CLINICO RADIOLOGICAL EVALUATION OF GYNECOLOGICAL NEOPLASMS BY USG AND COLOUR DOPPLER
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ABSTRACT: BACKGROUND: Gynecological neoplasms is one of the major causes of morbidity and mortality in females especially in peri and postmenopausal women. Ultrasonography (Both TAS & TVS) is the method of choice for examining the female pelvis and it is the principle imaging modality in the evaluation of gynecological diseases. Duplex study with color flow mapping helps in assessment of vascularity of structure. AIMS AND OBJECTIVE: Evaluating the efficacy of color and spectral Doppler in the diagnosis of gynecological neoplasms with histopathology as the reference. STUDY SETTING AND DESIGN: A prospective study of 50 patients was done in the department of Radio diagnosis, in association with Department of Obstetrics and Gynecology and Department of Pathology. Age, Sex, Address, Registration number was recorded in a proforma specially prepared for the purpose of our study & a brief note on presenting complaints. Any significant past history if present was noted. Significant, general, systemic & gynecological examination including P/A, P/S and P/V was done. MATERIALS AND METHOD: All patients of strong clinical suspicion of Gynecological neoplasms were taken as study subject. Patients were examined by real time Ultrasonography and color Doppler (GE-LOGIQ 3 Expert and Siemens-Sonoline 50) with convex, low frequency (2-5MHz) transducer by trans-abdominal and medium frequency (5-7MHz) transducer by trans-vaginal route. RESULT: Most of the benign neoplasm’s were seen before 50 years of age and most common presenting symptom in the present study was pain in abdomen (62%). Among 50 patients, 24(48%) were of benign and 26(52%) were of malignant neoplasm. Most common clinical diagnosis was pelvic mass (22%) and ovarian mass (22%). Out of 50 cases, 24(48%) were benign and 26(52%) were malignant neoplasm. In this study 85.72% of malignant ovarian tumors had PI value <0.8 in contrast to only 50% of benign ovarian tumors. In the same way 85.72% of malignant tumors had RI <0.6 and in contrast to only 50% of benign tumors. CONCLUSION: Ultrasonography and colour Doppler are very useful investigation in differentiating between benign and malignant gynecological neoplasms. Combined use of ultrasonography and color Doppler allows more confident diagnosis with higher accuracy than that obtained any one. KEYWORDS: Color Doppler, Gynecological Neoplasm, Ultrasound.

INTRODUCTION: Gynecological neoplasia is one of the major causes of morbidity and mortality in females especially in peri and postmenopausal women. In India, carcinoma cervix takes second position after carcinoma breast followed by ovarian carcinoma and endometrial carcinoma.¹ Ultrasoundography (Both TAS & TVS) is the method of choice for examining the female pelvis² and based on principle imaging modality in the work up of gynecological diseases because it is the safest, easiest, noninvasive and inexpensive screening procedure, which provides multiplanar view and has no hazards of ionizing radiation or contrast media.

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Normally, follicles, corpus luteum of ovary and endometrium are the areas in which dynamic vascular changes occur e.g., development of new blood vessels during normal menstrual cycle. Changes in vascular dynamics also occur during growth of cancer tissue by exploiting the normal cyclical changes. Thus with the ability to recognize these vascular changes Doppler sonography is playing a promising role in the diagnosis of pelvic cancers.

Color Doppler study facilitates duplex Doppler of vascular structure and is called color flow mapping, which is particularly helpful in evaluating vessels within the organ or those that are not readily delineated with conventional B mode scanning. Combining the detailed analysis of internal echo-texture with flow velocity pattern of the power Doppler ultrasound increases the specificity in the diagnosis of pelvic mass.

This study aims at evaluating the efficacy of color and spectral Doppler in the diagnosis of gynecological neoplasm with the reference of the study done by Folkmann (1991) who gives the theory of “neovascularisation” according to which malignant neoplasm’s elaborate a factor named tumour angiogenesis factor (TAF) which is mutagenic to endothelial cells and stimulates rapid neovascularisation which consist of blood vessels having little or no smooth muscle support i.e., tunica muscularis which in needed for the vessel stability.

In this study we take pulsatility index (P.I) value of 0.8 and resistive index (R.I) value of 0.6 as the reference value. P.I value less than 0.8 and R.I value less than 0.6 is to be categorized into malignant lesion and lesions of increased PI (>0.8) and RI value (>0.6) are refer to as benign. These findings are then further confirmed with the findings of histopathology and postoperative findings.

MATERIAL & METHODS: A prospective study of 50 patient was done to evaluate the role of ultrasonography and color Doppler in diagnosis of Gynecologic neoplasm in the department of Radio diagnosis, N.S.C.B. Medical College, Jabalpur in association with department of Gynecology and Pathology, N.S.C.B. Medical College, Jabalpur from September 2013 to October 2014. All patients of any age, sex and profession who had undergone USG and color Doppler with strong clinical suspicion of Gynecological neoplasm taken as study subjects. Permission from the Ethical Institute Committee was obtained prior to the study and informed consent of study subjects was taken before undergoing USG, and color Doppler.

Age, Sex, Address, Registration number recorded in a proforma specially prepared for the purpose of our study & a brief note on presenting complaints. Any significant past history if present is noted. Significant, general, systemic & gynecological examination including P/A, P/S and P/V noted.

Patients suspected of gynecological neoplasm was examined by real time Ultrasonography and color Doppler (GE-LOGIQ 3 Expert and Siemens- Sonoline50) with convex, low frequency (2-5MHz) transducer by trans-abdominal and medium frequency (5-7MHz) transducer by trans-vaginal route.

Scanning was done with the patient in supine position with proper exposure of pelvis and abdomen. Trans-vaginal scanning was done wherever necessary. It was recommended that a patient undergo full bladder for trans-abdominal scan and empty bladder for trans-vaginal scan.
RESULTS: These 50 patient had different gynecological neoplasm, Majority of these patients were in the age group of 40 – 49 years (32%). Most of the benign neoplasm occurred before 50 years of age and most common presenting symptoms in the present study are pain in abdomen (62%) and followed by vaginal bleeding (42%). 24 (48%) were benign and 26 (52%) were malignant neoplasm.

Out of 50 cases, 9 cases (18%) has carcinoma cervix, 3 cases (6%) cervical polyp, 3 patients (6%) carcinoma endometrium, 11 cases (22%) has fibroid. 23 cases of ovarian neoplasm were diagnosed of which 9 cases (18%) are benign ovarian neoplasm including 3 cases of dermoid cysts. 14 cases (28%) were of malignant ovarian neoplasm and 1 case of gestational trophoblastic neoplasm has been found.

Fibroid: Ultrasound features: Size of fibroid varies from 2x3 cm to 11x10cm. The margins were well defined in 10 cases (90.91%). Distortion of endometrial cavity in 2 cases due to multiple fibroids was seen. All fibroids were solid and most commonly had mixed echo-texture, among 6 cases (54.1%) cystic degeneration was seen in 3 cases.

Carcinoma Cervix: Commonest presenting symptom in carcinoma cervix was bleeding vaginum found in 8 cases (88.89%) followed by abdominal pain (55.56%) and vaginal discharge (55.56%) on per-vaginal examination. Growth was seen in 8 cases. On ultrasound all patient were diagnosed as altered echo-texture in cervical region or growth, 4 cases (44.45%) hypo-echoic growth, 3 cases (33.34%) mixed and 2 cases hyper-echoic (22.23%) echo pattern of the lesion. 5 (55.56%) patient had irregular ill-defined margins of growth. Fluid in endometrial cavity was present in 4 cases (44.45%).

Extension of growth most commonly seen in uterine body (22.23%) and urinary bladder (22.23%) followed by parametrium (11.12%). Calcification was seen in 4 cases (44.45%), lymphadenopathy in 2 cases (22.23%), liver metastasis in 1 case (11.12%), ascites in 1 case (11.12%) hydronephrosis was seen in 6 cases (66.67%).

Color Doppler study revealed vascularity in only 7 cases (77.78%) in which 5 cases shows central and 2 cases central as well as peripheral in location.

Cervical Polyp: Commonest presenting symptom in cervical polyp was bleeding per vaginum (100%) followed by vaginal discharge (66.07%) abdominal pain in 1 case and menorrhgea in 1 case.

On ultrasound all three polyps are hyper-echoic and well defined (100%), 1 case associated with fluid in endometrial cavity (33.34%) and 1 case associated with uterine fibroid (33.34%).

Color Doppler study revealed vascularity in all three cases (100%) in which 2 cases were central and one case shows peripheral in location.

Carcinoma Endometrium: Three cases of carcinoma endometrium have been diagnosed. Two patients presented with postmenopausal bleeding one case with vaginal discharge. 1 case with
pain abdomen. Burning micturition was seen in one patient (33.34%). P/V examination revealed bleeding through cervical os and discharge. All 3 cases had poorly differentiated endometrial myometrial junction. Endometrial collection seen in all three cases. One case shows hydronephrosis. On color & spectral Doppler, two cases (66.67%) showed low impedance vascularity in which, one showing central & another one central and peripheral in location.

**Gestational Trophoblastic Neoplasia:** A single case of persistent trophoblastic neoplasia has been diagnosed in this study; with complaint of vaginal bleeding in the form of grape like clots, on per abdominal examination uterus was 16 wks size.

**Ultrasound Appearance:** Evidence of multiple small variable size cystic lesion seen in mome trium. Biochemical study reveals raised beta HCG level 110,000 MIU/ml.

**On color Doppler Study:** Study revealed color flow seen in wall of cystic lesion on spectral Doppler. SV - 33.37 cm/s. R- 0.38 PI- 0.49

**Benign Ovarian Neoplasm:** Most common presented symptom pain in abdomen in 7 cases (77.78%) followed by abdominal discomfort and distension and white discharge (22.23%). 3 cases of dermoid ovarion cysts were diagnosed

**Ultra Sound Appearance:** On USG 8 patients were having unilateral tumors, while only 1 case have bilateral location.

These tumors were mostly of complex nature seen in 6 cases (66.67%) and 3 cases (33.34%) were cystic in nature. 6 cases (66.67%) have smooth well defined margins. Thin septations were found in 2 cases. Ascites was seen in 2 cases (22.23%).

3 cases were diagnosed as dermoid cyst have their characteristic feature with fat fluid level in all 3 cases (100%), calcification in 2 cases (66.67%) internal-echoes in 3 cases (100%).

**Malignant Ovarian Neoplasms:** Most common presentation in this study was abdominal pain (92.86%) followed by abdominal distension 50%, followed by loss of appetite in 35.72% cases and vaginal bleeding in 14.29% cases.

**Ultrasonography Appearance:** On ultrasound 11 cases (78.56%) are unilateral and 3 cases (21.43%) are bilateral.

11 cases (78.56%) had ill-defined margins, while 3 cases (21.44%) have well defined margins.

7 cases (50%) are complex in nature, 5 cases (35.72%) solid, in nature and 2 cases (14.29%) cystic in nature. Malignant features were seen in many cases including internal echoes in 50% cases, papillary projection 3 cases (21.43%) thick septations in 9 cases (64.29%) mural nodule in 6 cases (42.86%), ascitis in 10 cases (71.43%), hydronephrosis in 3 cases (21.43%) peritoneal and omental deposit in 4 cases (28.58%), liver metastasis in 2 cases (14.29%) and cystocele and rectocele in 1 one case (7.15%).
Study comprised of 23 patients of neoplastic ovarian masses. Colour Doppler showed blood flow in all the 14 cases (100%) of malignant ovarian neoplasm in contrast to only 2 cases (22.230%) of benign ovarian tumors. In present study 12 cases (85.72%) of malignant tumors had a value PI<0.8 (comment on RI) and 12 patient of malignant tumor have RI<.6. In 9 benign ovarian tumor, 2 cases show vascularity in which 1 case have PI>0.8, RI>0.6 and 2nd have PI<0.8 and RI<0.6.Vascularity was seen in only 16 cases (69.57%) of ovarian neoplasm PI<0.8 and RI<0.6. Vascularity seen in 2 cases (22.23%) of benign ovarian neoplasm in which 1 case show PI>0.8 and RI>0.6 and 2nd case showing PI<0.8 and RI<0.8. Both RI and PI values shows significance in our study in differentiating benign and malignant ovarian neoplasm with a sensitivity of 85.72%, specificity of 50%, positive predictive value of 92.3%, negative predictive value of 33.34%

**Correlation Between Histo-pathological Findings and Radiological findings:** Of all the neoplastic masses, all the 9 cases (100%) of carcinoma cervix, 3 cases (100%) of endometrial carcinoma, 14 cases (100%) of malignant ovarian neoplasm were diagnosed correctly. 3 cases (100%) of cervical polyp, 11 cases of fibroid (100%) and 1 case of GTD diagnosed. Of all the 9 cases of benign ovarian tumor, 8 cases diagnosed correctly while 1 case was wrongly diagnosed as ovarian carcinoma.

**DISCUSSION:** Malignant ovarian neoplasm and carcinoma cervix were the most common malignant neoplasm accounting 53.84% and 34.62% respectively (Table 1).

ICMR report of 1994-1995 ranks the carcinoma cervix as the most common malignancy in females in India. (4) Majority of patients were in the age group of 30-50 years with a mean age of 42.61 years, 11 patients of fibroid are included in this study in which 9 cases (81.82%) were below 50 years of age. (graph 2) Estrogens has been implicated the growth of the fibroids thus most of the fibroid are known to regress after menopause hence they are less often seen in older women (Daftary et al, 1999). (5) Most common presenting symptoms encountered during our study included were abdominal pain in 31 cases (62%) followed by vaginal bleeding in 21 cases (42%), (Table 2). 10 patient (20%) complaining of vaginal bleeding were post-menopausal and 90% of which were diagnosed to have malignancy of genital organs. All the 3 patient who complained of post coital bleeding (6%) had carcinoma cervix. Daftary et al (1999) (5) observed that the typical hemorrhage in carcinoma of cervix is intermenstrual and in most instances follows intercourse in (ie, post coital bleeding) therefore, strong suspicion of malignancy should be kept in mind, if patient present should with postmenopausal or post coital bleeding. (3)

**Leiomyomas (Fibroids):** 11 fibroids including in this study with chief complaints includes abdominal pain (45%) and irregular menses (45%) bleeding P/v (27%) abdominal lump (18%) dysmenorrhea 9% and frequency of micturation (9%). Pain and menorrhagia are characteristic symptom of intramural and submucosal fibroids as reported by Daftary SN. Et al. (1999). Out of 11 fibroids cases 72.73% are single and 27.2% are multiple. 54% cases are intramural 27.28% cases are submucosal fibroid, 1 case of subserosal (9%) and 1 case of cervical fibroids (9%).
Daftary et al (1999) observed among uterine fibroids 75% intramural 15% are submucosal 10% subserosal. They also mentioned that although majority of myomas arises from uterus they could also originate from round ligament, ovarian and uterosacral ligament, in vagina or in vulva. Site of origin was correctly diagnosed in all the 100% cases. In our study distortion of endometrial cavity was seen in 2 cases due to multiple fibroids. Cystic degeneration was seen in 3 cases (27.28%) of fibroid which was confirmed on post-surgical follow up study. Ultrasonography had diagnostic accuracy of 100% in this study for localizing the site of origin. Size, degenerative and necrotic changes that may occur in fibroids are better detected by USG as these are seen in cystic areas. On color Doppler study, vascularity was detected in 3 cases (27.28%) while 8 cases (72.73%) show absent vascularity. Vascularity pattern include in first case are peripheral and in second case central in location. Spectral Doppler study of these vessels shows RI>0.6 and PI value > 0.8 in all three cases. 72.73% of absent vascularity itself ruled out malignancy while fibroid which showing vascularity but RI and PI value >0.6 and >0.8 rule out malignancy according to our criteria. This was later confirmed on postoperative findings.

Cervical Carcinoma: There are 9 cases of carcinoma cervix included in this study.

Commonest presenting symptoms included bleeding per vaginum (88.89%) foul smelling vaginal discharge 55.56%, abdominal pain (55.56%) post coital bleeding (33.34%) postmenopausal bleeding (33.34%), burning and difficulty in micturation (11.12%), Difficulty in defecation (11.12%) Backache in (11.12%). Daftary et al (1999) described vaginal hemorrhage, vaginal discharge, cachexia and abdominal pain as 4 main symptoms of carcinoma cervix, vaginal hemorrhages includes post coital bleeding as the most common type. Vaginal discharge is blood stained. All 9 cases of carcinoma cervix are diagnosed correctly.

On USG lesion was described as predominantly hypo-echoic growth with irregular margins in the cervical region just posterior to bladder. Invasion of growth in to urinary bladder (22.23%), uterine body (22.23%) and parametrium (11.12%) were found respectively. Lewis (1987) and Hricak (1996) have acknowledged the limitations of USG in defining the involvement of rectum, urinary bladder and pelvic sidewall in carcinoma cervix. Ultrasound was found to have accuracy of 100% in the diagnosis of carcinoma cervix according to our study. Colour Doppler study revealed vascularity in 7 cases (77.78%). Thus cervical carcinoma is most effectively diagnosed by direct visualization of growth on per speculum, yet advanced tumors which invade surrounding organ can directly seen on USG.

Cervical Polyp: 3 cases of cervical polyp included in our study. Commonest presenting symptoms included bleeding per vaginum (100%) vaginal discharge (66.67%) and abdominal pain in (33.33%)

On ultrasonography all three cervical polyp are hyper echoic and well defined margins.

One case showing fluid in endometrial cavity and one case associated with uterine fibroid. On color Doppler all three polyps were showing vascularity 100%, 2 cases showing central and 1 case showing peripheral location.
Carcinoma Endometrium: Out of 3 patients of carcinoma endometrium included in the study, all three cases were diagnosed with sonography and colour Doppler evaluation with the diagnostic accuracy of (100%). All three women were post-menopausal and presenting mainly with complaints of post-menopausal bleeding and white discharge and abdominal pain. Frick et al (1973) in their study of 348 patients of carcinoma endometrium observed that post-menopausal bleeding was most common symptom occurring in 75% followed by menorrhagia (18%).(7) Requard et al (1981) described 3 type of endometrium echo-pattern in USG in case of endometrial carcinoma; a normal homogenous pattern homogenous hypo-echoic pattern and inhomogeneous or mix pattern with low intensity areas and bright specular echoes.(8)

In our study myometrial invasion was seen in 1 case, fluid in endometrial cavity in all three cases were detected by USG. 1 case showed hydronephrosis. Association of fluid collection with endometrial carcinoma is well known. Brackenridge et al (1982) in the study of intra uterine fluid collection in postmenopausal women found that 94% of cases had active carcinoma of either uterine corpus or cervix. Accuracy of USG in diagnosis of carcinoma endometrium was 100% as according to our study. (9)

Colour Doppler evaluation reveal vascularity in 2 growths in which one have homogenous hyperechoic and showing central vascularity and 2nd growth are heterogeneous in echo texture and showing central and peripheral vascularity. As in our patients vascularity was detected within the growth with low impedance. It can be compared with the statement by Bourneth (1991) (10) who stated colour Doppler imaging may be utilized to display abnormal vascularity associated with thickened endometrium with low impedance which can also be seen in hyperplasia.

Gestational Trophoblastic Neoplasia: A single case of persistent trophoblastic neoplasia has been diagnosed in our study. Age of the patient was 23 years. Patient gives complaint of vaginal bleeding in the form of grape like clots and on per abdominal examination uterus was 16 weeks size. Ultrasonographic appearance includes multiple small variable size cystic lesions seen in myometrium. Biochemical study reveals raised beta HCG level (110.000 miu/ml). Serial beta HCG levels are the gold standard for the diagnosis of GTN and monitoring therapeutic response. After evacuation of molar pregnancy the HCG level should be monitored weekly until it is undetectable this is followed by monthly monitoring for 6 to 24 months (Berkowitz RS, Gold Stain DP 1996) colour Doppler study revealed a florid mosaic pattern in cyst wall and spectral Doppler study revealed.

PSV – 33.37 cm/s, RI – 0.38 and PI -0.49.

In this case Doppler investigation of the uterine vasculature and of small intratumoral vessels have shown a low resistance flow and high peak systolic velocity (Archiron R et al (1993), Flam F et al (1991) and chanFy et al (1995) Thus the our findings can be well correlated with the above findings.

The changes in resistance to flow seem to parallel the gradual decrements in beta HCG levels (Maymon R et al, zennetta G et al 1996) the patients with lowest resistance to flow are more likely to experience drug resistance. (Long MG 1990, Herch FJ (1994). (12)

Ovarian Neoplasm: Vascularity was seen in 14 cases (100%) of malignant ovarian tumors in contrast to 2 cases (22.23%) of benign ovarian tumors. In benign ovarian tumor vascularity was
seen in septa in cystic benign tumor and in solid part in peripheral location in second complex benign ovarian neoplasm. In solid malignant neoplasm central or central with peripheral vascularity was encountered in 11 cases while only peripheral vascularity was seen only in 1 case. 2 cases are cystic malignant ovarian tumor which showing vascularity in thick septa. (Table 3)

This results correlate quite well with the study by Lit valentine et al (1994) and SimKuijak et al (1992).\(^{(13),(14)}\)

Malignant neoplasms offered lower resistant to blood flow due to present of aberrant tumor vessels. Our study takes a cut of criteria of PI value <0.8 and RI value <0.6 so as to optimize the study in terms of sensitivity and specificity as used by Jonathan Carter et al (1994).\(^{(15)}\)

In this study 85.72% of malignant ovarian tumors had PI value <0.8 in contrast to only 50% of benign ovarian tumors. In the same way 85.72% of malignant tumors had RI <0.6 and in contrast to only 50% of benign tumors.

Our study also illustrated the role of color Doppler in labeling the solid tumors of ovary as benign if it does not show any vascularity. The present study yielded fairly good specificity(60%) and sensitivity(85%) with PI and RI value of <0.8 and 0.6 respectively.

Guerriero et al (2002) found that high accuracy in predicting malignancy when color Doppler demonstrated arterial flow within solid portion of the mass.\(^{(16)}\)

Our study comprises of 23 cases of ovarian neoplasms which included 9 cases of benign neoplasm out of which 8 cases (88.89%) diagnosed correctly while 1 case was wrongly diagnosed as ovarian carcinoma. 14 cases of malignant ovarian carcinoma all which are correctly diagnosed. Role of color and spectral Doppler in detecting vascularity within the solid components and measuring RI and PI value further increases the sensitivity by categorizing mass with no vascularity and high RI and PI value as benign and mass with neovascularization or low RI and PI value as malignant neoplasms.

Kinkel K, Hricak H, Luy et al (2000) in a meta-analysis of 46 published studies concluded that ultrasound technique that combine morphologic assessment with color Doppler flow imaging is significantly better in characterizing in ovarian masses than morphologic assessment, color Doppler flow imaging or Doppler indices alone.\(^{(17)}\)

**CONCLUSION:** Ultrasonography and color Doppler are very useful investigation in differentiating between benign and malignant gynecological neoplasms. Most benign gynecological neoplasm below 40 years of age and most of malignant gynecological neoplasm are after 40 years of age. Ultrasonography is the first line of imaging method for localization and characterization of Gynecological neoplasms. Color Doppler improves the specificity, sensitivity and diagnostic accuracy of pelvic lesions. In this study 85.72% of malignant ovarian tumors had PI value <0.8 in contrast to only 50% of benign ovarian tumors and 85.72% of malignant tumors had RI <0.6 and in contrast to only 50% of benign tumors. Most of the benign lesions were avascular or showing mild to moderate amount of vascularity with predominantly peripheral pattern. Most of the malignant neoplasms offered lower resistance to blood flow due to presence of aberrant tumor vessels and vascularity was central or peripheral in location.
REFERENCES:

1. Puri S, Ashat M, Pandey A, Goel NK, et al. Socio-demographic characteristics of cancer patients: hospital based cancer registry in a tertiary care hospital of India. Indian J Cancer. 2014; 51(1): 1-4.

2. Beryl R. Benacerraf, MD; Alfred Z. Abuhamad, MD; Bryann Bromley, MD; et al. Consider ultrasound first for imaging the female pelvis. American Journal of Obstetrics & Gynecology. 2015: 450-455.

3. Folkman J, Watson K, Ingber D, Hanahan D (1991) Induction of angiogenesis during the transition from hyperplasia to neoplasia. Nature 339: 58-62.

4. ICMR: Annual Report of Director General 1994-95.

5. Daftary S.N., Padubidri V.G.: Howkins and Bourne, Show’s textbook of Gynecology 12th edition, B. I. Churchill Livingstone, 1999.

6. Lewis E: use and abuse of Imaging in Gynecologic cancer Cancer 60: 1993-2009, 1987.

7. Frick H.C. Munnel E.W., Richart RM., Berges A.P.: Carcinoma of endometrium. Am J. Obstet Gynecol, 1973.115(5): 663-676.

8. Reruard CK. Wicks ID, Mettler FA: Ultrasonography in staging of Endometrial adenocarcinoma. Radiology 140: 781-785, 1981.

9. Brackenridge JW, Kurtz AB, Ritchie O M, and Macht EL: Postmenopausal uterine fluid collection. Indicator of carcinoma. AJR, 139: 529-534, 1982.

10. Bourne TH, Campbells et al: Detection of endometrial cancer by transvaginal USG with colour flow imaging and blood flow analysis 1991, 253-259.

11. Berkowitz RS, Goldstain DP chorionic tumors N Engl. J. Med (1996), 353, 1740-48.

12. Zanetta G, Vergani P, Lissioni A (1996) Color Doppler ultrasound in the reoperative assessment or adnexal masses ActaObstet Gynecol Scand 73:637-641.

13. By lit valentine et al – Epithelial tumours of ovary Radiology 1994.

14. Slmkurjak& Harold Schulman et al: Transvaginal Ultrasound color flow and Doppler waveform of the postmenopausal adnexal masses. Obstet Gynecol 1992; 80, 917-21.

15. Jonathan carter and an brews stalzman et al: Flow characteristics of benign and malignant gynecological tumor using transvavinalcolour flow Doppler obstetgynecol 1994, 83:125-30.

16. Guerriero et al: complex pelvic mass as a target of evaluation of vessel distribution by colour Doppler for the diagnosis of adnexal malignancy 2002; 21: 1105-11.17.

17. Kinkel K, Hricak H, Luy et al: USG characterization of ovarian masses a meta-analysis 2000: 217: 803-11.

| Neoplasm's                      | No. of neoplasm's | Percentage |
|--------------------------------|-------------------|------------|
| Carcinoma Cervix               | 9                 | 18         |
| Cervical polyp                 | 3                 | 6          |
| Carcinoma endometrium         | 3                 | 6          |
| Fibroid                       | 11                | 22         |
| Benign ovarian tumor           | 9                 | 18         |
| Malignant ovarian tumor        | 14                | 28         |
| GTN                           | 1                 | 2          |
| **Total**                     | **50**            | **100**    |

Table 1: Distribution of gynecological Neoplasm's
| Symptoms                      | No. of cases | Percentages (%) |
|-------------------------------|--------------|-----------------|
| Abdominal pain                | 31           | 62              |
| Bleeding p/v                  | 21           | 42              |
| Post menopausal bleeding      | 10           | 20              |
| Vaginal discharge             | 9            | 18              |
| Abdominal distention          | 8            | 16              |
| Irregular menses              | 8            | 16              |
| Menorrhagea                   | 4            | 8               |
| Anorexia                      | 3            | 6               |
| Postcoital bleeding           | 3            | 6               |
| Wt loss                       | 2            | 4               |
| Burning and difficulty in micturation | 2   | 4               |
| Polymenorrhea                 | 1            | 2               |
| Dysmenorrhea                  | 1            | 2               |
| Difficulty in defecation      | 1            | 2               |
| Constipation                  | 1            | 2               |

Table 2: Presenting symptoms of patients with Gynecological neoplasm

| Ovarian neoplasm                  | Total no. of cases and % | Present of vascularity | Site of vascularity |
|-----------------------------------|--------------------------|------------------------|---------------------|
|                                   |                          |                        | Cystic neoplasm     |
|                                   |                          |                        | Mural  | Septal | Central | Peripheral |
| Benign ovarian neoplasm           | 9 (39.14%)               | 2                      | 0       | 1      | 0       | 1          |
| Malignant ovarian neoplasm        | 14(60.86%)               | 14                     | 1       | 6      | 11      | 8          |
| **Total**                         | **23(100%)**             | **15**                 | 1       | 6      | 11      | 9          |

Table 3: Color and spectral Doppler study of benign and malignant ovarian neoplasm

Diagnosis:

| HPR                  | CaCx | Cervical polyp | Ca, Endo | Dermoid | Fibroid | GTD | Benign ovation neoplasm | Malignant ovarian neoplasm | Total |
|----------------------|------|----------------|----------|---------|---------|-----|-------------------------|---------------------------|-------|
| Ca, CX               | 9    | 0              | 0        | 0       | 0       | 0   | 0                       | 0                         | 9     |
|                      | 100% | 0              | 0        | 0       | 0       | 0   | 0                       | 0                         | 100% |
| Cervical polyp       | 0    | 3              | 0        | 0       | 0       | 0   | 0                       | 0                         | 3     |
|                      | 0    | 100%           | 0        | 0       | 0       | 0   | 0                       | 0                         | 0     |
|                      |      |                |          |         |         |     |                         |                           | 100% |
Table 4: Correlation between histo-pathological findings and Radiological findings

|                      | Ca Endo | Fibroid | GTD | Benign ovarian neoplasm | Malignant ovarian neoplasm | Total |
|----------------------|---------|---------|-----|-------------------------|---------------------------|-------|
|                      | 0       | 0       | 0   | 0                       | 0                         | 11    |
|                      | 0       | 0       | 0   | 0                       | 0                         | 3     |
|                      | 0       | 0       | 0   | 0                       | 0                         | 5     |
|                      | 0       | 0       | 0   | 0                       | 0                         | 15    |
|                      | 0       | 0       | 0   | 0                       | 0                         | 50    |

Graph 1: Age distribution of patients with Gynaecological neoplasms

Graph 2: Mean age for individual neoplasm
Graph 3: Color and spectral Doppler study of benign and malignant ovarian neoplasm

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