Evaluation of Adnexal Masses in Perimenopausal Women by Ultrasonography and Color Doppler and its Correlation with Histopathology

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Abstract		Original Research Article

Introduction: Adnexal mass is a common clinical presentation in gynecologic practice and can be of gynaecologic or non gynaecologic origin. The term adnexal mass is most often used for masses involving the ovary because of the high propensity of the ovary for neoplasia. *Materials and Methods*: This study included all patients between 30-55 yrs with clinical diagnosis of adnexal masses who were admitted to Index medical college, hospital & research centre, Indore over period of 18 month. The study included 50 patients who underwent an ultrasound examination & Color Doppler. Following surgery, specimens were sent for histopathological examination, and the reports were correlated with pre-operative clinical and imaging findings. *Results:* Out of total 50 cases of adnexal masses, 24 were benign and 26 were malignant. Maximum no. benign cases of cases were in the age group 31-35yrs & maximum no. malignant cases of cases were in the age group 46-50 yrs. Diagnosis of benign and malignant adnexal masses by USG & Color Doppler had an overall diagnostic sensitivity of 100% and specificity of 92.3%. The positive predictive value was 92.85% and Negative predictive value was 100%. The overall diagnostic accuracy was 96.15%. *Conclusion:* Although the sensitivity of combined USG & Doppler in diagnosing adnexal masses is 100% but specificity is 92.3% so USG & Doppler findings should preferably be correlated with histopathological diagnosis because histopathological diagnosis is considered as Gold standard to rule out false positive & false negative cases.

Keywords: Adnexal mass, Perimenopausal, Ovarian neoplasm, Benign, Malignant, Color Doppler, RI, PI, Ultrasound, Histopathology.

INTRODUCTION

Adnexal mass is a common clinical presentation in gynecologic practice and can be of gynecologic or non-gynecologic origin. The term adnexal mass is most often used for masses involving the ovary because of the high propensity of the ovary for neoplasia [1]. Adnexal region is composed of ovary, fallopian tube, broad ligament, and associated blood and nerve supply. Indeed ovarian pathology is responsible for 70% of pelvic masses found at exploratory surgery on patients with preoperative diagnosis of pelvic mass [2]. Differential diagnosis of adnexal mass is complex and includes functional cysts, benign and malignant ovarian tumors, paraovarian cysts, tubo-ovarian abscesses, hydrosalphinx, ectopic pregnancies, tubal malignancy, broad ligament fibroid, fimbrial cysts, sigmoid colon or colon distended with gasses or feces, pelvic kidney, and pregnancy in bicornuate uterus [1]. Most common cause of adnexal mass is that ovarian origin.[3] Transabdominal sonography (TAS) gives the global view of the pelvic organs, While Transvaginal sonography (TVS) adds specificity as it gives information regarding tumor composition, texture, internal consistency and exact relationship with other pelvic organs. The combination of transvaginal probe and use of Colour Doppler ultrasonography for the identification of malignant ovarian masses by the detection of low resistance intra-tumoral blood vessels due to angiogenesis and neovascularization in malignant tumors opens up new avenues in gynaecological ultrasound, especially for tumour diagnosis in the lower pelvis [2]. Histopathology is still taken as Gold standard for the evaluation of benign and malignant adnexal masses [1].

MATERIALS & METHODS

The present study was a prospective study, conducted at the Department of Radio diagnosis, Index Medical College, Indore in the period between February 2018 and august 2019. The study included 50 patients with informed consent who had a preliminary diagnosis of an adnexal mass, which was detected clinically and confirmed sonographically to be adnexal masses. Relevant investigations were done according to their clinical findings. Using a 3-5 MHz Convex Array Transducer through a trans abdominal (TAB) approach, B-mode USG, color Doppler, and spectral Doppler were performed. Transvaginal sonography was also performed using 8-10 MHz Vaginal Transducer. B-mode morphological criteria were used for our study. Subsequently, Color and pulsed Doppler imaging was performed. Flow results were recorded as being absent or present and further as normal or abnormal. Vessel location arrangement and morphology were noted. Spectral Doppler analysis was performed by calculating resistive index (RI) and pulsatility index (PI) values, and the lowest values recorded in the masses were noted. RI ≤ 0.4 and PI ≤ 1.0 were taken as cutoff for ovarian malignancy

The study included female patients between 30 to 55 yrs of age in whom pelvic mass was detected clinically or by sonography & patients who were not giving consent & pregnant females or those with ectopic pregnancy were excluded from our study.

Patients of perimenopausal age group who were suspected to have a clinical diagnosis of an adnexal mass undergo sonography and Color Doppler to characterize and further supplement the diagnosis.

Follow up of histopathology report post operatively were Gold standard to confirm diagnosis.

RESULTS

In the present study, out of total 50 cases of adnexal masses, 24 (48%) were benign and 26 (52%) were malignant. In present study, that out of 24 benign cases maximum no. of cases were in the age group 31-35yrs (45.83%), followed by 36-40yrs (33.33%) and the least no of benign cases were in the age group 46-50yrs & 51-55yrs (4.77% each). Present study reveals that out of 26 malignant cases maximum no. of cases were in the age group 46-50 yrs (38.46%), followed by 51-55 yrs (30.76%) and the least no of malignant cases were in the age group 31-35 yrs & 36-40 yrs (7.70% each). In present study, out of 24 histopathologically proven benign cases, 17 (70.83 %) had RI >0.43 while 7 (29.17 %) cases had no obvious vascularity observed on Color Doppler so RI was not calculated. In present study, out of 26 malignant cases, 16 (61.54 %) had RI <0.43 and 10 (38.46%) case had RI > 0.43. Our study represents that out of 50 cases, 22 were diagnosed as benign & 28 were malignant by USG & Color Doppler. Similarly, 24 cases were diagnosed as benign & 26 were malignant by histopathology. In the our study out of 50 cases which were diagnosed by USG with Color Doppler and histopathology, 26 (true positive) were diagnosed malignant by USG, Doppler & histopathology while 2 cases (False Positive) were diagnosed malignant by USG & Doppler and benign by histopathology. 24 cases (True Negative) were diagnosed benign by all methods. No case was diagnosed as false negative. Present study reveals that, for the diagnosis of benign and malignant adnexal masses USG & Doppler had an overall diagnostic sensitivity of 100% and specificity of 92.3%. The positive predictive value was 92.85% and Negative predictive value was 100%. The overall diagnostic accuracy was 96.15%.

Table-1: Age distribution of benign lesions

Age	No. of Cases	Percentage
31-35	11	45.83%
36-40	08	33.33%
41-45	03	12.50%
46-50	01	4.17%
51-55	01	4.17%
Total	24	100%

Table-2: Age distribution of malignant lesion

Age	No. of Cases	Percentage
31-35	2	7.70%
36-40	2	7.70%
41-45	4	15.38%
46-50	10	38.46%
51-55	8	30.76%
Total	26	100%

Table-3: Cases diagnosed as benign & malignant by Usg with Doppler and histopathology

	Benign	Malignant
USG & Doppler Findings	22 (44%)	28 (56%)
Histopathology	24 (48%)	26 (52%)

Table-4: Comparative analysis of histopathological diagnosis and USG and Color Doppler diagnosis for benign and malignant lesions

USG & Color Doppler Diagnosis	Final diagnosis (Histopath)	
	Malignant	Benign
Malignant	26 (TP)	2 (FP)
Benign	0 (FN)	24 (TN)

TP-TRUE POSITIVE, TN- TRUE NEGATIVE, FP- FALSE POSITIVE, FN- FALSE NEGATIVE

Table-5: Diagnostic validity of USG & Color Doppler diagnosis as compared with histopathological diagnosis in patients with adnexal masses

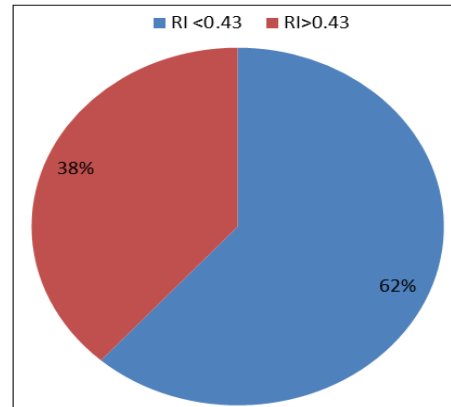| Statistical Parameter	Percentage (%)
Sensitivity	100 %
Specificity	92.3 %
PPV	92.85 %
NPV	100 %
DA	96.15 %

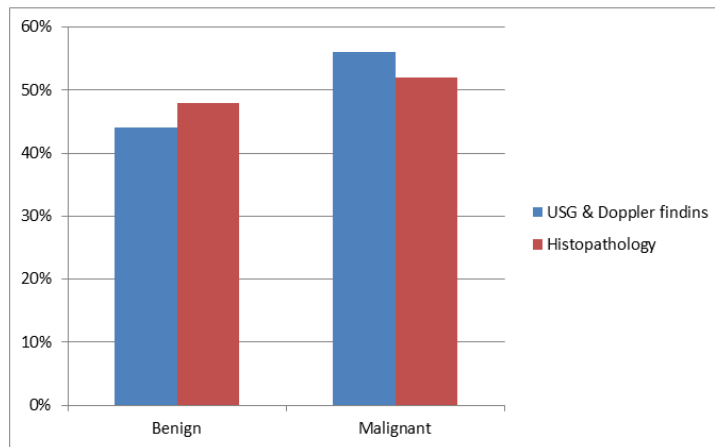**Fig-1: Significant Doppler findings in malignant lesion**

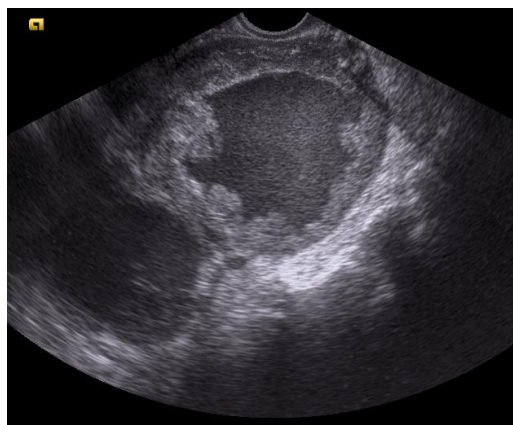**Fig-2: Cases diagnosed as benign & malignant by usg with Doppler and histopathology**

Fig-3: Histipathologically proven case of mucinous cystadenocarcinoma. TVS Image showing solid cystic mass with papillary projection
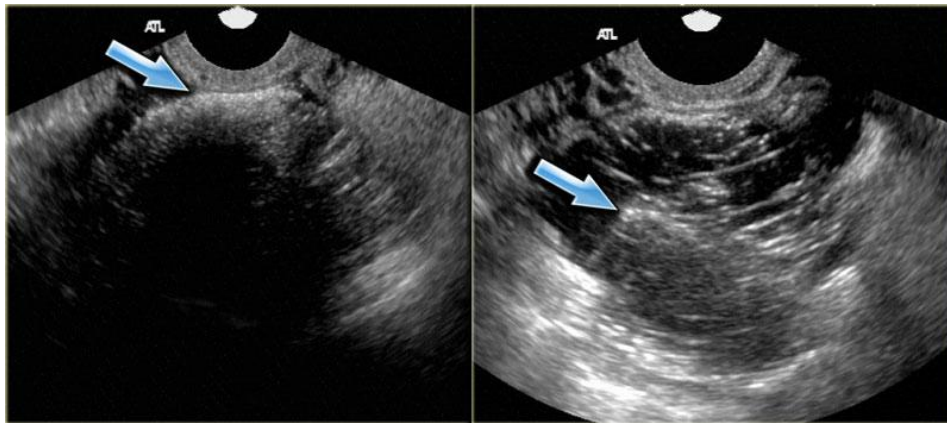
Fig-4(A & B): Histopathologically proven case of mature cystic teratoma, TVS images showing heterogenous hyperechoic lesion with posterior acoustic shadow s/o Dermoid
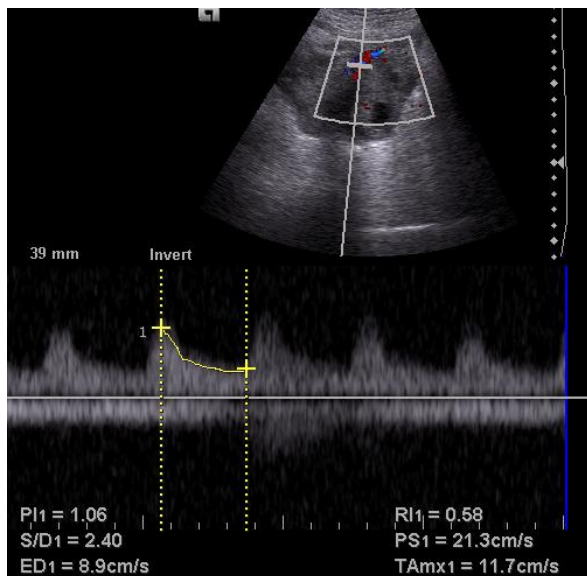

Fig-5: Histopathologically proven case of serous cystadenocarcinoma, showing vascularity within solid component. Low RI & PI with smooth flow with continuous diastolic flow

Fig-6: Histopathologically proven case of fibroma, showing homogenous solid appearing lesion with patchy vascularity on color Doppler

DISCUSSION

In current study, 50 patients who were initially diagnosed clinically to have an adnexal mass and further more confirmed by ultrasonography were included in this study. Their USG & Color Doppler findings were correlated with histopathology. In presents study, out of 50 cases 24 (48%) were histopathologically proven to be benign and 26 (52%) were malignant. Maximum numbers of benign cases were in the age group of 31-40 years (79.16%) and maximum numbers of malignant cases were in the age group of 46-55 years (69.23%), which was in almost perfect agreement with Jayadhar *et al.*, [16] (B-30-44yrs, M-45-59yrs) and close agreement with Mondal *et al.*, [9] (B-20-40yrs, M-41-50yrs), Salem *et al.*, [10] (B-20-50yrs, M-37-64yrs), Priya *et al.*, [11] (B-31-40yrs, M-41-50yrs) and Chandanwale *et al.*, [8] (M-41-60yrs). In present study, out of 24 histopathologically proven benign cases, 17 (70.83 %) had RI >0.43 while 7 (29.17 %) cases had no obvious vascularity observed on Color Doppler so RI was not calculated. In present study, out of 26 histopathologically proven malignant cases, 16 (61.54 %) had RI <0.43 and 10 (38.46 %) case had RI > 0.43. Overall in present study, 27 cases (54 %) had RI > 0.43 while 16 (32 %) had RI < 0.43 and there was 7 cases (14 %) for which RI was not calculated. Our observations were in near perfect agreement with Madan *et al.*, [4], Khurana *et al.*, [7] and Margaret *et al.*, [13]. The observation of present study was also in close agreement with Salem *et al.*, [10], Sehgal *et al.*, [14] and Shyamala *et al.*, [15] Sensitivity of the procedure in diagnosing malignant and benign lesions of the adenexal masses varied from 87.5% to 100%. Least sensitivity was reported by Radhamani *et al.*, [1] (87.5%) while the present study reported maximum sensitivity of 100%. A sensitivity of 95%, 94%, 92.3% and 90.9% were reported by Suhasini *et al.*, [12], Gupta *et al.*, [5], Margaret *et al.*, [13] and Hartman *et al.*, [6] respectively. Similarly specificity of the procedure ranged from 80.9% to 95.95% with Suhasini *et al.*, [12] reporting the least (80.9%) while Margaret *et al.*, [13] reporting maximum (95.95%) specificity. In the present study, a reasonably good specificity of 92.3% was found which was almost in agreement to that reported by Gupta *et al.*, [5] 90%. Positive predictive value which shows the likelihood of a diagnosis to be positive (malignant) on USG for those case diagnosed malignant

by histopathology and in our study positive predictive value was 92.85% which was closest to that observed by Margaret *et al.*, [13] (92.3%). In our study Negative predictive value was 100% which was closest to Radhamani *et al.*, [1] (98.87%). In our study diagnostic accuracy was 96.15% and which was closest to Radhamani *et al.*, [1] (95%). The difference observed in various studies due to the difference in the number of cases evaluated and the number of false positive and false negative cases reported which largely depends on interpretation of USG & Color Doppler by various radiologists, & also ruptured cases such as dermoid & collision tumor lead to diagnostic misinterpretation and incorrect diagnosis. This was the reason for two false positive cases in our study which were observed to be malignant on USG but they were diagnosed as benign on histopathology. This is the reason histopathology is the gold standard for accurate diagnosis of adnexal masses.

CONCLUSION

Although the sensitivity of combined USG & Doppler in diagnosing adnexal masses was 100% but specificity was 92.3% so USG & Doppler findings should preferably be correlated with histopathological diagnosis because histopathological diagnosis is considered as Gold standard to rule out false positive & false negative cases.

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