Original Article

A Diagnostic Reliability Of Combined Grey Scale Ultrasound And Doppler Flow Imaging To Differentiate Malignant And Benign Adnexal Masses

G. Premkumar[1], K. Rajalakshmi[2*], M. Sureendhar[3]

[1,2,3] Assistant Professor, Department of Radiodiagnosis, Meenakshi Medical College Hospital and Research Institute, Meenakshi Academy of Higher Education and Research, Kanchipuram-631552, Tamil Nadu, India.

***Corresponding Author**

Dr. K. Rajalakshmi,

Assistant Professor Department of Radiodiagnosis, Meenakshi Medical College Hospital and Research Institute, Kanchipuram-631552, Tamil Nadu, India. Email. premkumarg123@gmail.com

DOI: 10.47750/pnr.2022.13.S09.873

Abstract

Aim and Background: The objective of this study is to assess the diagnostic reliability of combined grey scale ultrasound and Doppler flow imaging to differentiate malignant and benign adnexal masses. Adnexa (uterine appendages) are the most closely related structure adjacent to the uterus that includes ovaries, fallopian tubes and ligaments. Adnexal mass represents the broad spectrum of conditions from gynaecologic and non-gynaecologic sources. It is considered the most common disease in gynaecology. It varies from benign conditions like functional cysts to malignant masses like ovarian cancer. **Materials and Methods:** This is Prospective study. Female patients with complaints of lower abdominal pain, menstrual irregularity referred from the department of gynaecology, surgery, general medicine from our and other hospitals to our Department of Radiodiagnosis at Meenakshi Medical College Hospital & Research Institute. After getting informed consent and detailed clinical history from the patients, all the subjects were scanned with Gray-Scale sonography using 3.5-5 MHZ and 8 MHZ probes for transabdominal and transvaginal scans respectively and subsequently Color and Spectral Doppler examination was done. **Results:** In total 50 adnexal masses, 16 were diagnosed as benign ovarian cyst, 5 were hemorrhagic cyst, dermoid, benign ovarian mass, malignant ovarian mass each, 3 were hydrosalpinx, 2 were endometrioma, inclusion cyst, ectopic pregnancy each, one was paraovarian cyst, pyosalpinx, broad ligament fibroid, ovarian torsion, polycystic ovary each. **Conclusion:** In the present study we conclude that the combined approach using both Transabdominal & Transvaginal ultrasound with Doppler gives the best results to differentiate malignant and benign adnexal masses.

Key words: Grey scale Ultrasound, Doppler Flow imaging, malignant and benign adnexal masses

1. Introduction

Adnexal mass occurs in all the age groups with significantly variable prevalence, but more common in the reproductive age group. Ovarian pathology alone represents two-thirds of all the cases. The fewer neoplasm may also occur in the fallopian tube; however, the inflammatory conditions are more common. The first and foremost clinical parameter to be considered is the age of the patient. Adnexal cysts are the most common in reproductive-age; however, the rate of

malignancy is low in this age group. In contrast, the risk of malignancy is more common in postmenopausal women [1].

Other factors to be consider while evaluating patients with adnexal masses are: symptoms of sudden pelvic pain (most common causes are ovarian torsion, endometriosis, pelvic inflammatory disease, or an acute hemorrhagic corpus luteum cyst) [2]; abdominal distention accompanied by gastrointestinal complaints and weight loss (which may be the complications of advanced ovarian cancer) [3]; and use of hormonal contraception (which may affect the functional ovarian cysts). Besides, personal or family history of ovarian cancer, even carrier state for the BRCA 1 or 2 genes, needs to follow up.

Ovarian cancer is the third most common cancer in women and fourth most common cause of cancer-related death, worldwide [4]. Approximately 1.6% of women will develop an ovarian malignancy during their lifetime. And 10% of women will have a benign tumour of the ovary requiring surgery [5].

There are no known causative factor in the development of ovarian carcinoma, Factors are known to increase the risk of developing ovarian cancer are genetic (BRCA 1, BRCA 2, HNPCC), nulliparity, late childbirth, early menarche, late menopause, family history, obesity, hormone replacement therapy, and high saturated fat diet etc [6].

The early and accurate diagnosis of ovarian malignancy is of grave clinical importance because prognosis entirely depends on early diagnosis. A preoperative diagnosis of malignancy can guide the gynecologist to refer the patient to a gynecological oncologist for appropriate therapy which is known to improve survival period of the patient (junior et 1999) [7] Besides, benign adnexal cysts (such as endometrioma, mature cystic teratoma, and paraovarian cysts) are also significant to diagnose correctly because it may turn as a risk factor for infertility, ovarian torsion. Therefore adnexal masses need to be evaluated as benign or malignant, hence to provide better treatment.

Ultrasonography is the primary imaging modality used for identification of adnexal mass. Because it is widely available, cost-effective, harmless and non-invasive procedure and high sensitivity in the detection of masses. It is the one of the excellent imaging modality to determine the nature of a mass lesion (cystic or solid), origin and its anatomic relation to adjacent structures
[8].

Therefore, the correct use of pelvic ultrasonography has become an integral part of the gynecologic evaluation and management. Addition of colour and spectral Doppler imaging that determines the vascular pattern of adnexal disease has been found to be a very useful tool in screening for malignancy. In this study, we characterized the adnexal masses with combined grey scale and Doppler flow imaging to identify the malignant potential of the lesion.

2. Materials and Methods

This is prospective type of study conducted in Meenakshi Medical College Hospital and Research Institute for a period of one and half years from January 2017 To September 2018. Female patients with complaints of lower abdominal pain, menstrual irregularity referred from the department of gynaecology, surgery, general medicine from our and other hospitals to our Department of Radiodiagnosis at Meenakshi Medical College Hospital & Research Institute. In this study, 50 female patients with clinically suspected adnexal masses were evaluated by transabdominal Ultrasound or transvaginal ultrasound with Doppler flow Imaging to detect and characterize adnexal masses.

After getting informed consent and detailed clinical history from the patients, all the subjects were scanned with Gray-Scale sonography using 3.5-5 MHZ and 8 MHZ probes for transabdominal and transvaginal scans respectively and subsequently Color and Spectral Doppler examination was done.

Transabdominal USG was done in all cases, followed by transvaginal sonography (TVS) wherever necessary. TVS was not performed in patients who were not willing to undergo TVS and virgin patients with the adnexal mass.

The following characteristics of adnexal masses were recorded:

Site; laterality (unilateral/bilateral), Size, Surface contour (smooth/irregular), Type of lesion-- [unilocular, unilocular with fibrin strands, unilocular with internal echoes, unilocular solid, solid, multilocular, multilocular with internal echoes, multilocular with solid, solid), Papillary projections, Septations (thin, thick, none), Associated findings (fluid in cul-de-sac and ascites) If possible, a Specific diagnosis was made, e.g Dermoid cyst, Ectopic pregnancy.

Following Grey scale examination of mass, Color flow imaging was done to assess the vascularity of the mass. if no blood flow was detected, the tumour was considered avascular tumour. After Color Doppler examination, the masses were evaluated on Spectral Doppler. A range gate was placed across an appropriate vessel and the flow velocity waveform was displayed. In the absence of arterial flow, the mass was considered as benign while in the presence of arterial flow, the mass was considered malignant if RI ≤ 0.4, PI ≤ 1.0 Pulsatility Index (PI) = Peak systolic flow –end diastolic flow / mean systolic flow.

Resistance Index (RI) =Peak systolic flow-end diastolic flow/peak systolic flow.

Based on this morphologic characteristic on Grayscale US and Doppler findings, the masses were classified as benign or malignant. Scanning was performed using Voluson S6 pro ultrasound machine equipped with a colour and pulsed Doppler and a 3.5 MHZ transabdominal and 8 MHZ transvaginal transducers.

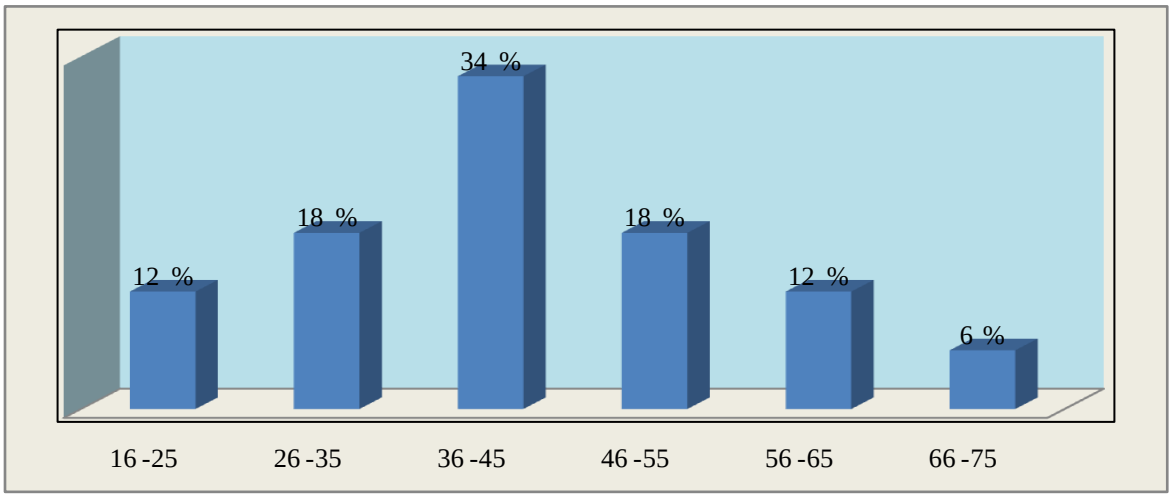
Statistical software: The Statistical software SPSS 21.0, was used for the analysis of the data and Microsoft Word and Excel have been used to generate graphs, tables etc**.**

3. Results

Age wise incidence of Adnexal Masses

Figure.1. showed that the patient‘s ages ranged from 16-75 years. In the present study, the maximum number of cases were in the age group of 36-45 years (34%) and the minimum number of cases were in the age group of 66-75 years (6 %). The maximum number of cases were in premenopausal age group <45 years (64%).

Figure.1. Age Wise Incidence of Adnexal Masses



Clinical Diagnosis

Table.1 indicates that the present study, the maximum number of patients clinically diagnosed as pelvic masses (38 %).

Table-1: Clinical Diagnosis

Clinical diagnosis	**Frequency**	**Percentage (%)**
Pelvic Mass	19	38.0
DUB	14	28.0
PCOD	1	2.0
Dysmenorrhoea	3	6.0
Pelvic pain	12	24.0
Ectopic pregnancy	1	2.0
Total	**50**	**100.0**

Site of the Lesions

Table.2 indicates that the commonest site of adnexal masses was in left ovary (42 %).

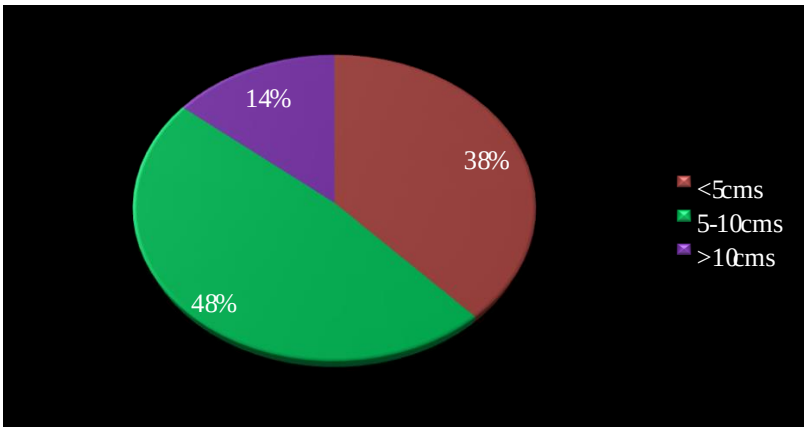
Table-2: Site of the Lesions

Site of the lesion	**Frequency**	**Percentage(%)**
Right ovary	10	20.0
Left ovary	21	42.0
Bilateral ovary	1	2.0
Right adnexa	10	20.0
Left adnexa	7	14.0
Bilateral adnexa	1	2.0
Total	50	100.0

Size of the Lesion

In the present study, 48% of adnexal masses measured about 5-10 cms. This study also depicts that 86 % of adnexal masses measured about less than 10 cms and 14 % measured about more than 10 cms **(Figure.2).**

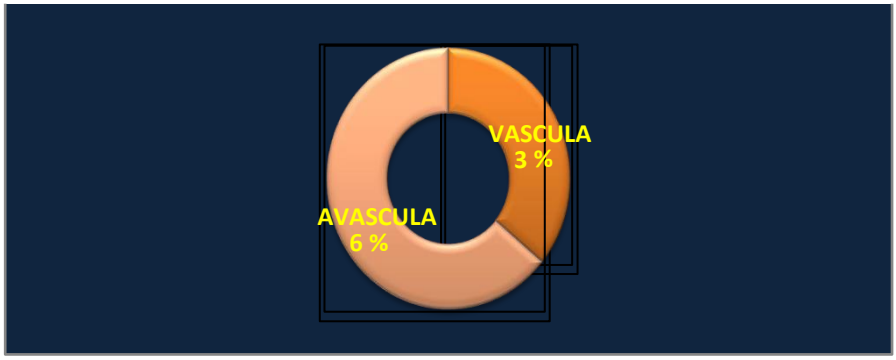
Figure 2. Size of the Lesion



Vascularity of the Masses

Figure.3. indicates that the 36 % of adnexal masses were vascular and 64 % were avascular.

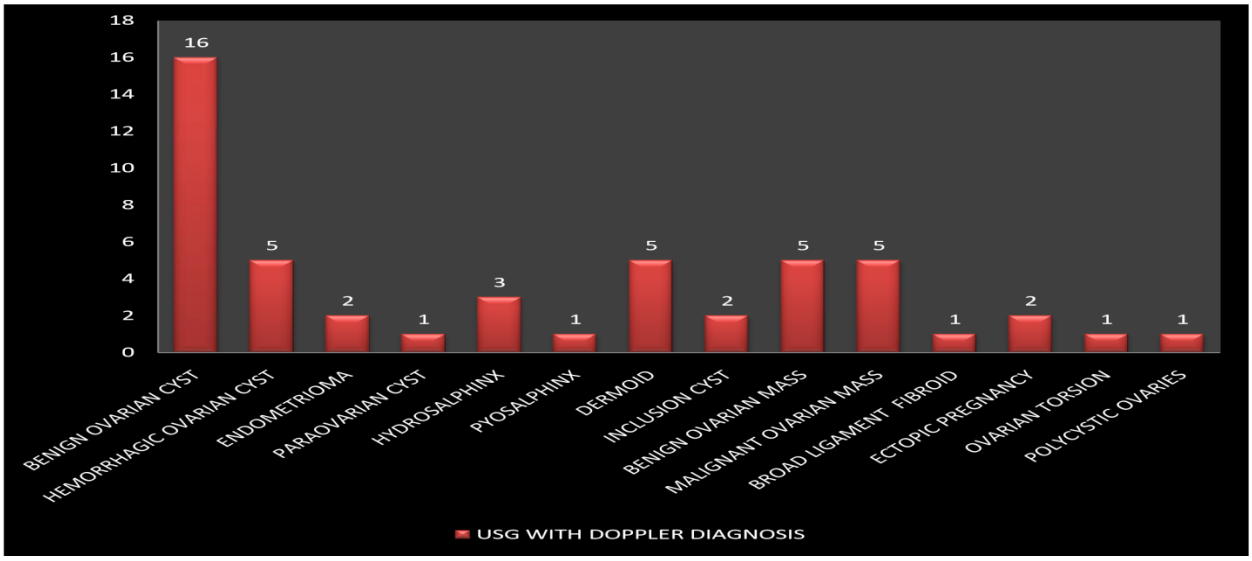
Figure.3. Vascularity of the Masses



Distribution of Adnexal Masses based on Ultrasound and Doppler Diagnosis

Figure 3 indicates that the total 50 adnexal masses, 16 were diagnosed as benign ovarian cyst, 5 were hemorrhagic cyst, dermoid, benign ovarian mass, malignant ovarian mass each, 3 were hydrosalpinx, 2 were endometrioma, inclusion cyst, ectopic pregnancy each, one was paraovarian cyst, pyosalpinx, broad ligament fibroid, ovarian torsion, polycystic ovary each.

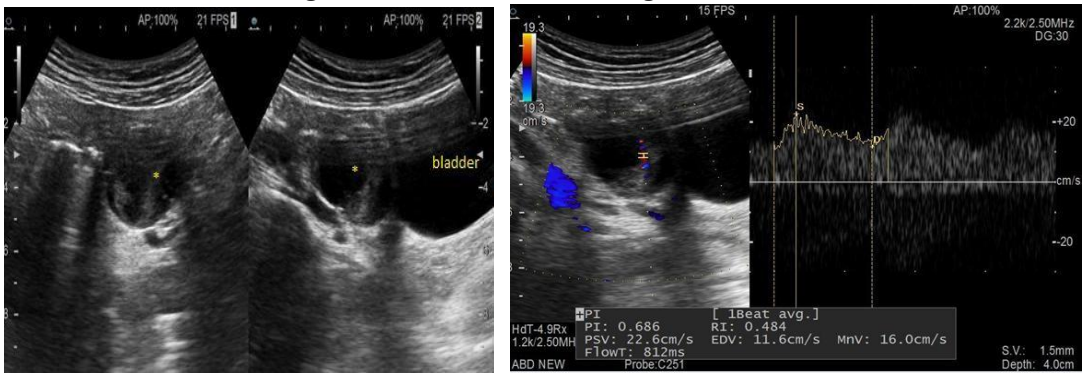
Figure 3. Distribution of Adnexal Masses Based on Ultrasound and Doppler Diagnosis



Transabdominal sonogram

Figure 4 transabdominal sonogram showing a complex mass lesion (cystic and solid) in right ovary and color Doppler lesion showing, internal vascularity, with low resistance flow (PI:0.686, RI:0.484) to identify malignant ovarian mass.

Figure.4. Transabdominal Sonogram



4. Discussion

Adnexal masses are common among all the age groups but more prevalent in reproductive age groups. Ovarian cancer is the leading cause of death from gynecologic malignancy. Most of the patients are asymptomatic, often presents at a late stage which leads to poor prognosis. The overall survival rate of an ovarian tumour in stage I is 90% [4].

Therefore, pre-operative discrimination of adnexal mass as benign or malignant is imperative for appropriate patient triage, referral, and management.

With this background, this study conducted with 50 patients having adnexal masses were evaluated prospectively on the grey scale, colour Doppler and spectral Doppler.

In this study group, the common clinical diagnosis was as follows, 38 % patients were as Pelvic masses (19 cases), 28 % were diagnosed of DUB (14 cases), 24 % diagnosed as Pelvic pain, 6% as Dysmenorrhoea, and 2% as PCOD and 2% as an Ectopic pregnancy.

This study group comprised of the patient‘s age ranged between 16-75 years. 64 % of cases were individuals with age of less than 45 years, 36 % of cases were with age of more than 45 years. A maximum number of benign cases were seen in individuals with age of less than 45 years (69%), and a maximum number of malignant cases were seen in individuals with age of more than 45 years (80 %). Thus the relationship of age with diseases are found to be statistically significant (p=0.01).

These findings were consistent with Disantis et al (1993) [9] In our study, 48 % of masses measured about 5-10 cms in diameter, 38 % of masses measured about more than 10 cms in diameter and remaining 14 % of masses were more than 10 cms in diameter. A maximum number of benign adnexal masses were found to be 5-10 cms (49%) in diameter, while a maximum number of malignant masses were found to be more than 10 cms in diameter(60 %). Thus size distribution among benign and malignant masses was found to be statistically significant (p=0.005). This is in concordance with tailor et al study results.

In our study, 86 % of masses had a well-defined surface contour and 14 % of masses had an irregular surface contour. Most of the benign masses had well-defined contour (91%), and 60 % of malignant masses had an irregular contour. Thus contour abnormality with the disease was found to be statistically significant (p=0.016). The most common consistency of the masses were cystic in 70 % (unilocular-54 %, multilocular-16%) . 16 % were solid, 8 % had mixed mass with calcifications and. 6% had a solid and cystic component. 40 % of the malignant lesions had solid consistency whereas only 13 % of benign lesions had a solid consistency. Also 76% benign lesion had cystic consistency whereas only 20 % of malignant cases had cystic consistency. Thus echogenicity of the lesion was significant with the disease (p=013). This one matched with the previous study conducted by Tailor et al., and Kobal B et al [10]. In our study group, The septa were found in 50 % of cases. Among that, 26 % of cases had thin septations and 24 % had thick septations. 80 % of malignant lesions had thick septations whereas only 18 % benign lesions had thick septations. 53 % of benign lesions did not have any septations whereas 20% of malignant masses did not have septations.

5. Conclusion

Ovarian cancer is the most common lethal gynaecological malignancy. Even though the histopathologic report is the gold standard for diagnosis, ultrasound is the primary modality to evaluate the adnexal masses. The present study signifies all the grey scale and Doppler features including size, age, consistency, papillary projections, septa, vascularity etc assessed in the study as statistically significant in differentiating benign from malignant masses. In the present study we conclude that the combined approach using both Transabdominal & Transvaginal ultrasound with Doppler gives the best results to differentiate malignant and benign adnexal masses.

References

1. Milan M. Terzic1,2, Jelena Dotlic1 , Ivana Likic et al.,Current diagnostic approach to patients with adnexal masses: which tools are relevant in routine praxis? Chin J Cancer Res 2013; 25(1):55-62.
2. Patel MD, Feldstein VA, Chen DC, Lipson SD, Filly RA. Endometriomas: diagnostic Performance of ultrasound. Radiology 1999; 210: 739 – 745.
3. Olson SSH, Migonen L, Nakraseine. Symptoms of ovarian cancer. Obstet Gynecol. 2004; 98:212-7.
4. Poveda, A., 2005. Ovarian cancer: is the news good enough? Int. J. Gynecol. Cancer, 15(Suppl 3): 298-306.
5. Greenlee RT, Murray T, Bolden S et al: Cancer Statistics, 2000. CA Cancer J Clin 50: 7, 2000.

6. Monica R. McLemore, Christine Miaskowski, RN, Bradley E. Aouizerat., Epidemiologic and Genetic Factors Associated with Ovarian Cancer. Cancer Nurs. 2009; 32(4): 281–290.

7. Junior, E.J., D.J. Hole, L. McNulty, M. Mason and J. Young, 1999. Specialist gynecologists and survival outcome in ovarian cancer: a Scottish National study of 1866 patients. Br. J. Obstet.
Gynaecol. 106: 1130-6.

8. Brown DL, Dudiak KM, Laing FC; Adnexal masses: US characterization and reporting. Radiology, 2010; 254(2):342-54.

9. DeSantis DJ, Scatarige JC, Kemp G et al. A prospective evaluation of transvaginal sonography for detection of ovarian disease. AJR 1993; 161: 91-94.).

10. Kobal B, Rakar S, Ribic-Pucelj M, Tomazevic T, Zaletel-Kragelj L. Pretreatment evaluation of adnexal tumors predicting ovarian cancer. Int J Gynecol Cancer. 1999;9(6):481-6.