Original Research Article

Comparison of Diagnostic Accuracy between CT scan and Colour Doppler USG in Detecting Malignant Ovarian Tumour

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Abstract

Background: Early detection of the nature of the tumor is crucial for the management of patients with ovarian tumor. The type of an ovarian tumor can be determined using serum markers, color doppler USG, and a CT scan. These assist clinicians in diagnosing and managing patients with ovarian tumors, as well as establishing treatment plans. ***Objective:*** To compare the accuracy of color doppler ultrasound with CT scan for detection of malignant ovarian tumor. ***Materials and Methods:*** It was a cross sectional analytical study that conducted in the Department of Gynecological Oncology, Bangabandhu Sheikh Mujib Medical University (BSMMU) and National Institution of Cancer Research & Hospital (NICRH), Dhaka. Total 65 consecutive patients attending at the inpatient department of BSMMU and NICRH with ovarian tumor were enrolled for the study. All the patients were selected by clinically, ultrasonography findings and serum marker (CA 125, CA 199, CEA, Alfa fetoprotein and LDH) study. For all these patients color doppler USG and CT scan were done. Patients then undergo laparotomy with frozen section biopsy and taking the histopathology report as a gold slandered. Level of significance was assumed at p value <0.05. ***Results:*** The sensitivity of Color Doppler USG and CT scan are 96.9% and 87.5%, respectively. The specificity of Color Doppler USG and CT scan are 60.6% and 57.6%, respectively and the accuracy of Color Doppler USG and CT scan are 78.5% and 72.3%, respectively. The positive predictive values of Color Doppler USG and CT scan are 70.5% and 66.7%, respectively. The negative predictive values of Color Doppler USG and CT scan are 95.2% and 82.6%, respectively. ***Conclusion:*** The results of the Color Doppler USG are compared to those of the CT scan results. Results found that the diagnostic accuracy of color doppler ultrasound and CT scan are almost similar for detection of ovarian tumor whether it is benign or malignant.
Keyword: Ovarian tumour, malignant, Color Doppler USG, CT scan.

INTRODUCTION

Ovarian cancer is one of the most common gynecological cancers. It is third common reproductive organ cancer after cervical and uterine cancer [1]. It is the seventh most common cancer in women and the 18th most common cancer overall worldwide. It also has the worst prognosis and the highest mortality rate [2]. Ovarian cancer has an age standardized (World) incidence of 3.9 per 100,000 women and mortality rate 2.9 per 100,000 women [3]. In Bangladesh, the incidence and mortality rate of ovarian cancer are 2% and 1.9% respectively [3].

For preoperative evaluation of abdominal malignancies, computed tomography (CT) has usually been used as the first line investigation. A CT scan uses a series of X-rays to create a picture of the abdomen or pelvis. It may be used to aid in diagnosis, but is more often used in staging cancer. It is a good test to evaluate lymph nodes, the intestine, the liver and the lungs (chest CT scan) for any evidence that cancer has spread [4].

Good sonologist can easily recognize the difference of signal between inflammatory process and malignancy. Most ovarian masses are benign, but

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considering the high mortality of ovarian cancer, adding color Doppler to a scan can add another element of certainty to the diagnostic process. Early detection and intervention can help improve a patient's chances at any age and any level of staging. When using color doppler in addition to morphology score, the sensitivity was 100%, specificity 95.5%, PPV 90.0%, NPV 100% and accuracy 96.6% [6]. Bangladesh is a country of Lower Middle Income (LMI, C) Status. About 60% people lived in rural areas. The cost of CT scan is too high compared to color doppler ultrasonography. Hospital infrastructure at Upazila level is not suitable for CT scan facilities. In present study, main aim is to see the sensitivity and specificity of these methods of imaging. Primary imaging like Ultrasonogram with color doppler and advanced imaging like CT scan.

The purpose of the study is to compare the diagnostic accuracy of Computed tomography scan and ultrasonography with color doppler in detecting patients with ovarian tumor. The histopathological results will be used as the gold standard.

MATERIALS AND METHODS

All the patients were selected clinically, ultrasonography findings and serum marker (CA 125, CA 199, CEA, Alfa fetoprotein and LDH) study. For all these patients color doppler USG and CT scan was done. Patients then undergo laparotomy with frozen section biopsy. During laparotomy who was positive for frozen biopsy, surgical staging was done. Then total abdominal hysterectomy with bilateral

salphingoophorectomy and biopsy from multiple sites were done in clinically early-stage cases. Lymph node sampling was done. In advance stages debulking surgery was done. All the samples were sent for histopathological examination. Ascitic fluid or peritoneal washing was also sent for cytology. Then the histopathological reports were compared with CT scan and color doppler USG report. Prior to data collection, the questionnaire was pre-tested in fifteen patients. After that, it was modified and finalized. Appropriate data was collected by using a preformed data sheet. After taking verbal consent from the patients following introducing and informing the study purpose and objectives, data was collected by face-to-face interview ensuring privacy and confidentiality by using the questionnaire. All other required data was collected from history sheet, investigation papers, per-operative findings and follow up records. After that, all data was compiled, modified and finalized. Statistical analyses were carried out by using the Statistical Package for Social Sciences version 23.0 for Windows (SPSS Inc., Chicago, Illinois, USA). The mean values were calculated for continuous variables. The sensitivity, specificity, accuracy, positive predictive value, and negative predictive value of the Colour Doppler USG and CT scan diagnosis evaluation of malignant ovarian tumor were computed for the validity of the study outcome, using the histopathology report as the gold standard. Level of significance was assumed at p value <0.05.
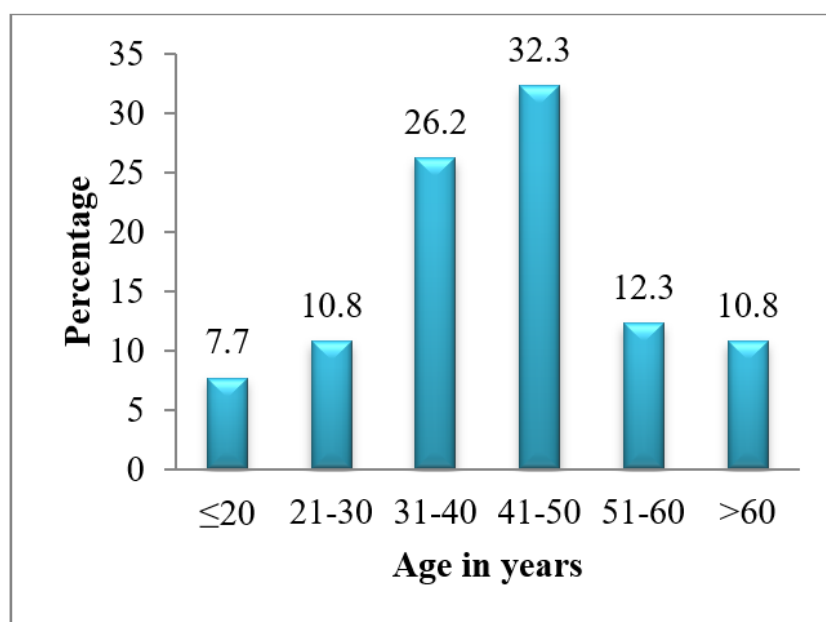
RESULTS

Figure I: Age distribution of the study population (n=65)

The mean age of the participants was 42.4 years with a standard deviation of 13.7 years, and the age range was 16-75 years. The majority of the participants were in the age range of 31-50 years, comprising 58.5% of the total sample (Figure I).

Table 1: Distribution of the study subjects by frozen biopsy report (n=65)

Frozen biopsy report	Frequency	Percentage
Benign	30	46.2
Borderline	2	3.1
Malignant	33	50.8

The table shows the distribution of 65 study subjects by frozen biopsy report. Of the total, 46.2% were diagnosed as benign, 3.1% as borderline and 50.8% as malignant. Specifically, 30 subjects were diagnosed as benign, 2 as borderline, and 33 as malignant (Table-1).
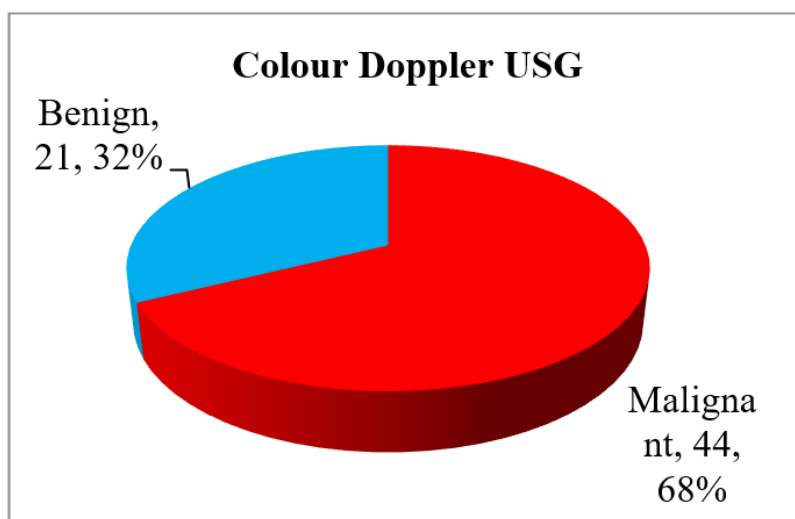

Figure II: Color Doppler findings of the study patients

Figure II shows majority 44(68%) were malignant and 21(32%) were benign.
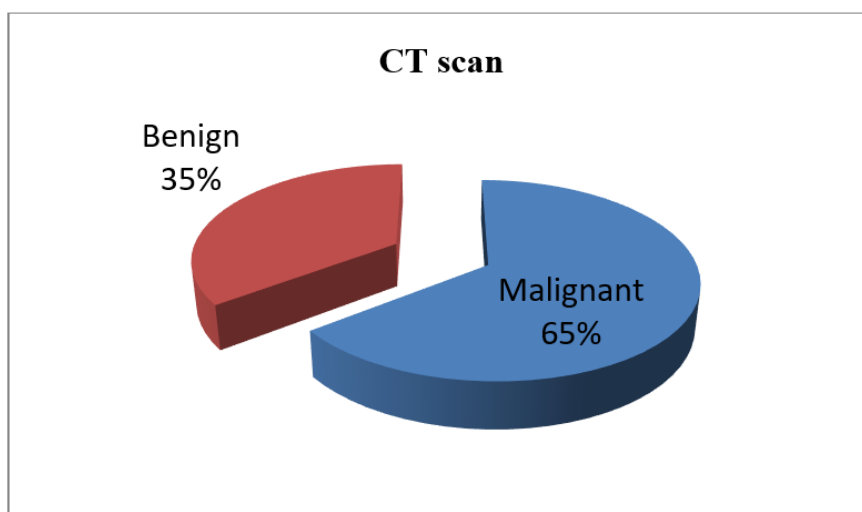

Figure III: CT findings of the study population (n=65)

According to CT findings malignant were found 65% and 35% were benign cases.

Table 2: Distribution of the study subjects by histopathological diagnosis (n=65)

Histopathological diagnosis	Frequency	Percentage
Benign	30	46.2
Borderline	03	4.6
Malignant	32	49.2

The table shows the distribution of 65 study subjects by their histopathological diagnosis. Of the total, 46.2% were diagnosed as benign, 4.6% as

borderline and 49.2% as malignant. Specifically, 30 subjects were diagnosed as benign, 3 as borderline and 32 as malignant (Table-2).
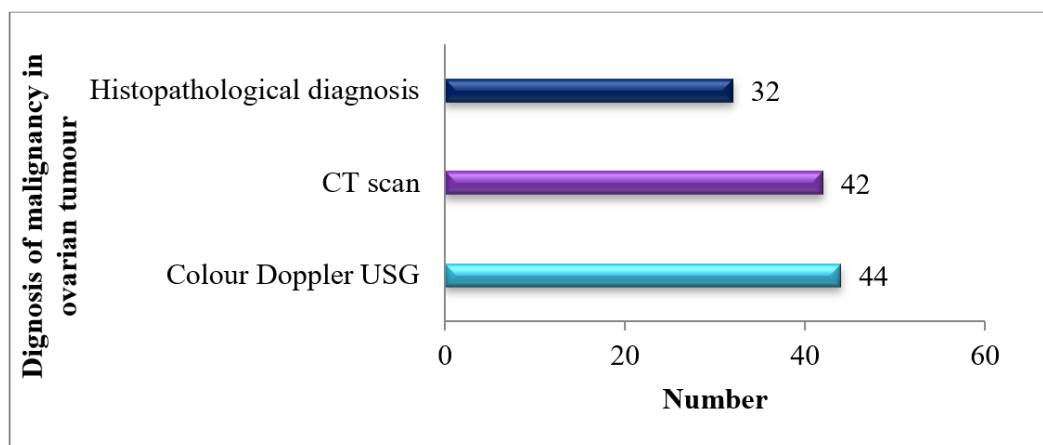

Figure IV: Diagnosis of malignancy in ovarian tumour (n=65)

Table 3: Comparison between histopathological diagnosis and Colour Doppler USG diagnosis evaluation for malignant ovarian tumour (n=65)

Colour Doppler USG	Histopathological diagnosis	
	Positive (n=32)	Negative (n=33)
Positive (n=44)	31 (True positive)	13 (False positive)
Negative (n=21)	1 (False negative)	20 (True negative)

P= 0.002
P value reached from McNemar's test

Table 3 Presents a comparison between histopathological diagnosis and Colour Doppler USG diagnosis evaluation for malignant ovarian tumors in a sample size of 65 cases. Out of 65 cases, 44 were

positive for Color Doppler USG and 21 were negative. The histopathological diagnosis was positive for 32 cases and negative for 33 cases.

Table 4: Comparison between histopathological diagnosis and CT scan diagnosis evaluation for malignant ovarian tumour (n=65)

CT scan	Histopathological diagnosis	
	Positive (n=32)	Negative (n=33)
Positive (n=42)	28 (True positive)	14 (False positive)
Negative (n=23)	4 (False negative)	19 (True negative)

P= 0.031
P value reached from McNemar's test

Table 4 compares the accuracy of CT scan diagnosis and histopathological diagnosis for 65 cases of malignant ovarian tumors. Out of the 65 cases, 42 were CT scan positive and 23 were CT scan negative. The histopathological diagnosis was positive for 32 cases and negative for 33 cases.

Among the 42 CT scan positive cases, 28 were correctly diagnosed by histopathology (true positives)

and 14 were incorrectly diagnosed as malignant (false positives). Among the 23 CT scan negative cases, 19 were correctly diagnosed as benign (true negatives) and 4 were incorrectly diagnosed as benign (false negatives) by histopathology. The statistical significance of the results was tested using McNemar's test, and the p-value obtained was 0.031, indicating a significant difference between the two diagnostic methods.
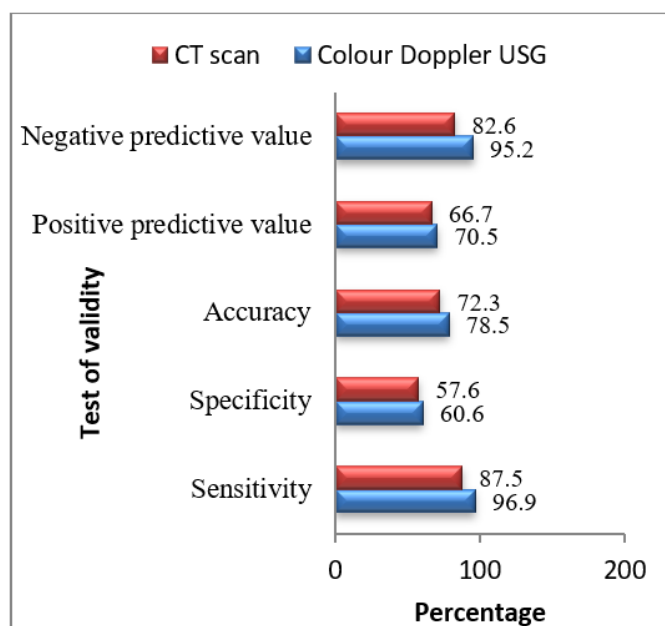
Figure V: Sensitivity, specificity, accuracy, positive and negative predictive values of the Colour Doppler USG and CT scan diagnosis evaluation for prediction of malignant ovarian tumour

Figure V presents the performance of two diagnostic tests, Colour Doppler USG and CT scan, in predicting malignant ovarian tumors. The sensitivity of Colour Doppler USG and CT scan are 96.9% and 87.5%, respectively. The specificity of Colour Doppler USG and CT scan are 60.6% and 57.6%, respectively. The accuracy of Colour Doppler USG and CT scan are 78.5% and 72.3%, respectively. The positive predictive values of Colour Doppler USG and CT scan are 70.5% and 66.7%, respectively. The negative predictive values of Colour Doppler USG and CT scan are 95.2% and 82.6%, respectively.

DISCUSSION

This cross-sectional analytic study was carried out in the Department of Gynecological Oncology, Bangabandhu Sheikh Mujib Medical University (BSMMU), and the National Institution of Cancer Research & Hospital (NICRH), Dhaka. The study involved 65 consecutive patients with ovarian tumors who were seen in the inpatient departments of BSMMU and NICRH. The aim of the study was to compare the accuracy of color Doppler ultrasound with CT scan for detection of benign and malignant ovarian tumor.

It was observed that the mean age of the participants was 42.4 years with a standard deviation of 13.7 years, and the age range was 16-75 years. The majority of the participants were in the age range of 31-50 years, comprising 58.5% of the total sample. Similar observation was found in different study, in study of Neelam *et al.,* reported the mean age of the study participants was 46.63±14.6 years [7].

In this study showed that 46.2% were diagnosed as benign, 3.1% as borderline and 50.8% as malignant by frozen biopsy report. Specifically, 30 subjects were diagnosed as benign, 2 as borderline, and 33 as malignant. In the current study, 24.7% of borderline tumors at IFS were upgraded to malignant tumors at final diagnosis. The figure was similar to the reported average upgrade rate of 21% [8]. Diagnoses were considered concordant when the IFS diagnosis was borderline or at least borderline with final malignant pathology, as these cases were managed in a similar way intra-operatively [9] Mohammed *et al.,* [10] reported four cases had the diagnosis at the time of FS deferred (6.6%). In the remaining 56 patients, the FS diagnoses were benign in 24 (40%), borderline in 9 (15%), and malignant in 23 (38.4%).

The present study showed the distribution of 65 study subjects by their histopathological diagnosis. Of the total, 46.2% were diagnosed as benign, 4.6% as borderline, and 49.2% as malignant. Specifically, 30 subjects were diagnosed as benign, 3 as borderline, and 32 as malignant. Ghazal *et al.,* [11] reported the 42 adnexal masses studied in group A, 8 (19.0%) were malignant, 33 (78.6%) were benign and 1 (2.4%) was borderline. On the other hand, of the 32 masses examined in group B, 7 (21.9%) were malignant, 23 (71.9%) were benign and 2 (6.3%) were borderline. Vijay *et al.,* [12] observed out of total 50 cases of adnexal masses, 24 (48%) were benign and 26 (52%) were malignant.

Present study observed the performance of two diagnostic tests, Colour Doppler USG and CT scan, in predicting malignant ovarian tumors. The sensitivity of Colour Doppler USG and CT scan are 96.9% and 87.5%, respectively. The specificity of Colour Doppler USG and CT scan are 60.6% and 57.6%, respectively.

The accuracy of Colour Doppler USG and CT scan are 78.5% and 72.3%, respectively. The positive predictive values of Colour Doppler USG and CT scan are 70.5% and 66.7%, respectively. The negative predictive values of Colour Doppler USG and CT scan are 95.2% and 82.6%, respectively. Similar observation was found in Valentin, study [12] they reported the sensitivity and specificity of 83% and 97% color Doppler, respectively. Neelam *et al.,* [7] reported the specificity and sensitivity of Doppler USG in comparison to histopathology (Gold Standard). The specificity was found to be 90.3% and sensitivity was 79.2% that reports were approximately similar to our study. But positive and negative predicative values were 92.9% and 73.1% respectively were not consistent our observation. These findings were nearly in line with those reported in another study where sensitivity was found to be 86.2% and specificity 97.58% [13]. In another study conducted by Shah *et al.,* [14] in India, also observed similar findings they showed B-mode USG achieved a sensitivity of 87.5%, a specificity of 45.45% and a PPV of 61.4%, but when Pulsatility index and Resistance index were included, more acceptable values of sensitivity at 97.5%, specificity at 84.1% and positive predictive value at 84.78% were obtained. Zhang, Wang and Guo also reported sensitivity, specificity and accuracy of Color Doppler ultrasound were 76.67%, 78.79 and 78.13%, respectively [15]. Vijay *et al.,* [16] reported the diagnosis of benign and malignant adnexal masses USG & Doppler had an overall diagnostic sensitivity of 100% and specificity of 92.3%. The positive predictive value was 92.85% and Negative predictive value was 100%. The overall diagnostic accuracy was 96.15%. Their observations did not correlate with our findings since their sample selection criteria did not match ours study. A sensitivity of 95%, 94%, 92.3% and 90.9% were reported by Gupta and Jain and Priya *et al.,* respectively [17,18]. Mukhtar *et al.,* [19] reported diagnostic accuracy of MDCT taking histopathology as gold standard showed sensitivity as 95.55%, specificity 97.34%, NPV 93.47%, PPV 97.34% and overall diagnostic accuracy as 96.83%. Khan, Gupta and Singh also observed highest accuracy was for benign ovarian lesions (89%) while for benign uterine lesions CT was least accurate (63%) [20] Liu *et al.,* [20] found the sensitivity, specificity, and accuracy of CT scan to be 80.3%, 90.3%, and 85%, respectively, which are significantly higher than those of ultrasound (P <0.05).

The sensitivity, specificity, and accuracy of CT scan and Color Doppler ultrasonography were examined in our study, and the results were nearly similar for both diagnostic techniques. As a result, we may recommend Color Doppler ultrasonography for detecting malignant ovarian tumors in areas of Bangladesh where CT scans are not available, as well as for poor individuals.

CONCLUSION
This study concludes that color doppler ultrasonography and CT scan have nearly equal diagnostic accuracy in identifying benign and malignant ovarian tumors. Therefore, for the preoperative assessment and distinction of ovarian tumor from benign to malignant, color doppler ultrasound is comparable to computed tomography (CT scan).

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