

**COLOR DOPPLER EVALUATION OF BREAST MASSES**Aarti Anand<sup>1</sup>, B. D. Sonawane<sup>2</sup>, N. G. Tembhekar<sup>3</sup>, P. U. Titare<sup>4</sup>, P. B. Rathod<sup>5</sup>**HOW TO CITE THIS ARTICLE:**

Aarti Anand, B. D. Sonawane, N. G. Tembhekar, P. U. Titare, P. B. Rathod. "Color Doppler Evaluation of Breast Masses". Journal of Evolution of Medical and Dental Sciences 2014; Vol. 3, Issue 63, November 20;

Page: 13900-13904, DOI: 10.14260/jemds/2014/3858

**ABSTRACT: OBJECTIVES:** Characterization of solid masses and assignment of levels of suspicion for being malignant on color and spectral Doppler and to co-relate the findings with histopathological features. **MATERIAL AND METHODS:** Sixty four patients with breast masses were evaluated with duplex and color Doppler ultrasound. Presence or absence of color flow, number of vessels, their situation and spectral Doppler analysis were performed. Comparison of color Doppler analysis with histopathological findings was done. **RESULTS:** Color signals were more commonly found in malignant (88%) than benign lesions (38%). Malignant lesions showed more number of vessels as compared to benign. Both central and peripheral vascularity was noted in 14 out of 16 malignant masses and in none of the benign masses. Spectral Doppler analysis did not prove to be helpful in differentiating benign from malignant lesions. **CONCLUSION:** Color Doppler is helpful in assigning a higher level of suspicion to a lesion for being malignant. Spectral Doppler analysis did not contribute to the differentiation between malignant and benign breast tumors. Therefore despite increased examination time, as an adjunct to B mode sonography, color Doppler evaluation is useful in solid breast masses, especially of indeterminate nature.

**KEYWORDS:** Color Doppler, Breast, Masses.

**INTRODUCTION:** Breast cancer is a leading cause of morbidity and mortality in women. Although there can be several reasons for considering surgical removal of a breast mass, concern about malignancy is probably the major reason. Hence the need for early and confident diagnosis of malignancy. As malignant tumors increase in size they stimulate the growth of new blood vessels by secreting angiogenesis factor. The multiplicity of vessels, their disordered pattern and presence of A-V shunts give rise to abnormal flow patterns which can be detected by Doppler assessment.

Initial studies using color Doppler ultrasonography to assess breast masses have shown that breast cancers as small as 10mm are associated with abnormal flow patterns. High resolution breast sonography has secured an important place in the diagnosis and management of breast carcinoma. Sonography augments the specificity of mammography and is valuable in characterizing masses as cystic or solid.<sup>1</sup> Numerous studies have examined whether grey scale or Doppler sonographic criterion can allow distinction between benign and malignant breast masses.<sup>2,3,4</sup> This study investigates further the value of color Doppler evaluation in characterization of solid masses and assignment of levels of suspicion to them.

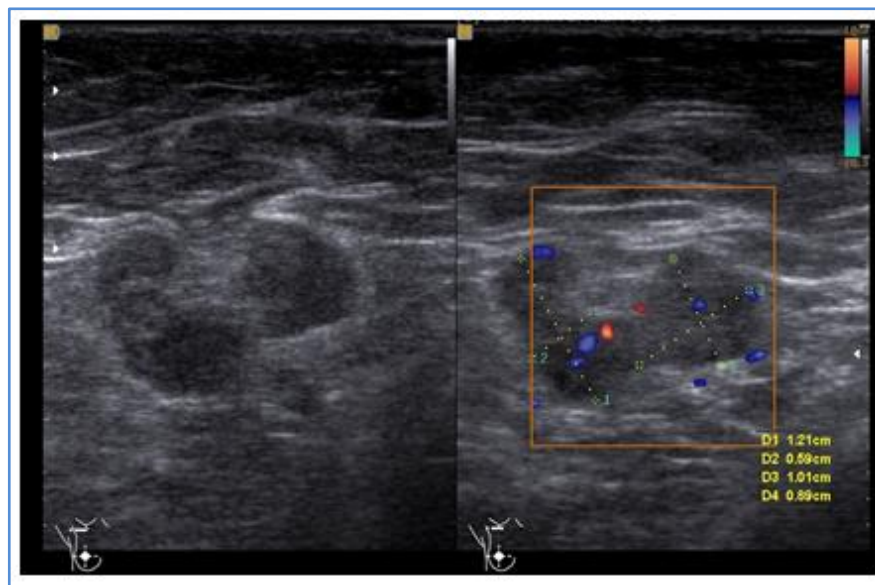
**MATERIAL AND METHODS:** Our study group included sixty four women in the age group of 20-65 yrs, with sonographically proven solid breast masses. The equipment used was Toshiba Ecocee color Doppler unit with a 7.5 mhz linear probe. Doppler settings were optimized for detection of slow flow. Patients were examined in supine position, rotated slightly away from the side of interest to flatten the breast evenly on chest wall, ipsilateral arm was positioned on the head.

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On the basis of their sonographic morphologic characteristics the lesions were categorized as benign, malignant or indeterminate, following which color and pulsed Doppler examination were performed. Color Doppler features evaluated were presence or absence of flow, location of flow (central, peripheral, central and peripheral both) and number of visualized vessels. On pulsed Doppler average values of RI and PI were recorded as well as presence of diastolic notch or reversal. Although arterial flow was always sought in some ( 8 %) lesions all pulsed Doppler waveforms were venous (fig 3) and out of these only one was malignant ( histopathologically a well differentiated ductal carcinoma ). Biopsies were performed on all patients.

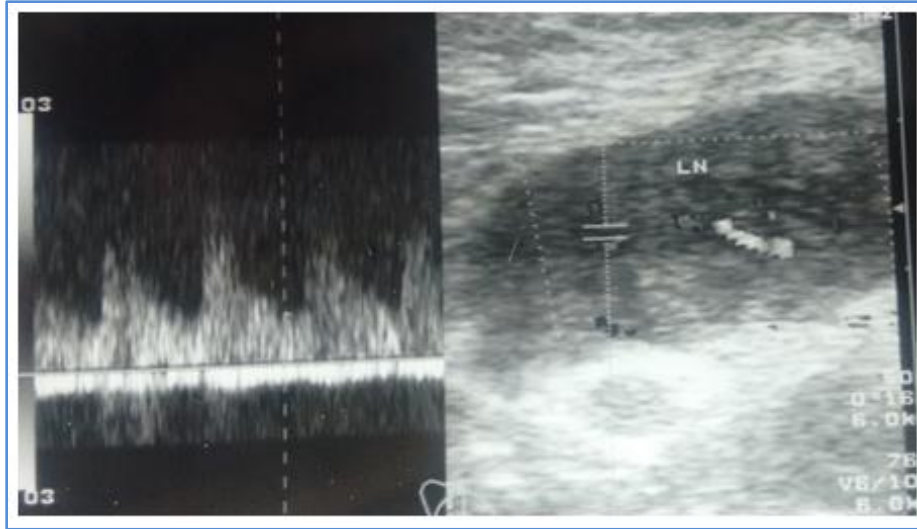
**RESULTS:** By sonographic criterion 18 lesions had benign morphology, 16 lesions had malignant morphology and 30 lesions were of indeterminate type. Blood flow was demonstrated in 88% of malignant masses, 38% of benign and in 70% of indeterminate masses. Both central and peripheral vascularity was noted in 14 out of 16 malignant masses, in 15 out of 30 indeterminate masses and in none of the benign masses (Fig. 1). In a significantly greater proportion of malignant lesions two or more vessels were counted (Fig. 2).

Various pulsed Doppler features showed no correlation and were not discriminatory. Both high (0.7-0.8) and low (0.6 & less) values of RI was recorded in histopathologically proven malignant lesions, same applied to PI & PSV values. Diastolic reversal was recorded in two malignant and in one benign lesion. Diastolic notch was not seen in any case in our study. Of the 30 sonically indeterminate lesions 70% showed flow and in 30% there was no flow. Histologically 14 were malignant and 16 were benign. All 14 sonically indeterminate and histologically malignant lesions showed both central and peripheral vascularity while only one benign lesion showed blood flow in both places. This single false positive case in our study was a cellular fibro adenoma on histopathology.

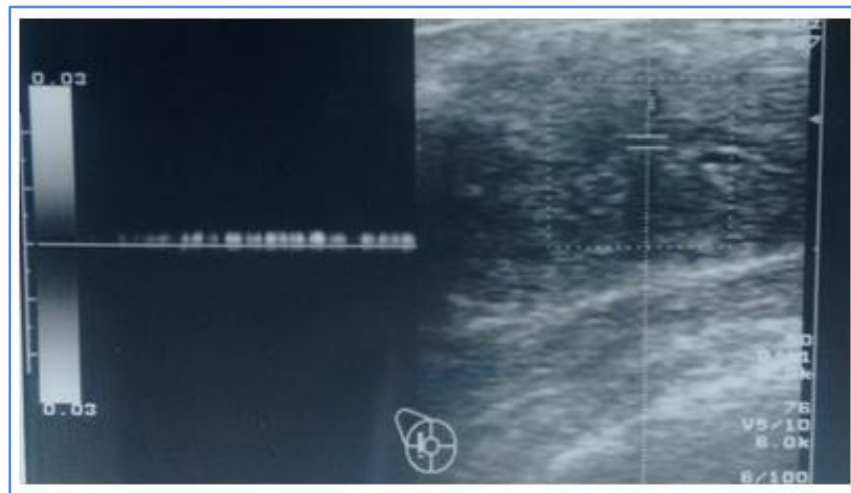


**Fig. 1: Central and Peripheral vascularity in an indeterminate mass**

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**Fig. 2: Arterial and venous flow pattern in a malignant mass**



**Fig. 3: Venous flow in a histologically proven malignant lesion**

**DISCUSSION:** As a whole the literature suggests that no single grey scale or Doppler feature allows reliable distinction between benignity and malignancy.<sup>5,6</sup> This study shows that color Doppler is helpful in assigning a higher level of suspicion to a lesion for being malignant. Color signals were identified in 87 % of malignant lesions in our study which corresponds with the sensitivity reported in most of earlier reports.<sup>7</sup> Subjective assessment of color Doppler signals revealed majority of benign lesions had either no flow or when present were found in a peripheral location. In contrast majority (87%) of malignant lesions had blood flow signals in both central and peripheral locations. 50 % of sonically indeterminate masses showed central and peripheral vascularity, of these all except one proved to be malignant histologically. This single false positive case in our study was a cellular fibro adenoma on histopathology.

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Thus location of flow at central or both central and peripheral locations on color Doppler has a stronger association with malignancy than does solely peripheral flow.<sup>3,8</sup> The pulsed Doppler evaluation in our study did not contribute in better differentiation between malignant and benign. This is at variance with some of the earlier published reports.<sup>9,10</sup>

**CONCLUSION:** Color Doppler is helpful in assigning a higher level of suspicion to a lesion for being malignant. Location of blood flow on color Doppler if both central and peripheral has a stronger association with malignancy than does solely peripheral flow. The spectral Doppler examination adds no further predictive information. Therefore despite increased examination time, color Doppler evaluation of breast masses in addition to grey scale sonography is useful especially where the lesion characteristics are indeterminate.

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Date of Submission: 12/11/2014.

Date of Peer Review: 13/11/2014.

Date of Acceptance: 15/11/2014.

Date of Publishing: 19/11/2014.