

The accuracy of ultrasound in the diagnosis of breast diseases

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Abstract

The study was intended to evaluate the role of ultrasound as diagnostic technique in the diagnosis of breast diseases, comparing it to the conventional and widely used technique i.e mammography ,FNAC and histopathology.

THE breast diseases were divided according to their clinical and ultrasound criteria into simple cyst(10), galactocele (3), fibro adenoma (64), carcinoma (36), duct ectasia (6), abscess (3), mammary dysplasia (25) , and undetermined cases (3).

All those patients were subjected for pathological confirmation by needle aspiration cytology in (80) and/or excisional biopsy in 110 patients .Twelve patients refuse FNAC (18%). The age of the patients ranged from 15-80 years with a mean of 40 years .One hundred and fourteen(76), patients had benign lesions and 36 cases of them (24%) had malignant lesions. For cystic lesions like simple cyst, abscesses , and cystic changes of mammary dysplasia , the study shows 100% sensitivity , specificity and accuracy. For FNAC , the sensitivity , specificity, and accuracy were 91% 92% respectively. For carcinoma of the breast , thee sensitivity , specificity and accuracy were 86.7% , 91%. And 90% respectively ,which is less because of some overlap of the ultrasonic criteria of benign and malignant lesions .The sensitivity ,specificity and accuracy of ultrasound is high, especially in benign lesions . therefore ultrasound is an accurate , safe , and non-invasive technique for diagnosis of breast diseases in addition to be without danger of radiation, especially for young patients less than 35 years of age.

Introduction

The accurate diagnosis of breast lesion without resort to formal biopsy is highly desirable both for patients who can be quickly reassured or counseled and clinician who can reduce the unnecessary surgery.

Recently ,the less traumatic technique of aspiration cytology long accepted abroad has been gaining in popularity. Several centers well now make affirm diagnosis of malignancy on appositive cytology alone ,or as a part of a triple assessment.

The diagnosis of breast cancer is primarily based on x-ray mammography .

under optimal conditions ,a sensitivity of approximately 90% can be achieved. When strict criteria are observed for additional use of ultrasound the sensitivity can be increased to about 98%.

In addition the differential diagnosis between benign and malignant lesion can be improved and the rate of biopsy due false-positive mammography can be reduced.

Therefore ultrasound is indicated in the following conditions.

- 1-The palpable mass:- cystic or solid.
- 2-Whether are one or more circumscribed masses seen on

mammogram to determine if they are cystic or solid.

3-The dense breast.

4-Patients under 35 years of age.

5-There is palpable mass that cannot be placed on mammographic film or that is too deep for assessment of chest wall involvement mammographically¹⁰.

6-Evaluation of indeterminate lesions on mammography¹³.

7-Patient has had breast augmentation surgery and has a palpable abnormality not completely evaluated by mammography alone.

8-A clinically non-palpable mass seen by mammography (occult mass)

9-Localization of occult lesions preoperative localization by insertion of a hook wire or needle under ultrasound guide.

10-In pregnant and lactating patients.

11-For fine needle aspiration cytology and cyst aspiration.

12-Detection of lymph node enlargement (number and size).

Patient and method

The study was intended to evaluate the role of ultrasound as diagnostic technique in the diagnosis of breast disease comparing it to the conventional and widely used technique i.e. mammography ,FNAC ,and histopathology .

The breast diseases were divided according to their clinical and ultrasound criteria into simple cyst(10), galactocele(3), fibro adenoma (64), carcinoma (36), duct actasia (6),

abscess(3), mammary dysplasia(25), and in determined cases(3).

All those patients were subjected for pathological confirmation by needle aspiration cytology in(80) and/or excisional biopsy in (110) patients. Twelve patients refused FNAC(18%) . The age of the patients ranged from 15-80 years with a mean age of 40 years . One hundred and malignant lesions .For cystic lesions like simple cyst ,abscesses and cystic changes of mammary dysplasia , the study shows 100% sensitivity, specificity and accuracy .for FNAC ,the sensitivity , specificity , and accuracy were 91% and 92% respectively. For carcinoma of the breast , the sensitivity , specificity , and accuracy were86.7% , 91%, and 90% respectively, which is less because of some overlap of ultrasonic criteria of benign and malignant lesions . The sensitivity , specificity , and accuracy of ultrasound is high ,in benign lesions , therefore ultrasound is accurate , safe and non-invasive technique for diagnosis of breast diseases in addition to be without dangers of radiation , especially for patients less than 35 years of age.

Results

Total number of hundred fifty patients with various types of breast disease or lesions were examined by ultrasound .

Of 150 pathologically confirmed cases , 30 cases had fibro adenoma , 25 had mammary dysplasia , 19 with breast cyst , 8 with duct actasia ,3 with galactocele ,4 with breast abscess , 4 with chronic inflammation , and 2 patients had fat necrosis.

The age distribution of all cases shown in table 1

Age group (Years)	Total no. of Patients		Patients with malignant lesions	
	NO.	%	NO.	%
15-29	42	28	1	3.4
30-44	67	44.7	14	46.6
45-64	31	20.7	6	20
65-80	10	6.6	9	30
Total	150	100	30	100

Table (2): he presenting features perceived by the patient in their order of frequency

Clinical Feature	NO. of patients	%
Breast mass only	98	65.4
Breast mass+pain	23	15.3
Pain only	11	7.3
Nipple discharge	8	5.4
Bilateral breast mass	2	1.3
Mass + node discharge	2	1.3
Mass + nipple discharge	3	2
Mass + skin discharge	3	2
Total	150	100

The most presenting symptoms is the breast mass.

Breast	NO. of cases	%
Left breast	98	65.3
Right Breast	50	33.3
Bilateral	2	1.4
Total	150	100

The anatomical distribution of breast diseases is shown in table (3).

Most of the breast diseases are located in the left breast 65.3% , followed by right breast 33.3% , and bilateral in 1.4%

The location of breast masses in the breast shown in table(4).the UOQ 40% , of total and 60.9% of malignant diseases , followed by UIQ .

Table(4): The anatomical distribution of breast masses as shown by ultrasound (total & malignancy)

Location of the mass	Total No. of masses		Malignant masses	
	NO.	%	NO.	%
Upper outer quadrant	68	41.2	14	60.9
Upper inner quadrant	30	18.2	3	13
Lower outer quadrant	25	15.1	2	8.7
Lower inner quadrant	20	12.1	1	4.4
Central	15	9	-	-
Diffuse breast mass	3	1.8	3	13
Axillary tail	2	1.3	-	-
Bilateral	2	1.3	-	-
Total	165	100	23	100

Table 5-comparison between ultrasound and pathological data in evaluation a breast mass.

		Histopathology		Total
Ultrasound	M	26 a	10 b	36 a+b
	B	1 + 1+ 1 + 1c	110 d	114 c+d
Total		30 a+c	120 b+d	150 a+b+c+d

1-sensitivity= 86.7% 2- specificity= 91.6% 3-accuracy=90.6%

Table (7)-shown the diagnostic accuracy of sonography in malignancy

Cancer				
Histopathology				
		Cancer	Non	Total
Ultrasound	Cancer	26	10	36
	Non	4	110	114
	Total	30	120	150

1-sensitivity=86.7% 2-specificity=91.6% 3-accuracy=90.6%

Table(8) show diagnostic accuracy of sonography in fibro adenoma

Fibro adenoma				
Histopathology				
		Fibro adenoma	Non	Total
Ultrasound	Cancer	58	6	64
	Non	6	80	86
	Total	64	86	150

Table (9) shown the diagnostic accuracy of sonography in cystic lesions

Cyst				
Histopathology				
		Cyst	Non	Total
Ultrasound	Cancer	10	0	10
	Non	0	140	140
	Total	10	0	150

Discussion

Ultrasonography of the breast is an essential technique in the diagnosis of mammary disease similar to mammography and fine needle aspiration .It is extremely reliable tool in differentiating cystic from solid breast lesions.

High resolution ultrasonic scanning permits solid tumor of the breast as

small as 5mm. and cystic lesions of 2mm in diameter to be detected ¹⁵ palpable mass of the breast are most suitable for sonographical examination.

The age distribution on this series indicates two peaks of malignancy , the first one is between 30-44 years(44.7%) , and the second one is between 65-80 years.

The commonest presenting symptoms was breast lump without pain or other complaining, and this was true in about 2/3rd of patients (65.4%), while lump associated with pain seen in 15.3%. Breast pain was present only in 7.3% of the patients.

The majority of malignant breast masses were located in UOQ of breast 61.2% of the patients

Sonographic diagnosis of breast cyst can be made with a very high accuracy, and sonography alone is sufficient to establish reliable diagnosis of a pure simple cyst.

In cystic lesions in differentiating cystic from solid masses of the breast our data of 100% accuracy rate for sonographic diagnosis is in full agreement with the literatures.

In benign breast diseases, sonography is of value in areas of varying radiologic density. It can be more ready identify the nature of such density and it has the additional advantage of being able to exclude circumscribed mass lesion in areas clinically nodular, and radiologically dense.

So in benign breast disease, the ultrasound provide diagnosis in 3 out of 4 patients with uncertain diagnosis in mammography, which were radiologically hidden by breast density or unsuitable sited for x-ray examination like extreme medial side of the breast.

The image quality and diagnostic reliability strongly depend on sonographic equipment and the operator.

In our study, the accuracy rate in the diagnosis of fibro adenoma was 92%. Fleisher et al, reported accuracy rate of 89% using (5-7mhz) transducers²⁷ and Nobushige et al reported accuracy rate of 93% using (7.5mhz) transducers²⁸.

Pregnant or lactating patients should be ideally examined sonographically, since it is non-invasive test. Lactating breast a problem for mammography examination as it usually causes a white-out appearance with little diagnostic details⁷.

To evaluate benign versus malignant characters of solid breast mass by ultrasonic imaging, attention must be paid to several imaging characteristics, rather than relying upon a single finding, such as irregular mass, polymorphous, with spicules and strongly heterogeneous echogenicity and there is attenuation of posterior echoes with acoustic shadow.

In investigating breast malignancy, sonography is mainly helpful when the malignancy present as a mass³⁹.

In determining malignant lesions, our sensitivity, specificity, and accuracy value were 86.7%, 91.6%, and 90.6% respectively.

These results correlate closely with published data of other who record ultrasound accuracy for malignancy varying from 80-90%^{24,33,37,44}.

Conclusion

This study in agreement with the available literatures has revealed that real-time sonography is a simple, safe, time saving, non-invasive, useful tool for investigating breasts with palpable masses.

It cause no discomfort, free of potential radiation hazards and can, therefore be repeated as often as it is necessary.

Those features have led us to agree with other authors that sonography is recommended as a conventional primary tool for patients under the age of 35 years. Moreover, it can be very reliably discriminate cystic from solid masses, solitary from multiple nodules, and can offer more detail about the nature of solid lumps to verify the possibility of malignant nature of these lumps.

It has been found in our study that it is possible to differentiate benign from malignant masses with a high degree of accuracy considering the difficulties in differentiating benign from malignant breast lesions. Ultrasound is helpful to guide fine needle aspiration to verify nature of equivocal cases.

The present ultrasound technology is rather poor in visualizing small solid lesions in fatty breast and cannot reliably detect micro-calcification therefore , sonography has no as yet , in screening early breast cancer cases.

References

- 1-Smallwood J, khong Y, boyd A, Guyer PB, Herbert a, Cooke T, Tsylor I. An assessment of a scoring scheme for the preoperative diagnosis of breast lumps. Am R COLL, Eng 1984;66 :2511-7.
- 2-Burns PE. False negative mammograms and delay in diagnosis of breast cancer .N Engl J Med 1987;299:2012.
- 3-Gardech TI, Melcher DM, Hogbin BM, Smith RS. Aspiration cytology in the management of breast cancer. Lancet 1980 ;2:790-2.
- 4-Dixon JM, Anderson TJ, Lamb J, Nixon BJ, Forrest APM. Fine needle aspiration cytology in relationship to clinical examination and mammography in the diagnosis of a solid breast mass. Br J, Sorg 1984;593-6.
- 5-Kirby I, Bland, Michael P, Vezeridis and Edward M, Copol and III.
- 6-Walter FA, Bell B, Die Bedeutung der B. Scan sonography in der kopfund Halschirurgte . Dtsch Z Mud-Kiefer-Geichts Chir, 1985;9:207.
- 7-Schneck CD, Lehman DA .Sonographic anatomy of the breast. Seminar in ultrasound 1982;10:33.
- 8-Basset LW, Corolyn Kimme-Smith. Breast sonography .seminar in ultrasound, CT, and MRI 1989;10:82-87.
- 9-Kessler M, Milz p, Sittek H et al. Imaging method in disgnosis and differential diagnosis of breast cancer . Bildburg 1995;62:160-172.
- 10-Jackson VP, Sonography of malignant breast disease. Seminar in ultrasound, CT, and MRI, 1989;10:119-131.
- 11-Smallwood JA, Guyer P, Dewbury K et al. the accuracy of ultrasound in the diagnosis of breast disease. Ann R Coll Surg. Eng 1986;86:19-22.
- 12-RUBIN E, Koehler RE, Urist MM. Ultrasound of the breast, what are the indications ? The Alabama Journal of medical sciences, 1986;23:192-195.
- 13-Mscsweeney MB, Murphy CH. Whole breast sonography. Radiologic clinics of north America, 1985;23:157-167.
- 14-Fletcher R. Clinical epidemiology .The essential 2nd ed. Baltmor: William and Wilkins, 1989;42-75.
- 15-Brombart JC. Breast sonography. J Belg-Radiol, 1995;78:34-38.
- 16-Mann CV, RUSSELLE RCG. The breast in ; Baily and loves, short practice of surgery, 23rd ed, Hong Kong, ELBS with champum and HULL, 1991;788-821.
- 17-Hadi AM. Correlation between mammographic and operative findings in breast mass. Collage of medicine, Baghdad university, 1988.
- 18-Walsh P, Baddeley H, Timms H et al. An assessment of ultrasound, mammography as an additional investigation for the diagnosis of breast disease. Br J Radiol, 1985;58:115-119.
- 19-Sickles EA, Filly RA, Callen PW et al. Benign breast lesions, ultrasound detection and diagnosis . Radiology, 1984;151:467-470.
- 20-Stasser K, Buchburger w, Hamberger L et al. Sonography in breast diagnosis. Radiology 1990;30:130-134.
- 21-Textidor HS. The use of ultrasonography in the management of mass of the breast. Surg Gynecol Obstet. 1980;150:486-490.
- 22-Baum G. Ultrasound mammography. Radiology, 197;122:199.
- 23-Cole Beuylet C and Belque RA. Continuous ultrasound B-scanning of palpable breast masses. Radiology, 1975;117:123.
- 24-Jellins J, Reeve TS, Crol, and Sydney, Australia, 1972-1979. seminar in ultrasound, 1982;3:38-50.
- 25-Fornage BD, Lorigan JG, Andy E. Fibro adenoma of the breast, sonographic appearance. Radiology 1989;172:671-675.
- 26-Croll J, Katevich K and Tbre HM. Diagnosis of benign disease and the exclusion of malignancy in patients with breast symptoms. Seminar in ultrasound 1982;3:38-50.
- 27-Fliescher AC, Muhletaler AC, Reynolds VH et al. Palpable breast masses: evaluation by high frequency, hand-held real-time sonography and xeromammography. Rdiology 1983;148:467-470.

- 28-Nobushigie H, Nagaratamaki, Yoshihiva Y et al. Real time sonography of palpable breast masses. The British Journal of radiology, 1985; 58:611-615.
- 29-Jellins J, Kossoff G, Reeve TS. Detection and classification of liquid-filled masses in the breast by gray scale echography. Radiology, 1977; 125:205-211.
- 30-Cole Beuylet C, Soriano RZ, Krutz AB et al. Fibro adenoma of the breast; sonomammography correlated with pathology. A J R, 1985; 140:369-375.
- 31-Heywang SH, Lipsit ER, Glassman LM et al. Specificity of ultrasonography in the diagnosis of breast masses. Journal ultrasound medicine, 1984; 3:453-461.
- 32-Maturo VG, Zusmer NR, Gilson AJ et al. Ultrasound of the whole breast utilizing a dedicated automated scanner. Radiology, 1980; 137:457-463.
- 33-Texidor HS and Kazam E. Combined mammographic and sonographic evaluation of breast masses. American Journal of Roentgenology, 1977; 128:409-417.
- 34-Harper AP, and Kelly Gry E. Ultrasound visualization of the breast in symptomatic patients. Radiology, 1980; 137:465-469.
- 35-Cole Beuglet C and Beique RA. Continuous ultrasound B-scanning of palpable breast masses. Radiology 1975; 117:123.
- 36-Kobayashi T. Clinical ultrasound of the breast, 1st ed, New York; Fearom 122 :207-214.
- 37-Croll J, Kotevich K and Tubrett M. Diagnosis of benign disease and the exclusion of malignancy in patients with breast symptoms. Seminars in ultrasound, 1982; 3:38-50.
- 38-Kobayashi T. Gray scale echography of breast cancer. Radiology, 1977; 122:305-311.
- 39-AL-Dabbagh AA, AL-Baghdadi TM. Evaluation of the sonographic features of malignant breast masses. Annals of Saudi medicine. 1996; 1:111.
- 40-Harper AP, Kelly Fry E, Noe JS et al. Ultrasound in the evaluation of solid breast masses. Radiology, 1983; 146:731-736.
- 41-Haagensen CD. Diseases of the breast. Philadelphia; WB Saunders CO. ,1976; 706.
- 42-Fournier D, Androux R. Ultrasonography of the breast. Therapeutische Umschau 1997; 54:6-12.