The effect of iliac angioplasty - as a single level correction in patients with multi-level arterial disease – on improving the patient's condition

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ABSTRACT

Aim: *The purpose of this study was to review the effect of iliac angioplasty alone on improving the patient's complaint in those who have multi-segmental arterial disease not affecting the common femoral and profunda femoris vessels.* ***Patients and Methods:*** *Between July 2013, and January 2018, 66 patients having multi-level arterial disease were treated by iliac angioplasty alone as a single level correction they were followed up for 6 months to identify patients who needed further intervention to improve their condition.* ***Results:*** *Data was obtained for 66 patients who underwent hybrid procedures during the study period. Technical success was achieved in 95.5% (63 patients). Clinical success, according to the American Heart Association (AHA) classification at 1 month showed, 80.95% (51 patients) improved with different grades, while 19.05% (12 patients) needed further intervention either due to no change in their condition or it got worse after iliac angioplasty alone. It was also found that 100% of patients having intermittent claudication (Rutherford category 2,3) improved by iliac angioplasty alone without further intervention, 90% of patients having rest pain also improved by iliac angioplasty alone, 40% of patients having minor tissue loss (Rutherford category 5)did not need any further management, while 100% of patients having major tissue loss (Rutherford category 6) needed further management. During follow up at 3 months another 10% of patients having minor tissue loss (Rutherford category 5) needed further intervention. At 6 months at total of 79.4% of patients were still improving by iliac angioplasty alone without further intervention.* ***Conclusion:*** *Iliac angioplasty in patients having multi-level arterial disease can be done alone without total correction especially in patients complaining of intermittent claudication or rest pain while patients having major tissue loss it is better to be done as a part of a plan for total correction.*
Keywords: *iliac angioplasty; multi-level arterial disease.*

INTRODUCTION

The anatomic distribution of lesions in patients having peripheral vascular disease is variable. Smoking tends to be associated more with aortoiliaic and femeropolitreal lesions while diabetes is strongly associated with femropopliteal and infragenicular lesions.[1-4]

Rueda etal. Found in a cohort of 450 patients, that more than half of those patients had combined occlusions of the popliteal and infragenicular segments, and another 30% had combined femeropoliteal and infragenicular occlusions. [5]

In patients with critical lower limb ischemia there is a common association with multi-level pattern of occlusive disease.[6]

Intervention in patients having multi-level arterial disease of the lower extremity may propose a challenge and may require intervention using both open surgical and endovascular techniques.

PATIENTS AND METHODS

Between July 2013, and January 2018, 66 patients having multi-level arterial disease in the form of stenosis or total occlusion involving the iliac access, superficial femoral, popliteal and infragenicular vessels but sparing the common femoral and the profunda femoris vessels were operated upon at Ain Shams University hospitals and Nasser Institute.

Inclusion criteria: All patients presenting with intermittent claudication and / or critical limb ischemia due to a lesion (stenosis or occlusion) involving more than one segment of the arterial tree including the iliac vessels with no previous history of surgical or endovascular intervention.

Exclusion criteria: Patients presenting with extensive tissue loss and infection necessitating a major amputation as a primary management also patients with common femoral, profunda femoris vessels affection were excluded from our study.

All patients underwent preoperative peripheral vascular evaluation including physical examination, and ankle-brachial indices (ABIs). Clinical category at the time of presentation was determined according to the Rutherford classification as specified by the Society for Vascular Surgery/American Association for Vascular Surgery reporting standards. Computed tomography angiography (CTA) was done to assess the arterial tree and the burden of the disease. Patients with no affection of the common femoral and the profunda femoris vessels were included in the study

All procedures were performed by in an operating theatre with vascular imaging. Access was obtained percutaneously through ipsilateral limb, or through a contralateral or transbrachial access according to the angiographic feasibility. Hydrophilic guidewires were used under fluoroscopic control to ensure true lumen entry. The use of angioplasty balloons and stents was tailored according to the patient's angiographic anatomy with the size and length determined according to the discretion of the operator with the preference of using self-expanding stents except for common iliac artery ostial lesions where balloon expandable stents were preferably used.

Intraoperative angiography was performed to confirm satisfactory revascularization at the conclusion of each case. Technical success was defined as residual stenosis <30% on biplanar intraoperative arteriography.

Postoperative follow up was done immediately post procedure and at 1,3, and 6 months thereafter. Clinical success was defined according to the American Heart Association (AHA) classification.[7] (Table I).

Table (1): American heart association guidelines for clinical improvement.

Grade	
3	Markedly improved; ABI > 0.9 and no ischemic symptoms
2	Moderately improved; ABI > 0.1 but not normal, and increase by one category
1	Minimally improved; ABI increase 0.1 but not normal, or increase by one category
0	No change
-1	Mildly worse; No category decrease or ABI increase <0.1
-2	Moderately worse; one category worse or unexpected minor amputation
-3	Markedly worse; more than one category worse or unexpected major amputation

ABI, Ankle-brachial index.

In our study, we assessed the improvement of the patient's complaint upon dealing with the iliac lesion access only, and the need for further intervention to improve the patient's outcome.

The decision for further intervention was based upon no improvement or worsening of the patient's condition and this intervention was tailored according to the angiographic anatomy of the arterial tree of each patient.

Major amputations included above-knee and below-knee amputations, while minor amputations included transmetatarsal amputations and toe amputations.

Our end point was improvement of the patient's condition which meant no need for further intervention to improve the patient's condition.

RESULTS

Data was obtained for 66 patients with multi-level arterial lesions not involving the common femoral and profunda femoris vessels, they were offered iliac angioplasty only as a single level correction. Demographic and clinical features of the study group are shown in Table 2. The group consisted of 42 (63.6%) males and 24 (36.4%) females with a mean age of 56.7 ± 9.14. Fifty three patients were having diabetes mellitus, forty five patients were under treatment for hypertension, fifty two patients were smokers, whereas thirty patients has had a history of cardiac disease.

Table 2: Demographic data

Characteristics	**N (%)**
Age	Mean 56.7±9.14
Gender	
Male	42 (63.6%)
Female	24 (36.4%)
Diabetes	53 (80.3%)
Ischemic Heart disease	30 (45.5%)
Hypertension	45 (68.2%)
Smoking	52 (78.8%)

According to Rutherford classification, 30 (45.5%) patients were treated for intermittent claudication (Rutherford category 2 and 3), 22 (33.3%) patients were treated for rest pain (Rutherford category 4), 10 (15.2%) suffered from minor tissue loss (Rutherford category 5), and 4 (6%) were treated for major tissue loss (Rutherford category 6), as shown in Table 3.

Table 3: Clinical presentation according to Rutherford classification

Rutherford category	**N (%)**
Intermittent claudication (category 2, 3)	30 (45.5%)
Ischemic rest pain (category 4)	22 (33.3%)
Minor tissue loss (category 5)	10 (15.2%)
Major tissue loss (category 6)	4 (6%)

In addition to the target treatment area, associated femoropopliteal lesions were present in 26 patients, combined femoropopliteal and infragenicular lesions were present in 40 patients Table 4.

Table 4: Associated lesions in the femoropopliteal or infragenicular teritory

Associated lesions	**N (%)**
Associated femoropopliteal lesions only	42 (63.6%)
Associated femoropopliteal and infragenicular lesions	24 (36.4%)

Trial of angioplasty was done for 3 patients, but we failed to cross the lesion and they were offered a surgical option. Forty three (43) patients has had ostial common iliac lesions were treated with primary stenting in a kissing fashion, eighteen (18) common iliac lesions not involving the ostium were treated with primary stenting, and two (2) patients with lesions confined to the external iliac artey were treated by balloon dilatation without stenting. Patients were followed up and clinical improvement was recorded.

Immediate technical success was achieved in 95.5% (63 patients), as shown in table (5). We failed to cross the lesion in a patient having intermittent claudication (Rutherford category 3), and two patients having rest pain (Rutherford category 4), and those 3 patients were offered a surgical option.

Table 5: Technical success rate

	N (%)
Successful	63 (95.5%)
Failed	3 (4.5%)

Table 6: AHA clinical improvement after intervention

Rutherford category		**1 month**		**3 months**		**6 months**	
		N.	**Grade**	**N.**	**Grade**	**N.**	**Grade**
Category 2, 3	29	5	3	20	3	23	3
		22	2	9	2	6	2
		2	1				
Category 4	20	9	3	14	3	14	3
		9	1	3	2	4	2
		2	0	1	1		
Category 5	10	3	2	3	2	3	3
		1	1	1	-1		
		3	0				
		3	-1				
Category 6	4	1	0				
		3	-1				

Clinical success, according to the AHA classification, at 1 month showed 22.2% (14 patients) had grade 3 improvement, 39.8% (25 patients) had grade 2 improvement, and 19% (12 patients) had grade 1 improvement, while 9.5% (6 patients) did not improve, and 9.5% (6 patients worsened. The patients who showed no improvement or worsened were further managed. A total of 51 (80.95%) patients were improved clinically by iliac angioplasty alone, while 12 (19.05%) patients needed further management during the first month.

At 3 months another patient needed further management because his condition got worse because of extension of 5th toe gangrene to adjacent 3rd and 4th toes. While 50 (79.4%) patients were improving and continued to improve till the 6th month of their follow up.

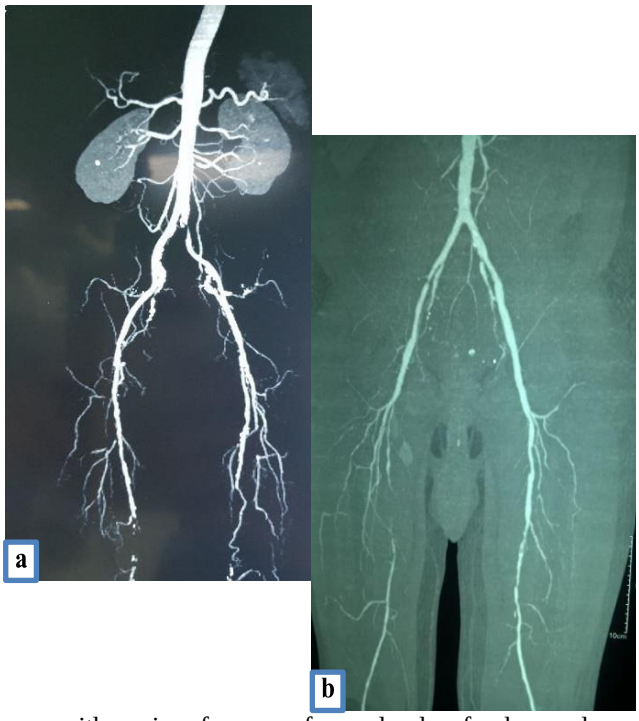

Fig. 1: Multi-level disease with sparing of common femoral and profunda vessels. a: common iliac artery stenosis of the left side. b: external iliac artery stenosis of the right side

It was found that , in the first month of follow up, for patient with intermittent claudication (Rutherford category 2,3), iliac angioplasty was sufficient to improve their complaint as 100% of patients in this category improved, 90% of patients having rest pain (Rutherford category 4) did not need any further management, 40% of patients having minor tissue loss (Rutherford category 5)did not need any further management, while 100% of patients having major tissue loss (Rutherford category 6) needed further management.

DISCUSSION

In our study, the patients underwent iliac angioplasty with or without stenting for patients having multi-level arterial disease of the lower extremity sparing the common femoral and profunda vessels, we followed up those patients for 6 months. The technical success was 95.5%, we failed to cross the iliac lesion in 4.5% of patients and they were offered a surgical option.

We had different patient presentation in our cohort, 45.5 % of patients had intermittent claudication (Rutherford's category 2, 3), 33.3% had rest pain (Rutherford's category 4), 15,2% had minor tissue loss (Rutherford's category 5), 6% had major tissue loss (Rutherford's category 6).

After the procedure was done and during follow up, we found that 51 patients (80.95 %) showed signs of improvement with different grades, while 12 patients (19.05%) showed no signs of improvement or got worse and those were subjected to a further procedure for revascularization Table 3. We found also that 100% patients with major tissue loss did not benefit from iliac angioplasty alone, while 100% of patients with intermittent claudication showed signs of improvement after the procedure and continued to improve during follow up.

90% of patients with rest pain showed signs of improvement after the procedure and continued to improve during the follow up period, Table 7,8,9.

Table 7: Improvement at 1 months

Rutherford category	3	2	1	0	-1	-2	-3
2,3	5	22	2				
4	9		9	2			
5		3	1	3	3		
6				1	3		
Total	14	25	12	6	6		

Table 8: Improvement at 3 months

Rutherford category	3	2	1	0	-1	-2	-3
2,3	20	9					
4	14	3	1				
5		3			1		
6							
Total	34	15	1		1		

Table 9: Improvement at 6 months

Rutherford category	3	2	1	0	-1	-2	-3
2,3	23	6					
4	14	4					
5	3						
6							
Total	40	10					

60 % of patients with minor tissue loss showed no signs of improvement and needed further revascularization procedure.

Several studies dealt with multi-level arterial disease in the form of iliac angioplasty and infrainguinal bypass.[8-14]

In the study by Timaran et al., it was found that previous iliac angioplasty improved the patency of later infrainguinal reconstruction.[14]

In another study by Timaran et al., it was found that poor distal run off doesn't affect patency of the iliac stent.[15]

As for Critical lower limb ischemia the European society of cardiology encourage aortoiliac correction (iliac stenting) with distal bypass in a one-step modality.[16]

CONCLUSION

Not so many studies that address the issue of multi-level disease in different categories of peripheral arterial disease, and most of them looks for total correction. As far our study addressed the issue of single level correction, and its effects on improving the patient's condition. We found that for patients with intermittent claudication, single level correction with follow up is a beneficial option. Patients with rest pain could also improve without

the need for further intervention while patients with major tissue loss, they will benefit more of iliac angioplasty as a part of a plan for total correction of their arterial disease.

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