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Original Article

Efficacy of the retrograde popliteal artery approach and results of rotational atherothrombectomy in total SFA occlusion

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Abstract

Aim: We aimed to evaluate the complication status, early and mid-term success rates (after 1 year), and efficacy of rotational atherothrombectomy treatment with retrograde popliteal artery (RPA) approach in patients with total superficial femoral artery (SFA) occlusion.
Material and Methods: Between 2014 and 2023, 75 patients admitted to our clinic for peripheral arterial disease (PAD) and treated with rotational atherothrombectomy using the RPA approach were retrospectively analysed. Preoperative demographic data, laboratory results, Trans-Atlantic Inter-Social Consensus (TASC) II classification and pre/post operative ankel-brachial index (ABI) values were evaluated. Patients were followed up for 1 year after treatment.
Results: The mean age of 75 patients was 62.32±10.90 years and 85.3% were male. The success rate of endovascular intervention was 98.67% (74 patients). According to the preoperative TASC-II classification, 80% (60 patients) were in TASC-II C, and 20% (15 patients) were in TASC-II D. Primary patency was 86.67% (65 patients) in the first month, 69.33% (52 patients) in 1-6 months and 57.33% (43 patients) in 6-12 months. Postoperative ABI values increased significantly in all patients ($p<0.001$). Postoperative Rutherford and Fontaine classifications were also significantly improved ($p<0.001$).
Conclusion: The RPA approach is an effective and safe method for the treatment of complex femoropopliteal diseases. Post-treatment patency rates were 57.33% at year 1 and significant improvements were observed in postoperative claudication distance and ABI values. The retrograde popliteal artery approach can be used as a successful alternative, especially when femoral access is not possible, and this study emphasises RPA as an important part of endovascular surgery.

Keywords: Peripheral arterial disease, superficial femoral artery, occlusion, retrograde popliteal artery, rotational atherothrombectomy, chronic total occlusion

INTRODUCTION

Peripheral arterial disease (PAD) is a global health issue, particularly prevalent among older populations, leading to reduced blood flow in the lower limbs and potentially severe outcomes like ischemia and amputation [1]. Endovascular treatments are now frequently employed, especially for infrainguinal cases [2].

Among affected vessels, the superficial femoral artery (SFA) often presents complex lesions or chronic occlusions, complicating management. Typically, SFA occlusions are addressed through antegrade or retrograde approaches with intraluminal or subintimal recanalization. If these fail, retrograde popliteal access (RPA) is considered as a valid alternative [3,4]. Initially considered a back-up option, RPA has become technically the first choice [5]. Studies by Trigaux et al. increased the applicability of this approach by defining the relationship between the popliteal artery and vein and safe access techniques [6].

The rotational atherothrombectomy devices are also effective and conjunctive methods that can be used in combination with RPA [7]. Designed to rapidly and effectively remove occluding thrombus and atherosclerosis material, the device uses a rotating system to create

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a continuous vacuum, allowing the atherom plaque/thrombus to be absorbed. Its use has been associated with shorter hospital stays and lower major bleeding rates, achieving a revascularization success rate exceeding 98% [8].

In this study, we aimed to evaluate the complication status, early and mid-term (1 year post-procedure) success rates of rotational atherothrombectomy with RPA and the efficacy of the RPA approach in patients with total SFA occlusion.

MATERIAL AND METHODS

Patients admitted to our clinic between 2014 and 2023 with a pre-diagnosis of PAD who underwent rotational atherothrombectomy with RPA after total occlusion of the SFA were retrospectively included in the study. Patients who were pregnant or breastfeeding, younger than 18 years of age, those who had a history of allergy to the drugs used, those who required urgent surgery and underwent surgery with grafting were excluded from the study. Informed consent was obtained from all patients before the study regarding the procedure. The study was carried out in accordance with the principles of the Declaration of Helsinki, and approval from the local ethics committee was obtained prior to its commencement (Date: 04.10.2024; No: 2024/5219).

Patient data were obtained from the hospital system, and preoperative demographics, laboratory values, and TransAtlantic Inter-Society Consensus (TASC) II [9] were recorded. Clinical status was recorded according to intermittent claudication distances, Rutherford and Fontaine classifications [9] and pre- and post-procedure ankle brachial index (ABI) values. For vascular access, the limb accessed, limb treated, stent length if a stent was used, atherothrombectomy application time and aspirated blood volume values were recorded. If the lesion was contralateral to the limb accessed or was unable to cross the lesion, the procedure was performed using the cross-over technique.

Procedural complications were defined as readmission or prolonged hospital stay due to complications such as ischemia, pain, bleeding or haematoma in the treated limb within one month after atherectomy.

During the one-year clinical follow-up of the patients, peripheral pulse was assessed by lower extremity colour Doppler ultrasound (CDUSG), magnetic resonance angiography or computed tomography angiography at the first, sixth and twelfth months after the procedure, and lesion patency rates and vessel flow were analysed.

Surgical Procedure

After skin cleansing in the prone position, the popliteal fossa was visualised under CDUSG guidance and local anaesthesia with 2% prilocaine was applied. The popliteal artery was punctured with an 18G needle and 8F sheath was placed (Figure 1). If necessary, both popliteal arteries were punctured. Heparin (5000 IU), and contrast (Omnipaque 300mg/100ml) was used to visualize the vessel and identify the occluded segment. The lesion was crossed with a hydrophilic guidewire (0.035-0.014) and a support catheter (TrailBlazer®). Rotarex® S (Straub Medical, Wangs, Switzerland) was used until the distal end of the occlusion was reached. After the control angiogram, a medicated balloon (In.Pact Admiral, Lutonix) was applied to the lesion and a control angiogram was performed after waiting for 3 minutes. If a dissection or residual stenosis was observed, a stent was placed with appropriate dimensions to cover the lesion. After the procedure, vessel flow was assessed by control angiography (Figures 2, 3 and 4). Technical success was defined as<30% stenosis in the target vessel (Figure 5). The puncture site was closed with Angioseal (St. Jude Medical Inc., Minnesota, USA) in selected patients or by manual compression.

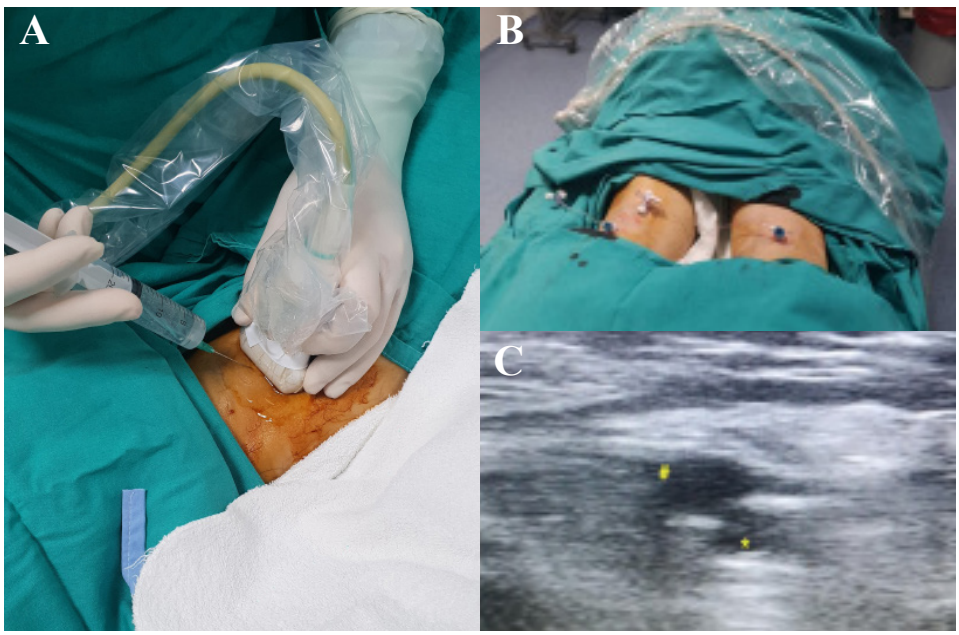

Figure 1. Popliteal intervention; **A.** guided by CDUSG, **B.** Bilateral popliteal intervention, **C.** CDUSG image #=popliteal vein and *=popliteal artery

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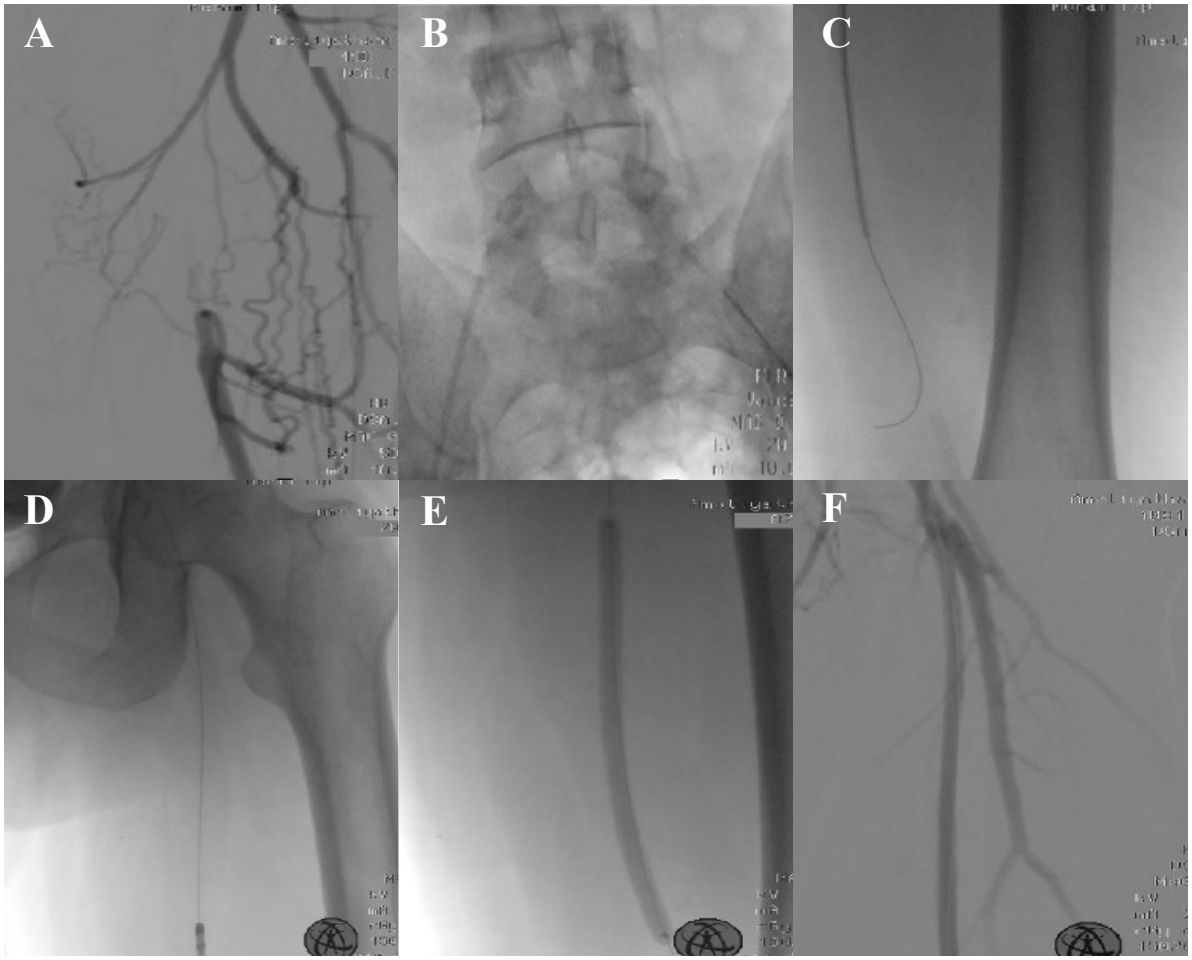

Figure 2. Endovascular procedure with retrograde popliteal Access; **A**. SFA total occlusion, **B.** and **C.** cross-over technique, **D.** rotational atherothrombectomy, **E.** balloon application, **F.** control angiogram after successful procedure

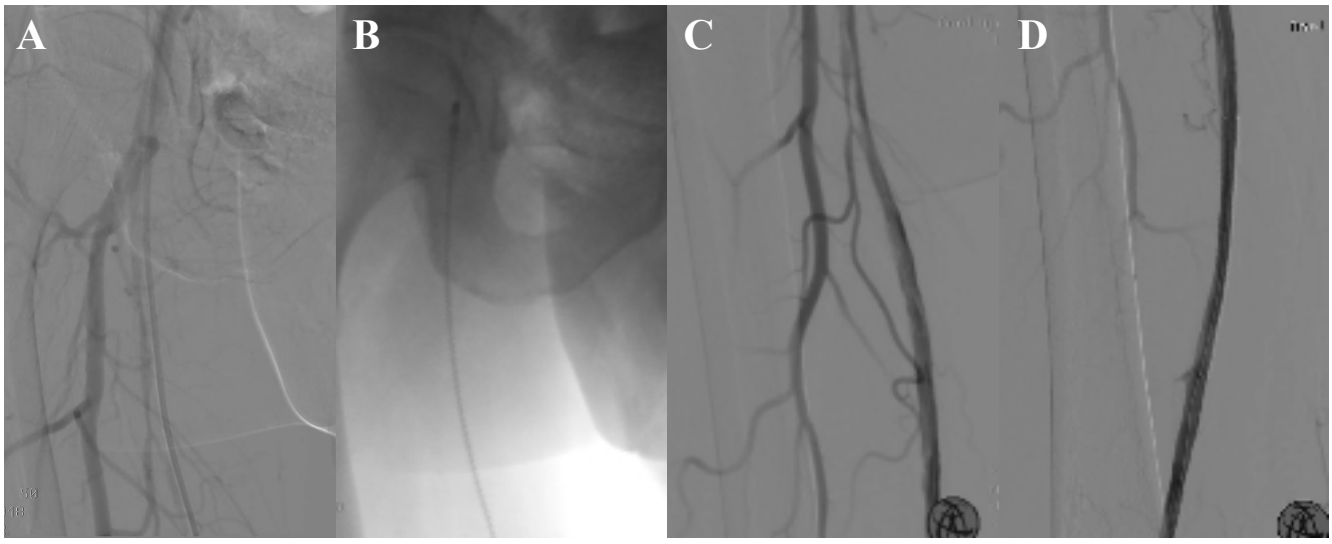

Figure 3. Dissection and successful stenting after rotational atherothrombectomy in SFA total occlusion, **A.** SFA total occlusion, **B.** rotational atherothrombectomy, **C.** dissection, **D.** successful stenting

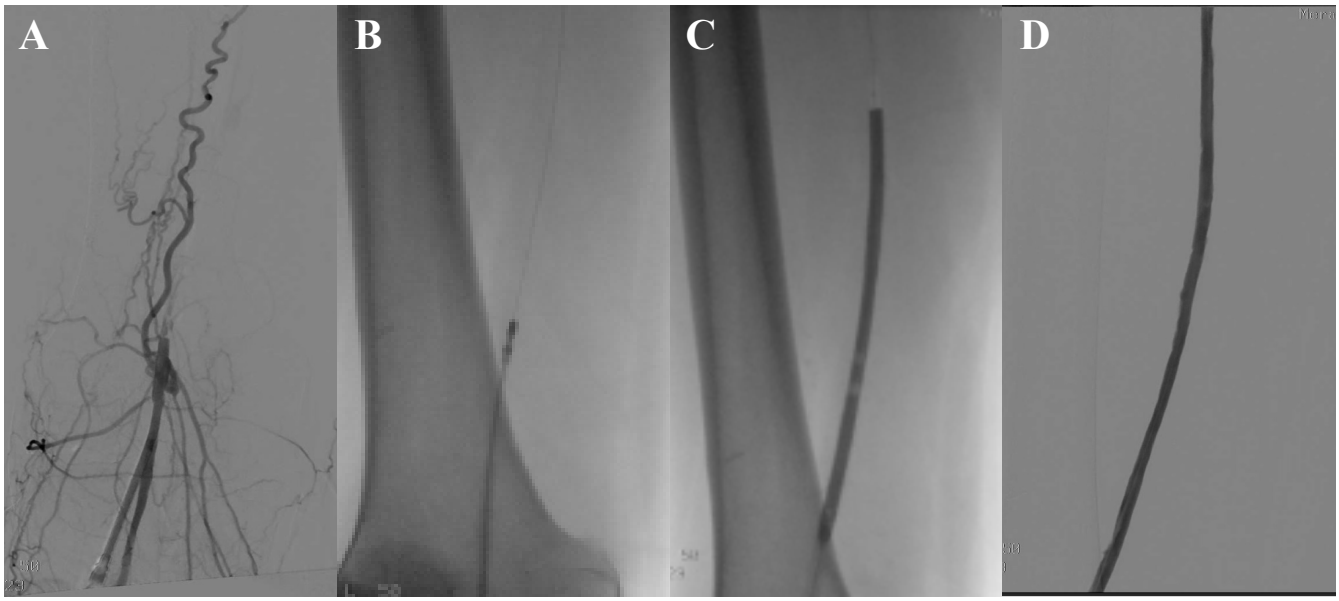

Figure 4. Successful balloon procedure after rotational atherothrombectomy in SFA total occlusion; **A.** SFA total occlusion, **B.** rotational atherothrombectomy, **C.** balloon, **D.** successful procedure

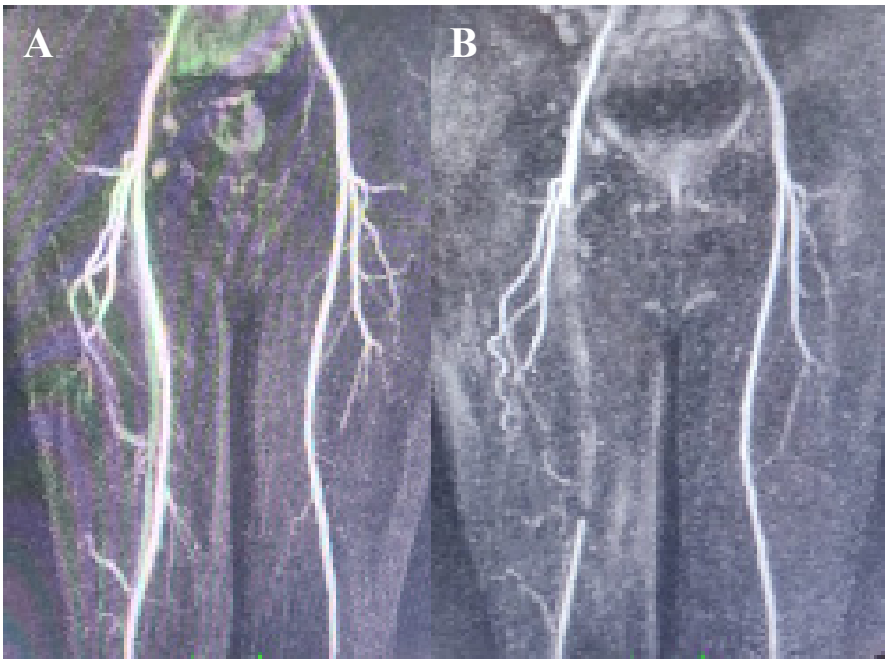

Figure 5. Pre-procedural SFA total occlusion and post-procedural SFA magnetic resonance angiography image; **A.** pre-procedural, **B.** post-procedural SFA

Medical Treatment Procedure

All patients received 100 mg of acetylsalicylic acid preoperatively. Intraoperatively, 5000 IU of heparin was administered. After the procedure, all patients received heparin infusion therapy for 24 hours (25000 IU/24 hours). All patients received long-term acetylsalicylic acid treatment (100 mg/day) and in case of stent implantation, a loading dose of 300 mg of clopidogrel was followed by 75 mg of clopidogrel for 6 months.

Statistical Analysis

Data were analysed using SPSS (Statistical Package for Social Sciences) version 25.0. Descriptive statistics were presented as frequency (n), percentage (%) and mean±standard deviation. The distribution of categorical variables was assessed using

Pearson's chi-squared test and Fisher's exact chi-squared test, while the distribution of categorical data in two dependent groups was assessed using the marginal homogeneity test. Normality of numerical data was tested using the Kolmogorov-Smirnov and Shapiro-Wilk tests. Non-normally distributed data were analysed using the Mann-Whitney U test and the Wilcoxon signed-rank test. Changes in repeated measures over time were assessed by repeated measures ANOVA. A p-value less than 0.05 was considered statistically significant.

RESULTS

A total of 75 patients underwent vascular interventional procedures. Mean age of these patients was 62.32±10.90 years and 85.3% (n=64) were male. The distribution of demographics, comorbidities and reasons for presentation according to primary patency status is given in Table 1.

Endovascular intervention was successful in 74 (98.67%) patients and surgical intervention was performed in the same session in one patient (TASC-II C) due to early failure. According to the preoperative TASC-II classification, 60 (80%) patients were class C and 15 (20%) patients were class D. Stenting was performed in 47 (62.67%) of the patients and included in the study after the endovascular procedure. When the primary patency status was evaluated on a monthly basis, 65 (86.67%), 52 (69.33%) and 43 (57.33%) patients had primary patency at 0-1, 1-6 and 6-12 months, respectively. Of all patients, 92% (n=69) presented with claudication.

The distribution of haematological, biochemical and clinical parameters according to vessel patency in all patients and at follow-up is presented in Table 2.

Postoperative claudication distance was found to be statistically significantly higher in patients with vascular patency in the 1st-6th month compared to those without vascular patency (p=0.041). It was determined that postoperative claudication distance increased in all patient groups compared to the preoperative period (p<0.001). It was also determined that postoperative right and left ABI results increased in all patient groups compared to the preoperative period (p<0.001) (Table 3).

It was determined that postoperative Rutherford classification changed significantly in the whole patient group compared to the classification evaluated in the preoperative period (p<0,001). In all patient groups, postoperative Fontaine classification changed significantly compared to the classification evaluated in the preoperative period (p<0.001) (Table 4).

The distribution of vascular procedure and postoperative characteristics according to vascular patency in all patients and during follow-up is given in Table 5. The length of hospitalisation was significantly lower in patients with vascular patency at 0-1 month compared to those without vascular patency (p=0.001).

During the follow-up of the patients, 2 (2.67%) deaths were observed during hospitalisation; both had critical leg ischaemia (CLI) at admission. The cause of death was myocardial infarction in one and septic shock in the other. During the follow-up, another patient had an exitus 4 months after the procedure due to brain tumour. After the procedure, only one patient (1.33%) developed arteriovenous fistula, 2 patients (2.67%) underwent below-knee amputation, 5 patients (6.67%) developed restenosis during the 1-month follow-up period; 3 were treated with endovascular therapy and 2 with femoropopliteal bypass.

Table 1. Distribution of demographic and comorbidity data

Variables	All Patients (n=75)	1st month vascular patency			1-6 months vascular patency			6-12 months vascular patency		
		Yes (n=65)	None (n=10)	p	Yes (n=52)	None (n=23)	p	Yes (n=43)	None (n=32)	p
Age (years)	62.32±10.90	61.75±11.04	66.00±9.62	0.170*	61.77±11.62	63.57±9.18	0.569*	61.98±11.57	62.78±10.10	0.830*
Sex (male)	64 (85.3)	55 (84.6)	9 (90.0)	1.000**	42 (80.8)	22 (95.7)	0.156**	34 (79.1)	30 (93.8)	0.103**
Hypertension	35 (46.7)	30 (46.2)	5 (50.0)	1.000**	27 (51.9)	8 (34.8)	0.170***	25 (58.1)	10 (31.3)	**0.021***
Diabetes mellitus	34 (45.3)	29 (44.6)	5 (50.0)	1.000**	24 (46.2)	10 (43.5)	0.830***	19 (44.2)	15 (46.9)	0.817***
COPD	20 (26.7)	16 (24.6)	4 (40.0)	0.442**	13 (25.0)	7 (30.4)	0.624***	12 (27.9)	8 (25.0)	0.778***
CAD	16 (21.3)	13 (20.0)	3 (30.0)	0.436**	11 (21.2)	5 (21.7)	1.000**	9 (20.9)	7 (21.9)	0.921***
HLD	38 (50.7)	33 (50.8)	5 (50.0)	1.000**	27 (51.9)	11 (47.8)	0.743***	19 (44.2)	19 (59.4)	0.193***
HD	3 (4.0)	1 (1.5)	2 (20.0)	**0.045****	0	3 (13.0)	**0.026****	1 (2.3)	2 (6.3)	0.572**
Smoking	42 (56.0)	35 (53.8)	7 (70.0)	0.497**	28 (53.8)	14 (60.9)	0.572***	23 (53.5)	19 (59.4)	0.611***

Mean±Standard Deviation, n (%), *: Mann-Whiyney U Test, **: Fisher's exact chi-square test, ***: Chi-square Test; CAD: coronary artery disease, COPD: chronic obstructive pulmonary disease, HD: hemodialysis, HLD: hyperlipidemia

Table 2. Distribution of haematological and biochemical parameters

Variables	All patients (n=75)	1st month vascular patency			1-6 months vascular patency			6-12 months vascular patency		
		Yes (n=65)	None (n=10)	p	Yes (n=52)	None (n=23)	p	Yes (n=43)	None (n=32)	p
Preop haemoglobin (g/dl)	14.31±2.26	14.50±2.13	13.08±2.82	0.079*	14.49±1.88	13.89±2.96	0.373*	14.57±1.76	13.95±2.79	0.281*
Preop hematocrit (%)	42.18±7.81	42.72±7.67	38.67±8.21	0.080*	43.43±5.86	39.35±10.66	0.114*	43.63±5.73	40.23±9.71	0.167*
Preop WBC (10^3/µL)	9.65±3.39	9.42±3.34	11.10±3.51	0.095*	9.29±2.61	10.46±4.67	0.469*	9.34±2.52	10.05±4.30	0.868*
Preop platelet (10^3/µL)	275.16±89.83	277.89±91.72	257.40±78.26	0.370*	285.52±95.20	251.74±72.83	0.121*	289.93±97.11	255.31±76.01	0.076*
Preop MPV (fL)	9.64±1.59	9.79±1.51	8.67±1.86	**0.047***	9.66±1.57	9.58±1.68	0.713*	9.58±1.60	9.71±1.61	0.654*
HbA1c (mmol/mol)	7.77±2.09	7.78±2.07	7.68±2.31	0.691*	7.80±2.21	7.69±1.81	0.959*	7.81±2.28	7.71±1.83	0.868*
Preop LDL (mg/dl)	110.87±41.60	112.61±42.12	99.60±38.11	0.459*	113.67±44.42	104.54±34.47	0.688*	110.83±47.16	110.93±33.45	0.374*
Preop urea (mg/dl)[A]	44.88±29.61	40.55±17.94	73.01±62.50	0.210*	39.72±17.74	56.52±44.89	0.210*	39.33±16.82	52.32±40.12	0.332*
Postop urea (mg/dl)[B]	45.06±20.63	43.44±17.29	55.56±35.08	0.436*	42.33±15.78	51.23±28.23	0.332*	41.70±12.99	49.56±27.40	0.460*
	p^{A-B}: 0.067**	p^{A-B}: **0.004****			p^{A-B}: **0.026****			p^{A-B}: 0.054***		
Preop creatinine (mg/dl)[C]	1.23±1.16	1.07±0.49	2.26±2.82	0.755*	0.98±0.31	1.79±1.95	0.079*	1.01±0.34	1.52±1.70	0.337*
Postop creatinine (mg/dl)[D]	1.20±0.75	1.10±0.50	1.83±1.52	0.407*	1.02±0.30	1.60±1.20	0.176*	1.03±0.31	1.42±1.06	0.405*
	P^{C-D}: 0.107**	P^{C-D}: **0.002****			P^{C-D}: **0.003****			P^{C-D}: **0.038****		

Mean±Standard Deviation, n (%), *: Mann-Whiyney U Test, **: Wilcoxan Signed Rank Test, ***: ANOVA Test for repeated measures; LDL: low-density lipoprotein, MPV: mean platelet volume, WBC: white blood count

Table 3. Distribution of clinical and ABI parameters

Variables	All patients (n=75)	1st month vascular patency			1-6 months vascular patency			6-12 months vascular patency		
		Yes (n=65)	None (n=10)	p	Yes (n=52)	None (n=23)	p	Yes (n=43)	None (n=32)	p
Preop claudication distance (mt)[A]	164.13±119.27	173.54±121.86	103.00±81.11	0.071*	181.35±130.64	125.22±77.51	0.102*	179.77±135.48	143.13±91.10	0.351*
Postop claudication distance (mt)[B]	389.17±223.15	405.56±221.99	274.44±207.61	0.219*	427.88±231.87	288.50±164.32	**0.041***	437.21±243.99	317.93±167.85	0.086*
	P^{A-B}: **<0.001****	P^{A-B}: 0.088***			P^{A-B}: **0.025****			P^{A-B}: 0.052***		
Preop ABI right[C]	0.71±0.12	0.72±0.12	0.70±0.14	0.804*	0.73±0.11	0.68±0.14	0.212*	0.73±0.12	0.70±0.13	0.460*
Postop ABI right[D]	0.79±0.10	0.80±0.10	0.76±0.14	0.304*	0.82±0.13	0.74±0.13	**0.003***	0.81±0.09	0.77±0.12	0.061*
	P^{C-D}: **<0.001****	P^{C-D}: 0.396***			P^{C-D}: **0.026****			P^{C-D}: 0.170***		
Preop ABI left[E]	0.74±0.14	0.75±0.14	0.67±0.18	0.054*	0.76±0.14	0.68±0.14	**0.010***	0.75±0.15	0.72±0.14	0.308*
Postop ABI left[F]	0.80±0.14	0.82±0.12	0.69±0.19	**0.012***	0.84±0.13	0.73±0.15	**0.003***	0.82±0.13	0.78±0.16	0.429*
	P^{E-F}: **<0.001****	P^{E-F}: **0.024****			P^{E-F}: **0.006****			P^{E-F}: 0.328***		

Mean±Standard Deviation, n (%), *: Mann-Whiyney U Test, **: Wilcoxan Signed Rank Test, ***:ANOVA Test for repeated measures, ABI: Ankle Brachial Index

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Table 4. Variables according to Rutherford and Fontaine classification

Variables	All patients (n=75)	1st month vascular patency		1-6 months vascular patency		6-12 months vascular patency	
		Yes (n=65)	None (n=10)	Yes (n=52)	None (n=23)	Yes (n=43)	None (n=32)
Preop Rutherford[A]							
2	4 (5.3)	3 (4.6)	1 (10.0)	2 (3.8)	2 (8.7)	1 (2.3)	3 (9.4)
3	48 (64.0)	46 (70.8)	2 (20.0)	40 (76.9)	8 (34.8)	34 (79.1)	14 (43.8)
4	18 (24.0)	14 (21.5)	4 (40.0)	8 (15.4)	10 (43.5)	6 (14.0)	12 (37.5)
5	4 (5.3)	2 (3.1)	2 (20.0)	2 (3.8)	2 (8.7)	2 (4.7)	2 (6.3)
6	1 (1.3)	0	1 (10.0)	0	1 (4.3)	0	1 (3.1)
Postop Rutherford[B]							
1	19 (25.3)	16 (24.6)	16 (24.6)	14 (26.9)	5 (21.7)	12 (27.9)	7 (21.9)
2	49 (65.3)	48 (73.8)	48 (73.8)	38 (73.1)	11 (47.8)	31 (72.1)	18 (56.3)
3	3 (4.0)	1 (1.5)	1 (1.5)	0	3 (13.0)	0	3 (9.4)
4	2 (2.7)	0	0	0	2 (8.7)	0	2 (6.3)
5	1 (1.3)	0	0	0	1 (4.3)	0	1 (3.1)
6	1 (1.3)	0	0	0	1 (4.3)	0	1 (3.1)
P^{A-B}: **<0.001***							
Preop Fontaine[C]							
2B	40 (53.3)	37 (56.9)	3 (30.0)	32 (61.5)	8 (34.8)	25 (58.1)	15 (46.9)
3	31 (41.3)	26 (40.0)	5 (50.0)	18 (34.6)	13 (56.5)	16 (37.2)	15 (46.9)
4	4 (5.3)	2 (3.1)	2 (20.0)	2 (3.8)	2 (8.7)	2 (4.7)	2 (16.3)
Postop Fontaine[D]							
1	3 (4.0)	3 (4.6)	0	3 (5.8)	0	3 (7.0)	0
2A	55 (73.3)	51 (78.5)	4 (40.0)	42 (80.8)	13 (56.5)	33 (76.7)	22 (68.8)
2B	9 (12.0)	8 (12.3)	1 (10.0)	6 (11.5)	3 (13.0)	6 (14.0)	3 (9.4)
3	5 (6.7)	3 (4.6)	2 (20.0)	1 (1.9)	4 (17.4)	1 (2.3)	4 (12.5)
4	3 (4.0)	0	3 (30.0)	0	3 (13.0)	0	3 (9.4)
P^{C-D}: **<0.001***							

Mean±Standard Deviation, n(%), *: Marginal Homogeneity Test

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Table 5. Distribution of vascular procedure and postoperative characteristics

Variables	All patients (n=75)	1st month vascular patency			1-6 months vascular patency			6-12 months vascular patency		
		Yes (n=65)	None (n=10)	p	Yes (n=52)	None (n=23)	p	Yes (n=43)	None (n=32)	p
Lesion side										
Right	31 (41.3)	27(41.5)	4 (40.0)	-	22 (42.3)	9 (39.1)	0.961*	19(44.2)	12(37.5)	0.842*
Left	35 (46.7)	30(46.2)	5 (50.0)		24 (46.2)	11 (47.8)		19(44.2)	16(50.0)	
Bilateral	9 (12.0)	8 (12.3)	1 (10.0)		6 (11.5)	3 (13.0)		5 (11.6)	4 (12.5)	
Lesion length (mm)	170.19±48.87	167.91±51.13	185.00±27.58	0.095**	171.42±51.11	167.39±44.33	0.799**	168.26±49.59	172.78±48.55	0.616**
Access side										
Right	29 (38.7)	25(38.5)	4 (40.0)		20 (38.5)	9 (39.1)		17 (39.5)	12 (37.5)	
Left	35 (46.7)	31(47.7)	4 (40.0)	-	25 (48.1)	10 (43.5)	0.886*	20 (46.5)	15 (46.9)	0.973*
Bilateral	11 (14.7)	9 (13.8)	2 (20.0)		7 (13.5)	4 (17.4)		6 (14.0)	5 (45.6)	
Stent length (cm)	12.21±5.86	11.65±5.64	15.43±6.50	0.150**	12.21±5.99	12.21±5.74	0.915**	11.81±6.45	12.71±5.14	0.345**
Mean rotarex time (minutes)	3.73±1.07	3.68±1.08	4.12±0.92	0.084**	3.69±1.01	3.84±1.20	0.712**	3.63±1.08	3.88±1.04	0.183**
Average aspirated fluid (mm)	401.08±133.26	398.00±135.62	423.33±119.47	0.359**	402.31±133.92	398.18±134.78	0.986**	410.70±137.86	387.74±127.63	0.566**
Operation performed										
Rotarex+balloon	25 (33.3)	22(33.8)	3 (30.0)		16 (30.8)	9 (39.1)		15 (34.9)	10 (31.3)	
Rotarex+balloon+stent	40 (53.3)	35(53.8)	5 (50.0)	-	29 (55.8)	11 (47.8)	0.769*	22 (51.2)	18 (56.3)	0.909*
Crossover	10 (33.4)	8 (12.3)	2 (20.0)		7 (13.5)	3 (13.0)		6 (14.0)	4 (12.5)	
Duration of hospitalisation (hours)	52.48±46.46	42.83±24.55	115.20±91.77	**0.001****	42.92±22.46	74.09±73.40	0.140**	44.65±23.76	63.00±64.73	0.616*

Mean±Standard Deviation, n(%), *: Chi-square Test, **: Mann-Whiyney U Test

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DISCUSSION

In this study, we aimed to discuss the early results of patients who underwent endovascular treatment using RPA in conjunction with the rotational atherothrombectomy. Symptomatic PAD usually presents with diffuse and complex lesions in the femoro-poplietal region. In most patients with PAD, lesions are defined as TASC-II class C and D [5]. Peripheral artery bypass grafting is considered the best treatment for symptomatic PAD, but is linked to considerable morbidity [10]. With the development of new endovascular techniques, endovascular treatment has become the primary option for patients with PAD [11].

Although it is traditionally thought that PAD is more common in men, recent studies show that the prevalence rate of the disease increases in older women. In particular, approximately 20-30% of women over 70 years of age are affected by PAD [12]. In our study, we found that 85.3% of the patients were male, the mean age was 62.32±10.90 years. We think that this difference in our study may be due to average age of the patients included in the study and the status of smoking.

Norgaz et al. [13] found that preoperative MPV>8.4 fL was linked to restenosis within six months after coronary stenting, while Dai et al. [14] reported that an MPV>10.1 fL was linked to restenosis within 16 months after carotid stenting. In a study involving 173 patients who underwent SFA stenting, where MPV and stent restenosis were evaluated, no significant correlation was found between the preoperative MPV level and postoperative stenosis [15]. In our study, preoperative MPV value was found to be higher in patients with vascular patency 0-1 month after the procedure performed in the SFA compared to those without (p=0.047). We think that this difference found in various studies indicates the need for further studies on MPV.

As one might expect, the postoperative ABI value increased statistically significantly compared to the preoperative value after endovascular procedure [16]. In our study, similarly to this research, it was determined that the postoperative ABI result increased compared to the preoperative period (p<0.001).

Krankenberg et al. [17] showed a significant improvement in preoperative Rutherford classification and a significant increase in claudication distance in patients with infrapoplietal artery lesions who underwent endovascular procedure. Similarly, in our study, significant improvement in preoperative Rutherford and Fontaine classifications (p<0.001) and significant increase in claudication distance (p<0.001) were observed in all patient groups. In addition, postoperative walking distance was statistically significantly higher in patients with vascular patency in the 1st-6th month compared to those without vascular patency (p=0.041).

The RPA technique, first described by Tonnesen et al. [18], combines subintimal arterial flossing with an antegrade-retrograde intervention. It is primarily indicated for cases involving a short SFA stump, flush occlusions, tandem femoral/SFA lesions, and failure of the antegrade approach. When both femoral and iliac lesions are present, a contralateral femoral approach may be required, and crossover at the abdominal aorta can be challenging in patients with angulated iliac arteries. Chronic total occlusions (CTOs) can also make crossing the aorta difficult, even when the aortic anatomy is normal. Access to the groin can be particularly challenging in obese patients [19].

In these situations, a prone popliteal approach is an important alternative. This approach allows the use of the contralateral popliteal artery to either obtain proximal visualisation of the occlusion or to allow crossover if retrograde access is unsuccessful.

Puncture of the popliteal artery and insertion of the sheath should be guided by ultrasound to avoid complications, particularly given the proximity of the popliteal vein, which may be overlying the artery. Visualisation of both structures helps to prevent iatrogenic arteriovenous fistula (AVF), which may be in close proximity (Figure 1). As popliteal pulses are often weak or absent, CDUSG-guided catheterisation is always recommended as part of the standard procedure.

RPA is often preferred in patients in whom femoral access is not possible. Femoral access failure in femoro-popliteal CTOs may be approximately 30% (10). In our study, the choice of the popliteal artery was not made out of desperation but in a planned manner and the technical success was 100%. Firstly, the high correlation between SFA and iliac lesions makes ipsilateral or contralateral intervention possible. Secondly, puncture of a diseased segment in the SFA/CFA has a high probability of procedure failure or permanent stenosis. Thirdly, if the CTO segment cannot be traversed with RPA, access via the contralateral RPA and iliac arteries may help to traverse the CTO lesion in an anterograde fashion. These factors are important advantages of the RPA access site.

In the literature, primary patency rates of intervention for femoropopliteal artery diseases with RPA access vary between 70 and 84% at 6 months [20,21] and, patency rates at 1 year vary between 45 and 86% [22,23]. Similar to these studies, primary patency was found in 52 (69.33%) patients at 1-6 months and 43 (57.33%) patients at 6-12 months.

In the study of Noory et al [22], AVF between the popliteal artery and vein was observed in 1 patient. Similarly, one patient had arteriovenous fistula in our study.

The limitations of our study include the evaluation of long-term outcomes with a maximum follow-up of one year, its

retrospective nature and therefore the inability to clearly evaluate treatment efficacy. In addition, surgical bypass treatment methods are available as a treatment option in SFA total occlusions, but our study did not include a surgical treatment group and no comparison could be made. Prospective randomised controlled studies are also needed.

CONCLUSION

Endovascular treatment options and procedures have significantly increased over the last two decades. A thorough preoperative evaluation and planning are essential for successful interventions. In patients with both common and SFA lesions, the popliteal artery approach is a safe and efficient method for percutaneous revascularization, enabling ipsilateral retrograde or contralateral antegrade interventions via the cross-over technique. In these patients, rotational atherothrombectomy prevents distal embolisation of the atherothrombotic material and provides better insertion of the stents, if needed. Vascular surgeons should consider the RPA as an alternative access site for complex procedures.

Ethics Committee Approval: The study was carried out in accordance with the principles of the Declaration of Helsinki, and approval from the Necmettin Erbakan University Non-Drug and Non-Medical Device Research Ethics Committee was obtained prior to its commencement (Date: 04.10.2024; No: 2024/5219).

Patient Consent for Publication: Our article is an original article and informed consent was obtained from each patient before the operation.

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