Am J Cancer Res 2024;14(10):4868-4879
www.ajcr.us /ISSN:2156-6976/ajcr0158740

Original Article

Predict value of tumor markers combined with interleukins for therapeutic efficacy and prognosis in ovarian cancer patients

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Received June 25, 2024; Accepted September 29, 2024; Epub October 15, 2024; Published October 30, 2024

Abstract: Ovarian cancer (OC) is the most prevalent and fatal malignancy of the female reproductive system, with the majority of patients diagnosed at an advanced stage due to the lack of early screening. Despite surgery and chemotherapy being the standard treatments, overall survival rates have not improved significantly, highlighting the need for new biomarkers for therapeutic efficacy and prognostic evaluation. This study aimed to clarify the application value of tumor markers (TMs), including carbohydrate antigen 125 (CA125), alpha-fetoprotein (AFP), and carcinoembryonic antigen (CEA), combined with interleukins (ILs), such as IL-1β, IL-2, IL-6, IL-8, and IL-10, in the evaluation of therapeutic efficacy and prognosis of OC, and to establish a prediction model. A retrospective analysis was conducted on 184 OC patients treated at the Affiliated Hospital of Henan University of Traditional Chinese Medicine from February 2020 to February 2023. Serum levels of CA125, AFP, and CEA were quantified by chemiluminescence immunoassay, and ILs by enzyme-linked immunosorbent assays. Significant decreases in CA125, AFP, CEA, IL-1β, IL-2, IL-6, and IL-10 levels were observed after treatment (all P<0.001), while IL-8 levels showed no significant change (P=0.597). The death group exhibited notably higher levels of CA125, IL-6, and IL-8 than the survival group (all P<0.001). Cox regression analysis identified CA125, IL-8, histological grading, ascites, intravascular tumor thrombus, and International Federation of Gynecology and Obstetrics (FIGO) staging as independent prognostic factors. The Nomogram model based on these factors showed strong predictive ability in predicting patient mortality with an area under the curve (AUC) of 0.756. In conclusion, the combination of TMs and ILs is valuable in evaluating therapeutic efficacy and prognosis in OC. Dynamic monitoring of CA125, IL-6, and IL-8 can guide clinical treatment adjustments, improving diagnostic accuracy and prognosis reliability.

Keywords: Ovarian cancer, tumor markers, interleukin, therapeutic efficacy evaluation, prognosis evaluation, CA125, IL-6, L-8

Introduction

Ovarian cancer (OC) is the most common and lethal malignancy of the female reproductive system, with the highest mortality rate among all gynecologic malignancies [1]. With changes in lifestyles, OC has shown a trend towards earlier onset, posing a major health threat to Chinese women and contributing to major public health problems and economic burdens [2]. OC is highly heterogeneous, with epithelial OC (EOC) accounting for 90%, which can be further divided into serous carcinoma, endometrioid carcinoma, clear cell carcinoma, and mucinous carcinoma [3]. Due to the anatomical characteristics of the ovaries, the early symptoms of OC are often subtle, and the lack of effective screening and early diagnostic measures results in about 70% of patients being diagnosed at an advanced stage; however, the 5-year survival of early OC can be up to 90% [4]. Occult symptoms, high propensity to metastasize, and

lack of screening methods are the primary reasons for the high mortality and poor prognosis of advanced OC [5]. Currently, surgery plus chemotherapy is the standard treatment for OC. Although emerging therapies such as anti-angiogenic drugs, PARP inhibitors, and immunosuppressants are increasingly being utilized in the treatment of OC, overall survival has not improved significantly [6]. Therefore, there is an urgent need for new biomarkers and treatment strategies to improve the prognosis and survival rate of OC patients.

Tumor markers (TMs) are substances existing in the blood, urine, or tissues that may fluctuate in the presence of cancer [7]. These markers can be used to diagnose cancer, monitor disease progression, evaluate therapeutic efficacy, and predict prognosis. Carbohydrate antigen 125 (CA125), alpha-fetoprotein (AFP), and carcinoembryonic antigen (CEA) are three essential TMs commonly used in the diagnosis and treatment evaluation of OC [8]. CA125, a high-molecular-weight glycoprotein, is widely used to monitor disease state and assess chemotherapy response in OC patients [9]. Its expression level during chemotherapy can help predict a patient's chemotherapy sensitivity and overall efficacy; however, its specificity is limited, as it can also increase in some benign conditions. AFP is mainly used to detect hepatocellular carcinoma and germinoma, but it also has some application in OC diagnosis when used in combination with other markers to improve the diagnostic specificity and sensitivity [8]. CEA is a protein found in embryonic tissues that is elevated in certain malignancies [10].

Interleukins (ILs) are cytokines that play a critical role in the development and treatment of OC [11]. They affect OC progression by regulating immune responses, modulating inflammation, and affecting the tumor microenvironment (TME) [12]. IL-6 enhances cell growth and chemotherapy resistance through JAK/STAT3 signaling in OC and reduces chemotherapy sensitivity by increasing the expression of multidrug resistance proteins and anti-apoptosis proteins [13]. IL-1β protects cancer cells by regulating nitric oxide-mediated expression of caspases and upregulating human leukocyte antigen-G expression in TME, thus mediating immunosuppression [14]. The high expression of IL-8 in OC patients is linked to cancer metastasis and poor chemosensitivity, which enhances tumor invasion by promoting angiogenesis and macrophage infiltration [15]. IL-10 interferes with anti-tumor response by inhibiting the proliferation and activity of T cells and dendritic cells and promotes tumor escape by downregulating MHCI expression [16].

With advances in medical technology, the clinical application value of serum biomarkers for tumor diagnosis, efficacy evaluation, and prognosis judgment has become increasingly prominent, providing important information for tumor research. Dynamic monitoring of changes in serum biomarkers not only helps doctors adjust treatment regimens in a timely manner, but also facilitates the early detection of disease progression. Given the limited sensitivity and specificity of a single biomarker in the assessment of tumor efficacy and prognosis, combined testing has been proposed to overcome these limitations and improve diagnostic accuracy. In this study, the levels of TMs and ILs in the serum of OC patients before and after chemotherapy were monitored and statistically analyzed to evaluate their predictive implications for therapeutic efficacy and prognosis, and to establish a predictive model incorporating clinically meaningful prognostic indicators.

Methods and materials

Patient data

A retrospective analysis was performed on OC patients treated at the Affiliated Hospital of Henan University of Traditional Chinese Medicine from February 2020 to February 2023. This study was conducted after obtaining approval from the hospital's Medical Ethics Committee. Due to the retrospective nature, informed consent was waived (**Figure 1**).

Eligibility and exclusion criteria

Inclusion criteria: Pathological diagnosis of EOC, peritoneal cancer, or fallopian tube cancer after open surgery, laparoscopic surgery, or core needle biopsy; presence of at least one lesion detected by computerized tomography (CT) or magnetic resonance imaging (MRI); estimated survival ≥6 months; standard first-line chemotherapy administered (paclitaxel + carboplatin); Eastern Cooperative Oncology Group (ECOG) score: 0-2.

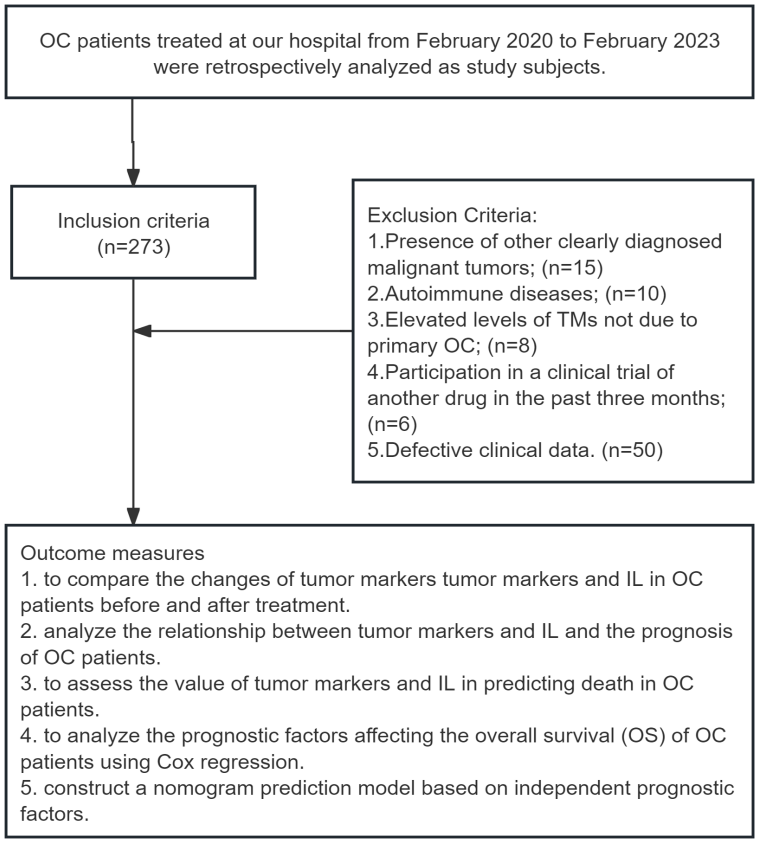

Figure 1. Study flow chart.

Table 1. Baseline data of ovarian cancer patients

Variables	Total number of people
Age	
≥55 years old	86 (46.74%)
<55	98 (53.26%)
Pathological type	
Serous	150 (81.52%)
Nonserous	34 (18.48%)
Histological grading	
Poorly differentiated	55 (29.89%)
Moderately or well differentiated	129 (70.11%)
Ascites	
With	51 (27.72%)
Without	133 (72.28%)
Intravascular tumor thrombus	
With	45 (24.46%)
Without	139 (75.54%)
FIGO staging	
III-IV	71 (38.59%)
I-II	113 (61.41%)

Note: FIGO, International Federation of Gynecology and Obstetrics.

Exclusion criteria: Presence of other malignant tumors; autoimmune diseases; increased levels of TMs caused by non-primary OC (such as adenomyosis or endometriosis); participation in clinical trials of other drugs in the past three months; incomplete or missing clinical data.

Sample collection

A total of 273 samples were initially screened according to the eligibility criteria. After excluding 89 samples based on the exclusion criteria, 184 samples met the requirements and were finally included as study participants (**Table 1**).

Acquisition of clinical data

Patients' clinical data, laboratory indicators, and survival data were obtained through electronic medical records, outpatient review records, and telephone follow-ups. The clinical data included age, pathological type, histological grading, ascites, intravascular tumor thrombus, and International Federation of Gynecology and Obstetrics (FIGO) staging. Laboratory indexes included CA125, AFP, CEA, Il-1β, IL-2, IL-6, IL-8, and IL-10. All pre-treatment indicators were measured one day before treatment initiation, while the post-treatment indicators were recorded the day after the patient completed the last treatment cycle.

Laboratory indicator testing

Fasting venous blood (5 mL) was collected from each patient in the morning before and after treatment. The blood samples were centrifuged to obtain serum. Chemiluminescence immunoassay (Roche Cobas80) was performed to measure serum CA125, AFP, and CEA levels, and enzyme-linked immunosorbent assays (Shanghai Meilian Biotech) were carried out to determine serum IL (IL-1β, IL-2, IL-6, IL-8, and IL-10) levels.

Table 2. Comparison of changes in tumor markers and interleukins in ovarian cancer patients before and after treatment

Indicators	Before treatment	After treatment	t/Z	P
CA125 (U/mL)	125.01±41.05	37.84±10.69	-27.871	<0.001
AFP (ng/mL)	85.65±15.40	29.11±10.04	-41.707	<0.001
CEA (ng/mL)	31.05 [27.52, 35.29]	11.63 [5.69, 16.80]	-15.653	<0.001
IL-1β (pg/mL)	4.95 [2.55, 7.36]	3.43 [2.12, 5.70]	-3.404	<0.001
IL-2 (pg/mL)	2.15 [1.32, 3.14]	1.83 [1.28, 2.31]	-3.418	<0.001
IL-6 (pg/mL)	7.66 [4.42, 11.41]	3.47 [2.20, 4.97]	-9.551	<0.001
IL-8 (pg/mL)	4.25 [2.26, 6.54]	4.09 [2.39, 5.92]	-0.529	0.597
IL-10 (pg/mL)	1.70 [1.07, 2.17]	1.43 [0.78, 1.85]	-3.306	<0.001

Note: CA125, carbohydrate antigen 125; AFP, alpha-fetoprotein; CEA, carcinoembryonic antigen; IL, interleukin.

Treatment methods

The treatment regimen consisted of paclitaxel and carboplatin. Carboplatin (100 mg, Qilu Pharmaceutical Co., Ltd., SFDA Approval No. H10920028) mixed with 500 mL of 5% glucose solution was administered intravenously within 5 hours. 175 mg/m^2 of paclitaxel (Haikou Pharmaceutical Factory Co., Ltd., SFDA Approval No. 10980170) was diluted in 500 mL of 0.9% sodium chloride solution and administered via intravenous drip over a 3-hour period. This treatment was repeated once every 3 weeks, with 21 days as a course of treatment, for a total of 6 courses.

Follow-up

Patient follow-up data was obtained through outpatient visit and telephone follow-ups, with the follow-up period ended in February 2024.

Outcome measures

Primary outcome measures: 1. The relationship between tumor markers and ILs and the prognosis of OC patients was analyzed; 2. The predictive value of tumor markers and ILs for mortality in OC patients was assessed.

Secondary outcome measures: 1. The prognostic factors affecting the overall survival (OS) of OC patients was identified using Cox regression; 2. A nomogram prediction model was constructed based on independent prognostic factors; 3. The changes in tumor markers and ILs were compared before and after treatment in OC patients.

Statistical analyses

SPSS 26.0 software was used for statistical analyses of the collected data. The K-S test was used to analyze the distribution of measurement data, and the mean ± standard deviation (Mean ± SD) was used to express the data with normal distribution; independent sample t-tests were used for inter-group comparisons, while paired t-tests were employed for intra-group comparisons. For ranked data, the rank-sum test was used, expressed by Z. Counting data (n, %) were analyzed by Chi-square tests. Receiver operating characteristic (ROC) curves were plotted to analyze the predictive value of TMs and ILs for patient mortality. The area under the curve (AUC) was compared using the Delong test. Kaplan-Meier (K-M) survival curves were drawn to analyze independent prognostic factors affecting OS, with statistical significance assessed using the Log-rank test. Multivariate Cox regression analysis was carried out to identify the independent risk factors affecting patient prognosis, and a Nomogram was constructed using rms package in R software. Statistical difference was denoted by P<0.05.

Results

Changes in TMs and ILs before and after treatment

Analyzing changes in TMs and ILs in OC patients before and after treatment (**Table 2**) revealed that the levels of CA125 (P<0.001), AFP (P<0.001), CEA (P<0.001), IL-1β (P<0.001), IL-2 (P<0.001), IL-6 (P<0.001), and IL-10 (P<0.001) reduced statistically in both groups after treat-

Table 3. Comparison of pre-treatment levels of tumor markers and interleukins between deceased and surviving patients

Indicators	Death group (n=86)	Survival group (n=98)	t/Z	P
CA125 (U/mL)	136.14±38.21	115.24±41.15	3.571	<0.001
AFP (ng/mL)	86.59±15.41	84.83±15.43	0.772	0.441
CEA (ng/mL)	31.99±6.65	30.32±6.48	1.722	0.087
IL-1β (pg/mL)	5.26 [3.10, 7.62]	4.74 [2.05, 7.21]	1.397	0.163
IL-2 (pg/mL)	2.34 [1.30, 3.17]	2.00 [1.35, 3.07]	0.311	0.757
IL-6 (pg/mL)	8.34 [5.75, 12.13]	6.64 [3.17, 10.96]	2.744	0.006
IL-8 (pg/mL)	5.17±2.71	3.59 [1.90, 5.68]	3.365	<0.001
IL-10 (pg/mL)	1.64±0.80	1.67±0.74	-0.210	0.834

Note: CA125, carbohydrate antigen 125; AFP, alpha-fetoprotein; CEA, carcinoembryonic antigen; IL, interleukin.

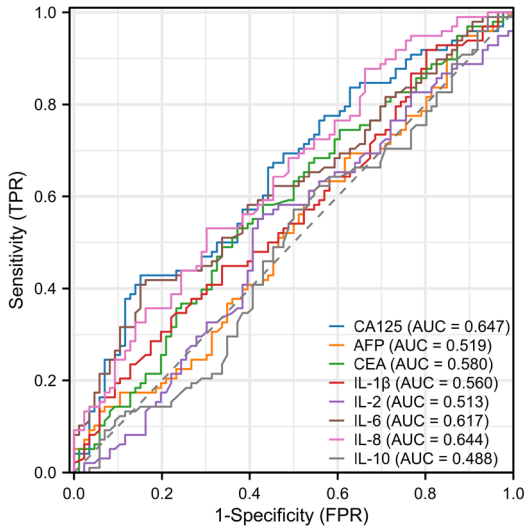

Figure 2. ROC curves of tumor markers and interleukins in predicting mortality in ovarian cancer patients. Note: CA125, carbohydrate antigen 125; AFP, alpha-fetoprotein; CEA, carcinoembryonic antigen; IL, interleukin.

ment, while IL-8 did not change markedly (P=0.597).

Association of TMs and ILs with prognosis of OC patients

To assess the relationship between TMs, ILs, and the prognosis of OC patients, we divided the patients into a death group and a survival group. The death group exhibited statistically higher CA125 (P<0.001), IL-6 (P=0.006), and IL-8 (P<0.001) levels than the survival group (**Table 3**).

The predictive value of TMs and ILs for mortality in OC patients

The predictive value of TMs and ILs for mortality in OC patients was further analyzed using ROC curves. Only CA125, IL-6, and IL-8 demonstrated an AUC greater than 0.6 in predicting mortality in OC patients, with CA125 having the highest AUC. However, the AUCs of the three indexes showed no statistical difference (all P>0.05, **Figure 2** and **Tables 4**, **5**).

Cox regression analysis of prognostic factors for OS in OC patients

Cox regression analysis was performed to identify the prognostic factors affecting OS in OC patients. Univariate Cox regression analysis revealed that CA125 (P<0.001, HR=1.010), IL-6 (P=0.008, HR=1.057), IL-8 (P<0.001, HR=1.181), histological grading (P<0.001, HR=2.344), ascites (P=0.001, HR=2.041), intravascular tumor thrombus (P=0.031, HR=1.644), and FIGO staging (P=0.001, HR=1.991) were prognostic factors affecting OS in OC patients (**Figure 3A**). Multivariate Cox regression analysis further identified CA125 (P=0.001, HR=1.009), IL-8 (P=0.002, HR=1.149), histological grading (P=0.016, HR=1.784), ascites (P=0.016, HR=1.782), intravascular tumor thrombus (P=0.012, HR=1.828), and FIGO staging (P=0.041, HR=1.612) were independent prognostic factors affecting OS in OC patients (**Figure 3B**). We then plotted the survival curve for each prognostic factor (**Figure 4**).

Construction of a prognostic model

At the end of the study, a Nomogram model (**Figure 5A**) was developed based on the independent prognostic factors affecting patients' OS. The AUC of this model in predicting patient mortality was 0.756, significantly higher than the predictive power individual markers (**Figure 5B**). Calibration curve analysis showed that the model had a high benefit rate in predicting patients' 1- and 2-year survival, with the highest benefit rate of 31.84% at 2 years (**Figure 5C**). In addition, DCA curve analysis found that

Table 4. ROC parameters of tumor markers and interleukins in predicting mortality in ovarian cancer patients

Marker	CA125	AFP	CEA	IL-1β	IL-2	IL-6	IL-8	IL-10
AUC	0.647	0.519	0.58	0.56	0.513	0.617	0.644	0.488
95% CI	0.567-0.726	0.434-0.603	0.497-0.663	0.477-0.643	0.428-0.598	0.537-0.698	0.565-0.723	0.404-0.573
Specificity	42.86%	61.22%	53.06%	91.84%	55.10%	40.82%	53.06%	57.14%
Sensitivity	84.88%	46.51%	62.79%	19.77%	58.14%	84.88%	69.77%	50.00%
Youden index	27.74%	7.74%	15.85%	11.60%	13.24%	25.70%	22.83%	7.14%
Cut off	101.895	88.765	30.19	9.99	2.105	5.105	3.765	1.775
Accuracy	62.50%	54.35%	57.61%	58.15%	56.52%	61.41%	60.87%	53.80%
Precision	84.88%	46.51%	62.79%	19.77%	58.14%	84.88%	69.77%	50.00%
F1 Score	67.91%	48.78%	58.06%	30.63%	55.56%	67.28%	62.50%	50.29%

Note: ROC, receiver operating characteristic; CA125, carbohydrate antigen 125; AFP, alpha-fetoprotein; CEA, carcinoembryonic antigen; IL, interleukin.

Table 5. Comparison of AUCs of CA125, IL-6, and IL-8 using Delong test

Marker 1	Marker 2	Z_value	*P*_value	AUC_difference	95% CI
CA125	IL-6	0.508	0.612	0.029	-0.084-0.143
CA125	IL-8	0.049	0.961	0.003	-0.110-0.116
IL-6	IL-8	-0.476	0.634	-0.027	-0.136-0.083

Note: CA125, carbohydrate antigen 125; IL, interleukin.

the slopes of the red and blue curves were close to the ideal curves, indicating reliable predictions for 1- and 2-year survival (**Figure 5D**). Finally, patients were further categorized into high- and low-risk score groups based on the ROC curve cut-off value (0.405572). Further analysis revealed that patients in low-risk score group (L group) had significantly better OS than those in the high-risk score group (H group) ($P<0.001$, **Figure 5E**).

Discussion

Ovarian cancer (OC) is the most common and fatal malignancy of the female reproductive system, with the highest mortality rate among all gynecologic malignancies [17]. Despite the presence of standard treatment, including surgery and chemotherapy, for OC, as well as emerging therapies such as antiangiogenic drugs, PARP inhibitors, and immunosuppressants, the overall survival rate of patients has not been significantly improved [18]. Therefore, it is urgent to find new biomarkers to improve the diagnosis, treatment, and prognosis assessment of OC.

In this study, we observed an obvious reduction in the levels of CA125, AFP, CEA, IL-1β, IL-2, IL-6, and IL-10 in OC patients after treatment, indicating that changes in TMs and ILs can serve as potential indicators for evaluating treatment efficacy. CA-125 is a high-molecular-weight glycoprotein widely used to evaluate the disease state and chemotherapy efficacy in OC patients. Zhang et al. [19] reported that CA125 level decreased in OC patients after receiving neoadjuvant chemotherapy, and that CA125 changes could predict optimal interval debulking surgery in advanced EOC patients. Rawert et al. [20] also showed a significant decrease in CA125 levels in OC patients after neoadjuvant chemotherapy compared to before treatment. This is because a significant decrease in CA125 typically indicates a decrease in tumor burden, which reflects effective treatment that reduces the number of cancer cells, thereby lowering serum CA125 levels. IL-6 is a proinflammatory pleiotropic cytokine that plays a pivotal role in the TME [21]. Multiple studies have reported that IL-6 directly stimulates many cancer cells by acting on a variety of cell signaling pathways that promote cell cycle and growth [22, 23]. For example, Zhang et al. [24] proposed that jointly targeting IL-6 and IL-8 signaling pathways may be an effective method to treat OC. The significant decrease in IL-6 level after treatment suggests that chemotherapy inhibited the growth and viability of tumor cells and weakened their chemoresistance. IL-10, an anti-inflammatory cytokine, inhibits the proliferation and activity of T cells and dendritic cells, interfering with antitumor immune responses [25]. The decrease in IL-10 levels after treatment may reflect the recovery of the immune system and the enhanced ability to attack tumor cells, thereby improving treatment effectiveness.

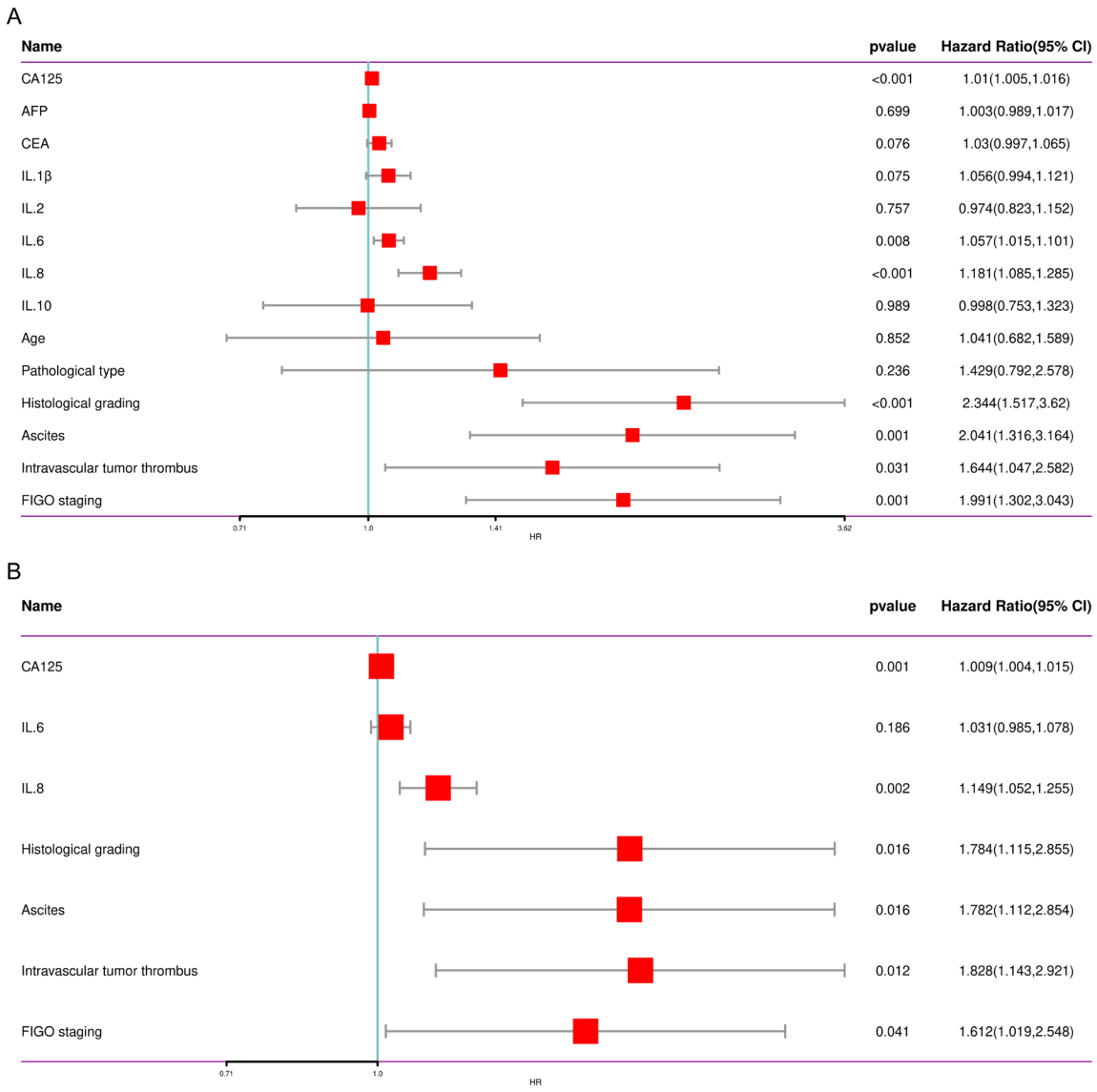

Figure 3. Cox regression analysis of prognostic factors affecting OS in ovarian cancer patients. A. Univariate Cox regression analysis of prognostic factors affecting OS in OC patients. B. Multivariate Cox regression analysis of independent prognostic factors affecting OS in OC patients. Note: FIGO, International Federation of Gynecology and Obstetrics; CA125, carbohydrate antigen 125; AFP, alpha-fetoprotein; CEA, carcinoembryonic antigen; IL, interleukin.

Predicting the mortality of OC patients offers significant advantages, including early identification of high-risk patients, thereby optimizing treatment plans and improving the efficiency of medical resource utilization [26]. By predicting the risk of death, clinicians can develop better monitoring plans, adjust treatment strategies in time, and avoid unnecessary treatment delays. Further analysis of this study showed significantly higher levels of CA125, IL-6, and IL-8 in the death group than in the survival group, indicating that these indexes are not only valuable in the treatment response, but also closely associated with patient outcomes. This is because the high levels of CA125, IL-6, and IL-8 reflect high tumor burden, active cell proliferation, and strong inflammatory responses, all of which are strongly linked to poor prognoses. In a previous research report, Chen et al. [27] reported that patients with elevated levels of CA125 had significantly lower median OS. Additionally, Rodrigues et al. [28] found that IL-6 and IL-8 levels in peritoneal lavage fluid were related to adverse prognostic fac-

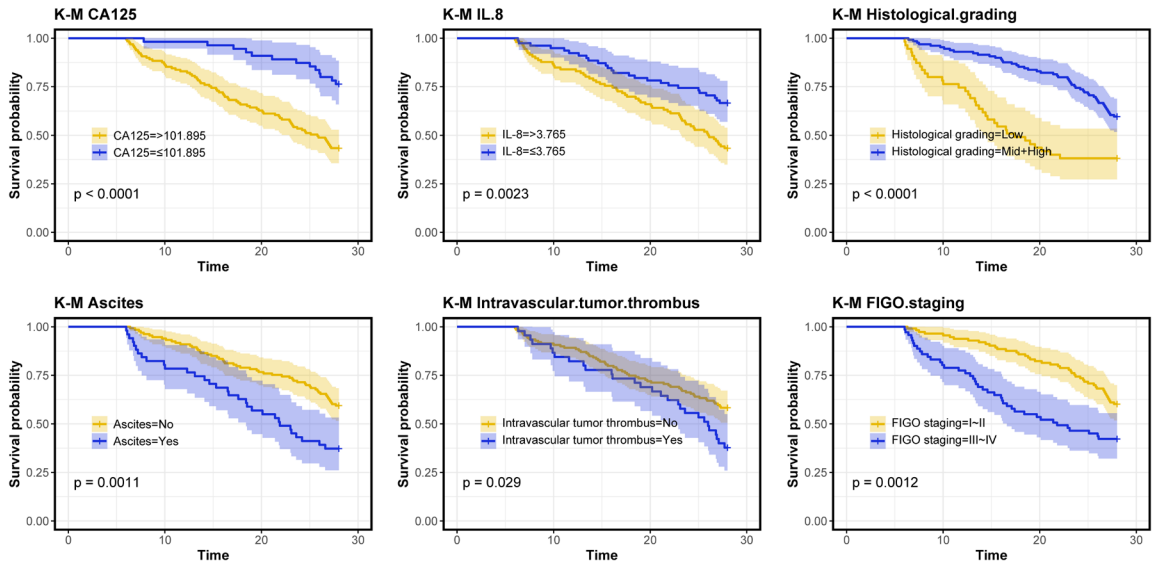

Figure 4. Survival curves of independent prognostic factors affecting OS in ovarian cancer patients. Note: FIGO, International Federation of Gynecology and Obstetrics; CA125, carbohydrate antigen 125; IL-8, interleukin-8.

tors. These studies further demonstrate the importance of CA125, IL-6, and IL-8 in predicting the risk of death in OC patients.

Finally, to determine the prognostic factors for OS in OC patients, we conducted a Cox regression analysis and found that CA125, IL-8, histological grading, ascites, intravascular tumor thrombus, and FIGO stage were independent prognostic factors for OS in OC patients. Elevated CA125 levels are a direct indicator of tumor burden, with higher levels generally indicative of severe disease [29]. IL-8, a pro-inflammatory cytokine, enhances tumor invasiveness by promoting tumor angiogenesis and inflammatory reactions, with its high levels closely correlated with tumor progression and metastasis. It has been reported that high IL-8 expression predicts an adverse prognosis in OC patients and is an important marker reflecting the biological behavior and prognosis of OC [30]. Histological grading reflects the degree of tumor cell differentiation, with poorly differentiated tumors being more aggressive and have a worse prognosis [31]. The presence of ascites often indicates that the tumor has spread to the abdominal cavity, complicating treatment and increasing the risk of recurrence [32]. Intravascular tumor thrombus indicates that tumor cells have entered blood vessels or lymphatic vessels, suggesting a higher risk of distant metastasis. FIGO staging provides a comprehensive assessment of tumor spread, with advanced FIGO staging indicating poor prognosis. Feng et al. [33] proposed that FIGO staging was an independent prognostic factor for 5-year survival in OC patients. Therefore, a comprehensive evaluation of patients before treatment, including biomarkers such as CA125 and IL-8, as well as clinical factors such as histological grading, ascites, intravascular tumor thrombus, and FIGO staging, can help accurately predict patient prognosis and develop personalized treatment plans.

At the end of the study, a Nomogram prediction model was built based on the identified independent prognostic factors, demonstrating high accuracy and reliability in predicting patient mortality. The Nomogram model reached an AUC value of 0.756, demonstrating strong predictive ability. Previously, Lin et al. [34] constructed a Nomogram model based on two immune-related genes, with an AUC of only 0.678 and 0.62 in predicting 3-year and 5-year survival, respectively. Moreover, a Nomogram model built by Sun et al. [35] based on the SEER database showed an AUC of 0.752 in predicting patients' 5-year survival, which is basically consistent with ours. This indicates that our model is a valuable tool for risk assessment and can provide effective guidance for predicting OS in OC patients.

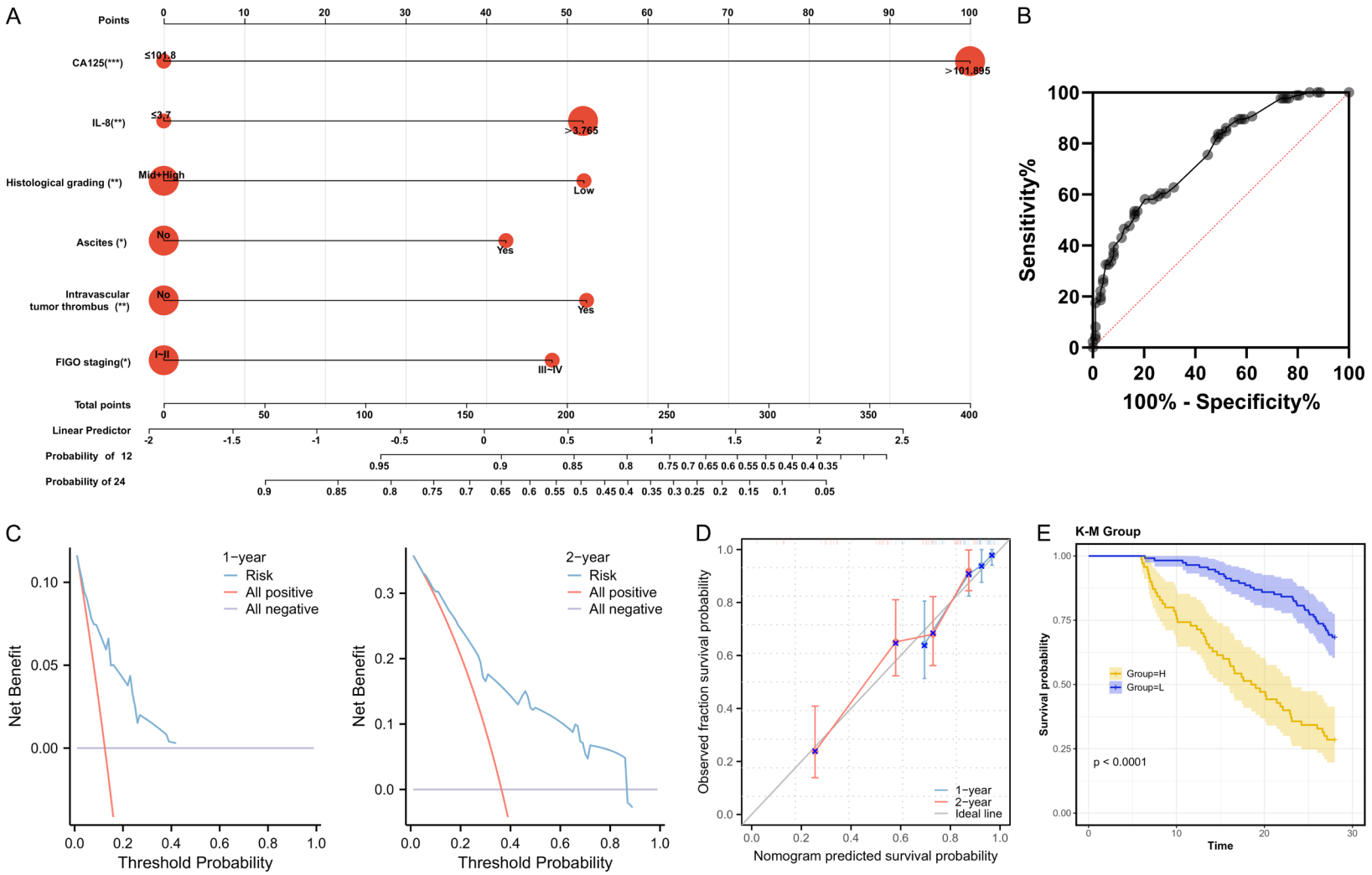

Figure 5. Nomogram model construction and analysis. A. A nomogram model for predicting OS. B. ROC curves of mortality predicted by the model. AUC=0.756. C. Calibration curves showing benefit rates for 1-year and 2-year survival. D. Decision curve analysis showing the stability of the 1-year and 2-year survival models. E. Kaplan-Meier analysis of survival curves of patients in high and low risk score groups. Note: OS, overall survival; ROC, receiver operating characteristic; FIGO, International Federation of Gynecology and Obstetrics; CA125, carbohydrate antigen 125; IL-8, interleukin-8.

There are still some limitations to be noted in this study. First, the small sample size may limit the statistical significance and generalizability of the findings. Second, this study was conducted in a single center, which may introduce geographic and institution-specific treatment biases, limiting the broader applicability of the results compared to multicenter studies. Third, due to the retrospective analysis design, the integrity and accuracy of data could be compromised, and potential confounding factors cannot be completely controlled. Finally, the follow-up was relatively short and did not allow for a comprehensive assessment of long-term survival and prognosis. To address these limitations, future research should consider expanding the sample size, conducting multi-center research, and extending the follow-up time to provide more comprehensive and reliable clinical guidance. Meanwhile, confounding factors should be controlled and adjusted as much as possible, and a prospective study design should be adopted to further validate and expand the results of this study.

Conclusion

In conclusion, TMs combined with ILs have important application value in assessing therapeutic efficacy and prognosis of OC. Dynamic monitoring of markers such as CA125, IL-6, and IL-8 can provide an important reference for the adjustment of clinical treatment schemes, and their joint detection can enhance diagnostic accuracy and improve the reliability of prognosis evaluation.

Acknowledgements

This work was supported by Henan Province Science and Technology research and Development plan Joint fund project (232301420068); Top talent project of traditional Chinese medicine in Henan Province (2022ZYBJ19); and Special subject of scientific research of traditional Chinese medicine in Henan Province (2023ZY1016, 2024ZYZD08).

Disclosure of conflict of interest

None.

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