ORIGINAL ARTICLE

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Role of gray scale and color Doppler in differentiating benign from malignant ovarian masses

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ABSTRACT

Objectives: To evaluate prospectively the relative usefulness of color Doppler and gray scale sonography in differentiating benign from malignant ovarian masses and evaluation of scoring systems Sassone and Alcazar for differentiating benign from malignant ovarian masses.

Methods: Study was conducted during the period of Jan 2006 to Oct 2007 in department of obstetrics and gynaecology, New civil Hospital, Surat. The study was conducted mainly with the help of department of radio-diagnosis. The study include 100 patient clinically suspected to have ovarian neoplasm and referred to department of radio-diagnosis where evaluation with Ultrasonography and Doppler was done. The efficacy of scoring systems were evaluated by histopathological examination of mass or fine needle aspiration cytology or presence of malignant cells in ascetic fluid.

Results: Sassone's scoring system was able to identify 72 out of 78 benign masses and 18 out of 22 malignant masses.where as Alcazar system with use of colour Doppler was able to identify 75 out of 78 benign and 21 out of 22 malignant ovarian masses. Sensitivity and specificity of sassone is 81.8%,92.3% respectively, where as that of Alcazar is 95.5%, 96.2% respectively.

Conclusion: Using both gray scale and colour Doppler in differentiating benign from malignant ovariam masses is giving results with more accuracy and Alcazar system is better performing than sassone's scoring systems.

Key Words: Alcazar scoring, ovarian mass, Sassone scoring

INTRODUCTION

Ovarian mass represents a common problem in clinical practice. Of all gynecologic carcinoma, ovarian carcinoma represents the greatest clinical challenge.

The majority of ovarian mass are benign (80%) with cystic, solid, and mixed characteristics and a favorable diagnosis. The other 20% masses are malignant, so we need diagnostic means which permit accurate classification of ovarian masses before surgery.

Ultrasonography is considered the primary imaging modality for confirmation of the ovarian origin of mass and characterization of nature of mass as benign or malignant.[1] It correlates morphologic images with gross macroscopic pathologic features of ovarian masses. However, when morphologic features alone are applied to the prediction of ovarian malignancy, there is tendency to over diagnose malignant tumors because of a substantial overlap between malignant and benign masses. Therefore, addition of color Doppler imaging with pulsed Doppler spectral analysis improves the characterization of ovarian masses by means of quantitative blood flow measurements obtained from tumor vessels and so increases sensitivity and specificity of characterization of ovarian masses.[2] High operator dependence and extreme variability of characteristics of ovarian tumor make a precise diagnosis still difficult. To overcome these limitations, use of scoring systems has been advocated.[3] These scoring system combining different parameters of ultrasonography and color Doppler increases the sensitivity and specificity of diagnosis with good accuracy.

Ovarian cancer represents a major surgical challenge, requires intensive and often complex therapies, and is extremely demanding of the patient's psychological and physical energy. It has the highest fatality-to-case ratio of all the gynecological malignancies. That is why it is

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DOI: 10.4103/0976-7800.66991

must to have a diagnostic tool for its early detection, proper treatment, and improve survival.

MATERIALS AND METHODS

The present prospective study was carried out between the period of January 2006 and October 2007 in Department of Obstetrics and Gynecology, New civil Hospital, Surat. The study included patients clinically suspected to have ovarian neoplasm and referred to Department of Radio-diagnosis where evaluation with Ultrasonography and Doppler was performed. All patients were examined on Esaote-FD-570 A color Doppler machine with 3.5–7 MHz convex transducer and 6.5 MHz transvaginal transducer and with gray scale, power, and spectral Doppler.[4] Detailed history of all patients were studied, and complete examination was performed. Ultrasonography preferably was performed during the proliferative phase of menstrual cycle in premenopausal women.[5] The same radiologist evaluated all the cases. Scanning was performed in supine position. The whole of the abdomen was examined in longitudinal and transverse plane with special reference to pelvis. The ovaries were identified. Any ovarian mass if present, was evaluated. In doubtful cases of ovarian masses on transabdominal ultrasonography, transvaginal sonography was done to rule out extra ovarian masses and Sassone scoring system on the basis of morphological parameters applied. Table 1 shows Sassone's scoring system.

Subsequently, power and Doppler flow imaging and spectral analysis were performed. Doppler parameters were optimized for detection of flow and calculation of impedance indices flow. Results were recorded as being absent or present and further characterized as vessel location (peripheral, central, and septal).

On spectral Doppler, the lowest resistance index (RI), and maximum peak systolic velocity (PSV) detected at any point in the mass was used for analysis.[2] The measurements are obtained from three consecutive waveforms, and the smallest sample volume used and alcazar scoring system applied. Table 2 shows Alcazar scoring system.

The sonographic findings were compared with histopathological examination of specimen or with fine needle aspiration cytology (FNAC) of ovarian mass or cytology of ascitic fluid. Borderline tumors were considered as malignant.

RESULTS

Table 3 shows that out of 100 ovarian masses 78 were found benign and 22 were malignant on confirmation. Table 4 shows distribution of 100 patients according to Sassone scoring system, and its comparison to final confirmed diagnosis. Out of 78 benign cases, Sassone score was able to diagnose 72 (92.3%) cases. Out of 22 malignant cases, Sassone score was able to diagnose 18 (81.8%) cases.

Table 5 shows distribution of 100 cases according to Alcazar scoring system and its comparison to confirmed diagnosis. Out of 78 benign cases, Alcazar scoring system able to identify 75 (96.2%) cases and for malignant cases, out of 22 cases, Alcazar scoring system was able to diagnose 21 (95.5%) cases. This shows good positive correlation of score with the final diagnosis.

Table 6 gives comparative efficacy of Sassone and Alcazar scoring systems in differentiating benign from malignant ovarian masses. It shows that Alcazar scoring system is a better performing scoring system.

Table 1: Sassone scoring system

Inner wall structure	Wall thickness	Septa	Echogenicity
Smooth	Thin ≤3 mm	No septa	Sonolucent
Irregularities <3 mm	Thick >3 mm	No septa	Low
Papillarities > 3 mm	NA, solid	Thick > 3 mm	Low with ecogenic core
NA, solid	–	–	Mixed
–	–	–	High

–Benign: <9; Malignant: ≥ 9

Table 2: Alcazar scoring system

Value	Thick papillary projections	Solid areas or purely solid echogenicity	Blood flow location	Velocimetry
0	No	No	Not present or peripheral	Other
2	Present	–	–	High velocity /low resistance
4	–	Present	Central	–

Benign: 0–5; malignant: 6–12.

Table 3: Distribution of masses

Masses	Cases
Benign	78
Malignant	22
Total	100

DISCUSSION

Using only gray scale–Sassone system, out of 78 benign tumors 72 were correctly diagnosed and 6

Table 4: Comparison between sassone scoring system and histopathology

Sassone score	Benign	Malignant	Total
Benign (0–8)	72 (72/78 = 92.3%)	4 (4/22 = 18.2%)	76
Malignant (≥9)	6 (6/78 = 7.7%)	18 (18/22 = 81.8%)	24
	78 (100%)	22 (100%)	100

Table 5: Comparison between Alcazar scoring system and histopathology

Alcazar score	Benign	Malignant	Total
0–5 (B)	75 (75/78 = 96.2%)	1 (1/22 = 4.5%)	76
6–12 (M)	3 (3/78 = 3.8%)	21 (21/22 = 95.5%)	24
	78 (100%)	22 (100%)	100

Table 6: Statistical comparison between two scoring systems

Statistical parameter	Sassone scoring system (%)	Alcazar scoring system (%)
Sensitivity	81.8	95.50
Specificity	92.3	96.20
PPV	75	87.50
NPV	94.7	98.70
Percentage of false positive	7.7	3.80
Percentage of false negative	18.2	4.50
Accuracy	90	96

were misdiagnosed. Out of 22 malignant tumors, 18 were correctly diagnosed as malignant and 4 were misdiagnosed as benign.

Using Alcazar scoring system, out of 22 malignant masses 21 were correctly diagnosed. The one case which was not diagnosed was of immature teratoma. In that case, tumor was of mixed echogenicity without solid mass or vascularization. Accordingly, out of 78 benign masses, 75 were correctly diagnosed as benign and 3 were misdiagnosed as malignant. These were fibroma-thecoma, serous cyst adenofibroma, and tuberculous granulomatous mass. The false positive results in the above-mentioned three cases were because of benign lesion fibroma and cystadenofibroma which were frequently encountered as unilocular cysts with solid areas and central flow. In case of tubercular mass, again central vascularity and solid mass (tubo-ovarian) were responsible for false positivity.

CONCLUSION

There is considerable overlap in the morphologic patterns of various ovarian masses. Gray scale ultrasonography in combination with color Doppler, spectral Doppler, and their combination in the form of scoring systems like ALCAZAR is proposed as the foremost diagnostic modality in patients with ovarian tumor, so as to establish the definite diagnosis of malignancy early in the course of the disease.[2]

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Source of Support: Nil, **Conflict of Interest:** None declared.