

**Utility of Preoperative Inflammatory Markers to Distinguish Epithelial Ovarian Cancer  
from Benign Ovarian Masses**

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## Supplemental Figure Legends

Figure S1. Receiver operating characteristic (ROC) curves of inflammation markers in predicting risk of ovarian cancer by stage, (A) Early stages versus benign masses, (B) Advanced stages versus benign masses.

Figure S2. Receiver operating characteristic (ROC) curves of inflammation markers in predicting risk of ovarian cancer by histological subtype, (A) Serous ovarian cancer versus benign masses, (B) Endometrioid ovarian cancer versus benign masses, (C) Other types of EOC versus benign masses.

Figure S3. Receiver operating characteristic (ROC) curves of inflammation markers in predicting risk of ovarian cancer by menopausal status, (A) Premenopausal ovarian cancer versus benign masses, (B) Postmenopausal ovarian cancer versus benign masses.

Figure S4. Univariate and multivariate analyses for EOC risk in stratified analysis by histological subtypes in high level of CA125 patients ( $CA125 > 35$ ).

Figure S5. Univariate and multivariate analyses for EOC risk in stratified analysis by stage.

Figure S6. Univariate and multivariate analyses for EOC risk in stratified analysis by stage in low level of CA125 patients ( $CA125 \leq 35$ ).

Figure S7. Univariate and multivariate analyses for EOC risk in stratified analysis by stage in high level of CA125 patients ( $CA125 > 35$ ).

## **SUPPLEMENTAL TABLES**

Table S1. Demographic and epidemiological characteristics of patients.

	Benign (N=207, N, %)	Malignant (N=887, N, %)	<i>P</i> value
Age (years, mean±SD)	47.17±14.66	54.23± 10.57	<0.001
Menopause			
No	106 (55.50)	280 (33.14)	<0.001
Yes	85 (44.50)	565 (66.86)	
BMI (kg/m <sup>2</sup> )			
<25	127 (61.35)	571 (64.37)	0.415
≥25	80 (38.65)	316 (35.63)	
Family history of cancer			
No	161 (81.31)	649 (75.47)	0.080
Yes	37 (18.69)	211 (24.53)	
Alcohol consumption			
No	196 (99.49)	824 (97.51)	0.044
Yes	1 (0.51)	21 (2.49)	
Age of menarche (years)			
≤13	64 (30.92)	231 (26.04)	0.155
>13	143 (69.08)	656 (73.96)	
Number of pregnancies			
≤2	104 (50.24)	425 (47.91)	0.546
>2	103 (49.76)	462 (52.09)	
Number of live births			
≤1	133 (64.25)	518 (58.40)	0.123
>1	74 (35.75)	369 (41.60)	
Abortion			
No	58 (28.02)	295 (33.26)	0.147
Yes	149 (71.98)	592 (66.74)	

BMI, body mass index

Table S2. Clinical and pathological features of patients.

	Benign ovarian masses ( <i>N</i> =207, <i>N</i> , %)	Malignant ovarian cancer ( <i>N</i> =887, <i>N</i> , %)
Tumor diameter (cm)		
<5	85 (41.06)	337 (37.99)
≥5	122 (58.94)	550 (62.01)
Pathology		
Benign ovarian masses		
Serous cystadenoma	33 (15.94)	—
Mucinous cystadenoma	11 (5.31)	—
Mature teratoma	81 (39.13)	—
Others	82(39.62)	—
Epithelial ovarian cancer		
Serous	—	477 (53.78)
Mucinous	—	55 (6.20)
Endometrioid	—	194 (21.87)
Other EOC	—	161 (18.15)
Stage		
I	—	133 (15.36)
II	—	165 (19.05)
III	—	483 (55.77)
IV	—	85 (9.82)
Residual disease (cm)		
≤1	—	437 (75.22)
>1	—	144 (24.78)

EOC, epithelial ovarian cancer

Table S3. Univariate and multivariate logistic regression model showing association of biomarkers with malignancy.

Variables	OR (95%CI)	<i>P</i> value	OR (95%CI)*	<i>P</i> value *
CA125 (U/mL)	1.006 (1.005-1.007)	<0.001	1.006 (1.004-1.007)	<0.001
HGB (g/L)	0.972 (0.960-0.985)	<0.001	0.973 (0.960-0.986)	<0.001
MCV (fL)	0.964 (0.934-0.995)	0.024	0.946 (0.914-0.978)	0.001
HCT (%)	0.931 (0.889-0.974)	0.002	0.928 (0.884-0.973)	0.002
WBC (10 <sup>9</sup> /L)	1.310 (1.191-1.447)	<0.001	1.323 (1.199-1.467)	<0.001
NLR	2.061 (1.750-2.455)	<0.001	2.009 (1.701-2.340)	<0.001
PLR	1.012 (1.009-1.014)	<0.001	1.011 (1.009-1.014)	<0.001
LMR	0.811 (0.756-0.868)	<0.001	0.823 (0.766-0.883)	<0.001
Age at diagnosis	1.054 (1.039-1.068)	<0.001	-	-

CA125, Cancer Antigen 125; HGB, hemoglobin; MCV, mean corpuscular volume; HCT, hematocrit; WBC, white blood cell count; NLR, neutrophil-to-lymphocyte ratio; PLR, platelet-to-lymphocyte ratio; LMR, lymphocyte lymphocyte-to- monocyte ratio; OR = odds ratio, CI = confidence interval.

\* adjusted for age.

Table S4. Area under the curve (AUC) for discriminating all malignant cases from benign cases adjusted for age.

Variables	AUC	95% CI	Cut-off	Sensitivity (%)	Specificity (%)
CA125 (U/mL)	90.8	88.6-92.9	193.65	78.6	89.4
HGB (g/L)	54.2	49.5-58.9	165.5	79.5	32.4
MCV (fL)	62.4	57.7-67.2	130.35	86.2	38.6
HCT (%)	62.8	58.0-67.6	83.55	80.8	45.9
WBC (10 <sup>9</sup> /L)	67.4	62.8-72.1	53.525	78.8	55.8
NLR	67.6	62.9-72.3	49.673	78.6	54.4
PLR	75.4	72.1-78.8	215.023	62.2	78.3
LMR	62.7	57.9-67.5	52.835	70.2	56.3

CA125, Cancer Antigen 125; HGB, hemoglobin; MCV, mean corpuscular volume; HCT, hematocrit; WBC, white blood cell count; NLR, neutrophil-to-lymphocyte ratio; PLR, platelet-to-lymphocyte ratio; LMR, lymphocyte lymphocyte-to- monocyte ratio; AUC, Area under curve; CI = confidence interval.

Table S5. Area under the curve (AUC) for discriminating malignant from benign in stratified analysis by stage.

Variables	AUC	95% CI	Cut-off	Sensitivity (%)	Specificity (%)
Early stage malignant vs. benign					
CA125 (U/mL)	81.3	77.6-85.1	59.03	68.4	78.9
HGB (g/L)	54.7	49.6-59.8	131.5	62.8	46.9
MCV (fL)	51.2	46.0-56.3	87.15	23.8	80.7
HCT (%)	52.4	47.3-57.6	42.15	87.6	18.4
WBC (10 <sup>9</sup> /L)	61.9	56.9-66.9	5.295	80.9	40.3
NLR	62.3	57.4-67.2	2.015	53.4	66.5
PLR	58.3	53.3-63.3	141.864	56.0	60.9
LMR	56.5	51.5-61.6	3.619	32.8	83.0
Advantaged stage malignant vs. benign					
CA125 (U/mL)	95.4	93.6-97.1	228.7	85.2	95.5
HGB (g/L)	62.6	58.2-66.9	123.5	47.9	72.9
MCV (fL)	58.6	54.1-63.2	87.15	34.5	80.7
HCT (%)	59.0	54.6-63.5	38.75	56.3	59.9
WBC (10 <sup>9</sup> /L)	64.4	60.1-68.8	5.815	71.0	52.4

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NLR	81.6	78.2-84.9	2.139	78.3	71.8
PLR	80.9	77.7-84.1	196.41	60.3	90.8
LMR	78.5	74.9-82.0	3.615	65.0	83.0

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CA125, Cancer Antigen 125; HGB, hemoglobin; MCV, mean corpuscular volume; HCT, hematocrit; WBC, white blood cell count; NLR, neutrophil-to-lymphocyte ratio; PLR, platelet-to-lymphocyte ratio; LMR, lymphocyte lymphocyte-to- monocyte ratio; AUC, Area under curve; CI = confidence interval.



Table S6. Area under the curve (AUC) for discriminating malignant from benign in stratified analysis by stage adjusted for age.

Variables	AUC	95%CI	Cut-off	Sensitivity (%)	Specificity (%)
Early stage malignant vs. benign					
CA125 (U/mL)	81.1	77.2-84.9	106.535	70.9	77.4
HGB (g/L)	55.3	50.2-60.5	164.5	80.9	30.4
MCV (fL)	60.8	55.7-65.9	130.35	82.9	38.6
HCT (%)	60.4	55.3-65.6	83.55	76.2	45.9
WBC (10 <sup>9</sup> /L)	63.7	58.6-68.8	53.56	72.1	55.8
NLR	62.8	57.6-67.9	51.023	66.4	57.8
PLR	61.4	56.5-66.4	192.133	56.7	62.3
LMR	60.9	55.7-66.1	52.874	66.2	56.3
Advantaged stage malignant vs. benign					
CA125 (U/mL)	95.7	94.1-97.4	276.4	85.4	96.0
HGB (g/L)	53.6	48.6-58.5	162.5	84.8	27.5
MCV (fL)	63.3	58.4-68.2	131.25	86.7	40.1
HCT (%)	64.1	59.1-69.0	83.6	83.2	45.9
WBC (10 <sup>9</sup> /L)	69.4	64.6-74.2	53.525	82.3	55.8

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NLR	70.1	65.3-74.9	49.673	83.8	54.4
PLR	83.0	79.8-86.1	215.385	74.9	78.3
LMR	63.7	58.6-68.7	52.835	72.3	56.3

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CA125, Cancer Antigen 125; HGB, hemoglobin; MCV, mean corpuscular volume; HCT, hematocrit; WBC, white blood cell count; NLR, neutrophil-to-lymphocyte ratio; PLR, platelet-to-lymphocyte ratio; LMR, lymphocyte lymphocyte-to- monocyte ratio; AUC, Area under curve; CI = confidence interval.

Table S7. Area under the curve (AUC) for discriminating malignant from benign in stratified analysis by histological subtype.

Variables	AUC	95%CI	Cut-off	Sensitivity	Specificity
Serous ovarian cancer vs. benign					
CA125 (U/mL)	93.1	91.0-95.2	228.7	78.8	95.5
HGB (g/L)	60.5	55.9-65.0	124.5	46.0	71.0
MCV (fL)	56.6	51.9-61.4	87.15	31.7	80.7
HCT (%)	57.4	52.8-62.0	38.65	52.4	60.9
WBC (10 <sup>9</sup> /L)	62.0	57.8-66.9	5.815	69.7	52.4
NLR	74.7	70.8-78.6	2.14	68.2	71.8
PLR	73.6	69.8-77.4	182.698	52.8	86.5
LMR	71.2	67.1-75.3	3.619	53.4	83.0
Endometrioid ovarian cancer vs. benign					
CA125 (U/mL)	91.7	88.8-94.5	129.0	84.0	88.4
HGB (g/L)	59.3	53.8-64.9	124.5	45.4	71.0
MCV (fL)	58.2	52.6-63.7	90.05	60.8	54.6
HCT (%)	55.5	49.9-61.2	38.75	51.5	59.9
WBC (10 <sup>9</sup> /L)	66.5	61.3-71.8	7.14	42.8	80.6

NLR	76.1	71.4-80.7	2.49	57.8	84.5
PLR	73.0	68.0-78.0	155.814	67.2	71.5
LMR	73.5	68.6-78.5	3.599	57.8	83.0
Other EOC vs. benign					
CA125 (U/mL)	84.1	80.3-87.9	59.03	74.4	78.9
HGB (g/L)	59.0	53.6-64.5	129.5	62.3	53.1
MCV (fL)	53.6	48.1-59.2	87.15	29.3	80.7
HCT (%)	56.5	51.0-61.9	35.65	21.4	89.9
WBC (10 <sup>9</sup> /L)	63.7	58.5-69.0	5.3	83.3	40.3
NLR	74.3	69.7-79.0	2.139	67.4	71.8
PLR	71.7	66.7-76.6	196.477	45.3	90.8
LMR	67.8	62.6-72.9	3.615	50.2	83.0

CA125, Cancer Antigen 125; HGB, hemoglobin; MCV, mean corpuscular volume; HCT, hematocrit; WBC, white blood cell count; NLR, neutrophil-to-lymphocyte ratio; PLR, platelet-to-lymphocyte ratio; LMR, lymphocyte lymphocyte-to- monocyte ratio; EOC, epithelial ovarian cancer; AUC, Area under curve; CI = confidence interval.

Table S8. Area under the curve (AUC) for discriminating malignant from benign in stratified analysis by histological subtype adjusted for age.

Variables	AUC	95%CI	Cut-off	Sensitivity	Specificity
Serous ovarian cancer vs. benign					
CA125 (U/mL)	93.3	91.3-95.4	276.4	78.8	96.0
HGB (g/L)	54.0	49.0-59.0	164.5	83.6	30.4
MCV (fL)	62.8	57.8-67.7	131.25	85.5	40.1
HCT (%)	63.2	58.1-68.2	83.55	82.7	45.9
WBC (10 <sup>9</sup> /L)	67.8	62.9-72.7	53.525	80.6	55.8
NLR	68.0	63.1-72.9	49.949	79.2	54.9
PLR	76.1	72.4-79.8	212.59	64.0	77.3
LMR	63.3	58.2-68.3	52.835	72.5	56.3
Endometrioid ovarian cancer vs. benign					
CA125 (U/mL)	92.4	89.7-95.1	203.15	84.0	89.9
HGB (g/L)	55.1	49.5-60.8	173.5	68.6	44.4
MCV (fL)	62.2	56.7-67.7	129.75	89.7	37.2
HCT (%)	63.4	58.0-68.9	77.7	93.3	33.8
WBC (10 <sup>9</sup> /L)	68.0	62.8-73.3	49.28	92.3	40.8

NLR	67.6	62.3-72.9	45.712	91.1	40.8
PLR	75.6	70.8-80.4	226.352	60.9	82.6
LMR	62.7	57.1-68.2	46.36	90.1	36.4
Other EOC vs. benign					
CA125 (U/mL)	83.5	79.6-87.5	106.535	76.4	77.4
HGB (g/L)	53.7	48.1-59.2	172.5	67.9	42.5
MCV (fL)	61.9	56.5-67.3	138.75	67.9	57.0
HCT (%)	61.6	56.2-67.0	78.25	87.4	35.3
WBC (10 <sup>9</sup> /L)	66.2	60.9-71.4	53.24	79.1	53.9
NLR	66.6	61.4-71.9	49.707	78.6	54.4
PLR	74.0	69.3-78.7	261.421	44.9	93.2
LMR	61.5	56.1-67.0	53.275	67.0	57.8

CA125, Cancer Antigen 125; HGB, hemoglobin; MCV, mean corpuscular volume; HCT, hematocrit; WBC, white blood cell count; NLR, neutrophil-to-lymphocyte ratio; PLR, platelet-to-lymphocyte ratio; LMR, lymphocyte lymphocyte-to- monocyte ratio; EOC, epithelial ovarian cancer; AUC, Area under curve; CI = confidence interval.

Table S9. Area under the curve (AUC) for discriminating malignant from benign in stratified analysis by menopausal status.

Variables	AUC	95%CI	Cut-off	Sensitivity	Specificity
<b>Premenopausal</b>					
CA125 (U/mL)	89.5	86.0-93.0	228.7	71.3	94.1
HGB (g/L)	58.5	52.2-64.8	132.5	70.3	44.3
MCV (fL)	56.3	50.0-62.6	87.25	40.9	74.5
HCT (%)	56.2	49.8-62.6	35.95	26.9	84.9
WBC (10 <sup>9</sup> /L)	63.7	57.6-69.8	5.81	74.5	47.2
NLR	74.9	69.8-80.0	2.59	55.2	84.0
PLR	74.7	69.7-79.7	182.243	54.8	87.7
LMR	73.6	68.5-78.6	3.624	56.6	84.9
<b>Postmenopausal</b>					
CA125 (U/mL)	90.9	88.0-93.9	133.95	78.8	91.5
HGB (g/L)	61.7	55.7-67.6	123.5	41.7	81.2
MCV (fL)	60.0	53.4-66.6	93.35	81.6	35.3
HCT (%)	58.8	52.6-65.0	38.75	49.9	68.2
WBC (10 <sup>9</sup> /L)	64.4	57.9-70.9	6.030	61.3	65.5

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NLR	75.0	69.6-80.4	2.113	66.9	73.8
PLR	71.5	66.1-76.8	196.197	45.1	90.6
LMR	69.1	63.2-75.0	3.721	52.9	81.0

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CA125, Cancer Antigen 125; HGB, hemoglobin; MCV, mean corpuscular volume; HCT, hematocrit; WBC, white blood cell count; NLR, neutrophil-to-lymphocyte ratio; PLR, platelet-to-lymphocyte ratio; LMR, lymphocyte lymphocyte-to- monocyte ratio; AUC, Area under curve; CI = confidence interval.



Table S10. Area under the curve (AUC) for discriminating malignant from benign in stratified analysis by menopausal status adjusted for age.

Variables	AUC	95%CI	Cut-off	Sensitivity	Specificity
<b>Premenopausal</b>					
CA125 (U/mL)	89.2	85.6-92.7	275.05	70.9	95.0
HGB (g/L)	55.4	48.9-61.9	172.5	43.4	68.9
MCV (fL)	65.8	59.6-72.1	129.9	65.9	61.3
HCT (%)	67.2	60.9-73.6	77.4	78.5	54.7
WBC (10 <sup>9</sup> /L)	74.7	69.2-80.2	47.225	79.1	59.4
NLR	74.8	69.3-80.4	43.012	80.6	60.4
PLR	76.8	72.0-81.7	224.952	54.8	89.6
LMR	67.1	60.9-73.3	45.159	74.2	56.6
<b>Postmenopausal</b>					
CA125 (U/mL)	90.3	87.3-93.3	190.75	79.1	90.2
HGB (g/L)	63.3	57.1-69.5	190.5	63.8	55.3
MCV (fL)	57.6	50.9-64.3	150.55	59.8	55.3
HCT (%)	57.7	50.9-64.5	97.05	49.7	64.7
WBC (10 <sup>9</sup> /L)	51.2	44.1-58.3	65.115	51.4	57.1

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NLR	50.5	43.3-57.7	73.529	90.0	17.9
PLR	71.3	65.9-76.7	209.7	66.5	69.4
LMR	58.9	52.0-65.9	66.898	71.1	46.4

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HGB, hemoglobin; MCV, mean corpuscular volume; HCT, hematocrit; WBC, white blood cell count; PLT, platelet; NP, neutrophil percentage; LP, lymphocyte percentage; NLR, neutrophil-to-lymphocyte ratio; PLR, platelet-to-lymphocyte ratio; AUC, Area under curve; CI = confidence interval.

## SUPPLEMENTAL FIGURES

Figure S1.

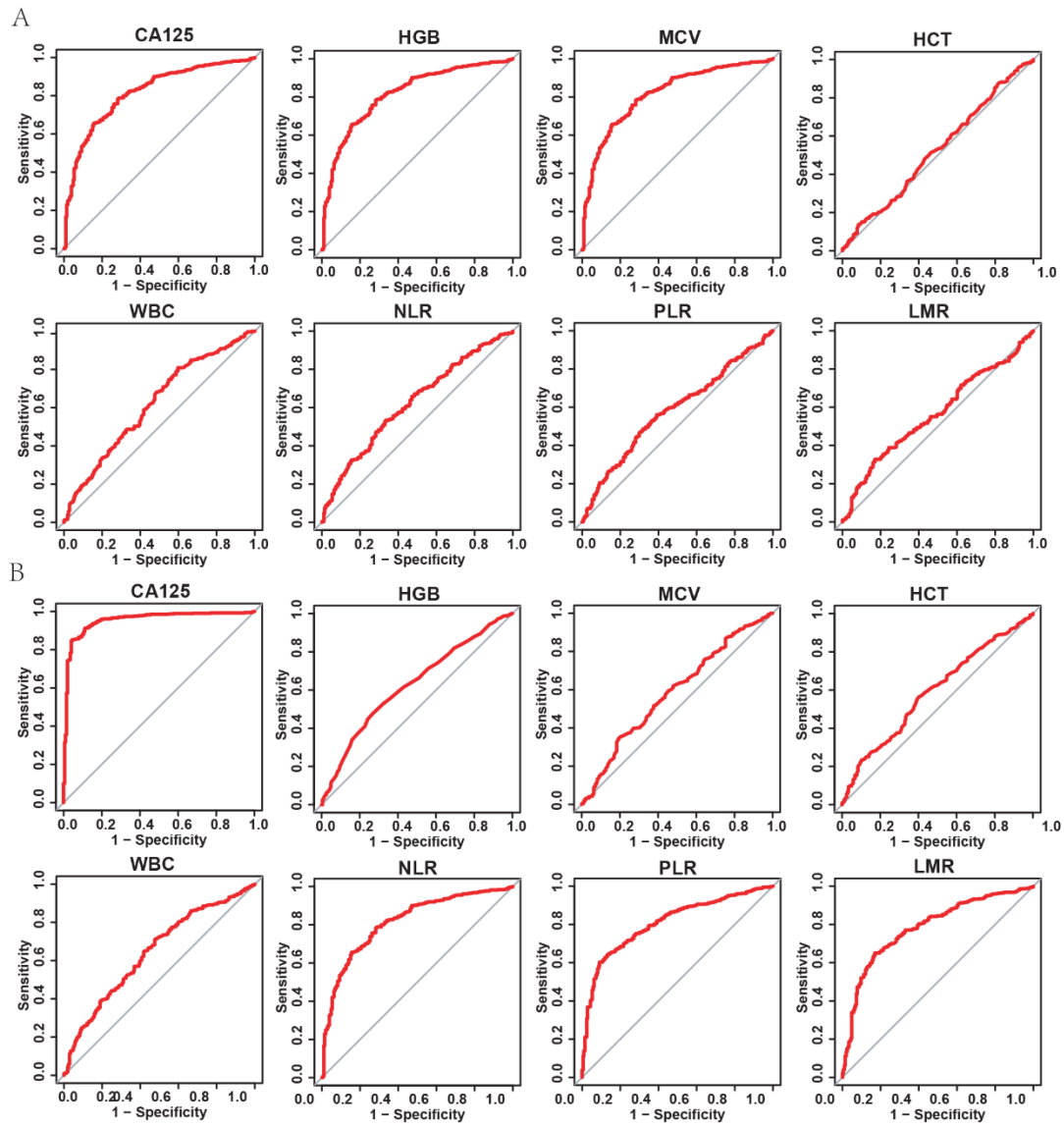


Figure S2.

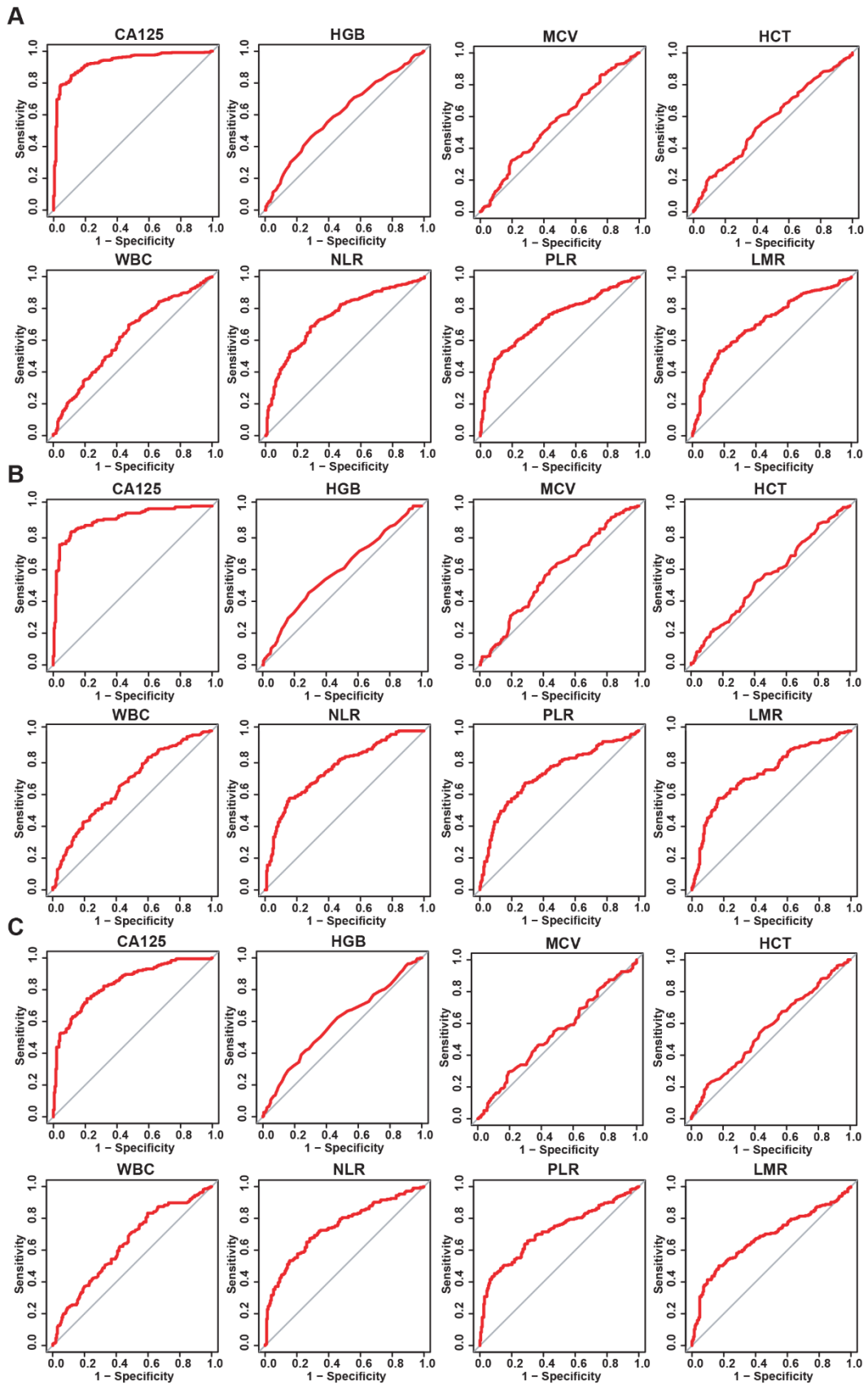
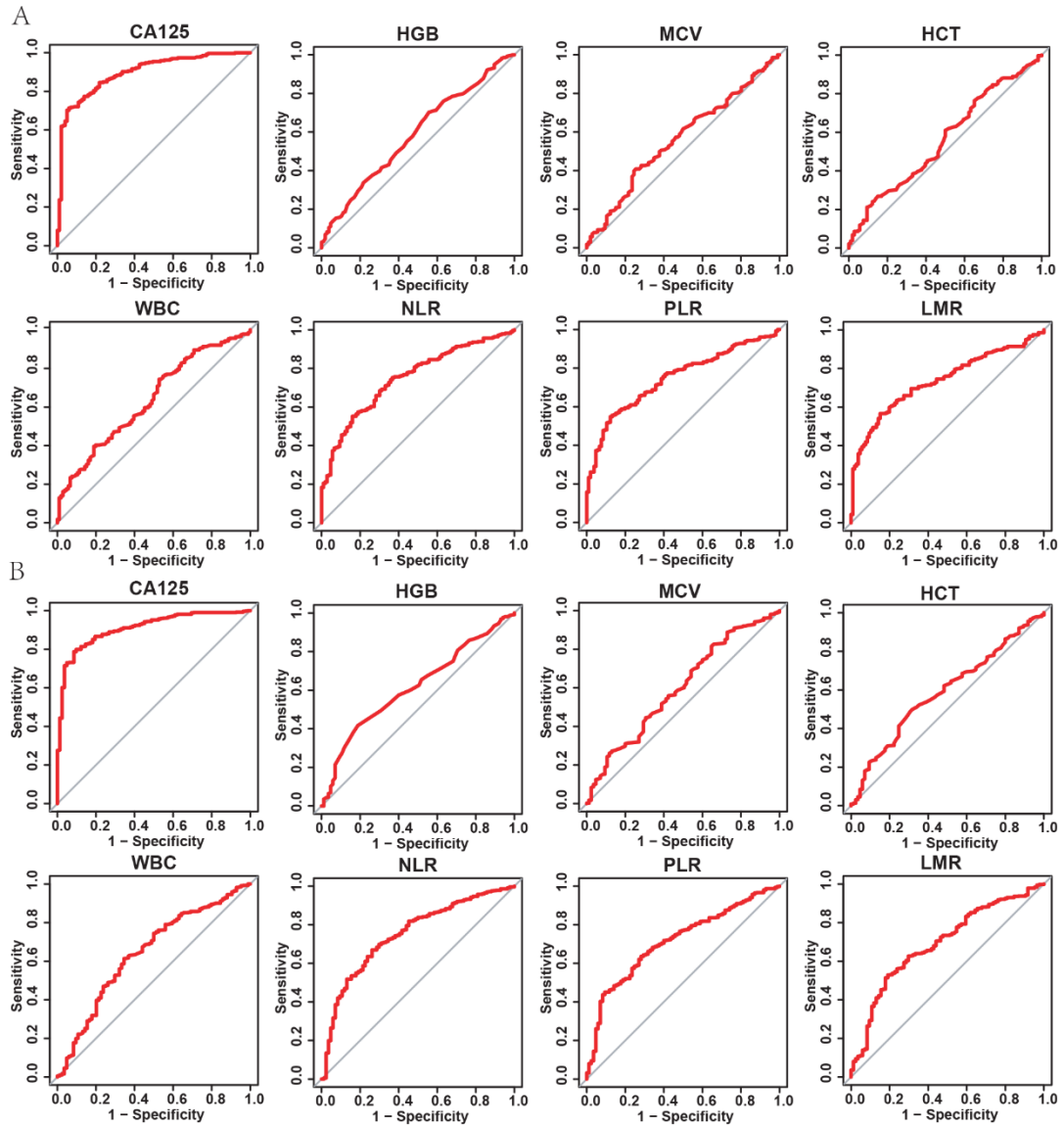
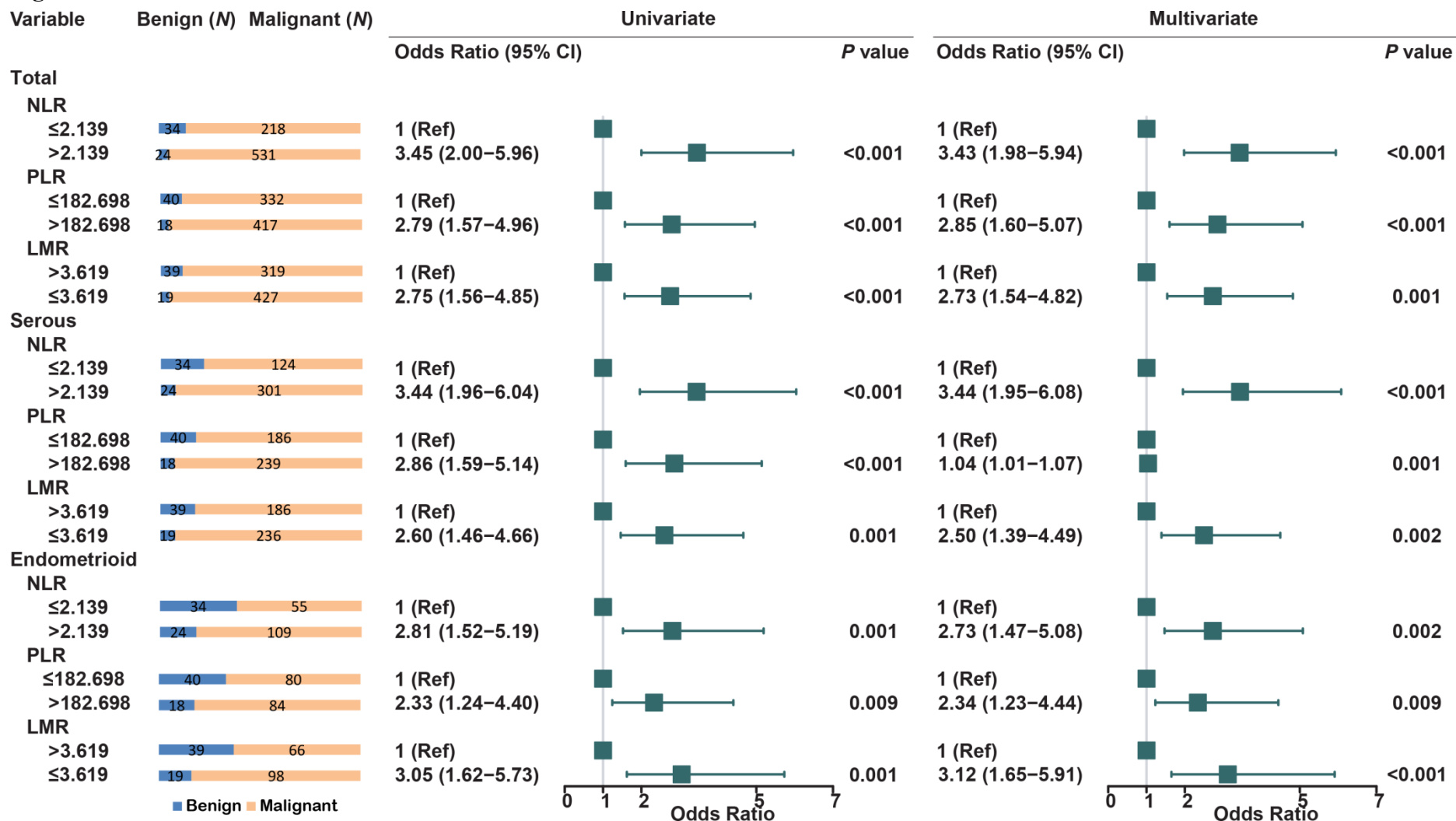


Figure S3.



**Figure S4.**



**Figure S5.**

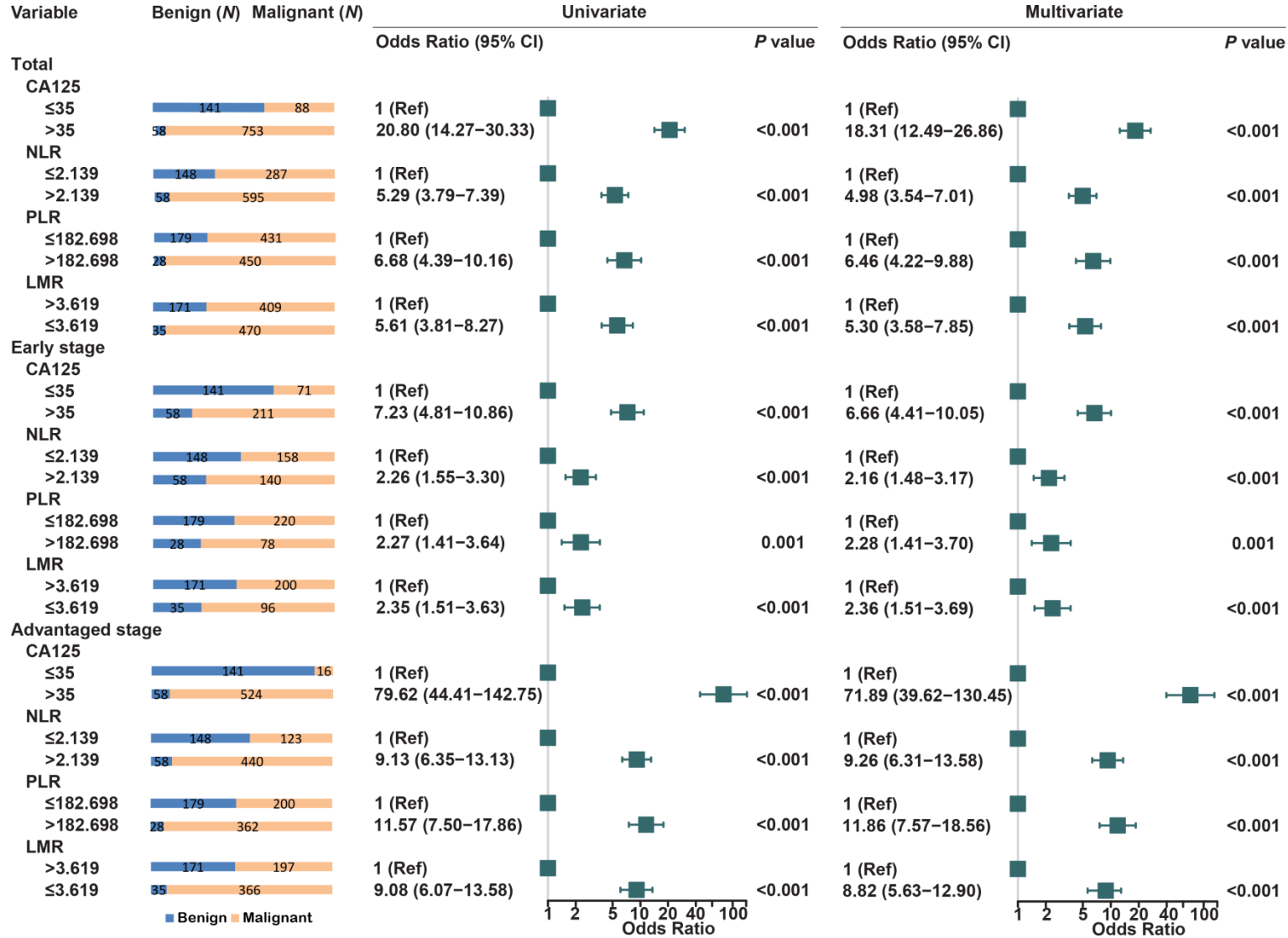


Figure S6.

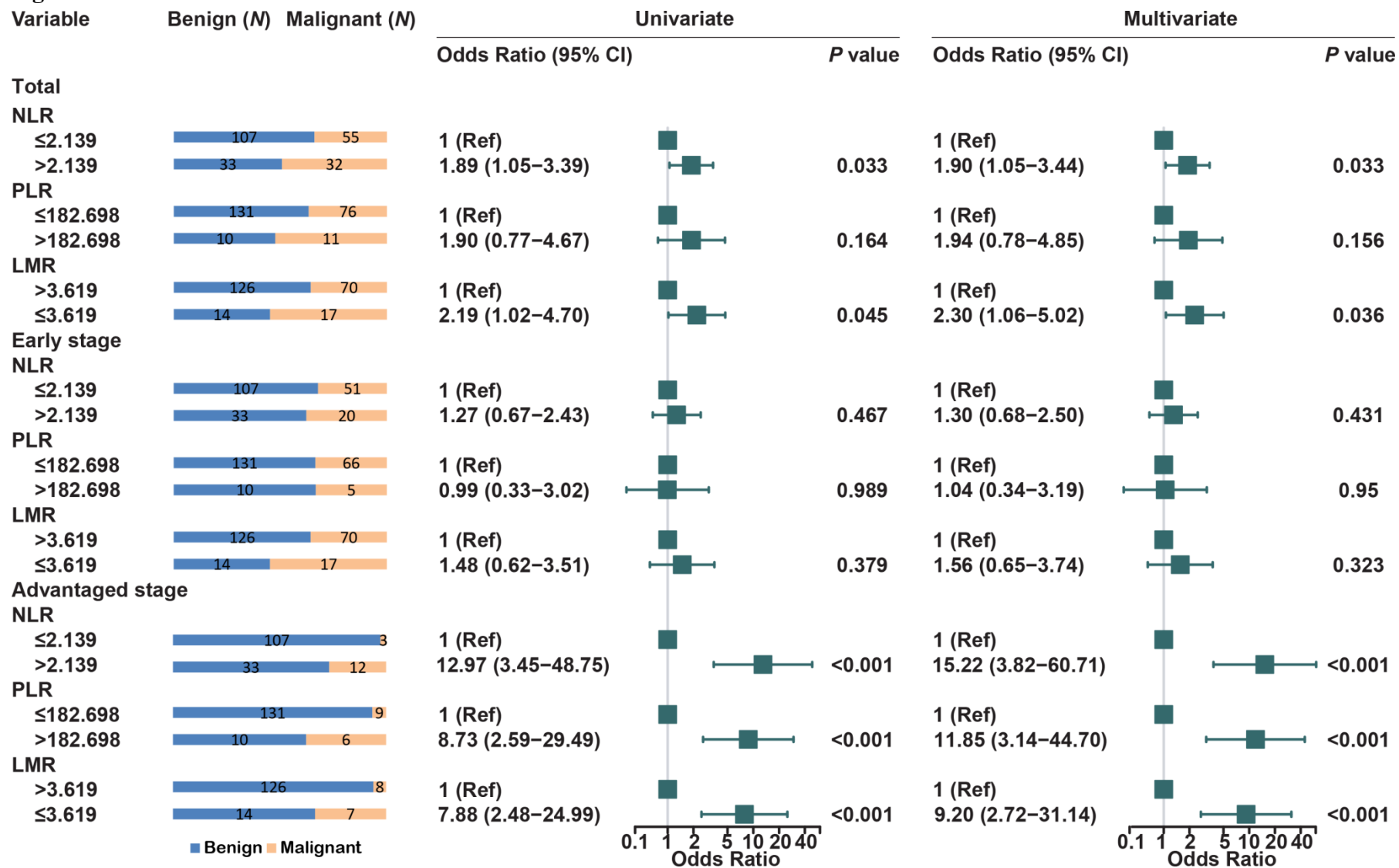




Figure S7.

