
Research Article

Comparison of diagnostic ability of ultrasonography, contrast enhanced computed tomography and magnetic resonance imaging in detection of ovarian masses with histopathology correlation

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Abstract:

Objective: To compare the diagnostic ability of ultrasonography, contrast enhanced computed tomography and magnetic resonance imaging in detection of ovarian masses with histopathology correlation.

Methods: This was a prospective observational study. The study was carried out in a tertiary care hospital in northern India. Women with perimenopausal and postmenopausal aged >40 years were included in the study. It was planned to include 130 women considering the previous study. After complete clinical evaluation and laboratory investigations, the patients first underwent USG evaluation followed by CT and MRI assessment.

Results: The mean age of patients was 56.70±11.81 years. USG was found to have the sensitivity of 75% and specificity of 96.5%. The PPV and NPV of USG for malignancy were 91.7% and 88.3% respectively. The accuracy of USG to differentiate between benign and malignant masses was 89.2%. CT was found to have the sensitivity of 79.5% and specificity of 93%. The PPV and NPV of CT for malignancy were 97.2% and 90.4% respectively. The accuracy of CT to differentiate between benign and malignant masses was 92.3%. MRI was found to have the sensitivity of 86.4% and specificity of 94.2%. The PPV and NPV of MRI for malignancy were 88.4% and 93.0% respectively. The accuracy of MRI to differentiate between benign and malignant masses was 91.5%.

Conclusions: The findings of this study suggest that in a setting where MRI is available, it must be the diagnostic modality of choice.

Key Words: Entamoeba Ultrasonography, Computed tomography, Magnetic resonance imaging, Ovarian masses.

INTRODUCTION

Ovarian tumors represent the most common lethal gynecologic neoplasm for women of reproductive age and older (Levesque et al, 1995; Chan et al, 2000)^[1,2]. It is the fifth leading cause of cancer related deaths in females and accounts for approximately 50% of all deaths from gynecologic cancers (Cai et al, 2004)^[3]. Although ovarian carcinoma is not the most common gynecological malignancy, yet it has a concerning rate of mortality among women. In spite of diagnostic and therapeutic advances in the care of women with ovarian cancer, the overall 5 year survival rate has changed little (Landis et al, 1998; Chiang et al, 2013; Sharifian et al, 2014)^[4-6].

With the advent of better imaging techniques such as computed tomography (CT) and magnetic resonance imaging (MRI), the possibility to detect and diagnose the malignant ovarian tumors has increased sharply. It has been shown that for lesions indeterminate on ultrasound, MRI increases the

specificity of imaging evaluation, thus decreasing benign resections. CT is useful in diagnosis and treatment planning of advanced cancer (Iyer and Lee, 2010)^[7].

AIMS AND OBJECTIVES

In the present study, it was planned to compare the diagnostic ability of ultrasonography, contrast enhanced computed tomography and magnetic resonance imaging in detection of ovarian masses with histopathology correlation.

MATERIAL AND METHODS

This was a prospective observational study. The study was carried out in a tertiary care hospital in northern India. Women with perimenopausal and postmenopausal aged >40 years were included in the study. Women with pain/discomfort lower abdomen with accompanying distension of abdomen due to ascites and/or per vaginal/per speculum examination with positive findings suggestive of mass of ovarian origin were also included in the study. Pregnant women and who did not

undergo complete pelvic abdominal exploration were excluded from the study. It was planned to included 130 women considering the previous study.

After taking informed consent, the demographic information was noted.

After complete clinical evaluation and laboratory investigations, the patients first underwent ultrasonographic (USG) evaluation followed by CT and MRI assessment. All the investigations were carried out independently and diagnosis based on findings of each evaluation was made.

The results of all the evaluations were validated against histopathological findings.

Statistical analysis

The results are presented in proportions. The sensitivity, specificity, positive predictive value (PPV), negative predictive value (NPV) and accuracy was calculated. All the calculations were carried out on SPSS 16.0 version (Chicago, Inc., USA) and Microsoft Excel computer program.

OBSERVATIONS AND RESULTS

The mean age of patients was 56.70±11.81 years. Pelvic mass was found in 95.4% and microcytic-hypochromic blood picture was seen in 10% of patients (Table-1).

Table-1: Profile of patients

Profile	Statistics
Age in years, mean±SD (Range)	56.70±11.81 (41-88)
Physical examination, no. (%)	
Pelvic mass	124 (95.4)
Fluid in peritoneal cavity	6 (4.6)
General blood picture, no. (%)	
Microcytic-hypochromic	13 (10.0)
Normocytic-Normochromic	117 (90.0)

On the basis of USG, a total of 36/130 (27.7%) cases were diagnosed as malignant while remaining 94 (72.3%) were diagnosed as benign. On evaluating the diagnostic efficacy of USG with respect to malignancy with histopathology as the gold standard, USG was found to have the sensitivity of 75% and specificity of 96.5%. The PPV and NPV of USG for malignancy were 91.7% and 88.3% respectively. The accuracy of USG to differentiate between benign and malignant masses was 89.2% (Table-2).

Table-2: Comparison of diagnostic ability of the three tests

Tests	Final diagnosis				Diagnostic value (%)				
	Benign		Malignant		Sensitivity	Specificity	PPV	NPV	Accuracy
	No.	%	No.	%					
USG									
Benign	83	96.5	11	25.0					
Malignant	3	3.5	33	75.0	75.0	96.5	91.7	88.3	89.2
CT									
Benign	85	98.8	9	20.5					
Malignant	1	1.2	35	79.5	79.5	93.0	97.2	90.4	92.3
MRI									
Benign	81	94.2	6	13.6					
Malignant	5	5.8	38	86.4	86.4	94.2	88.4	93.1	91.5

On the basis of CT, a total of 94/130 (72.3%) cases were diagnosed as benign while remaining 36 (27.7%) were diagnosed as malignant. On assessing the diagnostic efficacy of CT with respect to malignancy with histopathology as the gold standard, CT was found to have the sensitivity of 79.5% and specificity of 93%. The PPV and NPV of CT for malignancy were 97.2% and 90.4% respectively. The accuracy of CT to differentiate between benign and malignant masses was 92.3% (Table-2).

On the basis of MRI, a total of 43/130 (33.1%) cases were diagnosed as malignant while remaining 87 (66.9%) were diagnosed as benign. On assessing the diagnostic efficacy of MRI with respect to malignancy with histopathology as the gold standard, MRI was found to have the sensitivity of 86.4% and specificity of 94.2%. The PPV and NPV of MRI for malignancy were 88.4% and 93.1% respectively. The accuracy of MRI to differentiate between benign and malignant masses was 91.5% (Table-2).

DISCUSSION

Ovarian cancer is one of the most lethal gynecological cancers. However, it remains undiagnosed for a long period of time and is often diagnosed at later stages when medical management has little or no role at all. The risk of ovarian cancer is considered to be high in women aged above 40 years (17). In the present study also, age of women ranged from 41 to 88 years. In a study by Yen et al (2013)^[8], the age ranged from as low as 13-82 years. However, in their series too, the mean age was 52.6 years which indicated a higher risk in women over 40 years of age. In this study, the mean age of patients was 56.70 years which is only slightly higher than the mean age cited by Yen et al (2013)^[8]. With a view that these masses are a rare occurrence in younger women, the inclusion criteria of this study was suitably adapted to include only those women above 40 years of age.

In the present study, USG had sensitivity of 75% and specificity of 96.5% respectively. PPV, NPV and accuracy of USG were also high in this study. Timmerman et al (2010)^[9] reported both sensitivity and specificity of to sonography to be above 90% for different combinations of malignancy. Varying positive predictive values of different sonographic features could be one of the reasons for that. Some of the morphological scoring system have claimed to have a sensitivity as high as 100% (Sassone et al, 1991)^[10], yet when these scoring systems are validated extremely, both the sensitivity and specificity fall. In the present study, USG attained an accuracy of 89.2% which is slightly above the accuracy level of 80% as reported by Buy et al (1991)^[11]. Alcazar et al (2003)^[12] reported the projected accuracy of their scoring system based on receiver operating curve to be 98%.

In the present study, CT was found to have the sensitivity of 79.5% and specificity of 93%. The PPV and NPV of CT for malignancy were 97.2% and 90.4% respectively. The accuracy of CT to differentiate between benign and malignant masses was 92.3%. The predictive values of CT of this study is higher than the study by Behtash et al (2009)^[13]. Ozasa et al (1986)^[14]

while focusing on the accuracy of CT, found to be higher as compared to USG. Although the present study showed a higher accuracy of CT as compared to USG yet this was not statistically significant.

In this study, MRI was found to have the sensitivity of 86.4% and specificity of 94.2%. The PPV and NPV of MRI for malignancy were 88.4% and 93.% respectively. The accuracy of MRI to differentiate between benign and malignant masses was 91.5%. The findings of this study is in agreement with the other studies (Togashi et al, 2003; Huber et al, 2002)^[15,16].

The findings of the present study favoured CT and MRI as compared to USG for the evaluation of malignancy. The findings within the framework of present study support the use of these two advanced techniques yet still universally unavailable imaging modalities for the evaluation of ovarian masses. However, considering the low resource settings prevalent in our country and no near feasibility of availability of these modalities in primary care settings, USG is still recommended to be used coupled with assessment of serum CA-125 and other biochemical markers. Further studies on the topic with larger sample size are also recommended.

CONCLUSIONS

The findings of this study suggest that in a setting where MRI is available, it must be the diagnostic modality of choice.

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