COMPARISION OF ULTRASOUND AND DOPPLER EVALUATION WITH HISTOPATHOLOGICAL DIAGNOSIS IN ADNEXAL MASS

Meenakshi[1], Shriram.T[2], Ramalingam.A[3], Radhika[4]

Departments of Radiodiagnosis, VMRF, Aarupadai Veedu Medical college and Hospital, Puducherry, India.

Corresponding author- Dr. Ramalingam

Address for Correspondence:
Dr Meenakshi J
Department of Radiodiagnosis, Aarupadai Veedu Medical college and Hospital,
Kirumampaakam-607402 Puducherry, India
E-mail: meenakshijanakiram@gmail.com

ABSTARCT
Background: Ultrasonography (USG) is accepted as the primary imaging modality in the evaluation of adnexal pathologies and provides useful information regarding the nature of the lesion and to plan for appropriate intervention. The current study was planned to evaluate the diagnostic utility of USG and DOPPLER in differentiating different adnexal Masses (benign or malignant) and comparing them with histopathological findings.
Materials and Methods: A total of 70 patients referred from various departments were included in the study. B-mode sonomorphological criteria were used and subsequently spectral Doppler tracings were recorded by calculating resistive index (RI) and pulsatility index (PI) values. Modified International ovarian tumor analysis (IOTA) Scoring system, RI and PI value was applied to differentiate benign and malignant pelvic masses.
Results: On final diagnosis, the malignancy rate was 2.9% (n=2). As compared to histopathology, Doppler/USG was 100% sensitive and 96.3% specific. It had a positive predictive value of 96.3% and negative predictive value of 100%. The diagnostic accuracy was 96.6%.
Conclusion: The findings of this study showed that USG/Doppler evaluation is very useful in evaluation of adnexal masses and their management. Use of USG/Doppler in the initial evaluation helps to reduce the need for surgical intervention and successful detection of malignancy.

Keywords - Color Doppler, Pelvic masses, Spectral Doppler, Ultrasonography

1. INTRODUCTION

Adnexal masses are amongst one of the most common gynaecological problems. Adnexal masses may have gynaecological as well as non-gynaecological etiologies and could be benign as well as malignant in nature [1]. Understanding the etiology and underlying pathology of adnexal masses and its characterization is a challenging task for a clinician. However, their correct identification and categorization is essential to initiate a therapeutic management. Despite a high dominance of non-malignant pathologies, malignancy remains to one of the most important issues of concern. Ovarian cancer is the most common malignancy seen in adnexal masses [2].

Although histopathological evaluation is the gold standard yet being invasive in nature, it is often associated with undesired burden of invasive procedures, hence, non-invasive imaging is the available option. Some of the commonly available imaging options include ultrasound, computed tomography and magnetic resonance imaging. Of the three, both ultrasound and magnetic resonance imaging are the preferred techniques as they do not expose the patient to the ionizing radiation [3].

Among different imaging techniques, currently transvaginal ultrasonography is the preferred modality. Sonography is a very useful imaging modality that can be used in both symptomatic as well as asymptomatic women in reproductive or menopausal age groups. It is highly sensitive in detecting adnexal masses and their characterization [4].

USG helps to determine the size, texture, echogenicity of the adnexal masses in order to establish the correct diagnosis of the underlying pathology. It is very useful in differentiating benign from malignant pathologies. Apart from that it also plays a useful role in morphological characterization of masses that are helpful in clinical decision-making [5].

Ultrasound also fulfils the American College of Radiology (ACR) appropriateness criteria that recommends that in reproductive-age women with a negative pregnancy test having a possible gynecologic etiology for pelvic pain, ultrasonography is the recommended primary imaging modality [6]. Hence the present study was planned to evaluate the sensitivity and specificity of USG and Doppler in characterization of various adnexal masses. Further we studied its role in differentiating benign and malignant adnexal mass by correlating with histopathological findings and final diagnosis based on clinicopathological correlation.

2. MATERIAL AND METHODS

This Prospective diagnostic comparative study was done for the period of 2 years from November 2020 to October 2022.Women presenting to Department of Obstetrics and Gynecology with complaints of lower abdominal pain, menorrhagia, bleeding per vagina and ascites suspected of adnexal mass pathologies and referred to Department of Radiodiagnosis, Aarupadai Veedu Medical College and Hospital, Puducherry for sonographic assessment. Patients presenting with complaints of lower abdominal pain, menorrhagia, bleeding per vagina, ascites, patients in whom adnexal mass was found as an incidental finding during ultrasound examination were included and patient with non-adnexal mass, pregnant women and patient below 18 years and above 70 years were excluded.

Patients were enrolled after obtaining approval from Institutional Ethics Committee and getting informed consent from the patients or their legal guardians. During enrolment, age of the patients was noted and clinical records were assessed for major presenting complaints. MINDRAY DC 8EXP and MINDRAY DC 80EXP B-Mode Ultrasound Machine with linear ultrasound transducers at frequencies 7 MHz – 12MHz.

All the patients are scanned with Gray-scale sonography using 3-5 MHz and 5-7 MHz probes for transabdominal and transvaginal scans respectively. On gray scale sonography, the following features of adnexal masses were recorded namely site, laterality, size, surface contour, type of lesion, septation, papillary projection and associated findings. Thereafter, color flow imaging was done to assess the vascularity of the mass. If no blood flow was detected, the tumor was considered as avascular tumor. Following this, spectral Doppler assessment was done based on RI and PI index, where Relative Index (RI)=Peak systolic flow velocity-end diastolic flow velocity/peak systolic flow velocity and Pulsatility index (PI)=Peak systolic flow velocity-end diastolic flow velocity/ timed average velocity.PI<0.8 and RI <0.4 were considered as abnormal.Patients requiring surgical intervention underwent surgery and the specimen obtained was subjected to histopathological evaluation. Patients not requiring surgical intervention underwent conservative management as per ACOG guidelines

and were followed-up for treatment response to confirm the diagnosis. On the basis of clinical response to expectant treatment, a final diagnosis was prepared.

STATISTICS

Data obtained was fed into computer using Microsoft Excel 2013 software. Data was analyzed using IBM SPSS Stats 21.0 software. Diagnostic efficacy was evaluated in terms of sensitivity, specificity, positive predictive value, negative predictive value and accuracy of the tested imaging modality. A 'p' value <0.05 was considered as significant.

3. RESULTS

The present study evaluated the usefulness of USG and Doppler in differentiating adnexal masses among 70 patients. For this purpose, a total of 70 women with suspected or incidental USG diagnosed adnexal masses were enrolled in the study. Age of patients ranged from 17 to 67 years. Mean age of patients was 36.73 ± 10.13 years (Median age 37.5 years). Majority of patients were aged <40 years (71.4%). Pain abdomen (64.3%) and lump abdomen (15.7%) were the most common presenting complaints. Cycle and flow irregularities were reported by 45.7% and 58.6% patients respectively. Majority of women had haemoglobin levels <12 g/dl. Only 2 (2.9%) had TLC >11,000/mm3. CA-125 levels were assessed in 37 cases. Of these 8 (21.6%) had elevated levels.

On USG, bilateral involvement, multiple masses, larger size (>100 mm), ovarian localization, thick wall, septation, irregular margins, solid mass and papillary projections were revealed in 17.1%, 14.3%, 22.9%, 21.4%, 14.3%, 8.6%, 5.7% and 2.8% cases respectively. On Color Doppler, abnormal PI was seen in 9 (12.9%) cases. None had abnormal RI. USG/Doppler diagnosis of malignancy was made in only 3/70 (4.3%) cases. Histopathological evaluation could be done in 29 cases only, malignancy detection rate was 6.9% (n=2). A large number of cases did not undergo histopathological evaluation (n=41) and were monitored for clinical response to conservative management. Histopathology detected 2 cases as malignant and 27 as benign whereas USG/Doppler diagnosis was malignant in 3 and benign in 26 cases. As compared to histopathology, USG/Doppler has 2 true positive, 1 false positive, none false negative and 26 true negative cases. Correspondingly, the sensitivity, specificity, positive predictive value and negative predictive value of USG/Doppler for histopathologically detected malignancy was 100%, 96.3%, 66.7%, 100% and 96.6% respectively

In final diagnosis (clinicopathologcal correlation), the malignancy rate was 2.9% (n=2).As compared to histopathology, Doppler/USG was 100% sensitive and 96.3% specific. It had a positive predictive value of 96.3% and negative predictive value of 100%. The diagnostic accuracy was 96.6%.The findings of the study endorse the high utility of Doppler/USG in assessment of suspicious adnexal masses. Further studies on a larger sample size are recommended. Other objective parameters and combined approaches for assessment are also recommended to be evaluated.

Table 1: USG Evaluation Findings

SN	Variable	No. of cases	Percentage
1.	Side involved		
	Bilateral	12	17.1
	Unilateral	58	82.9
	Left	23	32.9
	Right	35	50.0

2.	Number of masses		
	One	60	85.7
	Two	10	14.3
3.	Size		
	21 to 50 mm	25	35.7
	51 to 100 mm	29	41.4
	>100 mm	16	22.9
4.	Location		
	Adnexa	55	78.6
	Ovary	15	21.4
5.	Thick wall	10	14.3
6.	Septation	15	21.4
7.	Irregular margins	6	8.6
8.	Solid mass	4	5.7
9.	Papillary Projections	2	2.8

Table 2: Correlation between Histopathological and USG/Doppler Diagnosis.

SN	HPE Diagnosis	USG Doppler Diagnosis	% Correct diagnosis by USG
1.	Malignancy – Serous cystadenocarcinoma	Serous cystadenocarcinoma	100%
2.	Benign		
	Simple cyst	Simple cyst, Complex cyst	75%
	Mucinous cystadenoma	Mucinous cystadenoma, Complex cyst, Carcinoma ovary	60%
	Complex cyst	Complex cyst	100%
	Paraovarian cyst	Paraovarian cyst	100%
	Endometriosis	Endometriosis, Endometriotic cyst	50%
	Serous cystadenoma	Serous cystadenoma	100%
	Haemorrhagic cyst	Haemorrhagic cyst	100%
	Tubo-ovarian abscess	Tubo-ovarian abscess	100%
	Tubo-ovarian complex cyst	Tubo-ovarian complex cyst	100%
	Mature cystic teratoma	Sex cord stroma tumor	0%

Table 3: Diagnostic Efficacy of USG/Doppler against Final Diagnosis for differentiation of malignant and benign adnexal masses

USG/Doppler Diagnosis	Final diagnosis		Total
	Malignant	Benign	
Malignant	2	1	3
Benign	0	67	67

Total	2	68	70	
Sensitivity	**Specificity**	**PPV**	**NPV**	**Accuracy**
100%	98.5%	66.7%	100%	98.6%

On clinicopathological correlation 2 cases were diagnosed as malignant and 68 as benign whereas USG/Doppler diagnosis was malignant in 3 and benign in 68 cases. As compared to final diagnosis based on clinicopathological correlation, USG/Doppler has 2 true positive, 1 false positive, none false negative and 67 true negative cases. Correspondingly, the sensitivity, specificity, positive predictive value and negative predictive value of USG/Doppler for final diagnosis of malignancy was 100%, 98.5%, 66.7%, 100% and 98.6% respectively.

4. DISCUSSION

Evaluation of adnexal masses is challenging. Although transvaginal sonographic assessment has become a standard diagnostic modality yet sonography alone is not sufficient to achieve a satisfactory diagnosis, particularly in differentiation between benign and malignant pathologies [7]. However, during the last few decades, a combination of Gray-scale sonography with Color Doppler assessment has been found to be highly precise. The combined use of Gray-scale sonography with Color Doppler flowmetric assessment has been duly recognized and clinically acceptable for evaluation of adnexal masses leading to formulation of International Ovarian Tumour Analysis (IOTA) criteria for diagnosis of adnexal masses [8]. The advantage of combined use of Gray scale sonography and Color Doppler flowmetric studies lies in the fact that they together are able to detect both structural as well as vascular abnormalities and thus help to localize, characterize and diagnose the underlying adnexal pathology accurately.

With this backdrop, the present study was planned to evaluate the diagnostic utility of USG and DOPPLER in differentiating different adnexal Masses (benign or malignant) by correlation with histopathological findings [9].

In the present study, a correlation between histopathological and USG/Doppler diagnosis was seen in 23/29 (79.3%) of cases. Compared to the present study, Anant *et al.* reported a correlation between histopathology and USG for 105/128 diagnoses (82.0%) of cases which is comparable to that in the present study [10].

With respect to specific differentiation between histopathological diagnosis for malignancy using Doppler/USG assessment, the present study witnessed a high correlation with only one false positive result and sensitivity, specificity, positive predictive and negative predictive values of 100%, 96.3%, 66.7% and 100% respectively. The accuracy of combined Doppler/USG assessment was 96.6%.In the present study, except for positive predictive value, for all the diagnostic efficacy parameters, the values were above 95%. Most of the previous studies have also reported high diagnostic efficacy of Doppler/USG assessment for evaluation of adnexal masses.

Prasad et al. on the other hand found the diagnostic performance to be 100% for all the diagnostic efficacy parameters [11]. As such, except for Firdous et al. who used only Doppler assessment, all the other studies have found a higher negative predictive value than the positive predictive value [12]. In their study, owing to high false positivity rate, Firdous et al. experienced a fall in negative predictive value. As such, the results in the present study, despite limitations of histopathological correlation are in agreement with most of the existing literature.

In the present study, when Doppler/USG results were compared with final diagnosis based on clinicopathological correlation, the sensitivity, specificity, positive predictive,

negative predictive and accuracy values were found to be 100%, 98.5%, 66.7%, 100% and 98.6% respectively which are close to the diagnostic efficacy obtained on histopathological correlation and do not make any major change except for slight increment in specificity and overall diagnostic accuracy.

The findings of the present study thus are in agreement with the other previous studies and endorse the high utility of Doppler/USG assessment in evaluation of adnexal masses in general and that of detection of malignancy in particular. The findings of the study also show that given the high diagnostic efficacy of USG/ Doppler assessment, they should be made the primary imaging modality for assessment of suspicious adnexal masses [13,14].

5. CONCLUSION

The findings of the study showed that USG/Doppler evaluation is very useful in evaluation of adnexal masses and their management. Use of USG/Doppler in the initial evaluation helps to reduce the need for surgical intervention and successful detection of malignancy. Further studies on larger sample size with availability of histopathological diagnosis and proper representation of post-menopausal women are recommended.

6. REFERENCES

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