

Short Term Results of Retrograde Transpopliteal Access in Management Flush Superficial Femoral Artery Chronic Total Occlusions.

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ABSTRACT

Purpose: to evaluate the safety and efficacy of retrograde transpopliteal access after failed antegrade recanalization in limbs with flush occlusion of the superficial femoral artery (SFA). **Methods:** this is a prospective study including patients presenting with critical limb ischemia due to flush SFA occlusion for whom retrograde transpopliteal access was utilized after failure of antegrade revascularization at the vascular surgery department in Kasr Al Aini hospitals during the period between May 2014-May 2016. **Results:** the study included 16 patients with a mean age of 64years and male to female ratio 7:1. All patients presented with CLI (Rutherford category 4-6), all lesions were TransAtlantic Society Consensus (TASC) II D, Technical success was accomplished in 15 cases (93.75%). In 2 cases, re-entry to the true lumen was achieved using bidirectional balloon dilatation. In one case, failure to cross the target lesion via both antegrade & retrograde accesses occurred. Complications included 2 puncture site hematoma that were managed conservatively; no AVF. There was no perioperative mortality. Primary patency was 75% at 6month. **Conclusion:** retrograde popliteal access is safe and effective bailout technique after failed antegrade recanalization in patients with flush SFA occlusion.

Keywords: Flush occlusion - superficial femoral artery - endovascular – retrograde.

INTRODUCTION

Peripheral arterial disease is widely prevalent, affecting about 17% of the US population above the age of 70^[1].

Involvement of Femoro-popliteal segment occurs in 20–40% of patients with critical limb ischemia (CLI). While it is the most common site affected in claudicants ^[2].

Treatment of CLI is directed towards prevention of limb loss, relieve rest pain, heal ischemic ulcers, improve the patients' function and prolong the survival. To achieve these goals unobstructed blood flow to one or more tibial vessels is required ^[3].

Surgical bypass has been the primary therapeutic modality for TransAtlantic Inter-Society Consensus (TASC) C and D lesions ^[4]. However there has been a paradigm shift over the past decade, currently endovascular-first approach is considered the standard of care for patient with femoropopliteal occlusive disease ^[5].

Flush occlusion of the superficial artery (SFA) represent a unique challenge for endovascular therapy, the absence of stump usually preclude

wire access to the artery. Moreover angioplasty and/or stenting of the proximal SFA might compromise the origin of profunda femoris artery^[6].

Choosing the ideal arterial access is another dilemma, endovascular treatment for chronic total occlusion (CTO) of the SFA is usually done in an antegrade fashion through the ipsilateral or more commonly the contralateral common femoral artery (CFA) ^[7].

However failure of intervention and or recanalization occurs in 25% of cases when using the conventional antegrade approach ^[8]. When the lesions are not amenable to antegrade recanalization retrograde Transpopliteal access is a viable alternative. Brachial access is used infrequently because it requires dedicated balloons and stents with long shafts to allow treatment of associated tibial lesion as well and may require a second ipsilateral access to increase the success rate ^[9].

Retrograde transpopliteal access described by Tonnesen et al. ^[10] has been reported to facilitate endovascular intervention ^[11-12].

PATIENTS AND METHODS

This is prospective study of consecutive 113 patients presenting with flush SFA occlusion (no stump or stump < 3 mm) and indicated for endovascular recanalization at the vascular departments in Kasr Al Aini Hospitals in Egypt between May 2014 and May 2016.

All patients presented with CLI, Rutherford categories (RC) 4, 5 or 6. Bypass surgery was not an option as a first choice either due to unfitnes, distal infection or patient's refusal to undergo surgery.

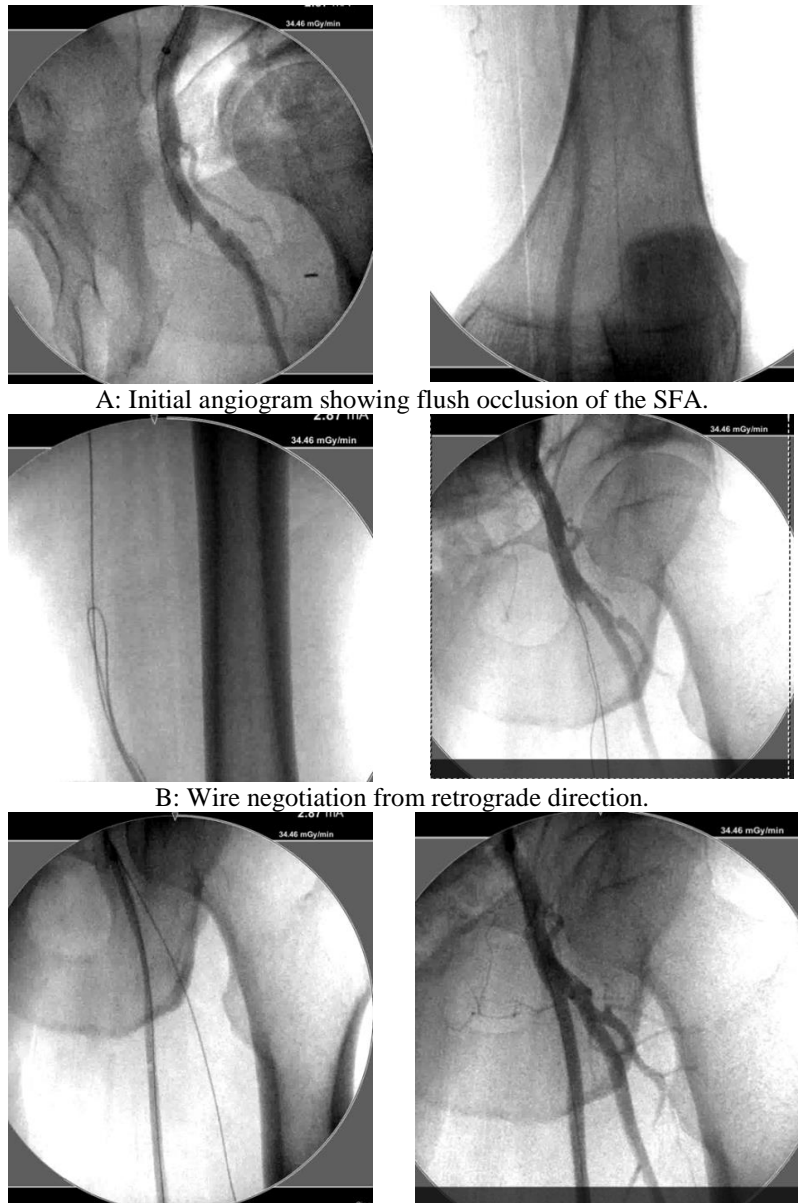
Patients were consented for the risks of the intervention. The study was approved by ethical committee of Kasr Al Aini, General Sugery department.

Of these, 16(14.1%) patients underwent trans-popliteal retrograde procedures after failure of a standard antegrade recanalization utilizing the retrograde contralateral femoral access. Patients' demographics are illustrated in table (1)

All patients started a 300-mg loading dose of clopidogrel, 6 hours pre-procedural. After initial anticoagulation with unfractionated heparin (5000 IU), all flush SFA lesions were tackled initially using a standard antegrade recanalization strategy utilizing a retrograde contralateral femoral access. A 0.035" hydrophilic Terumo wire supported by a 4F angled glide catheter was used to tackle the target lesion. If antegrade recanalization proved to be impossible (negotiation time up to 30 minutes) owing to inability to cross the lesion intraluminally or subintimally or failure of re-entry to the true lumen distal to the occlusion, we used a retrograde popliteal access strategy to complete the procedure.

While the patients were in a supine position, the lower extremity was externally rotated 60 degrees with slight knee flexion; a medial retrograde popliteal access at the level of the infracondylar plane was followed. After an initial angiogram, cannulation of the distal popliteal artery (P 3 segment) was done via a 21-gauge micropuncture needle, guided by fluoroscopy and a road map. Following a successful cannulation, 5 F sheath was inserted, and we started to negotiate the lesion distally either in subintimal or intraluminal plane, using a 300 cm V-18 guidewire (Boston Scientific, Natick, Mass). In most cases (13/16, 81.25%), the V-18 wire easily crossed the proximal subintimal passage created initially via the antegrade approach and re-enter into the true lumen Figure (1).

In cases (2/16, 12.5%) where the retrograde wire was unable to cross the lesion, or unable to re-enter the true lumen, a bidirectional balloon dilation was performed until the retrograde dissection entered comes in communication with the subintimal channel established previously through the antegrade approach. After crossing, the retrograde wire was directed into the tip of the antegrade multipurpose catheter to facilitate subsequent procedures in an antegrade manner, with PTA and elective stenting of the defined lesions. This is of extreme importance to limit the mechanical barotrauma to the popliteal vessel, as well to limit the size of the distal sheath. To achieve hemostasis, gentle balloon dilatation to P3 segment is done with an appropriate sized balloon and final angiogram was done via antegrade sheath, then manual compression was done at the site of popliteal puncture.



A: Initial angiogram showing flush occlusion of the SFA.

B: Wire negotiation from retrograde direction.

C: Angioplasty of the SFA and popliteal artery and final angiogram.

Fig. (1): Shows a successfully recanalized SFA occlusion via retrograde PA.

Postoperatively, the patients were maintained on clopidogrel (75 mg/d) and aspirin (100 mg/d) for 12 weeks, and then a mono anti-platelet therapy was prescribed. Follow up was done at 3, 6 months post-procedural, by means of clinical evaluation, ABI and duplex ultrasonography.

Technical success was defined as successful guidewire passage via the occlusion aided by a

retrograde popliteal artery (PA) access with <30% residual stenosis after intervention.

A technically successful PA puncture was defined as the performance of a retrograde procedure without causing local dissection, or an arteriovenous fistula at the puncture site.

RESULTS

In a 24-month period, 16 patients (14 male and 2 female) out of 113 patients who were treated for CTO flush SFA lesions mandated the use of retrograde popliteal access.

All patients had CLI Rutherford categories (RC) 4, 5 or 6. Bypass surgery was not an option as a first choice either due to unfitness, distal infection or patient's refusal to undergo surgery.

Table (1): Lists the patients' demographics.

<i>variables</i>	<i>n</i>
patients	16
Mean age	63 (56-70)
Diabetes	16
HTN	13
Smokers	14
IHD	5
Previous stroke	3
COPD	1
Renal impairment	2
Rutherford category	
4	5
5	7
6	4

Treated Lesions & technical success:

Indication for trans-popliteal access was failure of a standard antegrade recanalization utilizing the retrograde contralateral femoral access.

Table (2): lists treated lesions and technical success

<i>Variables</i>	<i>n</i>
Occlusions	16
TASC II	
D	16
Technical success	15(93.75%)
Bidirectional dilatation	balloon 2(12.5%)
Hematoma	2
AVF	0

Technical success rate was accomplished in 15 cases (93.75%). In 2 cases, re-entry to the true lumen was achieved using bidirectional balloon dilatation via antegrade & retrograde accesses. In

one case, failure to cross the target lesion via both antegrade & retrograde accesses occurred and the patient was immediately converted to an open surgery (femoro-lower popliteal bypass).

Complications included 2 puncture site hematoma that responded well to conservative management & no cases were reported to have AVF between the popliteal vessels at the final angiogram. During follow up period of 6 months, primary patency was 75%.

DISCUSSION

Flush SFA lesions (CTO) were considered a contraindication to endovascular therapy.⁽¹⁴⁾ However in a meta-analysis comparing the outcome of both infra-inguinal bypasses & endovascular therapy in femoro-popliteal lesions, it was shown that endovascular therapy has a technical success rate of 91%, and a primary patency of 62% at 1 year with a favourable salvage rate at 88%.⁽¹⁵⁾

It is advisable to perform endovascular therapy for flush SFA lesions using a retrograde contralateral femoral access or antegrade ipsilateral common femoral artery approach⁽¹⁶⁾.

A bail out technique was suggested by Tonnesen et al.⁽¹⁰⁾ to use ipsilateral popliteal artery (PA) as a retrograde access in cases with failure of antegrade revascularization for such lesions.

Though this technique had not gained popularity among surgeons due to concerns regarding PA puncture site complications⁽¹⁷⁻¹⁸⁾.

We believe that indications for PA should include cases with:

- Hostile femoral access
- Absent femoral pulse secondary to a proximal arterial occlusion, heavily calcified CFA, high SFA takeoff, prosthetic grafts, hostile groin scar and pendulous abdomen
- Lesion morphology
- Flush SFA lesions, large collaterals takeoff at sites of occlusion
- Failed antegrade femoral access

In the current study, cases with flush SFA lesions and failed antegrade revascularization were set for a retrograde PA as a bail out technique before conversion to open surgery, due to unfitness, distal infection or patient's refusal to undergo surgery.

16 patients out of 113 cases with flush SFA lesions over 24 months duration had a trial for retrograde PA aiming at crossing the addressed lesions. We had a technical success of 93.75% (n=15), with a 6months patency rate of 75%. 2 cases required bidirectional balloon dilatation to aid the process of wire passage via the addressed lesions, while in the rest of the cases, i.e. (n=13), the negotiating wire had passed through the occlusion easily to re-enter the true lumen in CFA. In one case, it was impossible to cross the lesion in a retrograde fashion as well as the antegrade access mandating conversion to open bypass.

These results were in accordance with Spreen et al., who had nearly similar results with technical success of 84 %⁽¹⁹⁾.

In a study by Ye et al.⁽²⁰⁾ they reported a success rate of 100% which stresses on our belief towards the high success rate of the retrograde popliteal puncture. About 81-100% technical success for retrograde PA was reported in the literature^(16,20).

Retrograde PA hasn't gained popularity among vascular surgeons as it needs the patient to be turned prone during the procedure, as well performing the rest of the procedure through the antegrade approach will be technically demanding and will lead to patient fatigue especially if obese or complaining of COPD,⁽²⁰⁾ that's why we adopted the medial infracondylar approach during popliteal puncture in a supine position described by Fanelli et al⁽¹¹⁾.

Concerns related to retrograde PA, include puncture site hematoma, AVF, PA occlusion. In our study, 2 cases had puncture site hematoma that responded well to conservative treatment. We haven't experienced AVF as a complication in our cases however there is a reported incidence of 14% especially if a retrograde puncture is done in a prone position.⁽¹⁷⁾ This may be attributed to the medial infracondylar approach in a supine position that significantly decreases this incidence⁽²⁰⁾. Instances for distal embolization during PA are less if compared to the usual antegrade femoral access⁽²¹⁾. In two cases we were obliged to utilize SAFARI (subintimal arterial flossing with antegrade-retrograde intervention) technique after a successful retrograde PA due to inability of re-entry to the true lumen. It is preferable to use a wire balloon technique without sheath insertion during performing retrograde PA to minimize the

mechanical trauma to P3 segment.⁽²⁰⁾ However, we tend to use 5F sheath in all of our cases without reporting any complication on final angiograms.

In a study done by Evans et al.⁽²²⁾ it was proved that the arterial approach used for angioplasty had no influence on patency rate.

CONCLUSION

Retrograde popliteal access is safe and effective bailout technique after failed antegrade recanalization in patients with flush SFA occlusion.

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