Submitted: 07 March, 2025 Accepted: 21 April, 2025 Published: 15 June, 2025 DOI:10.22514/ejgo.2025.088

ORIGINAL RESEARCH

European Journal of Gynaecological Oncology

Analysis of the clinical value of O-RADS classification combined with hematological indexes in the diagnosis of benign and malignant tumors of ovary-adnexa

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Abstract

Background: This study aimed to analyze the clinical value of the Ovarian-Adnexal Reporting and Data System (O-RADS) classification combined with hematological indices for the diagnosis of benign and malignant ovarian-adnexa. **Methods**: A retrospective analysis of 153 cases of ovarian adnexal masses was performed. All patients underwent O-RADS classification, and hematological indexes were measured upon admission, including neutrophil-to-lymphocyte ratio (NLR), C-reactive protein (CRP), fibrinogen (FIB), carbohydrate antigen 125 (CA125), carbohydrate antigen 199 (CA199) and human epididymis protein 4 (HE4). **Results**: The diagnostic results of O-RADS classification were consistent with the pathological findings in 134 cases, while 19 cases showed discrepancies, yielding an accuracy rate of 87.58%, demonstrating good agreement (Kappa = 0.713, $p < 0.001$). Compared with the benign group, patients in the malignant group exhibited a significantly higher proportion of tumors >5 cm in size (54.81%), as well as elevated neutrophil count, NLR, FIB, CRP, CA125, HE4 and CA199 levels ($p < 0.05$). Lymphocyte counts were significantly lower in the malignant group ($p < 0.05$). Multivariate analysis identified NLR, FIB, CRP, CA125 and HE4 as independent risk factors for ovarian-adnexal tumors ($p < 0.05$). The area under the curve (AUC) values for diagnosing ovarian-adnexal malignancy were as follows: NLR (0.813), FIB (0.788), CRP (0.780), CA125 (0.816), HE4 (0.771) and CA199 (0.604). The combined assessment of hematological indexes yielded an AUC of 0.844. Notably, the combination of O-RADS classification combined with hematological indexes achieved the highest diagnostic performance, with an AUC of 0.955, significantly higher than that of O-RADS or and hematological indexes alone ($p < 0.05$). **Conclusions**: Combining O-RADS classification with hematological indexes significantly enhances the diagnostic accuracy for distinguishing benign from malignant ovarian-adnexal masses. This integrated approach facilitates earlier detection and holds significant potential for clinical application in routine screening and diagnosis.

Keywords

Ovarian-adnexal reporting and data system; Hematological indicators; Ovarian tumors; Malignancy; Diagnostic accuracy

1. Introduction

Ovarian-adnexal tumors are common gynecological conditions characterized by insidious onset and nonspecific early symptoms. As a result, many patients are diagnosed at advanced stages, when therapeutic outcomes are poor and prognosis is unfavorable [1]. According to statistics, ovarian cancer has the highest mortality rate among all gynecological malignancies. While early-stage ovarian cancer patients can achieve a 5-year survival rate exceeding 90% with surgical treatment, this rate drops to below 20% in advanced-stage cases [2]. Therefore, accurately distinguishing between benign and malignant ovarian-adnexal tumors is crucial for the development of a reasonable treatment strategy and improving patient survival and quality of life.

Traditional ultrasound diagnosis mainly relies on the experience of ultrasound technicians, lacking standardized reporting protocols. This subjectivity often leads to inconsistent diagnostic interpretations among physicians, compromising both accuracy and reliability. To address this issue, the American College of Radiology (ACR) introduced the Ovarian-Adnexal Reporting and Data System (O-RADS) in 2019. O-RADS provides a standardized framework for interpreting and reporting ultrasound findings of ovarian-adnexal masses, aiming to reduce inter-observer variability and enhance diagnostic accuracy and consistency [3].

Tumor markers such as carbohydrate antigen 125 (CA125), carbohydrate antigen 199 (CA199), and human epididymis protein 4 (HE4) are widely recognized for their clinical utility in the screening, diagnosis and treatment monitoring of ovarian cancer. These are among the most commonly used hematological markers in routine clinical practice [3, 4]. In addition, the progression of ovarian-adnexal tumors including tumor growth, invasion and necrosis, may trigger a systemic inflammatory response, resulting in elevated levels of inflammatory markers such as C-reactive protein (CRP) and NLR (neutrophil-to-lymphocyte ratio) [5]. Studies have shown that by detecting the level of inflammatory indicators, it can assist in determining whether there is an inflammatory response in patients with ovarian-adnexal tumors, as well as the intensity of the inflammatory response, and thus provide a reference for the determination of the benign-malignant nature of the tumor [6].

Fibrinogen (FIB), a key component of the coagulation system, not only plays a central role in hemostasis, but is also closely related to inflammation and tumor development. Wu J *et al*. [7] found that elevated levels of FIB may promote tumor cell adhesion, migration and invasion and contribute to tumor progression and metastasis by affecting blood rheology, highlighting its potential diagnostic value in the ovarian cancer. Although individual serum markers offer some value in the assessment of ovarian-adnexal benign-malignancy, their diagnostic accuracy remains limited due to susceptibility to false-positive and false-negative results. Therefore, this study aimed to evaluate the combined diagnostic utility of the O-RADS classification and selected hematological markers to improve the differentiation between benign and malignant ovarian-adnexal tumors.

The findings of this study are expected to serve as a valuable reference for enhancing the diagnostic accuracy and guiding clinical management of ovarian-adnexal tumors.

2. Materials and methods

2.1 Patients

Clinical data were retrospectively collected from 153 patients diagnosed with ovarian-adnexal tumors admitted to our hospital between May 2022 and October 2024. Inclusion criteria: (1) Ovarian-adnexal tumors confirmed by postoperative pathological examination; (2) Availability of complete clinical and laboratory data. Exclusion criteria: (1) Presence of other concurrent malignant tumors; (2) Received antitumor treatment such as chemotherapy and radiotherapy before surgery; (3) Pregnancy and lactation; (4) Presence of cardiac, hepatic, renal and other major organ dysfunction.

2.2 O-RADS classification assessment

Ultrasound examinations were performed following standardized clinical protocols. For transvaginal ultrasound, patients were instructed to empty their bladders prior to the examination to enhance the ultrasound waves penetration and image clarity. The examination was conducted with the patient in the lithotomy position using a Mindray Resona 7 color Doppler ultrasound system (Resona 7, Mindray Medical Systems, Guangzhou, Shenzhen, China) equipped with a transvaginal probe operating at 7.5 MHz. Ovarian morphology, borders, internal echotexture and vascularity were evaluated. In cases where transvaginal ultrasound was not feasible, transabdominal ultrasound was performed with the patient in a supine position using a probe frequency of 3–5 MHz. The probe was gently pressurized over the lower abdomen to ensure adequate visualization of the adnexal structures.

Ovarian masses were classified according to the Ovarian-Adnexal Reporting and Data System (O-RADS) [8]: category 0: incomplete assessment due to technical factors; category 1: no abnormal ovarian tissue, physiologic mass, no risk of malignancy; category 2: inflammatory infections, changes in hormone levels, risk of malignancy $<1\%$; category 3: simple ovarian cysts ≥ 10 cm, risk of malignancy $<10\%$; category 4: moderate risk of malignancy, 10% to 50%; and category 5: high risk of malignancy $\geq 50\%$. Categories 4–5 were used as positive results (malignant tumors) and categories 0–3 as negative results (benign tumors).

Lesion vascularity was scored according to the criteria developed by the International Ovarian Tumor Analysis Group [9]: score 1, no blood flow; score 2, little blood flow; score 3, moderate blood flow; and score 4, abundant blood flow.

2.3 Detection of hematological indicators

Fasting peripheral venous blood samples were collected from all patients in the early morning, one day prior to surgery. Peripheral blood cells counts, including white blood cells, neutrophils, lymphocytes, monocytes and platelets were detected using a blood counting instrument (Sysmex XE-2100, Sysmex, Kobe, Japan). Then, NLR was calculated, NLR: neutrophil-to-lymphocyte ratio. Serum CRP level (latex turbidimetric method) was measured using TBA-FX8 Autolas automatic biochemical analyzer (Toshiba, Minato-ku, Tokyo, Japan). FIB level was detected using automatic blood coagulation analyzer (TOP 750, Wolfen, Beijing, China). Tumor markers CA199, CA125 and HE4 were quantified via chemiluminescence immunoassay using the Cobas 8000 automatic analyzer (Roche Diagnostics, Mannheim, BW, Germany).

2.4 Determination of the gold standard

Postoperative pathological diagnosis was used as the gold standard for determining the benign-malignant nature of ovarian-adnexal tumors. All patients underwent surgical treatment after completing ultrasound O-RADS classification examination and hematological index testing. The surgical approach was selected according to the patient's specific situation (*e.g.*, age, fertility needs, tumor size, nature, *etc.*). During surgery, the entire tumor tissue was excised and sent to the pathology department for examination. The patients were categorized into benign and malignant groups based on the results of the pathology examination.

2.5 Statistical analysis

Statistical analysis was performed using SPSS26.0 (SPSS, Inc., Chicago, IL, USA). Data that followed a normal distribution were expressed as mean $\pm$ standard deviation, and com-

parisons between groups were made using the independent *t*-test. For non-normally distributed data, values were presented as median (interquartile spacing), and comparisons were performed using nonparametric tests. Categorical variables were described as counts (percentages). The Kappa test was used to evaluate the agreement between the O-RADS assessment of benign and malignant tumors and pathological findings. Kappa values of 0.01–0.20 indicated poor agreement, Kappa values >0.20–0.40 indicated fair agreement, Kappa values >0.40–0.60 indicated moderate agreement, Kappa values >0.60–0.80 indicated good agreement, and Kappa values >0.80–1.00 indicated excellent agreement. Multivariate logistic regression was used to analyze the influencing factors of the benign and malignant nature of ovarian-adnexal tumors. The diagnostic efficacy of O-RADS classification and laboratory indexes on the benign-malignant nature of ovarian-adnexal masses was analyzed by using receiver objective characteristic curve (ROC). The area under the curve (AUC) was used to assess diagnostic accuracy: AUC <0.7 indicated low predictive efficacy, 0.7 to 0.79 indicated moderate predictive efficacy, 0.8 to 0.9 indicated high predictive efficacy, and AUC >0.9 indicated very high predictive efficacy. A p-value of < 0.05 was considered statistically significant.

3. Results

3.1 Clinicopathologic findings

A total of 153 ovarian-adnexal masses were identified in the 153 patients included in this study. Pathologic examination classified 104 masses as malignant (malignant group), which included 81 serous cystadenocarcinomas, 11 mucinous cystadenocarcinomas, 9 clear cell carcinomas of the ovary and 3 endometrioid adenocarcinomas. The remaining 49 masses were benign masses (benign group) and included 20 endometrioid cysts of the ovary, 12 serous cystadenomas, 7 mature teratomas, 6 hemorrhagic luteal cysts and 4 tubal mesenteric cysts.

3.2 Agreement between O-RADS classification and pathologic findings

O-RADS classification showed that the masses diagnosed as malignant were 105 cases out of which 10 cases had benign pathologic findings. It also diagnosed 48 cases as benign, of which 9 cases had malignant pathologic findings. The O-RADS classification of ovarian-adnexal tumors was consistent with the pathological findings in 134 cases, while 19 cases were inconsistent, yielding an accuracy rate of 87.58%. The agreement between O-RADS classification and pathological diagnosis was good, with a Kappa coefficient of 0.713 ($p < 0.001$, Table 1).

3.3 Comparison of clinical data between patients in the malignant and benign groups

There was no statistically significant difference between patients in the benign and malignant groups in terms of age and body mass index (BMI) ($p > 0.05$). Compared with the benign group, patients in the malignant group had significantly higher percentage of tumors >5 cm, neutrophil count, NLR, FIB, CRP, CA125, HE4, CA199 levels ($p < 0.05$) and significantly lower lymphocyte count ($p < 0.05$, Table 2).

3.4 Multivariate analysis of benign-malignant nature of ovarian-adnexal tumors

The benign-malignant status of ovarian-adnexal tumors was treated as the dependent variable (malignant = 1, benign = 0), and the indicators with statistically significant differences (as shown in Table 2) were included as independent variables in the logistic regression analysis. The results showed that NLR, FIB, CRP, CA125 and HE4 were all significant risk factors for malignancy in ovarian-adnexal tumors ($p < 0.05$), as shown in Table 3.

3.5 Clinical value of hematological indices alone and in combination for diagnosing ovarian-adnexal benign-malignant tumors

The ROC results showed that the AUCs of NLR, FIB, CRP, CA125, HE4 and CA199 for diagnosing ovarian-adnexal benign-malignant tumors were 0.813, 0.788, 0.780, 0.816, 0.771 and 0.604, respectively (Fig. 1 and Table 4). Since the AUC of CA199 was lower than 0.7, suggesting a low diagnostic efficacy, it was excluded from the subsequent analysis. NLR, FIB, CRP, CA125 and HE4 were included in the logistic regression model. The numerical formula for the joint hematological indexes was obtained through the regression coefficient: Hematological indexes = -20.688 + 1.935 × NLR + 1.261 × FIB + 0.172 × CRP + 0.094 × CA125 + 0.046 × HE4. The results showed that the AUC for the combined diagnosis of hematologic indicators was 0.844, with a sensitivity of 86.54% and a specificity of 81.63% (Fig. 1 and Table 4).

TABLE 1. Four-compartment table of O-RADS classification for diagnosis of benign-malignant ovarian-adnexal tumors.

O-RADS classification	Pathology gold standard		Total
	Malignant	Benign	
Malignant	95	10	105
Benign	9	39	48
Total	104	49	153

O-RADS: Ovarian-Adnexal Reporting and Data System.

TABLE 2. Comparison of clinical data of patients in malignant and benign groups.

Parameters	Malignant group (n = 104)	Benign group (n = 49)	t/χ^2	p
Age (yr)	55.66 ± 4.40	54.51 ± 4.81	1.467	0.144
BMI (kg/m^2)	21.59 ± 1.66	21.20 ± 1.74	1.366	0.174
Tumor size (n (%))				
>5 cm	57 (54.81)	15 (30.61)	7.827	0.005
≤5 cm	47 (45.19)	34 (69.39)		
Neutrophil count (×10^9/L)	5.34 ± 0.91	4.31 ± 0.80	7.091	<0.001
Lymphocyte count (×10^9/L)	2.07 ± 0.41	2.31 ± 0.41	3.271	0.001
NLR	2.68 ± 0.73	1.94 ± 0.57	6.800	<0.001
FIB (g/L)	3.56 ± 0.70	2.82 ± 0.64	6.474	<0.001
CRP (mg/L)	23.04 ± 6.46	16.54 ± 4.62	7.107	<0.001
CA199 (U/mL)	29.68 ± 6.23	27.21 ± 5.88	2.378	0.021
CA125 (U/mL)	55.08 ± 9.73	41.47 ± 10.15	7.841	<0.001
HE4 (pmol/L)	123.32 ± 25.94	97.42 ± 21.55	6.486	<0.001

BMI: body mass index; NLR: neutrophil-to-lymphocyte ratio; FIB: fibrinogen; CRP: C-reactive protein; CA: carbohydrate antigen; HE4: human epididymis protein 4.

TABLE 3. Multivariate analysis of the benign and malignant nature of ovarian-adnexal tumors.

Variables	β	S.E.	Wald	OR	95% CI	p
NLR	1.935	0.538	12.938	6.926	2.413–19.882	<0.001
FIB	1.261	0.444	8.069	3.529	1.478–8.423	0.005
CRP	0.172	0.054	10.121	1.188	1.068–1.320	0.001
CA125	0.094	0.028	11.721	1.099	1.041–1.160	0.001
HE4	0.046	0.014	10.966	1.047	1.019–1.076	0.001

NLR: neutrophil-to-lymphocyte ratio; FIB: fibrinogen; CRP: C-reactive protein; CA: carbohydrate antigen; HE4: human epididymis protein 4; S.E.: standard error; OR: Odds Ratio; CI: confidence interval.

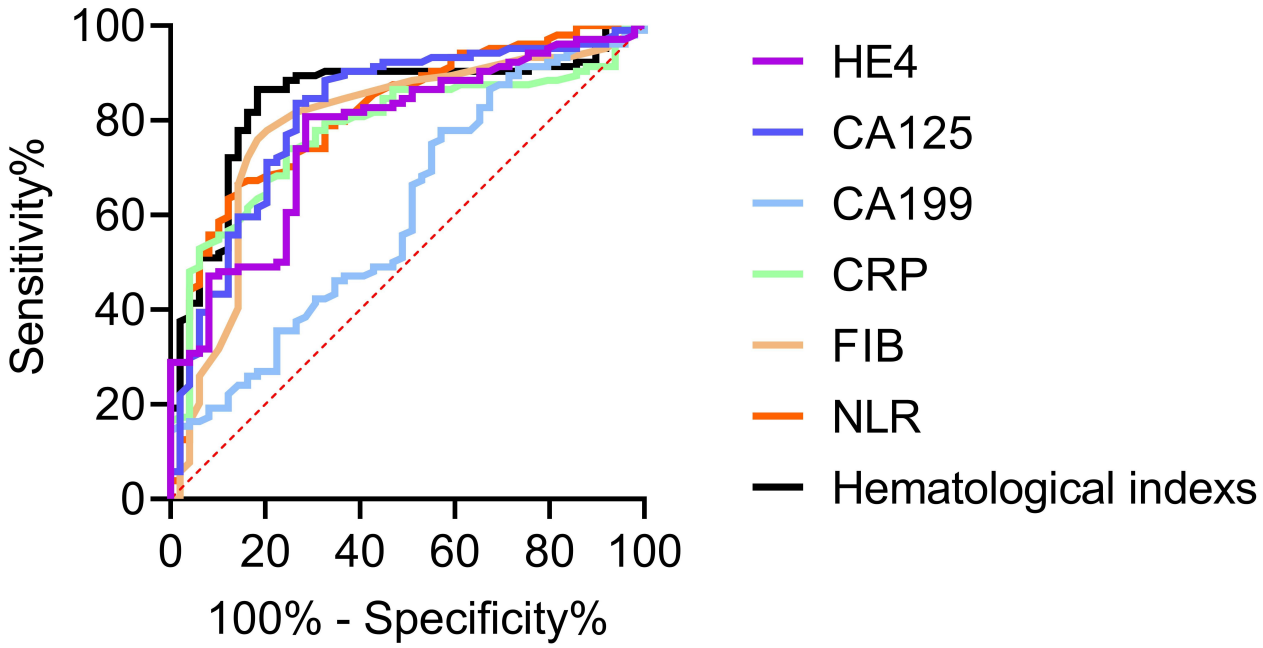

FIGURE 1. ROC curve of hematological indicators for diagnosis of benign-malignant tumors of the ovary-adnexa. NLR: neutrophil-to-lymphocyte ratio; FIB: fibrinogen; CRP: C-reactive protein; CA: carbohydrate antigen; HE4: human epididymis protein 4.

TABLE 4. Clinical value of hematologic indices alone and in combination for diagnosis of benign-malignant tumors of the ovary-adnexa.

Variables	AUC	Cut-off	95% CI	Sensitivity (%)	Specificity (%)	Youdne's index	*p*
NLR	0.813	2.37	0.742–0.871	66.35 (69/104)	85.71 (42/49)	0.521	<0.001
FIB	0.788	3.05	0.715–0.850	75.96 (79/104)	81.63 (40/49)	0.576	<0.001
CRP	0.780	18.20	0.705–0.842	74.04 (77/104)	75.51 (37/49)	0.495	<0.001
CA125	0.816	45.20	0.746–0.874	83.65 (87/104)	73.47 (36/49)	0.571	<0.001
HE4	0.771	100.80	0.696–0.835	80.77 (84/104)	71.43 (35/49)	0.522	<0.001
CA199	0.604	25.05	0.522–0.682	77.88 (81/104)	42.86 (21/49)	0.207	0.037
Hematological indexes	0.844	1.03	0.777–0.898	86.54 (90/104)	81.63 (40/49)	0.682	<0.001

NLR: neutrophil-to-lymphocyte ratio; FIB: fibrinogen; CRP: C-reactive protein; CA: carbohydrate antigen; HE4: human epididymis protein 4; AUC: area under the curve; CI: confidence interval.

3.6 Clinical value of O-RADS classification combined with hematological indicators in diagnosing benign-malignant tumors of ovary-adnexa

The combination of O-RADS classification and hematological indicators was included in the logistic regression analysis. The formula for calculating the value of the union was obtained through the regression coefficient: Combine = −3.176 + 0.758 × hematological indexes + 4.409 × O-RADS classification. The ROC results showed that the AUC of the joint was 0.955, which was higher than the hematological index (Z = 3.535, p < 0.001, Table 5 and Fig. 2) and O-RADS classification (Z = 4.363, p < 0.001, Table 5 and Fig. 2).

4. Discussion

O-RADS classification is mainly based on ultrasound analysis of various morphological features such as morphology, size, borders, internal echogenicity and blood flow of ovarian-adnexal masses [10]. By evaluating these features, ultrasound can effectively visualize the external features of the tumor. For example, benign tumors usually have regular morphology, well-defined borders, homogeneous internal echoes and minimal blood flow signals, while malignant tumors tend to have irregular morphology, blurred borders, heterogeneous internal echoes and abundant blood flow.

In this study, O-RADS classification categories 4 to 5 were defined as malignant, identifying 105 malignant and 48 benign cases. The accuracy of O-RADS in diagnosing benign-malignant ovarian-adnexal tumors was 87.58% with good overall concordance when compared to pathological findings. Du *et al*. [11] mentioned in their study that O-RADS has the ability to predict the risk of malignancy in ovarian tumors and can provide an important reference for clinical diagnosis and treatment, which is consistent with the results of this study. Therefore, O-RADS classification is a useful and practical tool for determining the benign-malignant nature of ovarian-adnexal tumors, aiding clinicians in making informed decisions, reducing unnecessary surgeries and avoiding over-treatment.

However, there are some limitations in the application of O-RADS classification. Since the classification system relies predominantly on the characteristics of ultrasound images, there is a risk of misdiagnosis or missed diagnosis of some tumors that present atypical ultrasound features. The wide variety of pathological types in ovarian-adnexal tumors are complex and diverse, and tumors adds to the complexity, as tumors with different histological types may present similar ultrasound findings, which can further complicate the diagnostic process [12]. Therefore, to enhance diagnostic accuracy, it is necessary to combine the patient's other clinical findings, such as hematological biomarkers, alongside ultrasound imaging for a more comprehensive evaluation.

The results of this study revealed that patients in the malignant group had significantly higher levels of neutrophil count, NLR, FIB, CRP, CA125, HE4 and CA199, while lymphocyte count was low. Further analysis revealed that NLR, FIB, CRP, CA125 and HE4 were independent risk factors for malignancy of ovarian-adnexal tumors. In addition, the ROC results showed that NLR, FIB, CRP, CA125 and HE4 had some diagnostic efficacy for ovarian-adnexal malignant tumors (AUC >0.7), and the diagnostic efficacy of the combination of multiple indicators was higher.

In the tumor microenvironment, tumor cells secrete cy-

TABLE 5. Clinical value of O-RADS classification in combination with hematological indices in diagnosing benign-malignant tumors of the ovary-adnexa.

Variables	AUC	Cut-off	95% CI	Sensitivity (%)	Specificity (%)	Youdne's index	*p*
O-RADS classification	0.855	0.50	0.789–0.906	91.35 (95/104)	79.59 (39/49)	0.709	<0.001
Hematological indexes	0.844	1.03	0.777–0.898	86.54 (90/104)	81.63 (40/49)	0.682	<0.001
Combine	0.955	--	0.908–0.982	83.65 (87/104)	93.88 (46/49)	0.775	<0.001

O-RADS: Ovarian-Adnexal Reporting and Data System; AUC: area under the curve; CI: confidence interval.

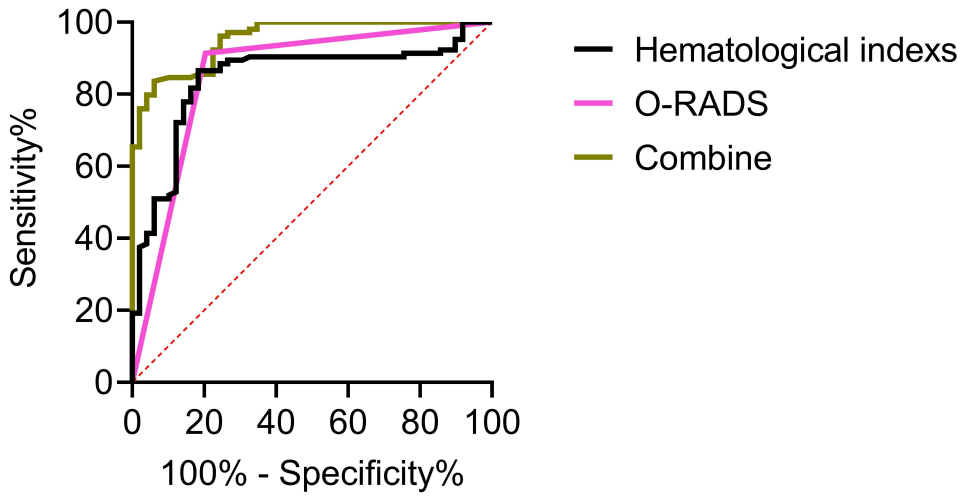

FIGURE 2. ROC curve of O-RADS classification combined with hematological indicators for diagnosis of benign-malignant tumors of ovary-adnexa. O-RADS: Ovarian-Adnexal Reporting and Data System.

tokines such as granulocyte colony-stimulating factor (GCSF), which stimulates the bone marrow to release more neutrophils into the peripheral blood. This increases the number of neutrophils in the tumor microenvironment and decreases the number of lymphocytes, which in turn elevates the NLR [13]. Elevated NLR reflects the state of inflammation and immune imbalance in the body and suggests malignant progression of the tumor. In ovarian-adnexal malignant tumors, the growth, infiltration, and necrosis of tumor cells activate the body's intrinsic immune cells, such as macrophages, causing them to secrete pro-inflammatory cytokines. These cytokines in turn, act on the liver to stimulate the synthesis and release of CRP [14, 15]. Detection of elevated CRP levels can assist in determining the degree of tumor malignancy and disease progression. FIB, as an acute-phase reactive coagulation protein, tends to have elevated levels in patients with malignant tumors. The fibrin formed by the breakdown of FIB provides a scaffold for the growth, infiltration, and metastasis of cancer cells and contributes to tumor infiltration and metastasis [16]. CA125 and HE4 are common clinical tumor markers with significantly elevated expression in ovarian epithelial carcinoma. Changes in CA125 and HE4 levels are closely related to tumor occurrence and development and can be used as important indicators for early diagnosis [14, 17]. The biological effects of interleukin (IL)-6 under physiological and pathological conditions involve various cells and organs [18]. This cytokine stimulates the production of acute phase proteins, including CRP and FIB. Therefore, alterations in the levels of CRP and FIB may provide clinical insights for differentiating between benign and malignant ovarian tumors. A comprehensive analysis of CRP and FIB as potential biomarkers in combination with other pro-inflammatory cytokines, such as CA125 and HE4, may better aid in the identification of ovarian cancer. In line with this, the present study further combined the O-RADS classification with serologic indicators, significantly improving the accuracy compared to a single diagnostic modality.

Magnetic resonance imaging (MRI) offers high soft tissue resolution and can clearly delineate the internal structure of ovarian masses, such as the thickness of the cystic wall, the presence or absence of papillary structures, and the distribution of solid components. However, MRI examinations are costly and not all medical institutions are equipped with MRI equipment. In addition, the cost of ultrasound examination is relatively low and is popular in medical institutions at all levels; the testing of hematology indicators is relatively simple and cheap. In addition, some patients are clinically unable to undergo MRI (such as claustrophobia, pacemaker implantation or renal dysfunction). Therefore, although MRI has advantages in the diagnosis of ovarian tumors, ultrasound O-RADS classification combined with hematological indicators also has its unique value.

However, this study also has some limitations. First, the sample size of this study is relatively small, which may affect the generalizability and stability of the results. As a single-center, retrospective analysis, this study may also be subject to have geographical limitations. It is necessary to expand the sample size and conduct a multicenter prospective study in future studies to enhance the reliability of the findings. In addition, this study mainly focused on the value of ultrasound O-RADS classification combined with hematological indicators in the preoperative diagnosis of benign and malignant ovari-adnexa tumors. During the progression and treatment of ovari-adnexal tumors, hematological indicators may change dynamically with time and disease status. However, this study did not conduct an in-depth analysis of the trends of preoperative and postoperative hematological parameters, which also limited a comprehensive understanding of the relationship between hematological parameters and ovari-adnexal tumors to a certain extent. Therefore, monitoring and analysis of trends in postoperative hematological parameters should be included in future studies.

Long-term follow-up could provide valuable insights into the relationship between dynamic changes in these markers and patient prognosis. Establishing a more comprehensive system for disease monitoring and prognosis assessment would allow clinicians to better understand patient conditions, develop more personalized treatment plans, and ultimately improve survival rates and quality of life.

5. Conclusions

In conclusion, combining O-RADS classification with hematological indicators allows for more accurate preoperative determination of the benign or malignant nature of ovarian-adnexal tumors. This integrated approach could improve early screening and diagnosis of ovarian-adnexal masses, providing a crucial reference for timely and precise treatment.

AVAILABILITY OF DATA AND MATERIALS

The authors declare that all data supporting the findings of this study are available within the paper and any raw data can be obtained from the corresponding author upon request.

AUTHOR CONTRIBUTIONS

LWZ—designed the study and carried them out. LWZ, LZ, CLZ—supervised the data collection; analyzed the data; interpreted the data; prepared the manuscript for publication and reviewed the draft of the manuscript. All authors have read and approved the manuscript.

ETHICS APPROVAL AND CONSENT TO PARTICIPATE

Ethical approval was obtained from the Ethics Committee of Lishui people's Hospital (Approval no. 2024-11-01). This retrospective study was approved by an ethics review board, and the requirement to obtain informed written consent was waived.

ACKNOWLEDGMENT

Not applicable.

FUNDING

This research received no external funding.

CONFLICT OF INTEREST

The authors declare no conflict of interest.

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How to cite this article: Lewei Zhan, Li Zhang, Chunlai Zhang. Analysis of the clinical value of O-RADS classification combined with hematological indexes in the diagnosis of benign and malignant tumors of ovary-adnexa. European Journal of Gynaecological Oncology. 2025; 46(6): 133-139. doi: 10.22514/ejgo.2025.088.