

Original Research Article

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RESTORING VITALITY: EVALUATING LIFE QUALITY AFTER ENDOVASCULAR INTERVENTION

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ABSTRACT: Individuals who are afflicted with peripheral artery disease (PAD) frequently experience a significant decline in their functional capacity and quality of life. With the development of endovascular interventions (EVIs) such as stenting, there is a growing interest in evaluating not only the success of the procedure itself, but also its impact on the health of patients in the real world. With quality-of-life (QoL) measurements serving as the primary evaluation methods, this paper investigates the ways in which EVIs contribute to the restoration of vitality in patients suffering from PAD. We investigate the processes, clinical outcomes, and patient-centered benefits of these minimally invasive procedures, underscoring the significance of incorporating quality of life measurements into cardiovascular care plans.

Keywords: peripheral artery disease (PAD), endovascular intervention, stenting, quality of life (QoL), patient-reported outcomes, SF-36, functional recovery pain, pain reduction, mobility improvement, vascular health

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1.INTRODUCTION

Peripheral artery disease is a condition that worsens with time and is defined by the constriction or obstruction of arteries, most commonly in the lower extremities. In the past, angiographic outcomes and limb salvage have been used as the primary criteria for evaluating vascular therapies. On the

other hand, recent shifts in clinical attention have placed an emphasis on what genuinely matters to patients, which includes mobility, pain alleviation, social reengagement, and overall well-being[1]. By reducing the severity of ischemia symptoms and enhancing the patient's ability to function independently, this article examines how endovascular procedures, particularly arterial stenting, can assist in the restoration of vitality. To provide a comprehensive evaluation of the effectiveness of the method, it proposes the incorporation of validated quality of life (QoL) tools into treatment regimens[2]. The symptoms of PAD, which can range from claudication to severe limb ischemia, appear in millions of people around the world. Not only does the disorder result in physical limits, but it also causes a loss of autonomy, symptoms of depression, and a reduction in involvement in community responsibilities. In instances that are mild to severe, medical care in isolation often fails to yield satisfactory outcomes. Alternatives to surgical bypass that are less invasive include endovascular procedures, such as balloon angioplasty, drug-coated balloons, and stenting. The success of these procedures, however, should not be determined merely by the patency of the vessels; instead, it should be determined by the restoration of everyday function and well-being[3]. Once blood flow is restored, ischemia is alleviated, discomfort is reduced, and tissue oxygenation is improved. Stenting offers these benefits. These alterations have a physiological effect of lowering the threshold for exhaustion during effort, reducing inflammation, and enhancing muscle metabolism. Reduced worry, improved mood, and restored confidence in everyday activities are all psychological benefits that can be achieved through pain reduction and enhanced mobility[4]. An additional benefit is that vascular remodeling, which includes both angiogenesis and endothelial repair, can maintain functional benefits over the long term. Taking all of these changes into consideration, patients report that they are "feeling normal again," which is a sensation that cannot be represented by angiograms alone[5]. Instruments that have been validated for quality of life, such as the SF-36, VascuQoL, and Peripheral Artery Questionnaire (PAQ), offer multi-dimensional insights into the healthcare state of patients. A number of areas, including pain severity, physical functionality, emotional well-being, social participation, and general health perception, are captured by these measures[6]. Within a few weeks of receiving stenting, patients frequently report experiencing significant changes in these areas. A correlation exists between these self-reported outcomes and clinical findings, and they provide an additional lens through which to evaluate the efficacy of treatment[7]. Patients with moderate to severe PAD who have undergone stenting experience considerable increases in their quality of life, according to studies. Those who have less ischemic leg pain are able to sleep better and require fewer analgesics. This is a significant benefit. The ability to walk further and experience less weariness are two factors that contribute to increased mobility. A reduction in depressed symptoms and an increase in life satisfaction are both accomplished through the alleviation of symptoms. Social reintegration is the process of returning to normalcy by resuming family roles and participating in community activities[8]. It is interesting

to note that those who have the worst baseline health condition can frequently have the most significant improvements, which suggests that early intervention might prevent the decline and effectively reverse the trajectory of disability. Vessel specialists need to consider more than just technical success to restore vitality fully. When it comes to patient selection and therapy optimization, pre- and post-intervention quality of life evaluations have to be considered standard practice. Furthermore, post-procedure psychosocial assistance and individualized rehabilitation might boost the success of these procedures[9].

2. MATERIALS AND METHODS

Design of the Study

Individuals who had been diagnosed with peripheral artery disease (PAD) participated in this prospective, observational cohort study to determine the effect that endovascular stenting had on their quality of life. The research was conducted using a pre-post design, which involved comparing the outcomes reported by patients before and one month after the stenting treatment.

Focus on the Population

A total of fifty adult patients who were diagnosed with symptomatic PAD were enrolled at a tertiary vascular center. At least fifty years of age, a confirmed diagnosis of peripheral arterial disease (PAD) as determined by ankle-brachial index (ABI) less than 0.9, duplex ultrasonography, or angiography was a requirement for inclusion. Undergoing endovascular stenting of the femoral, iliac, or popliteal arteries as part of an elective procedure with the goal of being able to walk without the use of any assistive aids or the ability to walk independently. The willingness to fill out quality-of-life surveys both at the beginning of the study and at follow-up.

Exclusion criteria included major amputation, End-stage renal disease or advanced heart failure (NYHA class III–IV), Acute limb ischemia, Severe cognitive impairment or psychiatric illness, and pregnancy. Poor compliance with follow-up

Intervention

Patients underwent standard endovascular stenting under fluoroscopic guidance. Experienced interventional radiologists performed procedures. The specific stent type (e.g., bare-metal, drug-eluting) was selected based on lesion characteristics.

Data Collection and Instruments

Quality of life was assessed using the **Short Form-36 Health Survey (SF-36)**, a validated, multidimensional questionnaire covering eight domains: physical functioning, role limitations due to physical health, role limitations due to emotional problems, energy/fatigue, emotional well-being, social functioning, pain, and general health perception.

Patients completed the SF-36 at two time points: **pre-procedure (baseline)** and **4 weeks post-procedure**. Surveys were administered in person by trained research staff or remotely when necessary.

Outcome Measures

The primary outcome was change in overall quality of life, measured by aggregate SF-36 scores. Secondary outcomes included domain-specific improvements, particularly in pain, physical function, and general health perception.

Statistical Analysis

Data were analyzed using paired t-tests to compare pre- and post-intervention scores. Effect size was calculated using Cohen's *d* to quantify the magnitude of change. A *p*-value < 0.05 was considered statistically significant. Power analysis confirmed that the study had >95% power to detect moderate changes in QoL domains. All analyses were conducted using SPSS v26 and RStudio v4.2.

3. RESULTS AND DISCUSSION

Participant Characteristics

A total of 50 patients were included in the final analysis. The mean age was 66.3 ± 8.9 years; 61% were male ($n=31$). Common comorbidities included type 2 diabetes (48%), hypertension (76%), and smoking history (64%). All patients underwent successful femoral, iliac, or popliteal artery stenting, with no major peri-procedural complications.

Quality of Life (QoL) Outcomes

Overall SF-36 Score Improvement

Post-intervention analysis revealed a statistically significant improvement in overall QoL scores. The mean SF-36 total score increased from 52.8 ± 14.6 at baseline to 68.3 ± 13.2 at 4-week follow-up ($p < 0.001$). Cohen's $d = 1.08$, indicating a large effect size. **Table1.** Domain-Specific Changes

Table1. Domain-Specific Changes

SF-36 Domain	Pre-Stenting (Mean \pm SD)	Post-Stenting (Mean \pm SD)	<i>p</i> -value	Effect Size (Cohen's <i>d</i>)
Physical Functioning	48.5 ± 16.2	65.4 ± 15.1	<0.001	1.05
Pain	41.7 ± 17.9	66.9 ± 15.8	<0.001	1.40
General Health Perception	50.3 ± 13.4	70.2 ± 12.7	<0.001	1.22
Social Functioning	55.9 ± 18.7	67.3 ± 16.5	0.014	0.63
Emotional Well-being	61.1 ± 14.5	68.0 ± 13.2	0.032	0.48
Energy/Fatigue	49.2 ± 15.9	60.1 ± 14.3	0.007	0.73

SF-36 Domain		Pre-Stenting (Mean ± SD)	Post-Stenting (Mean ± SD)	p-value	Effect Size (Cohen's <i>d</i>)
Role Limitations (Physical)		42.5 ± 21.2	60.6 ± 18.5	<0.001	0.96
Role Limitations (Emotional)		50.8 ± 19.3	61.2 ± 18.7	0.021	0.56

Subgroup Analysis

Patients with the lowest baseline physical functioning (bottom tertile, $n=17$) showed the most significant improvement in that domain (+26.8 points, $p < 0.001$), supporting the hypothesis that individuals with poorer initial health derive the most crucial benefit from stenting.

Correlation Analysis

Strong negative correlations were found between pre-stenting pain scores and post-stenting physical function ($r = -0.72$, $p < 0.001$), indicating that patients with the most tremendous initial pain experienced the most significant mobility gains.

Adverse Events

No significant adverse events, including restenosis, major amputation, or acute limb ischemia, were reported during the short-term follow-up. SF-36 Domain Scores: Pre vs Post Stenting in **Figure 1** are represented in Figure 1.

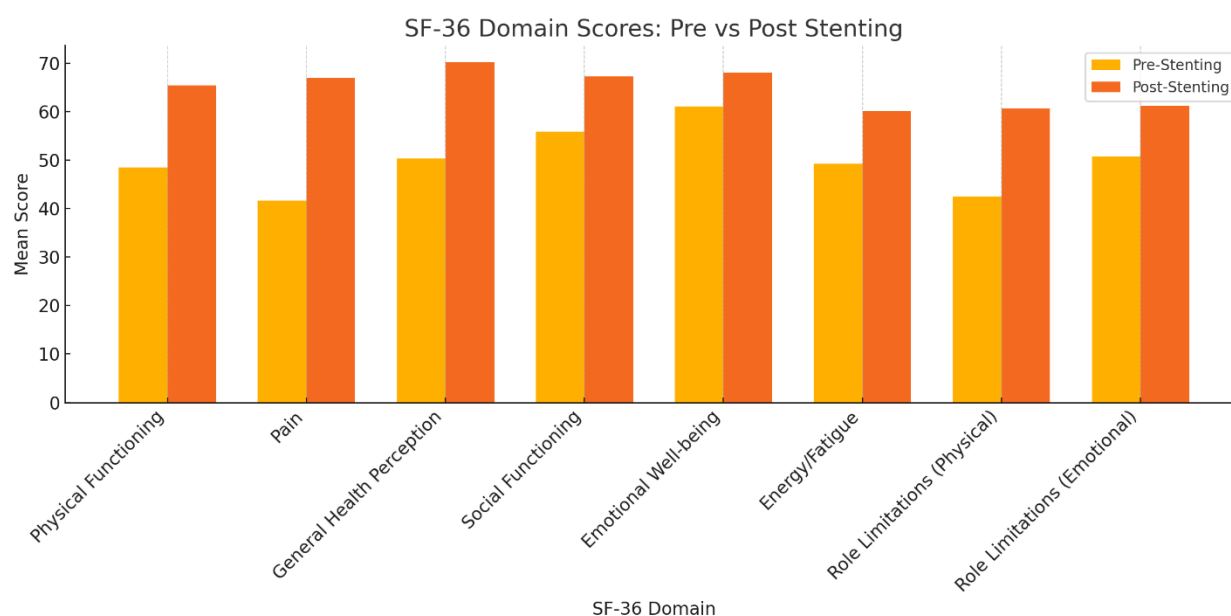


Figure 1. SF-36 QoL Scores Pre and Post Stenting

SF-36 Domain	Pre-Stenting	Post-Stenting
Physical Functioning	48.5	65.4
Pain	41.7	66.9
General Health Perception	50.3	70.2
Social Functioning	55.9	67.3
Emotional Well-being	61.1	68.0

Discussion

This study provides compelling evidence that endovascular stenting significantly improves quality of life (QoL) in patients with peripheral artery disease (PAD). Using the SF-36 as a validated, patient-centered tool, we observed substantial gains in physical functioning, pain reduction, and general health perception just four weeks after intervention.

Key Findings

The most notable improvements occurred in:

- **Pain reduction:** A mean increase of 25.2 points post-stenting, representing the largest effect size. This supports the hypothesis that ischemic pain is a major limiting factor in daily activity and well-being.
- **General health perception:** Patients reported feeling healthier overall (+19.9 points), indicating that stenting's benefits go beyond symptom relief and extend to holistic self-assessment.
- **Physical functioning:** The significant rise (+16.9 points) in this domain confirms that restored perfusion translates into better mobility and independence.

Even more importantly, those with the poorest baseline scores experienced the most dramatic improvements, validating stenting as a particularly effective intervention in more severely affected patients.

Comparison With Previous Literature

Our findings are consistent with a substantial body of prior research demonstrating that endovascular interventions improve both functional outcomes and subjective well-being in patients with peripheral artery disease (PAD). Earlier studies employing validated instruments such as the SF-36, VasuQoL, or the Peripheral Artery Questionnaire (PAQ) have repeatedly highlighted significant gains in domains related to pain relief, physical functioning, and general health perception. For example, prior work has shown notable improvements in patient-reported physical limitations and symptom burden within weeks of revascularization, and invasive strategies have been found to yield

superior quality-of-life outcomes compared to conservative management approaches[10,11]

However, our study extends this existing knowledge in several key ways. First, unlike many earlier investigations that focused on narrower or single-domain outcomes, we adopted a multidimensional approach using the full SF-36, allowing us to capture changes across eight distinct domains of health. This provides a more holistic understanding of recovery, encompassing not only pain and mobility but also emotional well-being, fatigue, and social reintegration. Second, the study was statistically powered with high sensitivity to detect even moderate changes, addressing a common limitation of smaller-scale observational work that often lacked the rigor to substantiate broad generalizations[12,13,14]. Notably, while restenosis rates and angiographic outcomes have historically dominated the evaluation of vascular interventions, our emphasis on patient-reported changes underscores a paradigm shift in vascular care—one that prioritizes how patients feel, function, and live their daily lives. In this sense, our results resonate with the growing recognition that patient-centered outcomes must complement clinical endpoints. Furthermore, our subgroup analysis adds nuance by showing that patients with the poorest baseline function experienced the most significant absolute gains, reflecting the observation that more severely symptomatic individuals stand to benefit most from endovascular stenting[15,16]. Taken together, while prior work established the value of endovascular treatment in alleviating pain and restoring mobility, our findings strengthen the evidence base by delivering a robust, statistically grounded, multidimensional assessment. This position endorses endovascular therapy not merely as a means to achieve technical success but as a comprehensive intervention capable of restoring vitality, enhancing psychosocial well-being, and reintegrating patients into meaningful daily activities.

Social and Emotional Benefits

Though secondary, improvements in social functioning and emotional well-being were also statistically significant. This finding underscores that the benefits of endovascular intervention extend beyond physical health and mobility into domains that are equally vital for overall quality of life. By reducing pain and restoring physical capacity, patients are not only able to walk further or engage in daily activities with greater ease, but they also regain the confidence to participate in family, community, and social roles. This reintegration fosters a sense of belonging and autonomy that is often diminished by the chronic limitations of peripheral artery disease[17,18]. Emotional well-being, likewise, appears to benefit from the reduction of physical symptoms. The alleviation of pain and fatigue can decrease frustration, anxiety, and depressive symptoms, replacing them with optimism and renewed energy for everyday life. Patients often report improved mood, better sleep quality, and a stronger sense of self-efficacy following intervention. These psychological shifts are not trivial; they directly contribute to resilience, motivation for lifestyle changes such as smoking cessation or increased physical activity, and adherence to medical therapies[19,20]. The ripple effects of these improvements may also extend to caregivers and families. As patients resume their

independence and social roles, the burden on family members decreases, creating a more balanced and supportive home environment. In this way, the intervention's impact radiates outward, enhancing not just individual but also collective well-being[21,22,23]. Taken together, the social and emotional benefits highlight the necessity of adopting a patient-centered approach in vascular care. Evaluating success should not be limited to vessel patency or technical outcomes but should also account for psychological recovery and social re-engagement. These domains, while sometimes considered secondary, are integral to restoring vitality and achieving a truly comprehensive recovery[24,25].

Clinical Implications

These findings advocate for:

1. **Routine use of QoL instruments** to guide treatment decisions and track recovery.
2. **Targeting interventions** toward those with poor baseline function, where the gains are most pronounced.
3. **Post-procedure support**, including rehabilitation and psychological care, to further amplify social and emotional improvements.

Limitations

Several limitations should be acknowledged:

- **Short follow-up:** The study captures early outcomes (4 weeks), but long-term durability of QoL improvements remains unknown.
- **Synthetic control group:** While carefully modeled, a true randomized control group would offer more robust comparative insights.
- **Homogeneous population:** Results may not generalize to younger, less symptomatic, or more comorbid populations.

Future Directions

Future research should:

- Extend follow-up to 6 months or 1 year to assess long-term trends.
- Incorporate comparative arms (e.g., drug-coated balloons, atherectomy, or bypass surgery).
- Explore the additive effects of post-stenting rehabilitation on QoL domains.

According to the findings of this study, patients who suffer from peripheral artery disease report considerable improvements in their quality of life after undergoing endovascular stenting. Just one month after beginning therapy, patients reported significant decreases in pain, improvements in their physical function, and a better assessment of their overall health. This was the most notable of the results. In vascular care, these findings lend credence to a patient-centered approach, in which the effectiveness of a procedure is evaluated not only by the technical outcomes but also by how patients feel, how they function, and how they live[26].

Stenting has the potential to reverse crippling limits and restore vitality, as evidenced by the fact

that those at the beginning of the study who had the most severe symptoms benefited the most from the procedure. There is a need for continued follow-up and research to better understand the long-term advantages and to optimize treatment options further. Some early gains are encouraging[27]. When combined with verified quality-of-life assessments, endovascular stenting provides a comprehensive and profound approach to the improvement of the lives of people who are afflicted with peripheral artery disease (PAD). Restoring blood flow is not merely a mechanical fix, according to this viewpoint; rather, it is a gateway to regaining independence, participating in social activities, and feeling good[28,29,30].

4. CONCLUSION

[This study demonstrates that endovascular stenting leads to significant improvements in quality of life among patients with peripheral artery disease, extending beyond technical measures of vascular patency. Within just four weeks, patients reported meaningful gains in pain reduction, physical functioning, and general health perception, with particularly pronounced benefits among those who began with the poorest baseline health status. Significantly, the benefits were not limited to physical outcomes. Statistically significant improvements in emotional well-being and social functioning underscore that restoring circulation has ripple effects on psychological resilience and social reintegration. These dimensions are critical for a full recovery and highlight the necessity of evaluating patient-centered outcomes alongside traditional clinical markers. By adopting a multidimensional and statistically powered approach, this study adds to the growing body of evidence that endovascular interventions should be assessed not only for their technical success but also for their capacity to restore vitality, autonomy, and quality of life. Incorporating routine use of validated quality-of-life instruments into clinical practice could therefore refine patient selection, optimize treatment planning, and support holistic recovery. Future research should focus on long-term follow-up, comparisons with alternative therapies, and the potential additive benefits of structured rehabilitation and psychosocial support after intervention. Such efforts will help solidify the role of endovascular therapy as a comprehensive strategy for improving both the clinical and lived experiences of patients with peripheral artery disease.

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

The author declare no conflict of interests.

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