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Original Research Article

Role of USG and CT scan in evaluating ovarian lesions

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Abstract

Introduction: Ultrasound helps by detecting lesions, give idea about its internal structure and also give opportunity to evaluate other abdominal organs. However evaluation by CT scan can give additional information, which can modify the course of treatment and prognosis of patient.
Material & methods: Study comprise of 84 patients who were evaluated with ultrasonography (USG) and computerized tomography (CT) scan of abdomen and pelvis. Ovarian pathologies were categorized with benign, malignant and metastasis and compared with histopathological diagnosis or conservative treatment follow up.
Results: 84 patients were evaluated; CT scan and sonography are excellent noninvasive modality to differentiate ovarian masses from benign and malignant lesions and both imaging techniques seem to be comparable in differentiation of malignant from benign ovarian tumors. CT scan was more sensitive than ultrasonography, but sonography is more specific than CT scan in diagnosis of malignant lesions. Ultrasonography has high positive predictive value as compare to CT scan to diagnose malignant lesions.
Discussion: Ultrasound by virtue of non-invasiveness, lack of radiation hazard and by ability to demonstrate structural changes in organ is investigation of choice in ovarian pathology and it can easily detect solid to cystic lesions and characterize the size, shape & extent of lesion. Computerized Tomography is particularly useful to know the enhancement pattern of the lesion, density and extent and staging of malignancies.
Keywords: Ovarian Lesion, ultrasonography, computerized tomography.

1. Introduction

The ovary is the third most common site of primary malignancy in female genital tract after cervix and endometrium accounting for 30% of all cancers of female genital tract Ovaries are paired organs measuring 4 x 2.5 x 1.5 cm each in dimension situated one on each side of uterus close to lateral pelvic wall [1].

Ovaries are subjected to monthly endocrine and traumatic insult during ovulatory cycle and prime site for tumor genesis. The primary and secondary carcinomas of ovary are frequent with variety of pathologic pattern, which is seen in all age and ethnic groups [2]. Fifty percent's of ovarian tumor are benign tumors, of malignant 90% are epithelial and remaining 10% are those resulting from metastasis [4]. But mortality rate exceeds the combined mortality of both endometrium and cervical neoplasm [3].

Ultrasound plays an important role in evaluation of ovarian pathology. In present years, ultrasonography is widely accepted as first line radiological investigation for ovarian pathology. It is non-invasive, cheap, quick, free of radiation hazards, comfortable for patients, easy to re-perform and very accurate in hands of skilled operator. With color Doppler it is possible to evaluate vascularity of lesion. Spectral Doppler waveform characteristics (e.g., resistive

index, pulsatility index) correlate well with malignancy but generally add little information to morphologic considerations. Ultrasonographic contrast media helps in determination of exact extent of lesion and vascularity of lesion.

CT scan is the preferred technique in the pretreatment evaluation of ovarian lesions, it is very helpful to define the extent of disease, evaluate benign and malignant ovarian pathology and staging of malignant lesion. It can detect actual density of lesion. Other investigations like MRI, radionuclide scanning, etc. are also helpful in ovarian pathology.

There is very little data available for correlation studies between ultrasonography and computed tomography of ovarian lesions. This study was conducted with a view to find out the diagnostic value of ultrasonography and computed tomography and its correlation with histopathological diagnosis.

2. Method and Material

2.1 Materials

Study Sample: The present prospective study aims at following up 50 suspected cases of ovarian lesions presenting at radiology department of Dhiraj general hospital, by using HD7 AND HD9 Ultrasonography machines and 16 Slice Siemens and Toshiba Xpress GX CT scan machines.

Inclusion Criteria:

1. Only those patients willing to participate in the study were included.
2. Patients referred to the radiology department for ovarian lesions investigation, and found to have positive findings, will be included in this study
3. All accidentally diagnosed cases of ovarian lesions will also be included in this study.

Exclusion Criteria

1. Patients presenting to radiology department not willing for examination or written consent, were excluded from this study.

2.2 Methods

Clinical: All 84 patients were subjected to a detailed clinical history and examination as outlined in Proforma (Annexure- I).

A. Investigations routine blood investigations were documented in all patients:

1. Complete hemogram, which include Hb, total and differential count, Erythrocyte sedimentation rate. Renal function test include blood urea and creatinine. Random blood sugar estimation; fasting blood sugar and 2 hours post prandial if required. HIV and Hepatitis if required.

B. Radiological Investigation: All of them were subjected to transabdominal sonography with full bladder technique with 3.5MHz and if required transvaginal sonography after voiding with 6.5 MHz. Contrast enhanced CT Scan of abdomen and pelvis with 16-slice Siemens machine and Toshiba xpress GX CT Scan machine.

3. Results and discussion

The present study was carried out at department of Radiodiagnosis and imaging at SBKS Medical College and Dhiraj General Hospital Pipariya from July 2011 to June 2013.In our study ultrasonography and CT Scan evaluated a total of 96 patients with clinically suspected ovarian pathology. All patients underwent gynecology examination prior to referral for sonography.

The findings obtained by ultrasound were compared with those of CT Scan to determine the accuracy of modality in diagnosis of ovarian pathologies and degree of echotexture detail provided by each method. Out of 96 patients who were referred to us, 4 were pregnant females and 8 were known postoperative case of ovarian malignancies, so excluded from study. A total 84 patients were examined and comparison done with Radiological and histopathological diagnosis. The salient observations are as follows.

Table 01: Demographic profile

Sr. No	Age Group (Years)	Total	Percentage (%)
1	0-10	2	2.3%
2	11-20	3	3.5%
3	21-30	24	28.5%
4	31-40	22	26.1%
5	41-50	14	16.6%
6	51-60	8	9.5%
7	61-70	8	9.5%
8	>70	3	3.5%
Total	84	84	100%

The study comprised of 84 females, between age groups of 0 - 80 years. The peak incidence was observed in the age group of 21 – 30 years, which comprised 24 (28.5%) of patients. Ovarian lesions were observed least frequently in paediatric 5 cases (0 – 20 years) and 11 cases in geriatric age group (> 60 years) patients.

Table 2: Final radiological diagnosis of benign lesions

Types of conditions	No. of cases	Percentage
Haemorrhagic cyst	9	23.6%
Tuboovarian abscess	6	15.7%
Mucinous cystadenoma	6	15.7%
Mature cystic teratoma	5	5.9%
Simple cyst	4	10.5%
PCOD	3	13.1%
Serous cystadenoma	3	13.1%
Brenner tumour	1	2.6%
Endometrioma	1	2.6%

In this study, 38 of the 84 lesions were benign and 43 were malignant. Of these benign lesions, hemorrhagic cyst was most common benign lesion presenting 9 (23.6%) of cases. The second most common lesion was mucinous cystadenoma 6 (15.7%) of cases.

Table 3: Clinical presentation

Complaints	No. of Patients	Percentage
Pain	42	50
Mass	30	35.7
Back ache	30	35.7
Wt. Loss	28	33.3
Menstrual irregularity	34	40.4
Dysmenorrhea	28	33.3
Infertility	11	13

Pain was the most common presentation with (50%) of cases followed by menstrual irregularity with (40.4%) of patients.Minimum number of patients presents with lump, dysmenorrhea, weight loss and infertility. Back pain and weight loss were most common complaint in ovarian malignancies. Abdominal pain was chief complaint of hemorrhagic cyst.

Infertility was seen in 100% patients of PCOD.

Table 4: Site

Types of conditions	Left	Right	Bilateral	Total
Benign tumour	19	8	11	38
Malignant	10	19	14	43
Metastasis	-	-	3	3
Total	29	27	28	84

Table 5: Association between CA 125 and ovarian tumours

	CA 125
Ovarian malignancy	38 (82%)
Benign lesions	7 (18%)

In our study, out of 46 malignant lesions, 38 (82%) shows raised CA-125 levels. Out of 38 benign lesions 7 (18%) showed raised CA-125 levels. In 4 cases of Tubo-ovarian abscess and 1 cases of endometriosis, raised levels of CA 125 detected.

Table 6: Comparison of pathological diagnosis and us findings

Pathological diagnosis	No. of lesions	Correctly diagnosed at US	Correctly diagnosed at CT
Benign	38	37(97.4%)	36(95.8%)
Malignant	43	38(88%)	43(100%)
Metastasis	3	2(66.6%)	3(100%)
Total	84	77(91.6%)	82(97.6%)

Out of 38 patients with benign tumours, 37 patients were correctly diagnosed on ultrasonography, while 36 (95.8%) were correctly diagnosed when CT done. Out of total 43 patients with malignant tumours, 38 (88%) patients were correctly diagnosed on ultrasonography, while 43 (100%) patients were correctly diagnosed when CT was done.

Table 7: Predominent findings on USG

	ECHO			Wall thickness		Septations	Inner wall structures		Ascites
Types of conditions	Hyper	Hypo	Mixed	(>3mm)	(<3mm)		Smooth	Irregular	
Benign tumour	3	17	22	1	20	25	28	3	5
Malignant	8	20	16	27	3	35	6	35	20

Malignant lesions were predominantly hypoechoic. In 27 malignant lesions wall thickness was more than 3 mm. Internal septations and solid component were prominent features of malignancy. There was wall irregularity seen in 41.6% of cases of malignancies. Ascites and pleural effusion were also associated with ovarian malignancies.

Table 8: Predominent Findings on CT scan

Types of condition	Benign	Malignant
Peritoneal deposits	0	28
Calcification	10	2
Ascitis	4	25
Enhancement	10	35
Metastasis	0	24

On CT scan peritoneal deposits were seen in majority of malignant lesions. Fat and calcification is prominent feature of teratomas. Brenner tumour shows bilateral calcification. Ascites and pleural effusion is also associated with malignancies.

Table 9: Comparative values of USG and CT scan in ovarian lesions

	Ultrasonography	CT Scan
Sensitivity	85.11 %	97.83 %
Specificity	94.59 %	92.11 %
Positive Predictive Value	95.24 %	93.75 %
Negative Predictive Value	83.33 %	97.22 %
Positive Likelihood Ratio	15.74	12.39
Negative Likelihood Ratio	0.16	0.02
Disease prevalence	55.95 %	54.76 %

The disease prevalence of malignant lesions in my study population was 55.95% on ultrasonography and 54.76% on CT Scan.

In evaluation of ovarian lesions, CT Scan (97.8%) was more sensitive than ultrasonography (85.1%), but sonography (94.5%) was more specific than CT Scan (92.1%) in diagnosis of malignant lesions.

Ultrasonography (95.2%) has high positive predictive value as compare to CT Scan (93.7%) to diagnose malignant lesions. But negative predictive value of CT Scan (97.2%) was higher than ultrasonography (83.3%) to rule out malignant lesions.

Positive likelihood ratio of Ultrasonography was 15.74 as compare to CT Scan(12.39), means that if ultrasonography detects malignancy there will be 15.7 times more chances of having malignancy as compare to 12.3 times on CT Scan.

4. Discussion

Ovarian cancer is one of the most common gynecological malignancies in India and worldwide [5,6]. However, it has the highest mortality among all gynecologic malignancies. The major reason for the poor prognosis is that, at the time of diagnosis, approximately 75% of patients have diseases that are at an advanced stage [7]. The early detection of ovarian carcinoma continues to be a formidable challenge and an elusive task. The risk of a woman developing ovarian cancer is 1 in 71.[8] Adnexal masses can be benign or malignant and the benign masses greatly outnumber malignant ones.[9] In our study 45% of patients had benign lesion and 55% had malignant lesion. This discrepancy was mainly due to selection bias. When an ovarian mass is detected, there are two major issues: to determine whether it is benign or malignant and then if it is malignant, to look for the extent of disease. [10,11] Precise characterization of an adnexal lesion is important, Because of the obvious significant differences in prognoses between early and advanced cancers, early detection with accurate staging is of paramount importance[12]. However, we understand that surgery has a role in definite diagnosis and the further characterization of masses.

Table 11: Sensitivity and specificity of multidetector computed tomography in differentiating benign from malignant adnexal masses

Author	Sensitivity (%)	Specificity (%)
Kinkel *et al* [13]	81	87
Tsili *et al* [14]	90	88
Liu *et al* [15]	87	100
Our study	97	92

5. Summary

1) Adnexal mass is common among all age groups but very common among women of reproductive age. Differential diagnosis of adnexal mass is difficult and complex.
2) In our study ultrasonography and CT Scan evaluated a total of 96 patients with clinically suspected ovarian pathology. All patients underwent gynecology examination prior to referral for sonography. The findings obtained by ultrasound were compared with those of CT Scan to determine the accuracy of modality in diagnosis of ovarian pathologies and degree of echotexture detail provided by each method.
3) Out of 96 patients who were referred to us, 4 were pregnant females and 8 were known postoperative case of ovarian malignancies, so excluded from study.
4) In the remaining 83 patients, 38 were benign pathologies. Simple ovarian cyst was diagnosed in 4 (10.5%) cases, 9 (23.6%) hemorrhagic cyst, 6 (15.7%) tuboovarian abscess, 1 (2.6%) case of endometrioma, 3 (13.1%) PCOD, 5 (5.9%) mature teratoma, 3 (13.1%) serous cystadenoma, 6 (15.7%) mucinous cystadenoma and 1 case of Brenner tumour were noted.
5) Out of 43 cases in which diagnosis of malignancy were made, 21 (45.6%) cases of serous cystadenocarcinoma, 12 (26%) cases of mucinous cystadenocarcinoma, 6 (13%) immature teratoma, 2 (4.3%) endometroid carcinoma, mixed epithelial tumour, pseudomyxoma peritonii, and fibroma accounts for 1 each case.
6) Out of 3 cases of ovarian metastasis, 2 were krukenburg and one was lymphoma.
7) Out of 43 malignant tumours 36 were surface epithelial tumours which were predominantly cystic with 33 of them showing irregular thick septae, 30 showing solid component, 28 showing papillary projections and 25 showing internal echoes. 6 cases were of immature teratoma, which was of mixed echotexture. Peritoneal deposits seen in 28 cases, enhancement in 35 cases and metastasis seen in 24 patients.

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