ACTA SCIENTIFIC MEDICAL SCIENCES

Volume 3 Issue 2 February 2019

Research Article

Complex Cystic Breast Lesions: Sonographic Pathologic Correlation and BI-RADS Assessment

Mohamed H Zahran*, Hebatallah Hassan and Eslam Gaber

Department of Radio-Diagnosis, Faculty of Medicine, Alexandria University, Egypt

***Corresponding Author:** Mohamed H Zahran, Department of Radio-Diagnosis, Faculty of Medicine, Alexandria University, Egypt.

Received: December 13, 2018; **Published:** January 17, 2019

Abstract

Background: Cystic breast disease has been recognized as the most frequent female benign breast lesion. Complex cystic breast masses are suspicious ultrasound findings that usually need biopsy.

Aims: To analyze the features of complex cystic breast lesions at ultrasonography (US) and to determine its appropriate Breast Imaging Reporting and Data System (BI-RADS) categories.

Patients and Methods: In this prospective study, 27 complex cystic breast lesions on ultrasonography were included. All lesions were subjected to ultrasonography, Doppler internal vascularity and biopsy. Complex cystic breast masses were classified according to their ultrasound features into three types. Positive predictive values for malignancy were calculated for each type. Pathological confirmation was performed by fine needle aspiration cytology in 15 lesions, core needle biopsy in 8 lesions and both FNAC and CNB in 4 lesions.

Results: All of type I complex cystic breast masses in this study were benign, and three (50%) of type II complex cysts and five (55.6%) of type III complex cysts were proved to be malignant. The PPVs for malignancy in type II was 50% and in type III was 55.6%.

Conclusion: Ultrasound is very useful in characterizing and guiding biopsy of these lesions. Ultrasound guided percutaneous breast biopsy proved to be an essential indication for confirming the final diagnosis. According to sonographic pathologic correlation; suggested type I complex cyst at Berg classification proved to be a complicated rather than a complex cyst. Ultrasonographic data for type II and III complex cystic breast lesions proved to correlate directly with BIRADs classification.

Keywords: Breast Complex Cystic Lesion; Breast Carcinoma; Breast Sonography; BI-RADs

Introduction

Cystic breast lesions are commonly observed on ultrasound (US) examinations performed for the evaluation of palpable or mammographically detected breast masses [1].

At US, cystic breast lesions are categorized as simple cysts, complicated cysts, clustered microcysts, and complex cysts.

Simple cysts are defined as anechoic, well-circumscribed, round or ovoid masses with an imperceptible wall and increased through-transmission of sound waves (Figure 1). When all the criteria of simple breast cysts are present, they are considered benign and do not require intervention. Painful cysts can be aspirated for symptom relief [1-6].

Complicated cysts contain low-level internal echoes or intracystic debris that may layer and shift with changes in patient position (Figure 2). Complicated cysts do not contain thick walls, thick septa, or other solid-appearing components. The risk of malignancy among complicated breast cysts is less than 2%; these cysts generally can be managed with short-interval follow-up imaging or aspiration. However, if a complicated cyst is symptomatic, new, or enlarging, needle aspiration is indicated [2,4,7].

The clustered microcysts are relatively common, 5.8% of breast sonogram (Figure 3), and are almostly proved to be non-malignant [8].

The term complex cyst is not a pathological classification; it is a sonographic diagnosis with variations in definition and

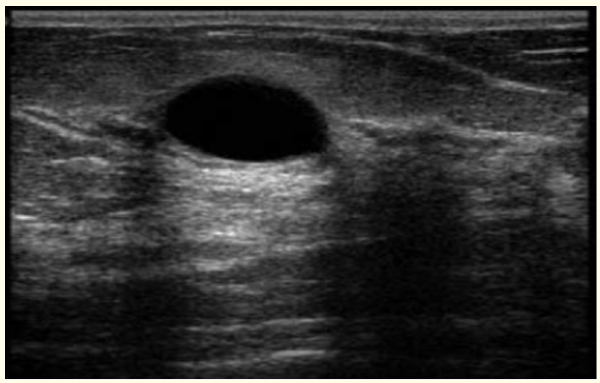

Figure 1: Simple cyst: an anechoic oval mass with an imperceptible circumscribed border and posterior enhancement.

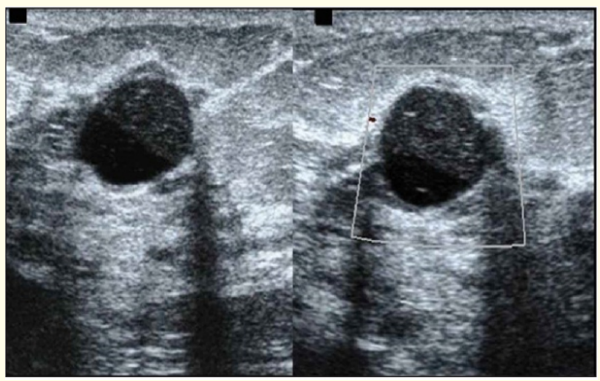

Figure 2: Complicated cyst: cyst appearing as a round mass with a fluid-debris level. No vascular signals are present on color Doppler analysis.

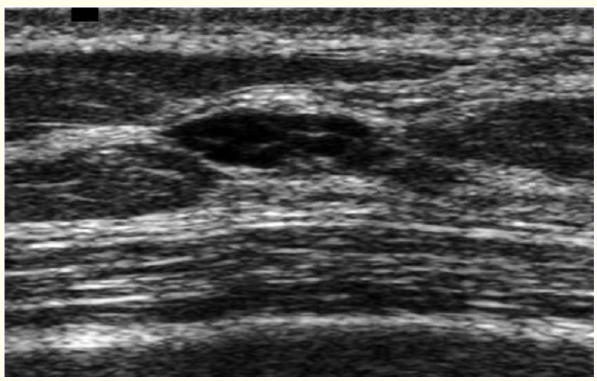

Figure 3: Clustered microcysts: clusters of tiny anechoic foci, individually smaller than 2 to 3 mm, with thin internal septations and no discrete solid component.

classification. Berg., *et al.* [2] have defined four categories of complex cysts depending on morphological criteria: type I cysts have a thick wall, thick internal septa (≥ 0.5 mm), or both; type II cysts contain one or more intracystic masses; type III masses contain mixed cystic and solid components and are at least 50% cystic; type IV masses are predominantly solid complex lesions (at least 50% solid components) including peripheral cystic components.

In this study, we used a classification which is a modified version from the previously mentioned classification of Berg., et al. [2] which states that complex cystic breast masses are classified into 3 types: [9] type I cysts (Figures 4 and 5) have a thick wall, thick internal septa (≥ 0.5 mm), or both; type II masses (Figure 6) contain mixed cystic and solid components and are at least 50% cystic; type III masses (Figure 7) are predominantly solid complex lesions (at least 50% solid components) including peripheral cystic components.

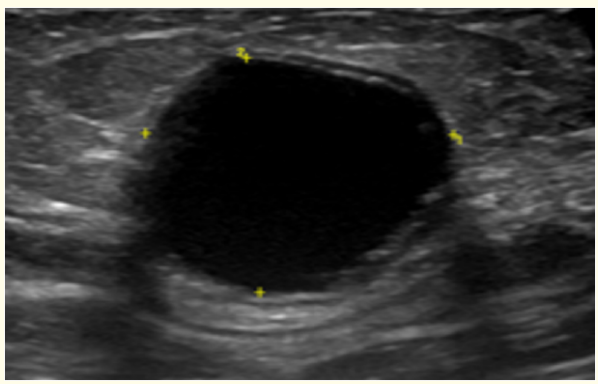

Figure 4: Type I complex cyst with thick wall.

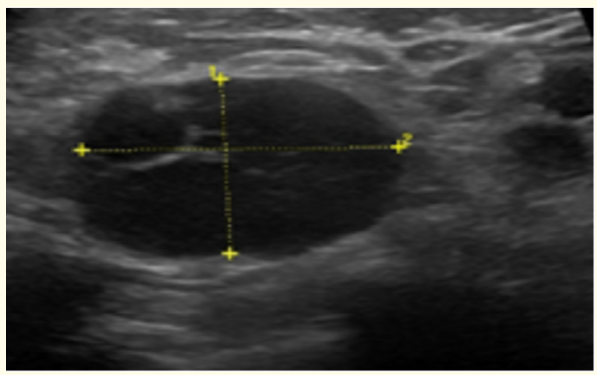

Figure 5: Type I complex cyst with thick internal septations.

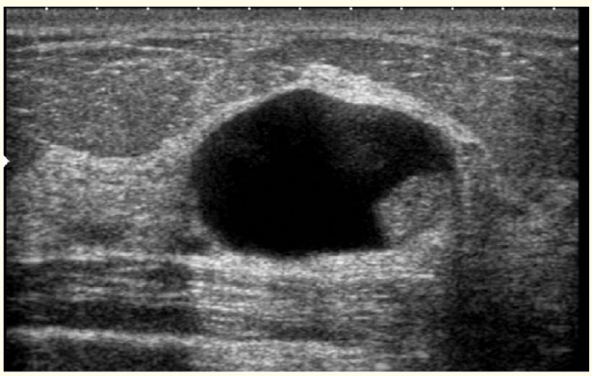

Figure 6: Type II complex cyst: predominantly cystic lesion with solid component.

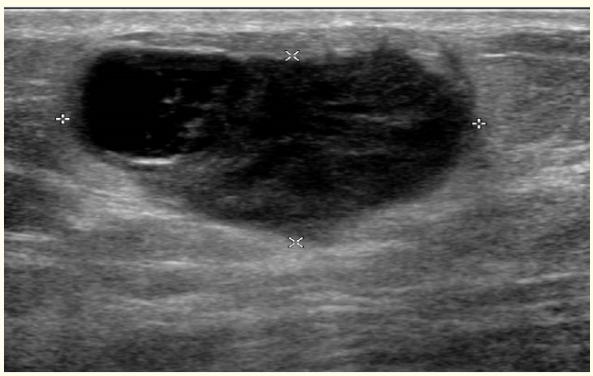

Figure 7: Type III complex cyst: predominantly solid complex lesion with peripheral cystic component.

One of the most popular diagnostic modalities in the present day is US. Not only its radiation safety and inexpensiveness, the US also has the benefit in the evaluation of palpable masses that are mammographically occult, adjunction to the mammographic study, persistent focal asymmetric densities or clinically suspected breast lesions in women younger than 30 years of age [10] Moreover, US is the ideal imaging modality to evaluate breast lesions and may be used to guide a fine-needle aspiration (FNA) or core needle biopsy (CNB) [11].

Numerous pathologic entities may produce complex cystic breast lesions or may be associated with them, and biopsy is usually indicated. Common benign findings include fibrocystic changes, intraductal or intracystic papilloma without atypia, and fibroadenoma. Common atypical findings include atypical ductal hyperplasia, atypical papilloma, atypical lobular hyperplasia, and lobular carcinoma in situ. Malignant findings include ductal carcinoma in situ, infiltrating ductal carcinoma, and infiltrating lobular carcinoma [1,5,7,12-17].

Material and Methods

This study was conducted on twenty seven female patients where complex cystic breast lesions were found. Inclusion criteria were a lesion diagnosed to be a complex cyst by US examination: complex cysts features are determined according to criterion of Berg., *et al.* and the exclusion Criteria were any previous history of breast surgery, US findings of a simple cyst, clustered microcysts or a complicated cyst and any biopsy contraindications.

The age of the included patients ranged from 21 to 51 years old and the majority were in their fourth and fifth decades, 14 patients (51.9%) gave a familial history of breast cancer.

All the studied patients were subjected to full thorough history taking, imaging studies which included high resolution ultrasonography of both breasts and color Doppler examination with ultrasonographic equipment (GE LOGIC P6 machine) and a superficial transducer with 7.5 MHz frequency. Ultrasound guided fine-needle aspiration biopsy and/or ultrasound guided core-needle biopsy and histopathological examination of the biopsied tissues. For each lesion, the imaging finding, the BI-RADS assessment category, and histological results were reviewed.

US features were analysed according to the ACR BI-RADS lexicon and assessment categories [6]. The lesion characteristics, US classifications, and presence of abnormal axillary nodes were determined.

Results

Among the 27 studied lesions, the histological analysis showed malignancy in 8 (29.6%) and benign in 19 (70.4%) lesions (Table 1). The malignancies included ductal carcinoma in situ (Figure 8) in two lesions, invasiveductal carcinoma (Figure 9) in five lesions and mucinous carcinoma in one lesion. The histological diagnoses of the remaining 19 benign lesions were: six abscesses (Figure 10), six fibrocystic changes (Figure 11), five fibroadenomas (Figure 12), one galactocele and one hematoma.

Pathological result	Type of complex cyst					
	Type I		Type II		Type III	
	No.	%	No.	%	No.	%
Benign (n = 19)	(n =12)		(n =3)		(n =4)	
Abscess	5	41.7	0	0	1	25
FCC	6	50	0	0	0	0
Fibroadenoma	0	0	2	66.7	3	75
Galactocele	0	0	1	33.3	0	0
Hematoma	1	8.3	0	0	0	0
Malignant (n = 8)	(n = 0)		(n = 3)		(n = 5)	
DCIS	0	0	2	66.7	0	0
IDC	0	0	1	33.3	4	80
Mucinous carcinoma	0	0	0	0	1	20

Table 1: Relation between histopathologic findings and US types for 27 complex cystic breast lesions.

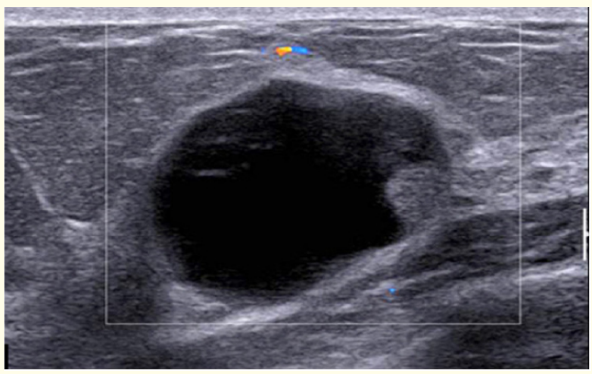

Figure 8: US showed a complex cystic breast lesion with a solid mural nodule (type II). US guided CNB proved to be DCIS.

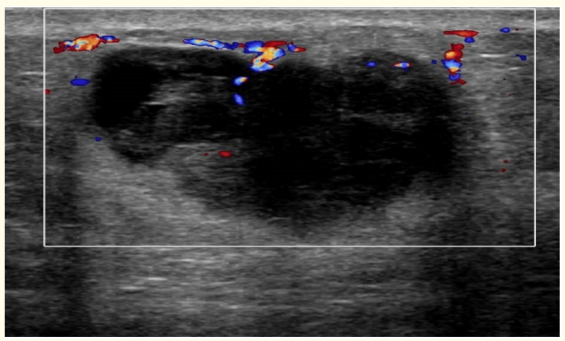

Figure 9: US showed a predominantly solid lesion with peripheral cystic changes (type III) and Doppler internal vascularity. US guided CNB proved to be IDC.

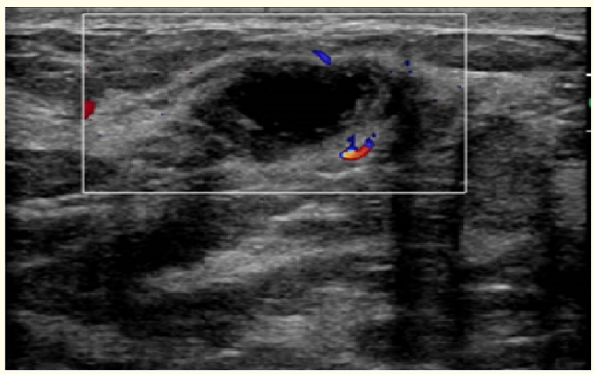

Figure 10: US showed a complex cystic lesion with thick wall (type I)and increased peripheral vascularity. US guided FNAC proved to be breast abscess.

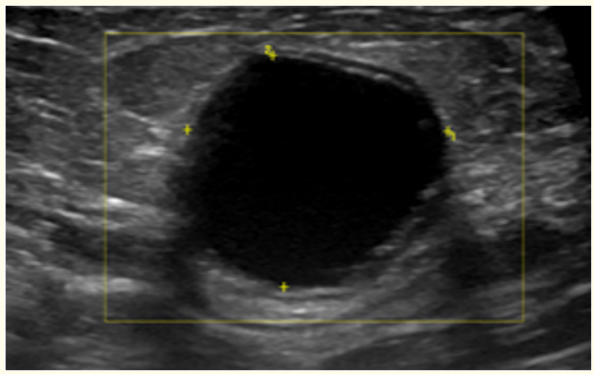

Figure 11: US showed a complex cystic lesion with thick wall (type I). US guided FNAC proved to be fibrocystic changes.

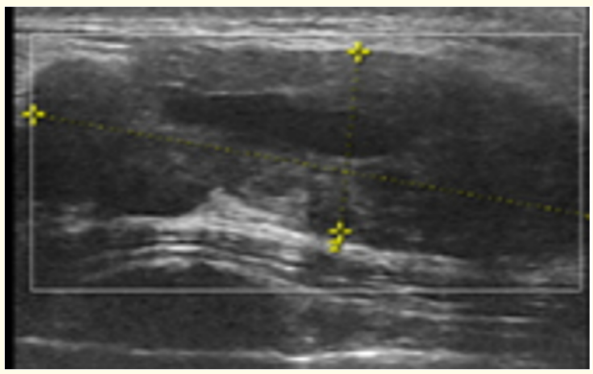

Figure 12: US showed a predominantly solid lesion with central cystic changes (type III). US guided CNB proved to be fibroadenoma.

A summary of the histological outcomes and US classifications for all lesions is shown in Table 1. Of the 27 complex cystic lesions on US, 12 (44.4%) were classified as type I, six (22.2%) as type II, and nine (33.3%) as type III. The relation between the pathological results and types of complex cysts are summarized in table 2. 100% of type I complex cysts were benign, 50% of type II were benign and 50% were malignant and 44.4% of type III were benign and 55.6% were malignant. The ultrasonographic features (shape, margins and posterior acoustic enhancement) of the studied lesions, Doppler internal vascularity and the presence of suspicious axillary lymph nodes were compared with the pathological results and were summarized in tables 3, 4 and 5.

	Benign (n = 19)		Malignant (n = 8)		Total (n = 27)		χ^2	P
	No.	%	No.	%	No.	%		
Type of complex cyst								
Type I	12	100	0	0	12	100	9.844*	$^{MC}p = 0.005^*$
Type II	3	50	3	50	6	100		
Type III	4	44.4	5	55.6	9	100		
Total	19	100	8	100	27	100		

Table 2: Relation between pathological results and type of complex cyst.

Ultrasound features	Benign (n = 19)		Malignant (n = 8)		Total (n = 27)		χ^2	P
	No.	%	No.	%	No.	%		
Shape								
Irregular shape	6	54.5	5	45.5	11	100	2.229	$^{FE}p = 0.206$
Regular shape	13	81.3	3	18.8	16	100		
Total	19	100	8	100	27	100		
Margin								
Not circumscribed	1	20	4	80	5	100	7.467*	0.017*
Circumscribed	18	81.8	4	18.2	22	100		
Total	19	100	8	100	27	100		
Posterior acoustic enhancement								
No	4	50	4	50	8	100	2.262	0.183
Yes	15	78.9	4	21.1	19	100		
Total	19	100	8	100	27	100		

Table 3: Relation between pathological results and ultrasound features.

	Benign (n = 19)		Malignant (n = 8)		Total (n = 27)		χ^2	^{FE}p
	No.	%	No.	%	No.	%		
Doppler internal vascularity								
No	19	82.6	4	17.4	23	100	11.152*	0.004*
Yes	0	0	4	100	4	100		
Total	19	100	8	100	27	100		

Table 4: Relation between pathological results and Doppler internal vascularity.

	Benign (n = 19)		Malignant (n = 8)		Total (n = 27)		χ^2	FEp
	No.	%	No.	%	No.	%		
Axillary suspicious lymph nodes								
No	19	90.5	2	9.5	21	100	18.321*	<0.001*
Yes	0	0	6	100	6	100		
Total	19	100	8	100	27	100		

Table 5: Relation between pathological results and Axillary suspicious lymph nodes.

The relation between the type of complex cyst and the assigned BIRADs category and the histopathological analysis were discussed in table 6. The PPV for malignancy in each type in our study are summarized in table 7. The overall PPV for malignancy in all lesions was 29.6% (8 of 27 lesions). The PPVs for malignancy in each type of lesion were 0% for type I, 50% for type II, and 55.5% for type III. Among these three types, the PPV was highest for lesions classified as type III.

	Benign (n = 19)		Malignant (n = 8)		PPV
	No.	%	No.	%	
Type of complex cyst					
Type I	12	100	0	0	0
Type II	3	50	3	50	50
Type III	4	44.4	5	55.6	55.6

Table 6: Positive predictive value (PPVs) for malignancy for each type of complex cysts.

Type of complex cyst	BIRADs						Malignancy (N = 8)	
	4a (n = 9)		4b (n =8)		4c (n =10)			
	No.	%	No.	%	No.	%	No.	%
Type I (n = 12)	9	75	3	25	0	0	0	0
Type II (n = 6)	0	0	5	83.3	1	16.6	3	50
Type III (n = 9)	0	0	0	0	9	100	5	55.6

Table 7: Relation between BIRADs and type of complex cyst.

Discussion

Upon analyzing the relation between the type of complex cyst and the assigned BIRADs category and the histopathological analysis we found that type I complex cysts [12] in our study were assigned both BIRADs 4a [9] and 4b [3] and all the type I cases were histopathologically found to have benign features so we advise that type I complex cysts be assigned BIRADs 3 (probably benign for follow up) category rather than BIRADs 4 (probably malignant for biopsy).

Whereas for Type II and Type III complex cysts they were assigned BIRADs 4b and 4c, histopathology reported that 50% of type II complex cysts had malignant features and 55% type III complex cysts has malignant features as well which is in accordance with the BIRADs categorization.

The most common histopathological diagnosis reported for type I complex cyst was fibrocystic changes (50% of type I cases), which was the same as the study by Hsu*., et al.* [18] where they reported 30.5% of their type I complex cysts to be fibrocystic changes.

The most common benign histopathological diagnosis reported for type II complex cyst was fibroadenoma (33.3% of type II), and the most common malignant histopathological diagnosis for type II was DCIS (33.3% of type II), whereas Hsu., *et al.* [18] reported fibrocystic changes as the most common benign diagnosis in type II cysts (27.3% of type II) and DCIS as the most common malignant diagnosis for type II cysts (7.8% of type II cysts).

The most common benign histopathological diagnosis reported for type III complex cyst was Fibroadenoma (44.4% of type III), and the most common malignant histopathological diagnosis for type III was IDC (44.4% of type III), whereas Hsu., *et al.* [18] reported fibrocystic changes as the most common benign diagnosis in type III cysts (12.8% of type III) and IDC as the most common malignant diagnosis for type III cysts (23.1% of type III cysts).

The correlation between the ultrasonographic type of cyst and the pathological results reported a P value of 005, with an increased incidence of malignancy in higher types.

Variable results of malignant rates for each type of the complex cystic breast masses (type I-III) have been reported [1,2,7,13].

In this study, 8 of 27 complex cystic lesions (29.6%) were pathologically proven to be malignant. This malignancy rate was comparable to one study of Berg., *et al.* with a reported malignant rate of 22.7% (18 of 79) [2]. A higher malignancy rate was reported in the study of Yun-Woo Chang., et al. which reported a rate of 50% (40 of 80) malignant lesions of the studied complex cysts [5].

Interestingly, none of the 12 type I cysts showed pathological malignant features giving a malignant rate of 0%. Opposing to Chang., *et al.* [5] which reported that 25.9% (7 of 27) their type I cysts were pathologically proven to be malignant. As for the study of Berg., *et al.* [2] malignant rate of type I cysts was 30% (7 of 23).

There was no significant statistical difference between malignant rates of type II and type III cysts which were 50% and 55.6%, respectively. Which is slightly higher than that reported by Pongrattanaman and Prueksadee [9], where they reported 38% and 31% for type II and type III respectively.

On comparing the results according to the ultrasonographic features, concerning the margin of the cysts, of eight malignant lesions in our study, 50% (4 of 8) had a well-circumscribed margin and (50%) had a non-circumscribed margin. While of 19 benign lesions in our study, 18 (94.7%) had a well-circumscribed margin and one (5.3%) had a non-circumscribed margin with a significant resultant P value of 0.017. which opposed the results of Pongrattanaman and Prueksadee [9] where more than half of their malignant cases had a well circumscribed margin.

Four of the reported cases had intra-lesional vascularity by color Doppler, 100% of which were pathologically proven to be malignant. Stating that intra-lesional vascularity is a good positive but a bad negative as the rest of the pathologically proven malignant complex cysts didn't show intra-lesional vascularity.

As for the presence of suspicious axillary lymph nodes, six out of the 27 cases had suspicious nodes of which 100% were pathologically proven to be malignant with a resultant significant P value of less than 0.001, this comes in harmony with the reported results of Hsu., *et al.* [18] where they reported a P value of 0.046.

Concerning the predictive value for the types of the cysts, the values were increasing from type I to type III with a 55.6% for type III and a 0% for type I, stating that the risk of malignancy increases with the increase in cyst type, which was in harmony with Hsu., *et al.* [18] where they reported the PPV to increase with the increase in the type of complex cyst.

Conclusion

- Complex cystic breast masses are suspicious ultrasound findings that usually need biopsy.
- Ultrasound is very useful in characterizing and guiding biopsy of these lesions.
- Ultrasound guided percutaneous breast biopsy proved to be an essential indication for confirming the final diagnosis.
- According to sonographic pathologic correlation; suggested type I complex cyst at Berg classification proved to be a complicated rather than a complex cyst.
- Ultrasonographic data for type II and III complex cystic breast lesions proved to correlate directly with BIRADs classification.

Bibliography

1. Doshi DJ., *et al*. "Complex cystic breast masses: diagnostic approach and imaging-pathologic correlation". *Radiographics* 27(2007): S53-64.

2. Berg WA., *et al*. "Cystic lesions of the breast: sonographic-pathologic correlation". *Radiology* 227.1 (2003): 183-191.

3. American College of Radiology. ACR BI-RADS breast imaging and reporting data system: breast imaging atlas. Reston: American College of Radiology (2003).

4. Mendelson EB., *et al*. "Toward a standardized breast ultrasound lexicon, BI-RADS: ultrasound". *Seminar on Roentgenology* 36.3 (2001): 217-225.

5. Chang YW., *et al*. "Sonographic differentiation of benign and malignant cystic lesions of the breast". *Journal of Ultrasound in Medicine* 26.1 (2007): 47-53.

6. American College of Radiology, BI-RADS Committee. ACR BI-RADS® Ultrasound. In: Mendelson E, Böhm-Vélez M, Berg W, Whitman G, Feldman M, Madjar H, *et al*. (eds). ACR BI-RADS® Atlas, Breast Imaging Reporting and Data System. 5th ed. Reston, VA: American College of Radiology (2013): 35-131.

7. Venta LA., *et al*. "Management of complex breast cysts". *AJR* 173.5 (1999): 1331-1336.

8. Huff JG. "The sonographic findings and differing clinical implications of simple, complicated, and complex breast cysts". *Journal of the National Comprehensive Cancer Network* 7.10 (2009): 1101-5.

9. Pongrattanaman S and Prueksadee J. "Sonographic-pathologic correlation of complex cystic breast lesions". *Asian Pacific Journal of Tropical Disease* 3.1 (2013): 51-55.

10. Rinaldi P., *et al*. "Cystic breast lesions: sonographic findings and clinical management". *Journal of Ultrasound in Medicine* 29.11 (2010): 1617-1626.

11. Dixon JM., *et al*. "Natural history of cystic disease: the importance of cyst type". *British Journal of Surgery* 72.3 (1985): 190-192.

12. Berg WA., *et al*. "Cystic lesions of the breast: sonographic-pathologic correlation". *Radiology* 227.1 (2003): 183-191.

13. Omori LM., *et al*. "Breast masses with mixed cystic-solid sonographic appearance". *Journal of Clinical Ultrasound* 21.8 (1993): 489-495.

14. Liberman L., *et al*. "Case 35: Intracystic Papillary Carcinoma with Invasion". *Radiology* 219.3 (2001): 781-784.

15. Soo MS., *et al*. "Papillary carcinoma of the breast: imaging findings". *AJR* 164.2 (1995): 321-326.

16. Reuter K., *et al*. "Intracystic carcinoma of the breast: the role of ultrasonography". *Radiology* 153.1 (1984): 233-234.

17. Han B-K., *et al*. "Benign papillary lesions of the breast: sonographic-pathologic correlation". *Journal of Clinical Ultrasound* 18.3 (1999): 217-223.

18. Hsu HH., *et al*. "Complex cystic lesions of the breast on ultrasonography: feature analysis and BI-RADS assessment". *European Journal of Radiology* 79.1 (2011): 73-79.

Volume 3 Issue 2 February 2019