



EFFICACY OF COLOUR DOPPLER ULTRASONOGRAPHY IN PRE-OPERATIVE DIFFERENTIATION OF OVARIAN MASSES

Obstetrics & Gynaecology

**Dr. Sarumathy
K.A.***

M.B.B.S., M.S. (OBG), DNB OBG, Senior Resident in Department of Obstetrics & Gynecology, Kharagpur S.D. Hospital, West Bengal. *Corresponding Author

ABSTRACT

Objectives: To assess the performance of Colour Doppler Ultrasonography and CA 125 in distinguishing ovarian masses preoperatively.

Methods: In this study, 150 suspected ovarian masses were subjected to Doppler Ultrasonography and resistance index and Pulsatility index of these masses were calculated. Of these 11 masses were found to be non ovarian origin intraoperatively and excluded from the study results (n=139). The cut off for malignancy was kept at PI<1 and RI<0.5. The intraoperative findings were confirmed with histopathology.

Results: Out of 139 ovarian masses, 63 were malignant and 76 were benign. 51 out of 63 malignant masses had low PI while 53 out of 63 had low RI value. The sensitivity; specificity; PPV & NPV of RI in our study were 84.13%; 90.62%; 89.83% & 85.29% respectively. The sensitivity; specificity; PPV & NPV of PI were 80%; 89%; 87.9% and 82.6% respectively.

Conclusion: Malignant ovarian masses are almost always associated with marked neovascularity with low impedance flow. Doppler study of these neovascular vessels has excellent sensitivity and specificity in differentiation of malignant and benign tumors and in guiding the need for Neo Adjuvant Chemotherapy, extent of surgery and post operative management.

KEYWORDS

Malignant, Benign, Doppler, Resistance Index, Pulsatility Index, Impedance

INTRODUCTION

Ovarian cancer is the seventh most common cancer among women worldwide and ranks eighth in cancer deaths among women (1). **When diagnosed in the early stage (STAGE I) the survival rate is around 95%.** Its well known that cervical cancer is preventable because of the availability of a very good screening test, the Pap smear. But no such effective screening test is available for ovarian cancers. Hence it is necessary to investigate methods for the detection of ovarian cancer in an early stage.

Any malignancy is characterized by rapid cell proliferation and neovascularisation due to the secretion of angiogenic factors by the tumour cells (Folkman's theory of neovascularisation) (2).

Neovascularity is required for a tumour to grow beyond a few millimeters in size. But these vessels lack smooth muscle in their wall resulting in an increased diastolic flow. This property of vessels can be demonstrated by the Doppler study and aid in differentiating malignant and benign ovarian mass.

RESISTANCE INDEX (RI):

The resistance index assesses arterial waveforms where there is no reverse flow component. The value is $RI = \frac{\text{Peak systole} - \text{End diastole}}{\text{Peak systole}}$. The cut-off value for malignancy is <0.5 .

PULSATILITY INDEX (PI):

This index was devised to determine quantitative energy in the oscillation of the waveform. The formula is $PI = \frac{\text{Peak systole} - \text{End diastole}}{\text{Mean peak value}}$. The cut-off value for malignancy is <1 .

Considering the neovascularisation theory of tumour angiogenesis and elaboration of the tumour markers by any malignancy we combine both Colour Doppler and CA 125 levels in the prediction of the nature of the ovarian malignancy and its association with the histopathological diagnosis.

MATERIALS & METHODS

The study was undertaken in the Gynecology OPD and ward and Radiodiagnosis OPD of IPGMER hospital, Kolkata after getting ethical clearance from the institution.. 150 ovarian masses were identified with sonography of which 139 were confirmed intraoperatively to be of ovarian origin. The remaining 11 were excluded (non ovarian). Colour and Pulsed Doppler US was used to calculate the RI and PI of each ovarian mass.

Inclusion Criteria :

- USG finding of adnexal mass
- Intraoperative ovarian origin

Exclusion Criteria:

- Women with no mass felt per vagina or found arising from the

uterus.

- tumours, no mass lesion in USG .
- Non-ovarian mass intraoperatively.

A detailed history and clinical examination followed by USG, color Doppler, and CA 125, and other tumor markers were done. Colour Doppler analysis of the vessels done and PI and RI value calculated.

The masses were classified as suggestive of malignancy when the lowest calculated PI was <1.0 or the lowest RI was <0.5 . These indices were correlated with Histopathology reports obtained from the surgical staging of the patient. The sensitivity, specificity, positive predictive value (PPV), and negative predictive value (NPV) of color Doppler was calculated, and also the efficacy of color Doppler established.

RESULTS

The prevalence was higher in the 41 – 50 years of the age group of females (Table 1). The mean age was 40.96 years in the benign group while 47.25 years in the malignant. Of 139 patients, the benign ovarian mass was found to be in 76 patients while malignant ovarian mass in 63 (Table 2). The prevalence of ovarian cancer is more in the post-menopausal group (61.9%) while in the premenopausal low (38.09%).

Table 1: Age Wise Distribution Of Ovarian Masses

Age	Benign (n=76)	Malignant (n=63)
11-20	07	05
21-30	12	02
31-40	17	07
41-50	15	23
51-60	14	22
61-70	10	04
71-80	01	0

Table 2: PI Values In Ovarian Masses

PI	Malignant	Benign
<1	51	7
≥ 1	12	57

Table 3: RI Values In Ovarian Masses

RI	Malignant	Benign
<0.5	53	06
≥ 0.5	10	58

Table 4: Sensitivity, Specificity, PPV & NPV of RI & PI

	PI	RI
Sensitivity	80%	84.13%
Specificity	89%	90.62%
PPV	87.9%	89.83%
NPV	82.6%	85.29%

Vascularity was not found in 12 benign masses.

The mean PI in the malignant group was 0.67 and 1.26 in the benign group mean. Both the above indices are statistically significant showing that the PI values are decreased in patients with malignant ovarian mass due to low resistance vessels.

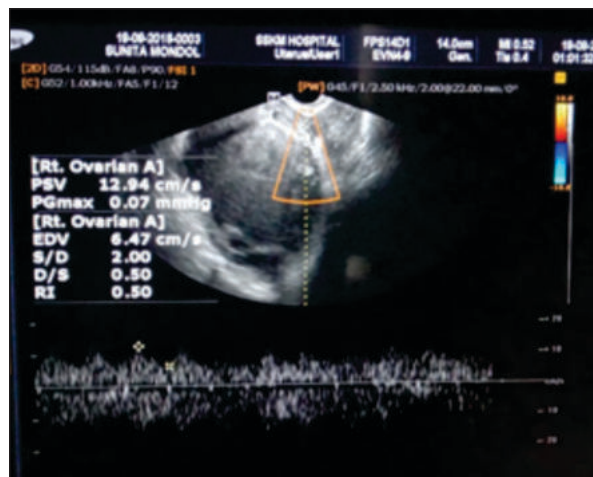


Fig 1: A 49 year old P2+0 with complaints of abdominal distension for 4 months and TV-CDS showed a right ovarian mass of 6 x 5 cm with RI 0.3. CA 125 – 331. Patient underwent Staging laparotomy. HPE report of patient showed serous cystadenoma carcinoma of ovary

The mean RI value in the malignant group was 0.38 and in the benign group 1.4 (Table 3). The sensitivity and specificity of PI in this study is 80% & 89% whereas that of RI is 84.13% & 90.62% respectively (Table 4).

DISCUSSION

Literature shows that the mean age of incidence of malignant ovarian tumors is around 40-50 years (5, 6). The changing trend in the incidence of ovarian cancer in the Indian scenario was shown in a study conducted by Murthy et al (7). Studies show that the postmenopausal age group is associated with ovarian cancers (8, 9, 10, and 11).

Taori KB et al (12) in 2002 concluded that Doppler study both colour Doppler and spectral Doppler improved the reliability of detection of ovarian cancer. I.E.Timor-Tritsch MD et al (13) in his study shows increased efficacy of Ultrasonography in the detection of borderline ovarian tumors.

The results of Desai et al (14) concluded that grayscale and colour Doppler differentiated benign from the malignant ovarian mass with more accuracy with a sensitivity of 81.8% and specificity of 92.3%. A study conducted in West Bengal by Sehgal N. et al (15) showed a sensitivity of 81.48% and specificity of 93.3%.

CONCLUSION

The results of this study show that Colour Doppler Ultrasonography might hold promise for earlier detection and evaluation of adnexal masses. But at the present scenario it can be recommended as a screening tool for women at high risk of ovarian cancer.

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