Supplementary Materials

The following are the Supplementary data to this article:

Supplementary Table 1. Missing or out-of-window data for study variables (N = 335).

Variable	Missing definition	Missing (n)	Missing (%)
Biochemical variables	Not available	3	0.90%
Baseline blood routine	Collected outside predefined window (>2 weeks before baseline)	3	0.90%
Preoperative blood routine	Collected outside predefined window (>1 week before surgery)	4	1.19%

Data are presented as number (n) and percentage (%). Missingness was defined as either unavailable measurements or values obtained outside predefined time windows. Such observations were treated as missing in the statistical analyses.

Supplementary Table 2. Detailed pathological outcomes after nICT.

Variable	Total (*n* = 204)
Number of examined lymph nodes (Median, IQR)	40.0 (30.0, 50.2)
ypT stage	
0	68 (33.3)
Tis	14 (6.9)
1	43 (21.1)
2	29 (14.2)
3	50 (24.5)
ypN stage	
0	140 (68.6)
1	49 (24.0)
2	15 (7.4)
ypTNM stage	
I	120 (58.8)
II	20 (9.8)
III	64 (31.4)
TRG	
0	59 (28.9)
1	54 (26.5)
2	49 (24.0)
3	42 (20.6)
Residual disease pattern	
pCR	59 (28.9)
Residual primary tumor only	81 (39.7)
Residual nodal disease only	9 (4.4)
Residual primary and nodal disease	55 (27.0)

Values are presented as n (%) unless otherwise indicated. The number of examined lymph nodes is presented as median (IQR). pCR was defined as the absence of viable tumor cells in both the primary tumor and all dissected regional lymph nodes, corresponding to ypT0N0. TRG was evaluated according to the CAP/NCCN-recommended modified Ryan scheme. Abbreviations: nICT, neoadjuvant immunochemotherapy; IQR, interquartile range; ypT, post-neoadjuvant pathological T stage; ypN, post-neoadjuvant pathological N stage; ypTNM, post-neoadjuvant pathological tumor-node-metastasis stage; TRG, tumor regression grade; pCR, pathological complete response; CAP, College of American Pathologists; NCCN, National Comprehensive Cancer Network.

Supplementary Table 3. ROC curve analyses for pCR.

Variable	AUC	95% CI	Cut-off value	Sensitivity	Specificity	*p*-value
Baseline NLR	0.690	0.607-0.772	2.080	0.458	0.862	< 0.001
Baseline PLR	0.611	0.525-0.698	104.982	0.339	0.890	0.011
Baseline LMR	0.652	0.570-0.734	2.849	0.847	0.386	< 0.001
Baseline CAR	0.528	0.444-0.611	0.128	0.729	0.441	0.515
Preoperative NLR	0.668	0.589-0.748	2.498	0.763	0.524	< 0.001
Preoperative PLR	0.471	0.381-0.560	143.080	0.458	0.586	0.518
Preoperative LMR	0.586	0.497-0.676	4.698	0.339	0.862	0.059
Preoperative CAR	0.579	0.494-0.664	0.073	0.831	0.352	0.070

Abbreviations: ROC, receiver operating characteristic; pCR, pathological complete response; NLR, neutrophil-to-lymphocyte ratio; PLR, platelet-to-lymphocyte ratio; LMR, lymphocyte-to-monocyte ratio; CAR, C-reactive protein-to-albumin ratio.

Supplementary Table 4. Multicollinearity assessment of candidate variables for multivariable logistic regression.

Variable	GVIF	Df	$GVIF^{1/(2\times Df)}$
Sex	1.152	1	1.074
Differentiation	1.039	1	1.019
cTNM stage	1.146	2	1.035
Baseline NLR	1.235	1	1.111
Baseline LMR	1.203	1	1.097
Baseline PLR	1.181	1	1.087
Baseline CAR	1.193	1	1.092
Preoperative NLR	1.102	1	1.050
Preoperative LMR	1.201	1	1.096
Preoperative CAR	1.161	1	1.078

Multicollinearity among candidate variables for multivariable logistic regression was assessed using the GVIF. For categorical variables with more than one degree of freedom, the adjusted GVIF, calculated as $GVIF^{1/(2\times Df)}$ was reported to allow comparison across variables with different degrees of freedom. Abbreviations: GVIF, generalized variance inflation factor; Df, degrees of freedom; cTNM, clinical tumor-node-metastasis; NLR, neutrophil-to-lymphocyte ratio; LMR, lymphocyte-to-monocyte ratio; PLR, platelet-to-lymphocyte ratio; CAR, C-reactive protein-to-albumin ratio.

Supplementary Table 5. Comparison between the clinical model and the full.

Model	EPV	AUC (95% CI)	Bootstrap-corrected AUC	Brier score	Bootstrap -corrected Brier score
Clinical model	19.67	0.683 (0.608–0.758)	0.667	0.187	0.193
Full nomogram model	9.83	0.816 (0.755–0.877)	0.792	0.154	0.167

The clinical model included tumor differentiation and cTNM stage. The full nomogram model included tumor differentiation, cTNM stage, baseline NLR, preoperative NLR, and preoperative CAR. Both models were developed using 204 patients with 59 pCR events. Internal validation was performed

using bootstrap resampling. EPV was calculated as the number of pCR events divided by the number of predictor parameters. Abbreviations: EPV, events per variable; AUC, area under the curve; NLR, neutrophil-to-lymphocyte ratio; CAR, C-reactive protein-to-albumin ratio; pCR, pathological complete response.

Supplementary Table 6. Separated baseline and preoperative models for pCR.

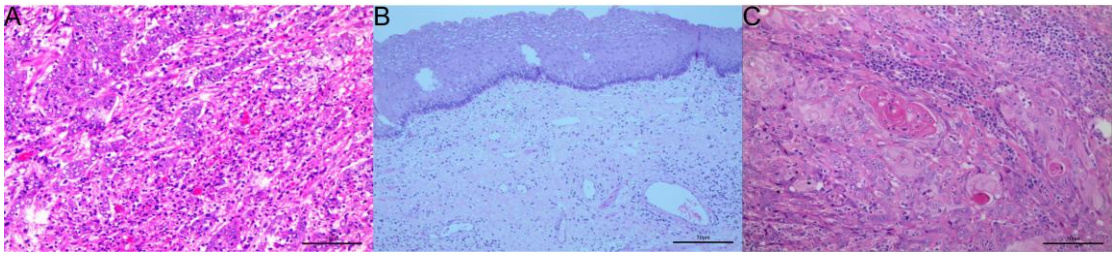
Model	Variable	Adjusted OR (95% CI)	*p*-value
Baseline model	Baseline NLR (low vs. high)	4.689 (2.246–10.033)	<0.001
Preoperative model	Preoperative NLR (low vs. high)	3.716 (1.815–8.039)	<0.001
	Preoperative CAR (low vs. high)	2.666 (1.197–6.409)	0.021

The baseline model included tumor differentiation, cTNM stage, and baseline NLR. The preoperative model included tumor differentiation, cTNM stage, preoperative NLR, and preoperative CAR. ORs were adjusted for tumor differentiation and cTNM stage. Abbreviations: OR, odds ratio; CI, confidence interval; NLR, neutrophil-to-lymphocyte ratio; CAR, C-reactive protein-to-albumin ratio; pCR, pathological complete response.

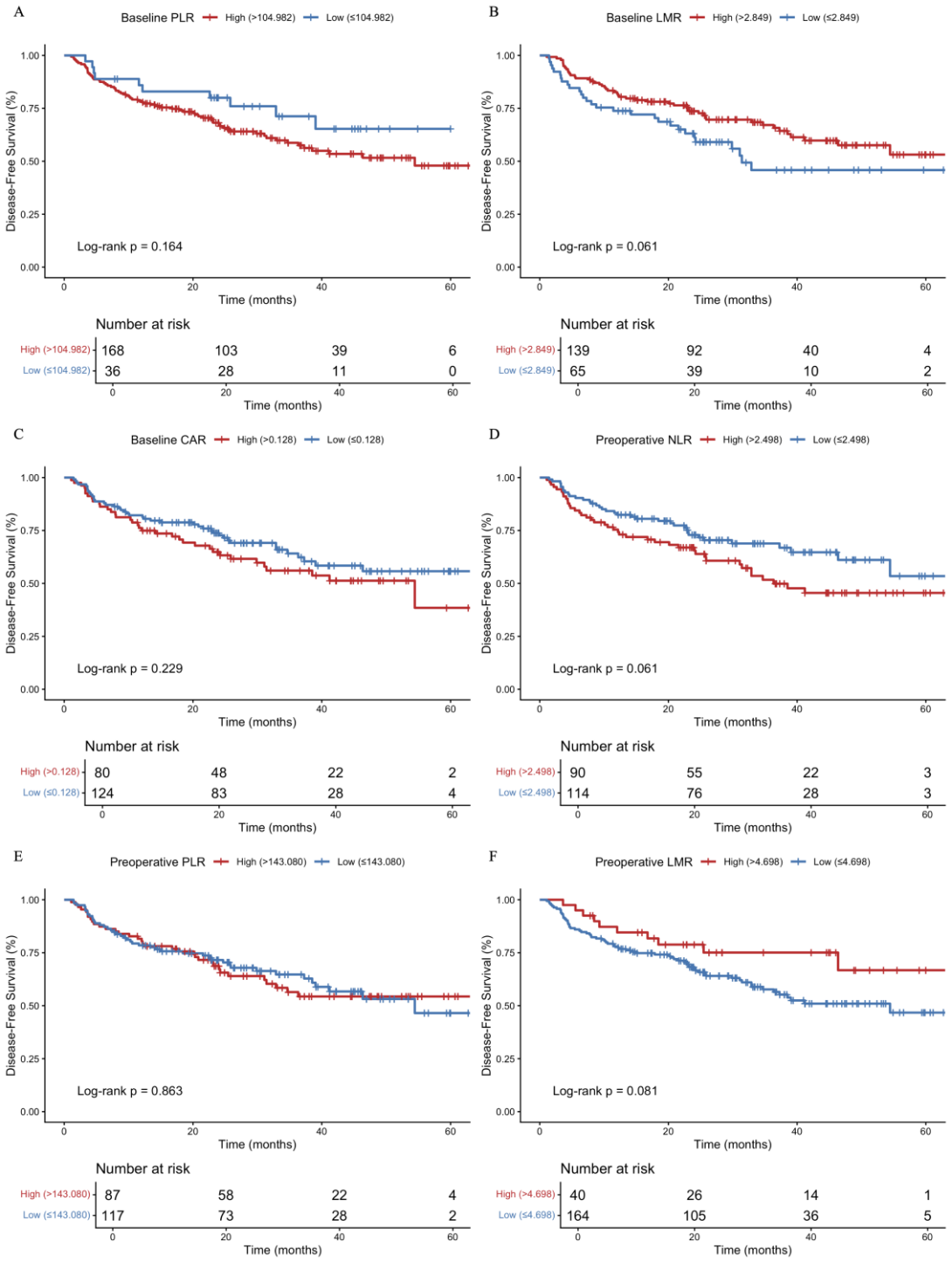
Supplementary Table 7. Sensitivity analyses of hematologic indicators associated with pCR after adjustment for treatment-related factors.

Variable	Model 0		Model 1		Model 2		Model 3	
	OR (95% CI)	*p*-value	OR (95% CI)	*p*-value	OR (95% CI)	*p*-value	OR (95% CI)	*p*-value
Baseline NLR (low vs. high)	5.044 (2.304–11.043)	< 0.001	5.244 (2.355–11.677)	< 0.001	5.264 (2.366–11.711)	< 0.001	5.719 (2.504–13.057)	< 0.001
Preoperative NLR (low vs. high)	3.420 (1.549–7.547)	0.002	3.312 (1.496–7.335)	0.003	3.657 (1.631–8.200)	0.002	3.511 (1.555–7.926)	0.003
Preoperative CAR (low vs. high)	3.466 (1.391–8.634)	0.008	3.908 (1.533–9.966)	0.004	3.535 (1.407–8.879)	0.007	4.137 (1.596–10.728)	0.003

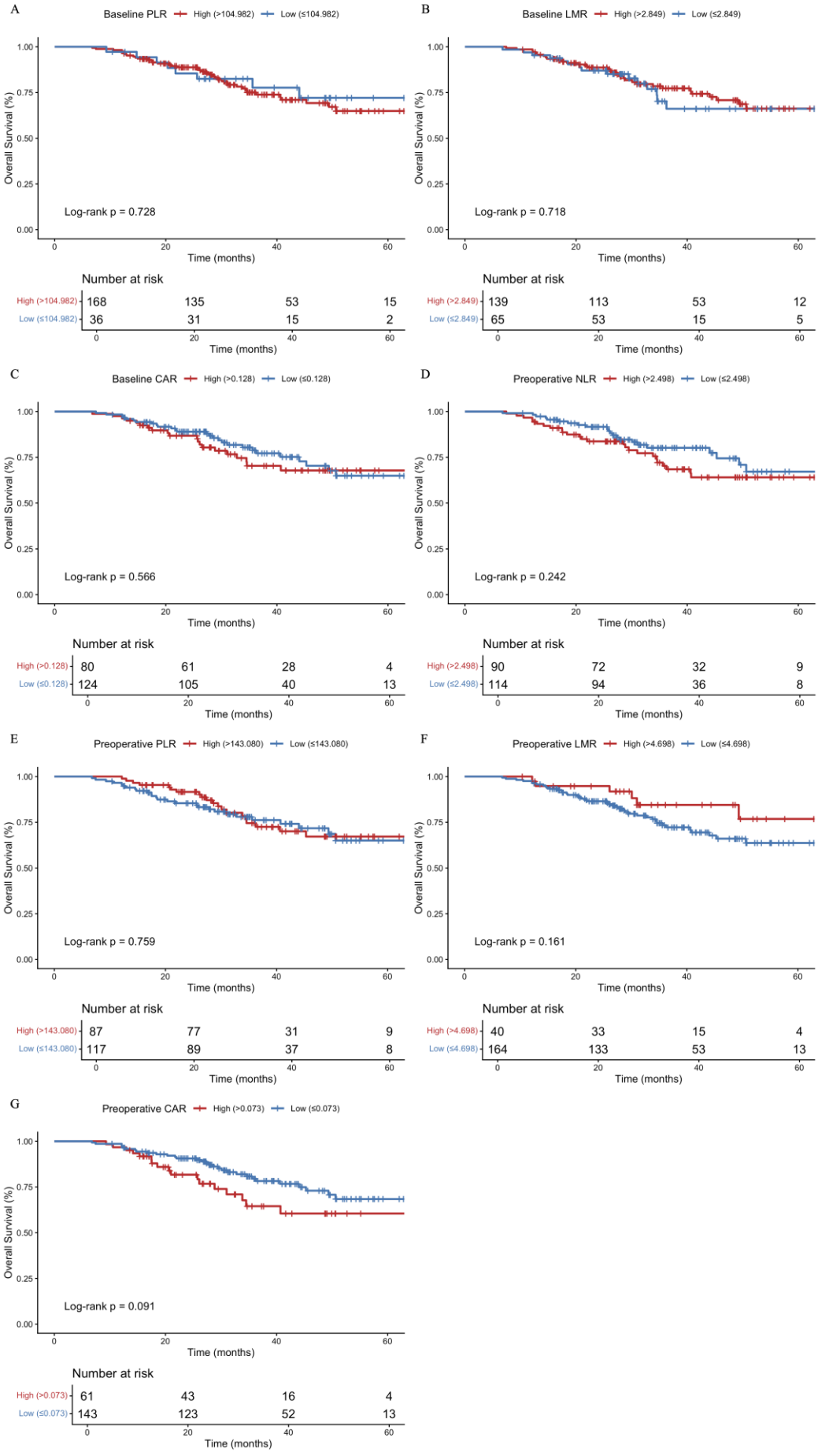
Model 0 was the original multivariable model adjusted for tumor differentiation, cTNM stage, baseline NLR, preoperative NLR, and preoperative CAR. Model 1 additionally adjusted for PD-1 inhibitor type and chemotherapy regimen. Model 2 additionally adjusted for the number of nICT cycles and interval from nICT to surgery. Model 3 additionally adjusted for all major treatment-related variables. Abbreviations: OR, odds ratio; CI, confidence interval; NLR, neutrophil-to-lymphocyte ratio; CAR, C-reactive protein-to-albumin ratio; pCR, pathological complete response; nICT, neoadjuvant immunochemotherapy.



Supplementary Fig. 1. Representative hematoxylin and eosin staining images. Representative H&E-stained sections showing: (A) primary esophageal squamous cell carcinoma tissue; (B) adjacent non-tumor esophageal mucosa; and (C) regional lymph node metastasis. All images were acquired using a 40× objective lens (total magnification, ×400). Scale bar, 50 μm.



Supplementary Fig. 2. Kaplan–Meier survival curves of disease-free survival (DFS) in patients with locally advanced esophageal squamous cell carcinoma (LA-ESCC) stratified by hematologic markers. (A) DFS stratified by baseline platelet-to-lymphocyte ratio (PLR). (B) DFS stratified by baseline lymphocyte-to-monocyte ratio (LMR). (C) DFS stratified by baseline C-reactive protein-to-albumin ratio (CAR). (D) DFS stratified by preoperative neutrophil-to-lymphocyte ratio (NLR). (E) DFS stratified by preoperative PLR. (F) DFS stratified by preoperative LMR.


A
Baseline PLR
High (>104.982)
Low (≤104.982)
Overall Survival (%)
Log-rank p = 0.728
Time (months)
Number at risk
High (>104.982) 168 135 53 15
Low (≤104.982) 36 31 15 2
B
Baseline LMR
High (>2.849)
Low (≤2.849)
Log-rank p = 0.718
Number at risk
High (>2.849) 139 113 53 12
Low (≤2.849) 65 53 15 5
C
Baseline CAR
High (>0.128)
Low (≤0.128)
Log-rank p = 0.566
Number at risk
High (>0.128) 80 61 28 4
Low (≤0.128) 124 105 40 13
D
Preoperative NLR
High (>2.498)
Low (≤2.498)
Log-rank p = 0.242
Number at risk
High (>2.498) 90 72 32 9
Low (≤2.498) 114 94 36 8
E
Preoperative PLR
High (>143.080)
Low (≤143.080)
Log-rank p = 0.759
Number at risk
High (>143.080) 87 77 31 9
Low (≤143.080) 117 89 37 8
F
Preoperative LMR
High (>4.698)
Low (≤4.698)
Log-rank p = 0.161
Number at risk
High (>4.698) 40 33 15 4
Low (≤4.698) 164 133 53 13
G
Preoperative CAR
High (>0.073)
Low (≤0.073)
Log-rank p = 0.091
Number at risk
High (>0.073) 61 43 16 4
Low (≤0.073) 143 123 52 13

Supplementary Fig. 3. Kaplan–Meier survival curves of Overall survival (OS) in patients with locally advanced esophageal squamous cell carcinoma (LA-ESCC) stratified by hematologic markers. (A) OS stratified by baseline platelet-to-lymphocyte ratio (PLR). (B) OS stratified by baseline lymphocyte-to-monocyte ratio (LMR). (C) OS stratified by baseline C-reactive protein-to-albumin ratio (CAR). (D) OS stratified by preoperative neutrophil-to-lymphocyte ratio (NLR). (E) OS stratified by preoperative PLR. (F) OS stratified by preoperative LMR. (G) OS stratified by preoperative CAR.