36 (0.015)	19.1 (0.06)
	ER	12.9 (0.49)	7.9 (0.79)
	PR	13.7 (0.18)	7.8 (0.68)
	HER2neu	38.8 (0.043)	24.3 (0.08)
	Atypical lobular	2.9 (0.92)	2.9 (0.82)
	As L CIS	5.8 (0.25)	7.8 (0.5)
	Positive resectable margin	6.8 (0.58)	6.8 (0.4)
	LV invasion	23.3 (0.099)	16.5 (0.83)
	Mass centric	4.9 (0.5)	1 (0.2)
	Mass focal	7.8 (0.75)	3.9 (0.86)

Tab. 11. Ultrasonography findings in liner regression analysis of histopathological appearances

	Mass	Shape (irregular)	Margin	Density
	p value			
Histopathology (IDC)	<0.0001	0.11	0.816	0.211
Grade (II)	0.117	0.066	0.224	0.77
Differentiation (moderately)	0.116	0.016	0.103	0.888
DCIS	0.095	0.125	0.188	0.141
LN positive	0.153	0.149	0.663	0.123
ER positive	0.763	0.09	0.294	0.4
PR positive	0.521	0.108	0.094	0.341
HER2neu negative	0.429	0.213	0.116	0.449
Atypical lobular	0.469	0.462	0.992	0.211
As L CIS	0.247	0.414	0.833	0.77
Positive resectable margin	0.332	0.071	0.843	0.326
LV invasion	0.378	0.106	0.673	0.304
Mass centric	0.469	0.372	0.977	0.94
Mass focal	0.289	0.117	0.718	0.557

Tab. 12. Mammography findings in liner regression analysis of histopathological appearances

	Mass	Shape (irregular)	Margin	Distortion	Micro-calcification
	p value				
Histopathology (IDC)	<0.0001	0.009	0.705	0.003	<0.0001
Grade (II)	0.207	0.117	0.392	0.973	0.072
Differentiation (moderately)	0.118	0.036	0.222	0.583	0.115
DCIS	0.004	0.13	0.542	0.864	<0.0001
LN positive	0.035	0.261	0.363	0.171	0.647
ER positive	0.373	0.109	0.641	0.485	0.452
PR positive	0.347	0.127	0.254	0.139	0.609
HER2neu negative	0.852	0.345	0.259	0.991	0.536
Atypical lobular	0.4	0.602	0.232	0.05	0.22
As L CIS	0.722	0.478	0.676	<0.0001	0.32
Positive resectable margin	0.548	0.132	0.274	0.03	0.322
LV invasion	0.047	0.176	0.534	0.281	0.604
Mass centric	0.4	0.51	0.846	0.268	0.64
Mass focal	0.228	0.171	0.585	0.696	0.581

DISCUSSION

The mean age of BC was 51.53 years ± 10.974 years and most of women belonged to age groups (36-45) and (46-55) in 24.1% and 39.2%, respectively. Left side BC was mostly recorded in 59.6%. The most common histopathology was IDC in 80(77.7%) of females, whereas ILC presented in 15.5%. Grade II and moderately differentiation was the common in 73.8% of patients. DCIS was figured in 48(46.6%) of specimens. Lymph nodes were positive in 51.5%. ER and PR were positive in 78.6%. HER2neu was negative in 63.1% and positive in 36.9%. Atypical lobular appearance and associated lobular CIS documented in low extent. Free resectable surgical margins were recorded in 89 (86.4%) of histology reports. The LV invasion was documented in 39.8%. The mass was centric in 5.8% and was focal located in 11.7%. Our findings supporting by studies conducted in Iraq like Al-Naqqash, et al. Alrubai, et al. Al-Alwan, et al. Al-Rawaq, [13-17]. The age is an important feature for the occurrence and management of BC [18].

The mean age recorded in comparative study done between Iraqi and British women was more than fifteen years than that demonstrated by our findings, while the breast cancer among US females reported to be in sixth decades of their life, which higher than we reported. In most Arabian countries, breast cancer is more commonly diagnosed in women under the age of 50, which is consistence with our study, unlike the USA, where women aged 50 years and older are most commonly affected. While are differ from that results recorded in Goldhirsch et al, and Al-Khafaji [19,20]. These very important in BC, the tumor size is the strongest predictors of metastasis, disease-free, and overall survival, that correlate strongly with the presence and number of involved axillary LN [21]. The lymph nodes status is the most important prognostic factor and is directly

related to survival and the best predictor of systemic micro-metastases [21-29]. Patient age was mammographic findings predictive, besides, histopathology, and invasive mass size. The malignancies proportion presenting as masses is high with age, and those presenting as calcifications decreased, as a results the invasive malignancies increased with older age.

Here, the mass of tumor in ultrasound detected in 93.2% of females with irregular shape found in 77(80.2%). Spiculated and indistinct margins were the most common seen with the 25-50 density. In relation to mammographic findings, the mass detected in 96(93.2%) of women. Irregularity of mass figured in 80.2% of patients. Both spiculated and indistinct margins were the most common seen. The distortion of breast masses was found in 44.7% and microcalcification presented in 40.8%.

In the Mount Sinai Hospital database in USA, a study on 5430 patients documented mammographic mass in 41% of patients, 47% had calcifications, 8% had calcifications, and 4% had distortion. Pathologically speaking, 56% were IDC, 8% were ILC, and 36% DCIS. Well differentiated was 8%, moderate differentiated was 53%, and poor was 39%. About 32% masses were related with an extensive ID component. Lymphatic invasion detected in 21%, and 25% had axillary lymph node spreading. In 80% of the tumors were expressed positive for ER and 68% for PR. About 35% of samples had negative margins, and 37% were positive.

Sturesdotter, et al. documented that Ill-defined, and spiculated tumors were more likely to be ER positive than negative, furthermore, spiculated masses were more likely to be PR positive than PR negative. They found no statistical evidence for a correlation between mammographic features and HER2 status. However, ill-defined calcifications were more often HER2 positive than other.

Thurfjell, et al. found that the predominant findings were spiculated tumors and calcifications alone [7]. In these masses without calcifications, invasive BC accounted for 95%. Grade I and Grade II were the common histologic diagnosis. DCIS accounted 63.3% with calcifications. There were no ILC presenting as calcifications. ILC presented as spiculated tumors with or without calcifications were presented. Axillary LN positive was found in 11.9% of cases. They concluded that invasive BC had a 12 times greater chance to appear as a spiculated lesion without calcifications. Likewise, DCIS showed a 19 times greater chance to present as calcifications alone than it had of manifesting as the other features. In Japan, 606 BC were studied, there were significant differences between oval, irregular and round shape of the mass, between microlobulated and indistinct margin, and between presence and absence of architectural distortion and calcification.

Gajdos and his colleagues concluded that tumors presenting as calcifications on mammography are most prevalent DCIS and of high-grade features, and the invasive BC were often HER2neu positive, besides, lymphatic invasion. The excisional biopsy margins were most commonly positive with figuring distortions. The mammographic findings of nonpalpable tumors is correlated to histopathologic features with prognostic value, which varies with age of patients and effects clinical management, which absolutely differ from our results.

In multinomial logistic regression analysis between age groups and ultrasound found that breast mass was more likely to detected fifth decade of life with irregular shape and indistinct margin. Similar findings were observed in mammography. In this study women aged from 46 to 55 years were more to have IDC, grade II, with moderately differentiation ($p=0.04$, 0.01 , 0.05), and positive ER and PR ($p=0.033$, 0.01).

Tamaki, et al. found significant differences between irregular and lobular or round masses, between speculated and indistinct or micro-lobulated margins, between amorphous and pleomorphic calcification, and between the presence and absence of distortion [8]. Also, they documented significant differences between irregular and lobular or oval shape in high grade. Moreover, in low grade tumor, significant differences were found between indistinct and spiculated margin, between spiculated and micro-lobulated margins, between high and equivalent or low density, and between linear and amorphous calcification shape.

In the HER2neu group, significant differences were recorded between irregular and oval or round, and between spiculated and microlobulated margins. In the triple negative group, significant differences were documented between spiculated and indistinct margins, and between high and equivalent or low density. While here, women with right side tumor were more likely to have IDC, grade II, with moderately differentiation ($p=0.02$, $p=0.05$, $p=0.02$), and more expressed negative HER2neu ($p=0.043$), which are dislike with.

The right side BC more likely to detected with irregular mass than other groups ($p \leq 0.02$). Further regression study showed no significant correlation. Right side cancer was more likely to

presented with irregular mass ($p=0.01$, $p=0.02$). In addition, no regression observed among other features. Also, right side BC was more likely to DCIS and LN positive ($p=0.041$, $p=0.015$) than left side. The explanation behind that the number of patients was small, this cause it more difficult to make any reliable discussions.

Furthermore, the liner regression analysis between ultrasound signs and histopathological appearances showed that the irregular mass was most like to be IDC with moderate differentiation signs. Whereas mammography mass was most likely to be IDC with CIS feature, LN positive and LV invasion. The irregular mass shape of IDC was more exhibited, with evidence of distortion, and atypical lobular appearance, besides, positive surgical margin. In addition, CIS and microcalcification were abundant.

The finding of that spiculated cancer is more often ER and PR positive is in agreement with several previous literatures [30-32].

A previous study by Shin, et al. in which a different categorization of mammographic findings was utilized, recorded a relation between higher histopathological grade and spiculation with calcifications [33]. However, the correlation was stronger in non-spiculated tumors, both with and without calcifications.

Sturesdotter and his colleagues provided strong evidence correlations between mammographic signs and histopathological feature, including molecular subtypes. Particularly, these findings consistently indicate favorable features of spiculated tumors. And they recommended to defining the associations between the mammographic findings and the histopathological fade to aid in featuring BC already from the initial mammogram study.

Recently, several studies that mentioned by Gajdos, et al. recorded that calcifications diagnosed in younger age group are more prevalent a feature of DCIS young patients may be increasing [6]. Implications of calcifications were different for invasive and noninvasive tumour according to presence of tumor mass. When invasive mass present, the DCIS is high grade depending on the EORTC and is HER2neu positive with extensive IDC. The rate of positive margins and local recurrence were high. Moreover, the lymphatic invasion is more common, which should raise the clinician's suspicion that LN involvement may be found.

When distortion on mammography present, it is clear that the positive margins are evident with tumors or calcifications; due to distortion on mammography study is most prevalent due to benign diseases.

As a result Gajdos, et al. concluded that the radiographic findings of non-palpable BC reflect the biology of BC, and due to the nonpalpable masses in young females most commonly detect with calcifications, this must be review with suspicion of malignant behaviour [6].

In summary, we established that the radiologic signs of

ultrasonography and mammography were a predictor of histopathologic detection in BC in this study. Although certain radiologic features of BC are strongly predictive of specific histopathologic and molecular subtypes, but these appearances may not be enough predictive to guideline for management decisions. As a result the radiologist should continuously recommended biopsy for detection as the standard.

CONCLUSION

To our knowledge, this is the first time study conduct in Iraq discusses the association between radiological appearances including breast ultrasonography and mammography with corresponding histopathologic appearances. The irregular

mass, spiculated or indistinct margins are the most common radiologic presentations. The distortion of architecture and microcalcification present nearly in half of cases. The most common histopathology of BC is IDC, grade II and moderately differentiation. Wide excisional procedures result in free resectable margins. Irregular and indistinct margin of masses are mostly presented in middle age groups. The right side tumor is more likely to detected with irregular shape mass, IDC, grade II, with moderately differentiation, and more expressed negative HER2neu than left side. Mass correlate to have CIS feature, with LN positive and LV invasion is malignant. The IDC signs are distortion, atypical lobular, associated LCIS, and positive surgical margin. IDC and CIS of mammography were more likely to showed micro calcification.

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