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PRE-SURGERY BLOOD CELL RATIOS AND SURVIVAL IN PATIENTS WITH MALIGNANT GLIOMAS

Background. Malignant diffuse gliomas (MG) of the brain (WHO grade 3—4) are highly aggressive primary tumors of central nervous system (CNS), spreading rapidly by infiltrating healthy brain tissue. In the majority of cases, tumor relapse occurs. The prognostic significance of pre-surgery factors, such as inflammatory markers, particularly, the peripheral blood counts in patients with MG is discussed and remains controversial. The **aim** of this study was to assess the relationship between the blood cell ratios and overall survival (OS) and relapse-free survival (RFS) in MG patients. **Materials and Methods.** The data on 59 MG patients were analyzed: 41 cases of primary (newly diagnosed) MG (astrocytoma (A-III, WHO grade 3, n = 8) and glioblastoma (GB, WHO grade 4, n = 33)) and 18 cases of recurrent MG (recurrent A-III (WHO grade 3, n = 7) and recurrent GB (WHO grade 4, n = 11)). Blood cell counts (peripheral blood leukocytes (PBL), platelets (Pt), neutrophils (Neu), lymphocytes (Ly), monocytes (Mo)) and NLR (Neu/Ly ratio), PLR (Pt/Ly ratio), MLR (Mo/Ly ratio), and systemic immune-inflammation index (SII)) in the preoperative period (prior to re-resection in cases of recurrent MG) were evaluated. The Kaplan — Meier and Cox regression analyses of OS/RFS were performed. The potential association between the blood counts and ratios PLR (≤146 vs. >146), NLR (≤4 vs. >4), MLR (≤0.27 vs. >0.27), SII (≤906 vs. >906), as well as sex (female vs. male) and age (≤60 vs. >61) with OS and RFS were analyzed. **Results.** PBL and Neu counts, as well as NLR and SII indices, in patients with primary and recurrent GB in the pre-operative period significantly exceeded the reference values ($p < 0.02$). PBL, Neu, and SII significantly correlated with tumor grade. In patients with primary A-III and GB, longer OS tended to be associated with high PLR, NLR, MLR, and SII values, while in patients with recurrent GB, longer OS tended to be associated with low values of these ratios. Patients with recurrent A-III and GB showed a significant association between low pre-surgery NLR, SII and better RFS while patients with recurrent GB — significant association between low pre-surgery MLR and better RFS. Significant association between OS and sex of patients with both primary and recurrent GB was shown. **Conclusions.** The results obtained suggest the possible prognostic significance of PLR, NLR, MLR, and SII values in the treatment outcomes of MG patients.

Keywords: diffuse glioma, high-grade astrocytoma, glioblastoma, neutrophil-to-lymphocyte ratio, platelet-to-lymphocyte ratio, systemic immune-inflammation index, overall survival.

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Malignant diffuse gliomas (MG) of the brain (WHO grade 3—4) are highly aggressive primary tumors of the central nervous system (CNS), spreading rapidly by infiltrating healthy brain tissue. According to the Central Brain Tumor Registry of the United States, the average annual age-adjusted incidence rate of all malignant CNS tumors in 2016—2021 was 6.89—6.94 per 100,000 population, and average annual mortality rate — 4.41—4.42 [1, 2]. According to the National Cancer Registry, the incidence of malignant variants of primary brain tumors in Ukraine in 2021—2022 was 4.8 per 100,000 population, and the mortality rate was 3.5% [3]. The corresponding quantitative values, as well as proportional rates in 2022—2023 did not involve overall population due to the lack of demographic data from the State Statistics Service of Ukraine [4].

Approximately 27.1% of all brain and other CNS tumors are malignant, and diffuse gliomas accounted for 22.9% of all the tumors [2]. Diffuse gliomas arise from glial or precursor cells and include glioblastoma (GB), astrocytoma (A), oligodendroglioma, ependymoma, and a few rare subtypes [5, 6]. The most common malignant primary brain tumor and the most aggressive one is GB. It accounts for about 14% of all primary brain and CNS tumors and 51% of all primary brain cancers [1, 2].

Despite comprehensive studies of the causes and mechanisms of the glial tumor progression, today no significant clinical progress in their treatment has been achieved. The five-year relative survival rate following diagnosis of malignant brain and other CNS tumors is 35.7%; of GB — 6.9—7.1%. The median survival for GB is 8—9 months; for malignant A-III (grade 3) — 21 months, for malignant oligodendrogliomas (grade 3) — 107—108 months [1, 2]. In most cases, tumor relapse occurs. The improvement of the patients' survival may be reached with novel approaches in line with the treatment personalization.

To determine individual treatment regimens for MG patients, the identification of non-invasive preclinical prognostic factors for overall survival (OS) and relapse-free survival (RFS) may be advantageous. As predictive factors, inflammatory markers as well as blood cell ratios are considered [7]. The assessment of the prognostic significance of the major cell populations proportions in the peripheral blood of patients, namely, indices such as ratios of neutrophil-to-lymphocyte (NLR), platelet-to-lymphocyte (PLR), and monocyte-to-lymphocyte (MLR) are assumed promising [8—12]. Several studies revealed associations between PLR and/or NLR and outcomes in patients with primary GB [7—26], and only few studies analyzed the prognostic role of PLR or NLR in patients with recurrent GB [27—30]. Moreover, the prognostic significance of pre-surgery blood cell counts for OS/RFS of MG patients remains controversial.

The aim of the study was to assess the association between blood cell ratios and treatment outcomes in terms of overall survival (OS) and relapse-free survival (RFS) in patients with MG.

Materials and Methods

59 patients with MG treated at the State Institution "Romodanov Neurosurgery Institute, the National Academy of Medical Sciences of Ukraine" (SI «INS NAMS») over 2022—2024 were included in this prospective study after providing an informed consent. The study was conducted within the scope of scientific research work (state registration No. 0122U000327, No. 0124U000618) in accordance with the protocol agreed by the Bioethics Committee of the SI «INS NAMS» (protocols No. 2 dated 04.14.2021, No. 2 dated 04.14.2023).

Diagnoses were verified by histological examination: 41 cases of primary (newly diagnosed) MG and 18 cases of recurrent MG. Among the cases of primary MG, the high-grade A (grade 3, A-III) was diagnosed in 8 patients, and GB (grade 4) in 33 patients. Among the cases of recurrent MG, recurrent A-III (grade 3) was diagnosed in 7 patients, and recurrent GB (grade 4) in 11 patients. MG subtypes were defined according to the approved WHO updated edition of the CNS tumor classification (2021) and utilizing ICD-O-3 for the assignment of histopathology and behavior, in keeping with CBTRUS current practice using histopathology groupings [1].

The inclusion criteria were as follows: histological verification of the diagnosis; functional status of the patient ≥60% by the Karnofsky scale; age of patients over 18 years; the patient's voluntary consent to participate in the study. Distribution by sex (59.3% males and 40.7% females) and age of the study participants and clinical parameters of the patient cohort are shown in Table 1.

OS was estimated from the day of the first surgery to the day of death or the last follow-up. RFS (for patients with MG recurrence) was estimated from the day of the first surgery to the day of confirmation of tumor regrowth (relapse) before the second surgery.

The follow-up was completed in March 2025 (right censoring date: March 1, 2025).

Patients were classified as alive, dead, or censored (Table 1). The censored patients were those who were unavailable for contact.

The absolute counts of peripheral blood leukocytes (PBL), platelets (Pt), neutrophils (Neu), lymphocytes (Ly), monocytes (Mo) in the preoperative period (prior to re-resection in cases of recurrent GB), and ratios NLR (Neu/Ly), PLR (Pt /Ly), MLR (Mo/Ly) were analyzed, as well as the systemic immune-inflammation index (SII) calculated by the formula [19]:

$$SII = \frac{Pt \times Neu}{Ly}$$

As a control, the indices of practically healthy persons (comparison group, n = 5) were used.

The statistical analysis of the data was carried out using the software package "Statistica 12.0" (Software StatSoft Inc., 2014) and IBM SPSS Statistics 27 (IBM corp., 2020). Parametric and nonparametric methods were applied (Kruskel — Wallis ANOVA rank discriminant analysis for multiple comparison of several independent groups, post-hoc Mann — Whitney U-test for pairwise comparison of independent groups with subsequent Benjamini — Hochberg adjustment for *p*-values). The normality of data distribution was determined by the Shapiro — Wilk test. The univariable analysis was performed using the Kaplan — Meier method, and differences between the survival curves were evaluated using the log-rank (Mantel — Cox) test with subsequent Benjamini — Hochberg adjustment for *p*-values. The Cox regression analysis (omnibus tests of model coefficients) was additionally performed, with the Benjamini — Hochberg correction applied to *p*-values. A p-value < 0.05 was considered statistically significant. The correlation analysis was performed using Spearman's rank correlation with subsequent Benjamini — Hochberg adjustment for *p*-values.

Results

Ratios of peripheral blood cells. The Kruskel — Wallis ANOVA rank discriminant analysis for multiple comparisons of blood cell counts in MG patients revealed a significant differences in absolute counts of PBL ($p = 0.012$), Neu ($p = 0.007$) as well as NLR ($p = 0.03$) and SII ($p = 0.04$). For further precise pairwise comparison, we used post hoc Mann — Whitney U-test with subsequent Benjamini — Hochberg adjustment (8 tests for each indicator (PBL, Neu, NLR, SII); Table 2).

The absolute PBL count in patients with MG significantly exceeded the reference values in a control group (Fig. 1, *a*). The differences in the absolute counts of Pt, Ly, and Mo as well as PLR and MLR ratios between the groups were insignificant (Fig. 1, *b, c, d, f, h*). The absolute count of Neu in MG patients both in primary GB and recurrent GB groups exceeded the reference values by 2.5—3 times (Fig. 1, *e*). At the same time, NLR and SII indices increased, reaching significant differences in patients with GB primary compared to control (Fig. 1, *g, i*). The differences in blood cell

Table 1. **Clinical parameters of the patient cohort**

Group	n	Type of malignant diffuse glioma	ICD-O-3 histopathology and behavior code	Grade	Primary / recurrent	Sex	Age (years) Me (min; max)	Status (alive / dead / censored)
1	8	Astrocytoma (A)	9401/3	G3	Primary	m (4) w (4)	38.5 (30—54) 38.0 (28—40)	6 / 1 / 1
2	7	Astrocytoma (A)	9401/3	G3	Recurrent	m (5) w (2)	38.0 (24—60) 38.5 (35—42)	4 / 3 / 0
3	33	Glioblastoma (GB)	9440/3	G4	primary	m (20) w (13)	58.0 (18—72) 57.0 (31—72)	12 / 16 / 5
4	11	Glioblastoma (GB)	9440/3	G4	recurrent	m (6) w (5)	48.0 (38—64) 50.0 (3— 65)	3 / 7 / 1

Table 2. **Results of the multiple (Kruskel —Wallis ANOVA rank discriminant analysis) and post hoc pairwise (Mann — Whitney U-test) comparisons between the groups. *P*-values < 0.05 are considered significant (marked in red), after Benjamini — Hochberg adjustment (8 tests per indicator)**

Indicator	Multiple comparison (Kruskel — Wallis ANOVA)	*p*-value	Pairwise comparison (Mann — Whitney U-test)	*p*-value	
		Kruskel — Wallis ANOVA		Mann — Whitney U-test	adjusted
PBL	A-III primary GB primary A-III recurrent GB recurrent Control	0.0118	A-III primary vs. GB primary	0.119607	0.191372
			A-III primary vs. A recurrent	0.754579	0.754579
			A-III primary vs. control	0.093240	0.186480
			GB primary vs. GB recurrent	0.520817	0.694422
			GB primary vs. control	0.000331	0.002646
			A-III recurrent vs. GB recurrent	0.660472	0.754825
			A-III recurrent vs. control	0.051948	0.138528
			GB recurrent vs. control	0.001832	0.007326
Pt	A-III primary GB primary A-III recurrent GB recurrent Control	0.2204	*p*-value from Kruskel — Wallis ANOVA test is non-significant, no need for post-hoc pairwise comparison		
Ly	A-III primary GB primary A-III recurrent GB recurrent Control	0.4669	*p*-value from Kruskel — Wallis ANOVA test is non-significant; no need for post-hoc pairwise comparison		
Mo	A-III primary GB primary A-III recurrent GB recurrent Control	0.8623	*p*-value from Kruskel — Wallis ANOVA test is non-significant; no need for post-hoc pairwise comparison		
Neu	A-III primary GB primary A-III recurrent GB recurrent Control	0.0072	A-III primary vs. GB primary	0.046456	0.074330
			A-III primary vs. A-III recurrent	0.662005	0.756577
			A-III primary vs. control	0.045066	0.090132
			GB primary vs. GB recurrent	0.260114	0.346819
			GB primary vs. control	0.000381	0.003047
			A-III recurrent vs. GB recurrent	1.000000	1.000000
			A-III recurrent vs. control	0.030303	0.080808
			GB recurrent vs. control	0.004662	0.018648
PLR	A-III primary GB primary A-III recurrent GB recurrent Control	0.8341	*p*-value from Kruskel — Wallis ANOVA test is non-significant; no need for post-hoc pairwise comparison		
NLR	A-III primary GB primary A-III recurrent GB recurrent Control	0.0304	A-III primary vs. GB primary	0.153410	1.227280
			A-III primary vs. A-III recurrent	0.413586	3.308691
			A-III primary vs. control	0.093240	0.745921
			GB primary vs. GB recurrent	0.738170	5.905364
			GB primary vs. control	0.000518	0.004148
			A-III recurrent vs. GB recurrent	0.427822	3.422577
			A-III recurrent vs. control	0.017316	0.138528
			GB recurrent vs. control	0.055278	0.442224

End of Table 2

Indicator	Multiple comparison (Kruskel — Wallis ANOVA)	*p*-value	Pairwise comparison (Mann — Whitney U-test)	*p*-value	
		Kruskel — Wallis ANOVA		Mann — Whitney U-test	adjusted
PLR	A-III primary GB primary A-III recurrent GB recurrent Control	0.9530	*p*-value from Kruskel — Wallis ANOVA test is non-significant; no need for post-hoc pairwise comparison		
SII	A-III primary GB primary A-III recurrent GB recurrent Control	0.0437	A-III primary vs. GB primary	0.087928	0.703421
			A-III primary vs. A recurrent	0.490842	3.926740
			A-III primary vs. control	0.065268	0.522145
			GB primary vs. GB recurrent	0.760230	6.081836
			GB primary vs. control	0.001165	0.009323
			A-III recurrent vs. GB recurrent	0.874875	6.999001
			A-III recurrent vs. control	0.051948	0.415584
			GB recurrent vs. control	0.099234	0.793873

counts between subgroups GB primary vs. GB recurrent and A-III primary vs. A-III recurrent were insignificant.

Thus, the PBL and Neu counts in patients with GB (primary and recurrent) in the pre-operative period significantly exceeded the reference values, as well as NLR and SII indices in patients with primary GB. Moreover, glioma grade (G3, G4) showed a significant direct medium-degree relationship with specified quantitative indicators of peripheral blood cells: PBL (Spearman correlation coefficient $r = 0.405$, $p = 0.009$), Neu ($r = 0.410$, $p = 0.005$), SII ($r = 0.314$, $p = 0.04$), with a trend for NLR ($r = 0.280$, $p = 0.065$).

Analysis of the studied indicators depended on sex and revealed a tendency to slight correlation of high Pt and PLR indices with female sex, however insignificant ($r = 0.292$, $p = 0.24$; $r = 0.277$, $p = 0.17$, respectively).

Based on the median sample value of quantitative ratios NLR (4.04), PLR (145.93), MLR (0.27), SII (905.97), patients were divided into corresponding low and high value groups for Kaplan — Meier curves and Log Rank test analysis.

Survival analysis using the Kaplan — Meier multiple assessments revealed that in the A-III primary group, the median OS was 16.0 (2.0; 68.0) months, in the A-III recurrent group — 57.0 (33.0; 94.0) months; in the primary GB group — 10.5 (0.5; 68.5) months, and in the recurrent GB group — 20.0 (3.5; 84.0) months. The median RFS in the A-III recurrent group was 35.0 (23.0; 84.5) months, and in the GB recurrent group — 12.0 (2.5; 97.0) months. The Log Rank (Mantel — Cox) test revealed significant differences ($p < 0.001$) in the OS Kaplan — Meier estimate between MG groups and insignificantly longer RFS in the A-III recurrent group vs. the GB recurrent group (Fig. 2). The OS of the MG group showed a significantly mild inverse correlation with age (Spearmen correlation coefficient $r = -0.427$, $p = 0.008$) and no correlation with sex ($r = -0.135$, $p = 0.321$).

PLR (≤146 vs. >146), NLR (≤4 vs. >4), MLR (≤0.27 vs. >0.27), SII (≤906 vs. >906), and two additional factors ((sex (female vs. male) and age (≤60 vs. >61)) were investigated for potential associations with OS and RFS. Analysis of the subgroups of patients with primary A-III and recurrent A-III revealed no significant associations between their OS and evaluated factors and significant association of RFS with NLR ($p = 0.035$) and SII ($p = 0.037$) in the A-III recurrent group (Fig. 3).

Analysis of the subgroups of patients with primary GB and recurrent GB revealed no significant association between OS/RFS and evaluated factors, except a trend for association of OS with PLR ($p = 0.055$), significant associations of RFS with MLR ($p = 0.031$) and SII ($p = 0.053$) (Fig. 4), and a tendency for association with sex ($p = 0.048$, Log Rank test; $p = 0.062$, Cox regression test; Fig. 5).

Discussion

The blood cell ratios NLR, PLR, MLR, an SII are considered non-invasive pre-clinical prognostic factors of OS/RFS of MG patients and the choice of their treatment regimens [7—12]. In this study, we have found a significant increase in PBL and Neu counts in patients with primary GB and recurrent GB and an increase in NLR and SII in patients with primary GB at the pre-operative stage. Tumor grade significantly directly correlated with PBL count, Neu count, and SII ratio.

Survival analysis found out that median OS significantly differed between the groups of patients with MG from 10.5 months in primary GB patients to 57.0 months in recurrent A-III patients. These data corresponded to the known data on median survival for newly diagnosed GB as 8—9 months and 21 months for anaplastic astrocytoma [1, 2].

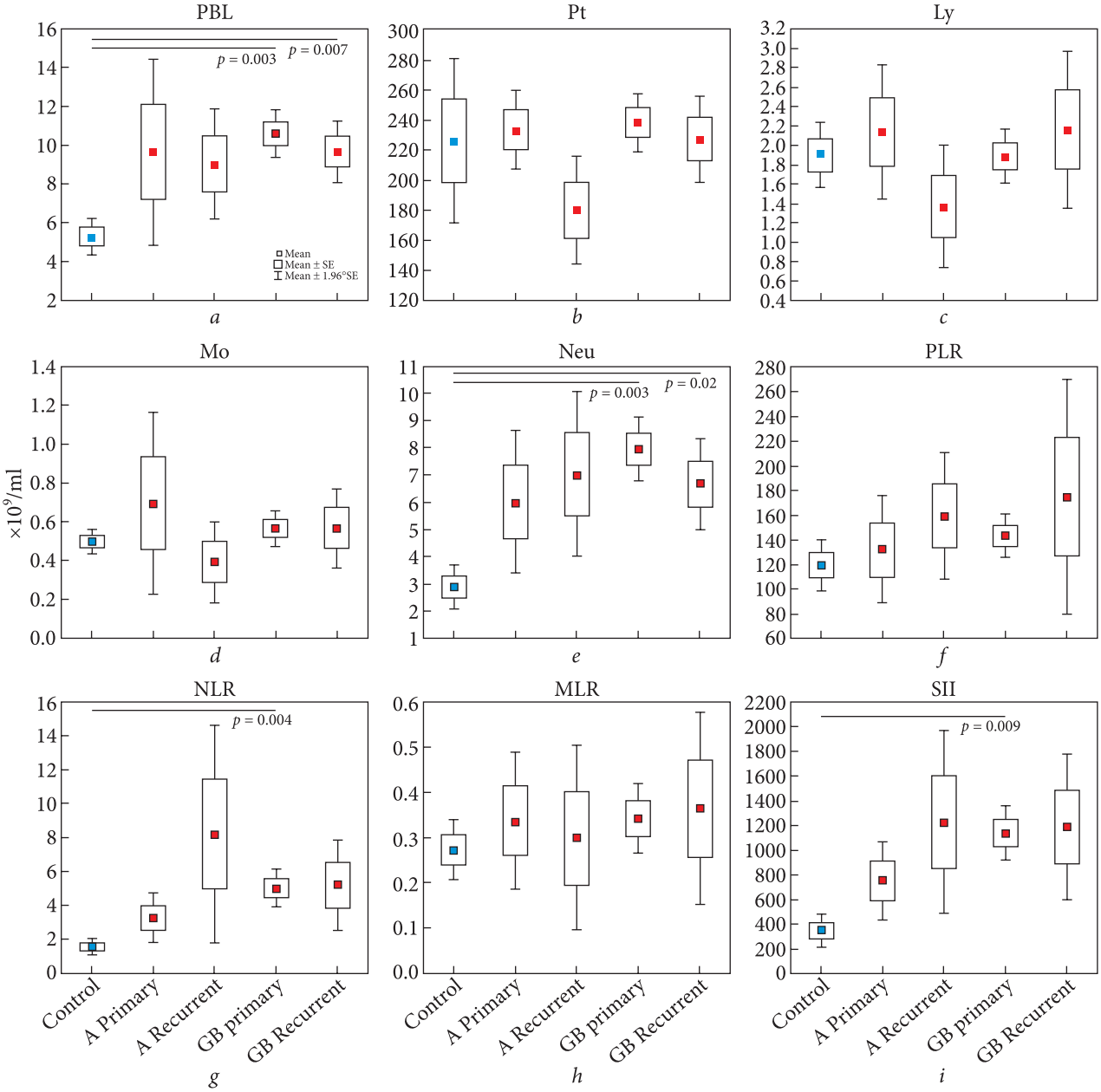

Fig. 1. Quantitative ratios of peripheral blood cells in patients with malignant gliomas: absolute counts of leukocytes (PBL, *a*), platelets (Pt, *b*), lymphocytes (Ly, *c*), monocytes (Mo, *d*), neutrophils (Neu, *e*), PLR (*f*), NLR (*g*), MLR (*h*), and systemic immune-inflammation index (SII, *i*). Control — healthy donors (n = 5); A-III primary — cases of primary astrocytoma grade 3 (n = 8); A-III recurrent — cases of recurrent astrocytoma grade 3 (n = 7); GB primary — cases of primary glioblastoma grade 4 (n = 33); GB recurrent — cases of recurrent glioblastoma grade 4 (n = 11). Mann — Whitney U-test with Benjamini — Hochberg adjustment

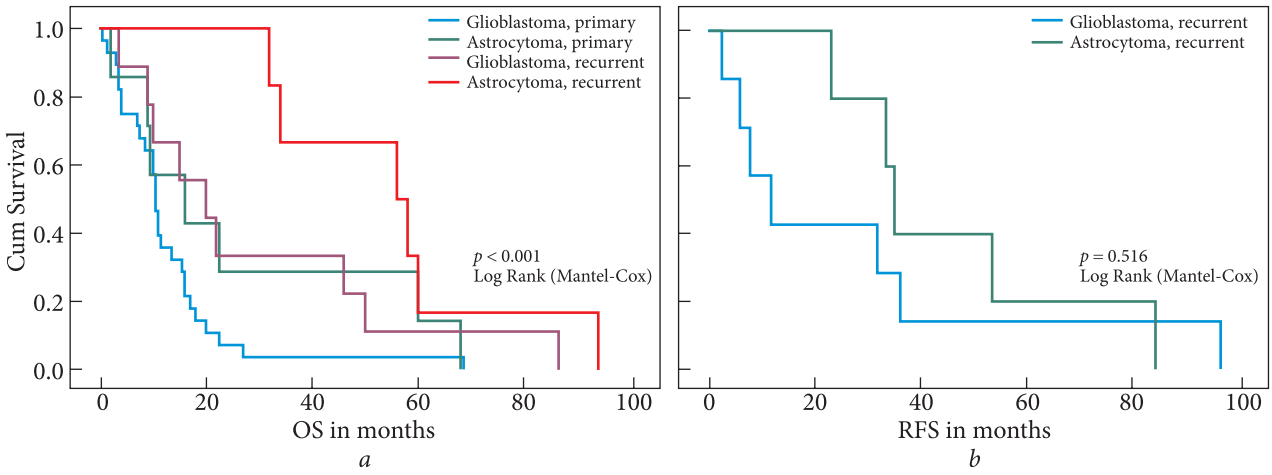

Fig. 2. OS (*a*) and RFS (*b*) of MG patients (Kaplan — Meier multiple assessments with Log Rank test)

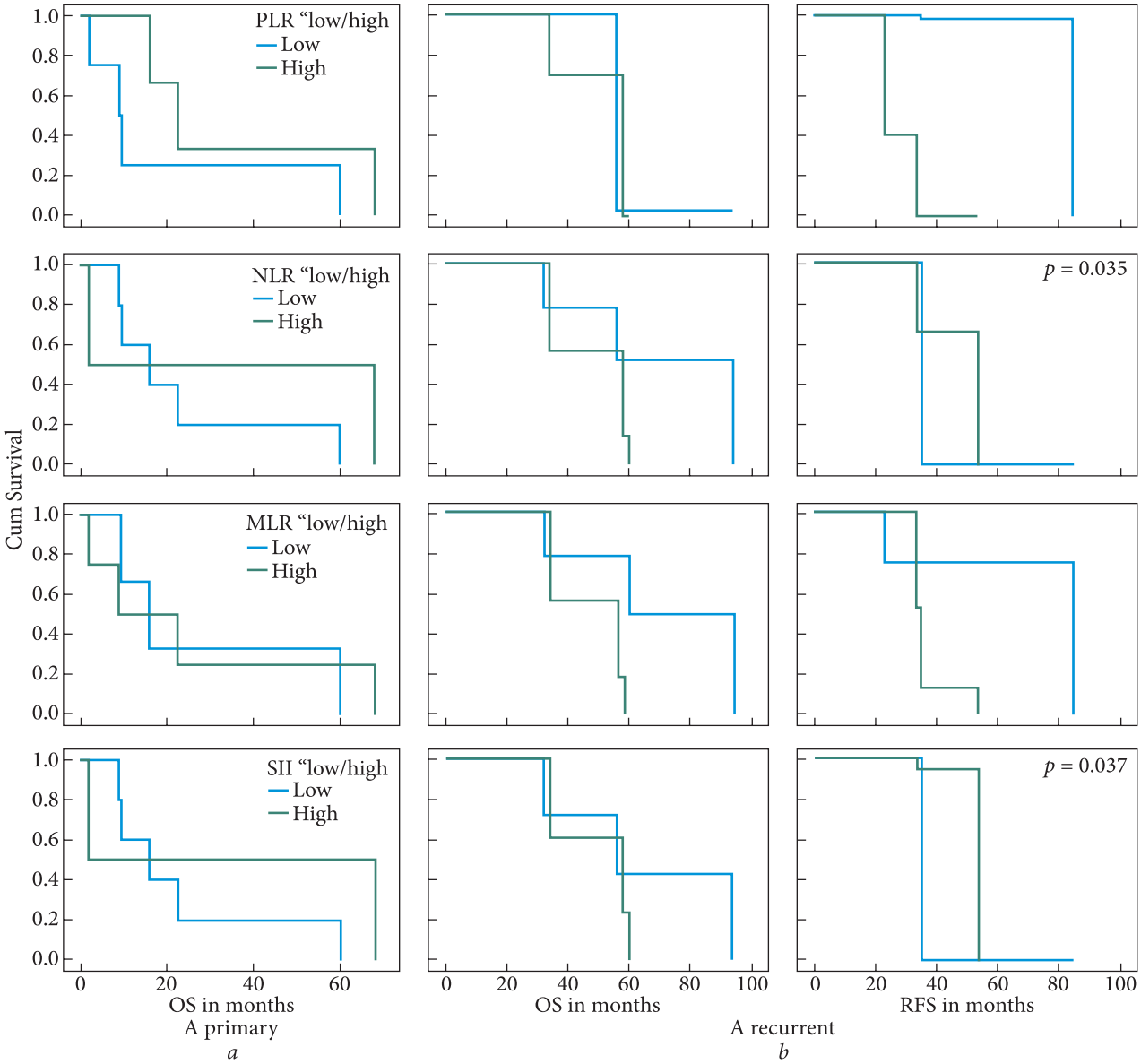

Fig. 3. Comparison of OS and RFS depending on "low vs. high" PLR, NLR, MLR, and SII at the pre-surgery stage in patients with primary (*a*) and recurrent (*b*) astrocytoma (A). Survival analysis using Kaplan — Meier multiple assessments with Log Rank test

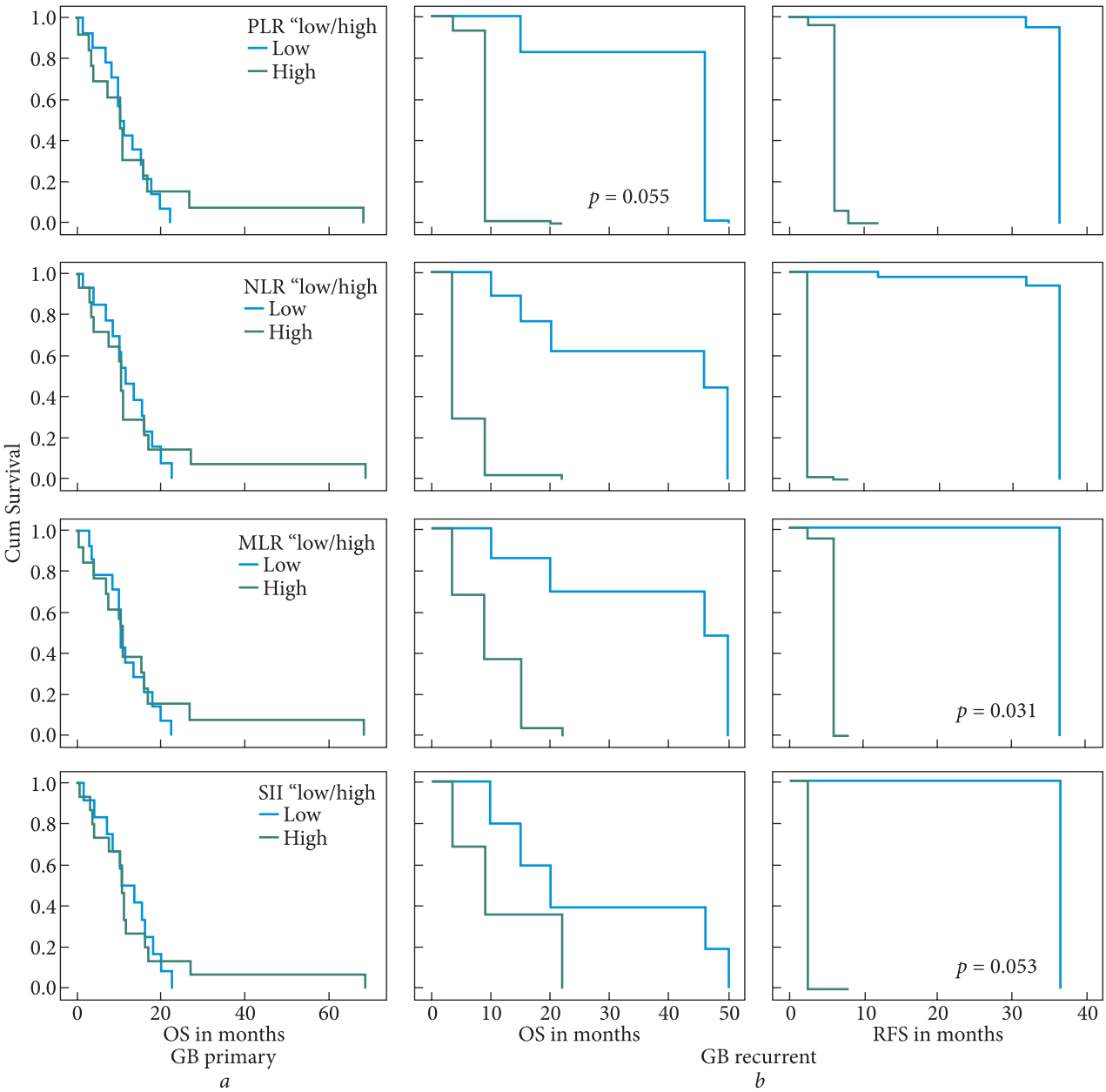

Fig. 4. Comparison of OS and RFS depending on "low *vs.* high" PLR, NLR, MLR, and SII at pre-surgery stage in patients with primary (*a*) and recurrent (*b*) glioblastoma (GB). Survival analysis using Kaplan — Meier multiple assessments with Log Rank test

OS of MG patients showed significant mild inverse correlation with age and no correlation with sex.

Then we have performed an analysis of survival of the patients depending on the median values of each of the parameters such as (NLR, PLR, MLR, and SII) (by comparison of the low and high value groups). In patients with A-III primary and A-III recurrent, no significant associations of OS with the factors were revealed. Patients with A-III recurrent showed a significant difference in RFS, depending on low and high values of NLR and SII. In patients with GB, significant difference in OS depending on low and high PLR and sex, and significant difference in RFS depending on MLR and SII were revealed.

Our data showed that longer OS tended to be associated with high PLR, NLR, MLR, and SII values in patients with primary A-III and primary GB, and low values of the indices in patients with recurrent A-III and recurrent GB. Based on these observations, a different role of inflammatory status in patients at different stages of tumor progression (primary *vs.* recurrent tumor) can be hypothesized. One could not exclude the influence of treatment regimens (chemotherapy, radiotherapy) on the

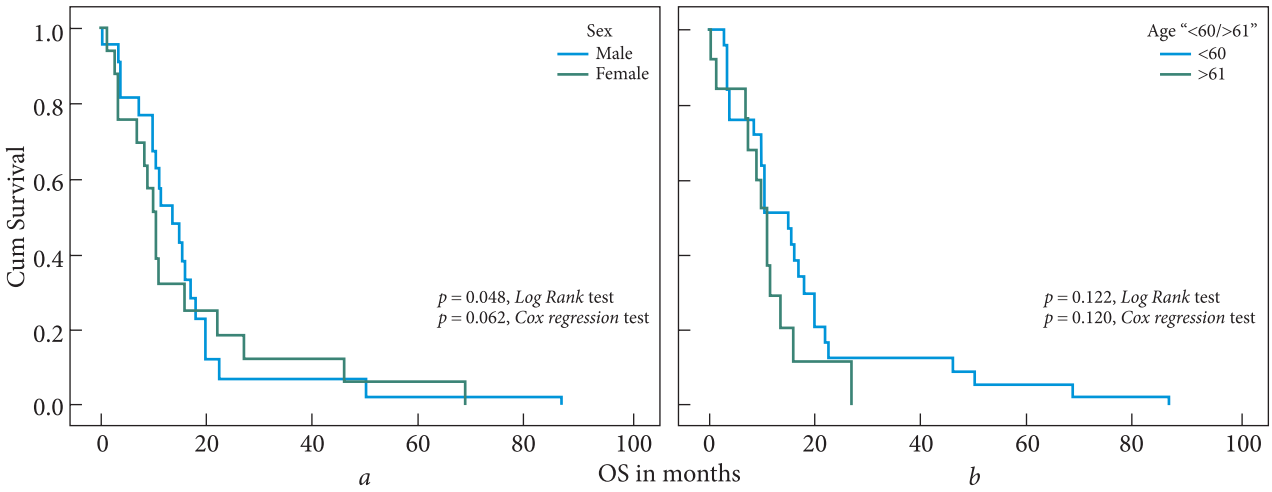

Fig. 5. Comparison of OS depending on sex (*a*) and age (*b*) of patients with primary and recurrent glioblastoma. Survival analysis using Kaplan — Meier multiple assessments with Log Rank test and Cox regression analysis (Omnibus tests of model coefficients) after Benjamini —Hochberg adjustment (6 tests)

blood cell counts in patients with recurrent MG; however, it is out of scope of this study.

Our findings partly corresponded to the data of Yang et al. [7], showing that lower NLR was significantly associated with worse OS, whereas the impact of PLR was insignificant.

It should be noted that known data on the prognostic significance of the preclinical blood cell counts regarding OS/RFS of MG patients remain controversial [20, 25].

In particular, a high PLR in the preoperative period is predictive of a poor prognosis for glioma patients, and reduced Pt counts correlate with OS [8, 9, 14, 15, 17, 18, 21—3, 26, 31, 32]. Improved outcomes showed a trend or were significantly associated with PLR ≤150 ($p = 0.029$), while PLR at the time of recurrence was identified as an independent predictor of OS in patients with recurrent GB [12, 30]. In our study a similar PLR median value tended to be associated with longer OS in patients with recurrent GB.

High NLR >4 ($p = 0.02$) before re-resection proved to be an independent predictor of OS of GB patients after the second surgery [27]. High NLR at the time of the first recurrence was negatively associated with OS of GB and diffuse glioma patients [17, 18, 21, 23, 26, 28, 29, 31]. These findings are consistent with our data: patients with recurrent A-III showed a significant association between low pre-surgery NLR (≤4) and better RFS.

However, other studies did not find a significant association between NLR and treatment outcomes in terms of OS and PFS [30]. In the retrospective study of Yersal et al. [16], the pre-operative PLR and NLR were not significantly associated with PFS or OS.

The discrepancies between our data and the results reported by other authors may have several explanations. Possibly, cut-off values of PLR, NLR, and SII in our study based on the median sample value of quantitative ratios, differs from that in some other studies. Also, lower sample size in our study hampered the achievement of significant results. The median age of our participants didn't exceed 58 years, which may also affect the final result of the study. Our study is prospective, whereas the previous studies had retrospective character, so there is a risk of hidden selection biases. Thus, further prospective studies performed on larger cohorts with inclusion of additional factors and variables (therapy modalities, chemotherapy, radiotherapy, number and size of GB lesions, *MGMT* promoter methylation, upfront resection etc.) are needed to properly define the prognostic value of PLR, NLR and SII in MG patients.

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ПОКАЗНИКИ ПЕРИФЕРИЧНОЇ КРОВІ В ДООПЕРАЦІЙНИЙ ПЕРІОД ТА ВИЖИВАНІСТЬ У ПАЦІЄНТІВ ЗІ ЗЛОЯКІСНИМИ ГЛІОМАМИ

Стан питання. Злоякісні дифузні гліоми (ЗГ) головного мозку (ВООЗ ступінь злоякісності 3—4) є агресивними інвазивними пухлинами, що переважають серед первинних пухлин центральної нервової системи (ЦНС) та характеризуються швидкою інфільтрацією у здорові тканини головного мозку. У більшості випадків ЗГ рецидивують. Прогностичне значення передопераційних факторів, таких як маркери запалення, зокрема, показники периферичної крові пацієнтів зі ЗГ, дискутується та залишається суперечливим. **Мета.** Оцінити зв'язок між співвідношенням клітин периферичної крові та результатами лікування за показниками загальної виживаності і безрецидивної виживаності в пацієнтів із ЗГ. **Матеріали та методи.** Проведено дослідження даних від 59 пацієнтів із ЗГ: 41 випадок первинно діагностованих ЗГ (астроцитома (А, ступінь злоякісності 3 за ВООЗ, n = 8) та гліобластома (ГБ, ступінь злоякісності 4 за ВООЗ, n =3)) та 18 випадків продовженого росту ЗГ (рецидив А (ступінь злоякісності 3 за ВООЗ, n =7) та рецидив ГБ (ступінь злоякісності 4 за ВООЗ, n = 11)). Проаналізовано вміст клітин периферичної крові (абсолютна кількість лейкоцитів периферичної крові, тромбоцитів (Т), нейтрофілів (Н), лімфоцитів (Л), моноцитів (М) та кількісні співвідношення Н/Л, Т/Л, М/Л, індекс системного імунного запалення (ІСІЗ)) у передопераційний період (перед повторною резекцією у випадках рецидивних ЗГ) та проведено аналіз загальної і безрецидивної виживаності за допомогою методу Каплана — Мейєра та регресійного статистичного аналізу Кокса. Показники Т/Л (≤146 проти >146), Н/Л (≤4 проти >4), М/Л (≤0,27 проти >0,27), ІСІЗ (≤906 проти >906), стать (жіноча проти чоловічої) та вік (≤60 проти >61) були досліджені для визначення потенційного зв'язку із загальною та безрецидивною виживаністю. **Результати:** Вміст лейкоцитів та нейтрофілів у пацієнтів з первинно діагностованою ГБ та рецидивною ГБ в передопераційному періоді достовірно перевищував референтні значення, також високими були показники Н/Л та ІСІЗ у хворих з первинними ГБ ($p < 0,02$). Ступінь злоякісності пухлини мав значущий прямий зв'язок з показниками вмісту лейкоцитів, нейтрофілів та ІСІЗ з тенденцією до зв'язку з індексом Н/Л. Для пацієнтів з первинними А та ГБ довша загальна виживаність мала тенденцію до асоціації з високими показниками Т/Л, Н/Л, М/Л, ІСІЗ, тоді як у пацієнтів з рецидивними А та ГБ довша загальна виживаність мала тенденцію до асоціації з низькими зазначеними співвідношеннями. У пацієнтів з рецидивом А спостерігався значущий зв'язок між низькими передопераційними показниками Н/Л, ІСІЗ та кращою безрецидивною виживаністю. У пацієнтів з рецидивною ГБ спостерігався зв'язок між низьким передопераційним показником Т/Л та кращою загальною виживаністю. У пацієнтів з первинними та рецидивними ГБ спостерігався значущий зв'язок між загальною виживаністю та статтю. **Висновки**. Отримані результати свідчать про ймовірну прогностичну значущість співвідношень Т/Л, Н/Л, М/Л, ІСІЗ для результатів лікування пацієнтів із ЗГ.

Ключові слова: дифузна гліома, астроцитома, гліобластома, співвідношення нейтрофіли/лімфоцити, тромбоцити/лімфоцити, індекс системного імунного запалення, загальна виживаність.