

CONTROVERSES ET ACTUALITÉS EN CHIRURGIE VASCULAIRE  
CONTROVERSIES & UPDATES  
IN VASCULAR SURGERY

**JANUARY 25-27 2018**

MARRIOTT RIVE GAUCHE & CONFERENCE CENTER

PARIS, FRANCE

WWW.CACVS.ORG



## ENDOVASCULAR TREATMENT OF **SFA**

WHAT TO DO IN CASE OF  
**DISSECTION**,  
HOW TO **REENTER THE LUMEN**,  
WHEN TO **STENT**,  
WHEN NOT TO?



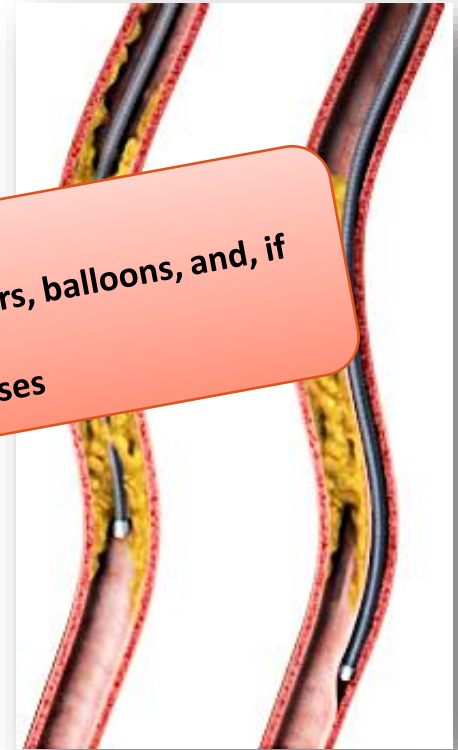
2018

**E.DUCASSE**

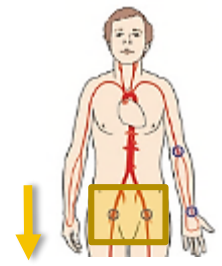
**MD PHD FEBVS, CHU DE BORDEAUX**

# ENDOVASCULAR TTT OF SFA NOWDAYS

- PTA first introduced in the 1960s' <sup>1,2</sup>
- Challenge = **passage of guidewire through CTOs**
- Clinical presentations are becoming **worse** and worse
  - ↗ length
  - ↗ number of **CTOs** (up to 50% in daily practice)<sup>3</sup>
- These lesions are often **underrepresented** in clinical trials
  - ≈30% of CTOs in most RCTs
- **Subintimal**
- **Reimbursement** is becoming more restricted
  - most revascularizations are performed with simply wires, catheters, balloons, and, if necessary, stents
  - reentry devices are usually reserved for exceptionally difficult cases
  - experience and devices now available
- CTOs with a strong calcium component and extensive lesions (>15 cm) are still a factor of failure
- **A crossing rate of 90% is only encountered in expert centers**
- Long CTOs starting in the SFA and reconstituting in a distal tibial vessel may be the most challenging



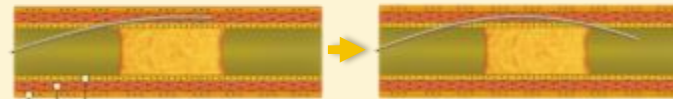
# WHAT TO DO IN CASE OF DISSECTION



## 1/ Antegrade approach

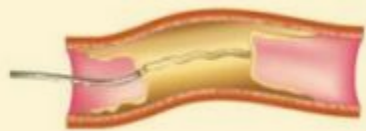
Sometimes dissection is **inevitable** or even **intentional**<sup>1,2</sup>

### Guidewire alone



$\pm$  support catheter or OTW balloon

### Sliding Technique

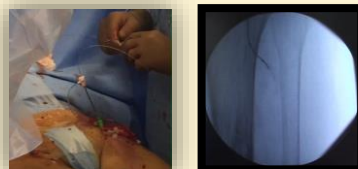


Guidewire with polymer + hydrophilic coating

### Drilling Technique



Stiff hydrophobic guidewire / non tapered



### Penetration Technique

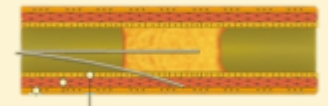


Alternative to the drilling technique

Severely calcified lesions/resisting CTOs

Super-stiff guidewire / tapered

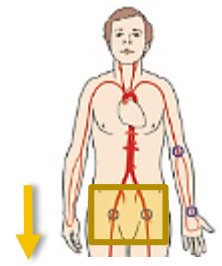
### Parallel wire technique



First wire enters false lumen, it is left in place

Second wire (typically stiffer and tapered with different tip bend) is passed parallel to the first wire into the true lumen

# WHAT TO DO IN CASE OF DISSECTION

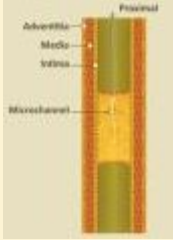


## Microchannel Technique

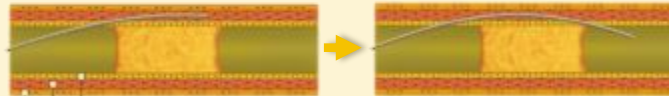
majority of CTOs have intraluminal microchannels from 100µm-500µm

proximal fibrous cap is first centrally penetrated to 1mm–2mm with very stiff guidewire and support catheter

careful injection of undiluted contrast (1mL) immediately distal to proximal cap of CTO identifies and enlarges microchannels creating a pathway between proximal and distal true lumens

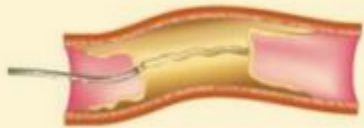


## Guidewire alone



± support catheter or OTW balloon

## Sliding Technique



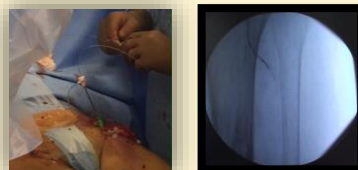
Guidewire with polymer + hydrophilic coating



## Drilling Technique



Stiff hydrophobic guidewire / non tapered



## Penetration Technique



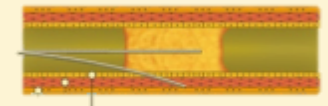
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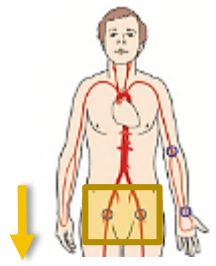
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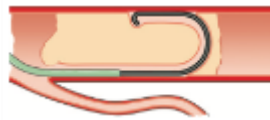
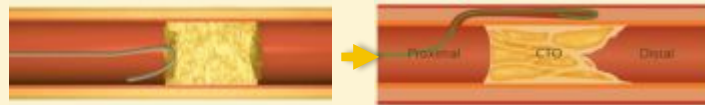
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# WHAT TO DO IN CASE OF DISSECTION



## 1/ Antegrade approach

**Guidewire loops over CTO**  
**Loop wire technique (Knuckle technique)**  
Standard floppy guidewire

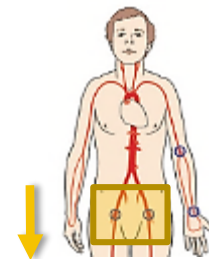


### + support catheter or OTW balloon

- Helps for loop creation and control of its length and shape during the recanalization process
- Helps « Un »looping the guidewire at the end to use its angulation in order to re-entre into the true lumen
- Helps verify the true lumen re-entry with contrast medium injection
- Helps exchange guidewires if necessary

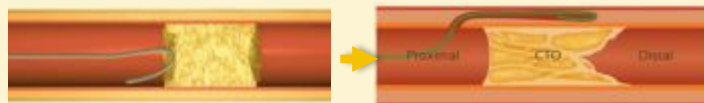
- Gradually choosing stiffer guidewires with higher tip loads
  - Start with 0.035 hydrophilic, angled Glidewire (Terumo Interventional Systems, Inc., Somerset, NJ)
    - supported by a 0.035-inch support catheter
  - Change for stiff 0.035 guidewire for more support
    - Or Terumo Advantage
  - Change for 0.018 or 0.014 if necessary

# HOW TO REENTER THE LUMEN



## 1/ Antegrade approach

**Guidewire loops over CTO**  
**Loop wire technique (Knuckle technique)**  
Standard floppy guidewire



## Perforation

- **5-8% of the cases** <sup>1,2</sup>



- Wire is seen under fluoroscopy as traveling outside the normal course of the arterial anatomy
- Tip of the wire curls abnormally as it enters the soft tissue planes
- Angiography may reveal extravasation of contrast material



**DO  
NOT  
PANIC**

- **Wire should be withdrawn**
  - and an attempt made to find a **new subintimal plane to cross the lesion**
- **Isolated wire perforations usually seal with conservative management**
- **Worse case scenario**
  - *Stop the procedure and resume a few weeks later*
  - *Use a Stent graft if you manage to re-enter*





# HOW TO REENTER THE LUMEN



## 2/ Retrograde approach

*First series by Spinosa et al. JVIR 2005*



- **High risk to damage distal target vessel by continuing antegrade approach**
  - while it might be the only landing zone for bypass
- **Inability to re-enter into the true lumen**
- **Rupture or loss of the antegrade vessel pathway**
- **Inability to correctly identify the origin of peroneal or tibial artery**

**Consider a retrograde approach rapidly after the first re-entry failures rather than engaging in prolonged attempts**

**These procedures are time and energy consuming for the patient and the team!!**



# HOW TO REENTER THE LUMEN

## 2/ Retrograde approach

First series by Spinosa et al. JVIR 2005



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**Optimal installation is key**

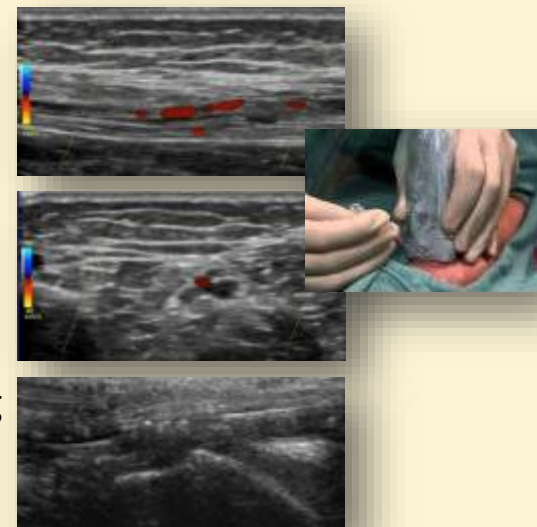
**Sterile preparation  
of both groins  
+ entire leg**



**Ultrasound guided puncture  
(ATA+++)**



- Identify target artery in longitudinal view
- Puncture at 45° in transversal view
- Verify intraluminal positioning of guidewire in longitudinal view





# HOW TO REENTER THE LUMEN

## 2/ Retrograde approach

First series by Spinosa et al. JVIR 2005



- **High risk to damage distal target vessel by continuing antegrade approach**
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### Fluoroscopy guided puncture

**Optimal installation is key**

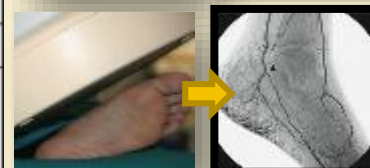
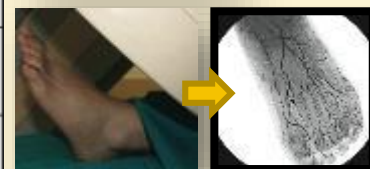
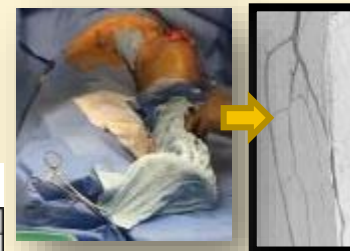
**Sterile preparation  
of both groins  
+ entire leg**



- **Simple scopy if calcified**
  - If not proximal injection + road-mapping
- **Parallax adjustment +++**

R. Ferraresi, CACVS 2014

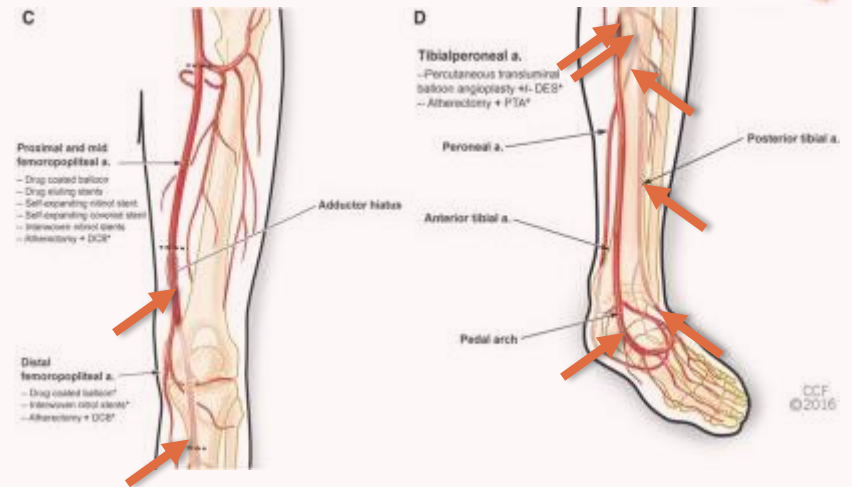
Artery	Preferred oblique view	Preferred segment	Skin puncture site	Needle length
Anterior tibial	Omolateral 20-40°	Every segment	Antero-lateral aspect of the leg	4-7 cm
Posterior tibial	Lateral	Distal, retromalleolar segment, proximal plantar arteries	Medial aspect of the ankle	4-7 cm
Peroneal	Omolateral 20-40°	Every segment	Antero-lateral aspect of the leg; the needle crosses the interosseus membrane	7 cm
Dorsalis pedis	Antero-posterior	Every segment	Dorsum of the foot	4 cm
Foot arteries	Antero-posterior	<ul style="list-style-type: none"> <li>First metatarsal artery</li> <li>Tarsal arteries</li> <li>Collaterals</li> </ul>	Dorsum of the foot Plantar access is not practical because of skin thickness	4 cm



# HOW TO REENTER THE LUMEN

## 2/ Retrograde approach

- Through the distal tract of the ATA
  - usually the easiest
- Through the proximal tract of the peroneal artery
  - right between the bones
  - not possible to perform manual compression
  - rare risk of compartment syndrome
- Through the PTA
  - more difficult, especially around the malleolar area



## Which artery?

Punctured artery	No.	Tibial artery	1.412
Popliteal	675 (32%)	Anterior tibial	350 (25%)
Tibial artery	1.412 (68%)	Posterior tibial	458 (32%)
Other (SFA, metatarsal etc.)	269 (11%)	Peroneal	42 (3%)
		Dorsalis pedis	130 (9%)
		Not specified	432 (31%)

## Results

	Popliteal	Tibial	Overall
Access	136/139 (98%)	246/263 (94%)	95%
Lesion crossing	115/136 (85%)	222/250 (89%)	87%
Complications	6/139 (4,3%)	13/263 (4,9%)	4,7%

**2017**

A systematic review  
of results with the  
retrograde tibial approach

**Olaf J. Bakker**  
Vascular Surgeon  
UMC Utrecht, The Netherlands

UMC Utrecht

Universitätsklinikum  
Leipzig  
Anstalt öffentlichen Rechts

# HOW TO REENTER THE LUMEN

## 2/ Retrograde approach



### Dedicated material

- 16-G needle or 21-G micropuncture kit
- Antispasm Cocktail
- Wires
  - 0.018" guidewires / 0.014" guidewires
  - Wire escalation strategy (stiffer wire)
- Support catheters or OTW balloon catheters



500 mL heparinized normal saline
3,000 µg nitroglycerin
2.5–5 mg verapamil

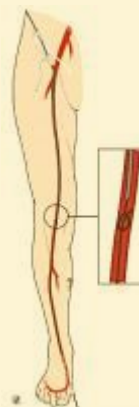


### Sheathless +++

- Guidewire and catheter inserted directly through the skin
- Procedure resumed by antegrade way



### SAFARI



### 3-4F microsheath

- Only when you need to use a balloon



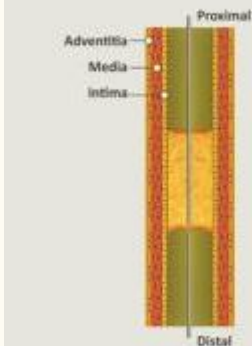
# HOW TO REENTER THE LUMEN



## 2/ Retrograde approach

### Sheathless

#### Just-Marker Technique



As compared to proximal cap, distal cap is usually less resistant which makes penetration easier

Proximal re-entry is usually not an issue

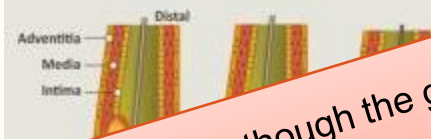
### Hemostasis

In certain cases, the balloons are not able to cross the lesion even though the guidewire crossed  
= **“Balloon Uncrossable” CTOs**  
Can be managed by a « telepherique » technique  
→ failure in 2–9% of CTOs

### 3-4F Micro-Sheath

#### « Rendez-vous »

#### CART Technique



Moderate-sized balloon in the sub-intimal space to create a dissection plane, crack the intima and allow reentry into the lumen either via an antegrade or retrograde approach

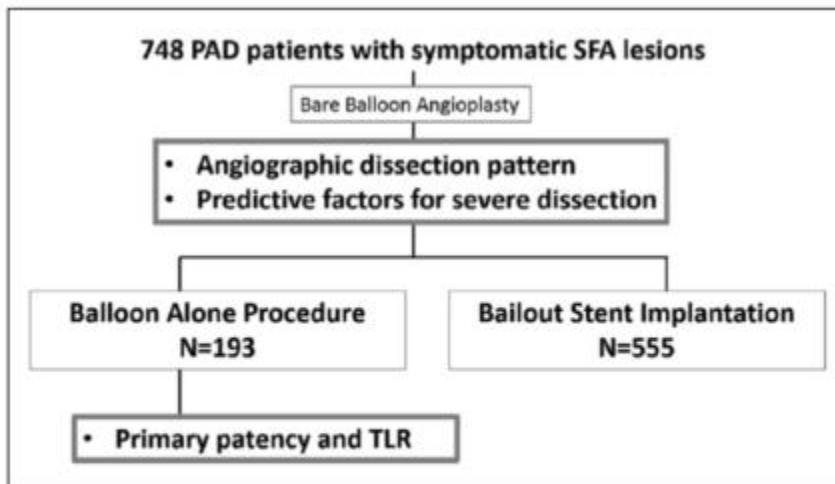
# WHEN TO STENT

J Endovasc Ther. 2017 Jun;24(3):367-375. doi: 10.1177/1526602817698634. Epub 2017 Mar 20.

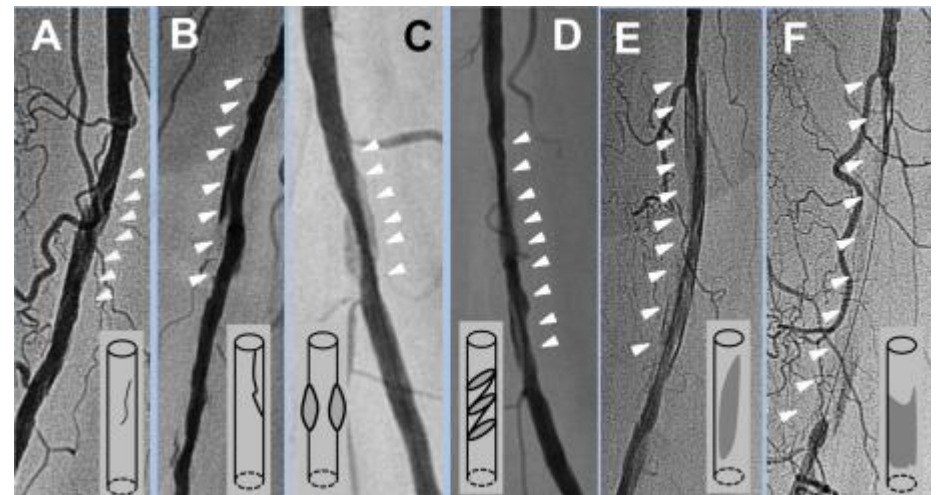
## Angiographic Dissection Patterns and Patency Outcomes After Balloon Angioplasty for Superficial Femoral Artery Disease.

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### Definition of Vessel Dissection



**Figure 1.** Flowchart of the study. PAD, peripheral artery disease; SFA, superficial femoral artery; TLR, target lesion revascularization.





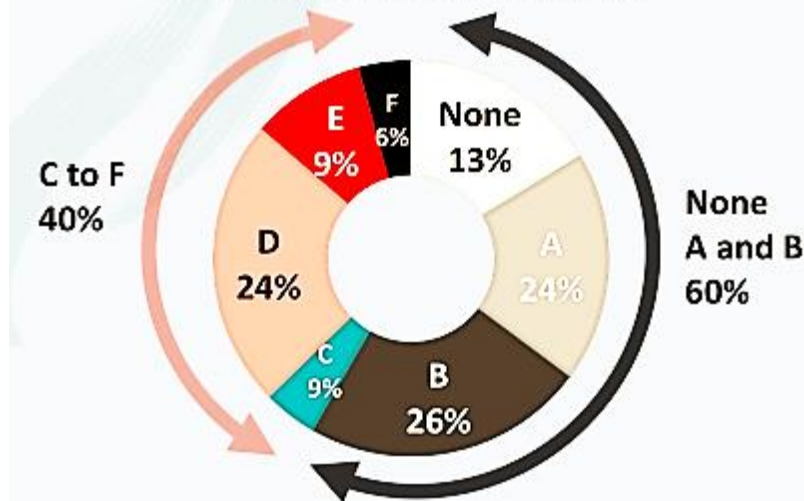
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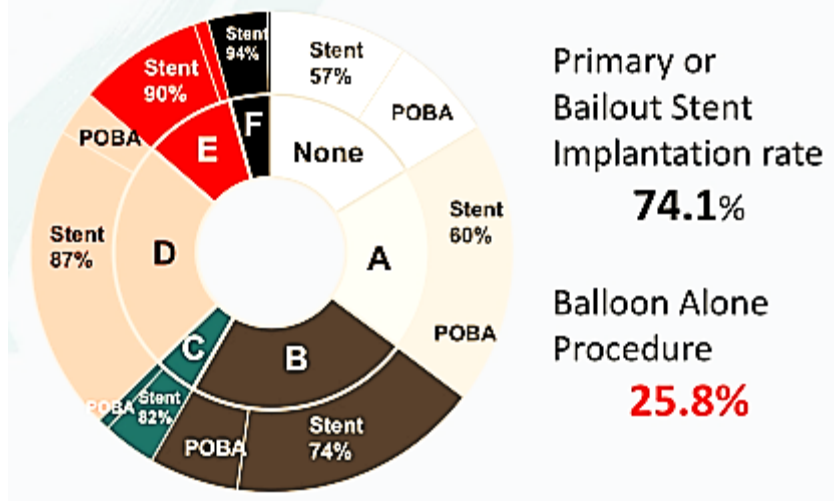
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### Dissection Pattern of Post Balloon Angioplasty



### Stent Implantation rate between Dissection Pattern





# WHEN TO STENT

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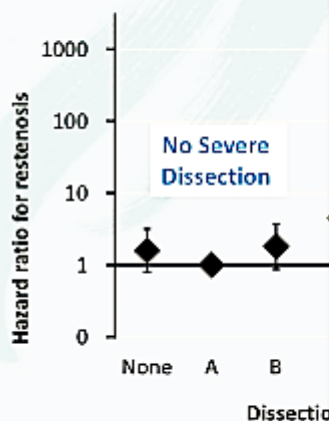
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### Predictive factors for Severe dissection - Multivariate analysis

	Severe Dissection (Type C,D and F)			
	Uni-P value	HR	Multivariate 95%CI	P Value
Non Hemodialysis	0.0159	1.09	0.74-1.63	0.64
CTO	<0.0001	4.3	3.02-6.4	<0.001*
TASC CD	<0.0001	2.1	1.46-3.06	<0.001*
Reference vessel diameter<5mm	<0.0001	1.94	1.25-3.04	0.0032*
Non Severe Calc	0.0308	1.38	0.95-2.02	0.08
Large inch system balloon (0.035inch)	0.0080	1.60	0.97-2.67	0.06
Vessel/balloon size<1.0	0.0004	1.28	0.76-2.15	0.34
IVUS usage	0.013	1.55	1.06-2.27	0.021*

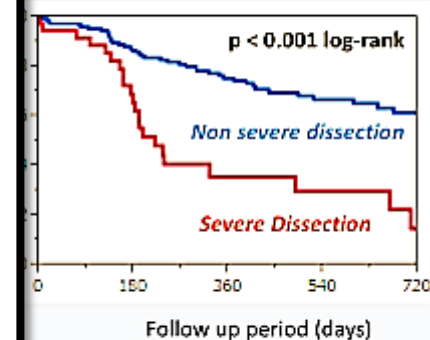
### Hazard comparison



Data are unadjusted hazard ratios for restenosis from a multivariate regression model with mixed effects. In each plot, the diamond indicates the hazard ratio and the vertical bars indicate 95% confidence intervals. \*p < 0.05 (Vienna, Austria).

### Outcomes of Procedure

Free from Clinically Driven TLR



Days	0	180	360	540	720
At Risk (Category 1)	155	118	78	47	33
%	100	86	75	67	62
At Risk (Category 2)	38	20	8	6	3
%	100	66	34	30	15

# WHEN TO STENT



- **SO YES** to the « no metallic implant left behind »
  - But only in lesions **<10-15 cm**
- **AND NOT** in **CTOs**
  - Which are **long and calcified** lesions
  - Often present with **Flow-limiting dissection**
    - A Dissection can't heal by itself when the blood-fluid pressure between the two sides of the dissection is **>10mmHg**
  - And **residual stenosis/recoil >50%**



**it's difficult to keep them open for a long time without scaffolding**

- At least in the proximal or distal portion
- and sometimes we need a full-length stent

# CLINICAL CASE : ♂ 58 YEARS OLD

- **CV risk factors : Active Smoking, DM**
- **History :**
  - 2008 : CLI right limb over occlusion of right SFA
    - Recanalization failure of SFA by antegrade & retrograde approach
    - Numerous collaterals coming from the profunda
  - **Medical therapy**
  - Obese, COPD, CKD-EPI : Cr 36 mL/min
  - **Alcoholic cirrhosis**
    - waiting for a second liver transplant for ischemic cholangitis
  - CAD with myocardial pathology (stents x 2), ablation of atrial fibrillation in 2016
- **Clinical Evaluation :**
  - **Severe claudication of right limb (<100m)**
    - Stridness : 70m right calf pain
  - No popliteal or distal pulses
  - ABI : 0.25 right / 0.83 left

# CTA

FRONT



BACK



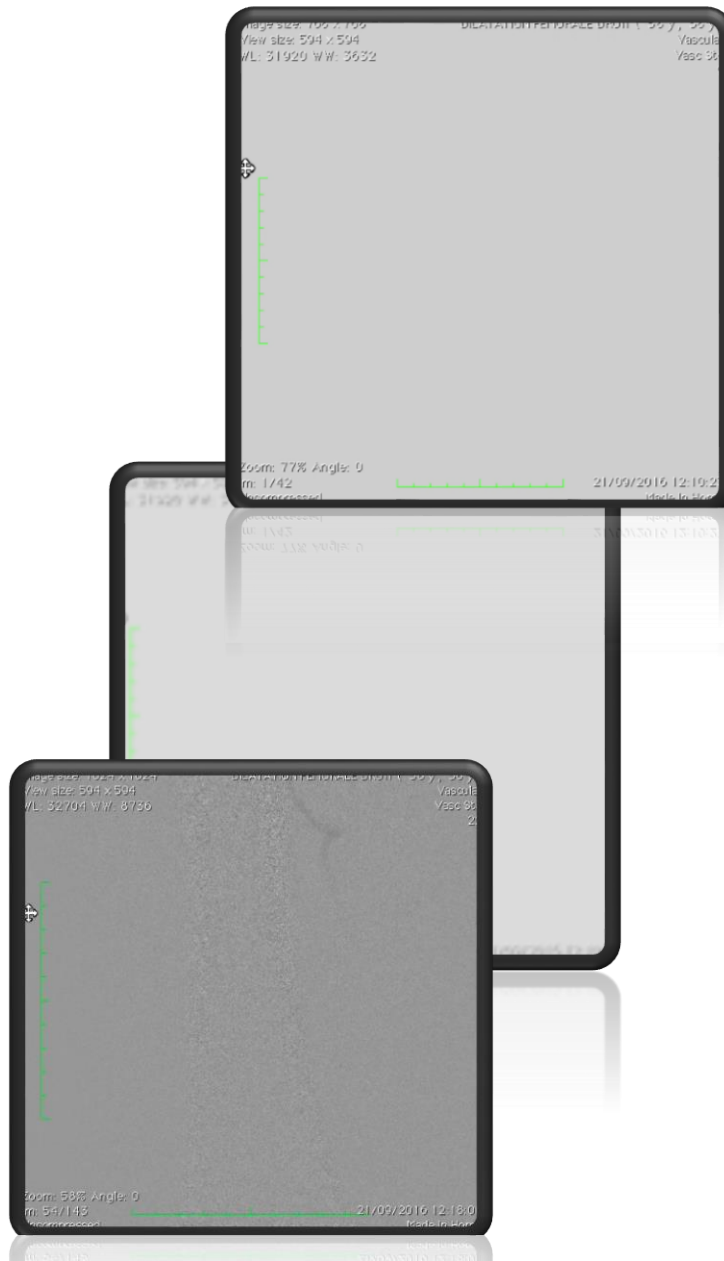
# ANTEGRADE APPROACH FIRST

**No SFA Stump** → PC puncture of left CFA + CROSS OVER

- Short 6F sheath
  - Glide Terumo guidewire 0.035" x 180 cm
  - UF catheter
- 
- Stiff Terumo guidewire 0.035" x 180 cm
  - Long 6F sheath pushed inside the right CFA



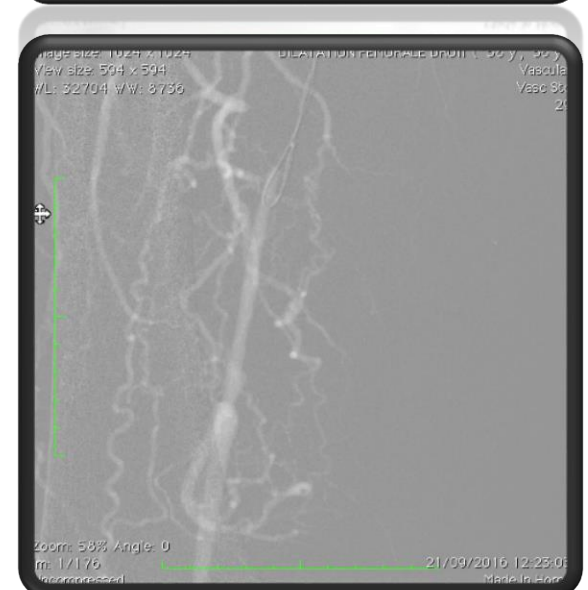
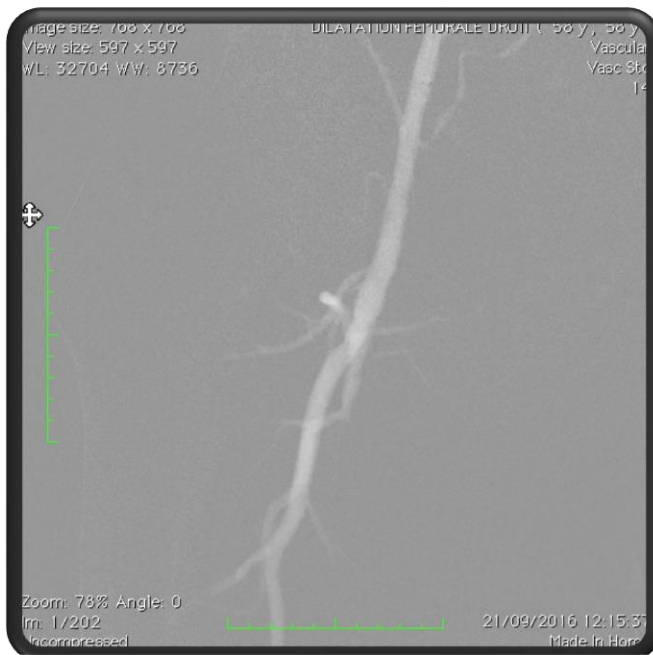
# ANGIOGRAM





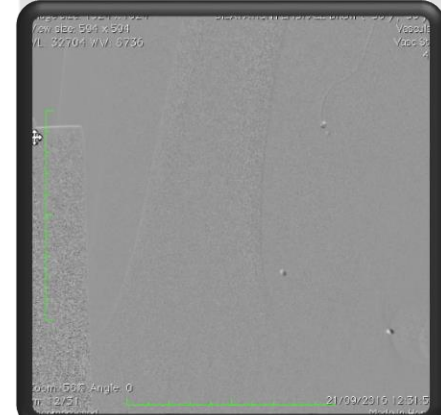
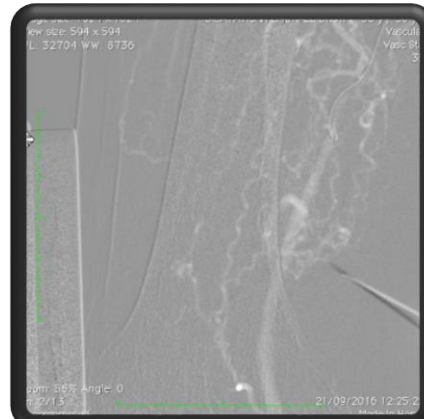
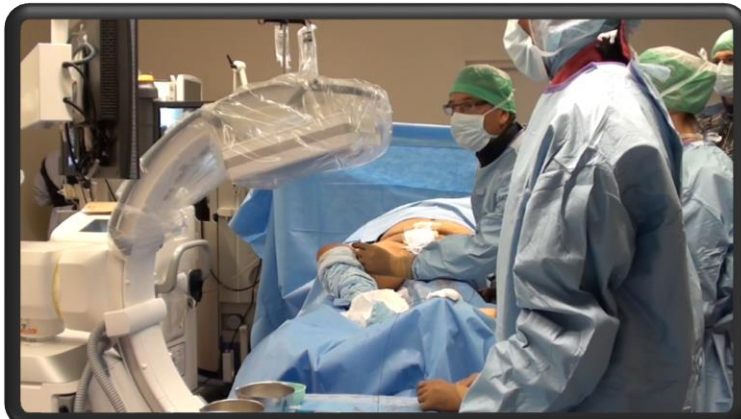
# ANTEGRADE APPROACH FIRST

- Glide Terumo guidewire 0.035" x 180 cm
- Trailblazer 0.035"
- Stiff Terumo guidewire 0.035" x 180 cm
- Trailblazer 0.035"
- Stiff Terumo guidewire 0.035" x 180 cm
- Seeker 0.035"

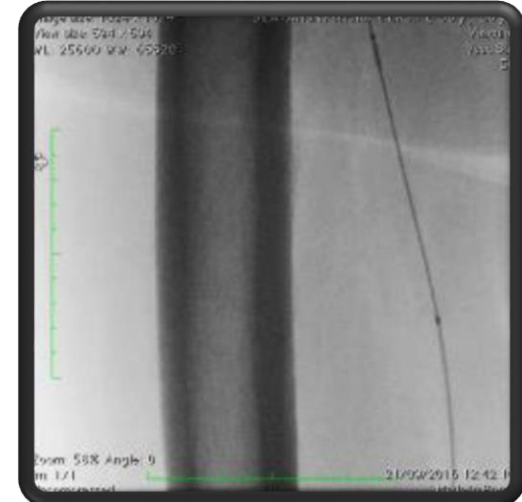


# RETROGRADE PUNCTURE OF THE POPLITEAL ARTERY IN A SUPINE POSITION

- 16-Gauge Needle x 83 mm



# PROCEDURE RESUMED BY ANTEGRADE WAY





# LENGTH TROUBLE = GUIDEWIRE EXCHANGE



- Glide Terumo GW 0.035" x 260mm



# « TELEPHERIQUE » TECHNIQUE

- POBA 5 x 100mm



# GUIDEWIRE PUSHED THROUGH THE POPLITEAL ARTERY

- Prolonged inflation over retrograde puncture site for hemostasis





Top image technical data:  
 Pos: 322.594 x 594  
 VL: 327.04 WVL: 5736  
 Vasc: 31  
 10

Middle image technical data:  
 Pos: 322.594 x 594  
 VL: 327.04 WVL: 5736  
 Vasc: 31  
 10

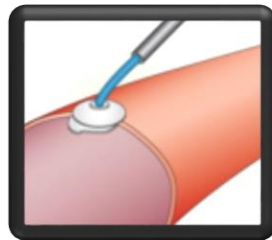
Bottom image technical data:  
 Pos: 322.594 x 594  
 VL: 327.04 WVL: 5736  
 Vasc: 31  
 10



- Long Stenting from distal to proximal part of the dissection :
  - SmartFlex® (Cordis) 6 x 150mm
  - SmartFlex® (Cordis) 6 x100mm
  - Tigris® (Gore) 7 x 60mm
- Post-dilation by 5 x 100mm balloon

# FINAL ANGIOGRAM

- Percutaneous closure device : Fémoseal®



# TAKE HOME MESSAGE

- Endovascular treatment of the SFA is almost always successful in the acute phase

- BUT experience

- it is very catheter
  - you should

- Subintimal and first-line approach

- Antegrade-Retrograde

- Stenting is almost always necessary in recanalized CTOs

- At least in part

"PATIENCE AND  
PERSEVERANCE HAVE A  
MAGICAL EFFECT  
BEFORE WHICH  
DIFFICULTIES  
DISAPPEAR AND  
OBSTACLES VANISH."

*John Quincy Adams*

g CTOs

ll of the guidewires and

hand

n result in a good  
ons

e success rates



**THANK YOU FOR YOUR ATTENTION**

