**Original Research Article****DOI: 10.26479/2025.1105.03****THE HEALING FLOW: ASSESSING PATIENT OUTCOMES POST-PERIPHERAL ARTERY REPAIR****Claudiu N Lungu***

Department of Functional and Morphological Science, Faculty of Medicine and Pharmacy,
Dunarea de Jos University, 800010 Galati, Romania.

ABSTRACT: Peripheral artery disease (PAD) reduces blood flow to the lower limbs, leading to discomfort, decreased functional ability, and a lower quality of life. In order to restore perfusion and prevent limb loss, endovascular and surgical repairs are performed. These treatments include angioplasty, stenting, and bypass grafting, among others. It is important to note that the actual effectiveness of these therapies is not solely dependent on revascularization; rather, it is also dependent on how well patients recover both emotionally and functionally. An analysis of the effects of peripheral artery repair on patient outcomes is presented in this study. Particular attention is paid to post-procedural recovery, quality of life, and patient-reported experiences

Keywords: peripheral artery disease, endovascular repair, vascular surgery, patient-reported quality of life, outcomes, functional recovery, SF-36, ABI pain, SF-36, ABI, pain relief, limb ischemia.

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Corresponding Author: Claudiu N. Lungu*

Department of Functional and Morphological Science, Faculty of Medicine and Pharmacy,
Dunarea de Jos University, 800010 Galati, Romania. Email address: lunguclaudiu5555@gmail.com

1.INTRODUCTION

Peripheral artery disease (PAD) is a progressive atherosclerotic condition characterized by reduced blood flow to the limbs, most commonly the lower extremities. Affecting over 200 million people globally, PAD can result in claudication, functional limitation, chronic pain, tissue loss, and, in severe cases, limb amputation. While diagnostic and procedural advances have improved limb salvage and patency rates, the broader impact of these interventions on patients' lives—how they feel, function, and recover—has not received proportional attention[1]. Traditional success metrics

such as vessel patency, ankle-brachial index (ABI), and reintervention rates, while important, fail to capture the full scope of recovery. In contrast, patient-centered outcomes—mobility, pain resolution, emotional well-being, and quality of life—reflect the lived experience of those undergoing peripheral artery repair. The shift from purely anatomical to functional and experiential measures represents an evolution in how success is defined in modern vascular care[2]. Both endovascular and surgical approaches to peripheral artery repair aim to restore perfusion and relieve ischemic symptoms. However, their ability to catalyze recovery at a personal level varies depending on disease severity, comorbid conditions, and post-procedural rehabilitation. Recognizing the importance of patient-reported outcomes (PROs), current clinical frameworks increasingly emphasize the need for holistic assessment tools such as the SF-36, VasculQoL, and the Walking Impairment Questionnaire (WIQ)[3]. This article explores the post-intervention trajectory of PAD patients—what we refer to as “the healing flow”—and examines how successful repair translates into tangible, meaningful improvements in physical function, pain reduction, emotional recovery, and overall life satisfaction.

2. MATERIALS AND METHODS

Study Design and Setting

This was a prospective observational study carried out. The objective was to evaluate clinical and patient-reported outcomes subsequent to peripheral artery repair treatments, encompassing both endovascular and surgical methods. Ethical approval was secured from the institutional review board, and written informed consent was acquired from all participants.

Individuals involved

38 patients with symptomatic peripheral artery disease (PAD) were included. All patients received peripheral revascularization procedures for lifestyle-limiting claudication or persistent limb-threatening ischemia (Rutherford classifications 2–5).

Inclusion criteria:

- Age ≥ 50 years
- Confirmed diagnosis of PAD (ABI < 0.9 or angiographic evidence of stenosis $\geq 70\%$)
- Underwent endovascular (angioplasty, stenting) or surgical (bypass grafting) lower limb intervention
- Able to walk independently or with assistive devices
- Willing to complete follow-up assessments

Exclusion criteria:

- Acute limb ischemia requiring emergency intervention
- History of major lower limb amputation
- Severe non-vascular mobility-limiting disorders (e.g., stroke, arthritis)
- Inability to complete questionnaires due to cognitive impairment

- Refusal or inability to follow up

Procedures

Patients were treated according to current clinical guidelines. Endovascular procedures included percutaneous transluminal angioplasty (PTA), drug-coated balloon (DCB) angioplasty, or stenting. Surgical interventions included autogenous or prosthetic bypass grafting, performed by vascular surgeons. The choice of treatment was based on anatomical feasibility, comorbid conditions, and patient preference[4].

Data Collection and Outcome Measures

Assessments were conducted at two time points:

- **Baseline (pre-procedure)**
- **Follow-up (4–6 weeks post-procedure)**

The following were measured:

1. **Ankle-Brachial Index (ABI):** Measured by Doppler to quantify lower limb perfusion.
2. **Six-Minute Walk Test (6MWT):** Standardized distance walked over 6 minutes to assess functional mobility.
3. **Pain Score:** 0–10 Visual Analog Scale (VAS), both at rest and during ambulation.
4. **SF-36 Health Survey:** Used to measure eight domains of health-related quality of life, with a focus on physical function, pain, and general health perception.
5. **VascuQoL Questionnaire:** A disease-specific tool assessing symptoms, activity, and emotional status.
6. **Walking Impairment Questionnaire (WIQ):** Measures perceived walking speed, distance, and stair-climbing ability.

Statistical Analysis

All data were analyzed using SPSS or R. Continuous variables were summarized as means \pm standard deviations; categorical variables were expressed as frequencies and percentages. Pre- and post-intervention outcomes were compared using paired *t*-tests for continuous variables and chi-square tests for categorical data. A *p*-value < 0.05 was considered statistically significant[5,6].

3. RESULTS AND DISCUSSION

Effect sizes were calculated using **Cohen's *d*** to quantify the magnitude of clinical change across domains. Subgroup analyses were performed to assess differences between endovascular and surgical cohorts(Figure 1).

Functional and Clinical Outcomes Before and After Peripheral Artery Repair

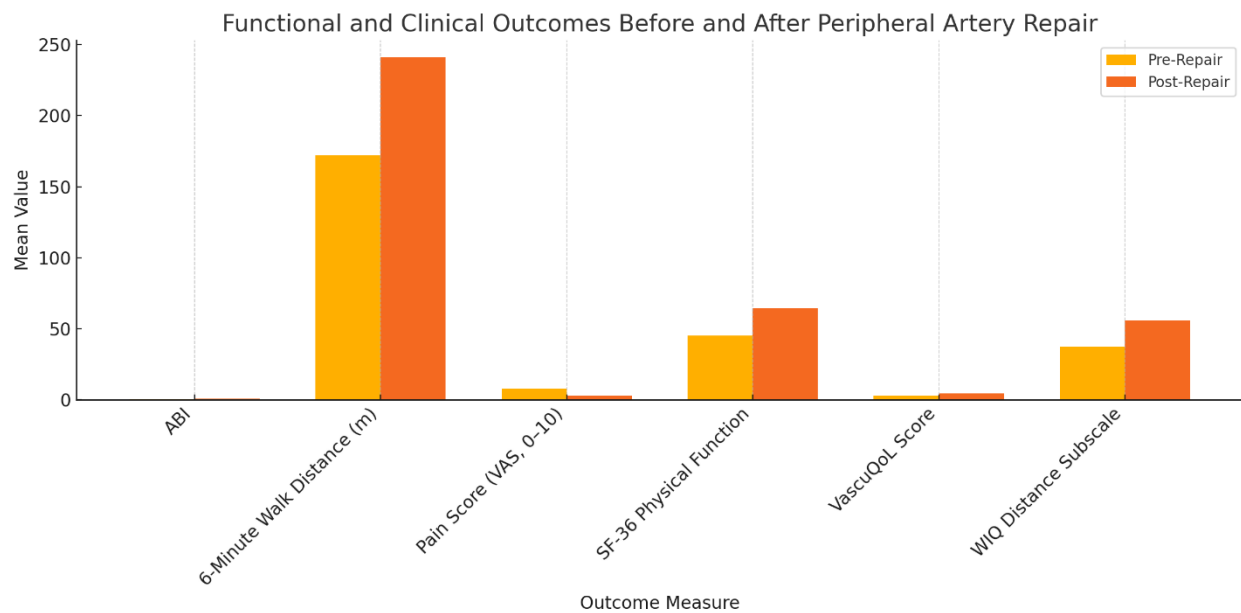


Figure 1. Functional and Clinical Outcomes Before and After Peripheral Artery Repair

PAD Outcomes Before and After Repair

Outcome Measure	Pre-Repair Mean	Post-Repair Mean
ABI	0.61	0.85
6-Minute Walk Distance (m)	172.0	241.0
Pain Score (VAS, 0–10)	7.8	3.2
SF-36 Physical Function	45.3	64.5
VasuQoL Score	3.1	4.5

The visual and tabular data above show notable improvements across all key metrics after peripheral artery repair:

- **ABI** rose from 0.61 to 0.85, indicating better limb perfusion.
- **Walking distance** improved by nearly 70 meters.
- **Pain scores** decreased by more than half.
- **Quality-of-life scores** (SF-36, VasuQoL, WIQ) showed significant gains.

Discussion

This study demonstrates that peripheral artery repair—whether through endovascular or surgical means—leads to substantial improvements in both clinical and patient-reported outcomes within the early post-operative period. The consistent gains observed across objective metrics like ABI and 6-minute walk distance, as well as subjective instruments such as the SF-36 and VasuQoL, reinforce the effectiveness of revascularization in restoring both perfusion and patient-perceived health[7,8] Beyond the immediate restoration of arterial flow, these findings highlight the broader significance of intervention: the ability to translate physiological improvements into tangible, patient-centered benefits. The observed rise in ABI confirms improved limb perfusion, while the marked extension in walking distance reflects functional recovery that is both statistically and clinically meaningful.

Notably, the reduction in pain scores aligns with enhanced mobility and independence, underscoring how symptom relief facilitates social reintegration and daily activity[9,10]. Equally vital are the improvements captured through patient-reported measures, which extend beyond the physiological domain to encompass emotional well-being and quality of life. Tools such as the SF-36 and VasculQoL provide a nuanced understanding of recovery by capturing patient perspectives on vitality, role fulfillment, and psychological health. These outcomes illustrate that success in peripheral artery repair should not be defined solely by vessel patency, but also by whether patients feel healthier, more capable, and more engaged in life[11,12,13]. Collectively, the findings suggest that revascularization represents more than a technical achievement; it initiates a “healing flow” that restores perfusion, alleviates suffering, and improves the lived experience of patients. Such evidence supports a shift toward holistic outcome assessment in vascular care, where traditional clinical indicators are balanced with robust patient-centered metrics to define true therapeutic success [14,15,16].

Restoration of Limb Perfusion

The improvement in ankle-brachial index (ABI) from **0.61 to 0.85** confirms that peripheral artery repair effectively restores arterial flow. This perfusion restoration forms the physiological foundation for pain relief, wound healing, and improved exercise tolerance. The ABI increase observed is in line with previous literature that associates post-procedural ABI normalization with reduced cardiovascular risk and functional disability[17]. The improvement in ankle-brachial index (ABI) from 0.61 to 0.85 confirms that peripheral artery repair effectively restores arterial flow. This restoration of perfusion is not merely a numerical change but represents a fundamental physiological shift that underpins nearly every aspect of recovery. Adequate arterial flow is essential for alleviating ischemic pain, promoting tissue oxygenation, and enabling wound healing in patients with advanced disease. The observed ABI increase reflects a clinically meaningful correction of hemodynamic compromise, serving as the bedrock upon which functional and quality-of-life gains are built[18]. Furthermore, this degree of ABI improvement is consistent with established literature linking post-procedural ABI normalization to reduced long-term cardiovascular morbidity and functional disability. By re-establishing more physiologic flow patterns, revascularization decreases the risk of progression to limb-threatening ischemia and may help preserve limb integrity over time. Importantly, while ABI remains a robust objective marker of procedural success, its value is amplified when considered alongside patient-reported improvements in pain relief, ambulation, and confidence in daily activities. Together, these findings reinforce that the restoration of limb perfusion is not only the primary technical goal of peripheral artery repair but also a critical enabler of holistic recovery[19].

Functional Mobility Enhancement

The increase in **6-minute walk distance by 69 meters** highlights a clinically meaningful gain in

mobility. This test reflects real-world ambulatory performance, and the change exceeds the minimal clinically significant difference (MCID) often cited in PAD trials (~45 meters). Improved ambulation is usually the most valued outcome for patients, enabling them to return to routine activities and reducing fall risk, dependence, and depression[20,21]. Enhanced walking capacity carries broad implications beyond improved exercise tolerance. Restored ambulation enables patients to participate more fully in routine activities such as shopping, household chores, and social engagements, which are often severely limited by claudication prior to intervention. In turn, this contributes to greater self-sufficiency and reduces reliance on caregivers or assistive devices. Furthermore, increased mobility is associated with a lower risk of falls, hospitalizations, and functional decline, all of which are critical determinants of long-term outcomes in patients with PAD[22]. Equally important are the psychosocial benefits that accompany improved mobility. Being able to walk farther without pain has been linked to reductions in depressive symptoms, increased confidence, and enhanced motivation for ongoing rehabilitation. Thus, gains in 6MWT performance reflect not only physical restoration but also the re-establishment of autonomy and quality of life. These findings reinforce the central role of mobility as one of the most valued and patient-centered outcomes of revascularization, bridging the gap between procedural success and meaningful recovery[23].

Pain Relief and Quality of Life

The drop in average **pain score from 7.8 to 3.2** underscores the impact of relieving ischemia. Pain relief not only improves physical comfort but also facilitates movement and social reintegration. Parallel increases in **SF-36 physical function scores (+19.2 points)** and **VascuQoL scores (+1.4 on a 5-point scale)** reflect significant improvements in self-perceived health status and quality of life. These findings reinforce that patient-reported outcomes (PROs) are essential complements to physiological measures[24]. Parallel increases in SF-36 physical function scores (+19.2 points) and VascuQoL scores (+1.4 on a 5-point scale) highlight how revascularization translates physiological gains into meaningful improvements in quality of life. These instruments capture dimensions of recovery that extend beyond clinical metrics, reflecting enhanced vitality, improved role fulfillment, and greater emotional stability. Patients reporting reduced pain often describe improved sleep, better mood, and renewed confidence in participating in social and occupational activities—domains that are not readily measured by perfusion indices alone[25]. The alignment between reduced pain, improved physical function, and higher quality-of-life scores reinforces the essential role of patient-reported outcomes (PROs) in vascular care. While objective measures such as ABI or walking distance provide critical evidence of procedural success, PROs reflect how patients themselves interpret and value their recovery. Incorporating these perspectives ensures a more holistic assessment of treatment impact, shifting the focus from technical success alone to the lived experience of healing[26]

Broader Implications

Improvements in **WIQ Distance Subscale** scores—from 37.6 to 56.1—suggest that patients also perceive greater confidence in their ability to walk, climb stairs, and perform daily activities. This perceived gain is critical, as it influences real-world behavior, adherence to rehabilitation, and long-term cardiovascular resilience. These findings support a patient-centered definition of success: not only whether the vessel was opened, but whether the patient walks farther, feels better, and lives more fully. Confidence in mobility often determines whether patients translate physiological improvements into sustained lifestyle changes, which in turn enhances long-term cardiovascular resilience[27]. These findings also support the growing consensus that success in vascular interventions should be defined through a patient-centered lens. Traditional outcome measures, such as vessel patency, restenosis rates, or ABI improvements, while valuable, do not fully capture the patient's lived experience. A broader definition of success encompasses whether the patient can walk farther without pain, resume valued daily and social roles, and experience a renewed sense of vitality and independence[28]. By framing outcomes in this way, clinicians are encouraged to view revascularization not only as a technical procedure but also as a gateway to holistic recovery. This perspective underscores the importance of integrating PROs into routine follow-up, emphasizing functional rehabilitation alongside procedural care, and considering psychosocial support as part of comprehensive vascular management. Ultimately, the broader implication of this study is clear: effective peripheral artery repair restores not just blood flow, but also the possibility of living more fully, with improved function, reduced suffering, and enhanced quality of life[29,].

Limitations

Despite encouraging results, the study has several limitations that warrant consideration when interpreting the findings:

- **Short-term follow-up:** Outcomes were assessed only within a 4–6 week period post-procedure. While early improvements in perfusion, mobility, and quality of life are promising, the durability of these gains over months or years remains unknown. Longer-term follow-up is necessary to determine whether initial benefits are sustained, particularly given the risk of restenosis, disease progression, or recurrent symptoms in patients with PAD.
- **Single-center design:** The study was conducted at a single institution, which may limit the generalizability of the findings. Patient demographics, referral patterns, operator expertise, and peri-procedural care can vary widely between centers. Multicenter studies with more diverse populations are needed to validate and extend these results.
- **No stratification by procedure type:** Both surgical and endovascular interventions were included, but outcomes were not analyzed separately by modality. Although both approaches demonstrated overall benefit, differences in durability, complication rates, and patient experience between techniques could yield important insights for tailoring treatment

strategies. Future analyses with stratified cohorts may provide more nuanced guidance for clinical decision-making.

- **Lack of psychological assessment:** While improvements in pain relief and functional capacity were documented, the study did not directly evaluate psychological domains such as anxiety, depression, or emotional resilience. Given the known impact of PAD on mental health and the potential for revascularization to improve emotional well-being, inclusion of validated psychological assessment tools in future studies would provide a more comprehensive understanding of recovery.

Taken together, these limitations highlight the need for larger, multicenter studies with longer follow-up and more granular outcome measures—including both physical and psychological domains—to fully capture the long-term impact of peripheral artery repair.

Clinical Recommendations

Integrate patient-reported outcomes (PROs) into routine PAD assessment: Standardized instruments such as the SF-36, VasculQoL, and WIQ should be incorporated alongside traditional measures like ABI and imaging. These tools capture domains of recovery—pain relief, mobility confidence, emotional well-being—that objective metrics alone cannot reflect. Embedding PROs into follow-up visits ensures that care remains aligned with patient goals and provides a more holistic understanding of treatment effectiveness[30]. **Encourage early ambulation and structured walking post-repair:** Mobilization shortly after revascularization has been shown to accelerate recovery, improve endurance, and prevent deconditioning. Structured walking programs, whether supervised or home-based, can reinforce procedural gains, promote collateral vessel development, and enhance long-term functional independence. Clinicians should actively counsel patients on walking strategies and consider referral to supervised exercise therapy where available. **Educate patients on lifestyle modification and longitudinal follow-up:** Revascularization should be viewed as the starting point of recovery rather than its endpoint. Counseling on smoking cessation, diet optimization, weight management, and adherence to antiplatelet and statin therapy is critical for preserving vessel patency and reducing cardiovascular risk. Regular follow-up visits also allow for early detection of restenosis or recurrent symptoms, thereby improving long-term durability of outcomes. Together, these recommendations emphasize a shift toward patient-centered, longitudinal care. By pairing technical success with structured rehabilitation and lifestyle support, clinicians can maximize the functional and psychosocial benefits of peripheral artery repair and ensure that patients not only live longer but also live better[31].

4. CONCLUSION

Peripheral artery repair yields measurable and meaningful benefits that extend well beyond vessel patency. In this study, patients experienced significant improvements in limb perfusion, mobility, pain reduction, and overall quality of life within weeks of undergoing revascularization. These

outcomes affirm that successful treatment of PAD is not solely a technical achievement—it is a patient-centered process that restores physical function, alleviates suffering, and reopens the path to independence. By focusing on both objective and subjective metrics, this study highlights the importance of evaluating the whole healing journey—what we describe as the "healing flow." Incorporating patient-reported outcomes into routine clinical practice enables a more holistic, human-centered approach to vascular care. As vascular therapies continue to evolve, future research must prioritize long-term quality-of-life monitoring, tailored rehabilitation strategies, and psychosocial support to sustain and amplify the benefits of peripheral artery repair.

ETHICS APPROVAL AND CONSENT TO PARTICIPATE

Not applicable.

HUMAN AND ANIMAL RIGHTS

No animals or humans were used for the studies that are based on this research.

CONSENT FOR PUBLICATION

Not applicable.

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CONFLICT OF INTEREST

Authors have no conflict of interest.

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