Risk Prediction Model of Postoperative Venous Thrombosis of Ovarian Cancer

Xue Wang
Lanzhou University  https://orcid.org/0000-0003-2461-6304

Xiao-hui Wang (✉ Xiaohuiwang2015@163.com)
Lanzhou University

Research Article

Keywords: Ovarian neoplasms, Venous thromboembolism, Risk factors, Logistic models, ROC curve

Posted Date: October 29th, 2021

DOI: https://doi.org/10.21203/rs.3.rs-949286/v1

License: ©  This work is licensed under a Creative Commons Attribution 4.0 International License. Read Full License
Abstract

Objective
To investigate the influencing factors of venous thromboembolism (VTE) after ovarian cancer surgery, and construct its prediction model.

Methods
A total of 67 patients with ovarian cancer who developed VTE after surgery were selected from October 2008 to June 2020 in the Department of Obstetrics and Gynecology, First Hospital of Lanzhou University, and conducted a retrospective study with 100 patients without VTE after the operation who were confirmed by imaging during the same period. The clinical data of two groups of patients were analyzed and compared, and the risk prediction model was established. The ROC curve was drawn to evaluate the prediction effect of the model.

Results
Univariate analysis showed that there were statistically significant differences in age, menopausal status, hypertension, neoadjuvant chemotherapy, FIGO staging, lymph node metastasis, operation time, preoperative plasma FIB and D-dimer between the thrombosis group and the non-thrombosis group; The results of multivariate analysis showed that old age, neoadjuvant chemotherapy, late FIGO staging, high levels of plasma FIB and D-dimer before surgery are independent risk factors for VTE after ovarian cancer surgery. Construct a prediction model based on the results of multivariate regression analysis: Logit(P) = 0.053 × age + 0.917 × neoadjuvant chemotherapy + 0.956 × tumor FIGO staging + 0.398 × preoperative plasma FIB + 0.531 × preoperative D-dimer -7.679 (Neoadjuvant chemotherapy, yes=1, no=0; tumor FIGO stage ++=1, +++=2; age, preoperative plasma FIB and D-dimer are actual values). The ROC curve analysis shows that the AUC value of the model is 0.773, the sensitivity is 74.6%, the specificity is 71.0%, and the total prediction accuracy rate is (78+39)/167=0.701.

Conclusions
Age, neoadjuvant chemotherapy, tumor FIGO staging, preoperative plasma FIB and D-dimer can be used as reliable indicators to predict the occurrence of postoperative VTE in patients with ovarian cancer. The constructed prediction model has good risk prediction ability, it has certain clinical application value.

Introduce
VTE is closely related to tumor, mainly including pulmonary embolism (PE) and deep venous thrombosis (DVT). Among gynecological malignant tumor patients, ovarian cancer patients have the highest
incidence of VTE. A retrospective study of 328 patients with ovarian cancer showed that ovarian cancer complicated with VTE was up to 39.3%. Radical resection of ovarian cancer has a large surgical scope, and surgical trauma will inevitably increase the risk of VTE again. In this paper, the related influencing factors of VTE occurrence after ovarian cancer surgery were analyzed to provide reference for the prevention of VTE occurrence and improvement of patients’ quality of life.

**Objects And Methods**

1 **Subjects and Groups** In this study, 67 patients with postoperative VTE in the first Hospital of Lanzhou University (our Hospital) from October 2008 to June 2020 were selected as the thrombus group, and 100 patients with ovarian cancer without postoperative VTE were selected as the non-thrombus group. The relevant data were retrospectively studied.

2 **Inclusion and exclusion criteria**

2.1 **Inclusion criteria**
- Surgical treatment was performed for all patients in our hospital;
- Complete clinical case data;
- Definite pathological diagnosis of ovarian cancer;
- Definite diagnosis of VTE by ultrasound or imaging department.

2.2 **Exclusion criteria**
- Complicated with hematological diseases;
- Taking anticoagulants or antiplatelet drugs;
- Laparoscopy was converted to laparotomy during the operation;
- With other malignant tumors;
- Patients who had been diagnosed with VTE before surgery.

3 **Methods** General information, preoperative laboratory examination, operation, tumor pathology and other information of patients in 2 groups were collected and recorded.

4 **Statistical Methods** SPSS 25.0 software was used for analysis. Normality test was performed for all quantitative data before statistics, and all data were skewness distribution, represented by median (quartile) [M (P25, P75)]. Comparison between groups was performed by Mann-Whitney U test. Qualitative data use cases (%) were compared between groups by χ² test. Multivariate analysis used binary Logistic
regression to construct the prediction model and draw the receiver operating characteristic (ROC) curve to evaluate the predictive value of the model. P < 0.05 was considered statistically significant.

**Results**

1 Univariate analysis of postoperative VTE for ovarian cancer

1.1 **Comparison of the general clinical data of patients between the two groups** In terms of age, menopausal status, hypertension and neoadjuvant chemotherapy, there were statistically significant differences between the two groups (P < 0.05), as shown in Table 1.

Table 1 Comparison of general clinical data between the two groups
| Influence factors                  | Thrombus group (n=67) | Non-thrombotic group (n=100) | Z or $\chi^2$ | $P$  |
|-----------------------------------|-----------------------|-----------------------------|---------------|------|
| Age (years)                       | 60.00±53.00±68.00     | 54.00±47.50±61.75           | -3.397        | 0.001|
| BMI (kg/m²)                       | 21.80±20.76±24.61     | 22.82±20.89±24.57           | -1.012        | 0.311|
| Menopausal status                 |                       |                             | 5.833         | 0.016|
| No                                | 19±28.4               | 47±47.0                     |               |      |
| Yes                               | 48±71.6               | 53±53.0                     |               |      |
| Diabetes                          |                       |                             | 3.689         | 0.055|
| No                                | 57±85.1               | 94±94.0                     |               |      |
| Yes                               | 10±14.9               | 6±6.0                       |               |      |
| Hypertension                      |                       |                             | 4.379         | 0.036|
| No                                | 40±59.7               | 75±75.0                     |               |      |
| Yes                               | 27±40.3               | 25±25.0                     |               |      |
| Hyperlipidemia                    |                       |                             | 1.030         | 0.310|
| No                                | 56±83.6               | 89±89.0                     |               |      |
| Yes                               | 27±40.3               | 40±40.0                     |               |      |
| Neoadjuvant chemotherapy          |                       |                             | 6.109         | 0.013|
| No                                | 42±62.7               | 80±80.0                     |               |      |
| Yes                               | 25±37.3               | 20±20.0                     |               |      |
| Caprini score                     |                       |                             | 6.308         | 0.081|
| <5                                | 0±0.0                 | 5±5.0                       |               |      |
| 5~7                               | 37±55.2               | 65±65.0                     |               |      |
| 8~10                              | 28±41.8               | 28±28.0                     |               |      |
| ≥11                               | 2±3.0                 | 2±2.0                       |               |      |

Note: Age and BMI were represented by [M(Q)].

1.2 Preoperative laboratory examination of two groups compared plasma fibrinogen (FIB) and plasma D-dimer in 2 groups, the differences were statistically significant ($P < 0.05$), as shown in Table 2.

Table 2 Comparison of preoperative laboratory examination between the two groups[$M\bar{P}_{25}\bar{P}_{75}$]
1.3 Comparison of surgical conditions between the two groups  

Comparison of surgical duration between the two groups was statistically significant ($P < 0.05$), as shown in Table 3.

Table 3 Comparison of surgical conditions between the two groups

| Influence factors                             | Thrombus group (n=67) | Non-thrombotic group (n=100) | Z or $\chi^2$ | $P$   |
|-----------------------------------------------|-----------------------|-----------------------------|---------------|-------|
| Operation time (min)                          | 290–240–3300          | 250–210–3000                | -1.985        | 0.047 |
| Intraoperative blood loss (ml)                | 350–200–500           | 300–200–400                 | 0.047         | 0.074 |
| Operation method                              |                       |                             | 1.376         | 0.241 |
| The cavity mirror                            | 32–47.8               | 57–57.0                     |               |       |
| open                                          | 35–52.2               | 43–43.0                     |               |       |
| Intraoperative/postoperative blood transfusion|                       |                             | 0.525         | 0.469 |
| No                                            | 61–91.0               | 94–94.0                     |               |       |
| Yes                                           | 6–9.0                 | 6–6.0                       |               |       |
| Postoperative preventive measures             |                       |                             | 0.632         | 0.729 |
| No                                            | 17–25.4               | 22–22.0                     |               |       |
| Machinery/medicine                            | 20–29.8               | 27–27.0                     |               |       |
| Mechanical + medicine                         | 30–44.8               | 51–51.0                     |               |       |

Note: The operative time and intraoperative blood loss were represented by [M (P25, P75)].
1.4 Comparison of postoperative tumor pathology between the two groups FIGO stage and lymph node metastasis of the two groups were statistically significant (P < 0.05), as shown in Table 4.

Table 4 Comparison of postoperative tumor pathology between the two groups

| Influence factors                        | Thrombus group (n=67) | Non-thrombotic group (n=100) | Z or $\chi^2$ | P      |
|-----------------------------------------|-----------------------|-----------------------------|---------------|--------|
| Tumor diameter (cm)                     | 10.00-8.00-12.50      | 10.05-7.00-12.92            | -0.150        | 0.881  |
| Tumor FIGO staging                      |                       |                             | 8.202         | 0.004  |
| Z + ☐                                   | 15-22.4              | 44-44.0                     |               |        |
| Z + ☐                                   | 52-77.6              | 56-56.0                     |               |        |
| Tumor tissue typing                     |                       |                             | 0.175         | 0.676  |
| Serous                                  | 49-73.1              | 76-76.0                     |               |        |
| The serous                              | 18-26.9              | 24-24.0                     |               |        |
| Degree of tumor differentiation         |                       |                             | 2.727         | 0.256  |
| Low level                               | 14-20.9              | 13-13.0                     |               |        |
| In the level                            | 18-26.9              | 23-23.0                     |               |        |
| High level                              | 35-52.2              | 64-64.0                     |               |        |
| Lymph node metastasis                   |                       |                             | 4.580         | 0.032  |
| No                                      | 36-53.7              | 70-70.0                     |               |        |
| Yes                                     | 31-46.3              | 30-30.0                     |               |        |

Note: Tumor diameter was expressed by [M (P25, P75)]

2 Multifactor analysis of postoperative VTE for ovarian cancer The meaningful indicators in the univariate analysis were included in the multifactor analysis. Logistic regression analysis showed that age, neoadjuvant chemotherapy, TUMOR FIGO stage, preoperative FIB and D-dimer were independent risk factors for the occurrence of postoperative VTE for ovarian cancer, as shown in Table 5.

Table 5 Logistic regression analysis of VTE occurrence after ovarian cancer surgery
### 3 Construction of prediction Model (Logit Model) and ROC Curve Analysis

The prediction model of postoperative venous thrombosis of ovarian cancer was constructed according to the results of binary Logistic analysis: Logit (P) = 0.053× Age + 0.917× Neoadjuvant chemotherapy + 0.956× Tumor FIGO stage + 0.398× Plasma fibrinogen + 0.531× D-dimer - 7.679 (neoadjuvant chemotherapy, yes = 1, no = 0; Tumor FIGO stage $1 = +, 2 = ++$; Age, plasma fibrinogen and D-dimer are actual values). Hosmer-Lemeshow test was used to analyze the fitting degree of the model, P=0.436, greater than 0.05, indicating that the model had a good fitting degree and could be used to predict the occurrence of VTE after ovarian cancer surgery. The ROC curve was drawn based on the results of multi-factor analysis. The results showed that the AUC value of the model was 0.773, 95%CI: 0.707 ~ 0.844, and the maximum Yoden index was 0.456. At this time, the sensitivity and specificity of the model were 74.6% and 71.0%. The total prediction accuracy was (78+39) / 167 = 0.701. shown in Figure 1 and Table 6.

Table 6 Comparison between model prediction results and actual results
Discussion

Tumor is closely related to thrombosis; malignant tumor will exacerbate thrombosis and cause cancer-associated thrombosis (CAT); conversely, thrombosis will accelerate the progression of malignant tumor. It is called thrombosis-associated cancer (TAC) [2]. The incidence of postoperative VTE is higher in gynecological patients due to the possible use of hormones, special surgical site and other reasons. In previous studies, perioperative VTE occurred in 38% of patients with gynecologic cancer, much higher than in patients with benign gynecologic surgery (14%) [3]. The incidence of VTE in ovarian cancer patients is the highest among gynecological tumors due to advanced age, multiple internal and surgical complications, late stage of diagnosis, pelvic compression by tumor and large amount of ascites, large surgical range, and long treatment course [4].

Literature has reported that up to 60% of VTE occurs in elderly patients over 70 years old [5]. A retrospective study on the incidence of preoperative VTE in 387 patients with primary ovarian cancer found that the incidence of preoperative VTE and PE were 13.4% and 9.3%, respectively. The risk of preoperative VTE in patients aged ≥60 years was significantly higher than that in patients aged < 60 years [5], which was basically consistent with the results of this study. The reason may be related to the decrease of physical activity and venous pump failure in most elderly patients, and the increase of coagulation promoting factors, such as factor V and factor VIII, homocysteine and fibrinogen with age [5-6]. In addition, in addition to the type and stage of cancer itself, the biggest risk factor for VTE is the presence of two or more potential chronic comorbidities, which are commonly diabetes, hypertension, chronic kidney disease, heart failure and lung disease [7]. Therefore, elderly, obese, hypertensive and diabetic patients should increase physical activity, eat a light diet, control BMI and actively control blood pressure and glucose levels.

Neoadjuvant chemotherapy is of great significance in the treatment of ovarian cancer. However, studies have shown that chemotherapy increases the risk of thrombosis in patients with malignant tumor by 6-7 times [8], which may be related to the direct damage of chemotherapy drugs to endothelial cells, the reduction of endogenous anticoagulants, the increase in the number of pro-coagulant proteins and the enhancement of their activity. In addition, chemotherapy can activate platelets, and may also lead to cell apoptosis and cytokine release, thereby enhancing the expression of tissue factors, resulting in the highly active form of monocyte/macrophage tissue factors, which are considered as physiological initiator of coagulation [2]. Ovarian cancer lesion resection and lymph node dissection cause severe trauma to human tissues, resulting in vascular endothelial injury and coagulation factor leakage, resulting in cytokine...
release and activation of exogenous coagulation pathway. The long operation time and postoperative bed rest lead to a long time of immobility of the limbs, the decline of the lower limb muscle pump function, slow blood flow and even stagnation, and then lead to thrombosis. In the literature, more than 100 minutes of operation time was associated with an increased risk of DVT (OR=1.30, 95%CI: 1.12-2.21) and PE (OR=1.25, 95%CI:1.11-2.43), each additional 10 minutes after 100 minutes increased the risk of DVT by 7%, while the risk of PE increased by 5%. In addition, most studies have pointed out that the recovery of minimally invasive surgery is faster, the patients move to the ground earlier, and some risk factors for VTE formation are avoided, thus the risk of VTE is lower than that of open surgery. However, some other scholars believe that the risk of thrombosis is increased due to the long time of minimally invasive gynecological surgery, the pressure of lower limb veins subjected to pneumoperitoneum, blocked blood return, and the increased operation time caused by laparoscopy or robotic surgery. In fact as long as patients surgery, and surgery related factors on the impact of thrombosis occurs cannot be avoided, but you can try to reduce risks in other way, such as operation skills, choose a suitable operation method, etc., at the same time improve the high-risk group recognition, to ensure more reasonable and normative thromboembolism prophylaxis.

According to previous studies, tumor pathology may affect the occurrence of venous thrombosis. Duska et al. showed that patients with advanced ovarian cancer were more likely to develop VTE than those with early ovarian cancer (P=0.004). On the one hand, tumor stage is late, huge tumor piece and a large number of ascites oppress pelvic vein, affect the blood circulation of pelvic cavity and lower limb, affect blood flow rate thereby, increase blood viscosity; On the other hand, with the progression of malignant tumors, the serum levels of pro-clotting factor D-dimer, fibrinopeptide A and von Willebrand factor (vWF) increase, and the risk of DVT naturally increases significantly. In ovarian cancer organization classification, epithelial carcinoma, most studies have found that is derived from epithelial tissue tumors often expressed higher levels of tissue factor, and release the micro vesicles (MVs) to the circulatory system, through the combined with endothelial cell activation or directly activate other cells, such as platelet trigger VTE, more illustrates the ovarian cancer patients with VTE risk, In epithelial ovarian cancer, the risk of VTE in patients with clear cell carcinoma is 2.5 times higher than that in other epithelial ovarian cancer subtypes. However, routine VTE screening for all women with pelvic masses is impractical and increases the patient's cost burden. Therefore, it is necessary to combine other effective factors to predict whether they are at high risk of thrombosis clinically. For example, the study notes that platelet, hemoglobin, white blood cell, D-dimer, prothrombin fragment and coagulation factor X can be used to predict the risk of ovarian cancer VTE, among which D-dimer is the most widely used. However, since most cancer patients have a high level of D-dimer, it is generally believed that the risk of VTE should be warned if the index is greater than 0.5 μg/mL, and VTE cannot be diagnosed. Higher d-dimer level before treatment is associated with poor prognosis in ovarian cancer patients with VTE, and may be used as a useful prognostic biomarker.

High-risk patients are identified by using internationally recognized thrombotic risk assessment scales, such as Caprini assessment scale and Padua assessment scale. If patients are found to be at risk of VTE
after comprehensive assessment, preventive measures should be actively taken, mainly mechanical prevention and drug anticoagulant prevention. Mechanical prophylaxis does not increase the risk of bleeding and can be used continuously during hospitalization \cite{16}. Low molecular weight Heparin (LMWH) has a long half-life, high bioavailability, and higher anti-Xa activity. Meta-analysis results showed that LMWH can effectively prevent DVT in patients with gynecological malignant tumor (RR=0.16, 95% CI: 0.05 ~ 0.47) \cite{17}; it has also been proved to significantly reduce the risk of recurrent VTE (RR=0.58, 95% CI: 0.43-0.77), and is a reliable method for preventing postoperative venous thromboembolism \cite{18}. However, patients with cancer VTE are still at high risk of recurrent VTE and anticoagulation-related bleeding despite appropriate treatment \cite{19}.

Therefore, for patients undergoing cancer surgery, VTE prophylaxis with the highest prophylactic dose of LMWH is recommended once a day, starting at the earliest 12 hours before surgery and lasting at least 7-10 days \cite{20}. In 2019, Chinese Society of Clinical Oncology (CSCO) formulated The Chinese Expert Guidelines for the Prevention and Treatment of Tumor-Related Venous Thromboembolism (2019 Version) in combination with relevant foreign guidelines and the current situation of tumor-related VTE in China. To provide reference for the clinical prevention and treatment of tumor-associated thrombosis \cite{21}. In this study, 167 patients with 123 cases (73.4%) were using drugs or (and) mechanical means to prevent blood clots, were the first day after surgery, showed the woman clinical doctors to patients at risk of VTE has a certain predictability, but even taking precautions, there are still part of VTE, suggests high-risk patients prevent degree is not enough, Low-risk patients may receive unnecessary overprevention, so a more rational and specific plan for VTE prevention is needed.

In conclusion, the occurrence of VTE after ovarian cancer surgery is the result of multiple factors. Advanced age, neoadjuvant chemotherapy, late tumor FIGO stage, high preoperative FIB and D-dimer are independent risk factors for the occurrence of VTE after ovarian cancer surgery. For high-risk patients, timely monitoring of relevant indicators combined with imaging monitoring can reduce the incidence of VTE to a certain extent, and help clinicians better grasp the patient’s condition, so as to formulate corresponding intervention plans.

**Declarations**

**Funding Information**

Science and Technology Project of Gansu Province, No.20JR5RA361

**Ethical Approval**

The study has received ethical approval.

**Conflicts of Interest**

The authors have no conflicts of interest to declare.
References

1. Trugilho I A, Renni M, Medeiros G C, et al. Incidence and factors associated with venous thromboembolism in women with gynecologic cancer[J]. Thromb Res, 2020,185:49-54.

2. Hamza M S Mousa SA. Cancer-Associated Thrombosis: Risk Factors, Molecular Mechanisms, Future Management[J]. Clin Appl Thromb Hemost, 2020,26:1076029620954282. doi: 10.1177/1076029620954282.

3. Yu R, Nansubuga F, Yang J, et al. Efficiency and safety evaluation of prophylaxes for venous thrombosis after gynecological surgery[J]. Medicine (Baltimore), 2020,99(25):e20928. doi: 10.1097/MD.0000000000020928.

4. Weeks K S, Herbach E, McDonald M, et al. Meta-Analysis of VTE Risk: Ovarian Cancer Patients by Stage, Histology, Cytoreduction, and Ascites at Diagnosis[J]. Obstet Gynecol Int, 2020,2020:2374716. doi: 10.1155/2020/2374716.

5. Nicholson M, Chan N B, Bhagirath V, et al. Prevention of Venous Thromboembolism in 2020 and Beyond[J]. J Clin Med, 2020,9(8):2467. doi: 10.3390/jcm9082467.

6. Liang S, Tang W, Ye S, et al. Incidence and risk factors of preoperative venous thromboembolism and pulmonary embolism in patients with ovarian cancer[J]. Thromb Res, 2020,190:129-134. doi: 10.1016/j.thromres.2020.02.019.

7. Rodriguez A O, Wun T, Chew H, et al. Venous thromboembolism in ovarian cancer[J]. Gynecol Oncol, 2007,105(3):784-790. doi: 10.1016/j.ygyno.2007.02.024.

8. Khorana A A, Dalal M, Lin J, et al. Incidence and predictors of venous thromboembolism (VTE) among ambulatory high-risk cancer patients undergoing chemotherapy in the United States[J]. Cancer, 2013,119(3):648-655. doi: 10.1002/cncr.27772.

9. Zhang W, Liu X, Cheng H, et al. Risk factors and treatment of venous thromboembolism in perioperative patients with ovarian cancer in China[J]. Medicine (Baltimore), 2018,97(31):e11754. doi: 10.1097/MD.0000000000011754.

10. Sakran J V, Ezzeddine H, Haut E, et al. Prolonged operating room time in emergency general surgery is associated with venous thromboembolic complications[J]. Am J Surg, 2019,218(5):836-841. doi: 10.1016/j.amjsurg.2019.04.022.

11. Wang X, Huang J, Bingbing Z, et al. Risk factors, risk assessment, and prognosis in patients with gynecological cancer and thromboembolism[J]. J Int Med Res, 2020,48(4):300060519893173. doi: 10.1177/0300060519893173.

12. Duska L R, Garrett L, Henretta J, et al. When 'never-events' occur despite adherence to clinical guidelines: the case of venous thromboembolism in clear cell cancer of the ovary compared with other epithelial histologic subtypes[J]. Gynecol Oncol, 2010,116(3):374-377. doi: 10.1016/j.ygyno.2009.10.069.

13. Petterson T M, Marks R S, Ashrani A A, et al. Risk of site-specific cancer in incident venous thromboembolism: a population-based study[J]. Thromb Res, 2015,135(3):472-478. doi:
14. Hisada Y, Geddings J, Ay C, et al. Venous thrombosis and cancer: from mouse models to clinical trials [J]. J Thromb Haemost. 2015;13(8):1372-1382. doi: 10.1111/jth.13009.

15. Yamada Y, Kawaguchi R, Iwai K, et al. Preoperative plasma D-dimer level is a useful prognostic marker in ovarian cancer [J]. J Obstet Gynaecol. 2020;40(1):102-106. doi: 10.1080/01443615.2019.1606176.

16. Barber EL, Clarke-Pearson DL. Prevention of venous thromboembolism in gynecologic oncology surgery [J]. Gynecol Oncol. 2017;144(2):420-427. doi: 10.1016/j.ygyno.2016.11.036.

17. Whitworth JM, Schneider KE, Frederick PJ, et al. Double prophylaxis for deep venous thrombosis in patients with gynecologic oncology who are undergoing laparotomy: does preoperative anticoagulation matter? Int J Gynecol Cancer. 2011 Aug;21(6):1131-4. doi: 10.1097/IGC.0b013e31821dc9f0. PMID: 21792016.

18. Kimpton M, Carrier M. What's new in the prevention and treatment of cancer-associated thrombosis? [J]. Hematology Am Soc Hematol Educ Program. 2019;2019:158-166. doi: 10.1182/hematology.2019000023.

19. Peterson EA, Lee A. Update from the clinic: what's new in the diagnosis of cancer-associated thrombosis? [J]. Hematology Am Soc Hematol Educ Program. 2019;2019:167-174. doi: 10.1182/hematology.2019000024.

20. Farge D, Le Maignan C, Doucet L, et al. Women, thrombosis, and cancer [J]. Thromb Res. 2019;181 Suppl 1:S47-S53. doi: 10.1016/S0049-3848(19)30367-6.

21. Chinese Society of Clinical Oncology Oncology and Thrombosis Expert Committee. Guidelines for prevention and treatment of tumor-associated venous thromboembolism (2019 edition) [J]. Chinese Oncology Clinic. 2019;46(13):653-660.
Figure 1

ROC curve analysis of the combined variable PRE and related factors