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Clinical correlation with ultrasound finding in patient in non-cancerous breast condition, single centre experience

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Abstract
Background: The breast is an organ that composed of glandular (milk producing) in female and fatty tissue drained by five groups of lymph nodes to the axilla which are important in case of cancer of breast. The glands empty though a duct system end to the nipple. Many diseases affecting this organ diagnosed by triple assessment, one of important screening tool is ultrasound examination in guiding interventional and bioptical procedures in the diagnosis of benign and malignant lesion is an additional examination in identifying the nature and the abnormalities detected though the glands or the duct system and surrounding tissue through BI-RAD classification.
Objective: To study the correlation of ultrasound finding in clinically examined patients with benign diseases attending breast clinic in Al-Jumhoori teaching hospital.
Patients and Method: A prospective randomized study (case series) include 100 patient of different age groups from 15 -65 yr.s old consulting a single breast center in al-Jumhoori teaching hospital during the period from January 2019 to November 2019. these patients came either just for checking of breasts or complain from pain in the breast or from discharge from the nipple either unilateral or bilateral or complain from mass in one or both breast. All those patients under gone clinical examination followed by ultrasound examination excluding suspicious cases of malignancy to show the correlation of this tool in symptomatic and asymptomatic patients finding.
Results: The study analyses the record of 100 patients whom came for regular checking or complain from mastalgia or nipple discharge uni or bilateral or there complains were masses in the breast. 7 patient are single females 3 of them are asymptomatic while 4 single patient are symptomatic. The remaining 93 married patients had symptoms. The mean age group of patients were 37.5 that's most of patients in this age group (44) patients. The common complaint were pain (mastalgia) 43 patients, nipple discharge 32 patients, breast mass 22, the remaining 3 patients had mastitis. Ultrasound examination results of breast complain was significant in case of breast mass and discharge while less significant in case of mastalgia. 64 patients with unilateral breast complaint consult the clinic. 10 patient feel amass, 24 patient had nipple discharge and the remaining 30 patient had mastalgia, ultrasound finding for them show in case of breast mass 3 patient had interstitial mass(fibroadenomas), 2 were intraduclal papilloma and the remaining 5 cases show breast cysts. Regarding the nipple discharge u/s finding 16 patient having dilated ducts the remaining 8 patients had duct debris. The u/s finding in 30 patients with mastalgia show 16 patients normal picture of breast screen, 8 patients with dilated ducts, the remaining 6 patient show signs of inflammation. 36 patient having bilateral breast complain u/s finding for them show 11 patients with mass feeling in breast. 9 patients of them diagnosed by u/s as breasts cysts, 2 patients with bilateral interstitial masses(fibroadenomas). While the discharge in12 patients u/s show dilated ducts in 8 patient and duct debris in 4 patient. Regarding the last 13 patients with bilateral breast pain show normal ultrasound finding.
Conclusion: Clinical examination with ultrasound evaluation has good correlation in examination of duct system in patients with discharge and of great importance in patients with benign breast masses (unilateral or bilateral). but in case of bilateral or unilateral mastalgia the ultrasound has no significant rule just in some cases of focal breast pain.

Keywords: breast, mass, mastalgia, nipple discharge

Introduction

The Anatomy of the breast

Breast is important in careful examination and safe surgical planning [1]. Vascular supply is of the breast is depend on subdermal plexus which is in communication with underlying vessels supply the parenchyma of the breast. 60% of breast supplied by internal mammary vessels [2]. The sensory innervation of the breast is dermatomal in nature which is mainly derived from thoracic intercostal nerves T3-T5. The nipple is sensory innervated by T4 dermatome [2, 3]. The base of the breast overlies on the pectorals major muscle between second to sixth rib. The breast composed of fatty tissue and glandular, milk producing tissue. The suspensory ligaments which described by Ashly cooper in 1840(cooper ligament) are anchored the gland to the pectoral's major fascia. The tail of the breast extends oblique up into the medial wall from the axilla [2, 3]. The basic structural unit are the lobes vary from 10-100 lobules empty by ducts known as lactiferous ducts which provided with the terminal ampulla. The nipple usually lies at the level of forth rib, near its apex lie the orifices of lactiferous ducts [3, 4]. The areola contains involuntary muscle s arranged in radial and concentric rings contain sweat glands and sebaceous glands. (See fig. 1) [3, 5]. The lymphatic's drain mainly about 85% to axilla which contain 6 groups of lymph nodes lateral, anterior, posterior, intercostal, central groups and apical lymph nodes. These groups are drain into

subclavian lymph trunk or jugular trunk [4, 5, 6]. (see fig.2)

Benign Breast Diseases

A disease constitute heterogeneous group of lesions arising in mammary parenchyma (glands or ducts) or linked to vascular, inflammatory or traumatic pathologies. Most lesions found in women whom consulting breast clinics or physician are benign [7].

Ultrasound scanning

It is an equipment that is useful in diagnostic and identifying the nature and abnormalities detected by physician of breast disease and essential in guiding interventional and bioptical procedure's [8, 9]. The ultrasound parameters in the diagnosis of benign lesion diseases physical examination classified to cystic, complicated cystic, solid lesions. Regarding the duct system dilated, intraductal papilloma, or debris [3, 4].

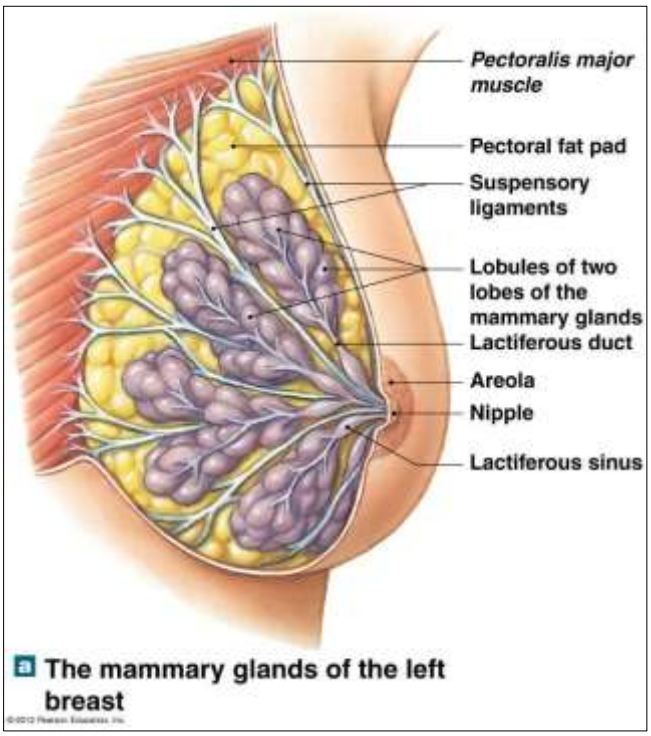


Fig 1: Structural anatomy of the breast

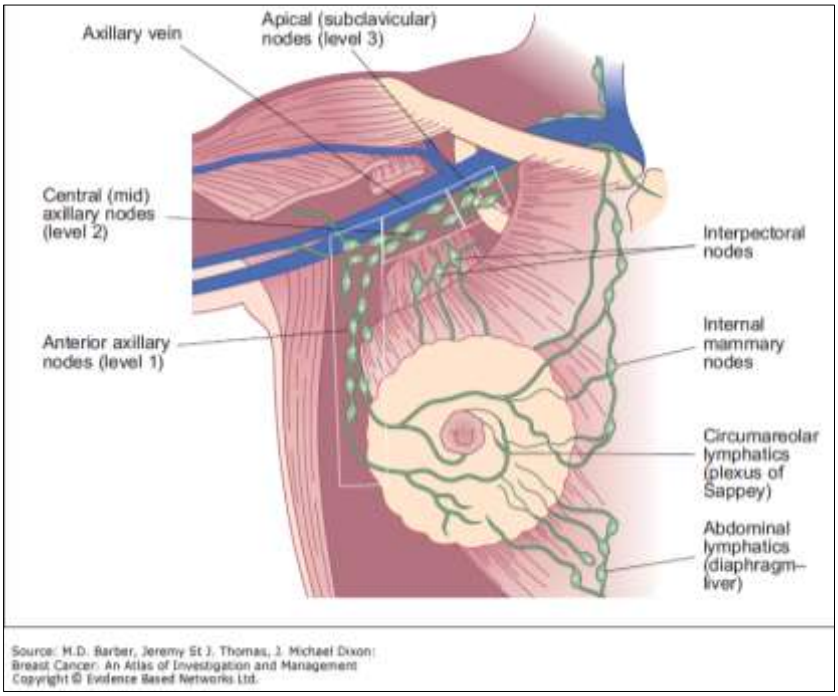


Fig 2: Lymphatic drainage of the breast

Doppler study by ultrasound is useful in differential diagnosis between benign and malignant masses on the basis of numbers of penetrating vessels using B-mode with frequency of 7-10 mHz [8, 9, 10, 11].

Aim

clinical assessment with ultrasound scan evaluation yield better predictive outcome in identified benign noncancerous breast condition.

Patient and Methods

This prospective randomized study (case series) include patients conducted to the breast clinic (single breast center) in Al-Jumhoori Teaching hospital during the period from January 2019 to November 2019. 100 female patient were involved in the study single or married female of different age groups classified to 4 groups according to the age from 15-25, 26-35, 36-45, 46-60 years old. these patients came either just for checking of breasts as part of early examination and assessment for Ca. breast or complain from pain in one or both breasts, or from discharge from the nipple either unilateral or bilateral, or complain from mass in one or both breast after excluding suspicions cases of breast cancer by sending them for cytology. All patient evaluated with through history clinical examination then all patients undergo ultrasound scanning. Patients excluded from this study include suspicious cases of malignancy that undergo triple assessment (clinical examination, imaging, FNA or core needle biopsy) [3]. Ultrasound scanning by use small hand held high frequency linear transducer with 7.5 mHz was used for breast examination, the criteria that used by the ultrasonic doctor for systemic analysis of the findings in the solid breast nodules by ultrasound examination in order to differentiate benign from malignant lesions was proposed by Stavros in 1995 and in 2003 the Breast Imaging Reporting And Data System (BI_RADS) was developed by American College Of Radiology BI_RADS Classified into category 1,2,3,4. 1and 2 are benign condition,3 mean less than 2% of conditions are malignant so follow up of an appropriate duration although needle biopsy or surgical excision should be considered according to the patient physician performance. BI_RADS 4 biopsy should be performed [9, 10, 11, 12, 13].

There are certain parameters also showing benign lesions in ultrasound imaging such as

*Well-defined curvilinear or only slightly lobulated margins; the presence of a complete, thin echogenic capsule

*Elliptical shape and horizontal orientation;

*Echo texture almost completely hyperechoic [14]

In case of duct papilloma with ectasia US image look like an isoechoic or slightly hypoechoic nodule with a microlobulated or lobulated surface. Doppler study by ultrasound is useful in differential diagnosis between benign and malignant masses on the basis of numbers of penetrating vessels as well as central or peripheral distribution. (see fig.3) Also color Doppler is essential to detect the absence of intraluminal vascular signals typical of all stages of duct ectasia [14, 15, 16, 17, 18].

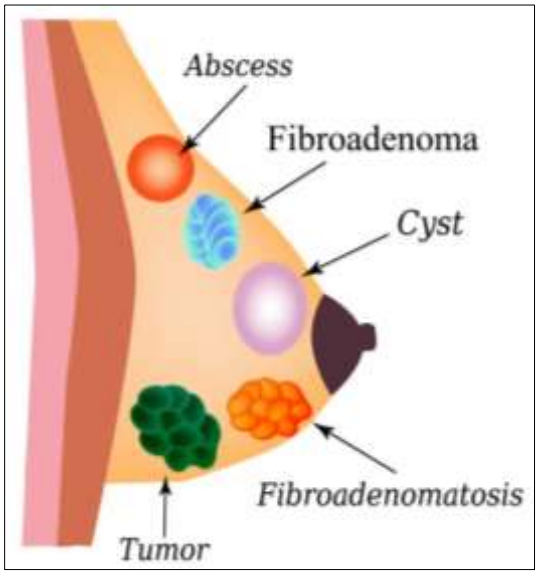


Fig 3: diagrammatic picture show breast masses in U/S

Results

The examined patient regarding marital status are 3 single women are asymptomatic and 4 are symptomatic. while married patient study show 93 patients are symptomatic.

Table 1: Symptomatic and asymptomatic patients in relation to marital status.

Marital status	A symptomatic	Symptomatic
Single	3	4
Married	-	93

The age group that involved in the study are groups from the age of 15 yr. old to 60 yr. old.

Table 2: Age group of patients involved in the study.

Age group	15-25	26-35	36-45	46-60
No. of patient	6	23	44	27

Most of the patient (44) were from age group 36-45 years the mean age group is 37. The other 2 groups that to be nearly equal are between 26-35 age group and 46-60yr. age group which were respectively 23,27. And the least group that are symptomatic were between the age group15-25 which were just 6 patient.

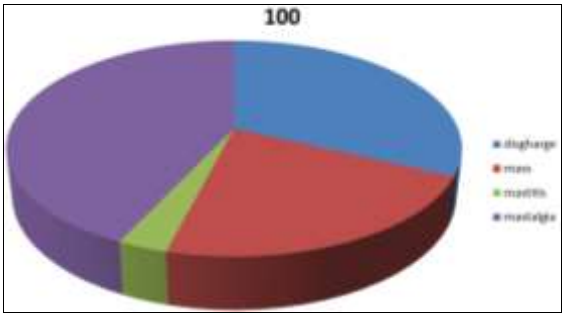
Regarding the clinical examination in this study as shown in pie square the finding were:

43 patients complain from pain with normal breast examination by physicion.

32 cases have nipple discharge.

22 cases has nodular breast examination

3 cases have mastitis



Pie square shows the percentage of breast problems

Regarding the ultrasound examinations after physical examination of 100 patients in the study shows. One of the symptoms is Nipple discharge. 24 patients with unilateral breast nipple discharge, ultrasound examination show dilated ducts in 16 patients with discharged nipple secretion and 8 Patient having dilated ducts with debris and thick secretion inside the ducts. (Table no.3)

Table 3: U/S finding with unilateral breast problem.

Unilateral breast problem	Patient no.	Ultrasound findings	Patient no.
Breast mass	10	Breast cyst	5
		Interstitial mass (fibroadenoma)	3
		Intraductal mass	2
Nipple discharge	24	Dilated ducts	16
		Duct debris	8
pain	30	Normal	16
		Dilated duct	8
		Sign of inflammation	6

with bilateral breast examination nipple discharge ultrasound examination done for these patients show 8 patients have just dilated ducts while 4 patients have an additional finding of debris inside the ducts (duct ectasia) as shown in table no. (4) The other symptoms where the patients consulting the breast clinic is mass in the breast (excluding malignant masses). In this study unilateral breast mass, they were 10 cases diagnosed by physician as a benign mass. ultrasound examination of these 10 cases show 5 of them have breast cyst, 3 of them show interstitial mass like fibroadenoma, the remaining 2 cases ultrasound finding where intraductal mass as shown in table no. (3) In cases of bilateral breast masses examined by physician which were 11 cases, 9 of them diagnosed by ultrasound as breast cyst while the remaining 2 cases show interstitial masses(fibroadenoma). see table (4). The third symptoms included in this study is the pain (mastalgia). 30 cases consulting breast clinic as unilateral breast pain 24 patient of them evaluated by ultrasound with no finding, 6 cases show sign of inflammation of breast tissue either related to duct system or the glands as shown in table no.3. 13 cases of bilateral breast pain consulting breast clinic. ultrasound examination for them done show no finding. as shown in table (4).

Table 4: U/S finding with bilateral breast problems.

Bilateral breast problem	No. of patient	Ultrasound finding	No. of patient
Breast mass	11	cyst	9
		Interstitial mass (fibroadenoma)	2
Nipple Discharge	12	Dilated ducts	8
		Intraduct debris	4
Pain	13	Normal	13

Discussion

The breast disease is sometime confusing unless its supported by ultrasound examination of these patients after clinical examination and the importance of these evaluation for follow up in future, so this study highlight the importance of ultrasound to evaluate patients with benign conditions. In compares with study done by Marchent DJ in north America in 2002 concentrate on diagnostic evaluation of breast should performed not only to confirm the diagnosis but also the extend of the disease. Careful evaluation begins on careful history for specific symptoms such as nipple discharge or mass so the examiner should note the date of onset, the history, the diagnostic plan for follow up [19]. One of the symptoms that our study concentrate on is the nipple discharge in 36 patients (24 cases unilateral 12 bilateral), with ultrasound all of those patients have finding which are dilated ducts with or without debris duct ectasia. A study of breast discharge and ultrasound with Doppler evaluation done by Hamed ST in 2008 show that symptomatic breast condition associated with nipple discharge can cause discomfort and anxiety to many women which is either the cause is duct ectasia or fibrocystic disease [20]. So, the study shows the rule of ultrasound examination regarding the duct system is highly sensitive 100% but less specific 82.4 %. In conclusion ultrasound is mandatory tool in diagnosis of pathological ducts. Unilateral duct ectasia is 37 patient (35%) bilateral duct ectasia 51 patient (47.7%) in age group 23-65 yr. Another study done by Diana M., Ferris-James, et.al published in 2012 this study describe the imaging appearance of normal duct anatomy, list the imaging appearance of benign and malignant diseases of ducts system show U/S is quickly becoming the new standard of reference for evaluation of suspected ductal disease the study show that by U/S, normal ducts are typically not visible; if visible, they appear as thin tubular anechoic or hypoechoic structures. A normal duct should taper peripherally and should not have focal areas of dilatation along its course. Evaluation of the retroareolar region with sonography often demonstrates mildly dilated ducts, which are usually secondary to a benign process [21]. This is goes with our study that the U/S is useful tool in diagnosing the ductal system abnormalities.

In our study the breast mass that found in unilateral breast were 10 cases 3 of them as fibroadenoma 5 as breast cysts and last 2 as intraductal papilloma were in case of bilateral breast mass 9 of them diagnosed by ultrasound as breast cyst (fibrocystic disease) and the last 2 as fibroadenoma of breasts. A study done by Laing F.C Jcan Assoc. Radiol. 1976 about ultrasound evaluation of the breast masses concentrate on that b-mode ultrasound contact scanning should be performed for any patient with a palpable breast mass that is 1cm or larger in diameter.

A study done by Andrea M. Bodine, MD; Brian Holahan, OMS IV about Benign Breast condition show that benign breast disease are present in some form in nearly all women. Breast masses and nipple discharge are common symptoms that cause women seeking medical care like in our study 57% of our patient (nipple discharge + breast mass). In this study approximately 50% of women have benign breast lesion and up 90% of palpable breast masses in menstruating women are begnin so basic ultrasound evaluation of underlying pathology of the breast problems provided the ability to assess the client breast complaint. Four common breast problems are described along with the guide lines, assessment and follow up by ultrasound in this study these are: Fibrocystic disease, Fibroadenoma, Mammary duct ectasia, Intraductal papilloma [23].

Also, a study done by Expert Panal on Breast imaging; linda Moy, and Samantha L Heller et.al in American college of radiology in 2017 concentrate on that any woman presenting with a palpable lesion should have a thorough clinical breast examination, but because many breast masses may not exhibit distinctive physical findings, imaging evaluation is necessary in almost all cases to characterize the palpable lesion. Recommended imaging options in the context of a palpable mass include diagnostic mammography and targeted-breast ultrasound and are dependent on patient age and degree of radiologic suspicion as detailed in the document Variants [24]. In our study the ultrasound evaluation was so useful in case of breast mass like 3 patients, with fibroadenoma, 3 with intraductal mass and 5 with cyst as fibrocystic diseases in case of unilateral breast mass patients while in bilateral breast masses diagnosed by ultrasound show 9 patients with cystic lesions (fibrocystic disease) and 2 patients with intraductal mass. So both study show the usefulness of ultrasound imaging in diagnosis of benign breast masses.

American study for evaluation of palpable breast masses 2005 done by SUSAN KLEIN, M.D., Southern Illinois University School of Medicine tell us that Ultrasonography can effectively distinguish solid masses from cysts, which account for approximately 25% of breast lesions. When strict criteria for cyst diagnosis are met, ultrasonography has a sensitivity of 89% and a specificity of 78% in detecting abnormalities in symptomatic women. Although ultrasonography is not considered a screening test, it is more sensitive than mammography in detecting lesions in women with dense breast tissue. It is useful in discriminating between benign and malignant solid masses, and it is superior to mammography in diagnosing clinically benign palpable masses (i.e., up to 97% accuracy versus 87% for mammography) [25]. That's why the ultrasound study is correlate with other studies about the important tool in examining breast lumps or mass. In our study U/S diagnosed 14 cases with breast cysts and 7 cases with breast masses which considered 21% of the cases examined

The last symptoms that the current study take it in consideration is pain (mastalgia) which show that 30 patients have focal breast pain with positive ultrasound finding in just 6 patient which show sign of inflammation while the remaining 24 patients are normal ultrasound evaluation. in case of bilateral mastalgia 13 cases examined. All of patient were normal ultrasound finding. A study done by Chetlen et. al in 2013 taking 236 patients with bilateral and focal unilateral mastalgia show just 3% of ultrasound finding in focal breast pain while in non-explained pain no ultrasound finding evaluated that's mean both study is nearly the same result that the ultrasound is not so informative in cases of bilateral breast pain but may be of somewhat informative in case of focal breast pain [26].

Another study done by Expert Panal on Breast Imaging; peter M Jokich, Lisa Bailey et.al published in Jan. 2017 American college of radiology, show that the breast pain remains a common cause of referral for diagnostic breast imaging evaluation. Appropriate workup depends on the nature and focality of the pain, as well as the age of the patient. Imaging evaluation is usually not indicated if the pain is cyclic or non-focal. For focal, noncyclic pain, imaging may be appropriate, mainly for reassurance and to identify treatable causes. Ultrasound can be the initial examination used to evaluate women under 30 with focal, noncyclic breast pain; for women 30 and older, diagnostic mammography is useful diagnostic tool [27].

Conclusion

Clinical examination with ultrasound evaluation is useful in examination of duct system in cases of discharge and of great importance in cases of breast masses either unilateral or bilateral which nearly to be diagnostic imaging superior to other imaging tools. but in case of bilateral or unilateral mastalgia the ultrasound has no significant rule just in some cases of focal breast pain.

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