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The Effect of Preoperative Neutrophil-to-Lymphocyte Ratio and Platelet-to-Lymphocyte Ratio on the Success of Regional Anesthesia Blocks

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ABSTRACT

Introduction: Effective postoperative pain control is essential for recovery. Peripheral nerve blocks, such as the infraclavicular brachial plexus block, are widely used in multimodal analgesia, but their efficacy may be influenced by systemic inflammation. This study evaluated the predictive value of preoperative neutrophil-to-lymphocyte ratio (NLR) and platelet-to-lymphocyte ratio (PLR) for block efficacy and postoperative pain in upper extremity surgery.

Methods: A retrospective cohort of 116 American Society of Anesthesiologists I–II patients (aged 18–93 years) undergoing surgery under an infraclavicular block was analyzed. Preoperative NLR and PLR were calculated from routine blood counts, and patients were stratified into “high” and “low” inflammation groups. Postoperative pain was assessed using the numeric rating scale (NRS) at 1, 6, 12, and 24 hours; tramadol use was recorded. Block success was evaluated by assessing sensory and motor functions.

Results: High NLR and PLR were associated with significantly higher NRS scores at 12 and 24 hours ($p<0.001$), greater tramadol use ($p<0.001$), shorter motor block duration, and earlier return of movement.

Conclusion: Elevated preoperative NLR and PLR predict reduced infraclavicular block efficacy and greater postoperative pain. These simple, cost-effective biomarkers may aid preoperative risk stratification and guide personalized analgesic strategies.

Keywords: Neutrophils, nerve block, postoperative pain, inflammation, inflammation mediators

Introduction

Effective management of postoperative pain is essential not only for ensuring patient comfort but also for reducing morbidity, facilitating early mobilization, and enhancing overall recovery. Inadequately controlled pain can impair pulmonary function, delay ambulation, prolong hospitalization, and reduce patient satisfaction. Consequently, multimodal analgesia approaches have become standard practice, with regional anesthesia techniques, particularly peripheral nerve blocks, playing a pivotal role in perioperative pain management. These methods have consistently been shown to lower postoperative pain scores, decrease opioid consumption, shorten the length of hospital stay, and support early functional recovery in various surgical populations (1). The success of peripheral nerve blocks is therefore critical; block failure may result in severe pain, the need for additional opioids, and an increased risk of adverse outcomes.

Surgical trauma triggers acute-phase and inflammatory responses, reflected in dynamic changes in circulating immune cells. Specifically, neutrophil counts typically rise, while lymphocyte counts fall, resulting in an elevated neutrophil-to-lymphocyte ratio (NLR). Platelet counts may also increase, contributing to an elevated platelet-to-lymphocyte ratio (PLR). Both NLR and PLR are easily derived from routine complete blood count (CBC) tests and serve as cost-effective, widely available biomarkers of systemic inflammation (2). These markers have been extensively investigated in various medical fields as prognostic indicators and have more recently attracted attention in anesthesiology and perioperative medicine.

Recent surgical studies have shown that elevated preoperative NLR is linked to higher postoperative pain intensity in major orthopedic surgery, while regional anesthesia techniques are associated with lower postoperative NLR and PLR levels, improved analgesia, and reduced opioid requirements. Postoperative NLR values have also shown significant correlations with pain scores in obstetric populations (3-6). In addition, regional anesthesia techniques such as the erector spinae plane block, the adductor canal block, and the IPACK block have been reported to attenuate the inflammatory response, resulting in lower postoperative NLR and PLR values, reduced pain, and improved recovery (7-9).

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These findings highlight the dual role of regional anesthesia in both modulating the surgical stress response and improving analgesia. However, it has been suggested that severe inflammation may compromise the pharmacological efficacy of local anesthetics. For example, reduced tissue pH in inflamed environments increases the proportion of ionized anesthetic molecules, impairing their diffusion across nerve membranes and thereby limiting block effectiveness (10).

Although numerous studies have examined the relationship between postoperative NLR/PLR and pain outcomes, there remains a critical lack of evidence regarding whether preoperative values of these markers can predict the success of peripheral nerve blocks and the severity of postoperative pain. This unresolved issue represents a significant gap in the literature, as identifying high-risk patients before surgery could allow anesthesiologists to anticipate block performance, individualize multimodal analgesic regimens, and optimize perioperative pain strategies.

To address this gap in the literature, this study aimed to evaluate the association of preoperative NLR and PLR with the efficacy of infraclavicular brachial plexus blocks and postoperative pain severity in patients undergoing upper extremity surgery. By focusing on preoperative inflammatory status rather than postoperative changes, this study explores the potential clinical value of baseline immune-inflammatory profiles for anticipating block performance, optimizing perioperative analgesic strategies, and improving individualized patient care.

Methods

Study Design and Patient Population

This retrospective observational cohort study was conducted with the approval of the Institutional Ethics Committee of Marmara University Faculty of Medicine (protocol code: 09.2025.25-0179, date: 09.04.2025). The primary objective was to evaluate the association of preoperative NLR and PLR with the efficacy of infraclavicular brachial plexus blocks and the severity of postoperative pain in patients undergoing upper extremity surgery.

In addition to the primary objective, the predefined secondary objectives were to evaluate postoperative pain intensity, measured by numeric rating scale (NRS) scores at 1, 6, 12, and 24 hours; total 24-hour tramadol consumption; and motor block characteristics during the first postoperative day.

Patients were identified through the institutional database, and all eligible cases during the study period were consecutively included according to predefined inclusion and exclusion criteria.

Eligible patients were adults aged 18 years or older who underwent upper limb surgery under infraclavicular brachial plexus block, had an American Society of Anesthesiologists (ASA) physical status of I or II, and had complete clinical and laboratory data available. Patients were excluded if they were younger than 18 years, had an ASA physical status of III or higher, underwent surgery with general anesthesia, had incomplete clinical or laboratory data, or received any postoperative analgesic other than tramadol.

Preoperative and Intraoperative Data Collection

The following preoperative variables were recorded: age, sex, body mass index (BMI, kg/m^2), ASA classification, CBC, NLR, and PLR. Intraoperative data included the duration of surgery and total anesthesia time.

Postoperative Pain Management and Assessment

Postoperative pain was assessed using the NRS, a validated, unidimensional tool ranging from 0 (“no pain”) to 10 (“worst imaginable pain”). NRS scores were recorded at 1, 6, 12, and 24 hours postoperatively using pain evaluation charts routinely completed by healthcare staff.

Intravenous tramadol was used as the sole rescue analgesic. A dose of 0.5 mg/kg tramadol was administered when the NRS score was ≥4, and total tramadol consumption over the first 24 hours was recorded. To ensure standardization and avoid confounding effects of multiple analgesic regimens, intravenous tramadol was the only rescue option permitted. Patients who required any additional analgesics beyond tramadol were excluded from the analysis.

Block Technique

All infraclavicular brachial plexus blocks were performed under real-time ultrasound guidance, following the same standardized institutional protocol. A high-frequency linear-array ultrasound transducer was used to identify the brachial plexus cords surrounding the axillary artery. After skin infiltration, the block needle was advanced in-plane under ultrasound guidance. A total of 20 mL of 0.5% bupivacaine was administered. The same local anesthetic agent, concentration, and volume were used in all cases, and all blocks were performed with ultrasound guidance.

Evaluation of Sensory and Motor Block

Successful block was defined as the presence of effective sensory and motor blockade in the relevant muscle groups innervated by the brachial plexus. Sensory block was evaluated by loss of pinprick sensation in the corresponding dermatomes, while motor block was assessed by inability to move the involved muscle groups. These assessments were recorded at postoperative hours 1, 6, 12, and 24.

All participants exhibited a sustained sensory block at 1 and 6 hours postoperatively. By 12 and 24 hours, the sensory block had fully resolved in all cases. Given the uniform distribution of these findings, no statistical analysis was performed on the sensory block duration.

Hemodynamic Monitoring

Postoperative hemodynamic parameters , including heart rate, peripheral oxygen saturation (SpO_2), and systolic and diastolic blood pressure, were recorded at 1, 6, 12, and 24 hours.

All perioperative data were collected using standardized pain evaluation charts routinely completed by anesthesiology residents under the supervision of the institutional pain management team. To ensure consistency, all staff received prior institutional training in the NRS assessment. Patients with missing clinical or laboratory data were excluded. Preoperative NLR was calculated as the absolute neutrophil count divided by the lymphocyte count, and PLR as the platelet count divided by the lymphocyte count.

Statistical Analysis

Statistical analyses were performed using IBM SPSS Statistics for Windows, Version 22.0 (IBM Corp., Armonk, NY, USA). The distribution of continuous variables was assessed using the Kolmogorov–Smirnov test, and the homogeneity of variances was checked before applying parametric tests. Normally distributed variables were expressed as mean ± standard deviation, whereas non-normally distributed variables were presented as median (minimum–maximum). Categorical variables were summarized as frequencies and percentages. Patients with missing laboratory or clinical data were excluded according to the predefined exclusion criteria.

Comparisons of continuous variables between two groups were performed using the independent-samples t-test or the Mann–Whitney U test, depending on the data distribution. Categorical variables were analyzed using the chi-square test or Fisher's exact test, as appropriate.

Participants were stratified into "low" and "high" NLR and PLR groups based on median values to ensure balanced group sizes and robust intergroup comparisons. In contrast, receiver operating characteristic (ROC) curve–derived cut-off values were used for predictive and clinical interpretation, with the aim of identifying patients at particularly high-risk of inadequate postoperative analgesia, rather than for group stratification. Postoperative pain scores (NRS) and hemodynamic parameters were compared between these groups. To minimize potential confounding, the comparability of the groups was assessed with respect to demographic and intraoperative parameters (age, BMI, ASA classification, surgery duration, and anesthesia time), and no significant differences were observed. The relationship between postoperative pain and NLR was further evaluated using ROC curve analysis. The area under the curve (AUC) was calculated to assess the predictive value. A p value of <0.05 was considered statistically significant.

Results

A total of 132 patients who underwent upper extremity surgery under an infraclavicular brachial plexus block between January 2023 and December 2025 were screened for eligibility. Of these, 16 patients were excluded based on predefined exclusion criteria, and 116 patients were included in the final analysis.

The age range of the study population was 18 to 93 years, with a mean age of 42.58±18.23 years. Of the participants, 105 (90.5%) were male and 11 (9.5%) female.

Participants were stratified into two groups using the median values of NLR (<3.09 vs. ≥3.09) and PLR (<118.4 vs. ≥118.4). No statistically significant differences were observed between the groups for demographic and intraoperative variables ($p>0.05$; Table 1).

There were no statistically significant differences between the low- and high-inflammation groups in terms of surgery duration or anesthesia time (Table 1; $p>0.05$), suggesting that surgical complexity was similar across groups.

Postoperative hemodynamic parameters were comparable between the low- and high-inflammation groups. Although a few isolated time points showed statistically significant differences, these were observed for postoperative 24-hour systolic blood pressure in the NLR groups and for heart rate at postoperative 6, 12, and 24 hours in the PLR groups (Table 2).

Pain assessment using the NRS showed that participants with elevated preoperative inflammatory markers (both NLR ≥3.09 and PLR ≥118.4) had significantly higher pain scores at postoperative hours 1, 12, and 24. These patients also required significantly greater tramadol consumption within the first 24 hours (all $p<0.001$; Table 3).

Persistence of motor block at postoperative hours 6, 12, and 24 was more frequent in both the high NLR and high PLR groups (all $p<0.05$). This indicates that elevated systemic inflammation is consistently associated with delayed motor recovery (Table 4).

ROC curve analysis demonstrated that NLR predicted postoperative pain with an AUC of 0.711 (95% confidence interval: 0.617–0.825; $p<0.001$). An NLR cut-off of >3.78 yielded 46.2% sensitivity and 100.0% specificity (Figure 1).

Discussion

In this study, we evaluated whether preoperatively determined NLR and PLR were associated with the success of infraclavicular brachial plexus blocks and postoperative pain intensity. The findings indicate that an elevated preoperative systemic inflammatory state, reflected by high NLR and PLR values, is associated with reduced block effectiveness and worse postoperative pain outcomes in upper extremity surgery. These results support our initial hypothesis that systemic inflammation may negatively influence both the success of the block and the severity of postoperative pain.

Participants with higher preoperative NLR and PLR values exhibited greater persistence of motor block, a delay in motor recovery, and significantly higher pain scores at 12 and 24 hours postoperatively. These findings indicate that a pro-inflammatory physiological environment may alter the pharmacodynamic profile of local anesthetics, resulting in prolonged motor blockade but reduced analgesic effectiveness. This dissociation between motor and sensory block suggests that inflammation may differentially affect nerve fiber types and pain pathways, leading to poorer pain control despite longer motor block duration.

Although NLR demonstrated a moderate discriminative ability for predicting postoperative pain (AUC: 0.711), the combination of its very high specificity (100%) and relatively low sensitivity (46.2%) indicates that it may be more useful for identifying patients at particularly high-risk of inadequate analgesia rather than as a broad screening tool. In this context, elevated preoperative NLR values may help anesthesiologists recognize individuals who would benefit most from intensified or personalized analgesic strategies, even though a normal NLR does not exclude the possibility of suboptimal pain control.

Table 1. Comparison of demographic and intraoperative parameters according to median NLR and PLR values			
Parameter	**Low NLR (<3.09)**	**High NLR (≥3.09)**	**p value**
Age (years)	43.05±18.77	42.09±17.85	0.777
BMI (kg/m²)	26.5±4.6	25.7±3.9	0.325
ASA score median (25-75)	1(1-2)	1(1-2)	0.304
Duration of surgery (minute)	147.76±62.47	159.31±49.41	0.272
Duration of anesthesia (minute)	155.60±61.33	167.24±49.36	0.263
Parameter	**Low PLR (<118.4)**	**High PLR (≥118.4)**	**p value**
Age (years)	41.27±18.91	43.91±17.59	0.438
BMI (kg/m²)	26.1±4.5	25.9±4.2	0.798
ASA score median (25-75)	1 (1-2)	1(1-2)	0.530
Duration of surgery (minute)	151.86±61.83	155.26±50.61	0.747
Duration of anesthesia (minute)	160.17±60.86	162.72±50.38	0.807

Data are presented as mean ± standard deviation for normally distributed variables and as median (25th–75th percentiles) for non-normally distributed variables. Either the independent-samples t-test or the Mann–Whitney U test was used for continuous variables; the chi-square test was used for categorical variables
p<0.05 was considered statistically significant
NLR: Neutrophil-to-lymphocyte ratio, BMI: Body mass index, ASA: American Society of Anesthesiologists, PLR: Platelet-to-lymphocyte ratio

Table 2. Comparison of postoperative vital signs by median NLR and PLR groups			
Parameter	**Low NLR (<3.09)**	**High NLR (≥3.09)**	**p value**
Postop 1st hr HR (bpm)	74.05±11.97	75.34±11.26	0.550
Postop 6th hr HR (bpm)	76.14±9.31	75.00±8.88	0.502
Postop 12th hr HR (bpm)	76.29±9.16	76.09±9.28	0.904
Postop 24th hr HR (bpm)	75.97±8.18	78.55±10.27	0.136
Postop 1st hr SBP (mmHg)	126.47±16.06	128.22±20.04	0.603
Postop 6th hr SBP (mmHg)	123.38±11.59	125.97±10.39	0.208
Postop 12th hr SBP (mmHg)	119.76±9.62	122.72±12.72	0.159
Postop 24th hr SBP (mmHg)	120.14±10.54	124.33±11.60	0.044
Postop 1st hr DBP (mmHg)	76.93±10.73	79.21±12.21	0.288
Postop 6th hr DBP (mmHg)	72.55±8.91	73.64±7.49	0.479
Postop 12th hr DBP (mmHg)	74.84±10.85	75.67±10.89	0.683
Postop 24th hr DBP (mmHg)	74.36±10.88	74.72±9.90	0.852
Parameter	**Low PLR (<118.4)**	**High PLR (≥118.4)**	**p value**
Postop 1st hr HR (bpm)	73.10±10.80	76.35±12.22	0.132
Postop 6th hr HR (bpm)	73.69±9.54	77.51±8.20	0.023
Postop 12th hr HR (bpm)	74.51±8.74	77.93±9.37	0.044
Postop 24th hr HR (bpm)	74.20±7.56	80.42±9.98	0.001
Postop 1st hr SBP (mmHg)	128.41±14.43	126.25±21.33	0.523
Postop 6th hr SBP (mmHg)	124.90±10.27	124.44±11.87	0.824
Postop 12th hr SBP (mmHg)	119.69±10.08	122.84±12.36	0.135
Postop 24th hr SBP (mmHg)	121.32±10.27	123.18±12.17	0.377
Postop 1st hr DBP (mmHg)	77.12±11.58	79.05±11.44	0.367
Postop 6th hr DBP (mmHg)	72.12±8.40	74.11±7.96	0.194
Postop 12th hr DBP (mmHg)	75.00±11.77	75.53±9.87	0.795
Postop 24th hr DBP (mmHg)	74.64±11.35	74.44±9.31	0.915

Vital signs were treated as continuous variables and presented as mean ± standard deviation because they were normally distributed. Between-group comparisons were made using the independent-samples t-test
p<0.05 was considered statistically significant
hr: hour, HR: Heart rate, postop: Postoperative, SBP: Systolic blood pressure, DBP: Diastolic blood pressure, NLR: Neutrophil-to-lymphocyte ratio, PLR: Platelet-to-lymphocyte ratio

Table 3. Distribution of postoperative NRS scores and total opioid dose according to median NLR and PLR

Parameter	Low NLR (<3.09)	High NLR (≥3.09)	p value
Postop 1st hr NRS	0 (0-0)	0 (0-1)	0.030
Postop 6th hr NRS	0 (0-1)	1 (0-1)	0.153
Postop 12th hr NRS	0 (0-0)	1 (1-3)	0.001
Postop 24th hr NRS	0(0-1)	1 (1-3)	0.001
Postop total tramadol dose (mg)	0 (0-75)	100 (0-200)	<0.001
Parameter	**Low PLR (<118.4)**	**High PLR (≥118.4)**	**p value**
Postop 1st hr NRS	0(0-0)	0 (0-1)	0.013
Postop 6th hr NRS	0 (0-0)	0 (0-1)	0.448
Postop 12th hr NRS	1(0-1)	2 (1-3)	<0.001
Postop 24th hr NRS	0 (0-1)	3 (3-3)	<0.001
Postop total tramadol dose (mg)	0 (0-100)	100 (0-200)	<0.001

Pain scores and opioid doses are presented as median (25th–75th percentiles). Comparisons between groups were made using the Mann–Whitney U test
p<0.05 was considered statistically significant
hr: hour, postop: Postoperative, NLR: Neutrophil-to-lymphocyte ratio, PLR: Platelet-to-lymphocyte ratio, NRS: Numeric rating scale

Table 4. Persistence of motor block at postoperative hours 1, 6, 12, and 24 according to NLR and PLR groups

Time	Low NLR (<3.09)	High NLR (≥3.09)	p value
1st hr	0 (0)	1 (1.7%)	0.315
6th hr	0 (0)	6 (10.3)	0.012
12th hr	0 (0)	37 (63.8%)	<0.001
24th hr	2 (3.4%)	40 (69.0%)	<0.001
Time	**Low PLR (<118.4)**	**High PLR (≥118.4)**	**p value**
1st hr	0 (0%)	1 (98.2%)	0.307
6th hr	0 (0%)	6 (10.5%)	0.010
12th hr	5 (8.5%)	32 (56.1%)	<0.001
24th hr	7 (11.9%)	35 (61.4%)	<0.001

Categorical data are presented as numbers (percentages). Chi-square or Fisher's exact tests were for comparisons, depending on expected frequencies
p<0.05 was considered statistically significant
hr: hour, NLR: Neutrophil-to-lymphocyte ratio, PLR: Platelet-to-lymphocyte ratio

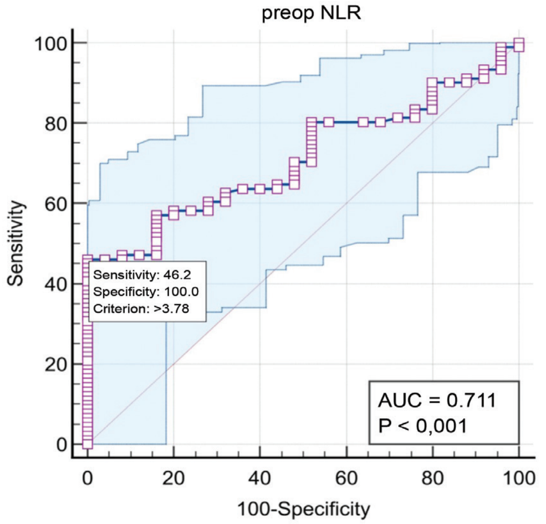

Figure 1. ROC curve showing the predictive power of NLR for postoperative pain presence
Preop: Preoperative, NLR: Neutrophil-to-lymphocyte ratio, ROC: Receiver operating characteristic, AUC: Area under the curve

Our findings agree with existing literature highlighting the complex relationship between inflammation, anesthetic techniques, and postoperative pain and thereby contribute to the growing evidence in this field (3,11,12). Elevated preoperative NLR has previously been associated with increased postoperative pain in cervical disc herniation (13), and with higher analgesic requirements in orthognathic surgery (14). However, most prior studies focused on NLR without evaluating PLR or applying standardized regional anesthesia techniques. Consistent with our results, Surhonne et al. (15) demonstrated that postoperative increases in leukocyte count and NLR were significantly attenuated in patients receiving spinal anesthesia compared with those under general anesthesia. Our findings extend these results by demonstrating that not only postoperative changes but also preoperative inflammatory status can significantly influence regional block success and pain outcomes. This supports the hypothesis that regional anesthesia suppresses the inflammatory response to surgical trauma. Furthermore, most available studies have either measured inflammatory markers postoperatively or included patients managed under general anesthesia (16,17).

Our study focused on the relationship between preoperative inflammatory status and the success of infraclavicular brachial plexus block, whereas Yeniay et al. (18) recently demonstrated, in a cesarean cohort, that elevated NLR, PLR, and other inflammatory indices were significantly associated with shorter durations of sensory and motor block under spinal anesthesia. Taken together, these findings indicate that systemic inflammation can adversely affect the success of regional anesthesia blocks; however, the magnitude of this effect and clinical implications may vary according to block type and patient population. By examining preoperative inflammatory status within the context of a standardized regional block, our study provides novel insight into how baseline inflammation can influence the success of the regional block and subsequent pain outcomes.

Several biologically grounded mechanisms may explain why preoperative systemic inflammation reduces the efficacy of local anesthetics. Inflammation is often accompanied by tissue acidosis, which lowers pH and shifts local anesthetics into their ionized form, thereby limiting their ability to penetrate nerve membranes and block sodium channels (19). Elevated NLR or PLR, as markers of increased systemic inflammation, may therefore compromise anesthetic diffusion into nerve fibers and shorten block duration. In addition, inflammation-induced vasodilation increases regional blood flow, thereby accelerating drug clearance from the injection site (20). Beyond these pharmacokinetic effects, neuroinflammatory mediators such as interleukin-1 beta, interleukin-6 (IL-6), and tumor necrosis factor-alpha (TNF-α) sensitize nociceptors, alter sodium channel expression, and promote glial activation, collectively enhancing neuronal excitability and lowering pain thresholds (21). Consequently, patients with elevated preoperative inflammatory markers are more likely to experience lower block success rates, more rapid resolution of anesthesia, and increased postoperative pain.

It is well established that regional anesthesia can modulate immune and inflammatory responses, and studies have shown that nerve blocks can reduce the surgical stress response and attenuate the release of pro-inflammatory cytokines (11,12). This bidirectional interaction suggests that while regional techniques can mitigate inflammatory responses, their analgesic efficacy can be compromised by the same systemic inflammatory processes. These mechanisms provide a rationale for incorporating preoperative inflammatory markers into clinical decision-making and tailoring analgesic strategies accordingly.

From a clinical perspective, preoperative NLR and PLR are simple, cost-effective markers that could be integrated into preoperative assessment. Patients with elevated values stand to benefit from personalized multimodal analgesia that incorporates preemptive approaches, continuous catheter-based techniques, and adjuvants to prolong and potentiate block success. Accordingly, NLR and PLR should be regarded not only as prognostic markers but also as as practical decision-making tools that can assist anesthesiologists in tailoring perioperative analgesic strategies.

In particular, agents such as dexamethasone or α2-agonists have been shown to help mitigate the negative impact of systemic inflammation on nerve block success and improve postoperative pain outcomes. These approaches align with the broader shift toward individualized pain management (22,23). Moreover, strategies aimed at reducing inflammation before surgery—such as preoperative NSAIDs (24), other anti-inflammatory agents, or optimization of comorbid conditions and nutritional status—are expected to further improve block success and postoperative outcomes. Future studies should investigate whether preoperative inflammatory profiles affect not only acute postoperative pain but also long-term outcomes, including the risk of chronic postsurgical pain.

Study Limitations

This study has several limitations. Peripheral nerve blocks were not performed by a single practitioner, which may have introduced variability despite standardized protocols. The relatively small sample size, heterogeneity in surgical procedures (e.g., urgent vs. elective, fracture fixation vs. tendon repair), and the lack of assessment of procedure-specific effects or inflammatory markers (IL-6, TNF-α) may have limited the mechanistic interpretation of our findings. Postoperative analgesia was restricted to intravenous tramadol, thereby ensuring standardization but not reflecting real-world multimodal practice. Additionally, because this was a retrospective study using electronic records, selection and measurement biases cannot be excluded. In addition, the inconsistent reporting of PLR compared to NLR in the current literature represents an unresolved limitation, likely reflecting variability in patient populations, cut-off values, and methodological differences. Larger prospective, randomized studies in homogeneous populations using standardized block techniques are warranted. Finally, the use of median-based grouping for statistical comparisons, together with ROC-derived cut-off values for predictive interpretation, may appear methodologically inconsistent; however, this approach reflects the dual aims of the study, combining statistical robustness with clinically meaningful risk stratification.

Conclusion

Our findings suggest that easily accessible preoperative inflammatory biomarkers, such as the NLR and PLR, are associated with both the efficacy of peripheral nerve blocks and postoperative pain scores. Elevated systemic inflammation, indicated by high NLR or PLR values, is associated with reduced block effectiveness and increased postoperative pain. Among these markers, NLR emerged as the stronger and more reliable predictor, whereas PLR provided supplementary but less consistent information. Incorporating these biomarkers into preoperative assessments could help anesthesiologists identify patients at greater risk of inadequate postoperative analgesia and guide the use of personalized strategies, such as multimodal regimens, adjuvants, or continuous catheter techniques. However, given the relatively small sample size and variability in block administration in our study, these results should be interpreted with caution and validated in larger, prospective trials. In summary, preoperative evaluation of NLR and PLR holds promise as a simple and cost-effective approach to support individualized perioperative pain management.

Ethics

Ethics Committee Approval: This study was conducted with the approval of the Institutional Ethics Committee of Marmara University Faculty of Medicine (protocol code: 09.2025.25-0179, date: 09.04.2025).

Informed Consent: Retrospective study.

Footnotes

Authorship Contributions: Concept - G.Ç., D.G.; Design - G.Ç.; Data Collection or Processing: D.G.; Analysis or Interpretation: D.G.; Literature Search: G.Ç., D.G.; Writing: G.Ç.

Conflict of Interest: No conflict of interest was declared by the authors.

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