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Correlation of mammography and sonography in palpable breast lesions.

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Abstract

Breast lump is a common problem affecting females which requires proper work up, early diagnosis and treatment. Mammography is used as both screening modality and as an efficient technique to evaluate clinically suspected breast lesions. High resolutions sonography is a adjunct used in detecting lesions in dense breast and supplementary assessment of breast lesions.
AIM: To determine the sensitivity, specificity, positive predictive value (PPV), negative predictive value (NPV),of mammography, sonomammography and both
Materials and methods: Fifty patients with suspicious breast masses were evaluated with mammography, sonomammography and were correlated,. Sensitivity, specificity, PPV, NPV and accuracy were computed for mammography, sonomammography and combined tests, characteristics of mammography and sonomammography of breast lesions which help to differentiate benign from malignant lesions are assessed.
Results: Overall accuracy of mammography was 86% with high false positive rates .Ultrasound was 96% accurate in detecting breast lesions. Difference in accuracy of mammography and sonography alone is significant.
Conclusion: Combined mammographic, sonomammographic evaluation of breast masses was more accurate than either method.

Keywords: Mammography,Sonography, Palpable breast lesions

Introduction

Breast diseases are one of the most feared disease by women all over the world[1-3]. Common pathologies of female breast include benign lesions like fibroadenomas, simple cysts, fibrocystic diseases, breast abscess, galactocele, ductectasia, enlarged lymph nodes and malignancies[4].

Incidence of breast cancer as per the ICMR studies show that one in the every 22 women is likely to suffer from breast cancer. Incidence has almost doubled in the last 24 years and it is expected to increase per year by 3%. At least 80% patients are in the advanced stages when they come to hospital. It is responsible for 20% of cancer related deaths in womens[1-3].

Standard technique of breast imaging include screen film X-Ray mammography and real time ultra sound. Other techniques are MRI, Colour Doppler, contrast enhanced ultrasound, scinti mammography and digital mammography[5]. Diagnostic mammography is highly accurate in the diagnosis and follow up of breast lesions, is safe, simple, acceptable and reproducible. Basic limitations of mammography are that solid and cystic masses cannot be differentiated. In a young breast ,due to dense fibroglandular tissues, masses can be obscured [6]and mammographic sensitivity may be as low as 30 to 48%. False negative rate of mammography in the detection of breast cancer has been reported to be around 10%. Therefore a negative mammography cannot exclude malignancy in women with palpable mass.[7]

The other imaging modality ultrasound should be considered in most instances in palpable breast findings especially in young women. Ultrasound is mostly useful to define a benign etiology of palpable lump that may not be evident on mammography such as lipoma or oil cyst. Primary advantage of ultrasound is its ability to directly correlate the physical examination finding on imaging.

In the patients younger than 30 yrs of age or pts who are pregnant, ultrasound may be the first or sole imaging modality to evaluate breast pathologies. Other uses of breast ultrasound include potential staging of cancer, evaluating breast implants and for guiding interventional breast procedures.

Ultrasound evaluation in addition to mammography can help to distinguish between solid and cystic lesions[8].Ultrasound is 96%to 100% accurate in diagnosis of cysts[9-12].

Ultrasound decreases the number of biopsies for benign masses in 25to35% cases by reliably identifying simple cysts.

It is more sensitive in detecting lesions in women with dense breast tissue, discriminates benign and malignant solid masses and is superior to mammography in diagnosing clinically benign palpable masses[13]. Ultrasound is limited by the failure to detect microcalcificattion[14].

Use of multiple modalities in diagnosing palpable masses increases the true positive rate. In two series evaluating palpable abnormalities, sensitivity of mammography was 86-91%[6,13]. Addition of ultrasound detects 93-100% of cancers that are occult on mammography[13,15]. Addition of ultrasound to mammography may also improve detection of benign etiology for a palpable finding. In one of the series, 40% benign palpable masses were identified only on ultrasound[6].Interval palpable breast lumps should be evaluated with targeted ultra sound. Mammography does not appear to add value beyond sonography performed by trained professionals and should not be routinely performed.[16]

Keeping in view, the limitations of individual modalities, we aimed in our study to evaluate palpable breast masses using mammography and ultrasound than either method along and correlated them with histopathological results[17].

Objectives of study:

1. To study the role of ultrasound in the diagnosis of palpable breast lesions
2. To study the role of mammography in the diagnosis of palpable breast lesions.
3. To establish a correlation between mammography and ultrasonography findings.

Materials and Methods

The study of correlation of mammography and sonography in palpable breast lesions was conducted in the Department of Radio diagnosis, Govt. Medical College and Hospital, Amritsar, on fifty female patients presenting with palpable

breast lump, After taking informed written consent of the patient or her relative, patients were subjected to breast examination. Then patients underwent mammography in the .

presence of female attendant. Both mediolateral oblique and craniocaudal views were done of each breast after firm compression(see fig 1)
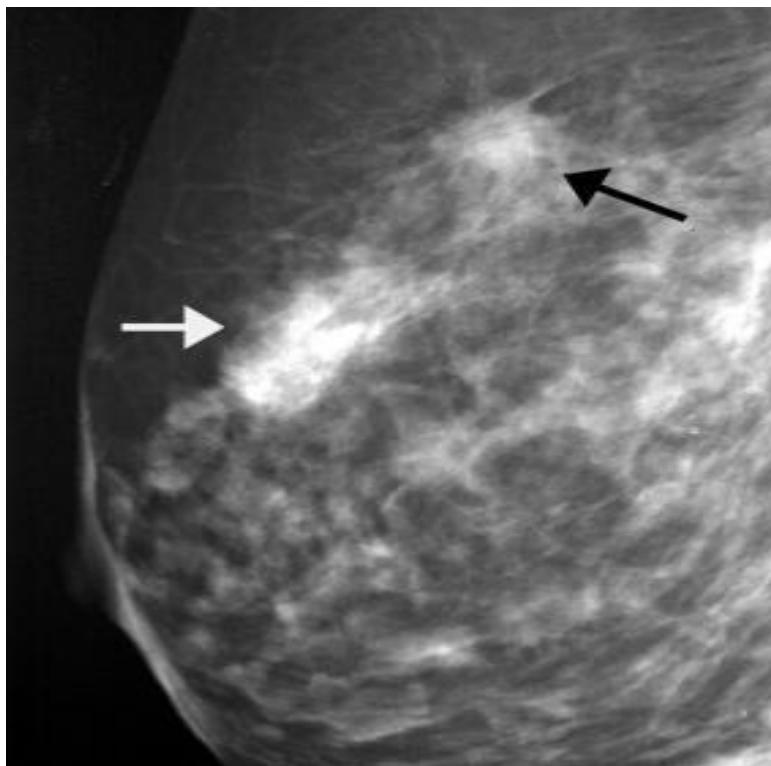
(Figure 1)

Mammography was done on MAM VENUS ALLENGERS equipment. Mammographic assessment was followed by ultrasonographic evaluation of breast using a real time scanner(Philips Envisor C) with 5to 12 Mhz broad band linear array probe with breast preset. Each quadrant of breast with lesion was scanned in radial and antiradial planes. Both breasts were scanned in every case for comparsion. Axilla was also scanned for any enlarged lymph nodes. The result of study were systematically collected ,assimilated and analysed to draw valid conclusion and correlate mammography and ultrasound in the diagnosis of palpable breast lesions.

Results

Age group of patients in our study varied from 19-60 yrs with maximum no. of cases being in the age group of 41-50 yrs. Benign cases especially fibroadenomas presented in the younger age group. Malignant cases presented in older age group with maximum no. of cases in more than 40 yrs of age. Out of 50 Patients presenting with lump breast,34 patients had benign disease,20 patients,(40%) had fibroadenoma, 4 patients had simple cysts and 4 patients had fibrocystic disease of breast. Other benign causes of palpable lump were lipoma 2%, phylloide(2%), lactational mastitis 4%, and chronic inflammatory disease of breast. Out of 50 patients 16(32%) patients had breast cancer.

Table 1 Distribution of patients according to final histopathological diagnosis

Final diagnosis	No. of patients	%age
Fibroadenoma	20	40.0
Simple cyst	4	8.0
Fibrocystic disease of breast	4	8.0
Lipoma	1	2.0
Phylloides	1	2.0
Lactational mastitis	2	4.0
Chronic inflammatory disease of breast	2	4.0
Malignancy	16	32.0

The results of mammography and sonography were correlated with histopathological results.On mammography, 27 lesions were diagnosed as benign in nature and on histopathology all were proved to be benign.None of the lesion described as benign in nature was proved to be malignant. 23 lesions were diagnosed as malignant on mammography, however on histopathology only 16 proved to be malignant. Seven lesions were falsely diagnosed as being malignant on mammography, Thus mammography is highly sensitive in detecting malignant cases but has high false positive rates(7 out of 23). So mammography is a good screening modality(high sensitivity) for breast cancers. On sonography, 34 lesions were diagnosed as benign,out of which 33 were proved to be benign and only one lesion was malignant in nature. Sixteen lesions were diagnosed as being malignant,out of which 15 proved to be malignant on histopathology and only one was benign in nature. So sonography is highly sensitive and specific in diagnosing benign and malignant lesions of breast.

Table 2 showing Comparison of mammorgraphy and sonography in diagnosing breast lesions

Type of lesion	Sensitivity	Specificity	Positive predictive value	Negative predictive value	Accuracy
Benign lesions					
• By mammography	79.4%	100.0%	100.0%	69.57%	86.0%
• By sonography	97.06%	93.75%	97.06%	93.75%	96.0%
Malignant lesions					
• By mammography	100.0%	79.41%	69.57%	100.0%	86.0%
• By sonography	93.75%	97.06%	93.75%	97.06%	96.0%

For benign lesions, sensitivity, specificity, positive predictive value and accuracy was 79.41% 100% ,100% , 69.57%,86% for mammography and 97.06%, 97.06%, 93.75%, 97..06% 93,75%,and 96% for sonography respectively.

For malignant lesions of breast sensitivity, specificity,positive predictive value, negative predictive value and accuracy was 100%,79.41%,69.57%,100%,86% for mammography and 93,75%, 97.06%, 93.75%, 97.06%,and 96% for sonography respectively. So mammography is highly sensitive in diagnosing breast malignancies but has less specificity. Ultrasound is highly sensitive and specific in diagnosing both benign and malignant pathologies.

Table 3 showing Comparison of overall accuracy of mammography and sonography

Accuracy of mammography	Accuracy of sonography
86%	96%

Out of 50 lesions, mammography could accurately characterize nature of 43 lesions as being benign(27/27) or malignant (16/23), seven lesions were falsely diagnosed as being malignant. Hence accuracy of mammography in our study was 86%.Out of 50 lesions, ultra sound could accurately diagnose 48 lesions. Hence accuracy of ultrasound was 96%. The difference in accuracy of mammography and sonography is significant. Thus ultra sound is superior to mammography in diagnostic accuracy.

Discussion

Breast disease is the most feared disease among females. Purpose of our study was to correlate mammography and sonography in palpable breast lump.

In the present study, age group of 50 females varied from 19-60 yrs with maximum no. of cases being in the age group of 41-50 yrs. Benign cases presented in younger age group. Malignant cases presented in older age group(10/16) were more than 40 yrs, This was in accordance with study conducted in2007 by Prasad.[18,19]

Most common clinical complaint was a palpable lump seen in100% of cases. Pain was seen in benign lesion. This was in accordance with study conducted in 2011. Nipple and skin retraction and fixity of lesion were associated with malignancy.[14]

On palpation 10% lesions were soft, 46% were firm and 36% were hard in consistency. Majority of firm masses (23/28) were benign.Majority of hard masses (11/18) were malignant. Out of 23 non mobile lesions fixed, 15 were malignant in nature. These were in accordance to the study conducted to evaluate palpable massesin 2005. Malignant masses are generally hard ,immobile and fixed to the surrounding skin and soft tissues[14,20].

Left breast masses was more commonly involved in breast pathologies[21].Upper outer quadrant was involved in maximum no.of cases(66%) which is consistent with other studies reflecting greater amount of breast tissues in this quadrant as compared toother quadrant[21].

Out of 50 patients, 20 had fibroadenomas, 4 had simple cysts, 4hadfibrocystic disease of breast,4 had mastitis and 16 patients had malignancy. While most cases of fibroadenomas (13/20) were seen in patients less than 30yrs, malignancy was seen more commonly in patients older than 40yrs, This was consistent with other studies also[18].

On mammography assessment of patients, it was observed that breast density varied according to age of patient. Majority of young patients less than 30trs had dense or heterogeneously dense breast. Density of breast tissue decreases with advancing age because fibroglandular tissue is replaced by fatty tissue. Sensitivity and accuracy of mammography in dense breast was about 50%. This was in accordance to study in 2014 where mammographic sensitivity in women with dense breast can be as low as 30-48%[19,20,22].

On mammography, features in favour of benign lesions included well defined smooth margins, oval or round shape and normal breast architecture.On the other hand ill defined speculated lesions taller than wider lesions, architectural distortion, nipple and skin retraction microcalcifications are the features suggestive of malignancy[6,14]. Mammography is more sensitive for detecting microcalcification[4,22].

On mammography, it was not possible to determine whether the lesion was solid or cystic in nature . Cases of fibrocystic disease of breast were falsely diagnosed as being malignant. Also we were unable to diagnose cases of lactational mastitis as it was uncomfortable for such patients to undergo mammography. Both cases of lactional mastitis were falsely diagnosed as malignant[4,19,21].

On ultrasound, out of 50 lesions, 8were cystic in nature .Primary advantage of ultrasound is to distinguish between solid and cystic lesions. In our study it was possible to correctly diagnose such cases with 100% accuracy with ultra sound. This was consistent with other studies in which accuracy of ultrasound to diagnose cystic lesions varied from 96-100%. However with mammography it was not possible to differentiate these 4cases of simple cysts from fibroadenomas. Similarly with mammography cases of fibrocystic mastitis mimicked malignancy[4].

On sonography,size ,shape margins, echogenicity, echotexture, blood flow and width to height ratio(W:H) of lesions was observed. Out of 50 lesions 16 lesions had W:H ratio greater than 1:4 and all of these 16 lesions were benign suggesting that benign lesions were wider than taller in shape and malignant lesions were taller than width.This was found in all 15 malignant lumps.These findings were in tune with various studies[23,24,25].

On ultra sound lesions with smooth margins were mostly benign (22/23) while lesions with angulated and speculated margins were mostly malignant(10 out of 13) . Likewise lesions with lobulated margins were benign(8out of 8) and lesions with microlobulations were malignant (4out of4). These findings were consistent with other studies[4,23].

On ultrasound, anechoic, isoechoic and hyperechoiclesions were found to be benign.Out of 33 hypoechoic lesions,20 were benign and 13 were malignant in nature. 4 lesions were hetrogenious in echotexture of which 3 were malignant and only 1 was benign. These findings were consistent with findings in other studies[25].

On color Doppler study all lesions with absent vascularity(9/9) and with minimally increased peripheral vascularity(20/21) were benign. 20 lesions showed markedly increased vascularity both centrally and peripherally,of these 15 were malignant in nature. This was in accordance with various studies[26,27].

Assesment of lymph nodes on ultrasound was done. Lympadenopathy was seen in 22 patients out of which 10 were benign and 12 were malignant. Most specific sign of detection of metastasis was absence of hilus and least specific sign was long to short axis ratio. Metastatic lymphnodes showed increased vascularity both peripherally and centrally. These features were in accordance to various studies[26].

With ultrasound it was possible to delineate lesions in young patients who had dense and heterogeneously dense breast. Ultrasound was a better modality to diagnose lesions in lactating women. Also it was comfortable for patients of mastitis with tenderness to undergo ultrasound(no compression needed as needed in mammography) .So it was observed that ultrasound is a preferred modality in all age groups when compared to mammography.

Overall accuracy of mammography is 86% with high false positive rates. Ultrasound was 96% accurate in detecting breast lesions, It showed high sensitivity and specificity in evaluating breast lesions. Difference in accuracy of mammography and sonography is significant

Conclusion

Ultrasound is better in younger populations with BIRADS1,2,3 lesions .Mammography is better in older patients and BIRADS 4,5 as with age breast density decreases and sensitivity of mammography increases. Mammography is the best screening modality for breast cancer.

Overall to consider a single modality, ultrasound is superior to mammography inaccuracy to evaluate and characterize palapable breast lesions in all age groups and all breast pathologies. Combining both modalities will increase diagnostic accuracy.

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