Radiodiagnosis

Ultrasonographic Evaluation of Gynecological Pelvic Masses and Correlate with Histopathological Diagnosis: An Observational Study

Dr. Neelendra Chakravarty[1], Dr. Anindya Sasmal[2*], Dr. Narsima Rao Banoth[3], Dr. Ayon Mitra[4], Dr. Ramesh Kumar Sahu[5]

[1]Assistant Professor, Department of Pathology, ICARE Institute of Medical Sciences and Research, Banbishnupur, Purba Medinipur, Haldia, West Bengal 721645 India

[2]Assistant Professor, Department of Radiodiagnosis, ICARE Institute of Medical Sciences and Research, Banbishnupur, Purba Medinipur, Haldia, West Bengal 721645

[3]Professor, Department of Pathology, ICARE Institute of Medical Sciences and Research, Banbishnupur, Purba Medinipur, Haldia, West Bengal 721645

[4]Assistant Professor, Department of Obstetrics & Gynaecology, ICARE Institute of Medical Sciences and Research, Banbishnupur, Purba Medinipur, Haldia, West Bengal 721645

[5]Professor, Department of Radiodiagnosis, ICARE Institute of Medical Sciences and Research, Banbishnupur, Purba Medinipur, Haldia, West Bengal 721645

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. This study was conducted with a view to find out the diagnostic value of USG and correlate with histopathological diagnosis. 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. 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. 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. 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). Ultrasonography is valuable in diagnosing functional and benign ovarian neoplasms. It is also useful in suspecting malignant ovarian neoplasms and confirming diagnosis of ectopic pregnancy, if correlated with the clinical findings. The correct use of pelvic ultrasonography has become an integral part of the gynecologic evaluation and exam.

Keywords: Pelvic masses, Adnexal masses, Ultrasonography, Histopathology, Diagnostic value.

INTRODUCTION

Adnexal region is composed of ovary, fallopian tube, broad ligament, and associated blood and nerve supply. Diagnosis of adnexal masses in a female patient presents diverse possibilities. These range from an ectopic pregnancy requiring immediate surgery to an ovarian malignancy or an inflammatory mass, requiring planned surgery or appropriate drug therapy. Ultrasonography has been used as a diagnostic modality in this situation [1-5].

When evaluating pelvic masses, sonologist should consider an ovarian aetiology in addition to uterine pathologies. Indeed ovarian pathology is responsible for 70% of pelvic masses found at exploratory surgery on patients with preoperative diagnosis of pelvic mass [6]. 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 [7].

The first clinical parameter to be considered is the patients' age: while adnexal cysts are the most common in reproductive-age women, the likelihood of malignancy in this age group is low, and a large proportion of cysts are of functional origin, tending to resolve over time. On the other hand, in postmenopausal women, the risk of malignancy and therefore clinical suspicion for malignancy are higher. Other factors to consider when evaluating patients with adnexal masses are: symptoms of pelvic pain (which may point to adnexal torsion but also to endometriosis, pelvic inflammatory disease, or an acutely hemorrhagic corpus luteum cyst); abdominal distention accompanied by gastrointestinal complaints and weight loss (which may arise from an advanced ovarian malignancy); and use of hormonal contraception (which may affect the likelihood of functional ovarian cysts)[7].

Pelvic ultrasound today forms the primary examination mode in the evaluation of pelvic masses. It provides the gynecologist the necessary information to plan out the right therapeutic approach required in the given situation. Hence, ultrasound has become a mandatory examination in the approach to the management of pelvic masses. This study was conducted with a view to find out the diagnostic value of USG and its correlation with the clinical and histological diagnosis.

OBJECTIVES
To evaluate the sonographic morphology of pelvic masses and to correlate with the histopathological diagnosis of the patients who underwent surgical intervention.

MATERIALS & METHODS
The study was conducted from July 2017 to September 2018 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. 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.

Inclusion Criteria
- Female patients prepubertal to post-menopausal of all age group presenting with symptoms such as pain in abdomen/pelvis, PV bleeding, PV white discharge, urinary and gastrointestinal pressure symptoms and palpable mass.
- Furthermore, asymptomatic patients where pelvic mass detected at time of routine pelvic examination or at the time of USG transabdominal (TAB) and transvaginal sonography done for other diagnoses

Exclusion criteria
- Patients with ovulation induction drugs
- Patients who will not undergo fine needle aspiration cytology or histopathological evaluation
- Those patients who will be lost in follow-up
- Patients with ectopic pregnancy are excluded
- Patients with normal pregnancy.

Pelvic ultrasonography was performed for all patients by real time equipment with 3.5 MHz transducer using transabdominal route as under. In order to have full bladder patient was asked to drink 2 liters of water one hour before examination and was advised not to empty her bladder until after scan was complete. The patient was asked to lie on examination table in supine position leaving lower abdomen and supra pubic area uncovered just sufficient to allow the examination to be performed. Acoustic gel was applied to patient's lower abdomen. The transducer was placed in midline above bladder at pubic area. The size, location of uterus, cervix, vagina and ovaries were determined and relation of pelvic masses to these structures noted. The nature of pelvic mass whether cystic or solid complex was assessed. The bladder contour and any fluid in pouch of Douglas noted. Scans were obtained at 1 or 2 cm interval in transverse and saggital planes. Final diagnosis was confirmed from operative findings [8, 9]. In almost every case proper sonographic evaluation of uterus, endometrium, both adenexa, ovaries, bladder and anterior pelvic structure, both pelvic walls, cul de sac, rectum, small bowel and posterior pelvic structures was done.

RESULTS
The study was conducted from July 2017 to September 2018 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 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. In the present study patients were in the range of 18 to 60 years. Majority of the patients were in

the age group of 31 to 50 years with mean age of 38.6 years [Table 1].

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

Age group (years)	Number of cases (%)
10-20	0 (0)
21-30	04 (8)
31-40	10 (20)
41-50	24 (48)
51-60	09 (18)
61-70	03 (06)
Total	50 (50)

Table 2: Percentage of patients with different chief presenting complaints [n=50]

Symptoms	Number of cases (%)
Pain in pelvic cavity	22 (44)
Pain and palpable mass	9 (18)
Pain and bleeding PV	08 (16)
Menorrhagia and menstrual irregularity	10 (20)
Post-menopausal bleeding	09 (18)
Primary amenorrhea	03 (06)
Infertility	05 (10)
Total	50

Out of 50 patients evaluated by ultrasonography 23 (46%) were having uterine pathologies and 13 (26%) were having ovarian pathologies. One patient was present with localized collection in to the pelvic region**.** Majority of uterine lesions were fibroids 19/23 (82.6%) and fibroid with pregnancy 1/23(4.35%). Adenomyosis was found in 1/23(4.35%) and malignant uterine was found in 8.7% patients.

Majority of ovarian lesions were benign cystic lesion 20/50 (40%) in which follicular cyst were most common (40%), followed by luteal cyst, serous cystadenoma, mucinous cystadenoma (20% each). Malignant ovarian masses found in 17% (4/23 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). Tubo-ovarian masses were found in 26% (6/23) of patients with ovarian pathology. Ovarian teratoma, hydrosalphinx and ovarian torsion were found in 4.3% each.

Accuracy to identify organ of origin was 100% in the presenting study. In the identification of the uterine pathology, 18 (19) 94.7% of fibroid diagnosed correctly by ultrasonography, 9% (2/22) of fibroids were diagnosed as adenomyosis after post surgical histopathological examination. Accuracy of ultrasonography in the diagnosis of uterine and cervical malignancies was 100% in the presenting study.

In various ovarian pathologies, benign cystic ovarian lesions were detected with 100% accuracy. Ovarian malignancies were diagnosed in 5 pateints echographically, out of which 4 diagnoses were proved correct, but 1 was corrected as ovarian torsion after postsurgical histopathological examination. 7 patients were diagnosed as tubo-ovarian masses out of which 6 were proved correctly by histopathology. One was diagnosed false positive and proved as hydrosalphinx after postsurgical histopathology. One lesion of ovarian teratoma diagnosed sonographically was found to be correct by histopathology. So accuracy of diagnoses of malignant ovarian masses and tubo-ovarian masses were found 80% and 85% respectively, in presenting study.

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 2].

Table-3: Different types of cases among study participants

Types of cases	Number of cases (%)
Ovarian/adnexal masses	13 (26)
Uterine masses	23 (46)
Fallopian tube pathologies	10 (20)
Vaginal pathologies	04 (08)
Total 50	50 (100)

Out of 50 patients evaluated by ultrasonography 13 (26%) were having ovarian pathologies and 23 (46%) were having uterine pathologies [Table 3].

Table-4: 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	0	01
OVARIAN		
Benign		
Follicular cyst	03	02
Luteal cyst	02	02
Serous cystadenoma	03	02
Mucinous cystadenoma	02	03
Benign cyst teratoma	02	01
Hydrosalpinx	00	01
Ovarian cyst torsion	00	01
Tubo-ovarian masses	08	07
Malignant Lesion		
Serous cystadenocarcinoma	03	03
Mucinous cystadenocarcinoma	01	01
Endometrial sinus tumor	01	01
Localized collection of pus in pelvic region	01	01
TOTAL	50	50

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. 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 4]. Accuracy of ultrasonography in the diagnosis of uterine and cervical malignancies was 100% in the presenting study.

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. A false diagnosis of fibroid in two cases was corrected as adenomyosis after postsurgical biopsy.

DISCUSSSION

van Nagell JR Jr *et al*. [10] showed that assessment of sonographically determined tumor volume and morphology is the most accurate means to differentiate benign from malignant ovarian tumors. Doppler flow studies generally have shown a lower impedance to flow in vessels supplying ovarian malignancies than in those associated with benign tumors. However, the overlap in pulsatility index and resistive index values of benign and malignant ovarian tumors, and the cost of this procedure, make its routine use impractical. In a postmenopausal woman with a sonographically confirmed ovarian tumor, a progressively rising serum Ca-125 is highly suspicious for malignancy.

Use of grayscale ultrasound combined with Doppler measurements when necessary allows the experienced sonographer to reliably diagnose functional, benign, and malignant adnexal masses [11]. In early studies, bi-stable ultrasound imaging was used to distinguish cystic from solid masses. Correct localisation and description of masses could be achieved in 79-95% of patients in various studies [12, 13].

With the advent of grey scale ultrasound, detailed tissue characterisation and histopathological diagnosis were attempted on ultrasound[14], attributed errors to an over interpretation of loops of bowel, technically poor examinations, misinterpretation of ectopic pregnancy or small lesions at the lower limit of resolution. The improved resolution and technological superiority of modern machines has improved the accuracy of ultrasonography. We found that the presence of adhesions around the mass is significant factor for diagnostic errors, possibly by the inter-position of bowel loops, latera anchoring of the adnexal or the presence of omentum surrounding the adnexal mass. Bowel gas is known to mimic hyper-echoeic zones of a dermoid Cyst [15].

Three-dimensional ultrasound and three-dimensional power Dopplerm[16,17] are relatively new technologies used to assess adnexal masses. Three-dimensional ultrasound visualizes the adnexa in three planes (coronal, sagittal, and frontal) and allows for reconstruction and further analysis of the volumes acquired and stored, while three-dimensional power Doppler allows for assessment of the vascularity of the mass in all three planes. Findings on three-dimensional ultrasound and power Doppler which have been associated with malignancy include vascular flow in the center of the mass ("central flow"), blood flow within septations and excrescences, and a complex appearance of the vascular architecture.

Multiloculated cystadenoma, benign teratoma, endometriosis and corpora lutea usually have characteristic appearances. It is possible to suspect malignancy on the basis of ultrasonic image but a definite diagnosis cannot be always made. Benacerref *et al.*[18] reported a 73% positive predictive value for excluding adnexal masses and 91% negative predictive value for excluding malignancy. Benign tumors usually have sharp well-defined margins and are more likely to be anechoic. Indistinct border and the presence of solid echoes pattern suggest malignancy and as echogenicity increases so does the possibility of malignancy although ascites is usually present when a malignant tumor involves peritoneum. There may be only a minimal amount of cul-de-sac fluid or none at all. Paraovarian, broad ligament cysts have very thin compressive walls and are never surrounded by ovarian tissue[19].

Ronald *et al.* [20] confirmed the clinical diagnosis by ultrasound in 36.8% and sonography established the diagnosis in 59% of cases. Thus reporting correct sonographic establishment of diagnosis by ultrasound is 56% in staging the tumors of cervix uterus11-12. Some authors found pelvic sonography and clinical examination to be equal in accuracy for determination of size, position of pelvic mass and superior in prediction of solid or cystic nature of such masses [21].

Our findings were consistent with study of Lawson *et al.* [22], Fleischer *et al.* [23] and Walsh *et al.* [25], 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 has many advantages being easily available, relatively inexpensive and nonionising. Leiomyomas are easily diagnosed on USG [Fig 1]. 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.

Study Limitations
- Studies on USG are operator dependent.
- Blinding biases may exist.
- Single centre study
- Small sample size
- USG approach has limitations with regard to the detection of tumors less than 5 mm in size and techniques inability to provide specific characterization.

CONCLUSION
Ultrasound is used to delineate the size, consistency and structure of origin of pelvic mass. The diagnosis of pelvic mass can be inferred in light of appropriate history and confirmatory sonographic findings. Ultrasound gives information about function and morphology of abnormal organ when pelvic examination is un-remarkable and difficult. In conclusion ultrasonography is highly accurate in determining the organ of origin of gynecological pelvic mass. Sonographic diagnosis of the lesion, on the characteristics of echogenicity, size, margins, solid or cystic or mixed nature of lesion, septation and vascularity, showing significant accuracy in correlation with histopathological diagnosis. 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. USG, both transabdominal and transvaginal have a well-established role in the initial evaluation of a pelvic mass.

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