

ORIGINAL ARTICLE

Diagnostic Accuracy of Colour Doppler in the Assessment of Resistance Index of Ovarian Tumors

SAIQA ZAHEER SHAH, SAIMA AMEER, SAIMA ZAHEER, NEELAM RAHEEL
Department of Diagnostic Radiology, Lahore General Hospital, Lahore, Pakistan.
Department of Obstetrics and Gynecology, Lahore General Hospital, Lahore, Pakistan.

ABSTRACT

Objective: The aim of this study was to determine the Diagnostic Accuracy of Doppler sonography for the diagnosis of Resistive Index of ovarian carcinoma taking histopathology as gold standard.

Methods: Fifty patients with complex pelvic masses assessed preoperatively with two-dimensional ultrasound (2DUS), two-dimensional power Doppler (2DPD), color Doppler taking histopathology as gold standard.

Results: All patients underwent exploration, 11 (22%) had other lesions, 39 (78%) had ovarian cancer. 2DUS with 2DPD & Color Doppler RI of 0.4 identified 39 cases, suggests these patients had ovarian tumour giving 92.6 % sensitivity, 88.8 % specificity, 97.4 % positive predictive value, 72.73 % negative predictive value and 92.0 % diagnostic accuracy.

Conclusion: Evaluation by power Doppler ultrasound improves diagnostic accuracy of ovarian tumors. We strongly recommend Doppler Sonography for the evaluation of ovarian carcinoma because it is highly accurate, easily available and non-invasive imaging modality for its diagnosis.

Keywords: 2DUS, 2DPD, Ovarian tumors.

INTRODUCTION

Ovarian cancer is the seventh most common cancer in women world-wide. Ovarian cancer is the fourth most frequent cause of cancer death in women and accounts for 5% of all cancer deaths. The death rate from ovarian cancer exceeds that of cervical and endometrial carcinoma combined¹.

Conventional two-dimensional (2D) ultrasound has been widely used for the evaluation of adnexal malignancy in gynecologic fields. This 2D ultrasound evaluation includes a morphological assessment, color/power and pulsed Doppler sonographic assessment, scoring system, and contrast agent assessment of adnexal masses². Doppler flow measures and assess tumour vascularity which increase the confidence with which correct diagnosis can be made, color and pulsed Doppler sonography depicts the vascularity of pelvic organs and can be used for assessment of angiogenesis in tumour masses producing insight of tumour³. Thus, patients may have less invasive surgical procedure such as laparoscopy or be referred to a gynecological oncologist^{4,5}.

CT imaging is not a primary imaging tool in the early diagnosis of ovarian cancer. CT offers much lower inherent tissue contrast than does MR imaging, even with the use of contrast agents. Other disadvantages of CT include a higher risk of adverse events due to the use of iodinated

contrast agents and ionizing radiation, which is especially undesirable in premenopausal women and is also suboptimal in a screening setting where repeated imaging is required [6]. CT scans often failed to detect very small calcifications, and intracystic type calcifications are difficult to distinguish from dense mucinous fluid by CT scans [7]. Combined morphological and vascular imaging obtained by 2D ultrasound with 2D power Doppler appears to further improve the pre-operative assessment of adnexal masses. CT is not indicated for differential diagnosis of adnexal masses because of poor soft tissue discrimination, except for fatty tissue and for calcification, and the disadvantages of irradiation [8]. The aim of this work was to determine whether introducing (2DPD) and color Doppler either alone, or in combination with 2D ultrasound will improve preoperative diagnostic accuracy of the nature of ovarian masses.

PATIENTS AND METHODS

This prospective study was conducted in the Department of Diagnostic Radiology, Lahore General Hospital, Lahore. This study included 50 patients with ovarian masses within the ages of 30-70 years, who attended indoor and outpatient departments from October, 2013 to October, 2014. The women with a known complex pelvic mass of

ovarian nature were referred for a preoperative ultrasound evaluation with both two-dimensional color and power Doppler ultrasound and 2D ultrasonography. Then the results of Doppler sonography and Histopathology were compared taking Histopathology as gold standard. By using convex probe of 2.5 to 3.5 MHz of ESOATE, My lab 40 ultrasound machine, scanning of patients was done at Department of Radiology, LGH, Lahore by researcher herself. After getting informed consent, Patients underwent 2D grey & 2D color Doppler sonography. Resistive index was calculated as the ratio of tumoural peak systolic velocity to the peak diastolic velocity of ovarian vessels on colour Doppler sonography. All basic demographic information of each patient (Name, age, sex, address and contact no) was also obtained. Then the biopsy acquisition was done in patients who have been labeled positive on color Doppler sonography. The procedure was done by researcher gynae & obs department. The obtained specimen was sent to Department of Pathology for histopathology examination. Then the reports of histopathology were assessed for the confirmation of positive and negative cases. All the information was recorded through pre-designed proforma.

All the cases were evaluated by the same person. On B-mode ultrasound scanning, the

definition of complex adnexal mass was based on the presence of at least 1 of the following parameters: thick wall (>3 mm), thick septum (>3 mm), thick papillary projections (>3 mm), solid areas or purely solid echogenicity. Masses in which the echo features were highly characteristic of a given pathologic condition (such as a simple cyst) were not included, thereafter, the 2-dimensional power Doppler gate was activated to obtain blood flow mapping from the tumour. Spectral pulsed Doppler analysis was done. [19,20].

RESULTS

All patients underwent appropriate standard oncological surgical procedures, and a definitive histological diagnosis was obtained. The study was conducted on 50 patients with ovarian tumors on color Doppler sonography for a period of 1 year.

Most common age group was 40-70 years and least patients were between 30-40 years. Out of 50 positive cases, the resistive index was equal to or less than 0.4 in 39 cases suggests these patients had ovarian ca, while resistive index was greater than 0.4 in 11 cases suggesting these patients had tumors other than ovarian ca.

Ovarian Tumor Resistive Index	On Basis of RI Labeled as	HISTOPATHOLOGY REPORT		
		Ovarian Carcinoma	Metastatic Tumor	Endometrioma
< 0.4	Malignant	38	01	00
> 0.4	Benign	03	02	06

So 39 tumors had resistive index equal to or less than 0.4, out of them 41 proven to be ovarian ca, while 09 were metastatic tumor/ endometrioma. According to resistive Index on Color Doppler sonography, 38 cases were true positive, 03 were false negative, 01 was false positive and 08 were true negative as confirmed by histopathology reports. Hence in ovarian lesions with resistive index equal to or less than 0.4 was associated with 92.6 % sensitivity, 88.8 % specificity, 97.4 % positive predictive value, 72.73 % negative predictive value and 92.0% diagnostic accuracy, in distinguishing ovarian carcinomas from ovarian metastases and endometriomas.

DISCUSSION

Ovarian cancer is the second most common gynecologic cancer. A woman has a one-in-70 risk of ovarian cancer in her lifetime [11]. Ovarian cancer is the most lethal of the gynecologic malignancies. Because ovarian cancer symptoms are subtle and nonspecific, the diagnosis is often delayed until the disease is well advanced [8]. Ovarian cancer is among the 5 leading causes of cancer death in women. Ovarian cancer confined to the ovary has a 5-year survival of 92%. However, most women with ovarian cancer are diagnosed with advanced stage disease, which has a 5-year survival of only 30%. The recognition that early detection of ovarian cancer may have

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the potential to improve prognosis [12]. It is most commonly diagnosed by ultrasound due to its cost effectiveness and easy availability. Other methods include the measurement of serum CEA in combination with the three phase CT/MRI.

The last decade has seen rapid technological advances in diagnostic ultrasonography, with the development of two-dimensional transabdominal gray-scale volume imaging and two-dimensional transabdominal power Doppler imaging. Initial studies suggest that these new technologies improve the diagnostic accuracy of two-dimensional transabdominal gray-scale imaging in the differentiation between benign and malignant adnexal pathology [11].

The current study reported that the best resistive index (RI) cut-off value for the diagnosis of malignancy was index equal to or less than 0.4 was associated with 92.6 % sensitivity, 88.8 % specificity , 97.4 % positive predictive value, 72.73 % negative predictive value and 92.0 % diagnostic accuracy. This coincided with Ueland et al. [13], who concluded that a resistive index (RI) cut-off point for the suggested Doppler's evaluation scale of the ovarian tumors vascularity was determined at the level of 0.4. And coincided with Nidhi Gupta. [5], who concluded that a resistive index cut-off point was determined at the level of 0.4 [5], this figure is comparable to our results. On the contrary M. Laban, H. Metawee. [1] concluded that <0.48 was a cut-off value. Also it was in contrary with Cnota et al. [14] and Mousavi et al. [15] who revealed that the best resistive index (RI) cut-off value was <0.5.

Data in the present study showed that by using the combined morphological and vascular imaging obtained by ultrasound improved the preoperative discrimination of adnexal tumors. To improve the accuracy of the differential diagnosis of Ovarian ca versus metastases / endometriomas, further studies are indicated on the use of the resistive index combined with the characteristics of the 3D gray-scale sonogram.

CONCLUSION

It is concluded that Color Doppler sonography is a highly effective mean for diagnosing ovarian cancer because of its easy availability, cost-effectiveness, quick, safe and non-invasive imaging modality. As compared to CT scan, it is safe in terms of no chance for radiation exposure. Doppler sonography not only provides reliable information regarding its location and

characterization but also aids in detecting its associated complications like ascities, metastasis etc. in simplest way. Moreover, due to its real time benefit, biopsy of lesion can be done easily. Resistive tumor index combined with the characteristics of the gray-scale sonogram provides better visualization of tumor vascularity in complex ovarian masses, significantly improving diagnostic accuracy in preoperative sonographic assessment of suspected ovarian lesions. Therefore resistive tumor index using Color Doppler sonography is useful for differentiating malignant ovarian cancers from benign masses. We strongly recommend Doppler Sonography for the evaluation of ovarian carcinoma because it is highly accurate, easily available and non-invasive imaging modality for its diagnosis.

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