ORIGINAL ARTICLE

Role of Colour Doppler Sonography in the Diagnosis of Breast Tumors

AAMIR NADEEM CH., MIAN WAHEED AHMAD, AMINA AHMAD

ABSTRACT

Objective: To determine efficacy of Doppler Sonography in diagnosis of breast tumours on the basis of Resistive Index (RI), and Pulsatility Index (PI) values using histopathology as gold standard.
Duration: The study was completed over a period of six months, from 27-03-2007 to 26-09-2007.
Methods: Fifty consecutive patients with breast mass suspected clinically were included. These cases were subjected to clinical examination. Gray scale ultrasound was performed to evaluate margins of the lesion, surrounding halo, echogenecity and calcification. Doppler ultrasound was done to see blood flow in the lesion calculate RI and PI.
Results: Mean age of the patients was 38.8±12.7 years. Sensitivity, specificity, and diagnostic accuracy of colour Doppler Sonography was observed 91.6%, 84.6% and 88.0%, respectively. Positive predictive value of colour Doppler Sonography was found to be 84.6% and Negative predictive value of colour Doppler Sonography was found to be 91.6%.
Key words: Solid mass, Malignant, Benign, Pulsatility index, Resistive index

INTRODUCTION

Breast ultrasound is a noninvasive (the skin is not pierced) procedure used to assess the breasts. Ultrasound technology allows quick visualization of the breast tissue. Ultrasound may also be used to assess blood flow to areas inside the breast. The examination is often used along with mammography. Breast sonography is a well accepted diagnostic method. For differentiation between benign and malignant lesions, quantified sonography is gaining increased importance. Malignancies usually show increasing vascularity, which is extremely disordered. The peripheral resistance is low due to numerous AV-shunts in malignant tissue. With high frequency CW Doppler ultrasound (8-10MHz), these anatomical and physiological features can be outlined objectively. Frequency analysis of Doppler signals in breast malignancies shows high intensities corresponding to increased blood flow. The different blood flow directions of the vessels recorded by the ultrasonic Doppler beam also causes broadening of the frequency range. In combination with B-mode ultrasound this method provides information essential for the differentiation of malignancies[1].

The results, already reported in literature, all indicate that more vessels are displayed on Doppler ultrasound and higher flow velocities are measured in malignant tumors than benign conditions. The potential role of Doppler sonography remains to be definitely determined. It appears that high measured

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Department of Diagnostic Radiology, Jinnah Hospital. Lahore.
Correspondence to Dr. Mian Waheed Ahmad, Email:mian132@yahoo.com,mwahmad10@hotmail.com

flow and markedly elevated number of detectable vessel density indicates malignancy[2-4].

Research has also shown that breast cancer vascularity as revealed by power Doppler sonography, correlates with lymph node involvement and lymphatic vascular invasion[5]. Since tumor vessels are structurally and functionally abnormal, therefore the degree of vascularity also determines tumor's aggressiveness, as well as its radiosensitivity and chemosensitivity.

Assessing tumor vascularity may help in differential diagnosis and therapy monitoring [6]. Patients with locally advanced breast cancer showed dramatic changes on repeated optical/Doppler examinations in concordance with response to chemotherapy[7].

PATIENTS AND METHODS

Inclusion criteria: Female patients between the age of 15-70 years. 2). Patients with history of breast mass, pain, nipple or palpable axillaries lymph nodes.
Exclusion criteria: 1) Patients diagnosed to have breast cancer and operated upon 2) Patients receiving chemotherapy / radiotherapy 3). Patients with some other primary cancer suspected to have secondary deposits in breast.

First consecutive 50 patients referred from OPD of medicine/surgery having a breast mass/nipple discharge/ pain breast/palpable axillary lymph nodes were included in this study.

An informed consent, with promise of confidentiality, was obtained from them for using their data in research. The demographic information (age,

parity etc) and detailed history was obtained from every patient regarding pain, discharge, palpable mass and skin involvement etc to be used later in data analysis.

These cases were subjected to clinical examination. gray scale ultrasound was performed to evaluate margins of the lesion, surrounding halo, echogenecity, and calcification. Axilla was examined for enlarged lymph nodes. Then Doppler ultrasound will be done to see blood flow in the lesion and calculate resistive index and pulsatility index by applying the formula given above.

All these cases were undergone FNAC in Radiology Department and histopathology was carried out in pathology lab of Allama Iqbal Medical College Lahore. The results of histopathology was taken as gold standard. All this information was collected through a specially designed proforma attached with the synopsis.

RESULTS

Present study was carried out in the department of diagnostic radiology of Jinnah Hospital, Lahore during the study period of 6 months from 27-03-2007 to 26-09-2007. Distribution of cases by age shows that majority of the patients 20 (40.0%) were between 31-40 years old while minimum patients i.e 4 (8.0%) were less than 20 years old with mean age of 38.8±12.7 years. History of pain was given by 12 patients (24.0%). Out of these 12 patients, 7 patients (58.3%) experienced mild pain, 4 patients (33.3%) had moderate pain and 1 patient (8.4%) faced severe pain. History of nipple discharge found in 1 patient (2.0%). Auxiliary lymph nodes were positive in 12 patients (24.0%). According to echogenicity, patients with hyperechoic were 1(2%), with hypoechoic were 33 (66.0%) and with mixed were 16 (32.0%). Tumours found in upper outer location in 17 patients (34.0%), upper inner location in 18 patients (36.0%), lower outer in 1 patient (2.0%) and retroareolar location in 9 patients (18.0%). Margins of masse were smooth in 22 patients (44.0%) while irregular in 28 patients (56.0%). Calcification with mass was found to be positive in 5 patients (10.0%) while negative in 45 patients (90.0%). On colour Dopplor Sonography positive cases were 26 and negative 24 while on FNAC (gold standard) positive cases were 24 and negative cases were 26. Sensitivity, specificity, and diagnostic accuracy of colour Doppler Sonography was observed 91.6%, 84.6% and 88.0%, respectively. Positive predictive value of colour Doppler Sonography was found to be 84.6% and Negative predictive value of colour Doppler Sonography was found to be 91.6%.

DISCUSSION

The incidence of breast cancer in Pakistan has gradually increased over the last three decades. Tumor angiogenesis plays an important role in the growth and extension of malignant neoplasms, including those of the breast[8,9].

The detection of vascularization in the lesion was the first Doppler feature used to differentiate between benign and malignant tumors, and this sign has shown a significant association with malignancy of lesions[10,13].

Yang et al[14] reported 98.4% sensitivity, 67.8% specificity, 38% PPV, 99.5% NPV, and 72.9% accuracy. In their study, the PPV was considerably lower, probably in relation to the different prevalence of breast cancer and to the different patient selection criteria. Predictive values were highly influenced by the sensitivity, specificity, and prevalence; particularly, the prevalence increase led to a PPV increase. In another study conducted by Tariq et al[15], the sonographic accuracy (RI=92% and PI=93%) in differentiating benign from malignant lesions was persistent to the results of Yang et al[14].

In the current study, we wanted to see the efficacy of Doppler sonography in diagnosis of breast tumors on the basis of Resistive Index (RI) and Pulsatility Index (PI) values.

Our study confirms that Doppler sonography had high sensitivity 91.6%. Specificity was found to be 84.6% and diagnostic accuracy was found to be 88%.

CONCLUSION

This study proves the efficacy of Doppler Sonography as a method of choice to evaluate breast masses in patients avoiding the need for biopsy.

The data confirms that certain Doppler Sonography features can help differentiate benign from malignant breast tumours. However, practice and interpreter variability should be further explored before these criteria are generally applied to defer biopsy of solid masses.

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