

# Subintimal angioplasty in BTK CTO intervention

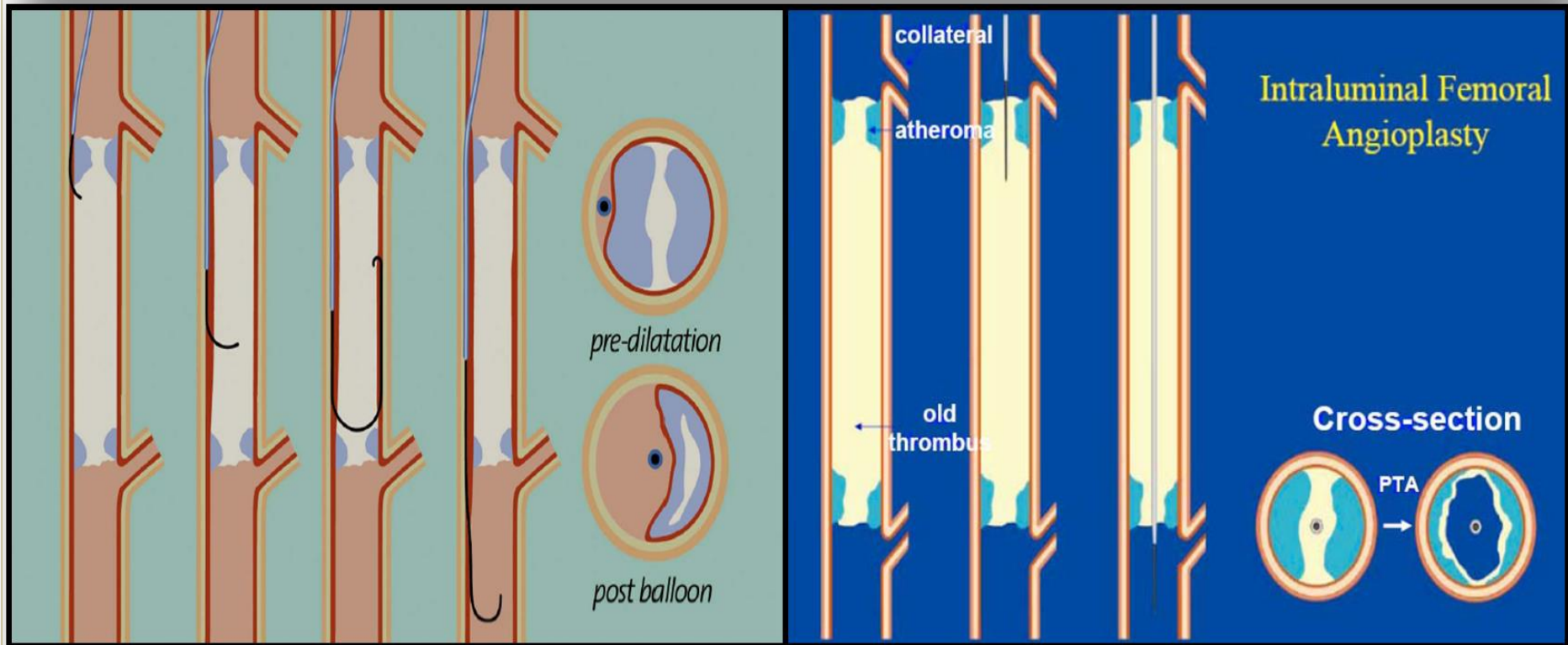


Sang-Ho Park MD. PhD,

Soon chun hyang University Cheonan Hospital

# Subintimal

# Intraluminal



- Percutaneous intentional extraluminal recanalization (PIER); CTO lesion of the femoral and popliteal arteries by subintimal dissection by **Bolia in 1990**

*CardioVasc Interv Radiol 1990;13:357-363*

- Femoro-popliteal lesion → crural applications

# Subintimal

## Pros

Low-cost device  
and procedure,  
Time-saving



# Intraluminal

## Cons

More expensive and  
time-consuming  
procedure



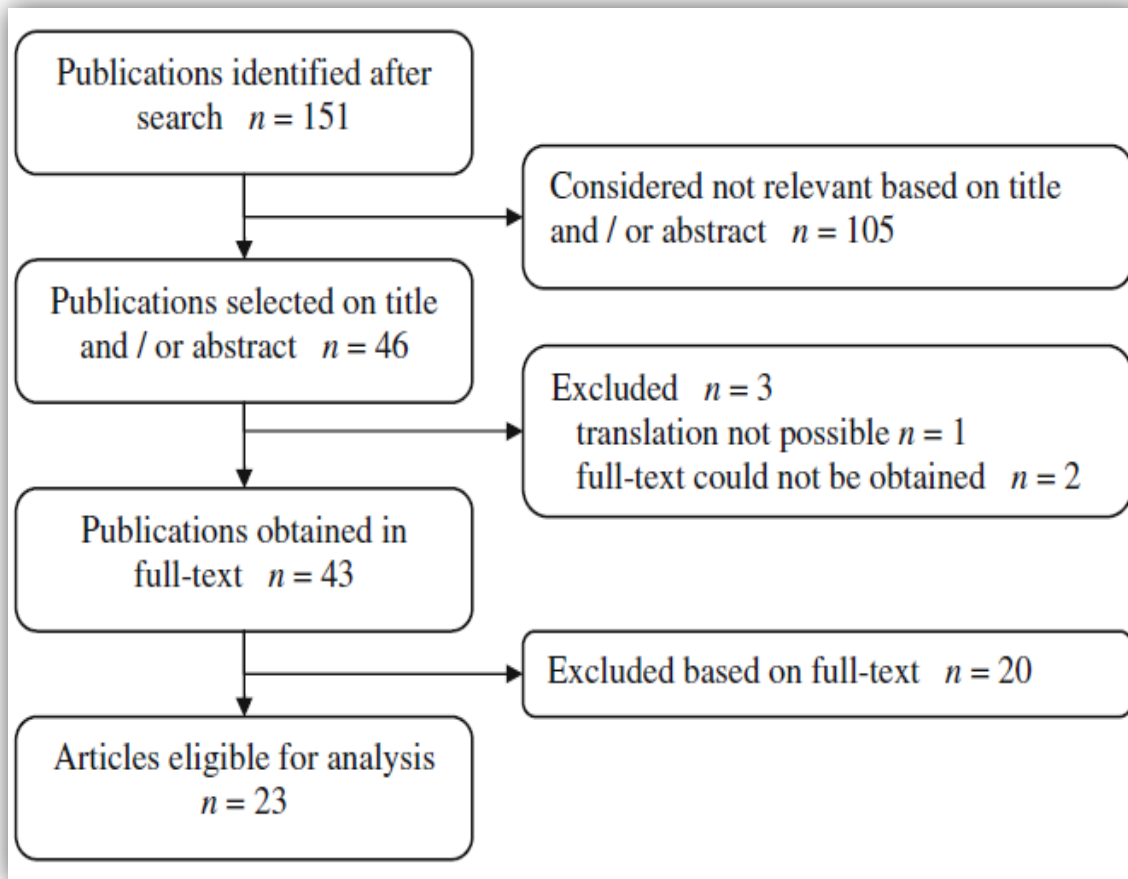


**Fig. 1. ant. Tibial artery: CTO (blue arrows) with good distal channel from peroneal a, 2. peroneal artery: two severe stenosis (red arrows), 3. post. Tibial artery: CTO without distal channel (yellow color), A and B. Subintimal approach & final angio (A,B) ; time to guidewire successful passage into true lumen (15 sec)**

**How about clinical outcomes  
for Subintimal angioplasty**

# Subintimal recanalization;

## clinical outcomes, meta-analysis data collection



the infrainguinal vessels. The keywords “percutaneous intentional extraluminal revascularization,” “subintimal angioplasty,” “peripheral arterial disease,” “femoral artery,” “popliteal artery,” and “tibial artery” were used.

# Subintimal recanalization;

clinical outcomes; primary patency, limb salvage, clinical success

- **Primary Patency:**  
< 50% stenosis at bmon  
or 1-year follow-up

- **Limb salvage:**  
no major amputation


- **Clinical success:**  
Relief of pain at rest  
Healing of ulcers  
Healing of minor  
amputation

# Subintimal recanalization; clinical outcomes

Study	Statistical method	Clinical success (mo)	Complications	Primary patency (mo)	Primary assisted patency (mo)	Limb salvage (mo)	Survival (mo)
Lesion (mostly) in crural vessels							
Ingle [14]	KMA	–	9/70 (13%)	–	–	94% (12)	–
Nydahl [23]	KMA	56% (12)	3/28 (11%)	53% (12) <sup>a</sup>	–	85% (12)	–
Vraux & Hammer [29]	KMA	68% (12)	5/40 (13%)	56% (12) <sup>b</sup>	–	81% (12)	78% (12)
Vraux & Bertonecello [30]	KMA	63% (12)	7/50 (14%)	46% (12) <sup>b</sup>	–	87% (12)	65% (12)
Lesion (mostly) in femoral or femoropopliteal artery							
Hynes [13]	LTA	–	6/74 (8%)	–	–	–	–
Myers [22]	KMA	–	2/82 (2%)	74% (3) <sup>a</sup>	87% (3)	–	–
Treiman [28]	KMA	–	4/29 (14%)	64% (24) <sup>b</sup>	–	80% (24)	50% (24)
Mixed lesions (all infrainguinal)							
Lazaris & Tsiamis [17]	KMA	69% (24)	14/112 (13%)	–	–	88% (12)	–
Lazaris & Salas [18]	KMA	–	–	50% (12) <sup>b</sup>	–	92% (12)	87% (12)
Spinosa [26]	KMA	–	4/40 (10%)	–	–	66% (12)	71% (12)

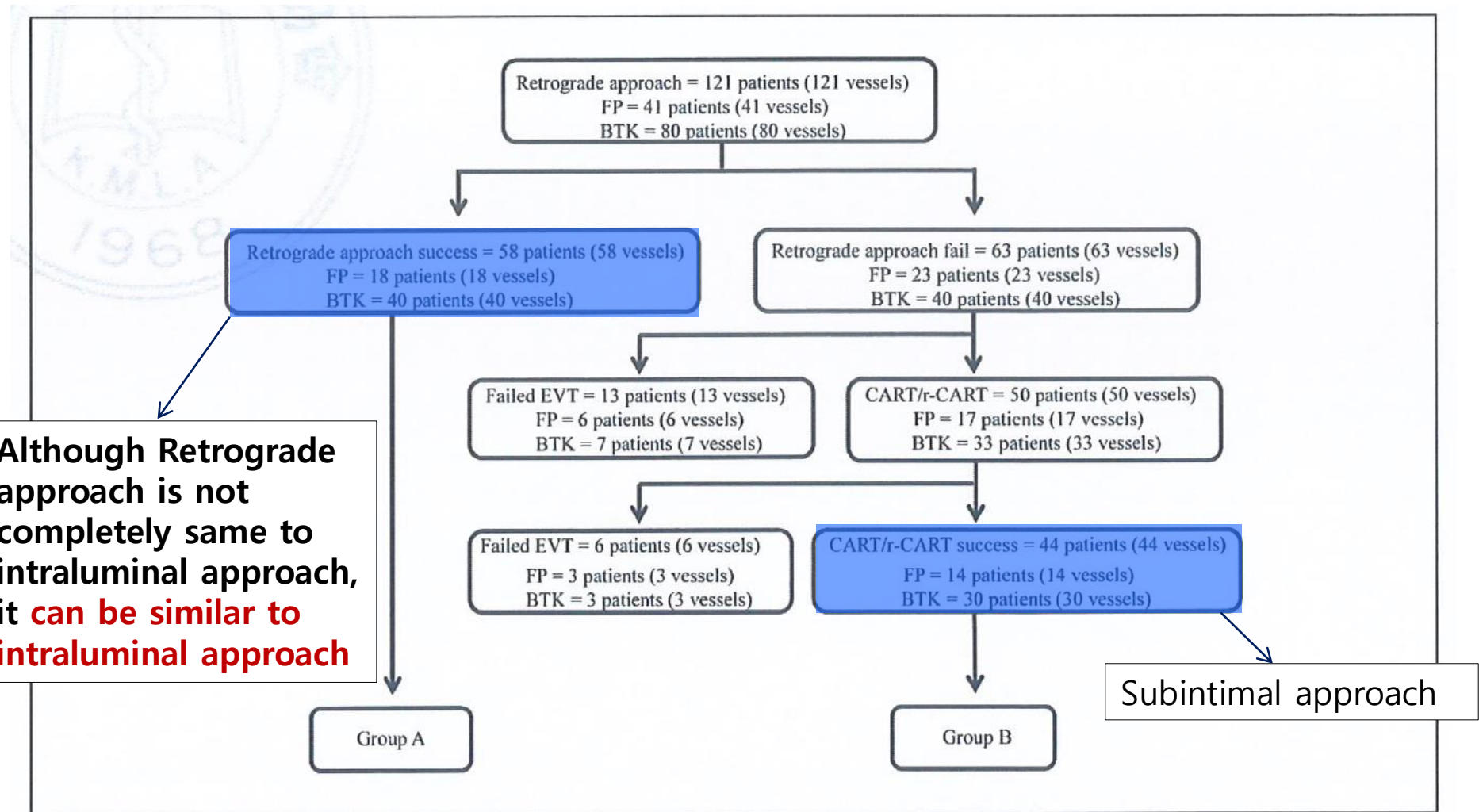


# Outcomes of Endovascular Therapy With the Controlled Antegrade Retrograde Subintimal Tracking (CART) or Reverse CART Technique for Long Infrainguinal Occlusions

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Hsin-Hua Chou, MD<sup>1,2</sup>, Hsuan-Li Huang, MD<sup>1</sup>, Chien-An Hsieh, MD<sup>1</sup>,  
Shih-Jung Jang, MD<sup>1</sup>, Shih-Tsung Cheng, MD<sup>1,2</sup>, Sou-Chan Tsai, MD<sup>1</sup>,  
Tien-Yu Wu, MD<sup>1</sup>, and Yu-Lin Ko, MD, PhD<sup>1,2</sup>

# Anterograde → retrograde → bi-directional (CART / reverse CART)

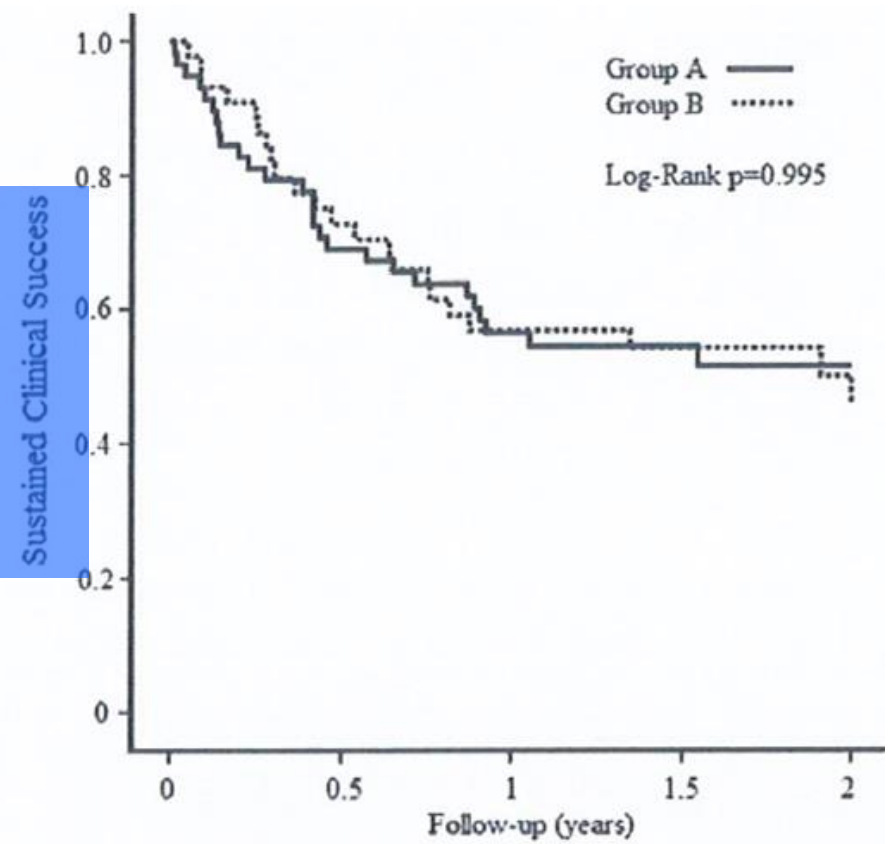


Although Retrograde approach is not completely same to intraluminal approach, it can be similar to intraluminal approach

Subintimal approach

Although this study is small sample size, it can indirectly show which is better between intraluminal and subintimal techniques in BTK long CTO lesion

➔ the answer may be 'no difference'



	CRA <sup>a</sup>	CART <sup>a</sup>	p
Follow-up duration, months	19.5±14.4	20.2±9.6	0.794
Death	18/58 (31.0)	10/44 (22.7)	0.380
Major amputation	4/58 (6.9)	1/44 (2.3)	0.279
Minor amputation	6/58 (10.3)	6/44 (13.6)	0.417
Binary restenosis <sup>b</sup>			0.655
6 months	23/58 (39.7)	17/44 (38.6)	
12 months	36/57 (63.2)	29/44 (65.9)	
24 months	39/45 (86.7)	32/36 (88.9)	
TVR <sup>c</sup>			0.845
6 months	9/49 (18.4)	8/40 (20.0)	
12 months	14/46 (30.4)	12/37 (32.4)	
24 months	17/26 (65.4)	13/24 (54.2)	

Group A : CRA (Conventional retrograde approach)

Group B : CART & rCART

**The relationship between Subintimal  
and intraluminal angioplasty is  
*complementary cooperation.***



Which  
better in  
BTK CTO  
lesions ??

There is no comparison study for clinical outcomes between two techniques

The step-by-step use of subintimal and intraluminal strategy could be improved technical success rate. Upto date, two technical modality seems to be the *complementary cooperation*.

# Subintimal and intraluminal; case

*complementary cooperation for technical success*



Diffuse long CTO lesion in ATA

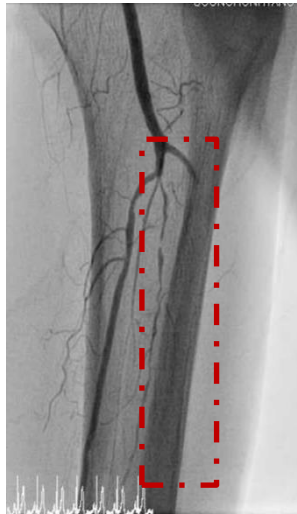
No distal channel

After successful ballooning of PTA

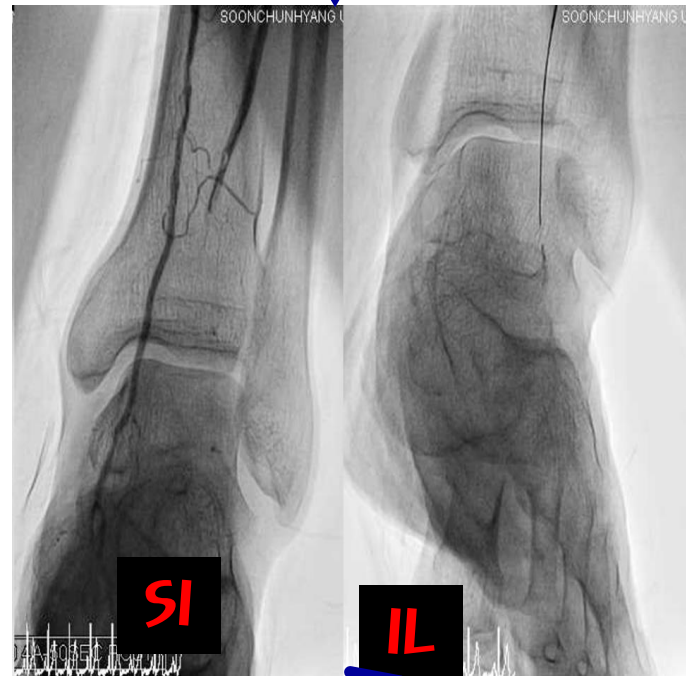
Relative good distal channel



# Subintimal and intraluminal; case complementary cooperation for technical success



**Subintimal compatible; Long lesion**



**Intraluminal compatible;  
-> angiographic finding & portion**

## **Subintimal limitation**



- calcified, complex long CTO lesion
- entry and re-entry failure
- Increase of original lesion length
- peri-adventitial hematoma and vessel perforation,
- collateral vessel occlusion
- using atherectomy device

## **Intraluminal option**



# My usual practices

- Intra-luminal angioplasty supported by microcatheter
- Subintimal angioplasty
- **Sub-maximal subintimal angioplasty** and intraluminal re-entry using stiffer guidewire with supported catheter
- **Sub-maximal subintimal angioplasty** and retrograde route
- ❖ **‘Submaximal subintimal’** → ankle area and collaterals vessel connection portion

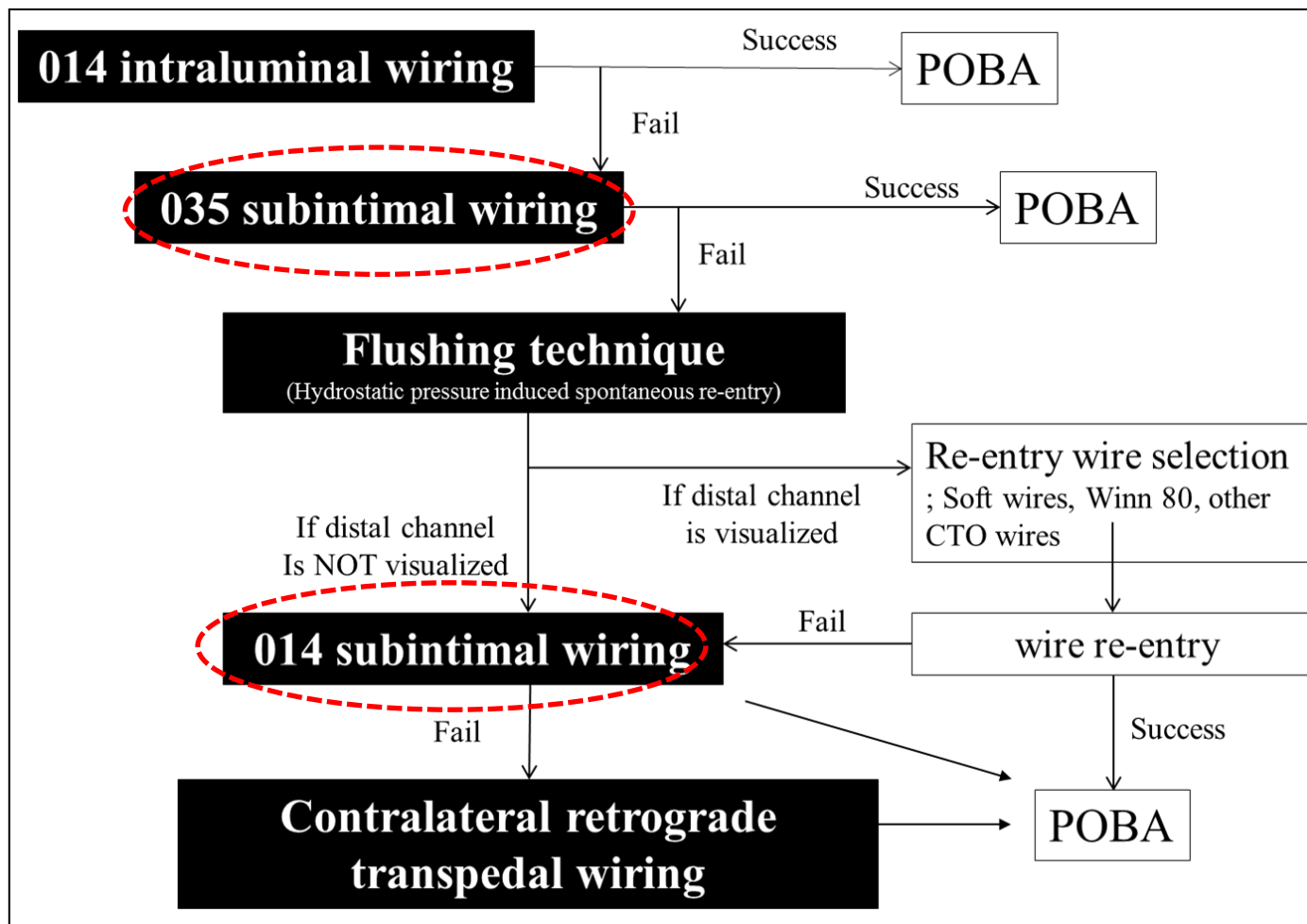
**Subintimal angioplasty is more useful in  
CTO lesion **without definite distal channel**  
than intraluminal angioplasty**

# Subintimal angioplasty

## in CTO lesion without distal channel

Subintimal		Intraluminal	
Pros	Cons	Pros	Cons
Low-cost device and procedure, Time-saving	failure of re-entry, lesion length increase, hematoma, perforation	Easy transition from crossing highly stenotic lesion in the CTO	More expensive and time-consuming procedure
<b>CTO lesion irrespective of distal channel may be available</b>	Limited use of atherectomy, collaterals occlusion	Atherectomy is more useful and safer	<b>CTO lesion Without distal channel; hard to application</b>

# How to recanalize the BTK CTO lesions without visible distal stump ; several subintimal wiring methods are effective



014 intraluminal wiring

Success

POBA

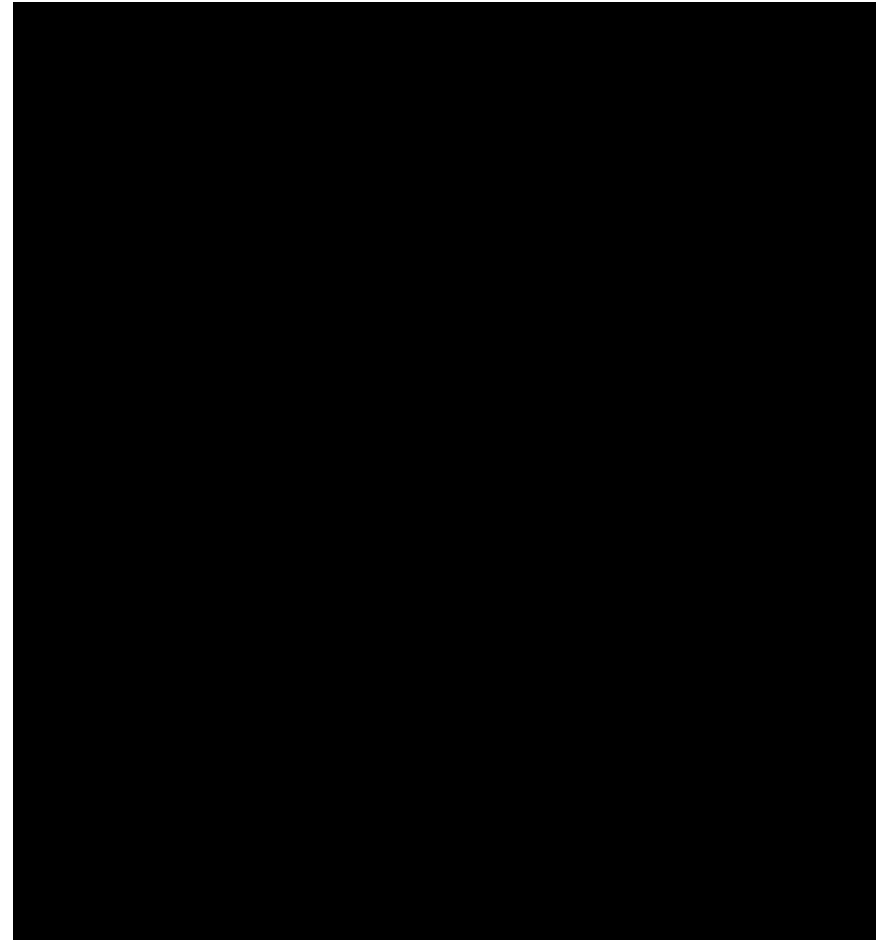
Fail



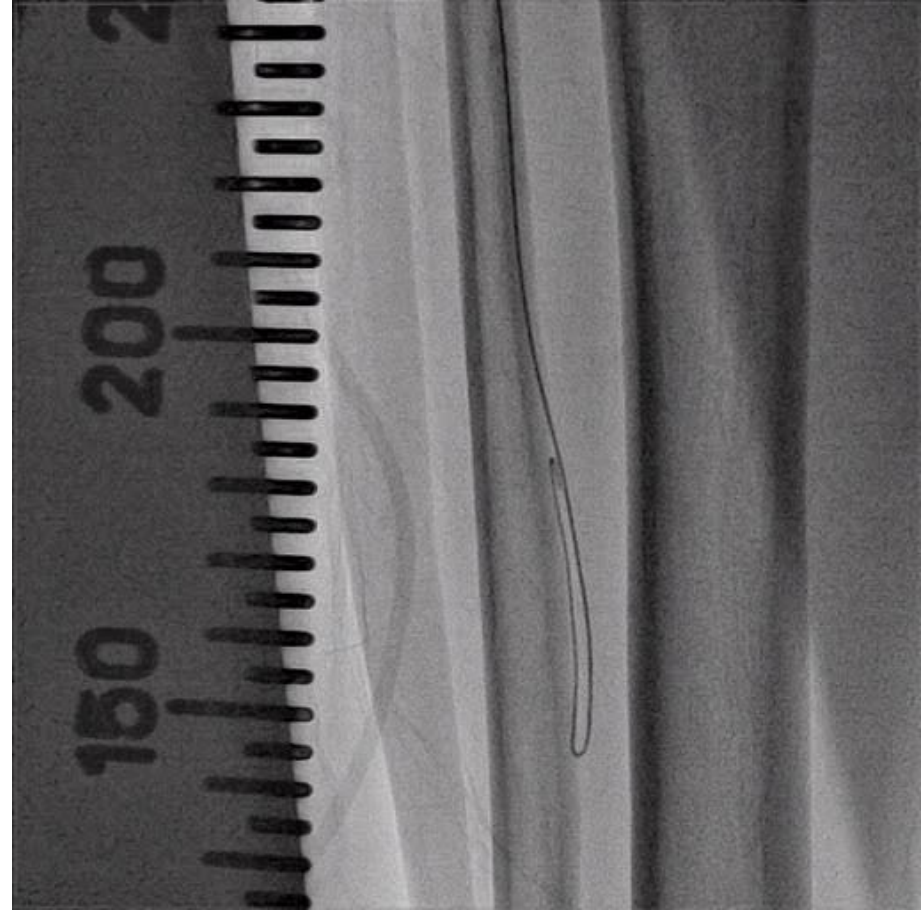
## 035 Terumo subintimal wire tracking

Empirical 035 Terumo subintimal wiring using 1.5 J-tip shape can be useful until feeling *free motion* around the ankle level (Push down far beyond the ankle level is *not recommended* due to the risk of rupture, esp in calcified lesion).

# Anterior tibial artery CTO without distal channel



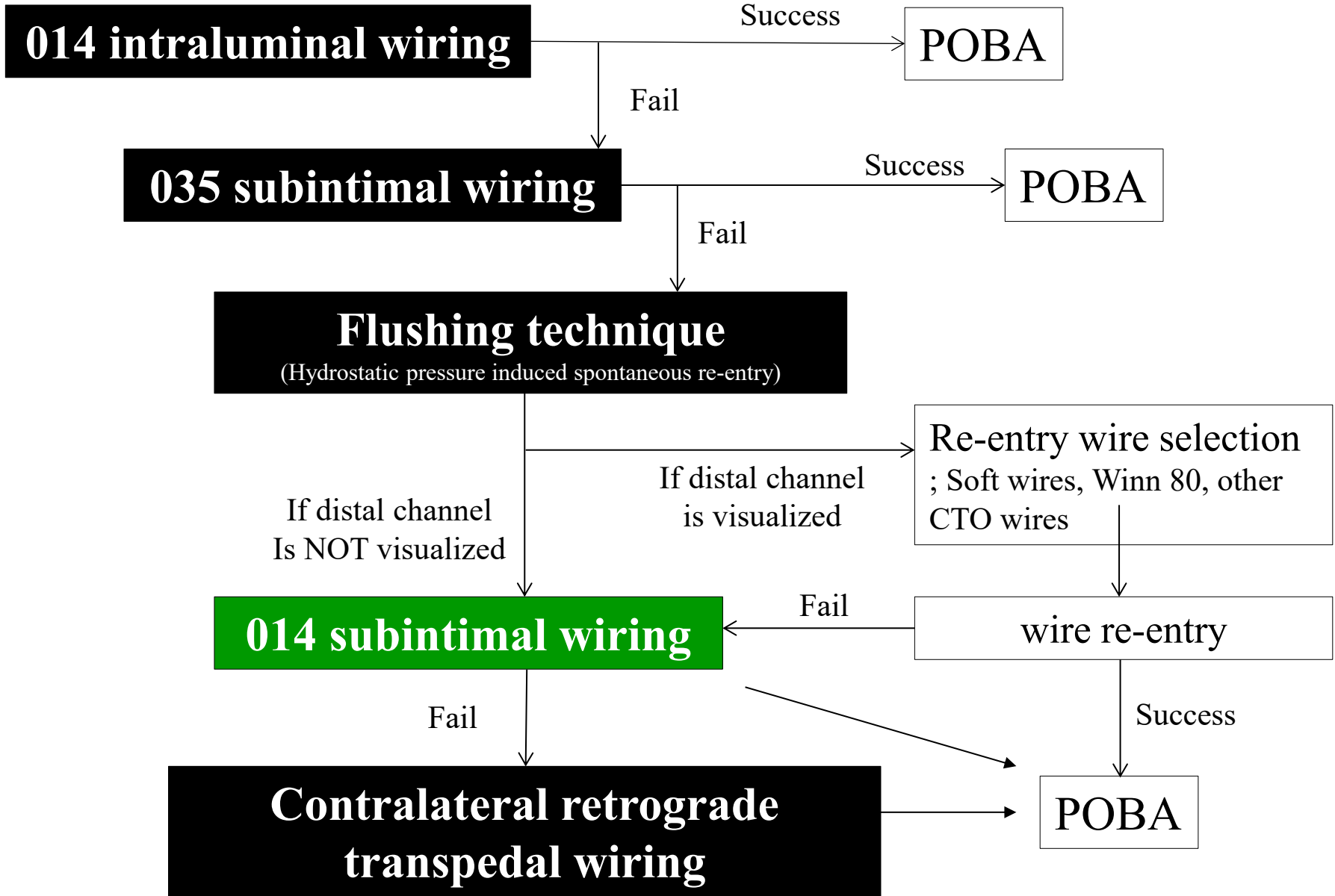
# 035 Terumo Subintimal Wiring (1.5J)



# Anterior tibial artery CTO without distal channel







014 intraluminal wiring

Success

POBA

Fail

035 subintimal wiring

Success

POBA

Fail

## Flushing technique

(Hydrostatic pressure induced spontaneous re-entry)

If distal channel  
Is NOT visualized

If distal channel  
is visualized

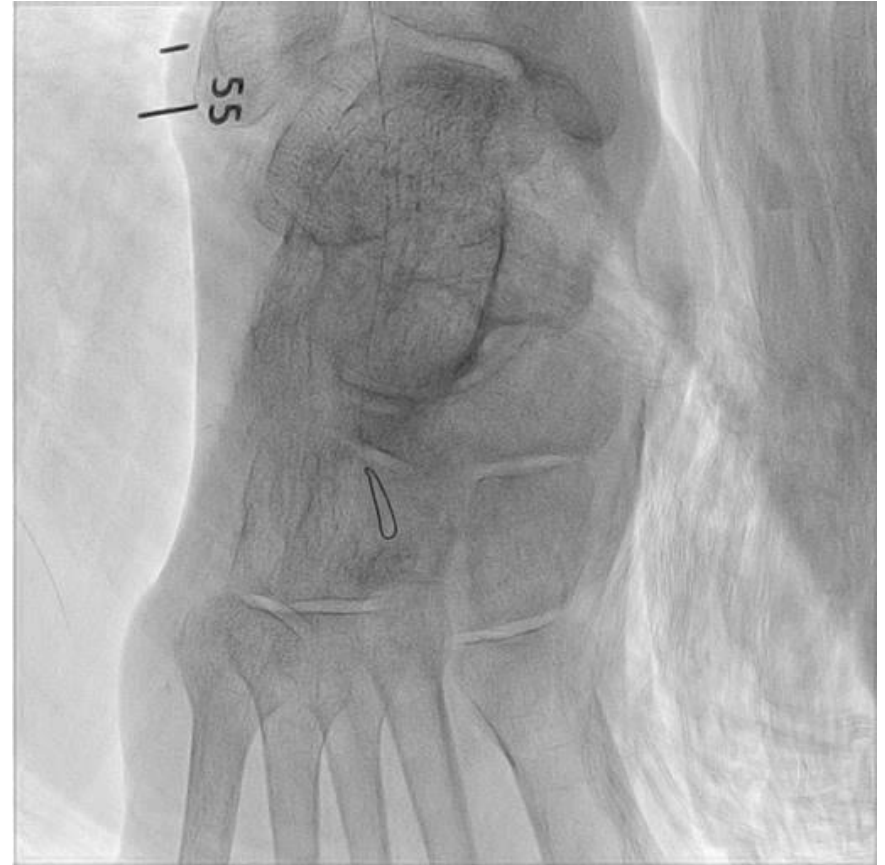
Re-entry wire selection  
; Winn 80, other CTO wire

**014 subintimal wiring**

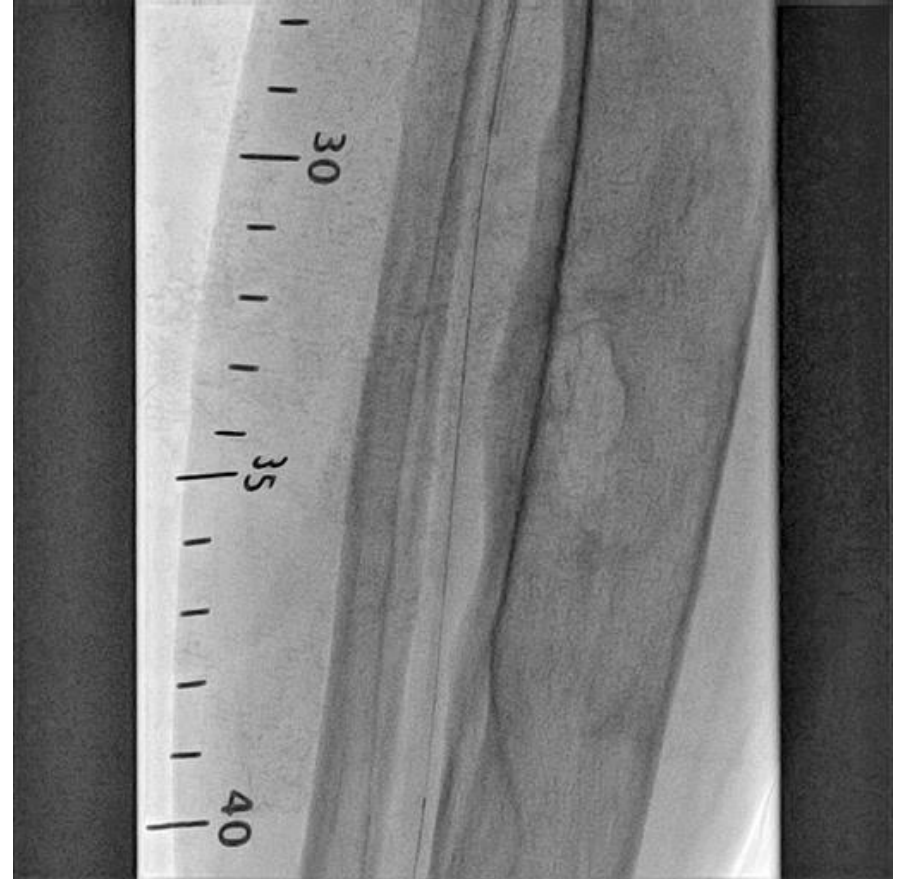
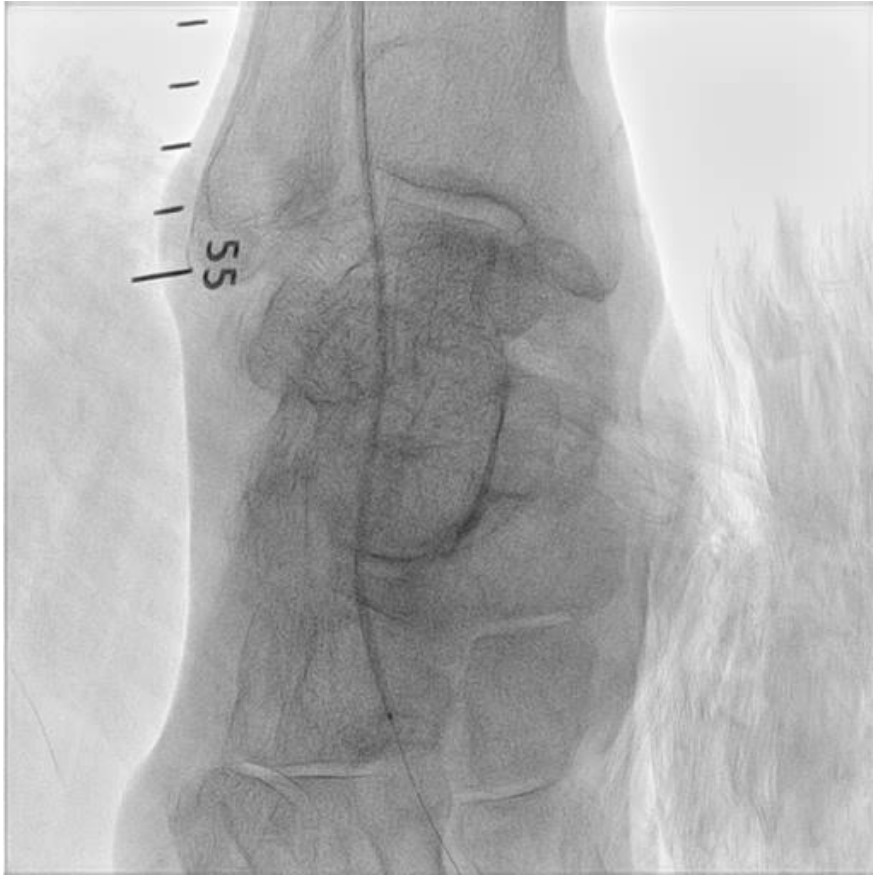
wire re-entry

Soft wires; 014 Fielder FC (coronary wire), HydroST, Regalia, Command and so on...  
Supported by dedicated microcatheters (CXC/CXI, Rubicon, and Trailblazer...)

# CASE 1; 014 Subintimal Wiring ; HydroST (COOK)



# CASE 1; 014 Subintimal Wiring ; POBA and Final



## CASE 2; 014 Subintimal Wiring ; Regalia (Ashai)



## CASE 2; 014 Subintimal Wiring ; Regalia (Ashai)



## CASE 2; 014 Subintimal Wiring; POBA and Final



# Summary

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Simple **subintimal** angioplasty

Hybrid angioplasty

- **Subintimal** → intraluminal
- Intraluminal → **subintimal**
  - Multiple cross-over
- CAR (**subintimal**) T or Reverse CART

Using, sometimes, bi-directional approach

**Subintimal** angioplasty (wiring)  
in CTO lesion without distal channel



**Thank you for your attention**