

## Ipsilateral Antegrade Access for Management of Ostial and Near Ostial SFA Occlusive Lesions; Appraisal of New Technique

A.A.Ghani, A.A.El Samadoni, H.S.Affi and M.M.kenawy

General & Vascular Surgery Dept., Faculty of Medicine, Benha Univ., Benha, Egypt

E-Mail: 2enaawy@gmail.com

### Abstract

Peripheral arterial disease (PAD) is a major world-wide health problem affects 12%–14% of the general population. PAD of the superficial femoral artery (SFA) is the most common cause of intermittent claudication. Critical limb ischemia (CLI) is the most severe form of PAD. CLI is associated with a higher risk of limb loss in the absence of revascularization. The aim of this work is to evaluate the feasibility and to demonstrate the effectiveness of proposed technique of ipsilateral antegrade management of ostial and near ostial SFA occlusive lesions. This study was conducted on (20) Patients with critical lower limb ischemia and ostial and near ostial SFA lesions in the form of rest pain and tissue loss. The study period started from May 2017 until March 2019. Patients included in the study were essentially attending the Vascular Outpatient Clinic at Benha University Hospitals and Nasser Institute for Search & Treatment at Cairo and treated by ipsilateral antegrade SFA angioplasty. From the 20 patients of our study who underwent ipsilateral antegrade SFA angioplasty around 17 cases (85%) showed technical success "the guidewire crossed the lesion", while in the other 3 cases the guidewire couldn't be passed through the lesion. Endovascular therapy (EVT) in ostial and near ostial SFA occlusive lesions with ipsilateral antegrade access through common femoral artery puncture is a feasible and effective approach. It is the only baile out alternative method for the preferred approach "contralateral crossover" to the extremely tortuous iliac arteries, hostile aortic bifurcations, and abdominal aortic stent grafts.

**Keywords:** Antegrade, Revascularization, Ostial SFA Angioplasty.

### 1. Introduction

Peripheral arterial disease (PAD) is a major world-wide health problem affects 12%–14% of the general population. PAD can be defined on functional considerations as arterial narrowing, causing a mismatch between the oxygen supply and demand resulting in symptoms of intermittent claudication, exercise limitations, or tissue loss [1].

The SFA is a target of atherosclerotic disease predominantly in the distal section in the region of Hunter's canal where the adductor muscles tend to compress the artery and in the proximal section near the bifurcation to the deep femoral artery [2].

Critical limb ischemia (CLI) is the most severe form of PAD and represents approximately 1% of the total number of patients with PAD. The common major manifestations of CLI are rest pain and ischemic ulceration or gangrene of the forefoot or toes, representing a reduction in distal tissue perfusion below resting metabolic requirements [3].

Percutaneous angioplasty of the SFA is the proposed treatment of choice in the majority of patients with CLI on the basis of its reduced perioperative morbidity and mortality, and reduced in-hospital stay [4].

Endovascular treatment of the superficial femoral artery (SFA) is usually gained through an antegrade approach from the ipsilateral common femoral artery (CFA), or by crossing over from the contralateral CFA and the retrograde approach has proved to be a reliable alternative

vascular access in patients not suited for transfemoral intervention [5].

SFA lesions were defined as ostial if extending less than 1 cm from the origin of the vessel by visual estimation. Endovascular treatment of stenotic ostial lesions of the SFA is challenging. Flush SFA chronic total occlusion (CTO) adds extra challenge and difficulty [6].

The contralateral crossover approach is preferred by many vascular surgeons, in order to allow a more comfortable working area, but it has the drawback of poor pushability and torquability in the manipulation of devices [7].

The antegrade approach has the advantage of permitting the use of shorter tools, and additional support for manipulating catheters and guidewires and it gives very good pushability of the wire to cross the lesion. Its main drawbacks are the more demanding technical skills required for percutaneous puncture of the CFA. Ultrasound guided puncture may help to increase the success rate, especially in obese patients [8].

### 2. Patients and Methods

This study was conducted on [20] Patients with critical lower limb ischemia and ostial and near ostial SFA lesions in the form of rest pain and tissue loss. The study period started from May 2017 until March 2019. Patients included in the study were essentially attending the Vascular Outpatient Clinic at Benha University Hospitals and Nasser Institute for Search & Treatment at Cairo and treated by ipsilateral antegrade SFA angioplasty.

### 2.1 Inclusion criteria

We included patients with critical limb ischemia with limb threatening conditions of rest pain and tissue loss (Rutherford category 4, 5 or 6). Also, patients with near ostial (within 5cm from the ostium) SFA stenosis or occlusion based on CT scan or duplex measurement. Finally, Patients with SFA flush occlusion.

### 2.2 Exclusion criteria

Patients with lesions involving the CFA, patients with acute lower limb ischemia and obese patients with hanging abdomen. Patients with elevated serum creatinine levels "Poor renal function", patients with previous endovascular intervention in the same limb and patients with significant aorto-iliac disease were also excluded.

### 2.3 Clinical work-up

Careful history taking with special consideration to the complaint of the patient, history of present illness, past medical history of the patient and previous surgical interventions.

Careful clinical examination including general and local examination in the form of full pulse examination of the lower limb arterial system for all patients and all patients were assessed symptomatically with intermittent claudication or critical limb ischemia. Any possible risk factor was accurately analyzed, and the ankle-brachial index (ABI) was assessed.

### 2.4 Imaging investigations

Color-Doppler ultrasound (USCD) was carried out and peripheral computerized tomography (CT) angiography examination before the procedure.

Multislice CT was important to show the anatomy of the femoral bifurcation (high or low bifurcation) and its relation to the proposed puncture site.

Flush SFA lesions defined as CTO involving the ostium of the SFA with no patent stump or a stump less than 5mm in length based on CT scan or duplex measurement.

### 2.5 Statistical methods

Data was recorded in a database sheet, which was verified before data entry. SPSS program version 17 was used for data analysis. P-value: to find significant relation between two or more percentages for qualitative data: Statistical significance if P-value <0.05, Statistical high significance if P-value <0.01, Statistical not significant if P-value >0.05.

### 3. Procedure description

Puncture of the ipsilateral CFA against the medial aspect of the femoral head was done using US guidance, a "high" CFA puncture site

is chosen at the most cranial segment of the CFA. Injection of contrast material through the needle was done performing a needle angiogram. This identifies the anatomy of the femoral bifurcation Fig (1).



Fig (1) Needle angiogram

We use double wire technique, V18 and a 0.035 angled guidewire are introduced into the sheath (7F) and the V18 wire is advanced deep into any side branch of the profunda femoris artery (PFA), and left as a "profunda anchor". The introducer sheath partially inserted in the CFA. Wire in the profunda artery is in place to secure the access while advancing and to protect the profunda artery Fig (2).

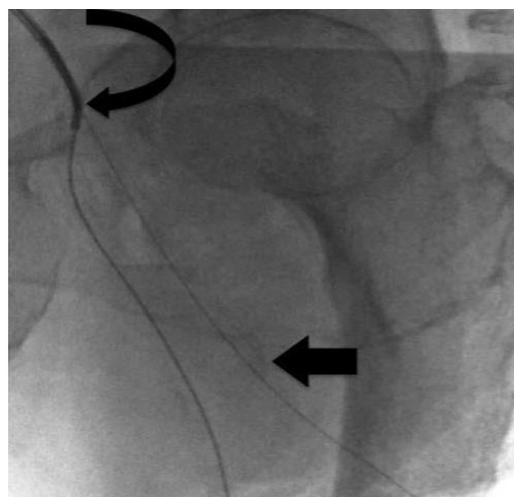


Fig (2) the two guidewires, V18 and a 0.035 "profunda anchor".

Terumo wire is advanced and to enter the SFA with angled short catheter with ipsilateral approach give very good pushability and used to engage any ostial cap or interrogate potential sites of SFA entry for recanalization. The option to obtain the intraluminal position of the wire will be usually difficult in this type of long lesions but it should be tried first. If failed, subintimal dissection plane will be created with an angled Terumo wire. Reentry into the true lumen below

the arterial occlusion was confirmed by angiography. The recanalized segment was then

subjected to balloon angioplasty, and finally we did completion arteriogram.



Fig (3) Successful recanalization of the SFA

4. Results

Demographic data: The present study included 20 limbs in 20 patients with severe chronic lower limb ischemia and near ostial SFA lesions. They

were 15 males (75 %) and 5 females (15%) ranged in age from 48 to 80 years (mean, 63.5 years) Table (1) .

Table (1) clinical associated Risk factors

Risk factors		Number	Percentage
Hypertension	No	3	15%
	Yes	17	85%
DM	No	2	10%
	Yes	18	90%
Smoking	No	7	35%
	Yes	13	65%
IHD	No	8	40%
	Yes	12	60%

From the total number of cases who underwent the ipsilateral antegrade SFA angioplasty around 17 cases (85%) showed technical success "the guidewire crossed the lesion", while in the other 3 cases the

guidewire couldn't be passed through the lesion. The three failed cases were suffering total length complete occlusion of the SFA. Also comparing the demographic data of both groups and the Rutherford classification were shown in the following Tables ( 2,3).

Table (2) Technical success

Technical success	Number	Percentage
Passed	17	85%
Not passed	3	15%

Table (3) Demographic data of the two groups

		Not passed (n=3)	Passed (n=17)	Test of sig.	p-value
Age (mean ±SD)		68.33± 10.4	62.65±6.7	t=1.25	>.05
Sex	female	1(33.3)	4(23.5)	X <sup>2</sup> =.131	>.05
No. (%)	male	2(66.7)	13(76.5)		
Rutherford	4	0(0)	4(23.5)	X <sup>2</sup> =1.14	>.05
Category	5	1(33.3)	7(41.2)		
No. (%)	6	2(66.7)	6(35.3)		

The guidewire was successfully passed endoluminal through the lesion in around 11 cases out of 17 total cases, which showed technical success. However, in the other six case the

guidewire could be passed through the subintimallayer. As shown in the following Table (4) .

Table (4) Type of wire passage

	Number	Percentage
Endo-luminal	11	64.7%
Sub-intimal	6	35.3%

#### 4. Discussion

Endovascular therapy (EVT) is on the frontline in the management of PAD of the superficial femoral artery and the treatment of occlusive disease has witnessed the introduction of more aggressive endovascular therapy. [9]

Ostial SFA lesion is significantly difficult due to the absence of SFA stump can impede successful wire access into the SFA. Furthermore, angioplasty at the SFA origin can occlude the ostium of the profunda femoris artery (PFA) [10].

Our study is concerned with evaluate the feasibility and efficacy of ipsilateral antegrade management of ostial and near ostial SFA occlusive lesions.

Another study is concerned with retrograde access to the ipsilateral iliac artery and conversion into an antegrade approach to the SFA [5].

While another study, is concerned with retrograde transpopliteal angioplasty for SFA occlusion [11].

In regards to age, the progressive increase in mean age of the population with CLI is responsible for the growing number of critical problems, as patients over 65 years old have a higher incidence of co-morbid factors (diabetes mellitus, atherosclerosis, hypertension, and heart failure).

Most of patients in our study and in others were above 50 years old. The age of patients in our study ranged from 48 to 80 years (mean, 63.5 years). M. Miralles ET AL., [5] in their series reported that the mean age of patients included in their study was 65.4 years (ranged from 60-71 years). However, in the study of [11] the age of patients ranged from 48- 85 years with a mean of 63.2 years.

In our study of 20 patients, 15 of them were males (75%) with Rutherford category (4 to 6).

Study of [5] was done on 16 patients, 14 of them were men and the other two were women. ). However, in the study of [11], they were 17 patients with frequency of gender, 11 were males and six were females and Rutherford (3 to 5).

From the above-mentioned data, males were majority and that may reflect that gender is an important determinant risk factor.

In our study, from the total number of cases who underwent the ipsilateral antegrade SFA angioplasty 17 cases (85%) showed technical success "the guidewire crossed the lesion", while

in the other three cases the guidewire couldn't be passed through the lesion.

In the study of [11] retrograde transpopliteal approach was done and either ultrasound or fluoroscopic guidance was used for retrograde puncture with initial technical success reaching 82.4%.

While in M. Miralles et al., [5] study, successful reverse ipsilateral catheterization was obtained in 15/16 patients. In one case, excessive calcification of the ipsilateral CFA and iliac arteries required a crossover approach from the contralateral groin.

According to the current study, the guidewire was successfully passed endo-luminal through the lesion in around 11 cases out of 17 total cases which showed technical success. However, in the other six cases the guidewire could be passed through the subintimal layer.

However, in [11] study, transluminal angioplasty was initially attempted in all 17 cases and if it did not succeed, subintimal angioplasty was then performed. Technical success was achieved in 14 patients and 5 of them passed by subintimal angioplasty.

In our study, vessel perforation occurred in 4 patients and the perforations occurred at the proximal SFA during the attempt to cross the lesion and they were small perforations treated only by compression without surgical intervention. However, none of our cases suffered Intraoperative thrombosis. Also, Small hematoma at the puncture site occurred in 2 cases which required no surgical intervention and resolved spontaneously.

However, in [11] study, two cases had complications at the popliteal puncture site (one was subclinical hematoma and the other was small aneurysm, 11.8 %).

#### 5. Conclusion

Endovascular therapy (EVT) in ostial and near ostial SFA occlusive lesions with ipsilateral antegrade access through common femoral artery puncture is a feasible and effective approach. The high success rate reported in the present study demonstrates the effectiveness of this approach in patients with occlusive peripheral arterial disease of ostial SFA lesions. The ipsilateral antegrade approach has the advantage of permitting the use of shorter tools, and additional support for manipulating catheters and guidewires. Superior wire's pushability, trackability, and torquability as the entire force applied to the wire and catheter is

transmitted to the lesion. Furthermore, it is the only reliable alternative method for the preferred approach "contralateral crossover approach" to the extremely tortuous iliac arteries, hostile aortic bifurcations, and abdominal aortic stent grafts. Elderly patients, who are unfit for surgery may greatly benefit from this less invasive therapy.

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