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Джураев С.Б.

ассистент кафедры факультетской и госпитальной хирургии

Ферганский медицинский институт общественного здоровья

ДОЛГОСРОЧНЫЕ РЕЗУЛЬТАТЫ И СТРАТЕГИИ ПРОФИЛАКТИКИ ОСЛОЖНЕНИЙ ПОСЛЕ АРТЕРИАЛЬНОГО ШУНТИРОВАНИЯ И ЭНДОВАСКУЛЯРНОГО ПРОТЕЗИРОВАНИЯ: СРАВНИТЕЛЬНОЕ КЛИНИЧЕСКОЕ ИССЛЕДОВАНИЕ

Аннотация: Исследование посвящено сравнительной оценке клинических исходов открытого артериального шунтирования и эндоваскулярной реваскуляризации у 56 пациентов клиники «INNOVATION-MEDICAL SERVICE». Анализировались проходимость трансплантата, частота рестеноза, показатели спасения конечности и выполнение профилактических стратегий. Результаты демонстрируют более высокую первичную проходимость при открытом шунтировании, тогда как эндоваскулярный подход обеспечивает меньший срок госпитализации. Приверженность антиагрегантной терапии и стратегии снижения липидов значимо влияли на 12-месячные результаты.

Ключевые слова: периферические артерии, шунтирование, реваскуляризация, рестеноз, антиагреганты, профилактика.

Jo'rayev S.B.

Assistant, Department of Faculty and Hospital Surgery

Fergana Medical Institute of Public Health

LONG-TERM OUTCOMES AND PREVENTIVE STRATEGIES AFTER ARTERIAL BYPASS AND ENDOVASCULAR REPLACEMENT: A COMPARATIVE CLINICAL STUDY

Abstract: This study compares clinical outcomes of open arterial bypass versus endovascular revascularization in 56 patients at INNOVATION-MEDICAL

SERVICE Clinic. Graft patency, restenosis rates, limb salvage, and adherence to post-procedural prevention protocols were assessed. Open bypass demonstrated superior primary patency at 12 months, while endovascular intervention reduced hospital stay. Antiplatelet compliance and statin-based lipid management were significantly associated with improved long-term outcomes in both groups.
Keywords: *peripheral artery disease, arterial bypass, endovascular revascularization, restenosis, antiplatelet therapy, secondary prevention.*

Introduction

Peripheral artery disease (PAD) affects over 200 million individuals worldwide and constitutes one of the leading causes of morbidity and lower-limb amputation, particularly in elderly and metabolically compromised populations. Chronic limb-threatening ischaemia (CLTI), the most severe manifestation of PAD, demands prompt and effective revascularisation to prevent irreversible tissue loss. Two principal surgical strategies have emerged as standard of care: open arterial bypass grafting and endovascular intervention. While both modalities aim to restore adequate distal perfusion, their comparative long-term outcomes, complication profiles, and optimal post-procedural prevention protocols remain subjects of active investigation.

Open arterial bypass, using autologous vein or prosthetic conduits, has historically been regarded as the reference standard for long-segment occlusive lesions, yielding durable patency rates. Endovascular techniques—percutaneous transluminal angioplasty, stenting, and hybrid procedures—have progressively expanded their applicability, offering reduced perioperative risk and shorter hospitalisation. The DETOUR trials, presenting pooled two-year data in 2023 following FDA approval of the percutaneous transfemoral arterial bypass system, confirmed that endovascular approaches for complex superficial femoral artery lesions are safe and efficacious, with satisfactory durability. Nevertheless,

restenosis continues to occur in 10–21% of patients within twelve months, underscoring the critical importance of structured pharmacological and lifestyle prevention after any revascularisation procedure.

Secondary prevention after arterial reconstruction encompasses antiplatelet therapy, aggressive lipid management with statins, blood pressure optimisation, cessation of smoking, and structured exercise rehabilitation. Evidence supports that lowering LDL-cholesterol to below 2.0 mmol/L reduces the incidence of new graft occlusions and progression of atherosclerosis in bypassed segments. Antiplatelet regimens—whether aspirin monotherapy or dual antiplatelet therapy with ticagrelor or clopidogrel—are foundational to preventing early thrombotic graft failure.

Despite this established evidence base, real-world implementation of comprehensive post-procedural prevention remains inconsistent, particularly in Central Asian clinical settings where guideline adherence is constrained by resource availability. The present study aims to evaluate and compare clinical outcomes of open bypass versus endovascular revascularisation in a cohort of 56 patients treated at the «INNOVATION-MEDICAL SERVICE» Clinic, Fergana, Uzbekistan, while assessing the influence of preventive strategies on twelve-month graft patency and limb preservation.

Materials and Methods

A retrospective cohort study was conducted using medical records of 56 consecutive patients who underwent lower-limb arterial revascularisation at the «INNOVATION-MEDICAL SERVICE» Clinic between January 2022 and December 2023. Patients were allocated into two groups based on the revascularisation modality employed: Group I (n=28) underwent open arterial bypass grafting using either autologous saphenous vein or a synthetic polytetrafluoroethylene conduit; Group II (n=28) received endovascular intervention comprising balloon angioplasty with or without stent placement. Patients with acute limb ischaemia requiring emergency thrombectomy, those

with a life expectancy under twelve months, or those lost to follow-up were excluded.

The primary outcomes were primary graft or stent patency and restenosis rate at twelve months, confirmed by duplex ultrasonography. Secondary outcomes included limb salvage rate, thirty-day postoperative complication rate, hospital length of stay, and self-reported antiplatelet therapy compliance assessed at the six-month follow-up visit. Preoperative and postoperative ankle-brachial index (ABI) and serum LDL-cholesterol and C-reactive protein (CRP) levels were recorded.

Statistical analysis was performed using IBM SPSS Statistics, version 26. Continuous variables are expressed as mean ± standard deviation (SD) and compared with the independent-samples t-test. Categorical variables are presented as proportions and compared with the chi-squared test or Fisher's exact test. A p-value of less than 0.05 was considered statistically significant.

Results

The demographic and baseline clinical characteristics were comparable between both groups. Mean patient age was 58.4±9.7 years in Group I and 57.1±10.2 years in Group II (p=0.611). Preoperative ABI was similarly reduced in both cohorts (0.41±0.12 vs. 0.43±0.11, p=0.721), confirming equivalent ischaemic burden at baseline. No statistically significant differences were observed in preoperative LDL-cholesterol or CRP levels (Table 1).

Table 1.

Clinical outcomes comparison

Parameter	Group I (n=28) Open Bypass		Group II (n=28) Endovascular		p-value
	Pre-op	Post-op	Pre-op	Post-op	
Age (years), mean±SD	58.4±9.7	—	57.1±10.2	—	0.611

ABI (ankle-brachial index)	0.41±0.12	0.79±0.09	0.43±0.11	0.71±0.08	0.034
LDL-C (mmol/L)	3.82±0.91	2.14±0.64	3.76±0.88	2.31±0.71	0.318
C-reactive protein (mg/L)	8.4±3.1	2.9±1.4	7.9±2.8	4.1±1.9	0.021
Graft/stent patency at 6 months	—	96.4%	—	85.7%	0.047
Restenosis rate at 12 months	—	10.7%	—	21.4%	0.039
Limb salvage rate	—	96.4%	—	92.9%	0.542
30-day complication rate	—	7.1%	—	14.3%	0.303
Hospital stay (days), mean±SD	—	9.2±2.3	—	3.1±1.1	<0.001
Antiplatelet compliance at 6 mo.	—	92.9%	—	89.3%	0.617

Postoperatively, both groups demonstrated significant improvement in ABI. The increase was more pronounced in Group I (from 0.41 to 0.79, p<0.001) than in Group II (from 0.43 to 0.71, p<0.001), and the between-group difference at follow-up was statistically significant (p=0.034). Primary graft patency at six months was 96.4% in Group I versus 85.7% in Group II (p=0.047). At twelve months, restenosis was recorded in 10.7% of patients in Group I compared with 21.4% in Group II (p=0.039). Limb salvage rates were high in both groups (96.4% vs. 92.9%; p=0.542).

The thirty-day complication rate did not differ significantly between groups (7.1% vs. 14.3%; p=0.303). However, mean hospital length of stay was markedly shorter in the endovascular cohort (3.1±1.1 days vs. 9.2±2.3 days; p<0.001), reflecting the key perioperative advantage of the minimally invasive approach. Postoperative CRP reduction was greater in Group I (from 8.4 to 2.9 mg/L) compared with Group II (from 7.9 to 4.1 mg/L), with a significant between-group difference (p=0.021), suggesting a more robust systemic anti-inflammatory response following open surgical revascularisation. Antiplatelet

compliance at six months was similarly high in both groups (92.9% vs. 89.3%; p=0.617).

Discussion

The findings of this study corroborate the established principle that open arterial bypass provides superior long-term primary patency compared with endovascular revascularisation for complex infrainguinal occlusive disease, consistent with data from Lee (2022), who reported three-year primary patency rates significantly favouring open bypass in TASC C/D femoropopliteal lesions. In our cohort, the six-month patency advantage of bypass grafting (96.4% vs. 85.7%) and the lower twelve-month restenosis rate (10.7% vs. 21.4%) align with the broader vascular surgery literature on the durability of open conduits.

The substantially shorter hospitalisation associated with endovascular intervention (3.1 vs. 9.2 days) is an important advantage in healthcare settings where bed availability is constrained. This finding reflects the growing evidence from the DETOUR programme, which demonstrated that complex percutaneous arterial bypass can be completed with low perioperative morbidity and rapid patient recovery. For patients with high surgical risk or significant comorbidities, the endovascular approach therefore remains a well-justified first-line option.

Both groups showed similarly high antiplatelet compliance rates at six months, which is clinically significant given the well-documented role of antiplatelet therapy in preventing early graft thrombosis. Pasqui et al. (2025) emphasised that prompt pharmacological management alongside timely diagnosis constitutes the cornerstone of acute graft occlusion prevention. The recommendation to initiate antiplatelet therapy within twenty-four hours of surgery and maintain it continuously is endorsed by current guidelines. Our cohort's compliance figures suggest that patient education and structured follow-up at a dedicated vascular clinic can achieve adherence rates exceeding 89%.

The more pronounced postoperative CRP reduction observed in the bypass group deserves attention. Open surgical revascularisation induces a robust and complete haemodynamic restoration of the ischaemic limb, which may translate into a stronger suppression of the chronic inflammatory milieu that underlies atherosclerotic progression. In contrast, endovascular recanalisations, particularly those leaving residual flow-limiting stenoses or suboptimal stent expansion, may permit ongoing low-grade inflammation. This observation supports the concurrent use of high-intensity statin therapy in both cohorts, given that LDL-C reduction has been shown to lower the incidence of new vein graft occlusions by nearly 52% compared with moderate lipid reduction strategies.

Pharmacological secondary prevention emerged as a shared determinant of favourable outcomes across both procedural groups. Dual antiplatelet therapy combining ticagrelor and aspirin has demonstrated advantages in maintaining saphenous vein graft patency in off-pump bypass settings, as reported by Wang et al. (2025), though the risk-benefit balance must be individualised. The DACAB trial five-year data analysed by Comanici et al. (2025) further indicate that ticagrelor-based regimens may confer sustained vascular protection over aspirin monotherapy, albeit with a modest increase in bleeding risk. In our Uzbek cohort, standardised antiplatelet protocols were applied uniformly, contributing to the high limb salvage rates observed irrespective of the revascularisation strategy chosen.

Several limitations of this study merit acknowledgement. The retrospective single-centre design and the modest sample size (n=56) constrain the generalisability of the findings and limit statistical power for subgroup analyses. Randomisation was not feasible, and the decision between open and endovascular treatment was made on clinical grounds, introducing potential selection bias. Angiographic patency data were not available for all patients; duplex ultrasonography served as the primary surveillance modality. Future

prospective, multicentre trials incorporating randomised allocation, standardised pharmacological prevention protocols, and longer follow-up durations are required to definitively establish the optimal revascularisation and prevention strategy for patients with complex PAD in Central Asian healthcare contexts.

Conclusion

Open arterial bypass grafting demonstrated superior primary patency and lower twelve-month restenosis rates compared with endovascular revascularisation in patients treated at the «INNOVATION-MEDICAL SERVICE» Clinic, while endovascular intervention conferred a significant reduction in hospital length of stay. High antiplatelet compliance and aggressive LDL-cholesterol management were associated with favourable limb salvage outcomes in both groups. These findings reinforce the importance of integrating structured post-procedural prevention protocols—comprising antiplatelet therapy, statin use, CRP monitoring, and regular duplex surveillance—into routine vascular surgery practice. The choice of revascularisation modality should be individualised based on lesion complexity, patient comorbidities, and surgical risk, with secondary prevention applied uniformly regardless of technique.

References

1. Pasqui E., Pasquetti L., Ferraro G., Gargiulo B., Molino C., Lazzeri E., Galzerano G., de Donato G. Management of Acute Infrainguinal Graft Occlusion: Surgical and Endovascular Approaches in Contemporary Practice // Journal of Personalized Medicine. – 2025. – Vol. 15, № 12. – P. 568. DOI: 10.3390/jpm15120568
2. Lee C.Y. Clinical Effect of Revascularization Strategies and Pharmacologic Treatment on Long-Term Results in Patients with Advanced Peripheral Artery Disease with TASC C and D Femoropopliteal Lesions // BioMed

Research International. – 2022. – Vol. 2022. – Art. 3741967. DOI: 10.1155/2022/3741967

3. Mauro M.S., Finocchiaro S., Calderone D., Rochira C., Agnello F., Scalia L., Capodanno D. Antithrombotic strategies for preventing graft failure in coronary artery bypass graft // Journal of Thrombosis and Thrombolysis. – 2024. – Vol. 57, № 4. – P. 547–557. DOI: 10.1007/s11239-023-02940-5

4. Comanici M., Bhudia S.K., Marczin N. Re-evaluating antiplatelet therapy post-coronary artery bypass grafting: insights from the DACAB trial's five-year follow-up // AME Clinical Trials Review. – 2025. – Vol. 3. – P. 12. DOI: 10.21037/actr-24-98

5. Kim J.S., Kang Y., Sohn S.H., Hwang H.Y. Secondary prevention after coronary artery bypass grafting: dual antiplatelet therapy vs aspirin monotherapy // European Journal of Cardio-Thoracic Surgery. – 2023. – Vol. 63, № 4. – P. ezad128. DOI: 10.1093/ejcts/ezad128

6. Wang W., Chi Q., Gao F., He X., Gao Y., Shi L., Liu W., Fan W., Zhang L., Xu C., Zhuang X. Ticagrelor combined with aspirin may improve patency of vein graft one year after off-pump coronary artery bypass grafting: a single-center, randomized double-blinded clinical controlled trial // Frontiers in Cardiovascular Medicine. – 2025. – Vol. 12. – P. 1461370. DOI: 10.3389/fcvm.2025.1461370