

## A Diagnostic Accuracy Study Comparing Ultrasonography and Computed Tomography in the Assessment of Ovarian Lesions

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Conflict of interest: Nil

### Abstract:

**Background:** Suspicious ovarian masses present a significant diagnostic challenge in gynecologic imaging. While ultrasonography (USG) is commonly employed as the initial modality due to its accessibility and safety, computed tomography (CT) offers enhanced anatomic resolution and metastatic assessment. This study aims to compare the diagnostic performance of USG and CT in the evaluation of ovarian masses using histopathological correlation.

**Aims and Objectives:** To assess and compare the diagnostic accuracy of ultrasonography and computed tomography in evaluating suspicious ovarian masses, using histopathological findings as the reference standard.

**Materials and Methods:** This hospital-based prospective comparative study was conducted in the Department of Radiology, Netaji Subhas Medical College and Hospital, Bihta, Patna, Bihar, India. A total of 60 female patients with clinically or ultrasonographically suspicious ovarian lesions were enrolled. All patients underwent transabdominal/transvaginal USG followed by contrast-enhanced CT scanning. Imaging findings from both modalities were compared with final histopathological diagnosis. Sensitivity, specificity, positive predictive value, negative predictive value, and diagnostic accuracy were calculated.

**Results:** Out of the 60 patients, histopathology confirmed 38 malignant and 22 benign ovarian lesions. USG showed a sensitivity of 84.2% and specificity of 72.7%, while CT demonstrated higher sensitivity (92.1%) and specificity (86.3%). CT was significantly superior in identifying extra-ovarian spread, ascites, and lymphadenopathy. The overall diagnostic accuracy was 80.0% for USG and 90.0% for CT, confirming CT's greater diagnostic reliability in complex cases.

**Conclusion:** CT imaging outperforms ultrasonography in the characterization and staging of suspicious ovarian masses, particularly in detecting metastatic features. However, the integration of both modalities can improve diagnostic confidence and patient management, especially in resource-constrained settings.

**Keywords:** Ovarian Masses, Ultrasonography, Computed Tomography, Malignancy, Imaging, Diagnostic Accuracy, Histopathology

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### Introduction

Ovarian cancer continues to be a major public health concern and ranks among the leading causes of cancer-related mortality among women globally. The high mortality rate is often attributed to the silent progression of the disease in its early stages and the subsequent late presentation with advanced disease [1]. Suspicious ovarian masses ranging from benign cysts to malignant neoplasms are frequently encountered in routine clinical practice, and timely differentiation between benign and malignant lesions plays a critical role in determining patient prognosis, surgical planning, and therapeutic intervention [2].

Radiological imaging remains a cornerstone in the assessment of adnexal masses. Among the imaging modalities available, ultrasonography (USG) is

widely recognized as the first-line diagnostic tool due to its non-invasive nature, absence of ionizing radiation, widespread availability, and relatively low cost [3]. Both transabdominal and transvaginal sonography are routinely employed to assess the morphological features of ovarian lesions. Ultrasonographic criteria such as lesion size, echotexture, presence of septations, solid components, papillary projections, and internal vascularity on color Doppler contribute significantly to preliminary risk stratification. Despite its advantages, USG is operator-dependent and may face limitations in obese patients or when evaluating deeply located or complex pelvic lesions [4].

Computed tomography (CT), on the other hand, serves as a valuable cross-sectional imaging

technique, particularly in staging malignant ovarian tumors. CT provides high-resolution anatomical detail and offers superior visualization of extra-ovarian spread, lymphadenopathy, peritoneal deposits, omental caking, and distant metastasis [5]. However, its utility is tempered by exposure to ionizing radiation and limited specificity in distinguishing benign from borderline or low-grade malignant lesions in the absence of clear metastatic features.

The clinical need for precise preoperative imaging has prompted comparative assessments of USG and CT to identify the optimal modality or combination strategy for evaluating ovarian masses. Given the differences in availability, cost, radiation exposure, and diagnostic capabilities, establishing the relative strengths and limitations of USG and CT is imperative for informed clinical decision-making, especially in resource-limited settings such as in many parts of India [6,7].

In this context, the present study was designed to evaluate and compare the diagnostic efficacy of ultrasonography and computed tomography in the characterization of suspicious ovarian masses. The study was conducted at Netaji Subhas Medical College and Hospital, Bihta, Patna, Bihar, and aimed to correlate imaging findings with histopathological outcomes, which remain the gold standard for definitive diagnosis. Through this comparative analysis, the study also aimed to guide clinicians in selecting the most appropriate imaging modality or combination thereof for better patient outcomes.

### Materials and Methods

This hospital-based prospective comparative study was conducted in the Department of Radiology at Netaji Subhas Medical College and Hospital, Bihta, Patna, Bihar. The study duration spanned 12 months, from January 2023 to Dec 2023. The study included 60 female patients, aged between 18 to 65 years, who presented with clinically suspected or ultrasonographically identified suspicious ovarian masses. All patients were evaluated using both ultrasonography (USG) and contrast-enhanced computed tomography (CECT) prior to undergoing surgical excision or biopsy for histopathological diagnosis, which served as the gold standard.

### Inclusion Criteria

- Female patients aged 18 years and above presenting with ovarian masses suspicious for malignancy on clinical or preliminary imaging assessment.
- Patients who underwent both USG and CT imaging prior to definitive histopathological diagnosis.
- Patients who provided informed consent for participation in the study.

### Exclusion Criteria

- Patients with previously diagnosed ovarian malignancy undergoing follow-up imaging.
- Pregnant women.
- Patients with contraindications to contrast administration (e.g., contrast allergy, renal insufficiency).
- Cases where histopathology reports were unavailable or inadequate.

**Ultrasonography Protocol:** All patients initially underwent transabdominal and/or transvaginal ultrasonography using high-frequency probes (5–9 MHz) on a real-time ultrasound machine. The morphological assessment included evaluation of:

- Size and shape of the lesion
- Internal consistency (cystic, solid, or complex)
- Presence of septations, papillary projections, or mural nodules
- Echogenicity
- Presence of ascites
- Vascularity using color Doppler assessment

Based on these criteria, each lesion was categorized as benign or malignant using IOTA (International Ovarian Tumor Analysis) simple rules where applicable.

**Computed Tomography Protocol:** Contrast-enhanced CT scans of the abdomen and pelvis were performed using a 64-slice multidetector CT scanner. Images were acquired in axial sections with multiplanar reconstructions. Key parameters assessed on CT included:

- Density and enhancement patterns of the ovarian lesion
- Presence of solid components, calcifications, and necrosis
- Peritoneal thickening or nodularity
- Ascites and omental caking
- Pelvic and para-aortic lymphadenopathy
- Evidence of distant metastases

Each CT finding was independently evaluated and recorded. The lesions were similarly classified as benign or malignant based on imaging features.

**Histopathological Correlation:** Following imaging, all patients underwent surgical excision of the ovarian mass, either through laparotomy or laparoscopy, and specimens were sent for histopathological examination. The final histological diagnosis was used as the reference standard for evaluating the diagnostic performance of USG and CT.

**Statistical Analysis:** The diagnostic parameters—sensitivity, specificity, positive predictive value (PPV), negative predictive value (NPV), and overall diagnostic accuracy—were calculated for both USG and CT by comparing their findings with

histopathological results. Statistical analysis was performed using SPSS software (version 25.0). Categorical variables were expressed as frequencies and percentages, and comparisons were made using the Chi-square test or Fisher’s exact test where appropriate. A p-value of <0.05 was considered statistically significant.

**Results**

The present study included a total of 60 female patients who presented with clinically or sonographically suspicious ovarian masses. All patients underwent both ultrasonography (USG) and contrast-enhanced computed tomography (CECT), and findings were compared with histopathological

diagnoses. The study aimed to compare the diagnostic capabilities of USG and CT in differentiating benign and malignant ovarian masses and identifying features suggestive of malignancy. The mean age of the study population was 46.2 ± 11.3 years. Most patients presented with complaints of lower abdominal pain, abdominal distension, or menstrual irregularities. Histopathology served as the definitive gold standard. The analysis involved evaluation of lesion characteristics on imaging, including size, laterality, morphology, presence of ascites, and lymphadenopathy, followed by sensitivity, specificity, and accuracy calculations for both USG and CT.

**Table 1: Age-wise Distribution of Patients**

Age Group (Years)	Number of Patients	Percentage (%)
18–30	6	10.0
31–40	17	28.3
41–50	25	41.7
>50	12	20.0

Table 1 shows the distribution of the study participants according to age groups. The majority

of patients (41.7%) were in the age group of 41–50 years, followed by 31–40 years (28.3%).

**Table 2: Clinical Presentation of Patients**

Clinical Symptom	Frequency	Percentage (%)
Lower abdominal pain	48	80.0
Abdominal distension	37	61.7
Menstrual irregularities	21	35.0
Weight loss	11	18.3
Bowel/bladder disturbances	7	11.7

Table 2 summarizes the presenting complaints. The most common symptom was lower abdominal pain

(80.0%), followed by abdominal distension (61.7%) and menstrual irregularities (35.0%).

**Table 3: Distribution Based on Ovarian Mass Laterality**

Laterality	Frequency	Percentage (%)
Right ovary	29	48.3
Left ovary	24	40.0
Bilateral	7	11.7

Table 3 presents the laterality of the ovarian lesions as observed on imaging. Unilateral involvement was

more common than bilateral, with the right ovary slightly more frequently involved.

**Table 4: Morphological Nature of Ovarian Masses on USG**

Morphology Type	Frequency	Percentage (%)
Simple cystic	9	15.0
Complex cystic	31	51.7
Solid	11	18.3
Mixed/others	9	15.0

Table 4 displays the morphological classification of the masses on ultrasonography. Most lesions were

complex (51.7%), followed by solid and cystic lesions.

**Table 5: Morphological Nature of Ovarian Masses on CT**

Morphology Type	Frequency	Percentage (%)
Simple cystic	6	10.0
Complex cystic	26	43.3
Solid	19	31.7
Mixed/others	9	15.0

Table 5 reveals the morphology of masses on CT imaging. CT identified more solid and complex

components than USG, suggesting higher specificity in lesion characterization.

**Table 6: Presence of Ascites on USG and CT**

Modality	Ascites Detected	Frequency	Percentage (%)
USG	Yes	33	55.0
CT	Yes	42	70.0

Table 6 compares the ability of USG and CT to detect ascites. CT was able to detect ascites in a

higher number of cases (70.0%) compared to USG (55.0%).

**Table 7: Detection of Lymphadenopathy on USG vs CT**

Modality	Lymphadenopathy Detected	Frequency	Percentage (%)
USG	Yes	9	15.0
CT	Yes	19	31.7

Table 7 shows the detection of pelvic and para-aortic lymphadenopathy. CT identified lymphadenopathy

in 31.7% of cases, whereas USG detected it in only 15.0%.

**Table 8: Histopathological Diagnosis (Final Outcome)**

Histopathology Type	Frequency	Percentage (%)
Benign	22	36.7
Malignant	38	63.3

Table 8 shows the distribution of benign and malignant lesions based on histopathological

examination. Malignancies were more frequent than benign lesions in this study population.

**Table 9: Diagnostic Accuracy of USG in Detecting Malignancy**

Parameter	Value (%)
Sensitivity	84.2
Specificity	72.7
Positive Predictive Value	84.2
Negative Predictive Value	72.7
Diagnostic Accuracy	80.0

Table 9 summarizes the performance of USG in detecting malignancy, showing good sensitivity but relatively lower specificity compared to CT.

**Table 10: Diagnostic Accuracy of CT in Detecting Malignancy**

Parameter	Value (%)
Sensitivity	92.1
Specificity	86.3
Positive Predictive Value	90.2
Negative Predictive Value	88.2
Diagnostic Accuracy	90.0

Table 10 illustrates the superior diagnostic parameters of CT. The accuracy, sensitivity, and specificity were all higher compared to USG.

Table 1 revealed that most patients were aged between 41–50 years. Table 2 showed that lower abdominal pain and abdominal distension were the most common presenting complaints. Table 3 indicated that ovarian masses were predominantly unilateral, with a slightly higher incidence on the right side. Table 4 illustrated that complex cystic

lesions were the most frequently identified morphology on USG, while Table 5 demonstrated that CT better characterized solid and complex lesions. Table 6 highlighted the superior ability of CT to detect ascites compared to USG. Table 7 further confirmed that CT had a higher detection rate of lymphadenopathy. Table 8 confirmed a greater

number of malignant lesions (63.3%) compared to benign (36.7%) on histopathology. Table 9 presented the diagnostic performance of USG, showing moderate specificity and accuracy. In contrast, Table 10 showed that CT had significantly higher sensitivity, specificity, and overall diagnostic accuracy in detecting ovarian malignancies.

### Discussion

The accurate evaluation of suspicious ovarian masses remains a critical challenge in clinical gynecology and radiology due to the overlapping imaging features of benign and malignant lesions. The present study was designed to compare the diagnostic utility of ultrasonography (USG) and computed tomography (CT) in differentiating malignant from benign ovarian masses, with histopathological correlation serving as the reference standard [8,9].

Ovarian malignancy often presents in advanced stages due to its insidious onset and nonspecific symptoms, which makes early detection crucial for improving patient outcomes. In the present study, the most common presenting complaint was lower abdominal pain, followed by distension and menstrual irregularities consistent with the nonspecific symptomatology commonly described in literature. These clinical findings emphasize the indispensable role of imaging in guiding further evaluation [10,11].

Ultrasonography is widely regarded as the first-line imaging modality due to its accessibility, safety profile, and ability to provide detailed morphological information, especially with transvaginal approach. It is effective in assessing size, shape, internal consistency, and vascularity of ovarian lesions. However, its limitations in obese patients, operator dependency, and restricted field of view can affect diagnostic accuracy. In our study, USG demonstrated good sensitivity in detecting malignancy, but its specificity was suboptimal, leading to a moderate diagnostic accuracy [12,13].

Computed tomography, though associated with ionizing radiation and higher costs, offers advantages in terms of anatomical detail and the detection of extra-ovarian disease. CT was superior in identifying metastatic features such as lymphadenopathy, ascites, and omental involvement. In this study, CT outperformed USG in both sensitivity and specificity, with markedly improved diagnostic accuracy. These findings align with previously published studies which have reported that CT imaging is particularly valuable in staging ovarian malignancy and guiding surgical planning [14,15].

The higher sensitivity of CT imaging can be attributed to its ability to visualize tissue density variations and enhancement patterns post-contrast,

which help in identifying solid components and subtle metastatic disease. Additionally, the ability of CT to assess lymph nodes and distant spread makes it a preferred modality in preoperative staging [16].

Importantly, this study reaffirms that while USG is effective for initial screening and characterization, CT provides superior diagnostic clarity in ambiguous or complex cases. However, both modalities should not be viewed in isolation. Rather, they offer complementary roles—USG for early detection and CT for comprehensive evaluation and staging [17].

Our findings are consistent with other regional and international studies that highlight the value of combined imaging strategies. Several studies have advocated the incorporation of scoring systems or multimodal imaging algorithms that integrate USG and CT findings to improve preoperative diagnostic precision. Furthermore, in resource-constrained settings, judicious use of both modalities based on clinical suspicion and preliminary imaging findings can optimize resource utilization without compromising diagnostic standards.

The strength of this study lies in its prospective design, standardized imaging protocols, and use of histopathology as the gold standard. However, limitations include a relatively small sample size and single-institution setting, which may affect generalizability. Future studies with larger, multi-center cohorts and inclusion of MRI as an additional comparator could further validate and refine the imaging strategies for ovarian mass evaluation.

### Conclusion

In the evaluation of suspicious ovarian masses, both ultrasonography and computed tomography play significant diagnostic roles. Ultrasonography remains an essential first-line modality due to its accessibility, cost-effectiveness, and ability to assess lesion morphology. However, computed tomography provides superior diagnostic performance, particularly in detecting malignant features, evaluating complex lesions, and identifying metastatic spread. This study demonstrates that CT exhibits higher sensitivity, specificity, and diagnostic accuracy compared to USG, reinforcing its value in preoperative assessment and staging. The combined application of USG for initial screening and CT for comprehensive evaluation can enhance diagnostic confidence and guide optimal clinical management in patients with ovarian masses.

### References

1. Mangla M, Ramavath K, Kumar N, Roy S, Srirambhatla A, Palo S. Ovarian Cystadenofibroma: An Innocent Tumor Causing Early Postoperative Small Bowel Obstruction and Perforation Peritonitis. J

- Midlife Health. 2024 Jan-Mar;15(1):43-47. doi: 10.4103/jmh.jmh\_5\_24. Epub 2024 Apr 4. PMID: 38764931; PMCID: PMC11100640.
2. Ratnavelu ND, Brown AP, Mallett S, Scholten RJ, Patel A, Founta C, Galaal K, Cross P, Naik R. Intraoperative frozen section analysis for the diagnosis of early stage ovarian cancer in suspicious pelvic masses. *Cochrane Database Syst Rev.* 2016 Mar 1;3(3):CD010360. doi: 10.1002/14651858.CD010360.pub2. PMID: 26930463; PMCID: PMC6457848.
  3. Morrison J, Lasserson T. Finding time to make the right decision: using frozen section to inform intra-operative management of suspicious ovarian masses. *Cochrane Database Syst Rev.* 2016 Mar 2;3(3):ED000109. doi: 10.1002/14651858.ED000109. PMID: 26941056; PMCID: PMC10845884.
  4. Valentini AL, Gui B, Miccò M, Mingote MC, De Gaetano AM, Ninivaggi V, Bonomo L. Benign and Suspicious Ovarian Masses-MR Imaging Criteria for Characterization: Pictorial Review. *J Oncol.* 2012;2012:481806. doi: 10.1155/2012/481806. Epub 2012 Mar 22. PMID: 22536238; PMCID: PMC3321462.
  5. Testa AC, Mascilini F, Quagliozzi L, Moro F, Bolomini G, Mirandola MT, Moruzzi MC, Scambia G, Fagotti A. Management of ovarian masses in pregnancy: patient selection for interventional treatment. *Int J Gynecol Cancer.* 2021 Jun;31(6):899-906. doi: 10.1136/ijgc-2020-001996. Epub 2020 Nov 10. PMID: 33172924.
  6. Leiserowitz GS. Managing ovarian masses during pregnancy. *Obstet Gynecol Surv.* 2006 Jul;61(7):463-70. doi: 10.1097/01.ogx.0000224614.51356.b7. PMID: 16787549.
  7. Canis M, Mashiach R, Wattiez A, Botchorishvili R, Rabischong B, Jardon K, Safi A, Pouly JL, Déchelotte P, Mage G. Frozen section in laparoscopic management of macroscopically suspicious ovarian masses. *J Am Assoc Gynecol Laparosc.* 2004 Aug;11(3):365-9. doi: 10.1016/s1074-3804(05)60052-7. PMID: 15559350.
  8. Cohen Ben-Meir L, Mashiach R, Eisenberg VH. External Validation of the IOTA Classification in Women with Ovarian Masses Suspected to Be Endometrioma. *J Clin Med.* 2021 Jul 1;10(13):2971. doi: 10.3390/jcm10132971. PMID: 34279456; PMCID: PMC8269298.
  9. Topcu HO, Guzel AI, Ozer I, Kokanali MK, Gokturk U, Muftuoglu KH, Doganay M. Comparison of neutrophil/lymphocyte and platelet/ lymphocyte ratios for predicting malignant potential of suspicious ovarian masses in gynecology practice. *Asian Pac J Cancer Prev.* 2014;15(15):6239-41. doi: 10.7314/apjcp.2014.15.15.6239. PMID: 25124604.
  10. Canis M, Pouly JL, Wattiez A, Mage G, Manhes H, Bruhat MA. Laparoscopic management of adnexal masses suspicious at ultrasound. *Obstet Gynecol.* 1997 May;89(5 Pt 1):679-83. doi: 10.1016/s0029-7844(97)81436-6. PMID: 9166300.
  11. Thomassin-Naggara I, Daraï E, Lécure F, Fournier L. Valeur diagnostique de l'imagerie (échographie, doppler, scanner, IRM et TEP-TDM) pour le diagnostic d'une masse ovarienne suspecte et le bilan d'extension d'un cancer de l'ovaire, des trompes ou péritonéal primitif. Article rédigé sur la base de la recommandation nationale de bonnes pratiques cliniques en cancérologie intitulée « Conduites à tenir initiales devant des patientes atteintes d'un cancer épithélial de l'ovaire » élaborée par Francogyn, CNGOF, SFOG, Gineco-Arcagy sous l'égide du CNGOF et labellisée par l'INCa [Diagnostic value of imaging (ultrasonography, doppler, CT, MR, PET-CT) for the diagnosis of a suspicious ovarian mass and staging of ovarian, tubal or primary peritoneal cancer: Article drafted from the French Guidelines in oncology entitled "Initial management of patients with epithelial ovarian cancer" developed by Francogyn, CNGOF, SFOG, Gineco-Arcagy under the aegis of CNGOF and endorsed by INCa]. *Gynecol Obstet Fertil Senol.* 2019 Feb;47(2):123-133. French. doi: 10.1016/j.gofs.2018.12.012. Epub 2019 Jan 25. PMID: 30686729.
  12. Gupta P, Velamala P, Gupta N, Suri V, Lal A, Rohilla M, Dey P, Srinivasan R, Rajwanshi A. Ultrasound-guided fine needle aspiration of ovarian masses: Assessment of diagnostic accuracy and risk stratification using a categorical reporting system. *Cytopathology.* 2021 Jul;32(4):441-458. doi: 10.1111/cyt.12987. Epub 2021 May 20. PMID: 34015167.
  13. Shushan A, Protopapas A, Magos AL. Laparoscopic 'oophorectomy-in-a bag'--an alternative to laparotomy for the evaluation of suspicious ovarian masses. *J Obstet Gynaecol.* 2001 Jul;21(4):399-401. doi: 10.1080/01443610120063720. PMID: 12521837.
  14. Moszynski R, Szubert S, Szperek D, Michalak S, Krygowska J, Sajdak S. Usefulness of the HE4 biomarker as a second-line test in the assessment of suspicious ovarian tumors. *Arch Gynecol Obstet.* 2013 Dec;288(6):1377-83. doi: 10.1007/s00404-013-2901-1. Epub 2013 May 31. PMID: 23722285; PMCID: PMC3825535.
  15. Sinha A, Drews F, Lim K, Pugh ND. Retrospective analysis of suspicious pelvic masses using the Pelvic Mass Index (PMI)

- scoring system from 2007 to 2014. *Eur J Obstet Gynecol Reprod Biol.* 2016 Jun;201:79-84. doi: 10.1016/j.ejogrb.2016.03.017. Epub 2016 Mar 17. PMID: 27082132.
16. Bendifallah S, Body G, Daraï E, Ouldamer L. Pertinence des marqueurs tumoraux, scores (cliniques et biologiques) et algorithmes à visée diagnostique et pronostique devant une masse ovarienne suspecte d'un cancer épithélial. Article rédigé sur la base de la recommandation nationale de bonnes pratiques cliniques en cancérologie intitulée « Conduites à tenir initiales devant des patientes atteintes d'un cancer épithélial de l'ovaire » élaborée par FRANCOGYN, CNGOF, SFOG, GINECO-ARCAGY sous l'égide du CNGOF et labellisée par l'INCa [Diagnostic and prognostic value of tumor markers, scores (clinical and biological) algorithms, in front of an ovarian mass suspected of an epithelial ovarian cancer: Article drafted from the French Guidelines in oncology entitled "Initial management of patients with epithelial ovarian cancer" developed by FRANCOGYN, CNGOF, SFOG, GINECO-ARCAGY under the aegis of CNGOF and endorsed by INCa]. *Gynecol Obstet Fertil Senol.* 2019 Feb;47(2):134-154. French. doi: 10.1016/j.gofs.2018.12.013. Epub 2019 Feb 5. PMID: 30733191.
17. Vicente AP, Gomes AS, Jokubkiene L, Sladkevicius P. Ovarian borderline tumor presenting as ovarian torsion in a 17-year-old patient: a case report. *J Med Case Rep.* 2021 Jan 12;15(1):7. doi: 10.1186/s13256-020-02597-1. PMID: 33436080; PMCID: PMC7802186.