Patency rate and factors affecting the clinical outcome of patients with aortoiliac artery occlusion undergoing intra-arterial stenting

Ehsan Rahimpour[1], Javad Salami[2]*, Morteza Taghavi[3], Mohammad Reza Zafarghandi[4], Hadi Ahmadi Amoli[5], Ali Abbaszadeh-kasbi[6], Pezhman Farshidmehr[7], Reza Hajebi[8], Hossein Zabihi Mahmoudabadi9, Parastoo Amiri[10]

[1]Assistant Professor of General Surgery, Sina Hospital, Department of Surgery, School of Medicine, Tehran University of Medical Sciences, Tehran, Iran.

[2]Professor of General Surgery, Department of General Surgery, School of Medicine Hepatobiliary and Liver Transplantation Research Center Sina Hospital, Tehran University of Medical Sciences, Tehran, Iran. Corresponding Author Email: Mjsalimi@tums.ac.ir

[3]Assistant Professor of Surgery, Department of General Surgery, School of Medicine, Sina Hospital, Tehran University of Medical Sciences, Tehran, Iran

[4]Professor of Vascular Surgery, Department of General Surgery, School of Medicine, Sina Hospital, Tehran University of Medical Sciences, Tehran, Iran

[5]Associate Professor of Surgery, Department of General Surgery, School of Medicine, Sina Hospital, Tehran university of medical sciences, Tehran, Iran

[6]Medical Student School of Medicine, Tehran University of Medical Sciences (Tums), Tehran, Iran

[7]Assistant Professor of Vascular Surgery, Department of General Surgery, School of Medicine Sina Hospital, Tehran University of Medical Sciences, Tehran, Iran

[8]Assistant Professor of Surgery, Department of General Surgery, School of Medicine Sina Hospital, Tehran University of Medical Sciences, Tehran, Iran

[9]Assistant Professor of General Surgery in Tehran University of Medical Sciences, Teharn, Iran

[10]Community Medicine Specialist, Department of Community Medicine, School of Medicine, Shahid Beheshti University of Medical Sciences, Tehran, Iran

Abstract

Background Occluding plaques are commonly found in the infrarenal aorta and the iliac artery in patients with peripheral arterial disease (PAD). Aortoiliacocclusive disease (AIOD) occurs commonly in patients with PAD.

Methods: This is a prospective study was carried out between 2015 and 2017 in Sina hospital. Patients with occlusion in aortoiliac artery and its branches were included. Stent was placed for patients, if they had any obstruction or stenosis in aortoiliac artery in angiography. Patients were examined in terms of clinical status and ABI calculation and underwent Color Doppler ultrasound of aortoiliac artery to determine patency rate at 1, 3, 12, and 24 months after stent placement.

Results: The mean age of patients was 64.60 (±10.41). The main symptoms of the patients were claudication (41.8%), ulcer (27.3%), pain at rest (20%), and gangrene (20%). The lesion was bilateral in 21 patients (38.2%). According to TASC stratification, lesions were of type A in 26 patients (47.3%), type B in 4 patients (7.3%), type C in 5 patients (9.1%), and type D in 20 patients (36.4%). The six-month, one-year, and two-year patency rates were 89.1%, 83.6%, and 72.7%, respectively. The mean annual ABI of patients was 0.79 (±0.11) and two year ABI was 0.68 (±0.1).

Conclusion: It seems that stenting and angioplasty are effective in improving patients' conditions and result in a good short and medium-term patency.

Keywords: Aortoiliac artery occlusion, patency rate, endovascular stenting, intraarterial stenting.

Introduction

Occluding plaques causing atherosclerotic obstructive disease are commonly found in the infrarenal aorta as well as iliac artery in patients with peripheral arterial disease (PAD)[1]. Atherosclerotic plaques can cause symptoms in distal vessels, due to blockage of blood flow, detachment and embolization of atherosclerotic or thrombotic debris. If the plaques become large enough to affect the arterial lumen, blood flow to the distal organs will be decreased[1,2].

Aortoiliac occlusive disease (AIOD) occurs commonly in patients with PAD. Significant lesions in the aortoiliac arterial wall can be easily detected by checking femoral pulses. Any reduction in the femoral palpable pulse suggests that the blockage is proximal to the femoral pulses. Occlusive lesions can be present in the infrarenal aorta, common iliac, internal iliac (hypogastric), external iliac or any or all of these arteries[3,4].

Surgical treatment of AIOD has been remained corn stone has remained the corner stone of treatment for many years and had somewhat favorable outcomes. Techniques such as percutaneous transluminal angioplasty (PTA) and stenting can be considered as alternative to open surgery for patients who are not proper candidates for surgical repair. Catheter-based endovascular therapies for AIOD have fewer benefits (?) in terms of morbidity, faster recovery, and shorter hospitalization. In fact, most endovascular interventions are easily performed in outpatient settings[3,4].

Regarding the mentioned issues, the present study aims to determine the survival rate and possible contributing factors in the clinical outcomes of patients with aortoiliac artery occlusion undergoing intra-arterial stenting.

Materials and methods

This prospective study was carried out on patients presented at outpatient vascular surgery clinic of Sina hospital from 2015 to 2017 with occlusion of aortoiliac artery and its branches, and subsequently, they were selected for angiography. Co_2 CO_2 angiography was considered for those who had raised creatinine level. Stent was placed for patients, if they had any obstruction or stenosis in aortoiliac artery in angiography. In this study, the exposure refers to patients with stenosis and obstruction of the common iliac or external iliac arteries, or both, diagnosed after angiography and the outcome refers to patients who underwent stenting during angiography after diagnosis. Variables include smoking, disease manifestations, comorbidities, symptoms onset to treatment onset interval, signs of limb ischemia, degree of artery stenosis and obstruction, anatomical site of stenosis, TASC II stratification, patency rate, 1-year prognosis, and ABI were gathered. Patients with poor compliance, rheumatologic diseases, due to the possible misdiagnosis of pain, were excluded from the study. The inclusion criteria were the eligible patients aged from 50 to 80 years with manifestations of arterial obstruction. The patients were examined clinically, ABI was calculated for each one, and patients underwent Color Doppler Ultrasound of aortoiliac artery for patency rate at 1, 3, 12, and 24 months after stent placement. Patency rates at four intervals and one- and tow-year two-year ABI were considered as the final outcomes of the study and the relationship of these variables with other parameters of the study was determined.

Statistical analysis was accomplished using the Statistical Package for Social Sciences (SPSS 16, SPSS Inc., Chicago, US). Data are expressed as number (%) or mean ± standard deviation (SD).

Results

The mean age of patients, including 48 males (87.3%) and 7 females (12.7%), was 64.6 (±10.41) years. Forty-three patients (78.2%) had a history of smoking. The underlying diseases were hypertension, diabetes mellitus, hyperlipidemia, heart failure, and renal failure in 19 (34.5%), 26 (47.3%), 7 (12.7%), 8 (14.5%), and 19 (1.8%) patients, respectively. The drugs used by patients were aspirin, warfarin, beta-blockers, Plavix, statins and insulin in 29 (52.7%), 2 (3.6%), 5 (9.1%), 8 (14.5%), 18 (32.7%), and 2 (3.6%), respectively.

The main symptoms of the patients were claudication, ulcer, rest pain, and gangrene in 23 (41.8%), 15 (27.3%), 11 (20%), and 11 (20%), respectively. The lesion (lesion has not been mentioned up to here) was at the right side, at the left side, bilaterally in 21 (38.2%), 12 (21.8%), 21 (38.2%), respectively. The interval between symptoms onset and treatment was less than 3 months in 6 patients (10.9%) whereas more than 3 months in 43 patients (78.2%). In patients whose symptoms had started more than 3 months, the mean interval between symptoms onset and treatment was 8.15 (±2.54) months. According to TASC stratification, lesions were type A, type B, type C, type D in 26 (47.3%), 4 (7.3%), 5 (9.1%), and 20 (36.4%) patients, respectively. The mean diameter of the vessel was 7.82 (±1.16) mm and the mean length of the lesion was 6.34 (±6.42) cm. The mean minimum stenosis was 81.18 (±8.86) percent prior the treatment.

The type of stent used was self-expanding in 37 patients (67.3%) and balloon-expanding in 18 patients (32.7%). The largest diameter of the stent was averagely 70.86 (±45.25) mm. The mean number of stents used was 1.83 (±0.97). The initial success was achieved in 98.70% of the cases (number of patients should be mentioned). Ultrasound performed after a month, 6 months, 1 year, 2 years, revealed that 0 (0.0%), 5 (9.1%), 8 patients (14.5%), 2 years, 11 patients (20%) had developed stenosis or obstruction, respectively. The mean 1 and 2-year calculated ABI of the patients was 0.79 (±0.11) and 0.68 (±0.1).

There was a significant difference between HLP and one-year ABI (p-value: 0.011). There was significant difference between claudication and one-year patency (p-value: 0.008). There was significant difference between two-year patency (p-value: 0.044). There was significant difference between and one-year ABI (p-value< .001). There was significant difference between gangrene and six-month patency (p-value: 0.021) and one-year ABI (p-value: 0.005). There was significant difference between TASC stratification and six-month patency (p-value: 0.010). There was significant difference between number of lesions with six-month patency (p-value: 0.011). There was significant difference between the maximum lesion diameter and six-month patency (p-value: 0.042). There was significant difference between and the number of stents and six-month patency (p-value: 0.042). The location of the disease was significantly differed among different TASC groups (p=0.015), so that 61.9% were bilateral TASC D and 57.1% unilateral TASC A. The relationship of between one and 2-year ABI and patency rate was statistically significant (p-value<001). (Table 1).

Table 1. Showing correlation between all studied variables and 6 month 1 year and 2 year patency rate as well as 1 year ABI.

Parameter	6-month patency	1-year patency	2-year patency	1-year ABI
Age	0.635	0.493	0.945	0.469
Gender	0.374	0.245	0.636	0.078
Smoking	0.902	0.731	0.480	0.051
HTN	0.516	0.885	0.935	0.156
DM	0.708	0.329	0.487	0.752
HLP	0.631	0.967	0.636	**0.011***
HF	0.738	0.845	0.622	0.866
Renal Failure	0.753	0.681	0.056	0.702
ASA	0.708	0.597	0.794	0.752
Warfarin	0.653	0.557	0.459	0.479
Betablocker	0.394	0.337	0.301	0.115
Plavix	0.374	0.845	0.141	0.130
Statin	0.649	0.595	0.439	0.862
Insulin	0.653	0.159	0.328	0.479
Claudication	0.053	**0.008***	**0.044***	**0.000***
Ulcer	0.924	**0.004***	0.860	0.932
Rest Pain	0.243	0.126	0.764	0.725
Gangrene	**0.021***	0.139	0.241	**0.005***
Unilateral/ Bilateral	**0.029***	0.624	0.639	0.423
Symptom to therapy interval	0.559	0.729	0.786	0.774
TASC	**0.010***	0.580	0.254	0.511
Reference vessel diameter	0.446	0.843	0.246	0.056
Lesion length	0.311	0.947	0.886	0.381
Occlusion severity	0.431	0.385	0.472	0.582
Number of lesions	**0.011***	0.388	0.283	0.878
Stent Type	0.516	0.218	0.237	0.643
Highest diameter of stent	**0.042***	0.315	0.681	0.747
Number of stents	**0.042***	0.705	0.254	0.830

*shows statistically significant values.

Discussion

As expected, the disease is most prevalent at a particular age. Accordingly, in the study of Van Haren RM et al[5] in 2017, the mean age of patients was 59 years. In the study of Rzucidlo Em et al.[6], the mean age of patients was 63 years. Indes JE et al.[7] stated that patients undergoing stenting are more likely to be over 65 years (54%), and to be female. The latter study is the only study in which the number of females was more than males.

There was a history of smoking in 43 (78.2%) of patients. The most common underlying diseases were diabetes mellitus (47.3%) and hypertension (34.5%). In the study of Rzucidlo Em et al.[6], 71% of patients were active smokers and hypertension was observed in 91%, diabetes in 26%, and renal failure in 21% of patients. The rate of renal failure in the present study was 1.8%. In current study, there was a relationship between hyperlipidemia and one-year ABI (p=0.011), so that, the higher levels of lipid profile, the lower one year ABI. Despite hyperlipidemia, the probability of ABI of less than 0.9 increased after one year. In a study by Kashyap VS et al.[8] (2008), hyperlipidemia and smoking led to poor outcomes in stenting and angioplasty compared to ABI. In the study of Kashyap VS et al.[4], diabetes mellitus had an inverse relation with patency rate[8].

The main symptoms in the present study were claudication, ulcer, resting pain, and gangrene, in descending order. In the study of Kashyap VS et al.[8], claudication was observed in 53%, resting pain in 28%, and gangrene and limb ischemia in 19% of patients; the findings of this study are similar to that of ours. In the study of Van Haren RM et al.[5], 100% of patients had resting pain and 40% had gangrene, which is completely in contrast with our findings. In a study by Rzucidlo Em et al.[6], resting pain was observed in 65% of patients and gangrene and limb amputation in 35% of patients.

The relationship of the number of symptoms with other parameters was statistically significant in the present study. Claudication was statistically significant with one-year and two-year patency and one-year ABI, worsening the prognosis of the patient. Ulcers, also, significantly reduced the one-year patency, while gangrene significantly reduced the six-month patency as well as one-year ABI. In this study, 38.2% of cases were bilateral and 60% were unilateral and there was a significant relationship between bilateral disease and less significant six-month patency rate, which is similar to the results of a study by Lun Y et al.[9].

The most common lesions in our study were TASC A, type D, type C, and type B, in descending order. In the study of RevueltaSuero et al.[10], as with the present study, TASC A lesions were the more common lesion. In the study of Rzucidlo Em et al[6], TASC C and D lesions were the common lesions in 85% of cases. The TASC type had a significant relationship with six-month patency in our study, so the more severe TASC group, the less patency rate. In numerous studies, TASC types had statistically significant relationship with the procedure and its clinical outcomes. Accordingly, Benetis et al.[11] found that endovascular procedure in TASC A lesions can lead to more complications compared to other interventions, and it is not a preferred method, while endovascular procedure can bring beneficial clinical outcomes in the other three types of TASC.

The mean length of lesions was 6.34 cm in the present study. In the study of Rzucidlo Em et al.[6], the mean length of lesions was 13.7 cm. The study by RevueltaSuero et al.[10] reported a mean lesion length of 42 mm. There was no correlation in the present study between the lesion length and other parameters of the study, but Karpenko AA et al.[12] concluded that increasing the lesion length to more than 100 mm was associated with restenosis or subsequent thrombosis.

The largest stent diameter in our study was averagely 70.86 mm. This diameter has a significant relationship with the six-month patency and larger stent diameter has led to lower patency rate. In a study by Kavaliauskienė et al.[13], stents smaller than 61 mm had 12-month and 24-month patency rates of 90.6% and 86.6%, respectively, while stents larger than 61 mm had 12- month and 24-month patency rates of 67.7% and 60.2%, respectively.

In the present study, the initial success rate was 98.70%. In the study of Kashyap VS [8], the success rate was 96%. Van Haren RM[5] reported a success rate of 100%. This was 95% in the study of Yuan L[14]. In general, the findings of most studies are to a great degree similar in terms of primary success rate.

Patency was the most important indicator in this study, which was 100% in the first month, 89.1% in 6 months, 83.6% in 1 year, and 72.7% in 2 years. One-year and 3-year patency rates were 86% and 80%, respectively in the study of Indes JE et al.[4]. In a study by Jongkind V et al.[3], the 4-year/ 5-year patency rates were 80%-98%. The three-year patency in the study of Kashyap VS et al.[8] was 74%. One-year and 2-year patency rates were 92.7% and 81.9%, respectively in the study of Karpenko AA et al.[12]. The one-year patency reported by Van Haren RM et al.[5] in 2017 was 80%. Lun Y[9] reported one-year, 3-year, and 5-year patency rates as 91.4%, 81.8%, and 64.2%, respectively. The 6-month, 18-month, and 24-month patency rates were 93.3%, 83%, and 66.4%, respectively in the study of Yuan L et al.[14]. The one-year patency was 91% in the study of Psacharopulo D et al.[15]. In our study, the number of stents was significantly associated with a decrease in six-month patency rate.

Changes in ABI have been recorded as one of the most important indicators after the procedure in various studies. In here, ABI was evaluated 1 and 2 years after the trial, which was 0.79 and 0.68. The study by Van Haren RM et al.[5] has shown that ABI is improved in both left and right legs by 0.5. In the study of Rzucidlo Em et al[6], ABI was increased from 0.3 to 0.59. In the study of Kashyap VS et al.[8], ABI reached from 0.48 to 0.84.

Limitations

Failure to measure ABI prior to the procedure was one of the drawbacks of the present study, which should be considered in future studies in order to allow its comparison before and after intervention and to calculate recovery after the procedure.

Conclusions

According to the findings of this study, it seems that stenting and angioplasty (irrespective of the stent type, i.e. self-expanding or balloon-expanding) are effective in improving patients, resulting in a good short- and medium-term patency. In addition, due to the strong association between patency rate and symptoms (i.e. claudication, gangrene, and ulcer) patients should be further evaluated in terms of these symptoms.

References

1. Mahe, G., et al., Internal Iliac Artery Stenosis: Diagnosis and How to Manage it in 2015. Front Cardiovasc Med, 2015. 2: p. 33.
2. Aboyans, V., et al., The general prognosis of patients with peripheral arterial disease differs according to the disease localization. J Am Coll Cardiol, 2010. 55(9): p. 898-903.
3. Jongkind, V., et al., A systematic review of endovascular treatment of extensive aortoiliac occlusive disease. J Vasc Surg, 2010. 52(5): p. 1376-83.
4. Indes, J.E., et al., Clinical outcomes of 5358 patients undergoing direct open bypass or endovascular treatment for aortoiliac occlusive disease: a systematic review and meta-analysis. J Endovasc Ther, 2013. 20(4): p. 443-55.
5. Van Haren, R.M., et al., Endovascular treatment of TransAtlantic Inter-Society Consensus D aortoiliac occlusive disease using unibody bifurcated endografts. J Vasc Surg, 2017. 65(2): p. 398-405.
6. Rzucidlo, E.M., et al., Early results of stent-grafting to treat diffuse aortoiliac occlusive disease. J Vasc Surg, 2003. 37(6): p. 1175-80.
7. Indes, J.E., et al., Endovascular procedures for aorto-iliac occlusive disease are associated with superior short-term clinical and economic outcomes compared with open surgery in the inpatient population. J Vasc Surg, 2010. 52(5): p. 1173-9, 1179 e1.
8. Kashyap, V.S., et al., The management of severe aortoiliac occlusive disease: endovascular therapy rivals open reconstruction. J Vasc Surg, 2008. 48(6): p. 1451-7, 1457 e1-3.
9. Lun, Y., et al., Comparison of midterm outcomes between surgical treatment and endovascular reconstruction for chronic infrarenal aortoiliac occlusion. J Vasc Interv Radiol, 2015. 26(2): p. 196-204.
10. Revuelta Suero, S., et al., Endovascular treatment of external iliac artery occlusive disease: midterm results. J Endovasc Ther, 2014. 21(2): p. 223-9.
11. Benetis, R., et al., Comparison of results of endovascular stenting and bypass grafting for TransAtlantic Inter-Society (TASC II) type B, C and D iliac occlusive disease. Arch Med Sci, 2016. 12(2): p. 353-9.
12. Karpenko, A.A., et al., [Results of endovascular interventions in patients with occlusive stenotic lesions of arteries of the aortoiliac segment]. Angiol Sosud Khir, 2016. 22(2): p. 77-82.
13. Kavaliauskiene, Z., et al., Factors affecting primary patency of stenting for TransAtlantic Inter-Society (TASC II) type B, C, and D iliac occlusive disease. Medicina (Kaunas), 2014. 50(5): p. 287-94.
14. Yuan L, B.J., Zhao Z, Feng X, Lu Q, Jing Z. , Endovascular therapy for long-segment atherosclerotic aortoiliac occlusion. J Vasc Surg, 2013/11/19. 59(3): p. 663-668.
15. Psacharopulo, D., et al., Increasing efficacy of endovascular recanalization with covered stent graft for TransAtlantic Inter-Society Consensus II D aortoiliac complex occlusion. J Vasc Surg, 2015. 62(5): p. 1219-26.