Doppler Evaluation of Breast Solid Masses Differentiation of Benign and Malignant Masses Role of Resistive Index

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Objective: To know the usefulness of color and spectral doppler in evaluation of solid breast masses using vascularity and resistive index. **Material and methods:** We performed duplex doppler sonography on 100 patients presenting with breast mass. Resistive index and vascularity of the vessels were detected and analyzed and correlated with histopathological results. **Results:** 70% of the benign lesions were found having ri below 0.8 and 45 out of 50 patients had low vascularity.43 malignant lesions had high vascularity and 80% had ri above 0.8. **Conclusion:** High flow visualization on power doppler and indicates a higher possibility of malignancy lesions with ri greater than 0.8 gives high probability of malignancy.
Key words: Breast solid masses, Doppler studies, malignant lesions

Sonography is currently one of the main diagnostic methods for evaluating breast diseases using this technique has become a common practice since the introduction of high frequency probes. Similarly sonography is one of the most widely used imaging technique for guiding breast intervention procedures. Gray scale ultrasound differentiates solid breast nodule on basis of certain characteristics.

Malignant Characteristics of a malignant nodule on sonography are Spiculated Capsule, taller Than Wide, Angular Margins, Shadowing, Branch Pattern, Markedly Hypoechoic, Calcification, Duct Extension, Microlobulation[1]. Benign Characteristics of a Solid Nodule on sonography are Hyperechoic, >3 Lobulations, Ellipsoid Shape, Thin Capsule[2]

Doppler ultrasound and other imaging modalities have been used to assess characteristics of vasculature associated with malignant breast masses.

Different doppler sonography criteria to differentiate between benign and malignant lesions of the breast has been used for breast masses. The results obtained have not always matched,so the usefulness of doppler sonography in diagnosing breast cancer is not currently defined. Resistive index is used as a Doppler Charcteristic[3,4].

Resistive index: The RI value is calculated as the maximum systolic velocity-minimum systolic velocity/ maximum systolic velocity We evaluated the Solid Breast Masses on Color & Spectral Doppler with special emphasis on Vascularity and Resistive Index

Purpose: To know the usefulness of Color and Spectral Doppler in evaluation of Solid Breast masses using vascularity and Resistive Index.

Material and method:

Place of study: Dept of Radiology, Mayo Hospital, Lahore

Duration of study: June 2004-July 2005

Study design: Descriptive study with convenient sampling

Method: Those were included who had a solid mass on gray scale ultrasound. Biopsy was Gold standard and was done on every patient. Color Doppler was done in which the vascularity of the lesion and Resistive index of the lesion were recorded. Machine used was Logic 7 GE High frequency probe of 7.5-10 MHZ was used.

Results:

On biopsy out of 100 , 50 were benign and 50 were malignant. The benign lesion showed low vascularity and the malignant lesions showed increased vascuarity. (Table 1 & 2). The Benign lesions showed that the Resistive index remained 0.8 or below and in the Malignant the RI remained 0.8 or above.(Tables 3 & 4).

According to the characteristic in the Benign group 70 % showed a low RI and in the Malignant group 80 % showed a raised RI than 0.8.(Table 5 &6)

Table 1: Benign masses

Characteristic	High	Low
Vascularity	5 pts(10 %)	45 pts (90%)

Table 2: Malignant

Characteristic	High	Low
Vascularity	43 pts(86 %)	07 pts (14%)

Table 3: Benign Lesions and RI

Characteristic	Range	Percentage
RI	0.41-0.49	10
RI	0.51-0.59	20
RI	0.6-0.69	30
RI	0.7-0.79	10
RI	0.8-0.85	30

4: Malignant Lesions and RI

Characteristic	Range	Percentage
RI	1.0-1.9	30
RI	0.9-0.99	10
RI	0.81-0.9	40
RI	0.7-0.73	20

Table 5 Percentage of Benign lesion in relation to RI

Characteristic	0.8 or above	Below 0.8
RI	30 %	70 %

Table 6: Percentage of Malignancy in relation to RI

Characteristic	0.75 or below	0.8 or above
RI	20 %	80 %

Figure 1. Fibroadenoma (No vascularity)

Figure 2 Benign lesion low vascularity

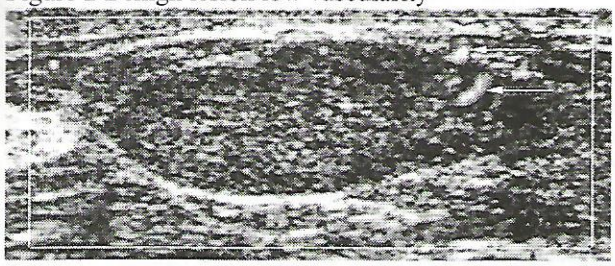


Figure 3 Malignant lesion high vascularity

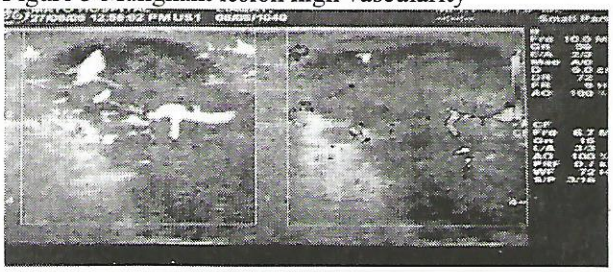


Figure 4 Benign lesion as characterized by RI

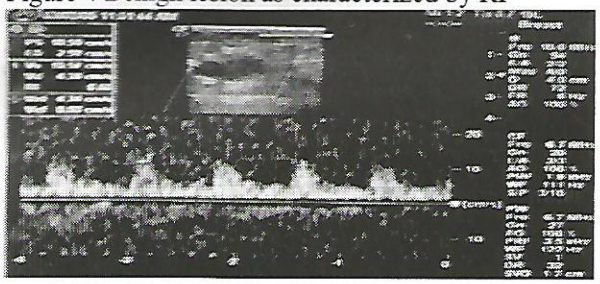


Figure 5 Benign

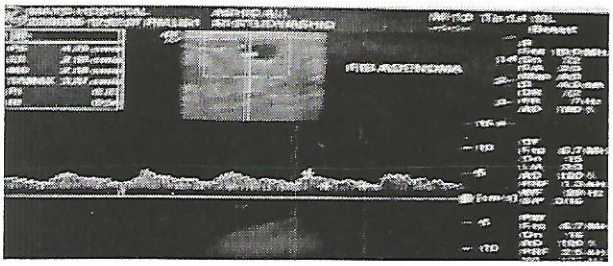
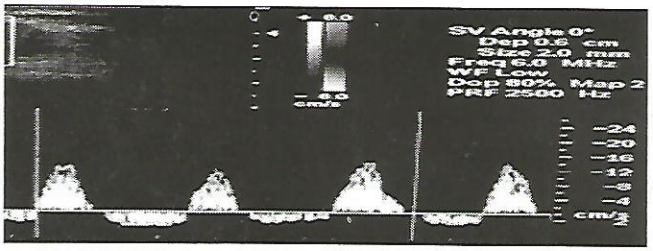


Figure 6. Reversal of diastolic flow , characteristic sign of malignancy in Breast



Conclusion:

Increased vascularity is seen in malignant lesions. Comparatively raised RI is seen in malignant lesions. The detection of a diastole with null or reversed flow is sign of a lesion classified as probably malignant.

Discussion:

Tumor angiogenesis plays an important role in the growth and extention of malignant neoplasms. The increase of tumor mass and the formation of metastasis require the formation of new vessels. Doppler sonograghy could be used to differentiate between benign and malignant breas lesions. 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. Doppler sonography is by itself of little use when it becomes to evaluating solid breast lesions however when it is used in conjunction with conventional sonography examinations it can provide help more accurate characterization of certain lesions

References:

1. Carson PL, Fowlkes JB, Roubidoux MA, Moskalik AP, Govil A, Normolle D, LeCarpentier G, Nattakom S, Helvie M, Rubin JM. 3D color Doppler image quantification of breast masses. Ultrasound Med Biol. 1998 Sep;24(7):945-52. PMID: 9809628 [PubMed - indexed for MEDLINE]
2. Carson PL, Moskalik AP, Govil A, Roubidoux MA, Fowlkes JB, Normolle D, Adler DD, Rubin JM, Helvie M.The 3D and 2D color flow display of breast masses. Ultrasound Med Biol. 1997;23(6):837-49. PMID: 9300987 [PubMed - indexed for MEDLINE]
3. Bhatti PT, LeCarpentier GL, Roubidoux MA, Fowlkes JB, Helvie MA, Carson PL. Discrimination of sonographically detected breast masses using frequency shift color Doppler imaging in combination with age and gray scale criteria.J Ultrasound Med. 2001 Apr;20(4):343-50.
4. Schelling M, Gnirs J, Braun M, Busch R, Maurer S, Kuhn W, Schneider KT, Graeff H. Opimized differential diagno American Journal of Roentgenology Web site for American Journal of Roentgenology.