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# Ultrasonographic Evaluation of Gynecological Pelvic Masses - An Observational Study

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**Abstract:** Pelvic ultrasound is commonly used as part of the routine gynecologic exams, resulting in diagnosis of adnexal masses, the majority of which are functional or benign. However, due to the possible complications involving benign adnexal cysts (ie, adnexal torsion, pelvic pain) and the utmost importance of early diagnosis and treatment of ovarian cancer, the correct ultrasound diagnosis of adnexal masses is essential in clinical practice. Aim and objectives of this study were to evaluate the sonographic morphology of pelvic masses and to correlate with the histopathological diagnosis of the patients who underwent surgical intervention. A hospital based prospective study was done on 50 female patients with gynecological masses using high resolution ultrasonography and findings correlated with histopathology or serial sonographic examination. Out of 50 patients evaluated by ultrasonography 14 (28%) were having ovarian pathologies and 21 (42%) were having uterine pathologies. The most common chief complaint of female patients enrolled in our study was pain in pelvic cavity 21 (42%) followed by pain and palpable mass 10 (20%). In various ovarian pathologies, benign cystic ovarian lesions were detected with 100% accuracy with USG. Ovarian malignancies were diagnosed in 5 patients USG, out of which 4 diagnoses were proved correct [80%], but 1 was corrected as ovarian torsion after postsurgical histopathological examination. Seven patients were diagnosed as tubo-ovarian masses out of which 6 were proved correctly by histopathology (85.71%). One case was diagnosed false positive and proved as hydrosalphinx after postsurgical histopathology. So accuracy of diagnoses of malignant ovarian masses and tubo-ovarian masses were found 80% and 85.71% respectively, in presenting study. USG is most commonly preferred imaging tool to evaluate gynecological masses. It's important to differentiate gynecological and non-gynecological masses on sonography for accurate management of the patient.
**Keywords:** Gynecological pelvic mass, uterus, ovary, adenexa, ultrasonography, Histopathological diagnosis.

## INTRODUCTION

The female pelvis is an anatomic region which is quite complex, because it contains some organs and systems accomplishing different and independent functions. The urogenital system represents the main part of the female pelvis but there are also portions of other organs and systems such as some important blood vessels, gastrointestinal tracts, lymphatics, nerves and parts of the musculoskeletal system. All these structures might house or generate pelvic masses even in para-physiologic conditions, and not necessarily because of current diseases, or congenital alterations, inflammatory illness and tumours1.

Due to the wide use of pelvic and transvaginal ultrasound for routine gynecological evaluation, during the reproductive years and after menopause, the incidental finding of adnexal masses has been observed

in a growing proportion of women, leading to discussions on the approach to be used in asymptomatic patients[2]. One of the main concerns of the gynecologist is the identification of risk markers for the development of ovarian cancer, which may lead to early surgical treatment and prevent progression of the disease during the expectant conservative treatment[2].

Ultrasonography has many advantages over the other imaging modalities like conventional X-ray, computed tomography, MRI and invasive procedures. Ultrasonography is a real time, non-invasive, safe, easy, quick tool, inexpensive, sensitive, scanning of patient involve no discomfort, results of scanning are apparent immediately on viewing screen and is a dynamic modality.

Ultrasonography permits to distinguish correctly between a benign and a malignant adnexal mass and, within these groups of diseases, to give an accurate diagnosis in most of the cases. Nevertheless ultrasonography isn't free from errors and limitations. Diagnostic errors are probable in the identification of masses which appear solid at US. In these cases is difficult to evaluate the uterine or ovarian or the extra-gynaecologic origin of the lesion. These cases require CT or MRI scan. In particular MRI has proven to be useful in detecting and staging of gynaecological malignancies and in detecting the origin of extra-gynecological pelvic masses[3].

Pelvic ultrasonography to visualize the adnexa and the uterus is commonly performed in symptomatic and asymptomatic women of reproductive and menopausal age. Although pelvic ultrasound is highly sensitive in detecting adnexal masses, its specificity in detecting malignancy is lower. In addition, the differentiation between functional ovarian masses that will resolve over time and nonfunctional masses has tremendous implications for patients' counseling and management. Other types of adnexal cysts (such as endometrioma, mature cystic teratoma, and paraovarian cysts) are also important to diagnose correctly since they may affect patients' fertility, may be associated with significant pelvic disease, or put the patient at risk for ovarian torsion. Thus, the correct use of pelvic ultrasonography has become an integral part of the gynecologic evaluation and exam[ 4, 5]

The space occupying lesions in female pelvis are very common over a wide age range. Many pathological conditions give rise to pelvic mass. It is difficult to arrive at an accurate diagnosis on clinical examination alone. Trans abdominal and Trans vaginal ultrasonography are precisely helpful to determine the origin of a mass from uterus or ovarian or adnexal or extra genital structures. Information about the internal anatomy & physiology of the ovary or uterus is frequently obtained during ultrasonography that would not be evident even by direct visualization of the pelvic organs at laproscopy or laparotomy[6].

The best examination in a clinical context is undoubtedly suprapubic and endovaginal ultra-sonography. In young patients, especially in those who are in the reproductive age, ultraso- nography shows the best accuracy in the differential diagnosis of ovarian and hydrosalpinx cysts, of the ectopic pregnancy, of uterine fibroids[6]. Serial sonography is done to detect changes in size and appearance of a particularly monitoring of a cyst that are functional in nature, for any progressive increase in size or changes in internal components. Serial sonography is also done for assessment of change in size following therapeutic response of pelvic malignancies and ovulation timing.

Aim and objectives of this study were to evaluate the sonographic morphology of pelvic masses and to correlate with the histopathological diagnosis of the patients who underwent surgical intervention.

## MATERIALS AND METHODS

This cross-sectional prospective study was conducted from June 2015 to December 2016 on patients referred for high resolution ultrasonographic evaluation from department of Obstetrics and Gynecology and General Surgery to the Department of Radiodiagnosis at a tertiary care teaching hospital, Haldia, West Bengal. This cohort study was done on 50 patients with complaints suggestive of a pelvic mass. The final diagnosis was correlated with histopathological diagnosis. The cytohistopathology diagnosis was considered as the final diagnosis. All the subjects were enrolled with detailed oral and written consents. This study was approved by institutional ethics committee and individual written consent was taken.

### Inclusion criteria

Female patients of all age groups with clinical suspicion of pelvic mass or chronic pelvic pain and gave written consent

### Exclusion criteria

Post-operative patients and non-gynecological female pelvic masses. The current methods of pelvic sonography in use are transabdominal real time scanning and transvaginal real time scanning, hi transabdominal scanning most often uterus and ovaries are visualized by using 3 MH transducer at a depth 10-15 cm through urinary bladder whereas with transvaginal sonography the same structures are visualized at depth 1-8 cm and 5-7 MH transducers are used. In every case. Trans abdominal sonography was done and in some cases finding are correlated with Trans vaginal sonography.

In almost every case proper sonographic evaluation of uterus, endometrium, both adenexa, ovaries, bladder and anterior pelvic structure, pelvic walls, cul de sac, rectum, small bowel and posterior pelvic structures was done.

Sonographic findings of each lesion were designed to assess echogenicity, shape, borders, size, composition, calcifications, septation, locularity, laterality, presence of invasion of capsule and fixation of mass. The presence or absence of ascites or other metastatic lesions were also noted in every case.

Echogenicity categories included markedly hypoechoic, isoechoic, hyperechoic and anechoic. Size was defined as the maximal dimensions of the lesion. Composition was defined as solid, cystic and mixed. Borders were defined as smooth and irregular. Calcifications were divided into those located centrally within the nodule, peripherally, and none. Posterior shadowing of at least one of the suspected calcifications was required to consider the finding present. The detailed clinical history was taken and general and local pelvic examination was performed for all patients with various palpable pelvic masses on bimanual pelvic examination. Pathological evaluation was performed on all the lesions.

## RESULTS

USG scan was performed in 50 female patients who presented with history, symptoms, and signs of the pelvic mass. In the present study patients were in the range of 10 to 70 years. Majority of the patients were in the age group of 31 to 40 years with mean age of 33.8 years. The minimum number was in the age group of 10-20 and 61-70 years [Table 1].

**Table-1: Age wise incidence among study participants [n=50]**

| Age group (years) | Number of cases (%) |
|---|---|
| 10-20 | 01 (02) |
| 21-30 | 05 (10) |
| 31-40 | 11 (22) |
| 41-50 | 25 (50) |
| 51-60 | 05 (10) |
| 61-70 | 03 (06) |
| Total | 50 (50) |

**Table-2: Percentage of pre- and post-menopausal patient among study participants [n=50]**

| Patients | Number of cases (%) |
|---|---|
| Premenopausal | 34 (68) |
| Post-menopausal | 16 (32) |

**Table-3: Percentage of patients with different chief presenting complaints [n=50]**

| Symptoms | Number of cases (%) |
|---|---|
| Pain in pelvic cavity | 21 (42) |
| Pain and palpable mass | 10 (20) |
| Pain and bleeding PV | 09 (18) |
| Menorrhagia and menstrual irregularity | 11 (22) |
| Post-menopausal bleeding | 07 (14) |
| Primary amenorrhea | 03 (06) |
| Infertility | 04 (08) |
| Total | 50 |

The most common chief complaint of female patients enrolled in our study was pain in pelvic cavity 21 (42%) followed by pain and palpable mass 10 (20%). Menstrual irregularity, menorrhagia, post-menopausal bleeding, infertility, and amenorrhea were the other less common complaints in the female patients of our study [Table 3].

**Table-4: Different types of cases among study participants**

| Types of cases | Number of cases (%) |
|---|---|
| Ovarian/adnexal masses | 14 (28) |
| Uterine masses | 21 (42) |
| Fallopian tube pathologies | 11 (22) |
| Vaginal pathologies | 04 (08) |
| Total 50 | 50 (100) |

Out of 50 patients evaluated by ultrasonography 14 (28%) were having ovarian pathologies and 21 (42%) were having uterine pathologies. Eleven patients presented with localized collection in to the fallopian tube pathologies. Few cases there were involvement 04 (08%) of vagina [Table 4]. In our study, the most common female gynecological masses were that of uterine, followed by ovary/adnexa, fallopian tubes and vagina.

Fibroids were the most common uterine masses in our study accounting for nearly 50%, i.e., 25 cases of total 50 cases of uterine masses and uterine fibroids also constituted 19 (38%) of total 50 cases in our cross-sectional study of female gynecological masses evaluation. Thus, uterine fibroid is one of the most important and common cause of female gynecological pelvic masses [Table 5].

Majority of ovarian lesions were benign cystic lesion 19 (38%) in which Tubo-ovarian masses 6 (12%) and follicular cyst were most common 5 (10%), followed by luteal cyst, serous cystadenoma, mucinous cystadenoma. Malignant ovarian masses found in 8% (4/50 of patients), in which serous cystadenocarcinoma most common found in 50% (2/4 of malignant ovarian masses) followed by mucious cystadenocrcinoma and endometrial sinus tumor (25% each) [Table 5].

In the identification of the uterine pathology, 94.73% (18/19) of fibroid, 33.33% (1/3) of fibroids were diagnosed as adenomyosis correctly by ultrasonography after post surgical histopathological examination. Accuracy of ultrasonography in the diagnosis of uterine and cervical malignancies was 100% in the presenting study [Table 5].

In various ovarian pathologies, benign cystic ovarian lesions were detected with 100% accuracy with USG. Ovarian malignancies were diagnosed in 5 patients USG, out of which 4 diagnoses were proved correct [80%], but 1 was corrected as ovarian torsion after postsurgical histopathological examination. Seven patients were diagnosed as tubo-ovarian masses out of which 6 were proved correctly by histopathology (85.71%). One case was diagnosed false positive and proved as hydrosalphinx after postsurgical histopathology. So accuracy of diagnoses of malignant ovarian masses and tubo-ovarian masses were found 80% and 85.71% respectively, in presenting study [Table 5].

**Table-5: Percentage wise distribution of pelvic masses and their histopathological diagnosis [N=50]**

| Types of Lesion | USG Diagnosis | Histopathological Diagnosis |
|---|---|---|
| UTERINE | | |
| Fibroid | 19 | 18 |
| Fibroid with pregnancy | 01 | 01 |
| Adenomyosis | 01 | 03 |
| Adenocarcinoma of uterus | 02 | 02 |
| Carcinoma of cervix | 01 | 01 |
| OVARIAN | | |
| Benign | | |
| Follicular cyst | 04 | 04 |
| Luteal cyst | 02 | 02 |
| Serous cystadenoma | 02 | 02 |
| Mucinous cystadenoma | 02 | 02 |
| Benign cyst teratoma | 02 | 01 |
| Hydrosalpinx | 00 | 01 |
| Ovarian cyst torsion | 00 | 01 |
| Tubo-ovarian masses | 07 | 06 |
| Malignant Lesion | | |
| Serous cystadenocarcinoma | 02 | 02 |
| Mucinous cystadenocarcinoma | 01 | 01 |
| Endometrial sinus tumor | 02 | 01 |
| Localized collection of pus in pelvic region | 02 | 02 |
| TOTAL | 50 | 50 |

On histopathological examination, the most common finding was leiomyoma 19 (38%) followed by tubo-ovarian masses 06 (12%). Study also had 2 cases of adenocarcinoma of uterus and one case of carcinoma of cervix. Serous cystadenocarcinoma was the most common ovarian malignancy 02 (4%). There was one case of endometrial sinus tumor (Table 5).

Two cases diagnosed as fibroid on USG were found to be adenomyosis on HPE. Five cases of ovarian

malignancy were reported on USG, however 4 cases were confirmed to be malignant on HPE (Table 5).

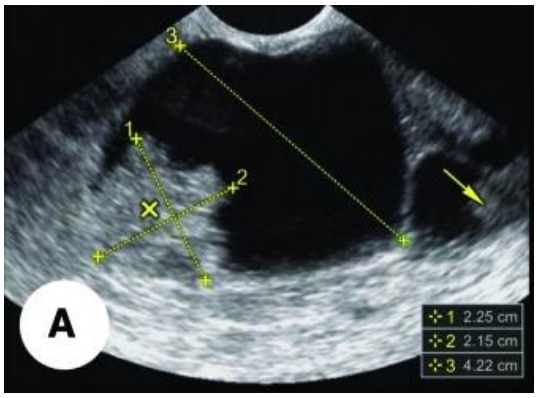


**Fig-1A: Serous borderline tumor (transvaginal scan). Multilocular-solid tumor with papillae, rather smooth inner cyst wall, and regular septa and anechoic intracystic fluid**

**Fig-1B: External surface of an ovary showing a serous cystadenoma of low malignant potential exhibiting papillary growth. The lateral aspect of the uterus and the entire fallopian tube are seen clearly**

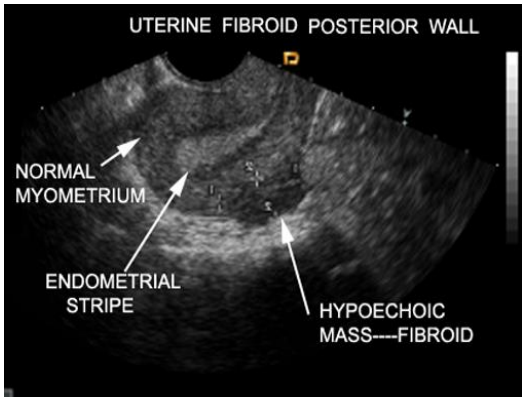


**Fig-2: Hypoechoic small fibroid and small anterior wall myoma**

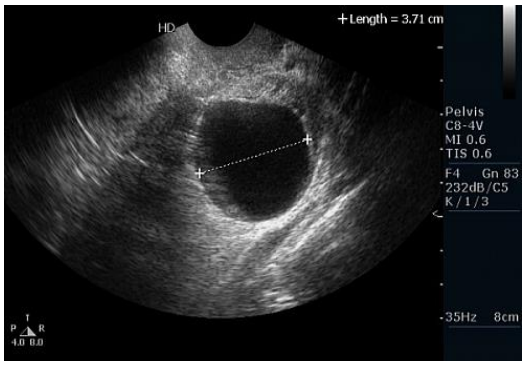


**Fig-3: Functional ovarian cyst**

## DISCUSSION

The present study was undertaken to evaluate the role of ultrasound in determining site, size, nature and consistency of pelvic masses and to evaluate the results of conservative management by serial sonographic examination. Fifty cases were studied sonographically and histopathologal confirmation of the diagnosis was obtained.

The evaluation of pelvic masses assumes importance due to the fear and anxiety driven by the potential of missing a malignancy. This study focussed on the clinicopathological spectrum of gynecological pelvic masses - both uterine and adnexal.

A major problem in diagnostic clarification of incidental findings on ultrasound is the characterization of the malignant potential of the lesions. Ovarian cancer, being a heterogeneous disease, is composed of different types of tumors derived from different cell lines with different behaviors and clinical-pathological characteristics.[7] Several scoring systems based on ultrasound morphology of adnexal cysts have been proposed to differentiate benign lesions from malignant adnexal masses [8-12]

These scoring systems are based on specific parameters such as surface, thickness of the wall, and cyst echogenicity; cyst volume; presence, thickness and number of septa; presence, size and number of vegetation, and presence and size of solid areas within the cyst.

A false diagnosis of fibroid in two cases was corrected as adenomyosis after postsurgical biopsy. Walsh et al described characteristics features of adenomyosis but these cases of our study only showing enlargement of uterus with normal endometrial and myometrial echotexture and without any definite mass**[**13**].** The common sonographic findings of adenomyosis in our study were globular uterine enlargement, cystic anechoic spaces in the myometrium, uterine wall thickening, heterogeneous echotexture and thickening of the transition zone[14]. Adenomyoma usually has indistinct margin form adjacent myometrium unlike leiomyoma or fibroid which show distinct well-defined margin[15]

According to Bezjian *et al*. Leiomyma are one of the most common pelvic masses countered during pregnancy**[**16**].** We found 1 case of leiomyoma in the pregnant patient. These cases were showed mixed echogenic pattern.

In our study of female gynecological masses, we included 3 cases of carcinoma. Only 1 case of carcinoma carcinoma cervix in our study underwent cervical biopsy and histopathological evaluation. The case in our study was squamous cell carcinoma on histopathological examination. We included two cases of histopathologically proven carcinoma endometrium diagnosed on USG as dysplastic endometrial thickening and mass [17]. In 2 cases of endometrial carcinoma, TVS did revealed abnormal prominent endometrial echo, growth in the endometrial cavity which had to be confirmed by HPE. TVS with its better resolution can differentiate between a benign ovarian or adnexal mass and a complex mass. Lesions with echogenic solid areas, irregular walls, thick septations, mural nodule, papillary excrescences, bilaterality and ascites along with evidence of neoangiogenesis on colour doppler are features suggestive of a possible malignancy [18]

Adenocarcinoma of uterus was diagnosed in two cases in our study, in which uterus was normal in size, it showed bulbar type of configuration of uterus with hypoechoic pattern and endometrial echo was prominent. Postsurgical histopathology confirmed the diagnosis as adenocarcinoma stage II.

In the identification of the uterine pathology, 94.73% (18/19) of fibroid, 33.33% (1/3) of fibroids were diagnosed as adenomyosis correctly by ultrasonography after post surgical histopathological examination. Accuracy of ultrasonography in the diagnosis of uterine and cervical malignancies was 100% in the presenting study.

All ovarian cystadenoma were anechoic with well defined walls. Fleischer et al found septation in all of their 18 cases of serous cystadenomas. We observed septation in both cases and loculations in one case. Mucinous cystadenoma may in addition contain low level echoes due to their mucin content. This finding was observed in our case. Similarly Walsh, Taylor *et al*.**[**19**]** also found week internal echoes occasionally in cases of mucinous cystadenomas. Hence it suggests that a cystic ovarian mass with septation and internal echoes is more likely to be a mucinous cystadenoma.

Five cases of ovarian malignancy were reported on USG, however 4 cases were confirmed to be malignant on HPE [Figure 1A & 1B]. In presenting study, all malignant ovarian tumors were showing cystic mass with ill defined walls and solid component. All cases present with ascites. Outwater EK *et al*.**[**20**]** suggested that irregular and solid component in a cystic mass suggested gross malignant changes. None of the malignant ovarian tumor was purely cystic. In our study 1 out of 4 malignant ovarian tumors (25%) was shows liver metastasis with ascites and peritoneal seeding.

In the tubo-ovarian masses two types of patterns were seen, the first consisting of large fusiform shaped cystic masses representing fallopian tubes and second type was that of a rounded or ovoid mass with ill defined walls. Well defined cystic tubo-ovarian masses were indistinguishable from other types of ovarian cysts, however clinical history and tenderness on physical examination helped in differential diagnosis. Ultrasound was especially helpful in cases treated conservatively since it gauged the results of treatment by serial sonographic examination. One case of ovarian cyst postoperatively diagnosed as torsion of cyst. Ultrasonographically cyst was anechoic and very large in size.

In various ovarian pathologies, benign cystic ovarian lesions were detected with 100% accuracy with USG. Ovarian malignancies were diagnosed in 5 patients USG, out of which 4 diagnoses were proved correct [80%], but 1 was corrected as ovarian torsion after postsurgical histopathological examination. Seven patients were diagnosed as tubo-ovarian masses out of which 6 were proved correctly by histopathology (85.71%). One case was diagnosed false positive and proved as hydrosalphinx after postsurgical histopathology. So accuracy of diagnoses of malignant ovarian masses and tubo-ovarian masses were found 80% and 85.71% respectively, in presenting study. The low specificity of ultrasound is due to the overlap in the sonographic characteristics of benign pelvic masses like endometriomas, pedunculated leiomyomas, borderline tumours and ovarian malignancies. Serial monitoring was helpful in these cases, which shows resolution of the lesion on subsequent sonographic examination. Luteal cyst appeared as an anechoic mass with well defined walls. In our study we were found 4 follicular and 2 luteal cyst, which was consistent with the findings of Fleischer *et al*. **[**21**]** Ovarian cysts [Figure 3] are relatively common finding on ultrasound, especially in postmenopausal women, with an estimated incidence of up to 21% in this population[2].

Our findings were consistent with study of Lawson *et al.* **[**22**]**, Fleischer *et al*. **[**21**]** and Walsh *et al.***[**19**]**, reported accuracy of 91%, 91% and 94% respectively. In the present study, fibroids were the most common uterine masses in our study accounting for nearly 50%, i.e., 25 cases of total 50 cases of uterine masses and uterine fibroids also constituted 19 (38%) of total 50 cases in our cross-sectional study of female gynecological masses evaluation. Thus, uterine fibroid is one of the most important and common cause of female gynecological pelvic masses.

USG, both transabdominal and transvaginal have a well-established role in the initial evaluation of a pelvic mass. USG has many advantages being easily available, relatively inexpensive and nonionising. Leiomyomas are easily diagnosed on USG [Figure 2]. In study by Shobha S. Pillai[23], 42 cases of leiomyomas were diagnosed preoperatively by physical examination and USG and 44 cases were confirmed by histopathological examination (HPE), showing a sensitivity of 95.5% and specificity of 61.4%[23]. Study by Eze JC *et al.* showed sensitivity of transvaginal scan (TVS) for diagnosis of uterine leiomyomas to be 94.5%, and specificity of 62.5%[24]. Accuracy of ultrasonography in the diagnosis of uterine and cervical malignancies was 100% in the presenting study.

Due to the low likelihood of ovarian cancer in incidental findings of adnexal pelvic masses, and because of the high rates of spontaneous resolution, ultrasound monitoring can be performed with good early diagnosis rates for borderline and type I tumors. The frequency of these revaluations should be established individually and according to the routine of each service. However, early screening of type II tumors remains a challenge.

Pelvic masses that are overlooked on physical examination will be identified by Ultrasonographic examination. Conversely the identification of small myomas, ovarian enlargement and physiological cysts may lead to increased patient concern and even operations that might be unnecessary. However the drawbacks of sonography include technical limitation caused by patient habitues, operator dependence and techniques inability to provide specific characterization.

The combined analysis of morphological parameters on ultrasound and Doppler study, CA-125 levels, and the assessment of a symptom index composed of abdominal bloating and/or increased abdominal size, pelvic and/or abdominal pain, and inability to eat normally and/or rapid feeling of fullness may increase diagnostic rates. Even with all the current technology and knowledge on the subject, it is not clinically possible to fully differentiate benign and malignant lesions preoperatively. Thus, pathological analysis remains the gold standard for definitive diagnosis[25, 26].

## CONCLUSION

The US is highly accessible, relatively inexpensive, does not use ionizing radiation, and is generally well tolerated by patients. Use of endovaginal US improves the diagnostic accuracy in the assessment of gynecological masses by better resolution of the image. By studying the various features of histopathology specimen of particular gynecological mass and correlating with imaging features of sonography we can classify, diagnose and evaluate various female gynecological diseases presenting as mass lesion and increased the diagnostic accuracy of sonographic examination. Serial sonographic monitoring of the function lesions were helpful in the management and helps to avoid unnecessary surgical procedures. Hence sonography is real time, non invasive, safe, easy, quick, devoid of any radiation hazard and high accuracy; it must be use first line modality for the evaluation of gynecological pathologies.

In case of incidental finding of adnexal mass pelvic, transvaginal ultrasonography remains the modality of choice for evaluating suspicious characteristics. In the presence of any abnormality detected during a screening test or when there are doubts about the interpretation of the images obtained, a second opinion from a sonographer with extensive experience in oncology imaging is recommended.

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