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Evaluation of Breast Masses in Hilly Areas, an Initial Experience

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Abstract

Objective: *Evaluation of breast masses with mammography and sonography and comparison with Fine Needle Aspiration Cytology (FNAC)/ histopathology examination.*

Materials and Method: *The study consisted of 25 women with incidentally detected breast masses in hilly population of Himachal Pradesh in 1 year period, in the age range of 24 to 70 years. Mammography of the symptomatic breast was done first and two standard views i.e. craniocaudal (CC) and mediolateral oblique (MLO) were obtained. All patients were then subjected to real time ultrasound scanning with 7.5 MHz linear array transducer. FNAC was done in all cases and histopathological examination was performed on all operated specimens.*

Results: *Out of 25 patients, mammography alone characterized 18 patients as having malignant lesions and seven as having benign masses.*

By using sonography alone 15 patients were diagnosed as having malignant masses, nine had benign lesions and one lesion was indeterminate. When mammography and sonography were combined together, 17 patients were diagnosed as having malignant masses and eight patients as benign masses.

On mammography, the most characteristic feature of malignant lesions was a spiculated mass in 75% cases or irregular margins in 25% cases. Mare's tail was seen in 19% cases and denotes a malignant pathology. On sonography, the contour of malignant masses was irregular in 88% and smooth in 12%. Margins of benign masses were smooth (67%), irregular (22%) or were not made out in (11%). In benign masses, the contour was smooth in 56%, irregular in 33% and a pseudocapsule was seen in 11%. 94% of the masses were hypoechoic in appearance and 6% masses showed extensive hypoechogenicity. Edge shadowing was present in 63%, extensive posterior shadowing in 6% and neutral sound transmission was seen in 31% malignant lesions. Sound transmission was neutral in 78% and edge shadowing was present in 22% benign masses.

Malignant masses were of high density in 94% and of mixed density in 6% patients. On the other hand, high density was seen in 67% benign masses and mixed density in 33%. Microcalcifications were present in 19% malignant masses and macrocalcifications were seen in 4% benign masses.

Conclusion: *Mammography is the initial imaging investigation of choice for detection and characterization of breast masses. Sonography is a useful adjunct to mammography for evaluating breast lesions. Combined evaluation of breast masses with mammography and sonography gives higher accuracy rate than either method alone.*

Keywords: *Breast masses, mammography, sonography.*

Introduction

Breast cancer is the second most common cancer in developing world after cancer of cervix in women[1]. Every symptomatic breast patient over 30 years of age, any woman with a dominant palpable mass, and every woman scheduled for breast biopsy require mammography[2].

Mammography is the gold standard for diagnosis of breast cancer and no other method approaches its effectiveness. Regular use of mammography screening can reduce the mortality rate of breast cancer by 20-30% in women older than 50 years [3, 4].

Breast sonography is appropriate in the initial evaluation of women younger than 30 years with a palpable lump. It is frequently used as an adjunct to mammography in evaluation of breast masses, persistent focal asymmetric densities and palpable abnormalities not seen on mammography[5]. Sonographically guided core needle biopsy is a readily performed, diagnostically accurate alternative to stereotactic or excisional biopsy[6].

Materials and Methods

The study consisted of 25 patients with breast masses, referred to department of Radio-diagnosis for breast imaging. The age of the patients ranged from 24 to 70 years. All patients were investigated with both mammography and ultrasound. Mammograms were obtained on a dedicated mammography unit, "Melody B" villa systemi medicali. Two standard views i.e. craniocaudal (CC) and mediolateral oblique (MLO), were obtained of the symptomatic breast. Mammograms of the other breast were also obtained wherever indicated. MLO views were taken at 45^0. The CC and MLO views were done at 27 and 27.5 KVp respectively with automatic exposure control. High speed single emulsion film screen combination was used and the films were processed in an automatic processor. All patients were then subjected to real time ultrasound scanning with 7.5 MHz linear array transducer (GE 3200) and a hard copy of the sonograms obtained. While scanning, patient's ipsilateral arm is raised and placed behind her head. This maneuver spreads the breast, thereby decreasing the amount of tissue the ultrasound beam must penetrate. For large or pendulous breasts, the patient is rotated to the contralateral side, which helps to image the outer quadrants. Lesions in upper breast are best imaged with patient seated.

The breast masses were classified into benign and malignant lesions according to following mammographic features: shape, margins, density and calcifications. In addition the following secondary signs of breast cancer were also looked for: asymmetric density, architectural distortion, asymmetric prominent ducts, asymmetric vessels, skin changes and adenopathy.

The breast masses were evaluated sonographically by applying the following criteria; shape, contour, echogenicity, sound transmission, echotexture and surrounding tissue.

Fine needle aspiration cytology (FNAC) was done in all cases in outpatient department with or without ultrasound guidance. Histopathological examination (HPE) was also performed on all operated specimens. The results of final diagnosis were correlated with the individual mammographic and sonographic diagnosis. The accuracy of mammography and sonography alone and in combination was calculated.

Results

Results of the study are given below in tabulated form.

Table No. 1 Primary mammographic features of breast masses in 25 cases

	Pathologic type	Carcinoma	Benign
	Number of cases	16	09
Shape			
	Round	08	02
	Oval	04	06
	Round to oval	02	00
	Irregular	01	00
	Vague	01	01
Margins			
	Spiculated	12	00
	Irregular	04	02
	Smooth	00	06
	Indistinct	00	01
	Mare's tail	03	00
Density			
	High density	15	06
	Mixed density	01	03
Calcifications			
	Microcalcifications	03	00
	Macrocalcifications	00	01

Table no. 2 Secondary signs of breast cancer demonstrated on mammography

Pathologic type	**Carcinoma**	**Benign**
Number of cases	16	09
Asymmetric ducts	05	01
Architectural distortion	04	00
Asymmetric density	01	00
Skin changes	01	00

Table No. 3 Sonographic features of breast masses in 25 cases

Pathologic type		**Carcinoma**	**Benign**
Number of cases		16	09
Shape			
	Round	08	02
	Oval	06	04
	Round to oval	01	02
	Irregular	01	00
	Lobulated	00	01
Contour			
	Irregular	14	03
	Smooth	02	05
	Pseudocapsule	00	01
Echogenicity			
	Hypoechoic	15	09
	Extensively hypoechoic	01	00
Sound transmission			
	Edge shadowing	10	02
	Extensive posterior shadowing	01	00
	Neutral	05	07
Echotexture			
	Homogenous	05	06
	Heterogenous	11	03
Sorrounding tissue	Normal	07	08
	Distortion	07	01
	Hyperechoic rim	02	00

Table No. 4 Comparison of accuracy of mammography, sonography and combined accuracy of mammography and sonography

Accuracy of	Carcinoma breast	Benign masses
Mammography alone	16/16 =100%	7/9= 78%
Sonography alone	14/16 = 88%	6/9=67%
Combined mammography and sonography	16/16=100%	8/9= 89%

Discussion

Majority of the carcinomas were round (50%) in shape, 25% were oval, 13% were round to oval and in 12% the shape was not made out. On the other hand, benign masses were predominantly oval in shape (67%), round masses were seen in 22% and in 11% the exact shape could not be made out. Gallager and Martin, Sadowsky and Kopans observed that malignant lesions have spherical or irregular shapes[7,8]. Sickles reported that benign masses have round or oval shapes[9].

The most characteristic feature of the malignant masses was spiculated (69%) or irregular (25%) margins. Mare's tail (19%) when seen also denotes a malignant pathology (Fig. 1 & 2). The margins of the benign masses were generally smooth (67%), irregular (22%) or were not made out in 11% cases. Pandya et al observed irregular margins in 90% malignant masses[10]. Sadowsky and Kopans found spiculated margins in 75% malignant lesions[8].

94% cancers were of water density and 6% presented as mixed density lesions. On the other hand water density was seen in 67% benign masses and mixed density in 33%. Samuel observed water density in 100% malignant lesions[11]. Pandya et al reported that water density is seen in 100% cancers but benign lesions are moderately dense in 60% and markedly dense in 32% cases[10]. The observations of Sickles that any mixed or fat density mass can be considered benign was in variance with our findings[9].

Microcalcifications were present in 19% malig-nant masses. Leborgne found microcalcifications in 30% cancers, Egan in 33%, Samuel in 39%, Pandya et al in 3% and Ciatto et al in 24% cases [12,13,11,10,14]. Macrocalcifications were seen in 11% benign lesions. The macrocalcifications were round or oval in shape and were distributed in periphery of the mass. Sickles also observed that benign calcifications are round to oval in shape[15].

Out of the secondary signs of breast cancer, asymmetric prominent ducts were seen in 31%, architectural distortion in 25%, asymmetric density, skin thickening and intramammary lymph nodes were seen in 6% each. Asymmetric prominent ducts were also seen in 11% cases of benign aetiology. Ciatto et al found architectural distortion in 11%[14]. de Paredes et al found asymmetric density in 5%, and Gallager and Martin found skin thickening in 26% patients[16, 7].

The shape of the malignant masses was round in 50%, oval in 38%, round to oval and irregular in 6% cases each. The benign masses were oval in shape in 45%, round in 22%, round to oval also in 22% and lobulated in 11% cases. Skaane and Engedal found the benign masses to be round or oval in shape in 86%, lobulated in 10% and irregular in 4% cases. They observed that round or oval shape is not a significant predictor about nature of the mass but irregular shape if present does indicate malignancy[17]. This observation was similar to the trend seen in our series.

The malignant masses were predominantly irregular (88%) in contour but smooth margins (12%) can also be seen (Fig. 3). On the other hand, the contour was smooth in 56%, irregular in 33% and a pseudocapsule was seen in 11% benign masses. Maturo et al found irregularity of contour in 100% cancer cases, Cole-Beuglet et al reported irregular contour in 72% and smooth in 28% cancers, Egan and Egan found smooth margins in 83% benign masses, Skaane and Engedal found irregular contour in 78% and smooth in 22% malignant masses while in benign lesions the margins were smooth in 41% cases[18,19,21,17]. Our findings were in agreement with the observations of Skaane and Engedal that the contour of the

mass is one of the most important sonographic features suggestive of benign or malignant nature of the mass. A pseudocapsule when present is strongly suggestive of a benign mass[17].

6% of the carcinomas were extensively hypoechoic while rest of the carcinomas and benign masses were hypoechoic in appearance (Fig. 4 & 5). Skaane and Engedal found extensive hypoechogenicity in 31%, hypoechogenicity in 61% cancer cases and 71% fibroadenomas, 11% fibroadenomas were isoechoic and 4% were extensively hypoehoic. Only extensive hypoechogenicity is a prominent feature of malignancy[17].

Sound transmission is a significant predictor of malignancy. Edge shadowing was seen in 63%, extensive posterior shadowing in 6% and the sound transmission was neutral in 31% carcinoma cases. On the other hand in benign lesions the sound transmission was neutral in 78% and edge shadowing was seen in 22%. Maturo et al observed edge shadowing in 69% and posterior shadowing in 31% cancers, Cole-Beuglet et al observed strong posterior shadowing in 57% and moderate posterior shadowing in 43% cancers, Jokich et al postulated that neutral acoustic change is the most common feature of fibroadenomas [18,19,20]. Skaane and Engedal found extensive shadowing in 9%, slight shadowing in 55%, edge shadowing in 10% and neutral sound transmission in 24% cases of carcinoma breast. In benign masses they observed neutral sound transmission in 61% and edge shadowing in 19% cases[17].

In malignant masses the echotexture was heterogeneous in 69% and homogenous in 31% while in benign masses the echotexture was homogenous in 56% and heterogeneous in 44%. Egan and Egan found heterogeneous echotexture in 70% and homogenous echotexture in 19% malignant masses. In benign lesions they found homogeneous echotexture in 51% and heterogeneous echotexture in 36% cases[21]. Skaane and Engedal found heterogeneous echotexture in 71% and homogeneous echotexture in 29% cancer cases. In benign masses homogeneous echotexture was reported in 65% and hetetogeneous echotexture was seen in 35% [17]. Our findings were similar to their observations that echotexture is the least significant predictor for differentiating benign and malignant masses.

Surrounding breast tissue was normal in 44%, distortion was seen in 44% and a hyperechoic rim was present in 12% carcinomas. In benign masses the surrounding breast tissue was normal in 89% and distortion was seen in 11% cases. Egan and Egan found altered breast architecture in 58% cases of malignancy[21]. Skaane and Engedal observed architectural distortion in 6%, normal breast tissue in 45% and a hyperechoic rim in 38% cancers. Breast tissue was normal in 94% cases of fibroadenomas. Hyperechoic rim was found to be a strong predictor of malignancy[17].

Diagnostic Accuracy

The accuracy rate of mammography was 100% in diagnosing malignant masses and 78% in benign lesions. But the false positivity rate of mammography was 7-9% in characterizing malignant lesions. Egan reported accuracy of mammography to be 97% for both benign and malignant lesions, Wolfe 92% in carcinomas and 88% in benign tumours, while Pandya et al achieved accuracy rate of 93% in diagnosis of carcinomas and 80% in benign lesions[13,12,10]. Accuracy rate of sonography was 88% in carcinoma breast and 67% in benign lesions in our series, while Egan and Egan correctly diagnosed 75% cancers and 83% benign lesions[21]. When mammography and sonography were combined together the accuracy rate increased from 78% to 89% in diagnosing benign lesions of the breast and the false positivity rate fell from 7-9% to 4% in diagnosing malignant lesions. Moss et al observed accuracy rate of 79% and 78% on mammography and sonography respectively when the two modalities were used separately. When both were combined together the cancer detection rate increased to 94%. Houssami et al reported the

combined accuracy of mammography and sonography to be 96% [23,24].

Conclusion

Mammography is the initial imaging investigation of choice for detection and characterization of breast masses. Round shape, spiculated or irregular margins, water density, microcalcifi-cations and mare's tail are the mammographic features highly suggestive of malignant nature of a breast mass. Mammography has its limitations in dense fibroglandular breasts. Presence of secondary signs of breast cancer i.e. asymmetric prominent ducts, architectural distortion, asymmetric density and skin thickening in presence of primary signs aid in diagnosis.

The sonographic features suggestive of malignancy are: irregular contour, hypoechoic or extensively hypoechoic mass, presence of edge shadowing or extensive posterior shadowing and a hyperechoic rim around the mass along with distortion of surrounding breast tissue. The sonographic features suggestive of benign nature of the mass are: smooth contour, neutral sound transmission and normal surrounding breast tissue.

Combined evaluation of breast masses with mammography and sonography gives higher accuracy rate than by either method alone or sonogrpahy is a useful adjunct to mammography for evaluating breast masses. Moreover, sonography is the preferred imaging modality in dense fibroglandular breasts.

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