



CLINICAL, IMMUNOLOGICAL, AND RADIOLOGICAL DIAGNOSTIC FEATURES OF OVARIAN TUMORS

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Abstract: Ovarian tumors remain one of the most challenging gynecological pathologies due to their asymptomatic course in early stages and high mortality associated with late diagnosis. This article reviews the clinical manifestations, immunological biomarkers, and modern radiological techniques used in the detection and differential diagnosis of ovarian tumors. Special emphasis is placed on the diagnostic value of tumor markers (CA-125, HE4), the role of multimodal imaging (ultrasound, CT, MRI), and the integration of clinical and laboratory findings for early detection. The review highlights the importance of comprehensive diagnostic algorithms to improve early recognition and patient outcomes.

Keywords: ovarian tumors, diagnosis, CA-125, HE4, ultrasound, CT, MRI, immunological markers, biomarkers

Introduction

Ovarian tumors are among the most common and lethal gynecologic malignancies worldwide. According to global statistics, more than 70% of ovarian cancers are diagnosed at stage III–IV due to the absence of specific early symptoms. Early diagnosis significantly improves survival rates, making the identification of reliable clinical, immunological, and radiological markers a priority in modern gynecology.

Clinically, ovarian tumors often manifest with nonspecific symptoms such as abdominal discomfort, bloating, or menstrual irregularities. Immunological diagnostic methods involving tumor markers have become indispensable tools for early detection and monitoring of the disease. Radiological imaging—including ultrasound, computed tomography (CT), and magnetic resonance imaging (MRI)—provides structural visualization, enabling differentiation between benign and malignant masses.

The aim of this article is to comprehensively analyze the clinical presentation, immunological parameters, and radiological features that aid in the diagnosis of ovarian tumors.

Materials and Methods

This review is based on published scientific literature, international clinical guidelines (ACOG, FIGO, ESMO), and meta-analyses describing diagnostic approaches for ovarian tumors. Data were collected from Scopus, PubMed, and Google Scholar databases. The analysis focused on:

- Clinical symptoms and physical examination findings
- Immunological biomarkers such as CA-125, HE4, AFP, β -hCG, LDH
- Risk assessment indices, including ROMA (Risk of Ovarian Malignancy Algorithm) and RMI (Risk of Malignancy Index)
- Radiological imaging methods: transvaginal ultrasound, Doppler mapping, CT, MRI, PET-CT
- Comparative evaluation of diagnostic accuracy and sensitivity/specificity indicators

Results and Discussion

1. Clinical Features

Early symptoms of ovarian tumors are minimal or nonspecific. Common clinical manifestations include:



- Chronic pelvic pain
- Abdominal distension, bloating
- Early satiety
- Menstrual irregularities
- Palpable abdominal or pelvic mass

On physical examination, adnexal masses may be detected, but clinical findings alone lack sensitivity for screening purposes.

Differential Diagnosis

Ovarian tumors must be distinguished from uterine fibroids, endometriosis, cysts, ectopic pregnancy, and gastrointestinal tumors.

2. Immunological Diagnostic Methods

Immunological testing plays a central role in diagnosing ovarian tumors.

2.1 Tumor Markers

CA-125

- Elevated in 80–90% of epithelial ovarian cancers
- Limited specificity (may increase in endometriosis, pregnancy, pelvic inflammatory disease)
- More informative in postmenopausal women

HE4 (Human Epididymis Protein 4)

- Higher specificity than CA-125
- Useful in early-stage detection
- Main component of ROMA index

AFP, β -hCG, LDH

Useful for diagnosing **germ cell tumors**, especially in younger women.

2.2 Risk Assessment Algorithms

ROMA score

Combines CA-125 and HE4 with menopausal status to estimate malignancy risk.

RMI (Risk of Malignancy Index)

Includes ultrasound score, menopausal status, and CA-125 level.

2.3 Immunohistochemistry (IHC)

Used for final histological confirmation and tumor typing:

- Cytokeratin 7
- WT-1
- PAX8
- Ki-67 proliferation index

3. Radiological Methods

3.1 Ultrasound (USG)

Transvaginal ultrasound is the **first-line diagnostic tool**.

Key sonographic features:

- Septations and papillary projections
- Solid components within cystic masses
- Increased vascularity on Doppler
- Ascites indicating possible malignancy

IOTA Classification

The International Ovarian Tumor Analysis (IOTA) group provides validated rules for benign vs malignant mass differentiation.



3.2 Computed Tomography (CT)

CT is especially useful for:

- Determining tumor spread
- Detecting metastasis
- Evaluating lymph node involvement

It is recommended for staging according to FIGO guidelines.

3.3 Magnetic Resonance Imaging (MRI)

MRI has high soft-tissue contrast resolution and differentiates:

- Solid vs cystic masses
- Hemorrhagic vs mucinous content

Diffusion-weighted imaging (DWI) improves diagnostic accuracy.

3.4 PET-CT

Used when other imaging results are inconclusive. Detects metabolically active lesions.

Conclusion

Timely diagnosis of ovarian tumors requires a comprehensive approach combining clinical evaluation, immunological testing, and radiological imaging. Clinical symptoms alone are insufficient for early detection; therefore, tumor markers such as CA-125 and HE4, along with ROMA and RMI indices, significantly enhance diagnostic accuracy. Radiological methods—especially ultrasound and MRI—play a critical role in differentiating benign from malignant masses.

Integrated diagnostic algorithms improve early detection, reduce misdiagnosis, and facilitate personalized treatment planning, ultimately improving patient prognosis.

References (APA style)

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