Prognostic and Predictive Role of Neutrophil-to-Lymphocyte and Platelet-to-Lymphocyte Ratios in Triple-Negative Early Breast Cancer Treated with Neoadjuvant Chemoimmunotherapy

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Abstract

Triple-Negative Breast Cancer (TNBC) is an aggresive subtype associated with por prognosis and limited therapeutic targets.

The integration of immune checkpoints inhibitors, such as Pembrolizumab, into neoadjuvant chemotherapy has improved phatological comlpete responses (pCR) rates and event-free survival in early stage TNBC, as demonstrated in the KEYNOTE-522 trial.

There is increasing interest in identifying accesible biomarkers to predict response and prognosis. Systemic inflammatory índices, including neutrophile-to-lymphocyte ratio (NLR) and platelet—to-lymphocyte ratio (PLR) have emerged as potencial prognostis and predictive markers in breast cancer, with meta-analyses showing that lower pre-treatment NLR and PLR are associated with higher pCR rates and improved survival outcomes.

We aimed to evaluate the impact of baseline NLR and PLR in pathological response and survival outcomes in patients with eTNBC treated with neoadjuvant chemo-immunotherapy.

Methods and Materials

A retrospective analysis was performed in patients with eTNBC treated with neoadjuvant chemotherapy combined with Pembrolizumab. Baseline blood counts (pre-treatment) were used to calculate NLR and PLR.

pCR was defined as no residual invasive cancer in breast and lymph nodes (RCB-0). Median values and interquartile ranges (IQRs)of NLR and PLR were compared between patients who achieved pCR and those with residual disease.

Multivariate logistic regression assessed predictors of pCR. Cox proportional hazard models evaluated associations with invasive disease-free survival (iDFS) and overall survival (OS).

Results

Seventy-nine patients were included; median age was 50 years (ED 10.4). The overall pCR rate was 64,2% (N:43). Baseline median NLR was 1.81 (IQR 1.37-2.55); PLR was 133.0 (IQR 104.5-164.9). No statistically significant differences in baseline NLR or PLR were observed between pCR and non-pCR groups (NLR: p=0.596; PLR: p=0.652). In multivariate analysis, baseline NLR >1.8 was not associated with pCR (OR 1.02; 95% CI 0.26-3.93; p=0.98).

A non-significant trend toward lower pCR was observed among patients receiving antibiotics prior to treatment (OR 0.69; p=0.48). Regarding survival, pCR was associated with a favorable trend for both iDFS (p=0.19) and OS (p=0.082). Baseline NLR >1.8 showed a non-significant association with worse iDFS (coef. -2.21; p=0.19) and OS (coef. -1.79; p=0.30). Clinical T3-T4 tumors showed a trend toward poorer survival outcomes but did not reach significance.

Variable	Total	RCB-0	Residual disease
Age – Median (SD) (p=0.298)	50.0 (10.4)	49.0 (10.3)	53.0 (10.5)
Clinical T – T1/T2 (%) (p=0.653)	76	75	79
Clinical T – T3/T4 (%)	19	25	16
Ki67 <20 (%) (p=0.249)	3	8	0
Ki67 ≥20 (%)	94	91	97
Grade 2 (%)	15	25	9.3
Grade 3 (%)	78	62.5	88
HER2-low (%) (p=1.000)	45.6	46	46.5
Baseline NLR – Median (IQR) (p=0.596)	1.81 [1.37–2.55]	1.66 [1.35–2.36]	1.84 [1.43–2.73]
Baseline PLR – Median (IQR) (p=0.652)	133.0 [104.5–164.9]	126.7 [104.5–159.2]	133.6 [103.4–170.5]

Table 1. Baseline characteristics in the overall cohort and by pathological response.

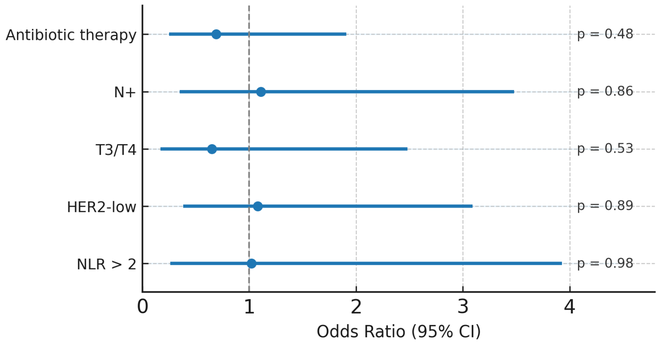


Figure 1. Forest plot of multivariate predictors of pCR. Dots show odds ratios with 95% Cis.

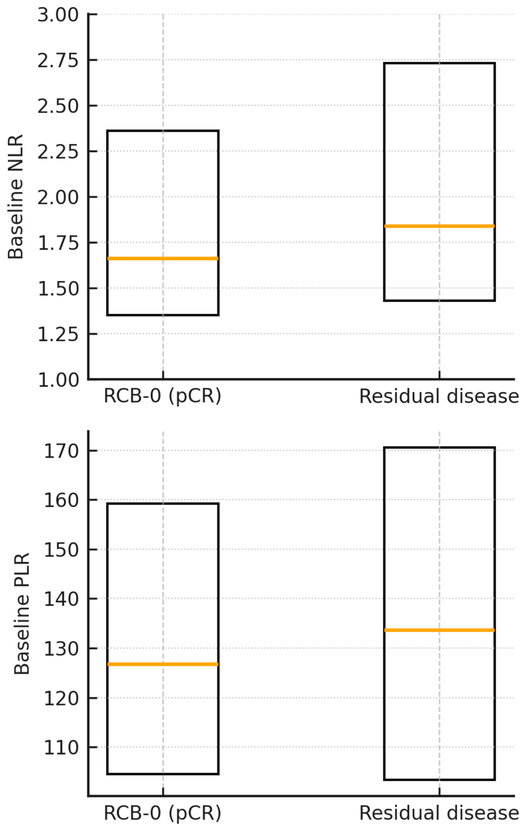


Figure 2. Baseline NLR and PLR stratified by pathological response (RCB-0/pCR vs residual disease)

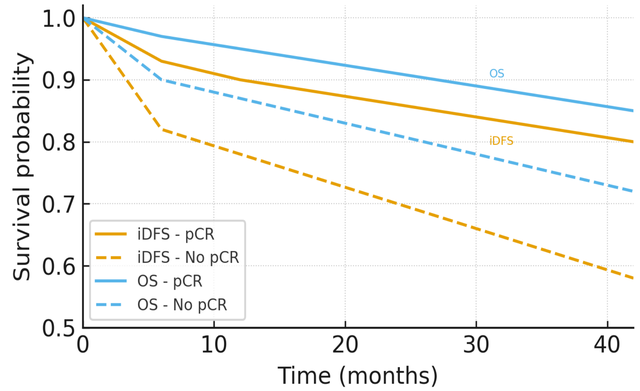


Figure 3. Kaplan-Meier curves of invasive disease-free survival (iDFS) and overall survival (OS) according to achievement of pathological complete response (pCR).

Conclusions

In this cohort of patients with localized TNBC treated with neoadjuvant chemoimmunotherapy, baseline NLR and PLR did not significantly predict pCR or survival outcomes. Although trends suggest that elevated NLR may correlate with poorer prognosis, these findings were not statistically significant, possibly due to limited sample size.

The current literature supports the potential of NLR and PLR as prognostic and predictive biomarkers in TNBC, but results are heterogeneous and depend on cut-off values, treatment context, and integration with other immune markers such as TILs. Larger prospective studies and integrated analyses are needed to validate their clinical utility and optimize patient selection for neoadjuvant immunotherapy.

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References

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