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## Original Research

### To determine role of colour doppler ultrasound in breast lesions

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#### ABSTRACT:

**Background:** Breast cancer is the leading cause of deaths among females, with over 1 million new cases in the world each year. Ultrasound is a safe, non-invasive and radiation free adjunct to mammography for the evaluation of palpable breast masses. The present study was conducted to determine role of colour Doppler ultrasound in breast lesions. **Materials & Methods:** The present study was conducted on 125 breast lesions of females age ranged 20-50 years. We subjected the patients to Ultrasound (USG) with Philips ultrasound machine. FNAC of the breast mass was performed to reach the final diagnosis. For each malignant mass, cytological grading was made by the pathologist using Robinson's cytological grading. **Results:** Normal breast mass was seen in 23 cases, fibroadenoma in 65, fibrocystic changes in 10, papilloma in 7, Phyllodes tumor in 4, invasive ductal carcinoma in 8, lobular ductal carcinoma in 3 and metastatic tumor in 5 cases. The difference was significant ( $P < 0.05$ ). There were 95 benign lesions, of which 40 were vascular on color doppler and 55 were avascular on color doppler. Out of 35 malignant lesions, 15 were vascular on color doppler and 20 were avascular on color doppler. The mean RI value for benign lesions was 0.68 and for malignant lesions was 0.82. The difference was significant ( $P < 0.05$ ). Under FNAC, 23 lesions were grade 1, 8 were grade 2 and 3 were grade 3. The difference was significant ( $P < 0.05$ ). **Conclusion:** Authors found that colour doppler ultrasound is now an important diagnostic tool for the evaluation of breast lesions.

**Key words:-** Breast, Colour doppler ultrasound, FNAC

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#### INTRODUCTION

Breast cancer is the leading cause of deaths (15%) among females, with over 1 million new cases in the world each year.<sup>1</sup> Ultrasound is a safe, non-invasive and radiation free adjunct to mammography for the evaluation of palpable breast masses. It is also used as a primary screening tool for breast cancer in women who are pregnant, young women with high risk for breast cancer and who have increased breast density on mammogram.<sup>2</sup>

The role of color Doppler sonography in breast disease remains a controversial issue. No solid evidence is available due to lack of large-scale population studies;

therefore, there are no prospective randomized controlled studies available.<sup>3</sup> Results largely obtained from small series— are heterogeneous, being conclusions not always reliable. Due to absence of clearly defined standards, evaluation of breast lesion vascularity is currently optional in BI-RADS US lexicon. Even so, with technological advances in the transducer industry and because of the experience gained in breast ultrasound (US), Doppler technique currently enjoys an ever-increasing utilization.<sup>4</sup> Color Doppler US is an easy-to-use tool, available in most ultrasonic imaging devices today. It provides information about the presence of vascularization in

tissues; it allows to depict the flow direction, and to distinguish a vein from an artery, according to the spectral type of curve observed.<sup>5</sup> The present study was conducted to determine role of colour Doppler ultrasound in breast lesions.

**MATERIALS & METHODS**

The present study was conducted in the department of Radiodiagnosis. It comprised of 125 breast lesions of females age ranged 20-50 years. The study got approval from institutional ethical committee. All patients were informed regarding the study and written consent was obtained.

Data such as name, age etc. was recorded. We subjected to patients to Ultrasound (USG) with Philips ultrasound

machine. A curvilinear transducer (2-5 MHz) was used when needed. Subsequently, the patient underwent ultrasound guided FNAC within a week after the initial ultrasound examination. The cytological study was done by a pathologist. Presence or absence of vascularity, the number of arteries within the mass, the distribution (central or peripheral, mixed, capsular) of vessels, the morphology of vessels, the arrangement of vessels, presence/ absence of penetrating arteries was done. FNAC of the breast mass was performed to reach the final diagnosis. For each malignant mass, cytological grading was made by the pathologist using Robinson’s cytological grading. Results thus obtained were subjected to statistical analysis. P value less than 0.05 was considered significant.

**RESULTS**

**Table I Distribution of cases as per FNAC**

Diagnosis	Number	P value
Normal breast mass	23	0.01
Fibroadenoma	65	
Fibrocystic changes	10	
Papilloma	7	
Phyllodes tumor	4	
Invasive ductal carcinoma	8	
Lobular ductal carcinoma	3	
Metastatic tumor	5	

Table I shows that normal breast mass was seen in 23 cases, fibroadenoma in 65, fibrocystic changes in 10, papilloma in 7, Phyllodes tumor in 4, invasive ductal carcinoma in 8, lobular ductal carcinoma in 3 and metastatic tumor in 5 cases. The difference was significant (P< 0.05).

**Table II Comparison of colour Doppler findings in benign and malignant breast lesions**

Pathology	Vascular on Color Doppler	Avascular on Color Doppler	P value	RI
Benign lesions (95)	40	55	0.01	0.68
Malignant lesions (35)	15	20		0.82

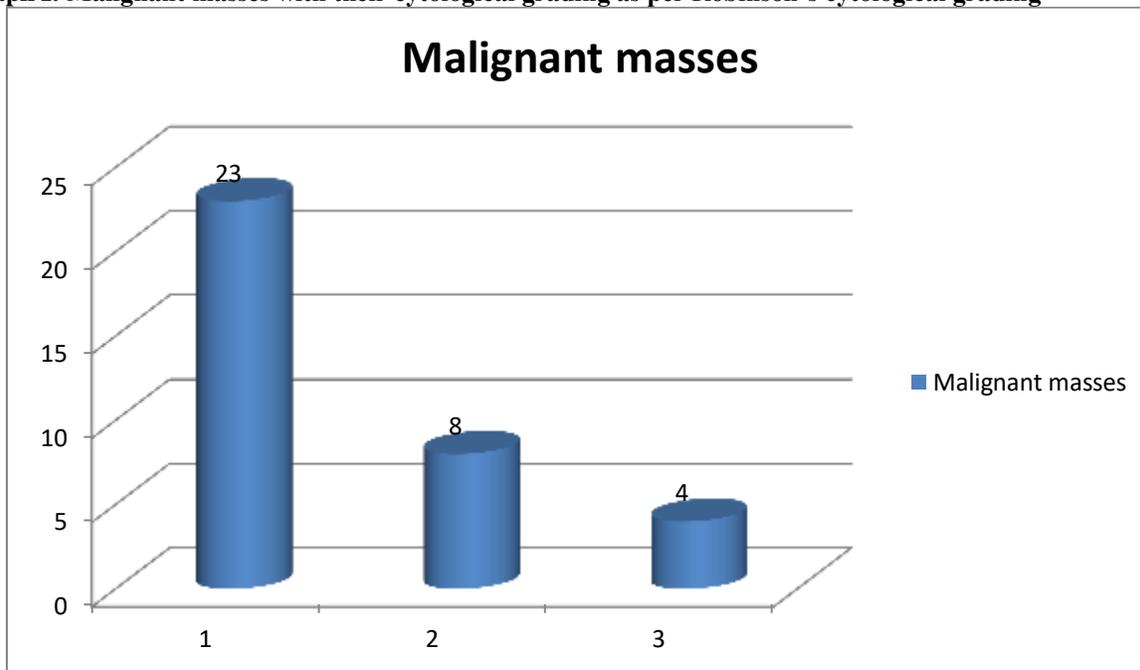
Table II shows that there were 95 benign lesions, of which 40 were vascular on color doppler and 55 were avascular on color doppler. Out of 35 malignant lesions, 15 were vascular on color doppler and 20 were avascular on color doppler. The mean RI value for benign lesions was 0.68 and for malignant lesions was 0.82. The difference was significant (P< 0.05).

**Table III Malignant masses with their cytological grading as per Robinson’s cytological grading**

FNAC grade	Malignant masses	P value
1	23	0.01
2	8	
3	4	

Table III, graph I shows that under FNAC, 23 lesions were grade 1, 8 were grade 2 and 3 were grade 3. The difference was significant (P< 0.05).

**Graph I: Malignant masses with their cytological grading as per Robinson’s cytological grading**



## DISCUSSION

In order to demonstrate very slow flows, it is necessary to apply minimal pressure on the breast, thus avoiding compression of the blood vessels.<sup>6</sup> Additionally, it is necessary to adjust some parameters to obtain an optimal staining of blood vessels [PRF between 700-1.000 Hz, wall filter as low as possible (50 to 100Hz max.), appropriate algorithm to remove motion artifacts, maximum gain (85-90%), medium persistence, box without angulation].<sup>7</sup> Power Doppler US is an optimal technique for detecting slow flow in small vessels since it is Doppler angle independent, thus being highly advantageous in breast lesion evaluation. It is estimated to yield 2 to 5 times higher sensitivity than color Doppler, although this assertion has not been confirmed in our practice. Its disadvantages are: increased number of artifacts and lack of information about the speed and direction of blood flow, thus hindering proper differentiation between arteries and veins.<sup>8</sup> The present study was conducted to determine role of colour doppler ultrasound in breast lesions.

We found that normal breast mass was seen in 23 cases, fibroadenoma in 65, fibrocystic changes in 10, papilloma in 7, Phyllodes tumor in 4, invasive ductal carcinoma in 8, lobular ductal carcinoma in 3 and metastatic tumor in 5 cases. Gupta et al<sup>9</sup> prospectively studied features of Doppler ultrasound on 173 treatment-naïve solid breast masses in 148 patients. Total 52 malignancies of the breast were detected and each malignant mass was given a grade (1, 2 or 3) on FNAC as per Robinson’s cytological grading system. We found colour Doppler characteristics of

hypervascularity, tortuous arteries with irregular caliber, presence of a penetrating artery and a central pattern of distribution of vessels as signs significantly associated with malignancy. Mean RI of malignant masses was noted to be higher than benign masses, however no statistically significant correlation was observed between RI values and the grade of malignancy.

In present study, there were 95 benign lesions, of which 40 were vascular on color doppler and 55 were avascular on color doppler. Out of 35 malignant lesions, 15 were vascular on color doppler and 20 were avascular on color doppler. The mean RI value for benign lesions was 0.68 and for malignant lesions was 0.82.

We found that under FNAC, 23 lesions were grade 1, 8 were grade 2 and 3 were grade 3. Watanabe et al<sup>10</sup> evaluated ultrasound images of 1408 solid breast masses. Multivariate analysis indicated that vascularity (amount of blood flow), vascular flow pattern (“surrounding marginal flow” or “penetrating flow”) and the incident angle of penetrating flow were significant findings for distinguishing between benign and malignant lesions. However, the sensitivity and specificity of B-mode alone did not improve significantly with CD addition. They explored the causes of these negative results and found that age should have been considered when evaluating vascularity. Simulation experiments suggested that specificity is significantly improved when age is taken into consideration and we thereby improved our diagnostic criteria.

## CONCLUSION

Authors found that colour doppler ultrasound is now an important diagnostic tool for the evaluation of breast lesions.

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