Scholars Journal of Applied Medical Sciences (SJAMS) **ISSN 2320-6691 (Online)**
Sch. J. App. Med. Sci., 2016; 4(7D):2553-2556 **ISSN 2347-954X (Print)**

(An International Publisher for Academic and Scientific Resources)
www.saspublishers.com DOI: 10.36347/sjams.2016.v04i07.052

Original Research Article

Color Doppler Evaluation of Palpable Breast Lump along with Cytological/ Histopathological Correlation

Jayati Bardhan[1], Sandip Kumar Ghosh[2], Koushik Sarkar[3], Somnath Paul[4], Debasish Nandi[4]
[1]Associate Professor, Department of Radiodiagnosis, Bankura Sammilani Medical College, Bankura, WB, India
[2]Associate Professor, Department of Radiodiagnosis, Bankura Sammilani Medical College, Bankura, WB, India
[3]Junior Resident, Department of Radiodiagnosis, Bankura Sammilani Medical College, Bankura, WB, India
[4]Junior Resident, Department of Radiodiagnosis, Bankura Sammilani Medical College, Bankura, WB, India

***Corresponding author**
Jayati Bardhan
Email: drjayatibardhan@gmail.com

Abstract: The complexity of breast structure, greater breast volume and the extreme sensitivity to endocrine influences are factors that predispose this organ to a number of pathological conditions. Imaging plays an important role in characterization of palpable breast lump. High Resolution Ultrasound acts as an adjunct to physical and mammographic examination to differentiate benign from malignant so as to avoid unnecessary biopsy and surgical excision. Color Doppler imaging helps to identify presence of vascularity in breast lesions and help in characterizing the lesion. Objectives- 1. To evaluate different palpable breast lumps on the basis of their color Doppler characteristic, 2. To corroborate the color Doppler diagnosis with histopathological and/or cytological correlation. Material And Methods- Subjects were the patients from indoor ward and out-patient department of Surgery and Gynecology Department. After obtaining consent from the appropriately selected patients, according to the inclusion and exclusion criteria, they were examined using HX color Doppler machine of Hewlett Packard (HP). Different pre-determined gray scale and color Doppler parameters were recorded and analyzed according to appropriate statistical methods. Conclusion-Use of color Doppler showed promising results in differentiating the nature of solid breast lumps thereby reducing unnecessary biopsies, allay anxiety and control cost. Flow velocimetry criteria especially RI is most important in characterizing breast masses.
Keywords: Breast; benign; malignant; Color Doppler; Resistive Index

INTRODUCTION

The complexity of breast structure, greater breast volume and the extreme sensitivity to endocrine influences are factors that predispose this organ to a number of pathological conditions.

An overall perspective of the frequency of various breast problems can be gained from study of a large series of patients with breast complaints. After careful evaluation about 30% of patients were considered to have no breast lesion, 40% had fibrocystic disease of breast, slightly over 10% had biopsy proven malignancy and about 7% a benign tumour (fibroadenoma).

The main field where color Doppler is to be exploited is differentiating the nature of solid breast lumps thereby reducing the number unnecessary biopsies, allay anxiety of patients and control cost. The qualitatively assessment of noting the regional variation from core to periphery, pattern of vascularity etc. and qualitative assessment by noting RI and PI of the vessels remarkably increase the sensitivity and specificity of breast neoplasm.

MATERIALS AND METHODS

Materials

A. Subjects of this study are patients from the:
   a. Indoor ward of Surgery department
   b. Indoor ward of Gynecology department
   c. Surgical out-patient department of the hospital advised for sonomammography.

B. Ultrasonography machine in the hospital.
HX color Doppler machine of Hewlett Packard (HP) having color Doppler, angio, pulse wave and continuous wave facility with 1.8, 2.5, 3.5, 7.5 and 10 MHz curvilinear and linear probes and Adonis

automatic multi-imager model AE:66 camera, HP Deskjet 640C printer.

Methods

All patients presenting for sonomammography and Doppler evaluation of breast lump were interviewed and data recorded accordingly.

Inclusion criteria

Any female patient coming with a palpable breast lump.

Exclusion criteria

1. Patient unwilling o be a part of the study.
2. Patients having history of breast irradiation, trauma and any type of intervention.

An informed consent was taken from the patient before any procedure. History and clinical examination was done thoroughly.

The patients were examined in the following positions:

1. Supine oblique- mainly for upper and outer quadrant of breast where tissue thickness is maximum and pathologies frequent.
2. Nipple areolar complex- for central quadrant.
3. Supine position with patient having arms behind her head.

Color Doppler study of the lesion was performed after proper Doppler angle correction. Power Doppler is more sensitive than color Doppler for detecting vessels. After locating the vessels, Doppler flow velocity waveforms from the vessels of mammary lesion (affected breast) and corresponding quadrant of contralateral breast (non-affected breast) respectively were compared in respect of the four parameters- Maximum systolic velocity, minimal diastolic velocity, Pulsatility index (PI) and resistance index (RI).

RESULT AND ANALYSIS

In this study total 40 patients underwent breast ultrasound and Doppler evaluation. The breast lesions were classified as either benign or malignant based on criteria set up by a study on color Doppler flow criteria of breast lesions by Madjar H *et al*. [6].

Table 1: Showing histological nature of the breast lump

Histological nature	Number	Subtype	Number
Benign (37.5%)	15	Fibro adenoma	5
		Benign breast changes	2
		Abscess	3
		Phyllode tumor	3
		Duct papilloma	1
		Infected breast cyst	1
Malignant (62.5%)	25	Duct cell carcinoma	19
		Discohesive papillary carcinoma	1
		Medullary carcinoma	1
		Colloid carcinoma	1
		Lobular carcinoma	1
		Lymphoma	1
		Inflammatory carcinoma	1

The patients were grouped into 4 groups according to imaging (Doppler indices) and histopathology study.

GROUP 1: Malignant by imaging + malignant by histopathology
No. of patients: 21

Table 2: Malignant by imaging + malignant by histopathology

Doppler Indices	Mean	Maximum	Minimum
PSV	13.92cm/sec	21 cm/sec	5.9 cm/sec
PI	2.58	10	1.1
RI	0.83	0.9	0.7

GROUP 2: Malignant by imaging + benign by histopathology
No. of patients: 4

Table 3: Malignant by imaging + benign by histopathology

Doppler Indices	Mean	Maximum	Minimum
PSV	32.35 cm/sec	36.3cm/sec	28.4cm/sec
PI	1.1	1.3	0.9
RI	0.6	0.6	0.6

GROUP 3: Benign by imaging +benign by histopathology
No. of patients: 12

Table 4: Benign by imaging +benign by histopathology

Doppler Indices	Mean	Maximum	Minimum
PSV	10.84cm/sec	16.1cm/sec	7.13cm/sec
PI	0.58	1.15	0.3
RI	0.4	0.6	0.3

GROUP 4: Benign by imaging + malignant by histopathology
No. of patients: 3

Table 5: Benign by imaging + malignant by histopathology

Doppler Indices	Mean	Maximum	Minimum
PSV	17.23 cm/sec	22.9 cm/sec	5.91cm/sec
PI	1.23	2.2	0.6
RI	0.76	0.9	0.7

Relative importance of different Doppler indices

1. Resistive Index
   Benign – out of 15 cases 3 had high RI (0.7)
   Malignant – out of 25 cases 21 had high RI (0.7)
   Therefore 20% of the benign masses and 84% of malignant masses had high RI.
   RI value >0.7 indicating malignancy whereas values <0.7 benignity.
   Accordingly 21 malignant and 12 benign breast masses were correctly diagnosed by imaging based on above-mentioned criteria.

2. Pulsatility Index
   Benign – out of 15 cases 1 had high PI (>1.4)
   Malignant – out of 25 cases 15 had high PI (>1.4)
   Therefore 6.67% of the benign masses and 60% of malignant masses had high PI.
   PI value >1.4 indicating malignancy whereas values <1.4 benignity.
   Accordingly 15 malignant and 14 benign breast masses were correctly diagnosed by imaging based on above-mentioned criteria.

3. Peak Systolic Velocity
   Benign – out of 15 cases 2 had high PSV (>18.8 cm/sec)
   Malignant – out of 25 cases 15 had high PSV (>18.8 cm/sec)
   Therefore 13.33% of the benign masses and 40% of malignant masses had high PSV.
   PSV value >18.8 indicating malignancy whereas values <18.8 benignity.
   Accordingly 10 malignant and 13 benign breast masses were correctly diagnosed by imaging based on above-mentioned criteria.

Sensitivity and specificity of color Doppler in evaluation of benign lesion were calculated to be 80% and 87.5% respectively.

Sensitivity and specificity of color Doppler in evaluation of malignant lesion were calculated to be 87.5% and 80% respectively.

Hence color Doppler evaluation is helpful for differentiating benign and malignant breast lesions and RI is the most suitable index among all quantitative indices for characterizing the nature of the tumor.

DISCUSSION

The main aim of this study is to differentiate benign from malignant lesion with considerable accuracy in order to avoid unnecessary biopsies.

Study conducted by Sehgal CM *et al* [1] to evaluate vascular pattern of malignant and benign breast lesions. The malignant masses were 14-54% more vascular than benign masses. Also benign masses were 2.2 times more vascular than surrounding tissue, the malignant masses were 5 times more vascular.

In a study by Mukta J *et al*. color signals were seen at the periphery and within the lump in five(55.56%) patients and at the periphery alone in four(44.44%) patients. None of the benign lesions show any color signals, thus giving a sensitivity of 81.8%, specificity of 100% and a positive predictive value of 100% for association with malignancy [2].

Regarding peak systolic velocity 13.3% of benign and 40% of malignant breast tumors showed high PSV (.18.8 cm/sec). 57.7% of breast lumps were correctly categorized depending on high PSV. This result corroborate well with a study conducted by Blohmer JU *et al*. [3].

20% of benign masses and 84% of malignant masses had high RI (0.7) where-as 82.5% of total 40 cases were correctly diagnosed by using only RI value as a differentiating criteria for benign and malignant masses.

In a study conducted by Medl M *et al* [4], on 87 women with mammographic ally suspicious breast lesions. It showed RI >0.7 an optimal threshold value to differentiate benign and malignant lesions.

Study conducted by Chao TC *et al*. [5] showed significantly higher values of vessel number, RI, PI and systolic peak flow velocity (V_{max}) in carcinomas but the

stiking overlap of the values did not allow defining cut off values which allows an accurate differentiation.

CONCLUSION

Ultrasound of breast has already proved to be an important method of examination. Doppler has additional advantage of narrowing of spectrum to come to a conclusive diagnosis. Different Doppler indices have been evaluated to differentiate the benign and malignant breast lesions. The present study showed color Doppler is a good diagnostic adjunct over gray scale sonography in characterizing breast masses and among all the flow velocimetry criteria, resistive index (RI) is the most significant one.

REFERENCES

1. Sehgal CM, Arger PH; Quantitative vascularity of breast masses by Doppler imaging: regional variations and diagnostic implications. J Ultrasound Med., 2000; 427-40; quiz 441-2.
2. Mukta J, Satish KB; Color Doppler ultrasonography study of palpable breast lumps-pilot study. Ind J Radiolimag., 1997; 7(2): 79-82.
3. Blohmer JU, Chaoui R, Schmalisch G, Bollmann R, Lau HU; Differential breast tumor diagnosis by comparing blood circulation of the tumor with the contralateral breast using color coded, pulsed Doppler ultrasound. Geburtshilfe und Frauenheilkunde, 1995; 55(1):1-6.
4. Medl M, Peters-Engl CH, Leodolter S; The use of color-coded Doppler sonography in the diagnosis of breast cancer. Anticancer research, 1993; 14(5B):2249-51.
5. Chao TC, Lo YF, Chen SC, Chen MF; Color Doppler ultrasound in benign and malignant breast tumors. Breast cancer research and treatment, 1999; 57(2):193-9.
6. Madjar H, Prömpeler HJ, Sauerbrei W, Wolfarth R, Pfleiderer A; Color Doppler flow criteria of breast lesions. Ultrasound in medicine & biology. 1994; 20(9):849-58.