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Original Research Article

Ultrasonography (USG) and Contrast-Enhanced Computed Tomography (CECT) Imaging Features in Malignant Ovarian Tumours in Patients Attending the Radiodiagnosis Department of a Tertiary Care Hospital – A Cross-Sectional Study

Dr. More Shivani Kailas[1]*, Dr Shephali S Pawar[2]

[1]Junior Resident, Department of Radiodiagnosis, B. J. Government Medical College & Sassoon General Hospital, Pune, (MH) India
[2]Professor and Head of Department, Department of Radiodiagnosis, B. J. Government Medical College & Sassoon General Hospital, Pune, (MH) India

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Abstract: ***Background:*** Ovarian tumours exhibit diverse imaging characteristics, and differentiating benign from malignant lesions is essential for appropriate management. Ultrasonography (USG) provides initial morphological assessment, whereas contrast-enhanced computed tomography (CECT) helps evaluate tumour extent and extra-ovarian spread. ***Aim:*** To compare USG and CECT in characterising ovarian tumours, identifying imaging features associated with malignancy, and assessing disease extent. ***Methods:*** This cross-sectional study included 73 patients with ovarian tumours evaluated at a tertiary care hospital. All patients underwent USG, including colour Doppler assessment, and CECT. Clinical characteristics, serum CA-125 levels, imaging findings, histopathological diagnoses, and FIGO stage were analysed. Imaging findings were compared between benign and malignant tumours, and agreement between USG and CECT was assessed for selected parameters. ***Results:*** Of the 73 patients, 48 (65.8%) had malignant tumours, 18 (24.7%) had benign tumours, and seven (9.6%) had borderline tumours. Malignant cases had a mean age of 52.5 ± 11.8 years, and 68.8% were postmenopausal. On USG, solid components, irregular walls, papillary projections, and ascites were observed in 100%, 89.6%, 68.8%, and 85.4% of malignant cases, respectively. High Doppler vascularity scores (3–4) were present in 93.8%. CECT demonstrated heterogeneous or intensely heterogeneous enhancement in 91.7% and necrosis in 58.3%. Omental involvement, peritoneal deposits, and lymphadenopathy occurred in 68.8%, 56.2%, and 54.2%, respectively. Advanced-stage disease (FIGO III–IV) accounted for 60.4% of malignant cases. USG and CECT showed strong correlation for tumour size ($r = 0.988$). ***Conclusion:*** USG and CECT provide complementary information for ovarian tumour characterisation and assessment of disease extent. Their combined use may support preoperative evaluation and treatment planning, with histopathology remaining essential for definitive diagnosis.

Keywords: Ovarian tumours; ultrasonography; computed tomography; colour Doppler; malignancy; FIGO staging.

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INTRODUCTION

Ovarian tumours comprise a heterogeneous group of lesions ranging from benign cysts to borderline neoplasms and invasive malignancies. Differentiating these lesions accurately is essential because the diagnosis and extent of disease influence referral, surgical planning, and subsequent treatment. Ovarian cancer remains a major cause of cancer-related morbidity and mortality among women worldwide, partly because many patients present with advanced disease.[1] Reliable imaging assessment is therefore important for identifying suspicious lesions, characterising tumour morphology, and determining the distribution of disease.

Ultrasonography (USG), particularly transvaginal ultrasonography supplemented by

***Corresponding Author:** Dr. More Shivani Kailas
Junior Resident, Department of Radiodiagnosis, B. J. Government Medical College & Sassoon General Hospital, Pune, (MH)India

transabdominal examination when required, is the first-line imaging modality for evaluating suspected ovarian and adnexal masses.[2] It provides information regarding tumour size, laterality, cystic or solid composition, wall irregularity, septations, papillary projections, and ascites. Colour Doppler imaging further evaluates vascularity within the lesion and may help distinguish benign from malignant masses. The International Ovarian Tumour Analysis (IOTA) group has developed and validated ultrasound-based approaches, including the Simple Rules and ADNEX model, to improve malignancy-risk assessment. [3,4] The American College of Radiology's Ovarian-Adnexal Reporting and Data System (O-RADS US) also provides a standardised framework for describing lesions, stratifying malignancy risk, and guiding clinical management.[5]

Despite its advantages, ultrasound may not conclusively characterise every complex ovarian mass. Overlapping morphological appearances, large tumour size, and extensive disease can create diagnostic challenges. When ultrasound findings are indeterminate, magnetic resonance imaging may provide additional characterisation; however, when ovarian malignancy is suspected, contrast-enhanced computed tomography (CECT) has an important role in evaluating the extent of disease. [2,6] CECT permits assessment of the primary mass, enhancement patterns, necrosis, ascites, omental involvement, peritoneal deposits, lymphadenopathy, and distant metastases. These findings are clinically relevant when determining disease burden and planning treatment.[6]

The International Federation of Gynecology and Obstetrics (FIGO) staging system classifies ovarian, fallopian tube, and primary peritoneal cancers according to anatomical disease distribution.[7] Preoperative cross-sectional imaging assists in identifying sites of extra-ovarian spread and potential factors affecting surgical management. European radiology recommendations support contrast-enhanced CT of the chest, abdomen, and pelvis for preoperative staging of suspected ovarian cancer [6,8] Nevertheless, imaging findings should be interpreted alongside clinical, surgical, and pathological information, as radiological assessment alone does not establish the definitive histological diagnosis.

Although USG and CECT provide complementary information, direct comparison of their findings can help clarify their respective contributions to ovarian tumour evaluation. The ESGO/ISUOG/IOTA/ESGE consensus recommendations emphasise structured ultrasound assessment for characterisation and CT evaluation when determining the extent of suspected malignancy. [2,9] Comparing selected features across modalities may demonstrate agreement in measurements and morphology while identifying parameters for which findings differ.

The present study was undertaken to comparatively evaluate USG and CECT findings in ovarian tumours, focusing on imaging characteristics associated with malignancy, assessment of extra-ovarian disease across FIGO stages, and agreement between the two imaging modalities. By examining these parameters in patients attending the radiodiagnosis department of a tertiary care hospital, the study aims to contribute to a systematic understanding of the complementary roles of USG and CECT in the characterisation and evaluation of ovarian tumours.

OBJECTIVES

1. To evaluate and compare the ultrasonographic and CECT imaging characteristics of benign and malignant ovarian tumours.
2. To identify the morphological and vascular imaging features associated with malignant ovarian tumours, including tumour size, solid components, wall irregularity, septations, papillary projections, Doppler vascularity, enhancement patterns, and necrosis.

METHODOLOGY

This hospital-based, observational, descriptive, cross-sectional study was conducted in the Department of Radiodiagnosis of a tertiary care hospital over 18 months. A total of 73 patients aged more than 18 years with suspected ovarian masses referred for ultrasonography (USG) and contrast-enhanced computed tomography (CECT) were enrolled using universal consecutive sampling. Patients who provided written informed consent were included, while those with known allergy to iodinated contrast media, previous surgery for malignant ovarian lesions, or previously diagnosed non-ovarian malignancies were excluded. Data regarding clinical presentation, gynaecological examination, serum CA-125 levels, and imaging findings were recorded using a structured proforma. All patients underwent transabdominal and transvaginal grey-scale ultrasonography with colour and spectral Doppler assessment. Tumour morphology, size, laterality, septations, papillary projections, solid components, vascularity, resistive index, and pulsatility index were documented. CECT of the abdomen and pelvis was performed to evaluate tumour architecture, enhancement, necrosis, calcification, ascites, omental and peritoneal involvement, lymphadenopathy, and distant metastases. Final diagnosis was established by histopathological examination of surgical specimens, and malignant tumours were staged surgicopathologically according to the FIGO 2014 classification. The collected data were analysed to compare imaging characteristics between benign and malignant tumours, assess disease extent across stages, and determine agreement between USG and CECT findings.

RESULTS AND OBSERVATIONS

Comparative Evaluation of Ultrasonography (USG) and Contrast-Enhanced Computed Tomography (CECT) in Ovarian Tumours: Imaging Characteristics of Malignancy and Assessment of Disease Extent

Table 1: Distribution of patients according to age and final diagnosis (N = 73)

Characteristic	Number (%)
Age group	
18–30 years	7 (9.6)
31–40 years	10 (13.7)
41–50 years	20 (27.4)
51–60 years	20 (27.4)
>60 years	16 (21.9)
Final diagnosis	
Benign ovarian tumour	18 (24.7)
Borderline ovarian tumour	7 (9.6)
Malignant ovarian tumour	48 (65.8)
Mean age ± SD	
Benign	42.3 ± 14.1 years
Borderline	43.3 ± 7.0 years
Malignant	52.5 ± 11.8 years
Overall	49.1 ± 12.8 years

Observation: The 41–50 and 51–60-year age groups were the most represented, each comprising 27.4% of the study population. Malignant tumours accounted for 65.8% of cases, and patients with malignant tumours had a higher mean age than those with benign or borderline lesions.

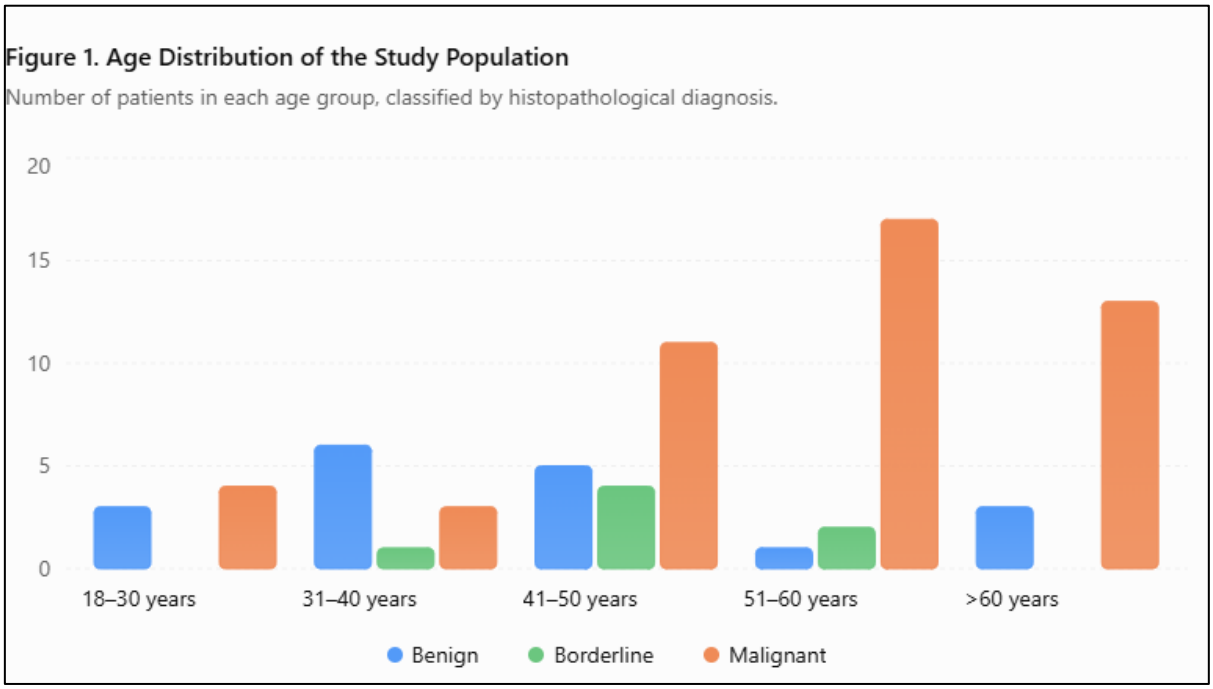


Table 2: Comparison of ultrasonographic features between benign and malignant ovarian tumours

USG feature	Benign (n = 18), n (%)	Malignant (n = 48), n (%)	p-value
Solid component	3 (16.7)	48 (100.0)	

Observation: The largest age groups were 41–50 and 51–60 years, with 20 patients in each group.

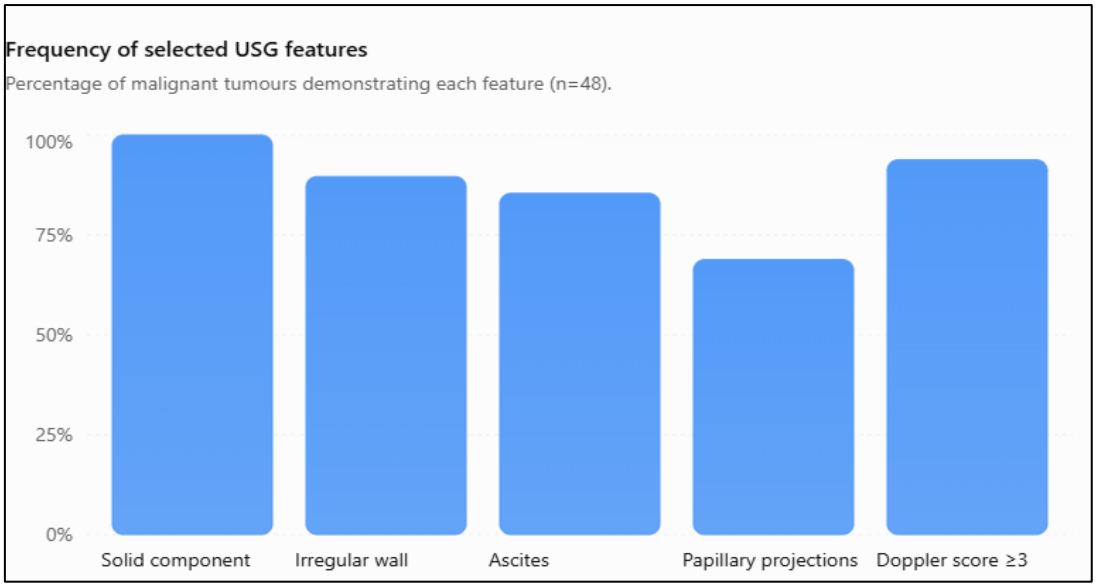


Figure 2: Selected USG features in malignant ovarian tumours

Observation: Solid components were present in all malignant tumours. High Doppler scores, irregular walls, and ascites were also frequent findings.

DISCUSSION

In the present study, 73 patients with ovarian tumours were evaluated using ultrasonography (USG) and contrast-enhanced computed tomography (CECT). Malignant tumours accounted for 65.8% of cases, while benign and borderline tumours represented 24.7% and 9.6%, respectively. The mean age of patients with malignant tumours was 52.5 ± 11.8 years, and 68.8% were postmenopausal, indicating that older age and postmenopausal status were common among patients with malignancy. These demographic findings emphasise the importance of considering age and menopausal status during the clinical assessment of ovarian masses. However, these factors should be interpreted alongside imaging findings and other clinical information rather than used independently to determine malignancy.

USG demonstrated important morphological features associated with malignancy. Solid components were present in all malignant tumours, irregular walls in 89.6%, papillary projections in 68.8%, and ascites in 85.4%. Furthermore, 93.8% of malignant lesions demonstrated colour Doppler scores of 3 or 4, suggesting that increased vascularity was a frequent finding in this group. The presence of solid tissue, irregular margins, papillary projections, and complex internal architecture can help identify lesions that require further evaluation. These findings support systematic ultrasound assessment for differentiating benign from malignant adnexal masses, consistent with established ultrasound-based risk-stratification recommendations. [11,12] Nevertheless, individual morphological features should be interpreted collectively because no single feature can independently establish the histopathological diagnosis in every patient.

CECT revealed large, complex malignant masses, with heterogeneous or intensely heterogeneous enhancement in 91.7% and necrosis in 58.3% of cases. These characteristics provide additional information about tumour composition and enhancement patterns. Extra-ovarian disease was frequently observed, including ascites in 72.9%, omental involvement in 68.8%, peritoneal deposits in 56.2%, and lymphadenopathy in 54.2% of malignant cases. The identification of these findings is clinically important because ovarian malignancy may extend beyond the primary tumour, affecting the peritoneal cavity, omentum, lymph nodes, and distant organs. CECT therefore complements ultrasound by providing a broader assessment of disease distribution and supporting preoperative staging and treatment planning. [13,14]

Advanced-stage disease, defined as FIGO stages III–IV, accounted for 60.4% of malignant cases. This finding indicates that a substantial proportion of patients in the study had advanced disease at evaluation. Omental involvement, lymphadenopathy, and distant metastases were more frequently associated with advanced disease, emphasising the importance of assessing extra-ovarian spread. [13,14] The identification of disease extent may assist clinicians in determining the appropriate treatment approach and evaluating the potential role of surgical management. However, imaging findings should be interpreted in conjunction with clinical assessment and the relevant pathological and operative findings.

Comparison of USG and CECT demonstrated a strong correlation in tumour-size measurements ($r = 0.988$) and excellent reported agreement for tumour

architecture and laterality (κ = 1.000). In contrast, agreement for ascites was fair (κ = 0.383), indicating that the two modalities did not consistently provide equivalent findings for this feature. These differences reinforce the complementary rather than interchangeable roles of the imaging techniques. USG remains valuable for initial characterisation of ovarian masses, while CECT contributes important information about disease extent. Overall, the findings support a combined imaging approach for evaluating suspected ovarian malignancy. Nevertheless, the results should be interpreted in view of the single-centre design, limited sample size, and comparatively small benign and borderline groups. Further studies involving larger populations are needed to validate these observations and clarify the diagnostic contribution of each imaging modality.

CONCLUSION

USG effectively demonstrated morphological and Doppler features associated with ovarian malignancy, while CECT provided valuable information about extra-ovarian spread and disease staging. Their complementary use may strengthen preoperative assessment and treatment planning. Histopathological examination remains essential for definitive diagnosis**.**

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