Complete blood count and their ratios can support diagnosis and survival outcomes in giant cell arteritis

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1 BACKGROUND

Rapid diagnosis and treatment of giant cell arteritis (GCA) is crucial to prevent complications like vision loss. While inflammatory markers such as C-reactive protein (CRP) and erythrocyte sedimentation rate (ESR) are commonly used, they lack specificity. Temporal artery biopsy (TAB) is specific but has low sensitivity. Blood count components, including neutrophil-to-lymphocyte ratio (NLR) and platelet-to-lymphocyte ratio (PLR), have been studied in other autoimmune diseases, but their role in GCA diagnosis and outcomes remains unclear.

2 OBJECTIVES

To compare NLR, PLR, neutrophil (N), lymphocyte (L) and platelet (P) count to classic inflammatory markers (CRP and ESR) for diagnosis of GCA, positive vascular ultrasound (vUS), positive TAB and death.

3 METHODS

A retrospective study was conducted using data from the University of Washington's GCA fast-track clinic (2017–2024). Patients were included if they had a vascular ultrasound (vUS), inflammatory markers, and complete blood count (CBC) within four weeks of GCA diagnosis. GCA patients met ACR classification criteria (>6), while controls had scores <5. Statistical analyses included bivariate tests, ROC curve analysis, and Cox regression models. Predictive models were built splitting the same into a training/test dataset using stepwise regression, LASSO regression, and non-parametric analysis with stepwise refinement. The model with the best performance was selected.

4 RESULTS

We included 119 patients with final GCA diagnosis and 131 controls. For GCA patients, the median age (p25-p75) was 68.5 (62.2–74.8), with 74 (62.2%) women. Ethnicity breakdown: 95 (87.2%) White, 8 (7.3%) Asian, 4 (3.7%) Black, and 2 (1.7%) Other.

In the bivariate analysis, all biomarkers (as continuous variables) were significantly associated with GCA diagnosis and positive vUS (except for N); none were associated with TAB. Biomarkers other than N and P were associated with death both in the wc and in the GCA group. We observed significant correlations between blood cell components and ESR and/or CRP, but with coefficients <0.4. Associations were weaker with dichotomized variables, especially when using median cutoffs pg rather than the wc.

Figure 1 shows the ROC of the individual biomarkers as well as the stepwise model with the combination of biomarkers that improved the AUC for each outcome. Blood count components improved the model for GCA diagnosis, positive vUS and death in the wc, and were not inferior to ESR or CRP (p-value 0.05 of superiory of ESR+Li vs ESR (Fig. 1a), non-significant p-value for the rest vs ESR or CRP).

The univariate COX regression model showed that NLR (HR 1.09 (95% CI 1.01-1.18), p-value 0.019), PLR (HR 1.00 (1.001-1.009), p-value 0.07), L (HR 0.17 (0.03-0.81), p-value 0.026), CRP (HR 1.02 (1.01-1.03), p-value 0.000) and ESR (HR 1.022 (1.00-1.04), p-value 0.029) were associated with death in the GCA group. The stepwise multivariate proportional hazard model showed that the combination of CRP (p-value 0.006) and L_inv (p-value 0.086) had the highest concordance of 0.83, suggesting better predictive ability than a model with only CRP. The components of the multivariate stepwise logistic regression model for death in the GCA group are shown in Fig. 2a while the ROC and AUC in Fig. 2b. It demonstrated strong performance (accuracy 94.44%, precision 94.29%, sensitivity 100%, F1 97.06%, specificity 33.33%, false positive rate 66.67%, false negative rate 0%).

5 CONCLUSIONS

Blood count components are associated with GCA outcomes including diagnosis, positive vUS, and death. Their combination with classic inflammatory biomarkers enhances the performance and predictive value of several models, suggesting their potential as biomarkers for GCA assessment.

Figure 2: Multivariate stepwise logistic regression model for death in the GCA group (2a) with its ROC and AUC (2b).

a

Variable	Coefficient	OR	Lower 95% CI	Upper 95% CI	*p*-val
Intercept	-11.1266	0.000047	0.0000000004	0.0345	**0.0136**
Coronary artery disease (Yes)	2.4751	11.8833	1.2279	160.3331	**0.0365**
No comorbidities	-17.2470	< 0.0001	NA	1.5624E+77	0.9935
Age in years (per 1-year increase)	0.0691	1.0715	0.9755	1.1990	0.1770
Platelet-to-lymphocyte ratio (PLR)	0.0049	1.0049	0.9998	1.0106	0.0634
Years from 1st rheumatology visit to now	0.5508	1.7347	1.0748	3.1849	**0.0396**

b

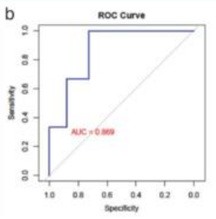

Figure 1: ROC of the individual biomarkers and the stepwise model with the combination of biomarkers with their AUC. All are significant except those marked as NS (not significant). In parenthesis in the following legend, it is specified the best biomarker(s) selected in the stepwise model. a) GCA diagnosis (L_inv + ESR), p-value 0.004 and 0.01); b) Positive vUS (NLR, p-value 0.01); c) Positive TAB (CRP, p-value 0.08); d) Death whole cohort (NLR + PLR + N + P + CRP; p-value NS; e) Death only in GCA patients (CRP, p-value 0.02).