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Effectiveness of remote endarterectomy in superficial femoral artery occlusion

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ABSTRACT

Objectives: The study aimed to evaluate the one-year patency rates of patients who underwent remote endarterectomy (RE) and compare them with femoral-popliteal bypass (FPB) surgery.

Patients and methods: The single-center observational study included 48 consecutive patients (46 males, 2 females; mean age: 60.0±6.1 years; range, 48 to 73 years) who underwent RE (n=24) or FPB surgery (n=24), which was performed solely for peripheral artery disease, between January 2017 and January 2022. Demographic and clinical data of the patients and data related to the procedures and follow-up were obtained from hospital records, and the evaluations were performed retrospectively. The exclusion criteria were defined as being under 18 years of age and undergoing FPB following trauma.

Results: While 21 (87.5%) of the patients who underwent RE had a lesion in the popliteal artery, none of the patients who underwent FPB had a popliteal artery lesion. The one-year patency rate in patients who underwent RE and FPB was 73.9% and 62.5%, respectively. Although the Global Limb Anatomical Staging System scores of patients who underwent RE were more advanced, patency rates were found to be higher. The number of patients who underwent RE and required revascularization within the first week was five (21.7%), and all of these procedures were performed endovascularly. In the FPB group, the number of patients requiring revascularization was two (8.3%), and embolectomy was performed in these patients.

Conclusion: Remote endarterectomy may be a good option in patients who have long-segment lesions, in those who previously underwent FPB surgery, in patients who require repeated intragraft embolectomy revisions, in those with limited access for endovascular procedures, in patients with graft infections, and in those who cannot use prosthetic materials.

Keywords: Femoropopliteal bypass, peripheral artery disease, remote endarterectomy.

The occlusion of the superficial femoral artery (SFA) is a common and debilitating condition, often associated with peripheral artery disease.[1] Patients with SFA occlusion frequently experience reduced blood flow to the lower extremities, leading to symptoms such as claudication, pain at rest, and impaired mobility.[2] While endovascular techniques, such as angioplasty and stenting, have gained prominence in the management of SFA occlusions, a surgical alternative known as remote endarterectomy (RE) has emerged as a compelling approach.

Remote endarterectomy, originally developed as a less invasive alternative to femoral-popliteal bypass (FPB) surgery, allows for the removal of the atherosclerotic plaque and restoration of blood flow through a small incision in a remote location of the artery. Nowadays, the role of endovascular interventional methods increases in the treatment of SFA stenosis or occlusion.[3] The segment most commonly treated with endovascular interventions is the femoropopliteal arterial segment.[4] As researchers and clinicians seek to refine and expand the scope of RE, it is vital to examine the effectiveness of this procedure in addressing SFA occlusions and its potential benefits over alternative treatment options.

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This study aimed to explore the current state of knowledge regarding RE in the context of SFA occlusion. By examining existing research, clinical outcomes, and patient experience, we endeavored to assess the efficacy of RE as a treatment modality for this challenging condition. This exploration sought to determine whether RE represents a promising avenue for improving outcomes in individuals suffering from SFA occlusion, potentially offering enhanced symptom relief, increased quality of life, and improved long-term vascular health.

PATIENTS AND METHODS

A total of 48 patients (46 males, 2 females; mean age: 60.0±6.1 years; range, 48 to 73 years) who underwent either RE (n=24) or FPB surgery (n=24) at the Bağcılar Training and Research Hospital, Department of Cardiovascular Surgery between January 1, 2017, and January 1, 2022 were included in the observational study. The exclusion criteria were as follows: patients under the age of 18 years and patients who underwent FPB for revascularization following trauma. Evaluations were conducted retrospectively. The primary endpoint of the study was to assess the one-year patency rate of RE. Additionally, its association with diabetes mellitus, the lipid panel (low-density lipoprotein, high-density lipoprotein, and total cholesterol), smoking status, age, sex, hypertension, and discharge medication were evaluated. In patients who underwent femoropopliteal procedures, saphenous vein grafts (SVGs) were never used; PTFE (polytetrafluoroethylene) grafts were used in all patients. The one-year patency of RE and FPB, which was performed solely due to peripheral artery disease, was compared. Demographic and clinical data of patients and variables related to the procedure and follow-up were obtained from hospital records. The study protocol was approved by the Bağcılar Training and Research Hospital Ethics Committee (date: 16.11.2022, no: 2022/11/04/025). Written informed consent was obtained from all participants. The study was conducted in accordance with the principles of the Declaration of Helsinki.

One-year patency was defined as the result of computed tomography angiography (CTA) or duplex ultrasonography (DUS) assessments performed at the one-year follow-up for all patients. Revision was defined as endovascular treatments and embolectomy procedures performed with the purpose of revascularization. Restenosis was defined as stenosis of more than 50% that did not lead to total SFA occlusion within the first seven days postoperatively. The target INR (international normalized ratio) for patients prescribed a vitamin K antagonist (VKA) at discharge was 2-3 mg/dL. Procedure success was defined as achieving complete patency during RE without extravasation during the operation. Performing distal and proximal anastomoses without complications was considered a successful FPB surgery. Concomitant lesion was defined as lesions classified up to less than 50% stenosis due to extensive calcification in the External iliac artery (EIA), common femoral artery (CFA), profunda femoral artery (PFA), or popliteal artery (PopA) that did not lead total occlusion. Additional surgery was defined as revision operations performed in case of restenosis, hematoma development, or bleeding using endovascular or open surgical methods. Values above the reference range of 1.00 mg /dL, determined by the central laboratory for creatinine levels, were classified as renal dysfunction.

Surgical procedure

Remote endarterectomy is generally performed in hybrid operating rooms; however, we conducted the procedure in the angiography unit within our available resources. An incision was made in the femoral region on the lesion side of the patient. After turning the CFA, SFA, and PFA with tapes, it was ensured that an adequate field of view was obtained, and heparinization was performed with heparin sodium administered at 5,000 IU. The activated clotting time (ACT) measurement was performed to achieve a target value >200.

After making an arteriotomy with a longitudinal incision of approximately 5 cm, the plaque was visualized, freed, and completely cut vertically from the middle. Endarterectomy was performed on both arteriotomy sites. A Martin dissector (LeMaitre, Burlington, USA) was passed around the plaque. The plaque was dissected from all sides of the vessel, and then using a Vollmar ring dissector (LeMaitre, Burlington, USA), the plaque was completely freed up to the area where preoperative measurements were taken and marked. Subsequently, the most distal part of the measured and freed region was cut using a MollRing cutting transection device (LeMaitre, Burlington, USA), and the plaque was

removed in one piece. Immediately afterward, a 6F sheath was stabilized from the arteriotomy site, and imaging was performed using digital subtraction angiography. The residual lesion remaining in the distal SFA region was retrieved using the EndoHelix Retrieval device (LeMaitre, Burlington, USA). After the residual lesion was removed, another digital subtraction angiography image was taken, and if focal stenotic foci were observed, balloon angioplasty was performed as needed.

In cases where complete patency was achieved without any complications, the arteriotomy site was closed by primary closure, with a Dacron graft or SVG depending on the diameter of the artery, using 5-0 sutures. Following hemostasis control, one Hemovac drain was inserted, and the procedure was successfully concluded.

Postdischarge medication

All patients received low-molecular-weight heparin (LMWH) after discharge. Nineteen patients who underwent RE were discharged with LMWH, acetylsalicylic acid (ASA), and VKA, while three patients were given clopidogrel treatment instead of VKA. Two patients were discharged with only LMWH and ASA due to the risk of bleeding.

In the group that underwent FPB, 16 patients were given LMWH, ASA, and clopidogrel, while six patients were given VKA instead of clopidogrel. Two patients were discharged with only LMWH and ASA due to the risk of bleeding.

When deciding on medication after discharge, parameters such as the antithrombotic and anticoagulant drugs used by patients before the operation, the presence of coronary artery and carotid artery diseases, atrial fibrillation, and comorbidities were evaluated.

Statistical analysis

Data were analyzed using IBM SPSS version 25.0 software (IBM Corp., Armonk, NY, USA). Descriptive statistics (number, percentage, mean ± standard deviation (SD), minimum, and maximum) of the data were provided in the study. As the first step in data analysis, the normality assumption was checked with the Shapiro-Wilk test. When the normality assumption was met, the independent sample t-test was used to examine the difference in means of two independent groups, and when the assumption was not met, the Mann-Whitney U test was conducted. In cases where the normality assumption was met, a paired t-test was used to examine the difference in means of two dependent groups, and in cases where the assumption was not met, the Wilcoxon signed-rank test was used. A p-value <0.05 was considered statistically significant.

RESULTS

Thirteen (54.2%) patients who underwent RE and nine (37.5%) patients who underwent FPB were diabetic. Demographic characteristics were similar for the groups (Table 1). There was no mortality in the study.

All patients included in the study had long-segment SFA lesions and were classified with the femoropopliteal Global Limb Anatomical Staging System (GLASS). According to GLASS scores, 18 (75%) patients who underwent RE were evaluated as Stage 3, and six (25%) were evaluated as Stage 4. Among patients who underwent FPB surgery, 20 (83.3%) were evaluated as Stage 2, and four (16.7%) were evaluated as Stage 3 (Table 2). There was also a statistically significant difference in lesion lengths according to the type of surgery ($p<0.05$). Lesions in RE were found to be longer than lesions in FPB surgery (Table 3).

In the RE and FPB groups respectively, according to the Rutherford category, nine (37.5%) and four (16.7%) patients had mild claudication, six (25%) and nine (37.5%) patients had moderate claudication, five (20.8%) and six (25%) patients had severe claudication, and three (12.5%) and five (20.8%) patients had rest pain. There was only one (4.2%) patient with minor tissue loss in the RE group.

Procedural success was achieved in 95.8% and 100% of cases in the RE and FPB groups, respectively. Among the patients who underwent RE and required revascularization within the first week, five (21.7%) underwent endovascular procedures. Two (8.3%) of patients who underwent FPB and required revascularization underwent embolectomy procedures.

Dacron grafts were used in four (16.7%) patients who underwent RE, and SVG patches were used

Table 1
Demographic and clinical characteristics by type of operation

	RE group		FPB group		Total	
	n	%	n	%	n	%
Sex						
Male	23	95.8	23	95.8	46	95.8
Female	1	4.2	1	4.2	2	4.2
Operation side						
Right	12	50.0	10	41.7	22	45.8
Left	12	50.0	14	58.3	26	54.2
DM	13	54.2	9	37.5	22	45.8
Hypertension	11	45.8	16	66.7	27	56.3
Smoking	17	70.8	16	66.7	33	68.8
Additional lesion						
CFA	19	79.2	12	50.0	31	64.6
EIA	4	16.7	1	4.2	5	10.4
SFA	24	100.0	24	100.0	48	100.0
PopA	21	87.5	0	0.0	21	43.8
Endovascular revision	5	21.7	0	0.0	5	10.4
Arteriotomi closure						
Dacron graft	4	16.7	0	0.0	4	8.3
SVG	11	45.8	0	0.0	11	22.9
Primary	8	33.3	0	0.0	8	16.7
PTFE interposition	1	4.2	0	0.0	1	2.1
VKA	19	79.2	6	25.0	25	52.1
Discharge medication						
CPD	3	12.5	16	66.7	19	39.6
ASA (single)	2	8.3	2	8.3	4	8.3
LMWH (single)	0	0.0	0	0.0	0	0.0
One-year patency	17	73.9	15	62.5	32	68.1
Follow-up evaluation						
DUS	10	41.7	17	70.8	27	56.2
CTA	14	58.3	7	29.2	21	43.8
Renal dysfunction	8	33.3	5	20.8	13	27.1

DM: Diabetes mellitus; CFA: Common femoral artery; EIA: External iliac artery; SFA: Superficial femoral artery; PopA: Popliteal artery; SVG: Saphenous vein graft; PTFE: Polytetrafluoroethylene; VKA: Vitamin K antagonist; CPD: Clopidogrel; ASA: Acetyl salicylic acid; LMWH: Low molecular weight heparin; DUS: Duplex Ultrasonography; CTA: Computed tomography angiography.

in 11 (45.8%). In this group, arterial integrity was achieved in eight (33.3%) patients using the primary closure method, while PTFE interposition was used in one (4.2%) patient (Table 1). No wound infection was reported.

In our study, it was found that RE was most frequent procedure when the additional lesion areas were PFA, CFA, and EIA ($p<0.05$). Lesion length was found to be longer in RE compared to FPB surgery ($p<0.05$; Table 3).

When the one-year patency of all patients was examined, 32 (68.1%) were found to have patent arteries. Postdischarge follow-ups for these patients were conducted using DUS in 27 (56.2%) and CTA in 21 (43.8%) (Additional Table 1). The mean preoperative ankle-brachial index was 0.49±0.10, and the mean postoperative ankle-brachial index was 0.86±0.08 (Table 4). The relationship between preoperative and postoperative ABI values and patency is also illustrated in Additional Table 2.

Table 2
Staging according to the type of operation

	RE group		FPB group		Total	
	n	%	n	%	n	%
Preoperative Rutherford category						
Mild claudication	9	37.5	4	16.7	13	27.1
Moderate claudication	6	25.0	9	37.5	15	31.3
Severe claudication	5	20.8	6	25.0	11	22.9
Rest pain	3	12.5	5	20.8	8	16.7
Minor tissue loss	1	4.2	0	0.0	1	2.1
Preoperative GLASS stage						
Stage 2	0	0.0	20	83.3	20	41.7
Stage 3	18	75.0	4	16.7	22	45.8
Stage 4	6	25.0	0	0.0	6	12.5
One-year Rutherford category						
Asymptomatic	13	54.2	11	45.8	24	50.0
Mild claudication	2	8.3	4	16.7	6	12.5
Moderate claudication	5	20.8	1	4.2	6	12.5
Severe claudication	4	16.7	7	29.2	11	22.9
Rest pain	0	0.0	1	4.2	1	2.1

GLASS: Global Limb Anatomical Staging System.

Table 3
Comparison of mean lesion lengths according to operation type

	Operation type	Mean±SD	Rank average	Test statistics	*p*
Lesion length	RE	26.17±2.39	35.23	30.50**	<0.0001*
	FPB	16.29±4.50	13.77		

SD: Standard deviation; RE: Remote endarterectomy; FPB: Femoral-popliteal bypass; * p<0.05; ** One-sample Wilcoxon signed-rank test.

Table 4
Variables related to operations

	Mean±SD	Min-Max
RE		
Age (year)	60.0±6.1	48-73
Preoperative ABI	0.49±0.10	0.31-0.67
Postoperative ABI	0.86±0.08	0.71-1.00
HDL-C	36.79±8.19	20-51
LDL-C	120.50±44.99	52-222
Creatinine	0.96±0.23	0.63-1.62
HbA1c	7.28±1.92	5.60-14
Total		
Age	60.29±11.35	23-91
Preop ABI	0.48±0.11	0.23-0.70
Postop ABI	0.87±0.09	0.67-1.00
HDL-C	41.10±10.66	20-79
LDL-C	121.02±37.82	52-222
Creatinine	0.91±0.24	0.56-1.75
HbA1c	6.88±1.66	5-14

SD: Standard deviation; ABI: Ankle-brachial index; HDL-C: High-density lipoprotein cholesterol; LDL-C: Low-density lipoprotein cholesterol; HbA1c: Hemoglobin A1c.

A statistically significant relationship was found between the patency status observed one year after surgery and the type of medication at discharge ($p<0.05$). When the data was examined, it was observed that all patients discharged with VKAs had patent grafts ($p<0.05$). While VKA was mostly prescribed to patients who underwent RE at discharge, clopidogrel was mostly given to patients who underwent FPB surgery ($p>0.05$) (Table 5).

When the relationship between the one-year patency of FPB patients and preoperative creatinine values was examined, it was observed that the graft was mostly occluded in patients with renal dysfunction ($p<0.05$). All patients were evaluated, and no significant relationship was found between renal dysfunction and one-year patency.

Diabetes mellitus is a well-known factor that may affect the success rates of surgical procedures.[5] Statistically significant relationships were not obtained between diabetes mellitus, sex, age, surgical side,

Table 5
Associations and cross-tabulation between patency status at one-year and demographic and clinical characteristics for all patients

	Patency status						
	Occluded			Patent			
	n	%	Variety (%)	n	%	Variety (%)	*p*
Sex							0.546
Male	16	34.8	100.0	30	65.2	93.8	
Female	0	0.0	0.0	2	100.0	6.3	
Operation side							0.888
Right	7	31.8	43.8	15	68.2	46.9	
Left	9	34.6	56.3	17	65.4	53.1	
Diabetes mellitus	8	36.4	50.0	14	63.6	43.8	0.682
Hypertension	11	40.7	68.8	16	59.3	50.0	0.217
Smoking	11	33.3	68.8	22	66.7	68.8	1.000
Additional lesion							0.931
CFA	11	35.5	68.8	20	64.5	62.5	
EIA	2	40.0	12.5	3	60.0	9.4	
SFA	16	33.3	100.0	32	66.7	100.0	
PopA	15	33.3	93.8	30	66.7	93.8	
Endovascular revision	2	40.0	12.5	3	60.0	9.4	0.829
Discharge medication							0.190
VKA	6	24.0	37.5	19	76.0	59.4	
CPD	10	47.6	62.5	11	52.4	34.4	
ASA (single)	1	25.0	6.3	3	75.0	9.4	

CFA: Common femoral artery; EIA: External iliac artery; SFA: Superficial femoral artery; PopA: Popliteal artery; VKA: Vitamin K antagonist; CPD: Clopidogrel; ASA: Acetyl salicylic acid.

hypertension status, smoking, one-year patency rate, and the type of surgery (p>0.05).

DISCUSSION

The importance of peripheral artery diseases in terms of mortality and morbidity is increasing.[6] Early diagnosis, treatment, and management of this disease, particularly in light of preventive medicine principles, are of great importance.

Remote endarterectomy is a good choice in long segment lesions, where the success rate of endovascular intervention is low, in redo patients who previously underwent FPB surgery, and in patients with graft infection.

The contributions of RE to the medical literature include offering a minimally invasive approach that accelerates recovery and reduces the risk of complications.[7] This technique results in reduced pain and faster recovery compared to open surgical methods, leading to shorter hospital stays. Additionally, studies on the long-term outcomes of RE provide valuable data for clinical applications.[8] Overall, these contributions enhance the understanding of this technique for both surgeons and patients, further enriching the clinical knowledge base.

As a result of examining the one-year primary patency rates, when the GLASS stage of the patients who underwent RE and FPB surgery were evaluated, although the stage of the RE group was more advanced, the one-year primary patency rate of the patients who underwent this operation was higher, which is important for the preferability of this method in suitable patients. In the study by Martin et al.,[9] it was observed that the patency rate was 70.0% at the 30-month follow-up of patients who underwent RE. In another study, it was observed that the one-year primary patency rate was 60.0%.[10] In the study by Gabrielli et al.,[11] the patency rate was found to be 76.5% at the 24-month follow-up.

In the study by Gisbertz et al.[12] comparing RE and FPB surgery, one-year patency rates were found

to be 61.0% and 73.0% for RE and FPB, respectively. In our study, the one-year patency rate was 73.9% in patients who underwent RE.

Antoniou et al.[10] found the RE success rate to be 94.0% in their study. In another study, the success rate was found to be 79.0%.[13] Our success rate was 95.8%. Karathanos et al.[14] reported the technical success as 100.0% in a study of 12 patients who underwent RE. While the mortality rate was 8.0% (n=1) in the same study, no mortality was observed in our study.

Gabrielli et al.[11] reported that the prevalence of diabetes mellitus, hypertension, and smoking was 45.0%, 68.0%, and 71.0% in the RE group, respectively. In the same study, the rate of renal dysfunction, limited to an upper creatinine value of <1.5 mg/dL, was found to be 14.0%. In our study, eight RE and five FPB patients with creatinine values above the specified reference range had chronic kidney disease and did not receive preoperative dialysis. None of the patients required dialysis or progressed to chronic renal failure after the operation.

In the study conducted by Rahman and Özkısacık,[15] the one-year patency rates of patients with lower extremity peripheral artery disease who underwent endovascular procedures were reported to be similar to the rates in our study.

The study had some limitations. The individual risk factors of the patients, the lack of standardization of the discharge medication due to the medications they previously used and comorbid diseases, and the fact that the GLASS scores of the patients who underwent RE and FPB surgery were not similar were among the limitations. The inability to standardize between DUS and CTA due to patient-specific comorbidities and renal dysfunction in patient follow-up could also be considered a limitation.

In conclusion, remote endarterectomy method may be a good option in patient groups who have long segment lesions, in those who previously underwent FPB surgery, in patients who require repeated intragraft embolectomy revisions, in those with limited access for endovascular procedures, in patients with graft infections, and in those who cannot use prosthetic materials. Further randomized controlled studies with larger samples are needed to support our findings.

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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REFERENCES

1. Bozkurt AK. Periferik Arter ve Ven Hastalıkları. Ulusal Tedavi Kılavuzu. İstanbul: Bayçınar Tıbbi Yayıncılık; 2021.
2. Erdinç İ. Single center experience with percutaneous peripheral atherectomy with the use of C-arm scopy for the treatment of lower extremity peripheral artery disease. Cardiovasc Surg Int 2022;9:111-20. doi: 10.5606/e-cvsi.2022.1351
3. Ketenciler S, Gemalmaz H. Effectiveness of directional atherectomy with the drug-coated balloon method for long and heavily calcified superficial femoral artery lesions. Cardiovasc Surg Int 2022;9:89-96. doi: 10.5606/e-cvsi.2022.1339
4. Özpak B, Çayır Çağdaş M. Farklı uzunluklardaki femoropopliteal stent içi restenozun ilaç salgılayan balon ile tedavisi. Turk Gogus Kalp Dama 2020;28:460-6. doi: 10.5606/tgkdc.dergisi.2020.18980
5. Saydam O, Şerefli D, Atay M, Yaprak Engin A. Endovascular treatment versus femoropopliteal bypass surgery for TASC II type C lesions of the superficial femoral artery. Turk J Vasc Surg 2022;31:25-32.
6. Saaya S, Osipova O, Gostev A, Rabtsun A, Starodubtsev V, Cheban A, et al. A prospective randomized trial on endovascular recanalization with stenting versus remote endarterectomy for the superficial femoral artery total occlusive lesions. J Vasc Surg 2022;76:158-64. doi: 10.1016/j.jvs.2022.02.019.
7. Oborin A, Muchamadeev I, Danilov V. Long-term outcome of remote endarterectomy and femoropopliteal bypass in TASC C and D lesions. J Vasc Surg 2022;75:e114.
8. Coppi G, Stringari C, Mottini F, Zaraca F, Perkmann R. Selective use of remote endarterectomy in the present vascular practice. Eur J Vasc Endovasc Surg 2019;58:e782.
9. Martin JD, Hupp JA, Peeler MO, Warble PB. Remote endarterectomy: Lessons learned after more than 100 cases. J Vasc Surg 2006;43:320-6. doi: 10.1016/j.jvs.2005.10.017.
10. Antoniou GA, Koutsias S, Antoniou SA, Giannoukas AD. Remote endarterectomy for long segment superficial femoral artery occlusive disease. A systematic review. Eur J Vasc Endovasc Surg 2008;36:310-8. doi: 10.1016/j.ejvs.2008.04.005.

11. Gabrielli R, Rosati MS, Vitale S, Baciarello G, Siani A, Chiappa R, et al. Randomized controlled trial of remote endarterectomy versus endovascular intervention for TransAtlantic Inter-Society Consensus II D femoropopliteal lesions. J Vasc Surg 2012;56:1598-605. doi: 10.1016/j.jvs.2012.06.081.
12. Gisbertz SS, Ramzan M, Tutein Nolthenius RP, van der Laan L, Overtoom TT, Moll FL, et al. Short-term results of a randomized trial comparing remote endarterectomy and supragenicular bypass surgery for long occlusions of the superficial femoral artery [the REVAS trial]. Eur J Vasc Endovasc Surg 2009;37:68-76. doi: 10.1016/j.ejvs.2008.09.014.
13. Devalia K, Magee TR, Galland RB. Remote superficial femoral endarterectomy: Long-term results. Eur J Vasc Endovasc Surg 2006;31:262-5. doi: 10.1016/j.ejvs.2005.10.019.
14. Karathanos C, Spanos K, Saleptsis V, Antoniou GA, Koutsias S, Giannoukas AD. Single-center experience with remote endarterectomy for the treatment of long-segment superficial femoral artery occlusion: Long-term results. Vasc Endovascular Surg 2015;49:250-5. doi: 10.1177/1538574415617555.
15. Rahman ÖF, Özkısacık EA. Patency and survival in patients undergoing revascularization for peripheral arterial disease. VHS 2024;14:215-23.

Additional Table 1

	Operation type							
	RE			FPB				
	n	%	Group (%)	n	%	Group (%)	Test statistics	*p*
Sex							**	1.000
Male	23	50.0	95.8	23	50.0	95.8		
Female	1	50.0	4.2	1	50.0	4.2		
Operation side							0.336	0.562
Right	12	54.5	50.0	10	45.5	41.7		
Left	12	46.2	50.0	14	53.8	58.3		
Diabetes mellitus	13	59.1	54.2	9	40.9	37.5	1.343	0.247
Hypertension	11	40.7	45.8	16	59.3	66.7	2.116	0.146
Smoking	17	51.5	70.8	16	48.5	66.7	0.097	0.755
Additional lesion							11.759***	**0.038***
CFA	19	61.3	79.2	12	38.7	50.0		
EIA	4	80.0	16.7	1	20.0	4.2		
SFA	24	50.0	100.0	24	50.0	100.0		
PopA	21	46.7	87.5	24	53.3	100.0		
One-year patency	17	53.1	70.8	15	46.9	62.5	0.375	0.540
Follow up evaluation							4.148	**0.042***
DUS	10	37.0	41.7	17	63.0	70.8		
CTA	14	66.7	58.3	7	33.3	29.2		

RE: Remote endarterectomy; FPB: Femoral-popliteal bypass; CFA: Common femoral artery; EIA: External iliac artery; SFA: Superficial femoral artery; PopA: Popliteal artery; DUS: Duplex Ultrasonography; CTA: Computed tomography angiography; * p<0.05; ** Fisher exact test; *** Multiple chi-square test.

Additional Table 2

	One-year patency	Mean±SD	Test statistics	*p*
Preoperative ABI	Occluded	0.45±0.08	–1.530	0.140
	Patent	0.51±0.10		
Postoperative ABI	Occluded	0.83±0.09	–1.263*	0.220
	Patent	0.88±0.07		

SD: Standard deviation; ABI: Ankle-brachial index; p<0.05; * Mann Whitney U test.