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Original Research Paper

Radio-Diagnosis

USEFULNESS OF RESISTIVE INDEX IN THE DIAGNOSIS OF BREAST TUMOUR

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ABSTRACT **Aims And Objectives:** to assess whether the resistance index (RI) adds to the differential finding of breast masses. **Materials And Methods:** In 40 breast cancer patients, colour coded Doppler sonography was performed and their resitance index was determined from their otherworldly Doppler findings. Histologic assessment was acquired by extraction biopsy. **Results:** In 3 of 14 benign cancers (25%) no lesion was seen on ultrasound. In another 4 benign cancers, no intratumoral vessels were illustrated. The resistance index of the rest 7 lesions (half) differed somewhere in the range of 0.5 and 0.75 with a mean worth of 0.62 (standard deviation 0.08). Ultrasound missed one of 26 carcinomas (3.5%) and in another cancer (3.5%) no stream was obvious. The obstruction list of 26 harmful growths fluctuated somewhere in the range of 0.56 and 0.9 with a mean worth of 0.7 (standard deviation 0.08). **Conclusion:** Breast malignancies report higher resistance index with a more extensive territory as surveyed by colour- coded Doppler ultrasound (81% surpass 0.6) than do the benign varieties. Due to the significant cross-over of the scope of the resistance index, the estimations in any single patient may not be analytic. The shortfall of stream doesn't authoritatively reject threat.

KEYWORDS : Benign, Malignant, Doppler, Resistance Index, Biopsy, Breast Cancer

INTRODUCTION

Doppler ultrasonography has been used in numerous attempts to distinguish between benign breast lumps and malignant cancers. Compared to malignant tumors, the flow in benign disease was, in my opinion, considerably less visible [1]. Valves in benign lesions have also been apparent as the sensitivity of color Doppler US has risen for portraying low flow volume and smaller flow velocities [1, 2]. Previous studies have demonstrated that tumor arteries on continuous wave and duplex US scans may exhibit higher systolic frequency shifts and flow velocities in carcinomas than in fibroadenomas [3–10]. However, the results of the many investigations have been inconsistent, and there is no consensus on the diagnostic standards for differentiating between benign and malignant lesions. Analysis of the resistive index value was the goal of our investigation.

AIMS AND OBJECTIVES:

to assess whether the resistance index (RI) adds to the differential finding of breast masses.

MATERIALS AND METHODS

This retrospective study comprised 40 patients with mammographic anomalies who were assessed pre-operatively using color-coded Doppler sonography. Their resistence indices were derived from their spectral Doppler tracing. The patients ranged in age from 17 to 85 years. For B-mode imaging, a 38mm linear array probe operating at 5-10 MHz switched automatically to 6 MHz for pulsed Doppler. The color Doppler settings were chosen to maximize the detection of weak signals and low Doppler shift frequencies typical of small vessels whenever a lesion could be detected by sonography. The vessels within the lesion were examined with pulsed Doppler ultrasound. The sample volume's length ranged from 1.5 to 3 mm. For five to ten heart cycles, doppler signals from three distinct intratumoral vessels were obtained, and the following formula was used to determine the resistance index:systolic peak flow divided by end diastolic peak flow)/systolic flow. The lesion's resistance index was determined to be the mean value of at least three different vessels' resistance indexes. For both benign and malignant lesions, the resistance index's mean, range, standard deviation, and variation coefficient were examined. The Student's t-test was used to compare the mean values of the resistance indices. A significance level of 0.05 was considered. One seasoned examiner carried out each ultrasound study. The examination took about a quarter of an hour on average. Within a week, an excision biopsy confirmed all lesions histologically.

RESULTS

Among 40 study participants, 14 were identified as benign and 26 as malignant. The mean value of resistive index of benign tumor was lower than the malignant tumors. (0.6± 0.08 vs 0.74 ±0.08). The value of resistive index of benign tumors ranges from 0.5- 0.63 whereas that of malignant tumor ranges from 0.56 -0.9.

Table 1 - Results of Doppler spectral analysis of benign (n = 14) and malignant (n = 26) lesions

	Benign (n = 14)	Malignant (n = 26)
Mean value of the RI	0.6	0.74
Range of the RI	0.5- 0.63	0.56-0.9
Standard deviation	0.08	0.08
Variation coefficient: range	0.07- 0.23	0.03-0.26
Variation coefficient: average	0.14	0.11

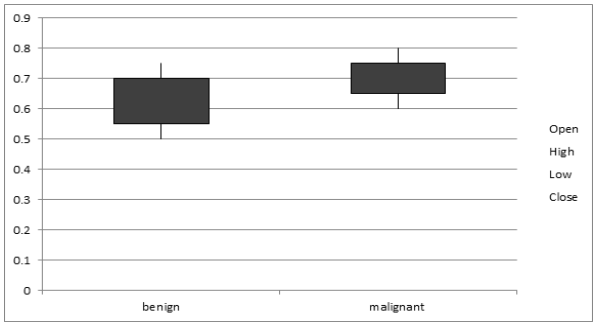

Fig. 1 Box-and-whisker plots depicting distributions of resistance indices (RI) obtained from benign and malignant breast lesions. In each box, the lower bound represents the

25th percentile, the upper bound the 75th percentile, and the notch the 50th percentile; each lower bar represents the 5th percentile, and each upper bar the 95th percentile.

DISCUSSION

For routine breast cancer detection, mammography has established itself as a quick, low-cost, and effective method. Sadly, not all cases can be diagnosed with it. There are two benign breast biopsies for every cancer detected because early cancer presents differently. When the combined diagnostic accuracy of stereotactic fine-needle biopsy and mammography is taken into account, malignant to benign ratios of 7:1.

Different diagnostic techniques have been used to help distinguish between benign and malignant breast lesions that operate at 5 MHz in a color Doppler US mode. Gray-scale imaging was used in the study by Starvors et al. [11] to detect benign and malignant lesions with sensitivity of 98.4% and specificity of 67.8%. Their criteria considerably increased the effectiveness of distinguishing between benign and malignant tumors.

Although color Doppler US has been frequently used to assess breast illness, it has not yet been possible to do a thorough review of the various Doppler criteria. Color Doppler sonography has the opportunity for quick detection of vascularization by displaying flow information over the entire area of the ultrasound image in real time. Typically, benign lesions contain fewer vasculature than malignant tumors. Some authors compare their results using pulsatility and resistive indices rather than frequency shifts because it is impossible to detect the exact direction of blood flow [1–10]. According to the findings of our investigation, malignant lesions had mean RI values that were higher (0.74 versus 0.62). When compared to benign lesions, these values were considerably greater in malignant tumors (P , 0.001). When the threshold value was set at 0.7, RI's sensitivity to identify cancer was 81%, and its specificity was 89%. According to Madjar et al. [12], the mean value of RI was 0.68 in benign lesions (n = 176) and 0.74 in malignant lesions (n = 582). With a threshold value of 0.7, the sensitivity and specificity of RI were 89 and 49%, respectively. The mean value of RI was 0.65 in benign lesions and 0.78 in malignant lesions, according to Konish et al paper .'s from 2010 (page 10). Sensitivity was 57.7% and specificity was 82.4% at threshold value of 0.75.

With such sensitivity and specificity, RI can only be used as a supplementary diagnostic tool and is unlikely to replace a biopsy in cases where other established techniques for differentiating between benign and malignant tumors are ineffective. As a result of the wide overlap in the RI's range, measurements in any given patient might not be diagnostic [13]. At a significant threshold of P 0.005, gray-scale sonography outperformed color Doppler sonography in the Wilkens et al. [14] series in terms of accuracy. Gray-scale pictures and RI can be utilized as an auxiliary in diagnosis. The mass is very suggestive of malignancy and requires particular attention if the RI value of the mass is greater than 0.7.

According to reports, the value of RI in carcinomas is both higher (10) and lower [15]. The malignant tumor vasculature resemble big capillaries or sinusoids in structure but lack nonstriated muscles. Additionally, tumor neovascularity lacks the distinctive taper of normal arteries: the size of tumor vessels varies. Arteriovenous shunts happen, and tumor vessels exhibit blockages, an irregular path, and a distribution [7].This alters the blood's flow velocity, which can be seen as an acceleration of the blood flow during Doppler sonography.

In breast tumors, aberrant, high-velocity signals were observed, and Burn et al. [6] and Jellins et al. [16] proposed that these signals were the product of arteriovenous anastomoses. Breast cancers have different flow properties than other organs. Rarely are breast lesions reported to have the high diastolic flow that is commonly found in gynecological malignancies. Therefore, increased RI in malignant lesions may be explained by high-velocity signals resulting from arteriovenous anastomoses and comparatively low diastolic flow. Wide sinusoids are frequently where tumor vascular termination occurs, which reduces peripherhal resistance. Despite being uncommon in breast cancers, this drop is said to appear as a loss of systolic-diastolic fluctuations (low RI).

Our analysis was limited by the fact that we only considered lesions with colored Doppler signals. Thus, the fact that our data demonstrated a better sensitivity and specificity of RI in comparison to other research may be the cause.

CONCLUSION

Doppler is likely used as an addition approach for US imaging in the present. A resistive index of greater than 0.7 may signal malignant breast masses and, while not diagnostic, may aid in differentiating between benign and malignant tumors. For a definitive diagnosis of breast lumps, a biopsy is still required.

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