

## Role of Color Doppler Ultra Sound Versus Histopathology in Differentiating Malignant From Benign Breast Masses

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### ABSTRACT:

#### BACKGROUND:

Cancer of breast is by far one of the most important clinical problems that concerns the surgeon. It is the commonest form of cancer in females, when detected early and given the proper treatment can be cured. Color Doppler imaging is modern technique that can be used in preoperative assessment of breast lumps.

#### OBJECTIVE :

To assess the role of color doppler imaging in differentiating malignant from benign breast lumps in comparison with the histopathology in AL- Najaf teaching hospital.

#### METHODS:

Total number of patients was 80 female of different age groups were assessed during the period from first of February 2004 to the first of February 2006 , presented with variable palpable breast masses. After clinical assessment, all our patients underwent , color doppler imaging and then subjected to the excisional biopsy and histopathology for confirmation of the diagnosis.

#### RESULTS:

The results of color doppler imaging for all our patients were found as follow, benign lumps in 54 cases (67.5%),malignant lumps in 26 cases (32.5%),two cases diagnosed as benign by color doppler imaging proved to be malignant by histopathology giving ( 2.5%),false negative rate. All obtained results of sensitivity, specificity and over all accuracy of color doppler imaging respectively as follow (92.85%),(100%),and(97.5%).

#### CONCLUSION:

Color doppler imaging is highly sensitive and specific method in evaluating malignant breast masses and is painless, non-invasive and time saving procedure, so we can reduce the rate of unnecessary surgery for histopathology.

**KEY WORDS :** Colored Doppler Imaging(CDI),Breast Mass, Breast Cancer.

### INTRODUCTION:

Differentiation between benign and malignant solid breast lumps by means of (CDI) has gained increased interest. In (CDI), the doppler signals received from flowing blood are processed and color-encoded .<sup>(1,2)</sup> (CDI) could be thought to increase diagnostic confidence in two ways either by showing vascularity in morphologically benign lump(even in cancers with a negative B-mode nature of lumps that are benign) or indeterminate at B-mode ultrasound. <sup>(1)</sup> It has been shown that (CDI) can reduce the number of open breast biopsies. <sup>(3)</sup> Tumor angiogenesis is a well known phenomenon for tumor growth, increasing numbers of new vessels are associated with an increased risk for malignancy . Doppler analysis proved to be successful on it's own for distinguishing benign from malignant lumps. <sup>(4)</sup> Neoangiogenesis demonstrated as:

- Feeding signal, entering the tumor through it's border with adjacent structure.
- Spotting signal, vascular spots within the tumor.
- Draining signal, coming out of the tumor.
- Penetrating signal, passing through the tumor zone.
- Feeding and draining vessels mostly present in primary tumor.

Neo angiogenesis is established in (80-85%) of primary malignant tumor and in (5-10%) of benign tumor concentrating on this phenomenon we can differentiate between benign and malignant tumors.<sup>(5)</sup>

#### PATIENTS AND METHODS:

80 patients presented with variable breast lumps were selectively chosen in this prospective study that was done in period from the first of February 2004 to the first of February 2006 in AL-Najaf teaching hospital. All cases were subjected to clinical evaluation (including history and physical examination), CDI and histopathological examination.

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Every patient was submitted to examination by U/S using Siemens-versa Pro U/S machine and/or Kretz Voluson by 7.5 Mega Hertz(MH<sub>2</sub>)linear probe (B-mode and color Doppler imaging) to evaluate structure and vascularity of breast masses and all patients were examined by the same operator.

Complete examination of the breast by 7.5 MH<sub>2</sub> probe with evaluation of mass vascularity, compared this with contra lateral area in the normal breast, the examination included the axilla of the both sides. After open surgical biopsy which is either incisional, excisional or mastectomy specimen, all specimens were fixed in 10% formaline solution and later stained by haematoxyline and eosins stain either in Al Najaf teaching hospital or in private laboratory.

**RESULTS:**

Total number of cases was 80, the ages range between 16-65 Years with an average of 40.5 Years. The peak age incidence was between 30-39 Years as shown in table (1). Regarding the marital status of our patients with benign and malignant lumps 66 cases were married (82.5%).

The first common presenting complaint of patients

was Breast lump and the second presenting complaint was pain. The distribution of masses between both breasts. malignant breast lumps are mainly found in right breast(69.3%), while benign lumps are mainly found in left breast (63%). Among the malignant cases , 4 cases presented with Axillary lymphadenopathy.

The incidence of lumps in relation to the quadrants of breast were different and it is more common in upper outer quadrant in both benign and malignant lumps.

**Results of CDI.**

- 1- Malignant (positive) = 26 patients diagnosed as malignant by CDI and confirmed by histopathological examination, so there is no false positive diagnosis table(2).
- 2- Benign (negative) = 56 cases the result of CDI were benign, but the histopathological examination confirmed that in 52 cases and only 2 cases were found to be malignant, so there were two false negative diagnosis, table(2). Results of Histopathological Examination(HPE). 52 cases were benign, 28 cases were malignant, table(3).

**Table (1):The distribution of benign and malignant lumps of breast diagnosed by CD study according to the age group.**

Age of the patient (years)	Benign lesion		Malignant lesion	
	No. of patient	%	No. of patient	%
10-19	4	7	-	-
20-29	14	25.9	-	-
30-39	30	55.5	4	15.4
40-49	6	11.6	12	46.2
50-59	-	-	6	23
60-69	-	-	4	15.4
Total	54	100	26	100

**Table (2):Results of CD-study of 80 patients with breast masses.**

Results of CD-study	No. of patients	%
Benign	54	67.5
Malignant	26	32.5
Total	80	100

**Table (3):Result of histopathology of 80 patients with breast masses.**

Results of Histopathology	No. of patients	%
Benign	52	65
Malignant	28	35
Total	80	100

Table(4):Correlation between CD-study and histopathological results.

CD-study	No. of patients	%	Histopathology		
			Benign	Malignant	%
-	-	-	Benign	Malignant	%
Benign	54	67.5	52	2	65
Malignant	26	32.5	-	26	35

Table(5):Validity of CDI in diagnosing malignant breast masses according to histopathological examination.

	+ve malignancy	-ve malignancy	Total
+ve malignancy	26/TP**	0/FP	26
-ve malignancy	2/ FN	52/TN	54
Total	28	52	80

\* HPE (validating test) CDI

$P < 0.001$

Sensitivity =  $TP / \text{all malignant} \times 100$

$26 / 28 \times 100 = (92.85\%)$

Specificity =  $TN / \text{all non malignant} \times 100$

$52 / 52 \times 100 = (100\%)$

Accuracy rate =  $TP + TN / \text{total} \times 100$

$78 / 80 \times 100 = (97.5\%)$

\*\*TP=True positive, FP=false positive, FN=false negative , TN=True negative,

\*HPE=Histopathological examination.

Tables (6&7) show the CD-findings versus histopathological findings of both benign and malignant lumps in 80 patient

Table(6):CD-study findings versus histopathological diagnosis of benign lumps in 54 patients.

Nature of mass	No. of patients	Findings of CDI	Ri	Size	Histopathological results
Cystic	4	Avascular	-	3.5-4 cm	Calactocoele
Solid	14	Avascular	-	0.5-1 cm	Fibroadenoma
Solid	26	Mild increment in the peripheral vascularity	0.40-0.55	1.5-2.5 cm.	Fibroadenoma(22 cases) Ductectasia (4 cases)
Solid	6	Mild increment in the central vascularity	0.55-0.60	1.5-2 cm	Fibroadenoma
Solid	2	Mild increment in the central vascularity	0.64	0.88-0.75 cm	Intraductal carcinoma
Solid	2	Mild increment in the central vascularity	0.66	2 cm	Fibroadenoma

Table(7):CD study findings versus histopathological diagnosis of malignant lumps in 26 patients.

No. of patients	Findings of CDI	RI	Size	Histopathological results
16	Increment of central and peripheral vascularity	0.69-0.82	1.5-2 cm	Intraductal carcinoma
6	Increment of internal vascularity	0.75-0.80	2-3 cm	Intraductal carcinoma
4	Increment of central and peripheral vascularity and presence of penetrating vessels	0.70-0.71	1.5-3 cm	Invasive lobular carcinoma

RI (Resistance Index) =  $S - D / S$

(S) =Systole, (D) =Diastole .

Table (8): Statistical results of CD-study.

Statistical parameters	CD-study results
True positive	26
False positive	-
True negative	52
False negative	2
Sensitivity	92.85 %
Specificity	100%
Accuracy	97.5%
Positive predictive value	100%
Negative predictive value	96%

**DISCUSSION :**

The value of any diagnostic test lies in its ability to detect the presence of disease when it's present (sensitivity) and verify the absence of disease when it is not present (specificity).<sup>(5)</sup> In this study CDI was used in the diagnosis of palpable breast masses in 80 female patients, all those patients were subjected to HPE. The number of patients was low due to different causes, the most important one is that many patients refused breast biopsies due to wrong believe that HPE may change benign lesion into a malignant one, other cause contributed in the reduction of number of visitors to our breast clinic was the last war's circumstances in Al- Najaf city which lead to close the teaching hospital for about 8 months. The breast lumps in our study occur in patients predominantly between 30-39 years old, the peak incidence of benign lumps was between 30-39 years old and of malignant lumps was 40-49 years old which is similar to that reported by Benedetto mentioned that carcinoma of the breast is extremely rare below the age of 20, but thereafter it is increasing.<sup>(6)</sup> Regarding the relationship of malignant and benign lumps to the quadrants of breast, the upper outer quadrant was involved in (75%) of malignant lumps and in (54.63%) of benign lumps, this is similar to other study done by Steinberg et al, 1996 and Meterissian et al, 1995.<sup>(7,8)</sup> In this study the use of contraceptive pills was in 24 patients (44.4%) with benign lumps and 15 patients (57.69%) with malignant lumps, in the contrast to other studies in which the place of oral contraceptive pills and hormonal replacement therapy as a low risk factor which remains controversial, because in our society the large usage of pills among females in contrast to other methods of contraception could be a matter of religion and this study is similar to the study was done by Powles et al (1991).<sup>(6)</sup> Lump and pain were the commonest associations in our patients presentation all patients presented with lumps, while in 24 (44.4%) of benign cases and in 4 (15.3%) of malignant cases were suffering from pain and this is consistent with other study by Arbor ; (2000), which reported that most breast

cancers present as a hard lumps, while in benign the common symptoms are pain (47%) and lump in (35%).<sup>(7,8)</sup> The findings of CDI in malignant lumps revealed that all malignant lumps show increased central and/or peripheral vascularity where RI ranging 0.69-0.82, while in benign lump only 8 cases show minimal or mild internal vascularity where RI ranging 0.5-0.6, and the remainder lumps were a vascular and this is similar to that reported by Al-Gul et al, (2003) that neo angiogenesis was established in (80-85%) of primary malignant tumors and in (5-10%) of benign tumors,<sup>(9)</sup> and to other study done by Reston (2001).<sup>(10)</sup> In our study the sensitivity, specificity and accuracy of CDI were ; Sensitivity =(92.85%), Specificity = (100%), Accuracy = (97.5%) these results are approximately similar to the study was done by Cosgrove et al. who used CDI to evaluate breast masses in 60 patients, they found that 20 of 21 breast cancers demonstrated the accuracy was (98.3%), the sensitivity was (95%) and the specificity was (97%),<sup>(11)</sup> other study by Raza et al ( 2003) with specificity of (95%).<sup>(12)</sup> In other studies, Jackson obtained a sensitivity of (96%) in the evaluation of 35 solid breast lumps in 1992,<sup>(13)</sup> Taylor et al . have identified abnormal Doppler signals obtained by Doppler ultrasound in a variety of malignant tumors, with accuracy of (86%) of 44 cases .<sup>(14)</sup> That difference between our study and other studies, because other studies were done in 1992 which was the near beginning use of CDI in breast lumps and this reflect the low experience and less developed machines.

**CONCLUSIONS AND RECOMMENDATIONS:**

**1.**CD-study is sensitive and highly specific method of evaluating breast mass for malignancy.

**2.**This type of procedure is essentially painless and non-invasive and can be done as outpatient procedure ,and can be repeated safely at the same or further session, but it is an operator dependant.

**3.**In this study I hope that CDI in addition to other diagnostic modalities such as ultrasound and fine needle aspiration cytology may replace histopathology in detecting breast cancer in future.

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