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Sonographic–pathologic correlation of complex cystic breast lesions

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PEER REVIEW

Peer reviewer

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Comments

This is a good study in which it is useful for radiologist to aware when making a decision of complex cystic breast masses and the result would remind the surgeon for carefulness in further management.

(Details on Page 55)

ABSTRACT

Objective: To understand the pathologic basis for sonographic features of complex cystic lesions. **Methods:** From 2646 female patients underwent breast sonography at King Chulalongkorn Memorial Hospital from January 2005 through December 2010, 103 cystic lesions were included. Pathologic confirmation was performed by fine–needle aspiration ($n=42$), core needle biopsy ($n=6$), excision ($n=54$) and mastectomy ($n=1$). Complex cystic breast masses were classified into 3 types as followings; thick outer wall and/or thick internal septa (type I); thick septation and thick wall were defined as equal or more than 0.5 cm, masses containing mixed cystic and solid components (at least 50% of cystic component) (type II), predominantly solid with eccentric cystic foci (at least 50% of solid component) (type III). **Results:** In 103 complex cystic masses, there are 27 lesions (26%) classified as type I cystic breast masses, 37 lesions (36%) as type II cystic breast masses and 39 lesions (38%) type III cystic breast masses, 26 lesions (25.2%) are proved to be malignant. All of type I cystic breast masses in our study are benign, and 14 (38%) of type II cystic breast masses and 12 lesions (31%) of type III cystic breast lesions are proved to be malignant. **Conclusions:** Type II and III lesions should suggest possibility of malignancy and biopsy should be performed in all lesions. All type I lesion in this study are benign. None of other parameters we included in this study (size or margin) can effectively differentiate between benign or malignant cystic breast lesions. Also, grading of the malignant lesions by using type of cystic breast mass cannot be applied.

KEYWORDS

Complex cystic breast lesion, Breast sonography

1. Introduction

One of the most common breast problems for which women consult a physician is palpable mass. One of the most popular diagnostic modality in the present day is ultrasonography. Not only its radiation safety and inexpensiveness, the ultrasonography 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^[1,2]. Moreover, ultrasonography 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)^[3].

Nowaday, the sonographically simple cysts which is the most common cystic breast lesion can be dismissed as benign^[4–6]. The clustered microcysts are also relatively common, 5.8% of breast sonogram, and are almostly proved to be non–malignant^[7]. Additionally, the complicated cyst may be classified as benign^[4].

The complex cystic breast mass are sonographically the cyst containing thick wall, internal septation or intracystic solid component. The incidence of complex cystic lesions of breast ultrasound examination is 5%^[8]. The pathologic results of these complex cysts are varied from benign to malignant. The previous study also showed varying results in proportion between benign and malignant of complex cysts based on sonographic study^[9–11].

Understanding the sonographic and pathologic correlation of complex cystic breast lesion would assist clinical

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decision-making based on sonographic finding. On the other hand, discordance between pathologic result and sonographic finding will remind the clinician to act on[8].

2. Material and methods

From January 2005 to December 2010, during this time 2646 female patients underwent breast sonography at King Chulalongkorn Memorial Hospital (KCMH) with sonographic report of the keyword concerned about complex cystic breast mass. Of these target population, 103 patients with 103 cystic lesions were included to our study with the inclusion criteria included sonographic reports diagnosed as complex cystic lesions, available ultrasonography study on picture archiving and communication system (PACS) and available histopathologic diagnosis data. The patients were excluded from the study if the following criteria was met; radiologic finding as simple cyst, clustered microcysts or complicated cyst, pathologic report as inadequate amount of tissues for definite diagnosis or prior breast surgery.

If the tissues for diagnosis are received from FNA or CNB and the pathologic reports reveal non-malignant outcomes, the follow-up data of the individual patient must be achieved for at least 2 years after receiving tissue diagnosis. Mass is categorized as benign only if clinical evaluation of the cyst in the follow-up period was stable or non-malignant change. Sonography was performed by physician using a broad-bandwidth linear array transducer with a frequency of 12 MHz.

In our study, complex cystic breast masses were classified

into 3 types, modifying from those mentioned in an article by Doshi *et al*[11]. Type I complex cysts were defined as thick outer wall, thick internal septa or both. Thick septation and thick wall were defined as equal or more than 0.5 cm. Type II complex cysts were defined as masses containing mixed cystic and solid components (at least 50% of cystic component). Type III cystic breast masses were predominantly solid with eccentric cystic foci (at least 50% of solid component).

One expert radiologist classified the types of cystic breast lesions according to sonographic findings. Each type of cysts were correlated with pathologic findings. Benign and malignant incidence were evaluated. Analyze of margin with presence of benign or malignant feature were also done in our study

3. Results

In 103 complex cystic masses, 92 patients presented with symptom and 11 came for their annual check up. Symptoms of patients included palpable mass, breast pain or nipple discharge. Pathologic confirmation was performed by fine-needle aspiration ($n=42$), core needle biopsy ($n=6$), excision ($n=54$) and mastectomy ($n=1$). The mean age of patient was 46.6 years (range, 17–87 years). The mean diameter of lesion was 3.6 cm (range, 0.7–8.9 cm).

There are 27 lesions (26%) classified as masses with thick wall and/or thick septation (type I), 37 lesions (36%) as masses with intracystic nodule or mixed cystic and solid masses (type II) and 39 lesions (38%) as solid masses with eccentric cystic foci (type III) (Tables 1 and 2).

Table 1

Classification, Sampling method and malignant rates of 103 complex cystic lesions.

Sonographic findings	FNA	CNB	Excision	Mastectomy	Malignancy
Mass with thick wall and/or thick septations, type I ($n=27$)	23	–	4	–	0(0%)
Mixed cystic and solid masses, type II ($n=37$)	13	4	20	–	14(38%)
Solid mass with eccentric cystic foci, type III ($n=39$)	6	2	30	1	12(31%)
Total	42	6	54	1	28(69%)

Table 2

Sonographic and pathologic correlation 103 complex cystic masses.

Findings	Mass with thick wall and/or thick septations (type I)	Mixed cystic and solid masses (type II)	Solid mass with eccentric cystic foci (type III)	Total
Benign				
Cyst	5	7	0	12
FCC	8	5	3	16
Fibroadenoma	0	2	5	7
Phyllode	0	0	4	4
Galactocele	1	0	0	1
Papilloma	0	5	9	14
Abscess and/or mastitis	1	2	2	5
Hematoma	1	1	1	3
Granulomatous inflammation	0	0	1	1
Benign proliferative change	9	3	2	14
Malignant				
IDC	0	8	7	15
DCIS	0	2	0	2
Papillary carcinoma	0	5	1	6
Papillary DCIS	0	0	2	2
Low grade carcinoma	0	0	1	1

Twenty six masses (25.2%) are proved to be malignant. All of cysts with thick wall and/or thick septation in our study are benign. A total of 14 (38%) of cysts with intracystic nodule or mixed cystic and solid masses and 12 (31%) of solid masses with eccentric cystic foci are proved to be malignant.

About margin, there are 85 masses described as well-defined margin and 17 masses as ill-defined margin. One mixed cystic and solid mass shows irregular margin. Intraductal papilloma is pathological confirm of this lesion. Seventeen (20%) of 85 masses with well-defined margin and 9 (53%) of 17 masses with ill-defined margin are proved to be malignant. However, there is moderate statistically significant difference of malignant rate between these two marginal-based groups ($P=0.004$). No statistically significant difference of benign or malignant cystic breast masses was documented by using age or size in our study.

3.1. Masses with thick wall and/or thick septation

All of masses with thick wall and/or thick septation (type I) are benign in our study. Only 2 masses show ill-defined margin which are benign. Fine needle aspiration were performed in these lesions and 2-years follow up showed no malignant change. Most of breast masses of this type are pathologically reported as fibrocystic change or benign breast cyst. Other benign causes included hematoma (Figure 1), abscess and galactocele.



Figure 1. Thick-walled complicated cyst (type I), hematoma. Ultrasonography obtained in 39-year-old woman shows cystic mass (dot line) with thick wall (arrows), minimal posterior acoustic enhancement, with internal floating content. The lesion was palpable and aspiration yielding unclotted blood. Follow up 2 years shows resolution of the lesion.

3.2. Intracystic or mixed cystic and solid masses

Of 14 proved malignant masses, seven masses are intraductal carcinoma (IDC) consisting of one high grade and one intermediate grade. This high grade IDC shows large size, 8.4 cm in maximal diameter. Other 5 masses are not identified the grade, not otherwise specified (NOS). Two lesions were

proved to be DCIS and one of them showed high grade with comedo feature. There are four invasive papillary carcinomas (Figure 2) and one intracystic papillary carcinoma.

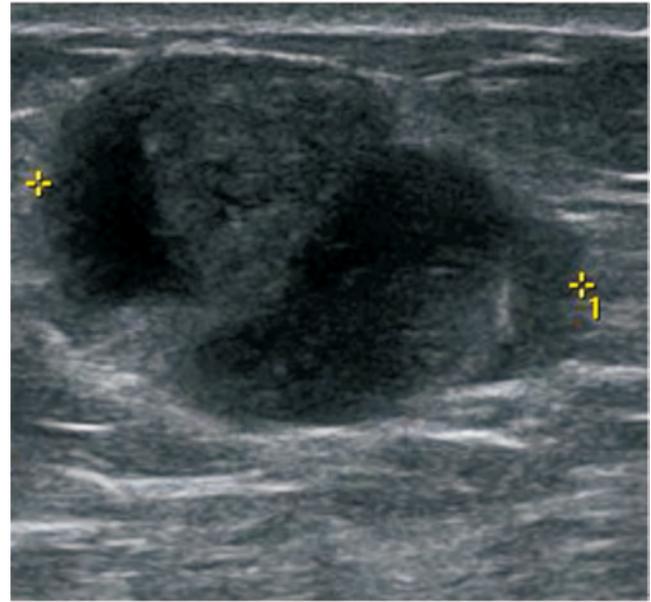


Figure 2. Intracystic mass (type II), invasive papillary carcinoma. Sonogram of breast in 61-year-old woman shows palpable complex mass with mixed cystic and solid components (+ markers). Excisional biopsy shows invasive papillary carcinoma.

Of total intracystic or mixed cystic and solid masses, 23 masses are benign including 5 intraductal papillomas, 2 fibroadenomas (Figure 3), 2 organizing mastitis and abscess, 1 hematoma with scar and the rest are fibrocystic change, cyst and benign proliferative change.

3.3. Solid masses with eccentric cystic foci

Of 12 proved malignant masses, nine masses are IDC including 4 grade 3 IDC (Figure 4), 2 grade 2 IDC, 1 grade 1 IDC, 2 unclassified IDC, 1 invasive papillary carcinoma. Two masses were proved to be papillary DCIS. Size of IDC range from 1.3 cm to 8.9 cm.

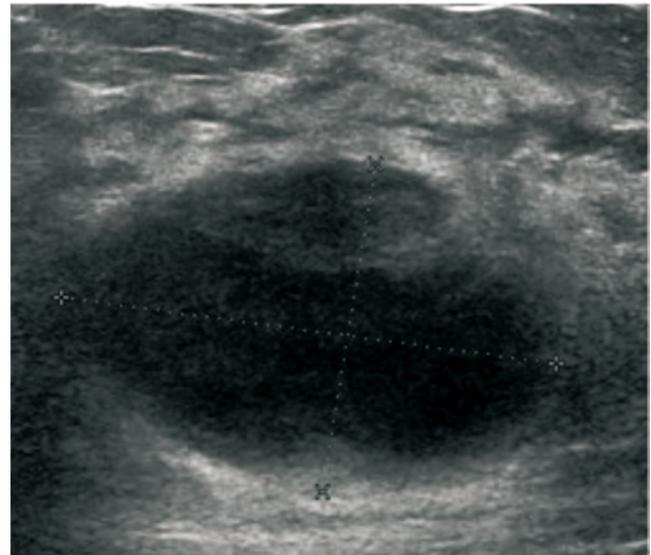


Figure 3. Mixed cystic and solid masse (type II), fibroadenoma. Breast sonography of 21-year-old-woman presented with palpable mass shows mixed cystic and solid mass with ill-defined margin (cross lines).

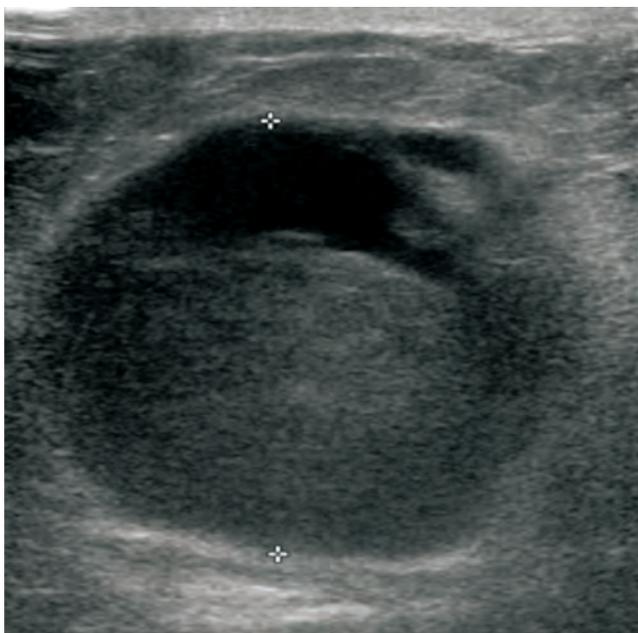


Figure 4. Solid mass with eccentric cystic foci (type III), high grade ductal carcinoma. Breast sonogram obtained from 48-year-old woman presented with palpable mass shows a well circumscribed predominantly solid mass with eccentric cystic area (+ markers). Ultrasound-guided core needle biopsy yielded high grade ductal carcinoma.

Of 27 benign masses, there are 8 intraductal papillomas, one papillomatosis (Figure 5), 5 fibroadenomas, 3 benign phyllodes, 1 borderline phyllode, 3 infectious/inflammatory process and one hemorrhagic cyst. The rest are fibrocystic change and benign cysts.



Figure 5. Solid mass with eccentric cystic foci (type III), papillomatosis with florid epithelial hypoplasia. Ultrasonography of breast of 31-year-old demonstrates 1.7-cm well-defined mass (+ markers) with a discrete solid component (arrow). Excisional biopsy yielded papillomatosis with florid epithelial hypoplasia.

4. Discussion

Complex cystic lesions in breast sonography were reported in approximately 5% of women who undergo examination. One article reported the malignant rate of complex cystic breast lesion is 22%. Variable results of malignant rate in each type of the complex cystic breast masses (type I–III) have

been reported in many study^[4,9–11].

In our study, 26 (of 103) complex cystic masses (25.2%) are proved to be malignant. This malignant rate was comparable to one study of Berg *et al.* with report of 22.7% (18 of 79) malignant lesions of complex cystic breast masses^[4]. Different result have been observed with the study of Yun–Woo Chang *et al.* which showed 50% (40 of 80) malignant lesions of studied complex cysts^[12].

Interestingly, none of 27 type I cysts showed malignant feature. This result was different from some of the study reported before. Yun–Woo Chang *et al.*^[12] reported that 25.9% (7 of 27) of cystic masses with a thick wall or septa were pathologically proved to be malignant included IDC and papillary carcinoma. In study of Berg *et al.*, malignant rate of masses with thick walls or thick septation is 30% (7/23)^[4]. There was one study that similar to our study, Venta *et al.*^[10] reported only one malignant lesion from 308 complex breast cysts. This tumor was a papilloma with a 3-mm focus of ductal carcinoma in situ. Complex cysts in this study were defined as absent posterior wall enhancement or presence of internal echoes and excluded lesions with intracystic nodule or solid component which include type I cyst in our study and also complicated cyst in our meaning.

Type II and III cysts, composed of mixed cystic and solid masses and solid masses with eccentric cystic foci; respectively, should be received pathological confirmation. There was no statistically different malignant rate between these two groups in this study which were 38% and 31%, respectively ($P=0.516$). Moreover, there was no difference in some pathological results among these types included invasive ductal carcinoma and invasive papillary carcinoma. However, in our study, DCIS and papillary DCIS were found only in type II and type III, respectively. Pathologic report of one intracystic papillary carcinoma was type II.

Variable grade of invasive ductal carcinomas was observed among patients with type III cystic breast masses. However, incomplete data of malignant grading, being reported as not otherwise specified, in type II masses were obtained. For the reasons, type of cystic breast masses cannot be applied for grading the malignant lesions in this study.

All of phyllodes (5 lesions) were categorized in type III masses. Some fibroadenomas (5 of 7, 71%) also showed type III cystic breast mass. From sonographic findings, no characteristic difference was found to separate these two identities confidentially.

Of 26 malignant lesions in our study, more than half (17 of 26) were cystic breast masses with well-defined margin. In contrast, 8 (47%) of 17 ill-defined masses were benign. For the reasons, use of the margin based on sonographic findings cannot define confidentially whether the lesion is benign or malignant.

In our study, most of patients with papillomas presented with palpable mass or nipple discharge with or without blood content. All of them showed well-defined margin, but only one lesion had irregular margin. Although, both type II and III cystic lesions were described in these papillomas, type III were slight predominance in number (9 of 14, 64%).

Abscesses and organizing mastitis in this study showed 4 well-defined margin and one ill-defined margin. Their morphologies varied from type I to type III cystic breast masses. Only one patient had chief complaint of fever and

pain of whom breast lesion showed type III mass with ill-defined margin. Like abscesses, hematomas had also variable cystic morphologies. Some of patients with hemorrhagic cyst had no symptom and came to the hospital for annual check up.

Limitation of this study is that the cases were selected by retrospective method and only static images were interpreted.

In summary, type II and III lesions should suggest possibility of malignancy and biopsy should be performed in all lesions. All type I lesions in this study were benign which similar to the study of Venta *et al*^[10]. However some studies of type I cysts were discordant to ours, regardingly we concluded the 2 years follow up after obtained benign pathological results after FNA of CNB. None of parameter that we included in this study (age, size or margin) can effectively differentiate between benign or malignant cystic breast lesions. Also, grading of the malignant lesions by using type of cystic breast mass cannot be applied.

Conflict of interest statement

We declare that we have no conflict of interest.

Comments

Background

Ultrasound is a very useful modality that can differentiate between solid and cystic lesions and also characterize these lesions. The complex cystic breast masses have varying results from benign to malignant. This study showed the correlation between ultrasound finding and pathologic result that would help clinical decision of the cystic mass and discordance between these two entities would remind the surgeon for proper management

Research frontiers

The study was performed by grouping the complex cystic masses to 3 types for appropriate criteria. These can help radiologists to report the types of masses correctly.

Related reports

This data is not in agreement with Yun–Woo Chang's study which showed higher percent of malignancy in complex cystic breast masses (50%) while the malignant rate in this study was 25.2%. The study of Berg WA reveals some pathological malignant results of the cystic lesions that were defined as complex cystic mass type 1 in this study. Whereas all masses of this type were benign in this study. That could be from different criterion to classified types of cystic masses and different number of the masses.

Innovations & breakthroughs

This classification could be useful and lead to be the standard report in the future because it can differentiate

between benign and malignant tendency and comply with pathologic result. Since there was the high malignant rate in type II and III complex cystic masses which composed mixed cystic and solid masses and solid mass with eccentric cystic foci. Pathologic confirmed of these masses should be done.

Applications

It is useful to know the difference between each type of complex cystic masses and the result helping the radiologist aware what types should have pathological confirmation.

Peer review

This is a good study in which it is useful for radiologist to aware when making a decision of complex cystic breast masses and the result would remind the surgeon for carefulness in further management.

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