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Original Article

Surgical and endovascular approaches in peripheral arterial dissections: A single-center clinical experience

Sefer Kaya, Meryem Ridvanogullari, Metin Onur Beyaz, Iyad Fansa

Hatay Mustafa Kemal University, Faculty of Medicine, Department of Cardiovascular Surgery, Hatay, Türkiye

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Abstract

Aim: Peripheral artery dissections are rare but clinically significant vascular events with heterogeneous presentations, and there is still no consensus on optimal treatment. This study aimed to evaluate the early and mid-term outcomes of endovascular, hybrid, open surgery, and conservative strategies in a single-center cohort.

Material and Methods: Between January 2018 and December 2024, 19 consecutive patients diagnosed with peripheral artery dissection were retrospectively included. Demographic data, cardiovascular risk factors, clinical presentations, dissection etiology, ABI, treatment strategies, and outcomes were recorded. Dissection severity was graded using a predefined institutional peripheral arterial dissection grading system adapted from the NHLBI classification. The treatment strategy was individualized according to dissection grade, arterial segment, hemodynamic significance, common femoral artery involvement, and suitability for endovascular, hybrid, open, or conservative management.

Results: 78.9% of dissections were iatrogenic, 21.1% were traumatic, and mostly affected the iliac arteries. Treatments included endovascular (n = 11), hybrid (n = 6), open surgery (n = 1), and conservative management (n = 1). Technical success among interventional procedures was 94.4%. The ABI improved significantly from 0.54 ± 0.21 to 0.75 ± 0.21 (p = 0.0002). At a mean follow-up of 10.8 months, the primary patency rate was 89.5%, limb salvage was 94.7%, and the 30-day complication rate was 26.3% (10.5% major). Preoperative ABI was significantly lower in the endovascular group compared to the hybrid group (0.51 vs. 0.71; p = 0.044), but ABI improvement was comparable (p = 0.208). Higher dissection grades showed lower primary patency (E-F grades: 67% vs. B-D grades: 100%).

Conclusion: Both endovascular and hybrid approaches achieved high technical success and favorable short- to medium-term outcomes in this cohort. Significant hemodynamic improvement was observed using ABI measurement. However, given the small sample size and population heterogeneity, these findings should be considered exploratory. The degree of dissection may be associated with outcomes, but this should be confirmed in larger studies.

Keywords: Peripheral artery dissection, endovascular treatment, hybrid surgery, ankle-brachial index, arterial dissection

INTRODUCTION

Peripheral artery dissection is a rare but potentially limb-threatening vascular event that can occur spontaneously in patients with underlying arterial wall pathology, due to iatrogenic causes during endovascular procedures, external trauma, or other underlying causes [1-3]. Unlike aortic dissection, which has established classification systems and treatment algorithms, there is no unified diagnostic framework, standardized grading system, or evidence-based treatment guidelines for peripheral artery dissections [4,5].

The increasing use of percutaneous vascular interventions, including coronary and structural heart procedures requiring large-bore femoral access, has been associated with an increased frequency of iatrogenic iliac and femoral artery dissections [6,7]. Damara et al. recently analyzed the Vascular Quality Initiative database and reported that artery dissection during peripheral vascular interventions increased from 2.4% to 3.6% during their study period, and 83.7% of cases were managed with endovascular

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Corresponding Author: Metin Onur Beyaz, Hatay Mustafa Kemal University, Faculty of Medicine, Department of Cardiovascular Surgery, Hatay, Türkiye
Email: metinonurbeyaz@gmail.com

treatment [8]. These dissections may present acutely with limb-threatening ischemia or may be discovered incidentally during follow-up imaging.

Treatment options range from conservative observation to endovascular stenting and hybrid approaches, and recent reports have demonstrated the feasibility of endovascular strategies in selected iliac artery dissections [9-11]. Acute arterial events in the peripheral circulation, particularly in the context of malperfusion syndromes, share common principles regarding emergency revascularization and hemodynamic monitoring [12,13]. However, the optimal treatment strategy remains unclear, particularly in terms of patient selection criteria for each method and the long-term durability of endovascular repair in this specific pathology [14,15].

Although iliac stent placement for atherosclerotic disease has been extensively studied with well-documented long-term patency rates, the outcomes of stenting for dissection, where the disease mechanism and vessel wall integrity are fundamentally different from atherosclerotic occlusion, are less well characterized [16-18]. Furthermore, the ankle-brachial index (ABI), a cornerstone of peripheral artery disease assessment, has not been systematically evaluated as an outcome measure in peripheral dissection series.

The aim of this study was to evaluate our single-center experience regarding the management of peripheral artery dissections and to compare treatment strategies in terms of technical success, hemodynamic improvement assessed by preoperative and postoperative ABI, mid-term patency, and limb salvage. We also examined the relationship between the degree of dissection and clinical outcomes. This is an analysis that has not been previously reported in the literature.

MATERIAL AND METHODS

Study Design and Patient Population

This is a single-center, retrospective study conducted at the Department of Cardiovascular Surgery, Faculty of Medicine, Hatay Mustafa Kemal University. All consecutive patients diagnosed with peripheral artery dissection (iliac, femoral, or popliteal arteries) between January 2018 and December 2024 were included in the study. The study was approved by the Institutional Non-Interventional Clinical Research Ethics Committee (Decision No. 03, dated 07/06/2023) and informed consent was obtained from all participants. This study was designed as a retrospective observational cohort study. A consecutive sampling method was used, including all eligible patients during the study period.

Inclusion criteria were: (1) patients diagnosed with peripheral arterial dissection involving the iliac, femoral, or popliteal arteries; and (2) availability of complete clinical and imaging data. Exclusion criteria included: (1) isolated aortic dissections; (2) patients with incomplete records; and (3) patients without follow-up data.

Due to the exploratory nature of the study and the rarity of the condition, a formal sample size or power calculation was not performed.

Data Collection

Baseline demographic data, cardiovascular risk factors (hypertension, diabetes mellitus, hyperlipidemia, coronary artery disease, atrial fibrillation, smoking status), and renal function (estimated glomerular filtration rate [eGFR]) were recorded at admission. The clinical presentation was classified as acute extremity ischemia, claudication, pain at rest, or asymptomatic. The etiology of dissection was classified as iatrogenic (procedure-related) or traumatic. The degree of dissection was assessed angiographically and classified using an institutional grading system adapted from the National Heart, Lung, and Blood Institute (NHLBI) coronary dissection classification (Table 1): grade B, intimal tear with a limited intraluminal flap but preserved flow; grade D, extensive spiral dissection with significant luminal compromise; grade E, dissection with a new persistent filling defect or total occlusion of the true lumen; and grade F, dissection resulting in complete vessel occlusion with absent antegrade flow. Grades A and C were not observed in this cohort.

Table 1. Peripheral arterial dissection grading system adapted from the NHLBI classification.

Grade	Angiographic definition	Flow/hemodynamic interpretation	Typical clinical implication
A	Minor intimal irregularity or linear radiolucency without a definite flap or double lumen	No relevant luminal compromise; preserved antegrade flow	Usually non-flow-limiting; observation may be sufficient
B	Definite intimal flap or short-segment double lumen, with preserved distal antegrade flow	Mild luminal compromise, generally <50%; no major runoff impairment	Conservative or endovascular treatment depending on symptoms and ABI
C	Localized false-lumen opacification or contrast staining with persistence after contrast clearance, without vessel occlusion	Potentially unstable lesion but preserved distal flow	Close imaging follow-up or intervention if symptomatic/progressive
D	Long-segment or spiral dissection with significant true-lumen narrowing	Flow-limiting dissection; delayed distal filling or impaired runoff may be present	Usually requires endovascular or hybrid repair
E	Persistent intraluminal filling defect, thrombus, or near-occlusion of the true lumen	Markedly impaired flow with high risk of occlusion	Urgent revascularization usually required
F	Complete vessel occlusion with absent antegrade flow	Occlusive dissection with severe hemodynamic compromise	Urgent endovascular, hybrid, or open revascularization required

The ankle-brachial index was measured both preoperatively and at the first postoperative examination.

This grading system represents an institutional adaptation of the NHLBI classification and has not been validated for peripheral artery dissections; therefore, it should be considered exploratory. Inter-observer variability has not been formally assessed and remains a limitation of this rating system.

Treatment Strategy

The treatment strategy was determined by the cardiovascular surgery team based on the clinical picture, degree of dissection, affected arterial segment, degree of flow restriction, ABI values, distal flow, and involvement of the common femoral artery or concomitant atherosclerotic disease. Hemodynamically significant dissections were defined as those associated with acute limb ischemia, resting pain, marked claudication, a decreased ABI, delayed distal opacification, severe true lumen narrowing, or complete occlusion.

Endovascular repair was preferred for dissections limited to the iliac, external iliac, superficial femoral, or popliteal artery segments when the lesion could be safely traversed, and true lumen patency restored. The goal of the procedure was to close the access tear, re-widen the true lumen, restore anterograde flow, and preserve distal flow. Lesions were traversed with a guidewire under fluoroscopic guidance, and the intraluminal position was confirmed by angiography before stent placement. In all interventional cases, complementary angiography was performed to assess residual stenosis, distal flow, flow restoration, and procedure-related complications.

Hybrid repair was preferred in cases where the dissection extended to the common femoral artery, where there was associated common femoral artery disease requiring endarterectomy, or where safe surgical access for iliac intervention was required. In these cases, open femoral exposure, endarterectomy, and/or patch angioplasty were combined with iliac or femoropopliteal endovascular stenting as needed. Open surgical repair was reserved for complex anatomy, failed endovascular passage, extensive arterial injury, or associated vascular pathology requiring direct reconstruction.

Conservative treatment was considered only in clinically stable patients with preserved distal flow, no limb-threatening ischemia, and no angiographic evidence of progressive or flow-limiting dissection. These patients received antithrombotic therapy and underwent close clinical, ABI, and duplex ultrasonographic follow-up. Treatment decisions were individualized based on clinical assessment and anatomical considerations; a standard treatment algorithm was not applied.

Stent Selection

Stent type and size were selected based on the arterial segment, reference vessel diameter, lesion length, degree of lumen narrowing, vessel tortuosity, calcification, and the need for precise placement. Reference vessel diameter was estimated using preoperative CT angiography and intraoperative angiography. Balloon-expandable stents were generally preferred in short, ostial, or common iliac artery dissections where accurate positioning and high radial force were required. Due to their flexibility and compatibility, self-expanding nitinol stents were preferred for longer lesions, external iliac artery lesions, femoropopliteal segments, and tortuous or mobile arterial segments.

Covered stents were evaluated in cases with arterial rupture, perforation, persistent extravasation, or persistent pseudolumen filling after standard stent placement. The stent diameter was selected to match the adjacent normal reference vessel, and the stent length was chosen to encompass the entire dissection segment restricting flow, including the access tear and distal re-entry site. Where possible, at least 10 mm of the proximal and distal landing zone within the undissected artery was targeted. Post-dilatation was selectively performed in cases with more than 30% residual stenosis, incomplete stent expansion, or persistent flow restriction on complementary angiography.

Medical Treatment and Follow-up Medications

Unless contraindicated, periprocedural systemic anticoagulation with intravenous unfractionated heparin was administered after arterial access. The dose was adjusted according to institutional practice and patient-specific bleeding risk. After endovascular or hybrid stent implantation, patients received dual antiplatelet therapy with acetylsalicylic acid and clopidogrel in the early postprocedural period, followed by mono antiplatelet therapy for long-term secondary protection. In patients with an established indication for oral anticoagulation, such as atrial fibrillation, the antithrombotic therapy was individualized according to thrombotic and bleeding risk.

All patients received optimal medical treatment, including statin therapy when indicated, blood pressure control, diabetes management, smoking cessation counseling, and treatment of other cardiovascular risk factors. Patients treated conservatively received anticoagulant therapy based on clinical presentation, thrombus burden, and bleeding risk, and were closely monitored with clinical examination, ABI measurement, and duplex ultrasonography.

Outcome Points

Primary outcome points were: (1) technical success, defined as the restoration of true lumen patency with less than 30% residual stenosis on complementary angiography; (2) the 30-day complication rate (major and minor); (3) primary patency at last follow-up; and (4) the limb salvage rate. Secondary outcome points included the change in ABI (ΔABI), in-hospital mortality, access site complications (hematoma, pseudoaneurysm), and target lesion revascularization (TLR).

Follow-up Protocol

Patients were followed up with clinical examination, ABI measurement, and duplex ultrasonography at 1-, 3-, 6-, and

12-month post-procedure and then annually. Computed tomography angiography was performed when clinically indicated. Loss of primary patency was defined as occlusion or ≥50% restenosis within the treated segment.

Statistical Analysis

Continuous variables were expressed as mean ± standard deviation and median (range). Categorical variables were presented as frequencies and percentages. Due to the small sample size and lack of normal distribution, non-parametric tests were used in all analyses. The Mann-Whitney U test was used for intergroup comparisons of continuous variables, the Wilcoxon signed-rank test for paired pre/post-operative ABI comparisons, Fisher's exact test for categorical comparisons, and the Spearman rank correlation for monotonic relationships. All tests were two-sided; a p-value < 0.05 was considered statistically significant. Analyses were performed using Python 3 (SciPy library). Given the small sample size, all statistical analyses should be interpreted as exploratory rather than confirmatory and hypothesis-generating in nature.

RESULTS

Patient Characteristics

Nineteen patients (12 men, 7 women; mean age 58.0 ± 8.2 years) were included in the study. The most common cardiovascular risk factors were hypertension (68.4%), history of smoking (63.2%), hyperlipidemia (47.4%), and diabetes mellitus (42.1%). Coronary artery disease was present in 26.3%, and atrial fibrillation in 10.5%. The mean eGFR was 66.7 ± 12.8 mL/min/1.73 m², and the majority of patients (78.9%) were in chronic kidney disease (CKD) stage G2. All baseline characteristics are presented in Table 2.

Table 2. Basic demographic data, comorbidities, and renal function (N = 19)

Variable		Value	n (%) or mean ± SD
Age (years)		58.0 ± 8.2	19
Median (range)		57.0 (43–73)	
Sex	**Male**		12 (63.2%)
	Female		7 (36.8%)
Comorbidities	**Hypertension**		13 (68.4%)
	Diabetes mellitus		8 (42.1%)
	Hyperlipidemia		9 (47.4%)
	Coronary artery disease		5 (26.3%)
	Atrial fibrillation		2 (10.5%)
Smoking status	**Active smoker**		9 (47.4%)
	Former smoker		3 (15.8%)
	Never smoker		7 (36.8%)
	Ever smoker (active + former)		12 (63.2%)
Renal function	**eGFR (mL/min/1.73m²)**	66.7 ± 12.8	
	CKD Stage G2 (60–89)		15 (78.9%)
	CKD Stage G3a (45–59)		3 (15.8%)
	CKD Stage G3b (30–44)		1 (5.3%)

Dissection Characteristics and Treatment Selection

The most common clinical presentation was acute limb ischemia (42.1%), followed by intermittent claudication (31.6%), pain at rest (15.8%), and incidental finding (10.5%). Dissections predominantly affected the iliac arteries: CIA/EIA in 42.1% and CIA/EIA with CFA extension in 31.6%. In terms of etiology, 78.9% were iatrogenic and 21.1% were traumatic; spontaneous dissection was not observed. The most common dissection grade was D (47.4%), followed by B (21.1%), E (15.8%), and F (15.8%). Representative preoperative angiographic images showing the morphology and size of peripheral artery dissections observed in our study group are presented in Figure 1. Among treatment methods, endovascular intervention followed by hybrid procedures (31.6%) was the most common (57.9%), while open surgery and conservative management were each seen in 5.3% of cases. The distribution of treatment strategies according to etiological subgroups is shown in Supplementary Figure S1, while a complete breakdown of clinical features, anatomy, grading, and treatment is given in Supplementary Table S1.

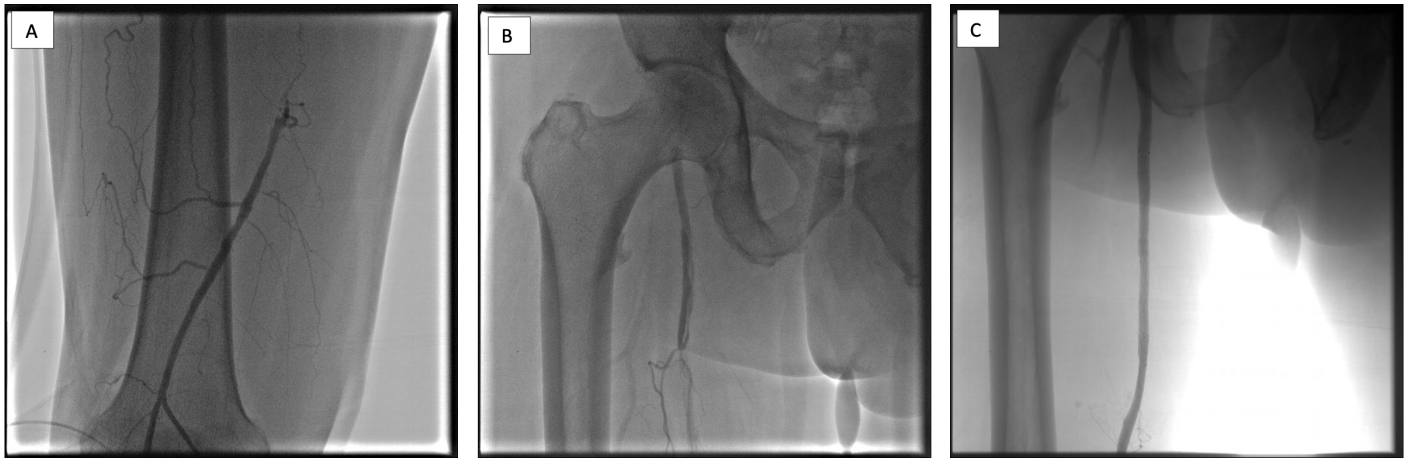

Figure 1. Representative angiographic images of peripheral arterial dissection; (A) Preoperative digital subtraction angiography demonstrating a spiral dissection of the external iliac artery with luminal compromise; (B) Angiographic view showing extension of the dissection flap toward the femoral segment with preserved distal runoff; (C) Postoperative angiography after endovascular stent implantation demonstrating restoration of the true lumen and satisfactory distal perfusion

Hemodynamic Outcomes: Ankle-Brachial Index

One of the key findings of this study is the significant postoperative hemodynamic improvement, as measured by ABI. The mean preoperative ABI was 0.54 ± 0.21 (median 0.49; range 0.15–0.90), confirming a significant baseline hemodynamic deterioration across the cohort. The postoperative ABI increased to a mean of 0.75 ± 0.21 (median 0.72; range 0.38–1.08), with a mean absolute improvement of 0.21 ± 0.08. This change was statistically highly significant (p = 0.0002, Wilcoxon signed-rank test).

Figure 2 shows the trajectories of ABI at the individual patient level, color-coded according to treatment method, from pre- and post-operative assessment. This upward trend was consistent across treatment groups, and the majority of patients showed significant hemodynamic improvement. Notably, several patients in the hybrid group achieved normalization of ABI (≥0.9), while endovascular patients with more severely impaired baseline values showed consistent but more modest absolute improvement.

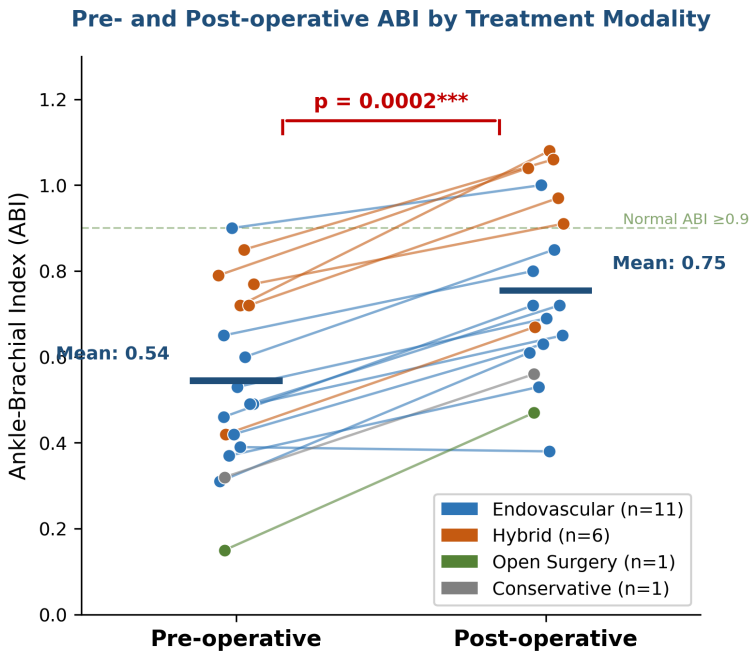

Figure 2. Pre- and post-operative ABI by treatment method. Individual patient ABI trajectories from preoperative to postoperative assessment are shown color-coded according to treatment method (blue = endovascular, n = 11; orange = hybrid, n = 6; green = open surgery, n = 1; gray = conservative, n = 1). Horizontal bars show group means. The dashed green line represents the normal ABI threshold (≥0.9). Overall improvement was statistically significant (p = 0.0002, Wilcoxon signed-rank test)

Clinical Outcomes

Technical success was achieved in 17 out of 18 interventional procedures (94.4%); patients managed conservatively were excluded from this endpoint. With a mean follow-up period of 10.8 ± 5.0 months (median 11.0; range 0–17.6 months), the primary patency rate was 89.5% (17/19) and the limb salvage rate was 94.7% (18/19). At the last follow-up, primary patency was assessed by duplex ultrasonography in 16 patients (84.2%), and by computed tomography angiography in 3 patients (15.8%) with suspicious duplex findings or suspected restenosis. Five patients (26.3%) experienced 30-day complications: two major (10.5%) and three minor (15.8%). Three patients (15.8%) developed an access-site hematoma and two patients (10.5%) developed a pseudoaneurysm. One patient (5.3%) required target lesion revascularization after 5 months. One patient with a grade F dissection died in the hospital (5.3%). A summary of all clinical outcomes is shown in Table 3, and a graphical overview of the baseline results is shown in Figure 3.

Table 3. Primary and secondary endpoints (N=19)

Outcome		Value	n/N (%)
Technical success (n=18)[a]			17/18 (94.4%)
Primary patency			17/19 (89.5%)
Limb salvage			18/19 (94.7%)
30-day complications	**Any complications**		5/19 (26.3%)
	Major complications		2/19 (10.5%)
	Minor complications		3/19 (15.8%)
Access-site complications	**Hematoma**		3/19 (15.8%)
	Pseudoaneurysm		2/19 (10.5%)
In-hospital mortality rate			1/19 (5.3%)
TLR, n (%)			1/19 (5.3%)
Time to TLR		5 months	
Follow-up time (months), mean ± SD		10.8 ± 5.0	
Median (range)		11.0 (0–17.6)	
ABI, Mean ± SD	**Pre-operative**	0.54 ± 0.21	
	Post-operative	0.75 ± 0.21	
	ABI improvement (Δ)	0.21 ± 0.08	p=0.0002 (Wilcoxon signed-rank test)

[a] Patients receiving conservative treatment are excluded (no technical procedure was performed). Statistically significant at $p < 0.05$.

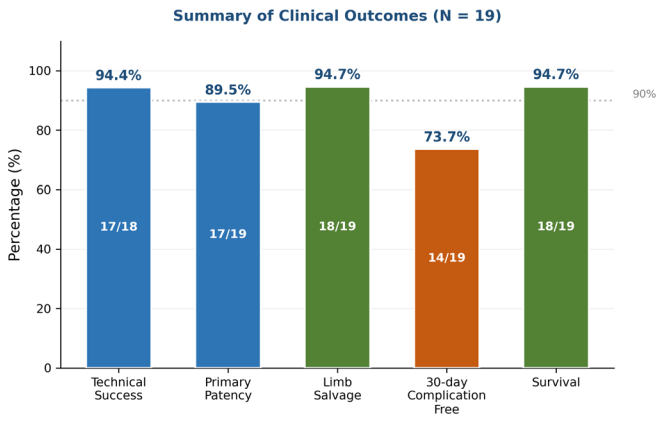

Figure 3. Summary of key clinical outcomes (N = 19). Bar graph summarizing key clinical outcomes. Technical success was calculated among the 18 interventional procedures (excluding conservative treatment). Numerators and denominators are shown within each bar

Subgroup Analysis: Endovascular and Hybrid

To investigate whether the treatment method affected hemodynamic improvement, we compared two dominant strategies: endovascular (n = 11) and hybrid (n = 6). No significant differences were found in technical success, primary patency, complication rates, or comorbidity profiles (all $p > 0.05$; full comparison in Supplementary Table S2). However, a notable finding emerged regarding baseline hemodynamic severity: preoperative ABI was significantly lower in the endovascular group (0.51 ± 0.16 vs. 0.71 ± 0.15; $p = 0.044$), and postoperative ABI also remained lower (0.69 ± 0.16 vs. 0.95 ± 0.15; $p = 0.014$). Critically, the magnitude of ABI improvement (ΔABI) was not significantly different between groups (0.18 ± 0.09 vs. 0.24 ± 0.07; $p = 0.208$), demonstrating comparable hemodynamic benefit despite differing baseline severity. These relationships are visualized in Figure 4, which presents box and strip plots comparing preoperative ABI, postoperative ABI,

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and ΔABI between the two groups. The significantly lower baseline ABI in the endovascular group suggests a selection bias related to prioritizing endovascular repair in more hemodynamically compromised patients, likely because they present with more acute limb-threatening ischemia and require rapid revascularization.

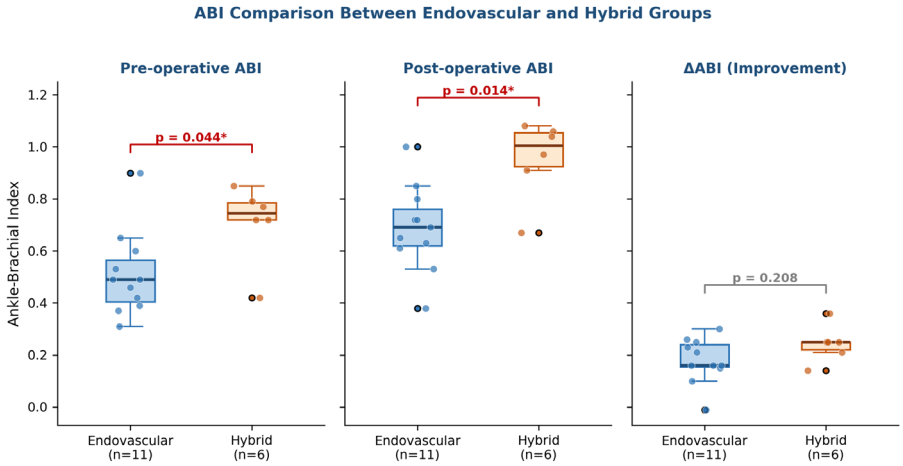

Figure 4. Comparison of ABI between endovascular and hybrid groups. Box and strip plots showing preoperative ABI (left), postoperative ABI (middle), and ΔABI improvement (right) in the endovascular (blue, n = 11) and hybrid (orange, n = 6) groups. Individual patient values are overlaid. Preoperative and postoperative ABI values differed significantly between groups (p = 0.044 and p = 0.014, respectively; Mann-Whitney U test), while the amount of improvement was comparable (p = 0.208)

Dissection Grade and Outcomes

To investigate the prognostic significance of dissection severity, outcomes were classified according to angiographic grade. As shown in Figure 5, 100% primary patency was achieved in dissections classified as grades B and D, while 67% patency was observed in grades E and F. Spearman rank correlation analysis revealed a trend toward greater ABI improvement with increasing dissection grade severity (ρ = 0.428, p = 0.068), but this did not reach the threshold of statistical significance. The lowest mean postoperative ABI (0.52) was observed in grade F dissections; this reflects severe baseline hemodynamic deterioration with limited potential for improvement despite successful intervention. These findings are hypothesis-generating and suggest that dissection grade may be associated with outcomes, although this finding requires validation in larger cohorts.

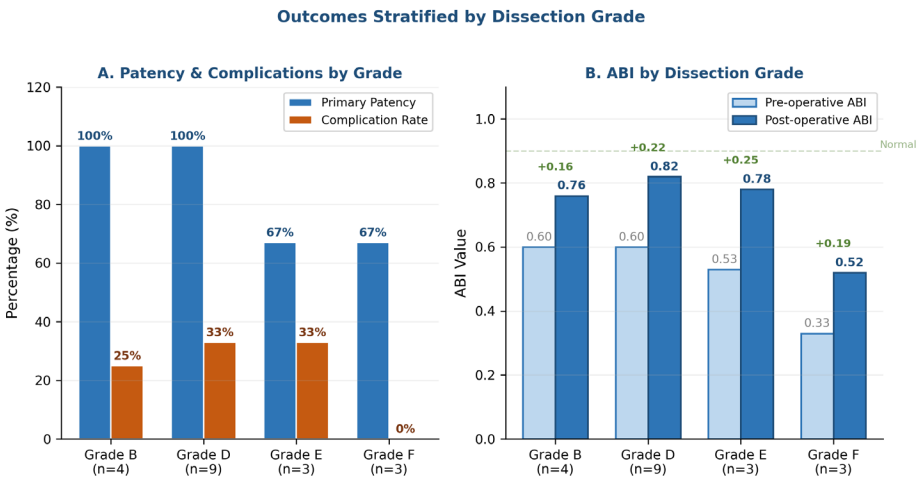

Figure 5. Results classified by dissection grade. Panel A: Primary patency and complication rates according to dissection grade. Panel B: Preoperative (light blue) and postoperative (dark blue) ABI values according to grade; ΔABI improvement is shown in green. Grades B and D provided 100% patency, while grades E and F provided 67% patency. The dashed line indicates the normal ABI threshold (≥ 0.9). Spearman correlation between grade severity and ABI improvement: ρ = 0.428, p = 0.068

DISCUSSION

This study adds single-center data evaluating the management of peripheral artery dissection in multiple treatment approaches with objective hemodynamic assessment. Three key findings emerged: (1) a highly significant improvement in post-intervention ABI ($p = 0.0002$); (2) similar hemodynamic improvement trends were observed between endovascular and hybrid approaches despite different baseline severity; and (3) a potential association between the degree of dissection and primary patency requiring further investigation. Representative angiographic images demonstrated successful restoration of true lumen patency after endovascular intervention, supporting the high technical success rate observed in this cohort.

The predominance of an iatrogenic etiology in our cohort (78.9%) is consistent with the published literature and reflects the increasing frequency of catheter-related vascular injuries. As endovascular interventions requiring extensive femoral access continue to expand, the frequency of iatrogenic iliac and femoral dissections is expected to increase, as reported in minimally invasive cardiac and vascular procedures [19,20]. Damara et al. reported a significant increase in the Vascular Quality Initiative (VQI) database incidence of arterial dissection from 2.4% to 3.6% over five years, with endovascular treatment used in most cases [8]. Our approach also reflects this trend; endovascular techniques were used in 57.9% of cases, while hybrid strategies were used in 31.6% of dissections extending to the common femoral artery region.

The statistically significant improvement in ABI (from 0.54 to 0.75; $p = 0.0002$) is a key clinical finding of this study. While the ABI is routinely used to assess the severity and treatment response of peripheral artery disease, its systematic application to peripheral dissection outcomes has been limited. The mean improvement of 0.21 represents a clinically significant gain, typically corresponding to symptomatic improvement in Fontaine stages; e.g., from resting pain to claudication or from claudication to asymptomatic status. As shown in Figure 1, this improvement was consistent across treatment approaches, with only one patient (grade E dissection of traumatic etiology) showing a decrease in ABI during follow-up.

Subgroup analysis comparing endovascular and hybrid approaches (Figure 3; Supplementary Table S2) revealed a key insight into treatment choice. The significantly lower preoperative ABI in the endovascular group ($p = 0.044$) suggests that patients with more severe hemodynamic instability were prioritized for treatment with endovascular techniques; likely because these patients presented more acutely with limb-threatening ischemia requiring rapid percutaneous intervention. In contrast, hybrid procedures were more frequently used for dissections extending to the common femoral artery, where both endarterectomy and proximal stenting could address the full extent of the disease. The lack of significant differences in ΔABI, technical success, and patency between the groups supports the concept that treatment choice appeared to be influenced by anatomical considerations.

The heterogeneity of the current cohort should be interpreted carefully. Peripheral artery dissection is not a uniform disease; it can vary significantly depending on etiology, arterial segment, degree of dissection, ischemic severity, and timing of diagnosis. In this series, most dissections were iatrogenic, while a smaller proportion were traumatic. Iatrogenic dissections are usually noticed during or shortly after catheter-based procedures and may be anatomically localized, while traumatic dissections may be associated with more extensive vessel wall damage, thrombosis, soft tissue trauma, or delayed presentation. Similarly, only iliac artery dissections were more amenable to purely endovascular repair, whereas dissections extending to the common femoral artery more frequently required a hybrid approach. Therefore, comparisons between treatment strategies should not be interpreted as evidence of the superiority of one method over another. Instead, the observed differences primarily reflect treatment selection based on anatomy and severity. The significantly lower baseline ABI values in the endovascular group support indication-related confounding; Because patients experiencing more severe hemodynamic deterioration have been shown to be more amenable to rapid endovascular revascularization, the subgroup analyses in this study should be considered descriptive and hypothesis-forming rather than conclusive. Larger multicenter cohorts stratified by etiology, arterial segment, degree of dissection, and initial ischemic severity are needed to determine whether specific treatment strategies deliver superior outcomes in defined patient subgroups. This heterogeneity introduces significant confounding factors and limits the ability to directly compare treatment methods or draw conclusions about the superiority of any approach. Although a formal treatment algorithm was not applied, treatment strategies were guided by anatomical extent, hemodynamic severity, and clinical presentation, as illustrated in Supplementary Figure S2.

Dissection grade analysis (Figure 5) provides novel and hypothetical data. The complete primary patency observed in grades B and D, compared to 67% patency in grades E and F, suggests that dissection severity may be associated with outcomes, although this finding should be interpreted cautiously. The nearly significant correlation between grade severity and ABI improvement ($\rho = 0.428$, $p = 0.068$) may indicate that greater hemodynamic impairment in severe dissections provides more room for healing, or conversely, that higher-grade dissections benefit proportionally more from the restoration of true luminal flow. However, grade F dissections

showed the lowest postoperative ABI (0.52), suggesting that even the most severe dissections may have limited healing potential despite technically successful intervention. These observations support the development of a standardized peripheral dissection grading system that incorporates both anatomical extent and hemodynamic impact.

Our technical success rate of 94.4% is comparable to the results reported for endovascular treatment of iliac artery dissections. Onal et al. reported sustained patency in a series of 30 patients with obstructive iliac dissection treated with bare stents [17], and hemodynamically significant dissection during iliac angioplasty (reported at approximately 7.1%) is now mostly managed with stent implantation with excellent immediate results [18]. Notably, our institutional experience in complex vascular reconstructions has contributed to the technical competence required for the management of these challenging dissection cases.

The 30-day complication rate of 26.3% (10.5% major) deserves careful interpretation: access site complications (hematoma 15.8%, pseudoaneurysm 10.5%) constitute the majority, which is consistent with the use of extensive access in patients with already compromised iliac arteries. Pseudoaneurysm formation is a well-known complication of peripheral arterial interventions and can occur even in non-dissection vascular procedures [21]. Recent studies have shown that most access-related vascular injuries can be effectively managed using endovascular techniques, including covered stent implantation when required [22-24]. The TLR rate of 5.3% at 5 months is a positive result compared to the reported re-intervention rates for iliac stenting in atherosclerotic disease. This low TLR rate can be partly attributed to advances in contemporary stent technology, which aim to reduce neointimal hyperplasia and improve long-term patency after peripheral arterial interventions. Recent studies evaluating coated and drug-eluting stent technologies have shown encouraging medium and long-term results in iliofemoral arterial disease [21,25]. Emerging technologies, including biodegradable stents and multilayer flow modulator stents, have the potential to further improve long-term outcomes in arterial disease and their potential applications in dissection management warrant future investigation.

These findings should be interpreted as hypothesis-generating and warrant validation in larger multicenter studies.

Limitations

The heterogeneity of arterial segments, etiologies, and treatment strategies reflects real-world clinical practice but limits the ability to make direct comparisons between treatment methods. Several limitations need to be considered. First, the small sample size (n = 19) limits statistical power, particularly for subgroup analyses, and hinders multivariate adjustment for confounding factors. Second, being a single-center study, the results may reflect institutional practice patterns that cannot be generalized. Third, the mean follow-up period of 10.8 months is relatively short; longer-term data are needed to assess stent durability and late complications. Fourth, the lack of a standardized peripheral dissection classification system necessitated the use of an institutional grading framework. Fifth, treatment selection was not random and was based on clinical judgment; this leads to potential selection bias, as evidenced by significantly different baseline ABI values among treatment groups. Sixth, the heterogeneity of dissection etiologies, locations, and treatment approaches within a small cohort limits the ability to draw definitive conclusions about the superiority of any strategy. Future multicenter registries and ideally randomized trials are necessary to validate these findings and establish evidence-based treatment algorithms.

CONCLUSION

In this retrospective single-center series of 19 patients with peripheral artery dissection, endovascular and hybrid strategies demonstrated high technical success (94.4%), favorable mid-term primary patency (89.5%), and excellent limb salvage (94.7%). The ankle-brachial index significantly improved after intervention ($p = 0.0002$) and served as a useful hemodynamic indicator in this pathology. Preoperative hemodynamic severity influenced treatment choice, with higher-risk patients undergoing endovascular repair, but both approaches provided comparable functional recovery. Dissection grade may represent a potential indicator of outcomes, with higher grades associated with lower primary patency. An individualized, anatomy-based treatment strategy is recommended, and larger multicenter studies are needed to validate dissection grading as a prognostic tool and establish standardized treatment algorithms for peripheral artery dissections.

Ethics Committee Approval: This study was approved by the Hatay Mustafa Kemal University Non-Interventional Clinical Research Ethics Committee (Decision No. 03, dated 07/06/2023).

Patient Consent for Publication: All participants provided written informed consent.

Data Sharing Statement: The data that support the findings of this study are available from the corresponding author upon reasonable request.

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