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Association of systemic inflammatory indices with lesion localization and revascularization outcomes in peripheral artery disease

Cagri Erdim, Sila Solak, Mehmet Cingoz, Oguzhan Turksayar, Tevfik Guzelbey

Başakşehir Çam and Sakura City Hospital, Department of Radiology, İstanbul, Türkiye

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Abstract

Systemic inflammation plays a key role in peripheral artery disease (PAD) pathophysiology and may influence revascularization outcomes. This study aimed to compare inflammatory indices between patients with isolated superficial femoral artery (SFA) and below-the-knee (BTK) lesions and to evaluate their association with revascularization success. A total of 90 patients who underwent successful endovascular treatment between January 2023 and May 2025 were retrospectively analyzed. Patients were divided into two groups: isolated SFA (Group 1) and isolated BTK (Group 2) lesions. Inflammatory indices including neutrophil-to-lymphocyte ratio (NLR), platelet-to-lymphocyte ratio (PLR), systemic immune-inflammation index (SII), and systemic inflammatory response index (SIRI) were calculated. Lesions were classified using TransAtlantic Inter-Society Consensus II (TASC II) and Global Limb Anatomic Staging System (GLASS) systems. Correlations between revascularization success and inflammatory indices were assessed through Spearman and multivariable regression analyses. Group 2 (BTK) had significantly higher NLR, SII, and SIRI values compared to Group 1 ($p<0.05$). Revascularization success showed significant negative correlations with elevated inflammatory indices. GLASS stage, NLR, and presence of diabetes emerged as independent predictors of procedural outcome ($p<0.05$). The inflammatory burden in PAD varies by anatomical location, with BTK lesions exhibiting greater systemic inflammation. Inflammatory indices may serve as prognostic tools in predicting endovascular treatment outcomes.

Keywords: Peripheral arterial disease, angioplasthy, inflammation; biomarkers

Introduction

Peripheral artery disease (PAD) is a manifestation of systemic atherosclerosis affecting the lower extremities, with a substantial global burden. It affects over 118 million people worldwide [1]. In community cohorts, PAD prevalence is roughly 10–20% in individuals over 65 years of age [2], and it is higher among older patients seen in general practice. PAD patients usually harbor widespread atherosclerosis. For example, PAD is frequently accompanied by coronary, cerebral, and renal artery disease [3], and these patients traditional risk factors such as smoking, diabetes, hypertension, and hyperlipidemia [4]. Importantly, PAD confers markedly increased risk of adverse events: patients with PAD have higher incidence of myocardial infarction, stroke, aortic aneurysm rupture, and vascular death, as well as ischemic limb complications [1,5-7].

Inflammation is now recognized as a key driver of atherosclerosis, including in PAD. Chronic inflammatory processes underlie plaque formation, progression, and instability. Numerous studies have linked inflammatory mediators to PAD: for instance, elevated C-reactive protein (CRP) levels correlate with PAD severity, and elevated CRP levels predicts incident PAD and restenosis after revascularization [8]. More

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Corresponding Author: Cagri Erdim, Başakşehir Çam and Sakura City Hospital, Department of Radiology, İstanbul, Türkiye
Email: cagrierdim@hotmail.com

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broadly, rev"iews highlight that acute-phase reactants, pro-inflammatory cytokines (e.g., IL-6), and leukocyte activation markers are associated with atherosclerotic disease severity [9]. In PAD specifically, higher levels of CRP and other inflammation markers are independently associated with more advanced disease and poorer outcomes. This evidence supports the concept that systemic inflammation plays an important role in PAD pathophysiology. In recent years, interest has grown in readily available inflammatory biomarkers derived from peripheral blood counts. Indices such as the neutrophil-to-lymphocyte ratio (NLR) and platelet-to-lymphocyte ratio (PLR) integrate neutrophil, platelet and lymphocyte counts to reflect systemic inflammatory status. More complex indices, for example, the systemic immune-inflammation index (SII) and systemic inflammatory response index (SIRI), incorporate multiple leukocyte subtypes to capture innate and adaptive immune activity [10].

The potential differences in systemic inflammatory biomarkers between patients with isolated superficial femoral artery (SFA) lesions and those with isolated below-the-knee (BTK) arterial lesions have not been systematically evaluated to date. This knowledge gap is significant, as identifying anatomical variations in inflammation may enhance our understanding of the pathobiology of PAD and contribute to more individualized risk assessment. This study was designed to examine the association between systemic inflammatory biomarkers and the extent of PAD by comparing patients with isolated SFA lesions and those with isolated BTK lesions.

Material and Methods

Study Design and Participants

A total of 90 patients who underwent endovascular treatment for isolated lower extremity arterial disease between January 2023 and May 2025 were retrospectively analyzed in this single-center study. The study was conducted at a high-volume tertiary referral hospital.

Patients were included if they had disease confined to a single anatomical level, either an isolated SFA lesion or an isolated BTK lesion. Diagnostic angiographic images and clinical records were reviewed to confirm lesion localization. All procedures were performed using standard percutaneous transluminal angioplasty (PTA) techniques, with or without stent implantation, at the discretion of experienced interventional radiologists. Only patients who underwent successful endovascular revascularization, defined as residual stenosis ≤30% with restored antegrade flow and no immediate procedural complications, were included in the final analysis.

Exclusion criteria were as follows: combined SFA and BTK lesions, iliac artery involvement, prior vascular surgery or endovascular treatment on the same limb, acute limb ischemia, and non-atherosclerotic occlusive diseases (e.g., Buerger's disease or vasculitis), asymptomatic patients. These criteria ensured a homogeneous study population and isolated the clinical and procedural outcomes of single-segment disease.

Based on angiographic findings, patients were categorized into two groups: those with isolated SFA lesions and those with isolated BTK lesions. Clinical and imaging data were retrospectively reviewed for all eligible patients.

Ethical Considerations

The study protocol was approved by the Institutional Review Board of Başakşehir Çam and Sakura City Hospital, Scientific Research Ethics Committee (Protocol number: 2025-222, Date: 07 July 2025). Given its retrospective design and use of anonymized data, the requirement for individual informed consent was waived. All patient records and imaging data were de-identified and coded prior to analysis to ensure confidentiality.

Data Collection and Laboratory Measurements

Clinical and demographic data were retrospectively collected from the hospital's electronic health record and picture archiving and communication system (PACS). For each patient, information was obtained on age, sex, and smoking status, along with comorbidities including diabetes mellitus, hypertension, and chronic kidney disease. Laboratory data included complete blood count (CBC) with differential, CRP, fasting blood glucose, hemoglobin A1c (HbA1c), and serum creatinine. All laboratory analyses were performed on peripheral venous blood samples using standardized procedures in the hospital's central laboratory.

Based on CBC results, systemic inflammatory indices were manually calculated by the principal investigator using established formulas. These included the NLR, calculated as the absolute neutrophil count divided by the absolute lymphocyte count; the PLR; the derived neutrophil-to-lymphocyte ratio (dNLR), defined as the neutrophil count divided by the difference between total leukocyte count and neutrophil count; the SII, calculated as platelet count multiplied by the neutrophil-to-lymphocyte ratio; and the SIRI, calculated as the monocyte count multiplied by the neutrophil-to-lymphocyte ratio.

Angiographic Procedure and Assessment

All procedures were performed in a dedicated angiography suite under sterile conditions and local anesthesia. Vascular access was achieved via percutaneous puncture of the common or superificial femoral artery. A 6 French (F) introducer sheath was used in patients with isolated SFA lesions, while a 5F sheath was used for those with infrapopliteal artery involvement, allowing for safer navigation of smaller distal vessels. Following arterial access, digital subtraction angiography

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(DSA) was performed by manually injecting a nonionic iodinated contrast agent at a rate of approximately 3–5 mL/s. Lesions were assessed in terms of location, severity, length, and degree of calcification, and were classified according to the TransAtlantic Inter-Society Consensus II (TASC II) and Global Limb Anatomic Staging System (GLASS). These classifications were manually recorded by the interventional radiologist for descriptive purposes.

Whenever feasible, endovascular intervention was performed during the same session. A hydrophilic guidewire was advanced across the lesion under fluoroscopic guidance, followed by predilation with appropriately sized balloon catheters. Longer and higher-pressure balloons were typically used for SFA lesions, whereas smaller and more delicate low-profile balloons were preferred for infrapopliteal arteries. Balloon inflation was generally maintained for 2 to 3 minutes. In cases of significant residual stenosis (>30%) or flow-limiting dissection, self-expanding nitinol stents were selectively deployed in SFA lesions. Stent placement was generally avoided in infrapopliteal arteries. At the end of the procedure, completion angiography was performed to confirm technical success, defined as restoration of antegrade flow with residual stenosis of 30% or less and absence of immediate complications. Hemostasis at the access site was achieved using manual compression or vascular closure devices, depending on the operator's preference. All patients were monitored post-procedurally, and dual antiplatelet therapy with aspirin and clopidogrel was initiated in accordance with institutional protocols.

All patients underwent lower extremity DSA performed by interventional radiologists using standard techniques. DSA remains the reference standard imaging modality for detailed evaluation of arterial lesions in PAD. Angiograms were reviewed to document the vascular anatomy, lesion localization (SFA vs. BTK arteries), and lesion characteristics (stenosis severity, length, and calcification). Major affected arterial segments were recorded according to GLASS and TASC II categories. Revascularization procedures performed during angiography (or planned subsequently) were noted, including PTA, stent placement, or surgical bypass. Procedural success was defined as angiographically satisfactory revascularization (residual stenosis ≤30%) without immediate complications. Details of adjunctive therapies and technical outcomes were collected.

Statistical Analysis

All statistical analyses were conducted using IBM SPSS Statistics for Windows, Version 26.0 (IBM Corp., Armonk, NY, USA). The normality of continuous variables was assessed using the Kolmogorov–Smirnov test. Normally distributed data are presented as mean±standard deviation (SD), whereas non-normally distributed variables are expressed as median and interquartile range (IQR). Categorical variables are reported as frequencies and percentages.

Group comparisons between isolated SFA lesion and isolated BTK lesion groups were performed using the independent samples t-test for normally distributed continuous variables and the Mann–Whitney U test for non-normally distributed variables. The chi-square test or Fisher's exact test was used to compare categorical variables, as appropriate.

Systemic inflammatory indices—including NLR, PLR, dNLR, SII, and SIRI—were calculated from complete blood count parameters using established formulas. Due to non-normal distributions, between-group comparisons of these indices were conducted using non-parametric tests.

Spearman's rank correlation analysis was employed to explore associations between inflammatory indices, CRP, lesion classification scores (TASC II and GLASS), diabetes, and technical success of revascularization. Correlations were interpreted with a significance threshold of $p<0.05$.

Finally, a multivariable linear regression model was constructed to identify independent predictors of revascularization success. Variables included in the model were selected based on prior clinical relevance and univariable analysis results. Model performance was assessed by R^2 and standardized beta coefficients.

A two-sided p-value <0.05 was considered statistically significant for all analyses.

Results

Patient Demographics, Clinical Characteristics and Angiographic Classifications

A total of 90 patients were analyzed; 50 (55.6%) had isolated SFA lesions (Group 1), and 40 (44.4%) had isolated BTK arterial lesions (Group 2). Patients in Group 2 were significantly older (69.8±8.5 years) than those in Group 1 (65.2±9.1 years; p=0.03). Smoking was significantly more prevalent in Group 1 (80% vs. 50%; p=0.002), whereas diabetes mellitus (70% vs. 30%; p=0.001) and chronic kidney disease (25% vs. 10%; p=0.04) were significantly more common in Group 2. Sex distribution, hypertension, and dyslipidemia did not differ significantly between the groups.

In Group 1, the distribution according to the TASC II classification was as follows: 16% were categorized as type A, 24% as type B, 40% as type C, and 20% as type D (Figure 1 and Figure 2). In contrast, Group 2 was evaluated using the GLASS classification, revealing 25% in Stage I, 50% in Stage II, and 25% in Stage III (Figure 3). Additionally, among Group 2 patients, BTK lesions involved the anterior tibial artery in 45% of cases, the posterior tibial artery in 30%, and the peroneal artery in 25% (Table 1).

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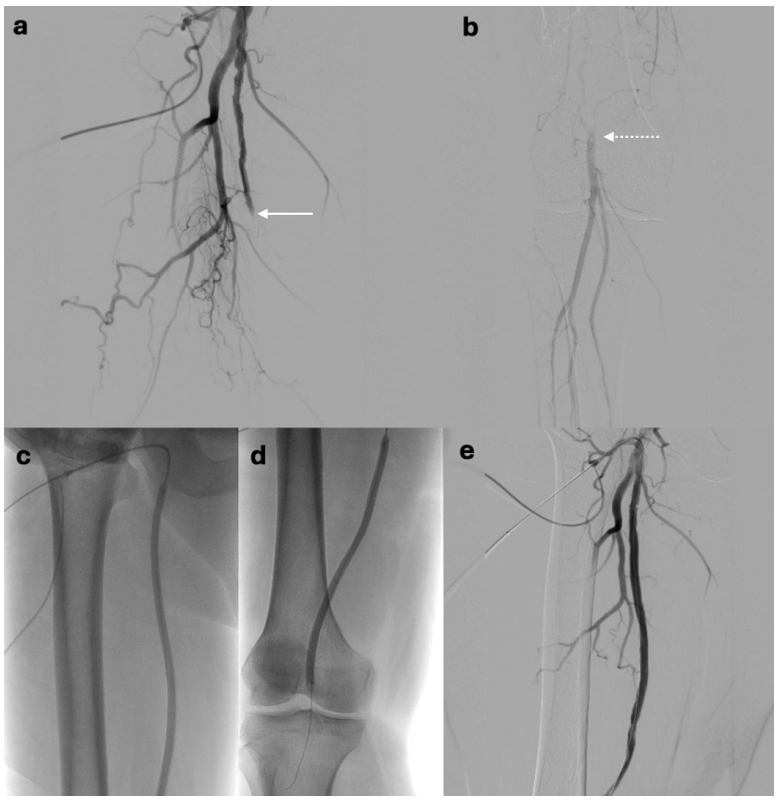

Figure 1. a) DSA image obtained after placement of a 6F introducer sheath into the right common femoral artery demonstrates total occlusion of the proximal segment of the SFA (solid white arrow, occlusion origin); **b)** Popliteal artery is visualized via collateral filling, with patent trifurcation arteries (dashed white arrow, collateral filling of the popliteal artery); **c–d)** Balloon angioplasty is performed across the occluded segments of the SFA; **e)** Final control DSA shows successful revascularization with restored patency of the SFA

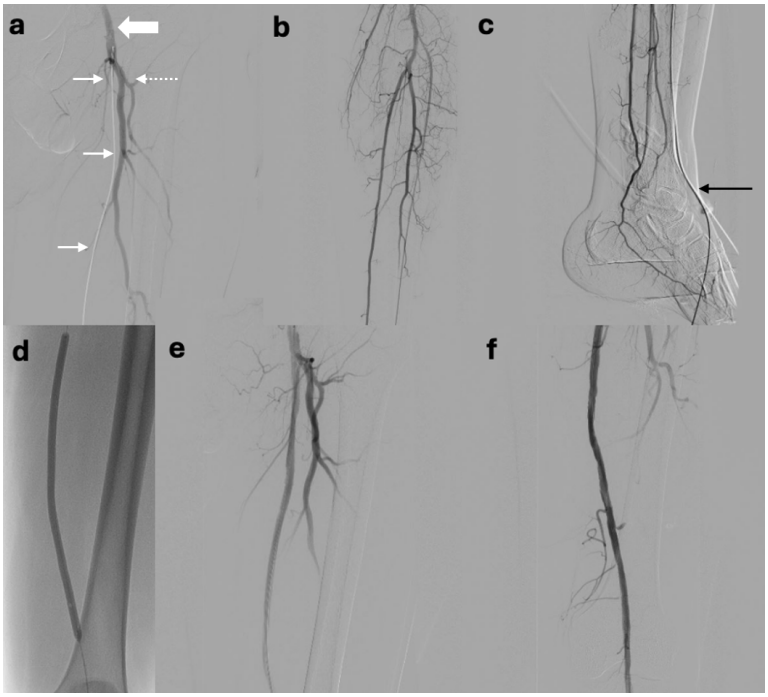

Figure 2. a–c) After arterial access was obtained via the dorsalis pedis artery (DPA) using a micropuncture set, a 5F introducer sheath was placed and angiographic imaging from the external iliac artery revealed total occlusion of the SFA extending from its origin (thin white arrows, occluded SFA; dashed white arrow, DFA; thick white arrow, CFA); The popliteal artery and trifurcation vessels were visualized as patent; The introducer sheath placed via dorsalis pedis access is also visible (black arrow, DPA introducer); **d)** Balloon angioplasty performed after successful retrograde crossing of the occluded segment; **e–f)** Final angiographic control images show restored patency of the SFA from its origin following revascularization

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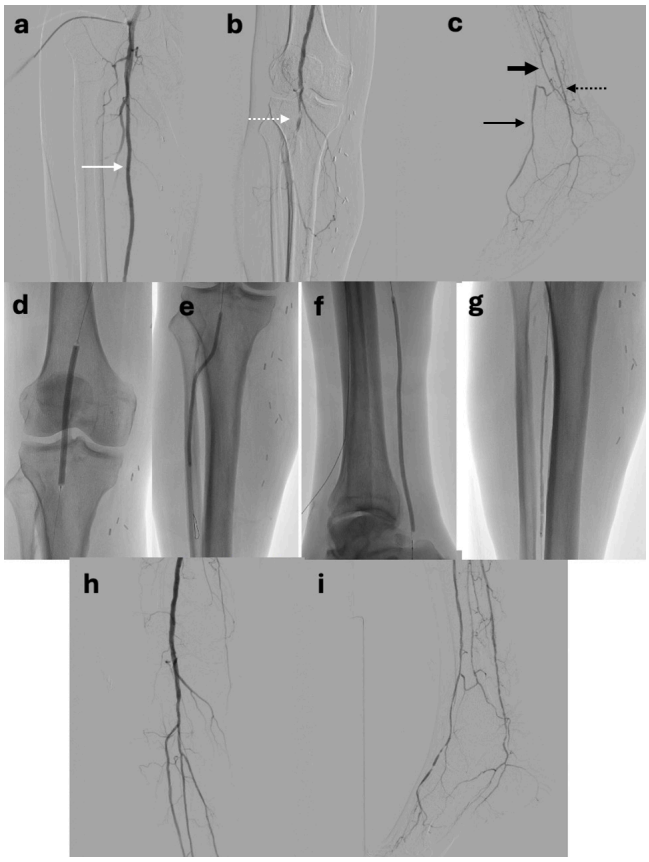

Figure 3. a) Digital subtraction angiography (DSA) following antegrade placement of a 6F introducer sheath into the superficial femoral artery (SFA) demonstrates a patent SFA (solid white arrow), with the popliteal artery showing a steno-occlusive segment (dashed white arrow); **b)** The popliteal artery lesion is more clearly visualized (dashed white arrow); **c)** The trifurcation arteries were occluded: anterior tibial artery (thin black arrow), peroneal artery (thick black arrow), and posterior tibial artery (dashed black arrow) with distal runoff maintained via collateral filling; **d–g)** Balloon angioplasty was performed following successful crossing of occluded segments in the following order: popliteal artery (d), anterior tibial artery (e), posterior tibial artery (f), and peroneal artery (g); **h–i)** Final angiographic control images confirmed restored patency of the popliteal and trifurcation arteries

Table 1. Comparison of demographic and clinical characteristics between groups

Demographic and clinical variables	Group 1 (Isolated SFA)	Group 2 (BTK)	p-value
Number of patients	50	40	N/A
Age (years)	65.2±9.1	69.8±8.5	0.03
Sex (male/female), n (%)	40(80)/10(20)	24 (60)/16 (40)	0.06
Smoking, n (%)	40 (80)	20 (50)	0.002
Diabetes mellitus, n (%)	15 (30)	28 (70)	0.001
Hypertension, n (%)	30 (60)	28 (70)	0.35
Dyslipidemia, n (%)	25 (50)	22 (55)	0.68
Chronic kidney disease, n (%)	5 (10)	10 (25)	0.04
TASC II category			
A	8 (16)	-	N/A
B	12 (24)		
C	20 (40)		
D	10 (20)		
GLASS category, n (%)			
I	-	10 (25)	N/A
II		20 (50)	
III		10 (25)	

TASC II: transatlantic inter-society consensus II, GLASS: global limb anatomic staging system

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Hematological Parameters

The comparison of hematological parameters showed no significant differences in total WBC, neutrophil, lymphocyte, monocyte, or platelet counts. However, hemoglobin levels were significantly lower in Group 2 compared to Group 1 (12.8±1.3 vs. 13.5±1.2 g/dL, respectively; p=0.02). CRP levels were higher in Group 2, but the difference was not statistically significant (7.5±5.0 vs. 5.0±4.5 mg/L; p=0.08) (Table 2).

Table 2. Comparison of hematological and inflammatory parameters between groups

Parameter	Group 1 (Mean±SD)	Group 2 (Mean±SD)	p-value
WBC (×10³/µL)	7.8±2.1	8.2±2.4	0.40
Neutrophils (×10³/µL)	4.5±1.8	5.0±2.0	0.25
Lymphocytes (×10³/µL)	2.2±0.8	2.0±0.7	0.30
Monocytes (×10³/µL)	0.6±0.2	0.7±0.3	0.10
Platelets (×10³/µL)	250±60	270±70	0.20
Hemoglobin (g/dL)	13.5±1.2	12.8±1.3	0.02
CRP (mg/L)	5.0±4.5	7.5±5.0	0.08

WBC: white blood cell, CRP: C-reactive protein

Inflammatory Indices

Patients in Group 2 exhibited significantly elevated systemic inflammatory indices compared to Group 1. Specifically, median NLR was significantly higher in Group 2 (4.0 [IQR: 2.5–5.5]) compared to Group 1 (2.5 [1.8–3.2]; p=0.01). Similarly, SII was significantly elevated in Group 2 (900 [700–1300]) versus Group 1 (600 [500–800]; p=0.02), and SIRI was higher in Group 2 (2.5 [1.5–3.5]) compared to Group 1 (1.5 [1.0–2.0]; p=0.03). PLR (150 [110–200] vs. 120 [100–150]; p=0.06) and dNLR (2.3 [1.8–3.0] vs. 1.8 [1.5–2.2]; p=0.07) values were also higher in Group 2, although these differences did not reach statistical significance (Table 3).

Table 3. Comparison of systemic inflammatory indices between groups

Inflammatory index	Group 1 (Median [IQR])	Group 2 (Median [IQR])	p-value
NLR	2.5 (1.8–3.2)	4.0 (2.5–5.5)	0.01
PLR	120 (100–150)	150 (110–200)	0.06
dNLR	1.8 (1.5–2.2)	2.3 (1.8–3.0)	0.07
SII	600 (500–800)	900 (700–1300)	0.02
SIRI	1.5 (1.0–2.0)	2.5 (1.5–3.5)	0.03

NLR: neutrophil-to-lymphocyte ratio, PLR: platelet-to-lymphocyte ratio, dNLR: derived neutrophil-to-lymphocyte ratio, SII: systemic immune-inflammation index, SIRI: systemic inflammation response index

Correlation and Regression Analyses of Revascularization Outcomes

Significant negative correlations were observed between successful revascularization and NLR (ρ=-0.42), SII (ρ=-0.39), SIRI (ρ=-0.37), and CRP (ρ=-0.35), all $p<0.05$.

In Group 1, a statistically significant negative correlation was observed between TASC II classification and revascularization success (ρ=-0.41, $p<0.05$). No significant correlations were found between revascularization success and either NLR or SII values ($p>0.05$).

In Group 2, revascularization success showed statistically significant negative correlations with NLR (ρ=-0.48, $p<0.05$), SII (ρ=-0.45, $p<0.05$), GLASS stage (ρ=-0.52, $p<0.05$), and the presence of diabetes (ρ=-0.39, $p<0.05$).

Significant positive correlations were identified between the presence of diabetes and NLR (ρ=0.38, $p<0.05$) and CRP (ρ=0.41, $p<0.05$) across the entire patient cohort. In Group 2 specifically, diabetes exhibited stronger correlations with NLR (ρ=0.52, $p<0.05$) and CRP (ρ=0.49, $p<0.05$).

Multivariable regression analysis identified GLASS stage (standardized β=-0.47, p=0.003), NLR (β=-0.36, p=0.01), and presence of diabetes (β=-0.31, p=0.02) as significant independent negative predictors of revascularization success. Patient age showed a non-significant negative trend (β=-0.18, p=0.09).

These statistical findings provide detailed quantitative evidence of the relationships between inflammatory markers, anatomical lesion severity, diabetes, and revascularization outcomes in patients with peripheral artery disease. Detailed statistical outputs supporting these findings are available upon request.

Procedure-Related Complications

Among the 90 patients who underwent endovascular revascularization, procedure-related complications were observed in 7 patients (7.8%). The most common complication

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was access-site hematoma, reported in 4 patients (4.4%). All cases were managed conservatively without the need for surgical intervention. Distal embolization occurred in 1 patient (1.1%) following a BTK intervention. The case was successfully managed with mechanical thrombectomy. Local site infection was reported in 1 patient (1.1%) and resolved with oral antibiotic therapy. Mild allergic reaction following contrast administration was observed in 1 patient (1.1%) and resolved spontaneously with antihistamine treatment.

No cases of pseudoaneurysm, major bleeding, arteriovenous fistula, or procedure-related mortality were noted.

Discussion

The present findings highlight a significant association between the anatomical distribution of PAD and systemic inflammatory status. Patients with isolated BTK lesions demonstrated significantly higher levels of inflammatory indices such as NLR, SII, and SIRI compared to those with isolated SFA involvement. To our knowledge, this is one of the first studies to systematically assess inflammatory burden in PAD based on lesion localization. These results suggest that inflammation may play a more dominant role in the pathophysiology of distal arterial disease, which could influence both risk stratification and individualized treatment strategies in clinical practice.

The observed elevation of inflammatory markers such as NLR, SII, and SIRI in patients with BTK lesions may be attributed to several interrelated mechanisms [11-13]. A growing body of evidence suggests that chronic inflammation plays a central role in the development and progression of atherosclerosis, particularly in distal arterial segments where ischemic burden tends to be more pronounced [13,14]. Neutrophils, monocytes, and platelets, key components of these indices, actively contribute to endothelial dysfunction, plaque instability, and thrombotic events. [13,15,16]. An elevated NLR reflects a shift toward pro-inflammatory neutrophil predominance and lymphocyte suppression, both of which are associated with more advanced or unstable atherosclerotic disease [17,18]. SII, by integrating neutrophil, lymphocyte, and platelet counts, offers a broader assessment of systemic immune and inflammatory status [12]. Previous studies have demonstrated that patients with chronic limb-threatening ischemia and complex, multilevel PAD, frequently involving BTK arteries, exhibit significantly higher systemic inflammatory indices and poorer clinical outcomes [11,14,15,17]. These findings imply that the heightened inflammatory activity observed in BTK PAD may reflect not only greater lesion complexity and chronic ischemia but also a more aggressive atherosclerotic phenotype [12,13].

In contrast, patients with isolated SFA lesions in our cohort exhibited significantly lower NLR and SII levels, indicating a relatively milder systemic inflammatory response. This is consistent with previous studies suggesting that proximal PAD manifestations are typically associated with less severe ischemia, preserved distal runoff, and reduced immune activation [10,13,15]. Consequently, anatomical location appears to correlate not only with procedural complexity but also with the extent of systemic inflammation, which may have prognostic implications [12,16].

From a clinical perspective, elevated inflammatory indices in BTK PAD may carry important prognostic and therapeutic implications [14,17]. These markers, particularly NLR, SII, and SIRI, have been associated with increased cardiovascular mortality, major amputation, and reduced amputation-free survival in PAD patients [10,12,15]. Their simplicity, low cost, and availability make them valuable tools for risk stratification and long-term monitoring in chronic limb-threatening ischemia (CLTI) [11,14]. Furthermore, SII and NLR have shown predictive value for restenosis, amputation, and mortality after revascularization procedures [10,15].

The prognostic significance of GLASS further reinforces our findings. In our study, GLASS stage emerged as an independent predictor of revascularization success among patients with BTK lesions [19]. This aligns with previous data indicating that higher GLASS stages, particularly Stage II and III, are associated with increased risk of restenosis, reintervention, and reduced limb salvage [20,21]. GLASS provides a structured, anatomy-based approach to assess procedural difficulty and predict long-term outcomes [19-21].

In our cohort, a significant negative correlation between TASC II classification and revascularization success was found among patients with isolated SFA lesions, supporting the prognostic relevance of TASC grading in femoropopliteal disease [21]. Higher TASC categories likely reflect increased lesion complexity, contributing to lower technical success despite advances in endovascular techniques [22]. Although some studies report no association between TASC grade and in-stent restenosis [18] our findings emphasize its potential value in predicting initial procedural outcomes. Still, known limitations of the TASC system, such as limited reliability and lack of anatomical detail, must be considered when interpreting results [23].

Diabetes mellitus emerged as another independent determinant of both systemic inflammation and revascularization outcomes in our cohort, particularly among patients with BTK lesions. This finding aligns with the well-established role of diabetes as a major risk factor for PAD and its progression to CLTI [1,24]. Chronic hyperglycemia induces a persistent pro-inflammatory state, accelerating atherosclerosis and contributing to vascular calcification, endothelial dysfunction, and impaired immune regulation [12,14,25]. Inflammatory indices such as NLR and SII, both significantly elevated in diabetic patients, have been previously linked to decreased amputation-free survival and increased mortality in diabetic PAD [14,18,25]. PLR, though not statistically significant in our cohort, has also been linked in the

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literature to adverse outcomes such as osteomyelitis and higher amputation risk in diabetic foot infections [26]. Furthermore, the diffuse and distally located arterial disease pattern commonly seen in diabetic patients often limits revascularization options and reduces procedural success, particularly in infrapopliteal segments [4,22]. These findings underscore the importance of integrating glycemic control and inflammation-based risk assessment into individualized treatment strategies for diabetic patients [12,26,27].

Beyond anatomical distribution, inflammation also plays a crucial role in long-term revascularization outcomes. In our study, significant negative correlations were observed between successful revascularization and systemic inflammatory markers—including NLR (ρ=-0.42), SII (ρ=-0.39), SIRI (ρ=-0.37), and CRP (ρ=-0.35), all $p<0.05$—underscoring their prognostic relevance in PAD management. These findings suggest that heightened systemic inflammation may impair procedural success by promoting endothelial dysfunction, impaired neovascularization, and thrombo-inflammatory cascades [10,28]. Notably, while CRP levels were higher in patients with BTK disease compared to the SFA group, the difference did not reach statistical significance; however, the inverse correlation between CRP and procedural success aligns with literature highlighting CRP as an acute-phase reactant linked to vascular injury and restenosis [10,28]. Moreover, prior studies have consistently shown that elevated NLR and SII levels are associated with reduced amputation-free survival and higher restenosis rates following femoropopliteal interventions [10,15]. Anti-inflammatory endovascular strategies, such as drug-coated balloon (DCB) angioplasty, have demonstrated improved patency and lower systemic inflammation markers compared to standard PTA, reinforcing the dual role of inflammation as both a prognostic marker and a modifiable therapeutic target in PAD [10,28,29].

This study has several limitations that warrant consideration. First, its retrospective design inherently limits the ability to control for all confounding variables, and causality cannot be established. Second, the study was conducted at a single center with a limited sample size, which may affect the generalizability of our findings. Third, although we focused on key inflammatory indices—NLR, SII, and SIRI—other biomarkers such as IL-6 or TNF-α were not included due to data constraints, potentially underrepresenting the full scope of the inflammatory response. Additionally, lesion classification was based on angiographic evaluation, which—despite standardized protocols—may still be prone to interobserver variability. Another limitation of our study is that only patients who underwent successful endovascular revascularization were included in the final analysis. As a result, our findings regarding the associations between inflammatory markers, anatomical staging, and revascularization outcomes are limited to this selected cohort. This approach excludes patients with failed or incomplete procedures, potentially introducing selection bias and limiting the generalizability of the results to the broader PAD population.

Finally, long-term clinical outcomes such as restenosis rates, limb salvage, or overall survival were not assessed, which could further clarify the prognostic significance of inflammatory markers and anatomic classification systems.

Nevertheless, the integration of anatomical staging systems (GLASS and TASC) with systemic inflammatory biomarkers provides a multidimensional approach to evaluating PAD. Our results highlight the potential value of combining imaging-based and laboratory-based parameters in refining risk stratification and guiding individualized management strategies. Future prospective studies with larger, multicentric cohorts and long-term follow-up are warranted to validate and expand upon these findings.

Conclusion

Our findings demonstrate that the anatomical distribution of peripheral artery disease is closely linked to systemic inflammatory burden, with BTK lesions exhibiting significantly higher levels of inflammation. Moreover, elevated inflammatory indices were associated with lower revascularization success, underscoring their potential role as both prognostic markers and modifiable contributors to procedural outcomes. These results support the integration of systemic inflammation into the clinical assessment of PAD, paving the way for more refined risk stratification and individualized therapeutic approaches.

Conflict of Interests
The authors declare that there is no conflict of interest in the study.

Financial Disclosure
The authors declare that they have received no financial support for the study.

Ethical Approval
Before the commencement of the study, written ethical approval (Decision No: 2025-222) was obtained from the Ethics Committee of the University of Health Sciences, Başakşehir Çam and Sakura City Hospital on 07 July 2025. The study was conducted in accordance with the ethical principles of the Declaration of Helsinki.

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