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ORIGINAL ARTICLE

Incidence and Risk Factors of Peripheral Artery Disease Recurrence in Patients Who Underwent Angioplasty or Stenting

MUHAMMAD IRFAN SHAHZAD ANJUM[1], MUHAMMAD UMAIR[2], AWAIS GHULAM NABI[1], AASIM ALI SAJID[3], M. MUSTANSAR MANSOOR GILL[1]
[1]*PGR Cardiology, Faisalabad Institute of Cardiology Faisalabad*
[2]*PGR Cardiology, Multan Institute of Cardiology, Multan*
[3]*PGR Medicine, CMH Rawalpindi*
Correspondence to: Muhammad Irfan Shahzad Anjum, Email: dralishahzad567@gmail.com

ABSTRACT

Objective: This study was conducted to assess the incidence and risk factors of peripheral artery disease recurrence in patients who underwent angioplasty or stent.

Methodology: A retrospective study was conducted in the Department of Cardiology of Faisalabad Institute of Cardiology from January 2021 to January 2023. A total of 100 patients presenting at the hospital with lower extremity peripheral artery disease diagnosed by ankle-brachial index or ultrasound were included in the study by consecutive sampling. Inguinal region was percutaneously accessed via iliac artery and a balloon expandable stent was deployed followed by additional stenting with dynamic balloon stent. A drop of more than 0.1 in the ankle-brachial index and >50% degree of stenosis at follow up indicated recurrence which was evaluated by angiography.

Results: Out of 100, twelve patients (12%) showed restenosis on follow-up and 88 (88%) had a successful procedure, free of recurrence. The rate of recurrence insignificantly related to gender (OR = 9.0, 95% CI 1.42–57.1, p=0.68), smoking (OR = 9.0, 95% CI 1.42–57.1, p=0.09), diabetes (OR = 15.0, 95% CI 2.03–111.1, p = 0.09), hypertension (OR = 9.0, 95% CI 1.42–57.1, p=0.22) and dyslipidemia (p=0.47). The significant predictors of PAD recurrence were external iliac and common iliac involvement (p=0.05) and use of balloon retransmitted stent (p=0.008).

Conclusion: It is concluded that the incidence of peripheral artery disease recurrence was low in patients undergoing angioplasty or stenting. It was significantly associated with type of vessel involved and endovascular revascularization technique.

Keywords: Peripheral Artery Disease Recurrence, Angioplasty or Stenting, Department of Cardiology

INTRODUCTION

Peripheral artery disease is a frequent vascular condition that causes narrowing of peripheral arteries due to formation of scoliosis, thrombosis, dysplasia, atherosclerosis or embolism. It is a strong predictor of severe cardiovascular diseases and poor quality of life.[1]PAD is one of the top three risk factors of atherosclerosis morbidity after stroke and CHD.

Up to 30% of PAD patients experience claudication including limb ischemia and amputations.[2] Diabetes, high blood pressure and dyslipidemia are common risk factors that cause peripheral atherosclerosis. The risk of PAD is significantly increased in smokers, diabetes and foot ulcer patients.[3] The diagnosis of PAD is complex in patients with diabetes and may present as severe tissue loss. PAD also enhances the risk of fat metabolism disorders up to 2.2 folds.[4]

Several procedures can be used to diagnose PAD including CT and contrast angiography, doppler ultrasound, magnetic resonance angiography, duplex ultrasound, treadmill exercise test, segmental pressure measurement, pulse volume recording and ankle-brachial index. The recommended treatment is ballon angiography or stenting for endovascular revascularization in addition to medical therapy.[5]

This study was conducted to assess the incidence and risk factors of peripheral artery disease recurrence in patients who underwent angioplasty or stent.

METHODOLOGY

A retrospective study was conducted in the Department of Cardiology of Faisalabad Institute of Cardiology from January 2021 to January 2023. A total of 100 patients presenting at the hospital with lower extremity peripheral artery disease diagnosed by ankle-brachial index or ultrasound were included in the study by consecutive sampling. Pregnant patients, with renal or hematological disorder, infection and those had previously undergone angioplasty or stent were excluded. All patients agreed verbally to participate and ethical committee approved the study.

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Angiography was performed to confirm involvement of femoral artery or iliac artery. Endovascular therapy was performed in all patients by administering 5000 units Heparin before procedures. Inguinal region was percutaneously accessed via iliac artery and a balloon expandable stent was deployed followed by additional stenting with dynamic balloon stent. An oral dose of 75-162 mg of aspirin and 10 mg of prasugrel was given to act as dual antiplatelet drug. Patients continued their hyperlipidemia and hypertension medications prescribed before endovascular therapy.

A digital subtraction angiography was performed before and after the procedure for two different viewing angles to measure severity of stenosis. Procedure was considered successful if the residual stenosis <30% when patients was followed up after 1 month, 3 months and 6 months after endovascular treatment. A drop of more than 0.1 in the ankle-brachial index and >50% degree of stenosis indicated recurrence which was evaluated by angiography.

All data was analyzed by SPSS version 21. Chi-squared test and t-test was performed to analyze association between parameters. Odds ratio and 95% confidence interval was used to analyze risk factors. Statistical significance was set at $p<0.05$.

RESULTS

A total of 100 patients with peripheral artery disease were included in the analysis with a mean age of 69.5 ± 6.12 years. 78 patients (78%) were men and 22 patients (22%) were women. Half of the population was smokers, 40% were diabetic, 55% were hypertensive and 63% had dyslipidemia. Majority of patients (36%) had an involvement of common iliac artery and only 10% patients had the femoral artery involved (Table I).

Twelve patients (12%) showed restenosis on follow-up and 88 (88%) had a successful procedure, free of recurrence. The mean age of patients with recurrence was 74.68 years and that of recurrence free patients was 69.4 years, however, the difference was not significant (p=0.16). The mean size of the lesion was 55.57 in recurrence group and 47.10 in the recurrence free group (p=0.12).

The rate of recurrence was three times higher in males as compared to females (75% vs 25%) but gender was not a

significant predictor of recurrence (OR = 9.0, 95% CI 1.42–57.1, p=0.68). Similar results were seen for smoking status, where smoking increased the risk of recurrence by 3 times than non-smokers (75% vs 25%) (OR = 9.0, 95% CI 1.42–57.1, p=0.09). The risk of recurrence was 3.33 times higher in diabetes (84%) in comparison to non-diabetics (25%) (OR = 15.0, 95% CI 2.03–111.1, p = 0.09).Although, the risk of restenosis was 3 times in hypertensive patients the difference was insignificant as compared to non-hypertensive patients (75% vs 25%) (OR = 9.0, 95% CI 1.42–57.1, p=0.22). Recurrence was not related to dyslipidemia (p=0.47). The significant predictors of PAD recurrence were external iliac and common iliac involvement (p=0.05) and use of balloon retransmitted stent (p=0.008) as shown in Table II.

Table 1: Demographic and Clinical Features of Patients

Variables	N (%)
Gender	
Male	78 (78%)
Female	22 (22%)
Smoking status	
Smokers	50 (50%)
Non-smokers	50 (50%)
Diabetes	
Yes	40 (40%)
No	60 (60%)
Hypertension	
Yes	55 (55%)
No	45 (45%)
Dyslipidemia	
Yes	63 (63%)
No	37 (37%)
Involved vessels	
External iliac	24 (24%)
External + common iliac	30 (30%)
External iliac + common femoral	10 (10%)
Common iliac	36 (36%)
Recurrence	
Yes	88 (88%)
No	12 (12%)

Table 2: Risk factors of recurrence of peripheral artery disease

	Recurrence (n=12)	Non-recurrence (n=88)	P value
Age	74.68 ± 6.51	69.40 ± 7.02	0.16
Lesion size	57.86 ± 20.08	47.3 ± 14.47	0.12
Involved vessels			
External iliac	2 (16.7%)	20 (22.8%)	0.05
External + common iliac	5 (42%)	29 (33%)	
External iliac + common femoral	3 (25%)	9 (10.3%)	
Common iliac	2 (16.7%)	20 (22.8%)	
Method of stenting			
Self-prophylactic stent	5 (42%)	5 (5.7%)	0.006
Balloon retransmitted stent	7 (58%)	83 (94.3%)	

DISCUSSION

This study was conducted to assess the incidence and risk factors of recurrence of peripheral artery disease in patients who underwent angioplasty or stents. The recurrence rate was 12% after the procedure with vascular involvement and stenting method as strong predictors. Gender, smoking, diabetes, hypertension and dyslipidemia were also insignificantly related to restenosis. These results comply with previous studies conducted in PAD patients undergoing angioplasty.[6, 7] However, different findings have been reported in stenting patients due to difference in demographics.[8, 9]

Sayfo et al found a 31.6% recurrence rate in stenting patients and 42.1% in angioplasty patients with PAD, the difference between groups was significant (p=0.046) which is similar to our study.[10]AbuRahmaet al also found that stenting leads to a significantly lower risk of recurrence (16%) as compared to angioplasty (32%) in over 800 patients.[11]Similarly, Changal et al also showed that stent angioplasty patients had a 18% recurrence rate and angioplasty patients showed 32% restenosis.[12]

The conclusion regarding age and sex being risk factors for recurrence of PAD has been different in literature. These demographic parameters have been suggested as independent determinants of restenosis in patients who underwent angioplasty in various studies.[13, 14] In current study, the rate of recurrence was three times higher in males as compared to females (75% vs 25%) but gender was not a significant predictor of recurrence (OR = 9.0, 95% CI 1.42–57.1, p=0.68).Bekken et al and Atasoy et al also did not consider the link between restenosis and demographic factors.[15, 16] Consistent with our study, Evans et al also found that smoking was a predictor of PAD recurrence.[17]

The risk of recurrence was 3.33 times higher in diabetes (84%) in comparison to non-diabetics (25%) (OR = 15.0, 95% CI 2.03–111.1, p = 0.09).Soyoye et al showed that diabetes was a significant predictor of recurrence (OR= 0.91), however, Tsujimura et al found that diabetic patients undergoing stent angioplasty had a high risk of recurrence.[18, 19] There have been differences regarding data about role of diabetes in restenosis for stent and non-stent angioplasty.

Patients with coexistence of hypertension and diabetes has been reported to lead to high incidence of PAD. Contrary to our study, other studies have shown a significant association between recurrence and hypertension after angioplasty.[20]The significant predictors of PAD recurrence were external iliac + common iliac involvement (p=0.05)and use of balloon retransmitted stent (p=0.008).

This study had some limitations. The sample size was limited and we did not record complete cardiovascular history of patients. Secondly, we also did not analyze the complications of each procedure.

CONCLUSION

The incidence of peripheral artery disease recurrence was low in patients undergoing angioplasty or stenting. It was significantly associated with type of vessel involved and endovascular revascularization technique.

REFERENCES

1. Divya P, Ahmed MA, Anmol M, Rakesh GV. Peripheral Arterial Disease: A Narrative Review. Cureus. 2023;15(6).
2. Bierowski M, Galanis T, Majeed A, Mofid A. Peripheral artery disease: treatment of claudication and surgical management. Medical Clinics. 2023;107(5):823-7.
3. Bernatchez J, Fortin W, Boisvert A, Douville Y, et al. Peripheral Arterial Disease: What You Need to Know. Cardiovascular Explants: Biofunctionality, Biodurability and Biocompatibility: Springer; 2025. p. 91-139.
4. Lempesis IG, Varrias D, Sagris M, Attaran RR, et al. Obesity and peripheral artery disease: current evidence and controversies. Current obesity reports. 2023;12(3):264-79.
5. Heiss C, Olinic D-M, Belch JJ, Brodmann M, et al. Management of chronic peripheral artery disease patients with indication for endovascular revascularization. Vasa. 2022.
6. Choi BG, Hong J-Y, Rha S-W, Choi CU, et al. Long-term outcomes of peripheral arterial disease patients with significant coronary artery disease undergoing percutaneous coronary intervention. Plos one. 2021;16(5):e0251542.
7. Eleshra A, Abdelgawwad M, Regal S, Soliman M, et al. Short-term outcome of primary stent graft for peripheral artery aneurysm in patients with Behçet disease. Journal of Vascular Surgery. 2021;73(1):279-84.
8. Marzlin N, Jan MF, Kostopoulos L, Moreno ACP, et al. Peripheral Artery Disease Intervention: Drug-Coated Balloon vs Drug-Eluting Stent, A Long-Term Comparison. Journal of interventional cardiology. 2022;2022(1):5175607.
9. Gouëffic Y, Torsello G, Zeller T, Esposito G, et al. Efficacy of a drug-eluting stent versus bare metal stents for symptomatic femoropopliteal peripheral artery disease: primary results of the EMINENT randomized trial. Circulation. 2022;146(21):1564-76.
10. Sayfo S, Rosol ZP, Vazquez DF, Mamawala M, et al. Clinical Outcomes of Non–Stent-Based Interventions for Symptomatic Below-the-Knee Peripheral Artery Disease in the Excellence in Peripheral

Artery Disease (XLPAD) Registry. The American journal of cardiology. 2024;228:38-47.
11. AbuRahma AF, Beasley M, Davis M, Adams E, et al. Use of drug-eluting stents in patients with critical limb ischemia and infrapopliteal arterial disease: a real-world single-center experience. Journal of Vascular Surgery. 2021;74(5):1619-25.
12. Changal K, Patel M, Devarasetty PP, Royfman R, et al. Drug-eluting stents versus conventional endovascular therapies in symptomatic infrapopliteal peripheral artery disease: a meta-analysis. Journal of the Society for Cardiovascular Angiography & Interventions. 2022;1(2):100024.
13. Gressler LE, Ramkumar N, Marinac-Dabic D, dosReis S, et al. The association of major adverse limb events and combination stent and atherectomy in patients undergoing revascularization for lower extremity peripheral artery disease. Catheterization and Cardiovascular Interventions. 2023;102(4):688-700.
14. Darling JD, Caron E, van Galen I, Park J, et al. Outcomes following drug-coated balloons and drug-eluting stents in patients with peripheral arterial disease. Journal of Vascular Surgery. 2025.
15. Bekken JA, Geensen R, Kok R, Kuijper M, et al. Covered stents vs. angioplasty for common iliac artery in stent restenosis: a retrospective comparison. European Journal of Vascular and Endovascular Surgery. 2022;63(2):315-22.
16. Atasoy MS, Guven H. Evaluation of 24-Month Follow-up Outcomes of Patients Undergoing Combined Rotational Atherectomy and Drug-coated Balloon for Lower Extremity Peripheral Arterial Disease. Indian Journal of Surgery. 2025:1-6.
17. Evans P, Sobieszczyk P, Eisenhauer AC, Ostrowski S, et al. Risk of mortality related to recurrent limb events after endovascular revascularization of the superficial femoral artery for peripheral artery disease: the Boston Femoral Artery Endovascular Revascularization Outcomes (Boston FAROUT) study. The American journal of cardiology. 2023;205:425-30.
18. Soyoye DO, Abiodun OO, Ikem RT, Kolawole BA, et al. Diabetes and peripheral artery disease: A review. World journal of diabetes. 2021;12(6):827.
19. Tsujimura T, Takahara M, Iida O, Soga Y, et al. Clinical outcomes of polymer-free, paclitaxel-coated stents vs stent grafts in peripheral arterial disease patients with femoropopliteal artery lesions. Journal of Vascular Surgery. 2021;73(6):1998-2008. e1.
20. Kinlay S, Sobieszczyk P, Eisenhauer AC, Ostrowski S, et al. Patient and limb outcomes 10 years after endovascular revascularization of the superficial femoral artery for peripheral artery disease: the Boston Femoral Artery Endovascular Revascularization Outcomes (Boston FAROUT) study. Vascular Medicine. 2023;28(4):290-8.

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