**Section:** Radiation Oncology

**Original Research Article**

# PREOPERATIVE EVALUATION OF OVARIAN MASSES WITH ALCAZAR Vs SASSONE SCORING AND THEIR CO-RELATION WITH PATHOLOGICAL FINDING

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## Abstract

**Background:** Ovarian cancer (OC) is reported to be the 8th most common cancer incidence-wise globally. The study aimed to assess the effectiveness of alcazar versus Sassone scoring in delineating malignant ovarian masses from benign ones in Indian females attending a tertiary government hospital in South India. **Materials and Methods:** This prospective study was conducted at a tertiary government hospital, Chennai, on 100 patients admitted with adnexal mass in the Department of Obstetrics and Gynaecology. A patient's history includes females who underwent preoperative transvaginal or transabdominal ultrasound and color Doppler examination. Alcazar and Sassone scores were calculated. The efficacy of these scoring systems was evaluated using the specimen's histopathology as the gold standard. **Result:** Of the total 100 patients, Sassone scored 100% sensitivity while Alcazar scored 87%. The latter had 97% specificity with an NPPV of 97.62%. Out of these 12, eleven (91.6%) were malignant as per HPE. Other variables like wall thickness ≥3mm (P=0.0006), RI ≤0.45, presence of central vascularisation (P=0.002). Irregularity of the tumour wall did not have significant association with malignancy (P=0.74), and high velocity/low resistance flow on color Doppler was consistently associated with malignancy. **Conclusion:** By comparing Sassone's and Alcazar's scores, the former had 100% sensitivity, and the latter showed high specificity with high NPPV. Therefore, the cases classified as benign by Alcazar scores can undergo less aggressive surgery with less morbidity.

## INTRODUCTION

Ovarian cancer (OC) is reported to be the 8th most common cancer incidence-wise globally. As per GLOBOCAN 2020 statistics, ovarian cancer is attributable to 1.6% of new cases and 2.1% of deaths of all sites.[1] As per the ICMR –population-based cancer registry, the OC incidence ranked now as the 3rd most common cancer in Chennai between 2007-12. The Median age of diagnosis of OC in Western patient cohorts is 63 years, while in India, the median age of diagnosis is 50-54 years.[2,3] Asian countries accounted for nearly 50% of the OC deaths. Although during 1990–2019, the age-standardized DALYs rate worldwide was stable without significant changes, these countries experienced a drastic 42% change, thereby casting much burden on their family.[4] A disease affecting a much younger productive population with a higher DALY poses a huge financial burden on an already resource-poor country like India. So effective screening is the best way to overcome the consequence of this disease burden in countries like India.

This scenario is further complicated by the inherent limitation of imaging modalities in differentiating benign from Malignant Ovarian lesions.[5] However, ultrasonography is the most useful modality of investigation for diagnosing ovarian tumors because of its easy availability and non-invasive nature. But since the imaging characteristics of malignant and benign ovarian neoplasm often overlap and USG is a real-time reporting modality, the results become highly operator dependent. Making a precise diagnosis is, therefore, difficult utilising sonography alone.

This highlights the imminent necessity to diagnose this cancer at an early stage by various research methodologies that are non-invasive and cheap and generate reproducible results. Henceforth many scoring systems based on grayscale and Doppler

studies, like Sassone and Alcazar scoring, became popular as they overcame the shortcomings of conventional USG studies.

Nevertheless, Since the Indian OC patients' presentation differs from their Western counterparts (as discussed above), we analyse the validity of these Western-based screening modalities in the Indian scenario and compare the relative efficacy of these two scoring systems in delineating adnexal mass lesions in this study.

## MATERIALS AND METHODS

This prospective study was conducted at a tertiary government hospital, Chennai, on 100 patients admitted with adnexal mass in the Department of Obstetrics and Gynecology. A patient's history includes females who underwent preoperative transvaginal or transabdominal ultrasound and color Doppler examination.

**Inclusion Criteria**

Patients presenting with mass per abdomen/menstrual symptoms with an adnexal mass, with a history of abdominal pain, found to have adnexal mass on bimanual examination, and also with an infertility history whose clinical or ultrasound examination revealed an adnexal mass.

**Exclusion Criteria**

Patients with Unilocular cystic masses size less than 5cm, Extra ovarian mass mimicking Adnexal Masses (uterine/ broad ligament cyst etc.), Pregnant women harbouring ovarian masses, Ectopic pregnancy, and Inflammatory adnexal masses (tubo-ovarian masses, abscess, etc).

A patient's history includes females who underwent preoperative transvaginal or transabdominal ultrasound and color Doppler examination. The sonographic parameters assessed were the wall thickness of the adnexal mass, its echogenicity, septal thickness (if present), and the structural morphology of its inner wall. On the color Doppler front, the following parameters were assessed, namely, blood flow (its presence or its absence), if present, whether it was central or peripheral, resistance index, peak systolic velocity (PSV), and velocimetry (high velocity/low resistance). Alcazar and Sassone's scoring was calculated using the above parameters, the results were then tabulated, and the efficiency of both these scores in predicting malignancy was statistically evaluated. The efficacy of the scoring systems was analysed, keeping the histopathology of specimens obtained from laparotomy or surgery as the gold standard.

**Statistical Analysis**

Statistical values were represented in numbers (%). Suitable statistical tests of comparison were done. Continuous variables were analysed with the Z test. Categorical variables were analysed with the Chi-Square Test. Statistical significance was taken as P< 0.05. The sample size was estimated with a confidence level of 95% and a z- value 1.96. The confidence interval or margin of error was estimated at +/-10, Assuming p% and q% as 45.76 and 54.24, respectively. The minimum sample size required for the study at 80% power was 96 patients; in our cross-sectional study hence we recruited 100 patients.

## RESULTS

The preoperative evaluation of ovarian masses with grayscale sonography plus colour Doppler was performed for all. The correlation of these imaging results was analysed against the final pathological finding [Table 1].

Out of 100 patients recruited in the study, the histopathological results revealed that 11 patients had malignant lesions, two cases were found to be Borderline Ovarian Tumours (BOT), Rest 87 patients harbouring benign ovarian masses [Table 2].

12 of these 100 cases (12%) showed high velocity with low resistance. Out of these 12, eleven (91.6%) were malignant as per HPE. Wall thickness did relate well with malignancy (P< 0.001). Irregularity of the tumor wall was not significantly associated with malignancy (P=0.74).

Out of 13 malignant cases detected by histopathology, 5, i.e. only 38.5 %, had irregular wall structure on ultrasonography, whereas 27 out of 87 benign cases had irregular wall configuration. Central vascularity was another variable significantly (P=0.003) associated with malignancy.

**Table 1: Correlation of Variables associated with imaging results and Points**

| | | VARIABLES | | |
|---|---|---|---|---|
| **Inner Wall Structure (mm)** | **Wall Thickness (mm)** | **Septa (mm)** | **Echogenicity** | **Points** |
| Smooth | Thin </ - 3 mm | No septa | Sonolucent | 1 |
| Irregular </=3mm | Thick > 3mm | Thin </ - 3 mm | Low echogenicity | 2 |
| Papillarities > 3mm | Not applicable mostly | Thick > 3mm | Low echogenicity with echogenic core | 3 |
| Not applicable mostly | | | Mixed echogenicity | 4 |

**Table 2: The statistical correlation of the various patient variables with the histopathological result**

| Variable | Malignancy criterion | Univariate analysis |
|---|---|---|
| Age | >40 years | P <0.00059 |
| Inner wall structure | Irregular | P =0.74 |
| Septal thickness | >= 3 mm | P <0.001 |
| Papillary structure | Present | P = 0.34 |
| Central vascularity | Present | P <0.002 |


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| | | |
|---|---|---|
| RI | < =0.45 | P <0.003 |
| PSV | >30 cm/ sec | P <0.003 |
| Velocimetry | High Velo/ low resistance | P <0.003 |
| Wall thickness | > = 3 mm | P <0.0006 |

**Table 3: Correlation of the score with the final diagnosis (Whether malignant/ benign) by Alcazar Score**

| Alcazar Score | Diagnosis based on HPE | | Total |
|---|---|---|---|
| | Malignant | Benign | |
| 7-12 | 11 | 2 | 13 |
| 0-6 | 2 | 85 | 87 |
| Total | 13 | 87 | P <0.00001 |

**Table 4: Correlation of the score with the final diagnosis (Whether malignant/ benign) by Sassone Score**

| Sassone Score | Diagnosis based on HPE | | Total |
|---|---|---|---|
| | Malignant | Benign | |
| 8-15 | 13 | 13 | 26 |
| 0-8 | 0 | 74 | 87 |
| Total | 13 | 87 | P <0.00001 |

**Table 5: The statistical difference between Sassone and alcazar Scores is associated with various parameters.**

| Statistical Parameter | Alcazar score | Sassone score |
|---|---|---|
| Sensitivity | 87 % | 100 % |
| Specificity | 97 % | 85.06 % |
| Positive Predictive value | 81.25 % | 50 % |
| Negative Predictive value | 97.62 % | 100 % |

Coming to the Alcazar score, 87 (87%) had a score between 0 and 6; they were supposed to be benign, and 85 out of these 87 (97.7%) were found to be benign on histopathology. 13 out of the 100 cases (i.e. 13%) were having a score between 7 and 12 and out of these thirteen cases 11 of them (84.6%) were malignant on histopathology showed a good positive correlation of the score with the final diagnosis [Table 3].

The sassone score could predict all 13 malignant cases; the sensitivity was 100%. However, out of the 87 benign cases, the Sassone score could pick up only 74 cases; the specificity was 85.06%, the PPV was 50%, and the negative predictive value was 100% [Table 4].

The various statistical parameters, such as sensitivity, specificity, and positive and negative predictive values for the Alcazar and Sassone scores, were estimated, and the statistical difference between those scores was tabulated [Table 5].

## DISCUSSION

As it is well-established that in the early stages, ovarian cancer remains largely asymptomatic, women present only in the advanced stage to the medical facility. Screening the high-risk female population is essential to detect these cases early for a favorable survival outcome. An estimated 5%–10% of women with a suspected adnexal mass will require surgery, but out of these patients, only 3%–21% will the mass be malignant on HPE. Thus, around five patients with ovarian pathologies must be screened surgically to detect one malignant ovarian patient.

On the same note, if we add cancer antigen (CA)–125 along with Ultrasonogram for screening, this discrepancy further increases, requiring 10–20 surgeries for every malignant ovarian tumor detected. Screening with CA125 showed no significant increase in survival.[6] Hence a one-time CA 125 value is not recommended for screening ovarian lesions. Hence we refrained from including CA 125 in our study.

Sassone et al. developed a scoring system to characterise ovarian masses by using grey-scale transvaginal ultrasonography in our study. The scoring system was based on determining the inner wall structure, wall thickness, septal characteristics, and the lesion's echogenicity.[7]

Similarly, De Priest et al. proposed a scoring system based on septal structure, cyst wall structure, mass, and volume of the adnexal lesions based on ultrasonography in our study. Color Doppler parameters were not included in the above scoring systems. However, these two variables could not be used as independent predictors of malignancy as their values were found to overlap between benign and malignant tumors.

To tide over that deficiency, Alcazar et al. devised this scoring & they classified tumors based on four velocimetric categories by the best RI and PSV cut-off values. Alcazar's scoring system may give a total score from 0 to 12. Malignancy was considered when the Score was more than 6, and it was found to be the best criterion as per the receiver operator characteristic (ROC) curve with a sensitivity of 87 % and a false positive rate of 5.5%. In our study, we found it to have 87% sensitivity and 2% false positivity and also, out of 100 cases, 87% had a score of < 6, and out of these, 85 were benign on histopathology.[8]

The borderline ovarian tumors require the performance of comprehensive surgical staging more similar to true malignant ovarian neoplasms; we grouped them also into the malignant ovarian tumour category and studied the power of both scoring


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systems to delineate these borderline ovarian tumors as malignant. 75% of borderline ovarian tumor patients present at an early FIGO stage- A study by Pirrello and Guillaume.[9]

In our study, lowering the threshold score of >= 8 effectively picked up all the malignant cases and captured the two borderline malignant cases missed by Alcazar's scoring.

Conversely, Sassone's score falsely delineated 11 benign cases as malignant by scoring 10 to 11. Hence the specificity of this score dropped to 85.06% (incidentally, all these false positive cases were teratoma), while the specificity of Alcazar's scoring was 97%. Since the Sassone score picked up 100% of all malignant ovarian tumours, it is a better screening test than the Alcazar scoring system. At the same time, Alcazar is better at predicting malignant cases correctly, as it had high specificity in our study.[10]

## CONCLUSION

Of all the ultrasonographic parameters, wall thickness >3mm (P=0.0006) and RI <0.45 are most consistently associated with malignancy. Central vascularisation (P=0.002) and high velocity/low resistance flow on color Doppler were also consistently associated with malignancy. As per our study, fixing Sassone score ≥8 appears to be a better cut-off parameter in the Indian population. Sassone scoring has a high sensitivity of 100% while Alcazar scoring system has 87%. Alcazar score, on the other hand, has a very high specificity of 97% and a high negative predictive value of 97.62%. Hence in the Indian population, Sassone and Alcazar scoring can be run on series one after the other so that at the culmination of these two tests, Those subjects delineated as nonmalignant by Alcazar score can favorably undergo less aggressive surgery. Eventually, morbidity following adnexal mass surgery can be largely obviated so that many females can be prevented from losing their productive years to unnecessary treatment-related complications.

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