Tips and Tricks in BTK Intervention

- Diverse Recanalization Strategies in BTK Intervention -

Seung-Woon Rha, MD, PhD,
FACC, FAHA, FSCAI, FESC, FAPSIC

Div of Cardiovascular Intervention and Research
Cardiovascular Center,
Korea University Guro Hospital, Seoul, Korea

Dec 13, 2014

JCR meeting 2014

Contents

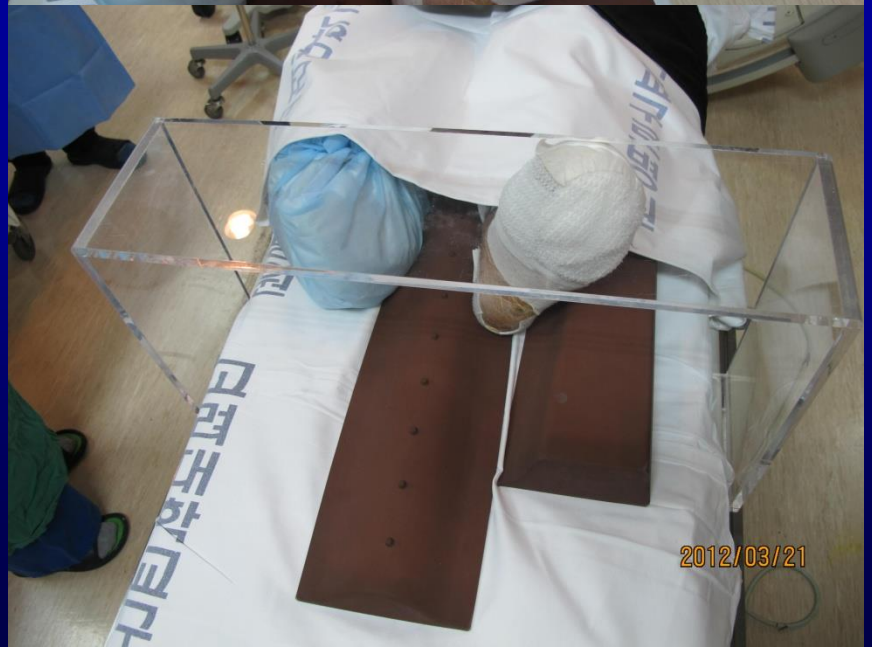
1. BTK & BTA-Intraluminal Angioplasty
2. BTK & BTA-Subintimal Angioplasty
   (035 & 014 system)
3. BTK-IVUS guided Stenting Case
4. BTK & BTA-retrograde pedal approach & Transcollateral approach

**** I do not have any potential conflict of interest**

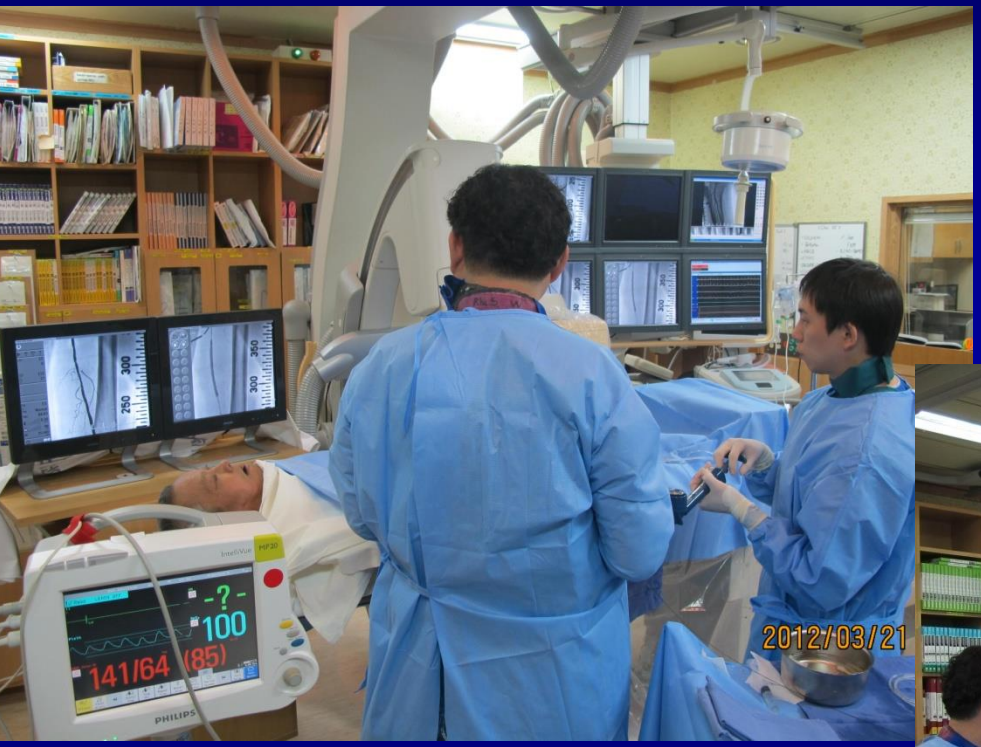
Contents

1. BTK & BTA-Intraluminal Angioplasty
2. BTK & BTA-Subintimal Angioplasty
   (035 & 014 system)
3. BTK-IVUS guided Stenting Case
4. BTK & BTA-retrograde pedal approach & Transcollateral approach
   (Next lecture…due to limited time)

Patient Preparation for BTK (k



Total 6 monitors and Operator friendly system



Outcomes of Patients with Critical Limb Ischemia who Undergo Routine Coronary Angiography and Subsequent Percutaneous Coronary Intervention

Background: Critical limb ischemia (CLI) is associated with a high risk of subsequent cardiovascular ischemic events. We assessed the strategy of routine coronary angiography in patients with CLI when coronary revascularization is performed based upon clinical judgment.

Methods: A total of 286 consecutive CLI patients were treated by percutaneous transluminal angioplasty (PTA). A total 252 patients who underwent coronary angiography (CAG) before or after PTA were enrolled. Coronary artery disease (CAD) was defined as angiographic stenosis ≥ 50% and significant CAD as ≥ 70% stenosis.

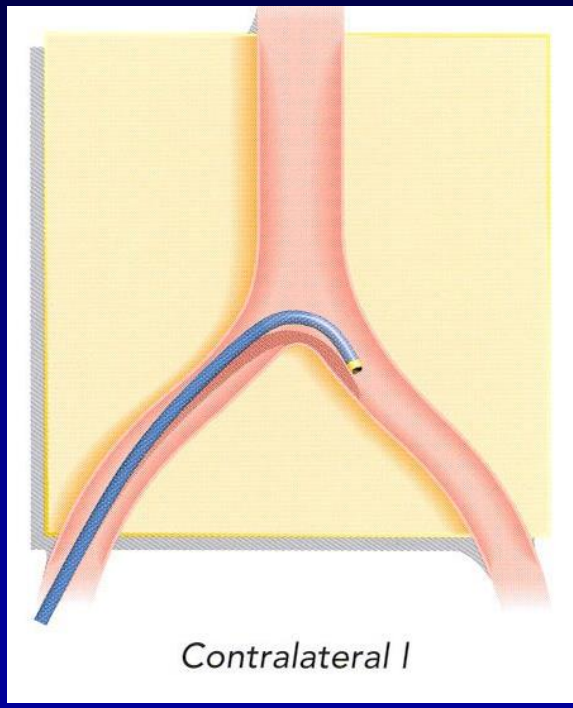
Results: Of the 252 CLI patients who underwent coronary angiography, *167 patients (66.3%) had CAD* and 85 patients (33.7%) did not have CAD. Patients in the CAD group were older, had a higher prevalence of diabetes mellitus and cerebrovascular disease, and had a lower mean ejection fraction. At one year, the CAD and non-CAD group had similar rates of repeat PTA (16.7% vs. 17.6%, p=0.86), target lesion revascularization (13.7% vs. 14.1%, p=0.94), and amputation (19.1% vs. 16.4%, p=0.60). In the CAD group, of the 145 patients with significant CAD, percutaneous coronary intervention (PCI) was performed in 114 patients (78.6%). At one year, the CAD and non-CAD group had similar rates of mortality (7.1% vs. 4.7%, p=0.45), myocardial infarction (1.1% vs. 0%, p=0.31), and PCI (4.7% vs. 1.1%, p=0.31) and these outcomes were similar after the adjustment of baseline confounders.

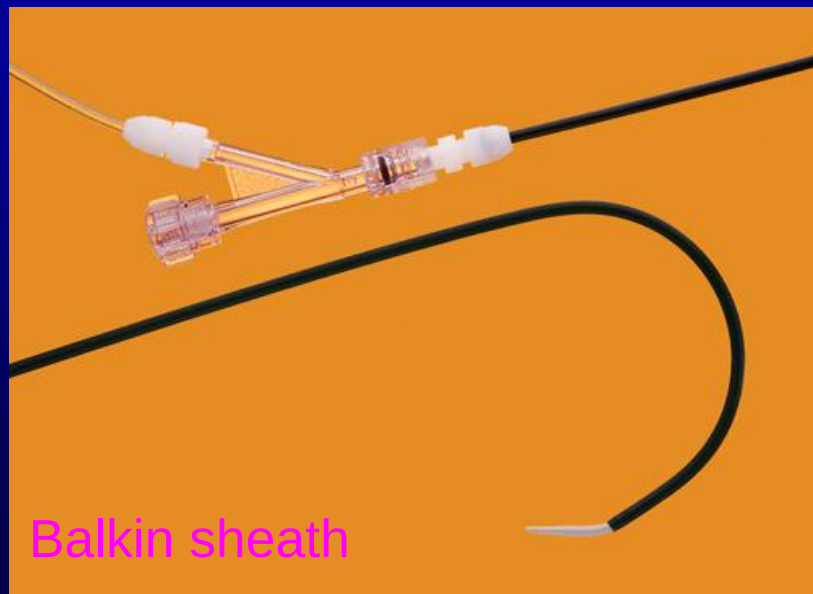
Conclusion: In addition to optimal medical therapy, a strategy of routine coronary angiography and coronary revascularization was safe and effective. A randomized trial is needed to determine if this is the preferred strategy for CLI patients undergoing PTA.

M Lee and Rha SW et al. J Invasive Cardiol 2014 (In Press)

Guiding Sheath

1. Ipsilateral sheath
   ; usual introducer sheath
   1) SFA; 6F short sheath
   2) *BTK; 5F short sheath*/ **5F Heartrail**
      5F Shuttle, Ansel
2. Contralateral sheath
   1) Vista Bright Tip, Contralateral I, II (Cordis, 8F)
   2) Ansel checkflo (Cook, 6-7F)
   3) Balkin sheath (Cook, 8 Fr)
   4) Arrow sheath, 25cm
   5) Destination (Terumo)





Wires for BTK Intervention (1)

A. Intraluminal Approach

1. Wires for intraluminal wiring

1) 014 Coronary wires (Fielder series, Miracle & Conquest series-Asahi)

2) 014 Peripheral wires (***Approach CTO*** 6, 12, 18, 25g-Cook, ***Astato 20g***-Asahi, **Command ES, *Winn 40, 80, 120, 200T***-Abbott)

3) 016 Peripheral wires (Fathom-16, Boston Scientific)

4) 018 Peripheral wire (SV-5 from Cordis, V18/Victory wire from Boston Scientific, Connect Flex from Abbott)

Wires for BTK Intervention (2)

2. Supporting microcatheter for true lumen wiring

1) CXI 018/CXC 014 (Cook), Rubicon 014/018 (Boston), Trailblazer (EV3)

2) 2.4F Renegrade STC 18 (Boston Scientific)

** Soft 014; **HydroST** (Cook), **Regalia** (Astato), Nitrex (EV3), **Journey** (Boston Scientific), **Command** (Abbott), Skipper deep (Medtronic), Coronary soft wires

B. Subintimal Approach

1. Wires; 035 soft long Terumo (***1.5J***, angled), 018 Terumo, 014 wires (hydrophilic)

2. Supporting catheter; 5F MP or 4-5F Glide catheter

** Above the ankle; 035 wire

Below the ankle; 014 wire/018 wire

Wires for PTA

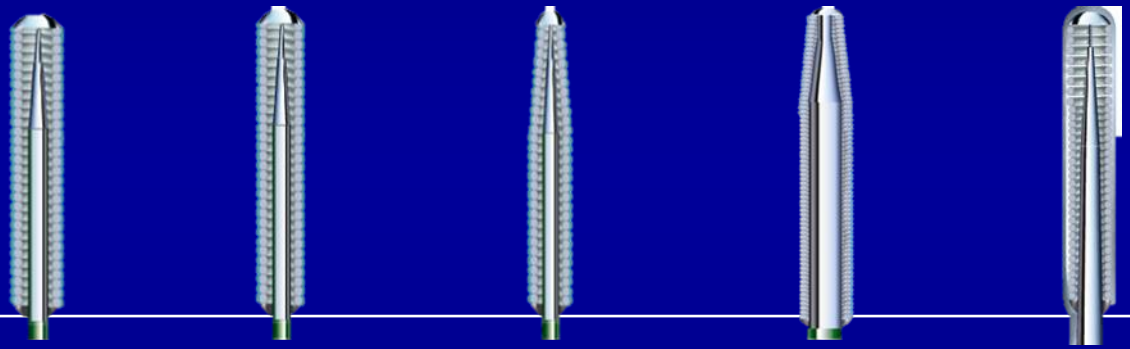
	Abbott	Asahi	Boston	Cook	Covidien
014	Command *Command ES*	Regalia XS *Astato XS*	Journey V-14 Victory 014	HydroST Approach CTO	Nitrex
018	Connect *Connect Flex* Connect 250T	Treasure 12 Treasure Floppy *Astato 30*	V-18 Victory 018		

*Underline; CTO wires

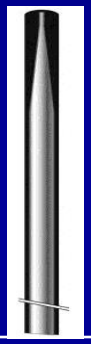
Hi-Torque Command

Wire	Command	Command ES
Shape		
Tip stiffness(g)	2.8	3.5
Tip diameter	014’	
Length(Cm)	190, 300	
Feature	stainless steel with nitinol tip	

Asahi

Wire	Treasure floppy	Treasure12	Astato 30	Astato XS 20	Regalia Xs
					
Tip Stiffness(g)	4	12	30	20	1
Tip Diameter(in)	018’	018’	018’	014’	014’
Length(Cm)	190, 300	190, 300	180, 300	180, 300	180, 300

Boston

Wire	Journey	V-14	V-18
			
Tip Stiffness (g)	1.3	3 (long Taper) 6 (short Taper)	7.6 (Short Taper) 6.7 (Long Taper)
Tip Diameter (in)	014’	014’	018’
Length (Cm)	145, 195, 300	145, 195, 300	145, 195, 300

Frontrunnner™ CTO Catehter

Controlled blunt micro-dissection

Possible advantages for:

- Blunt occlusion
- Bridging collaterals
- Side branch presence
- Long lesions

TruePath™
CTO DEVICE

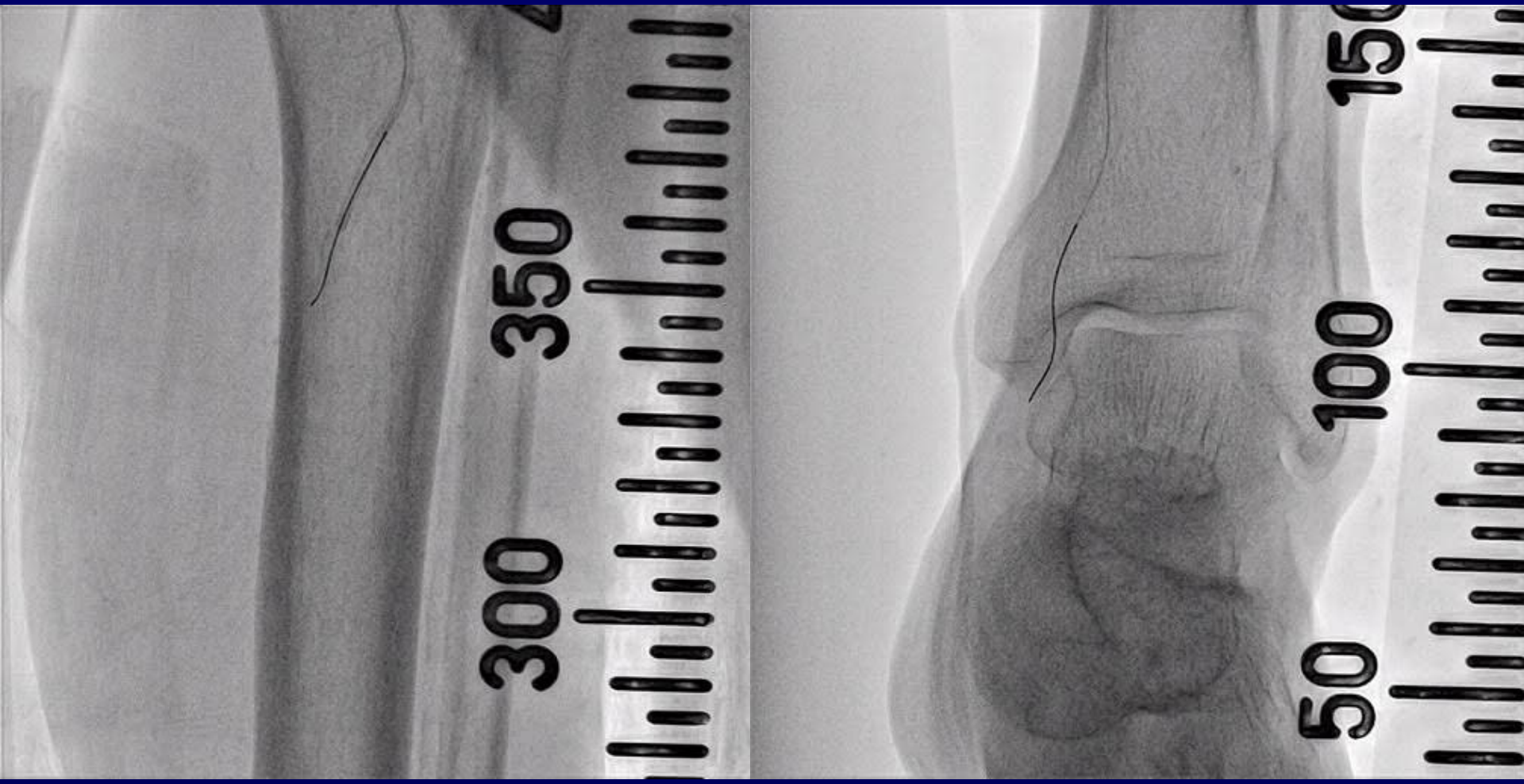
Boston Scientific

CRV
Cardiology, Rhythm and Vascular

BTK-Baseline Angiography

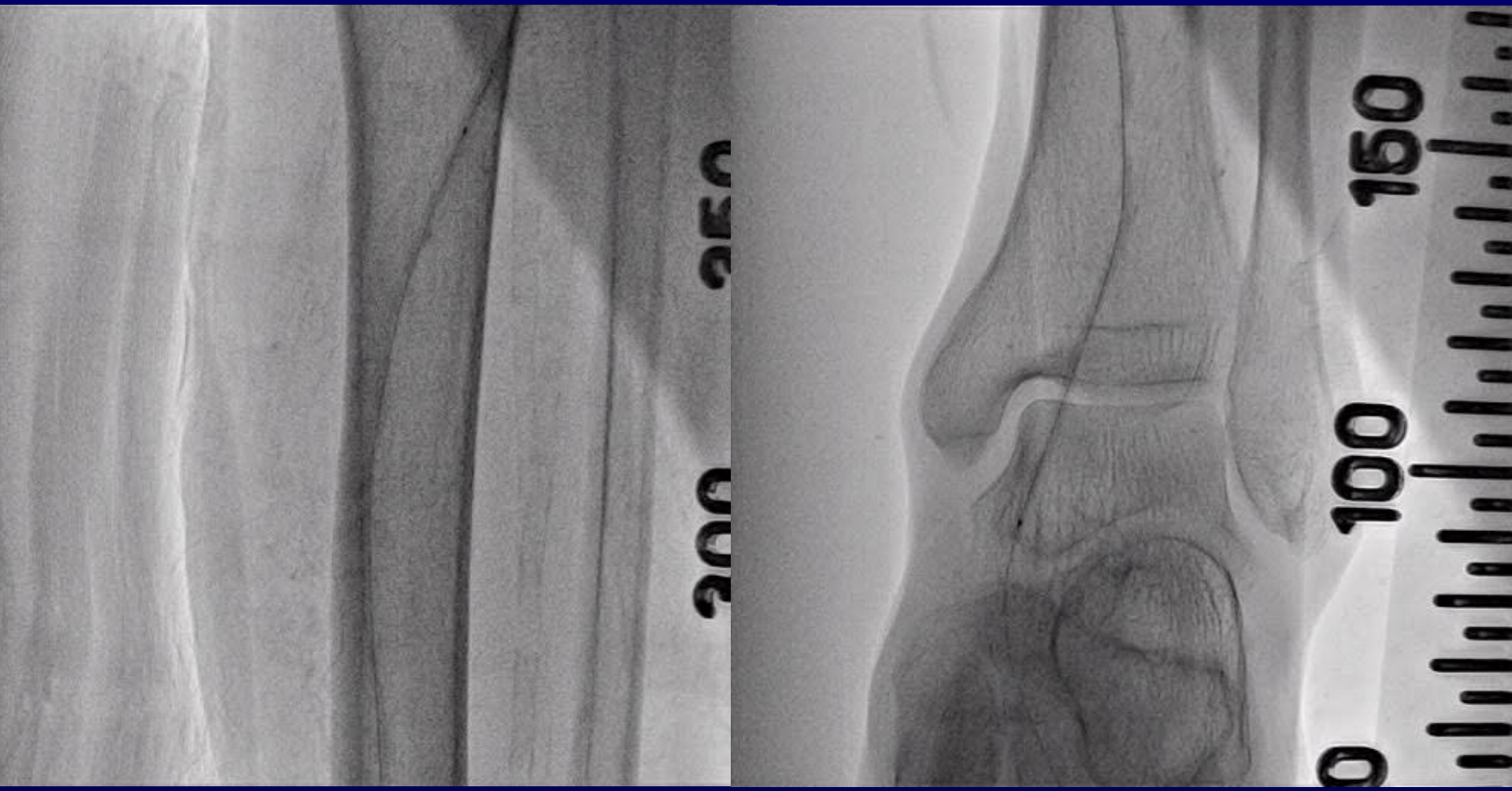
Isolated BTK disease; Ipasilateral anerograde approach with 5F short sheath

Intraluminal Wiring



5F Heartrail catheter, 014 Command ES

PTA-POBA



Sleek 2.0X220mm

BTK balloon selection

1. Cardiologist; prefer *monorail type*
2. Contralateral approach, angulated course, needs more shaft support and below ankle level; prefer *Advance LP*
3. Below ankle; tapered balloon (1.5/2.0mm) or low pressure (<6 atm) with 2.0mm
4. Incomplete expansion; NC balloon (coronary) or scoring balloon
5. Longer balloon, at least 2-3 min

Balloon for PTA

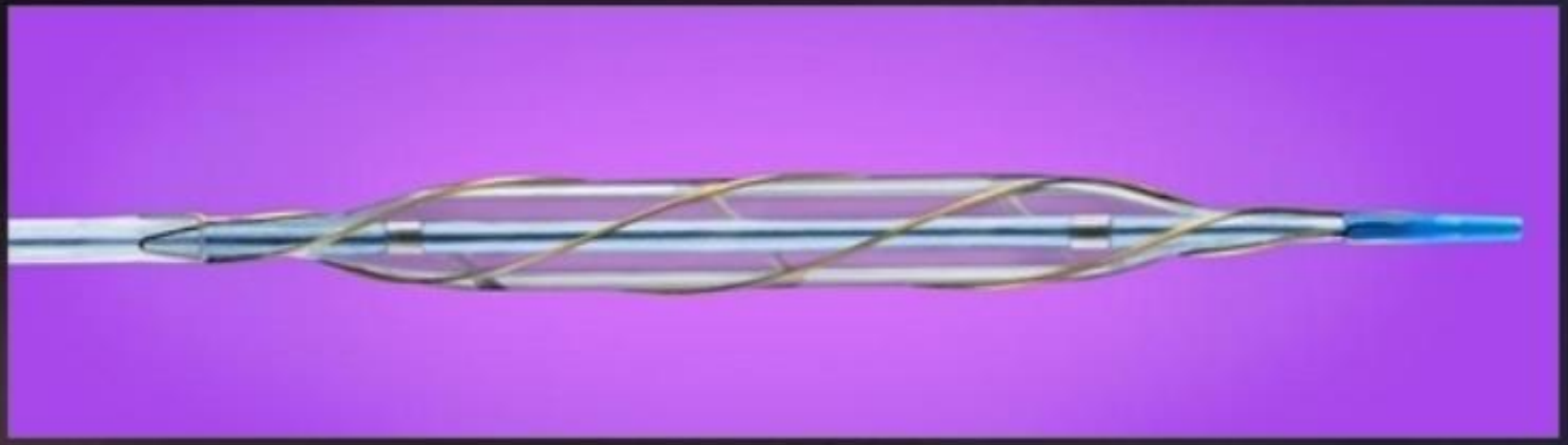
	014	018	035
Abbott	Armada14	Fox cross	Armada35
Boston	Coyote (M)		*Mustang (NC)*
Cook	Advance 14 (M)	Advance 18	Advance 35
Cordis	Sleek (M)	Savvy	PowerFlex
Medtronic	Amphirion (M)		***InPact (DEB)***
Covidien	Nanocross		Evercross
Bard			Rival, *Conquest (NC)*

*M; monorail type available

NC; Non-compliant balloon

AngioSculpt® Scoring Balloon Catheter

- Larger diameter balloons (5 mm and 6 mm) now available in 2 cm and 4 cm lengths

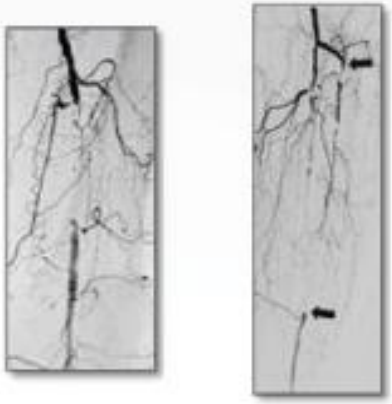


InPact (Paclitaxel-eluting Balloon)

Peripheral Drug Eluting Balloon

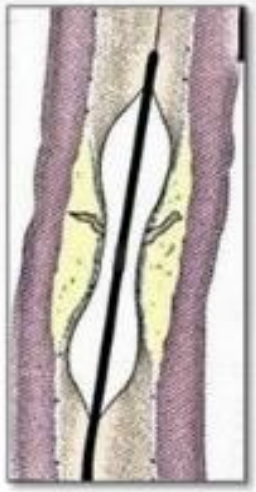
De Novo Lesions

Small vessels(BTK) high movement or flexion Sites(SFA/POP)



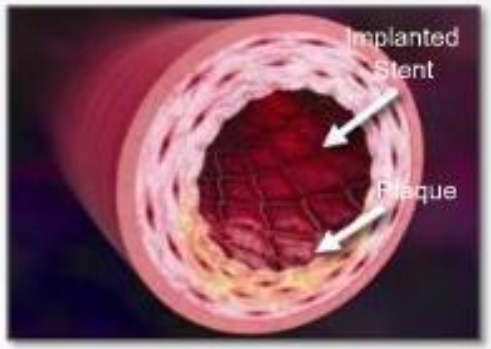
Stent should not be placed or It may not be ideal

Restenosis After POBA



Anti-proliferative therapy desired

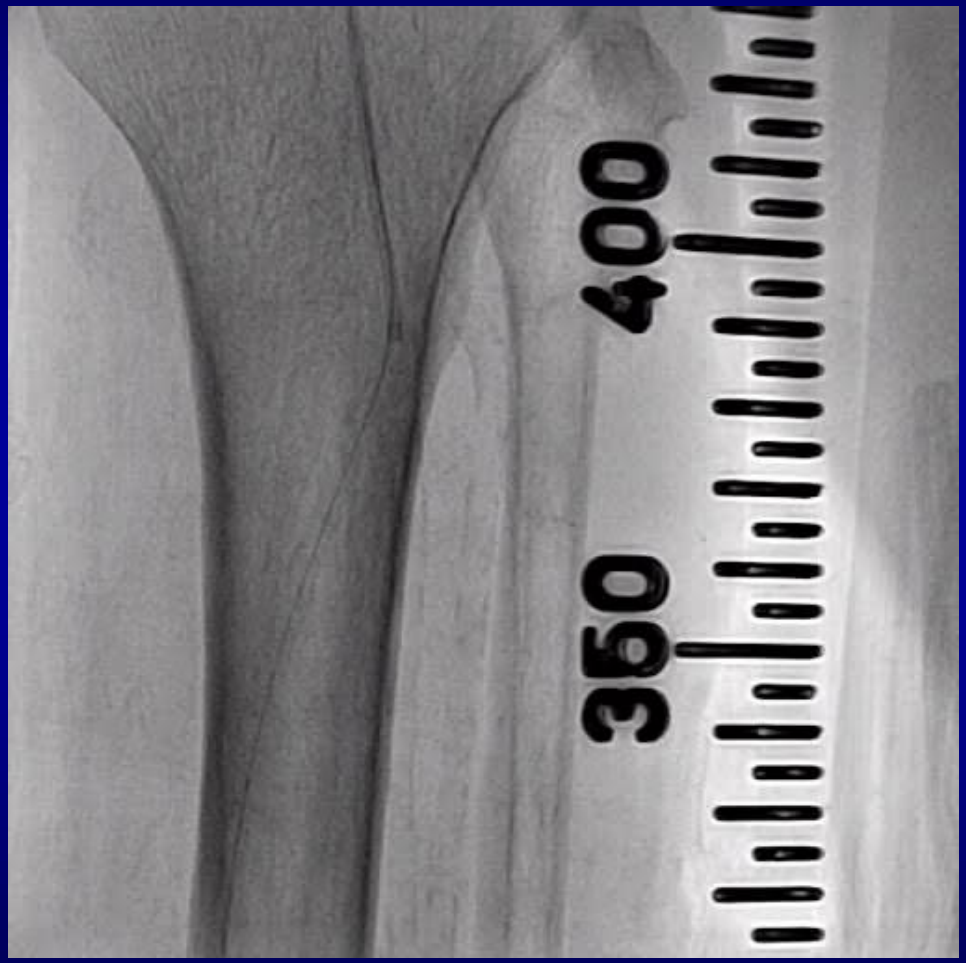
In-Stent Restenosis



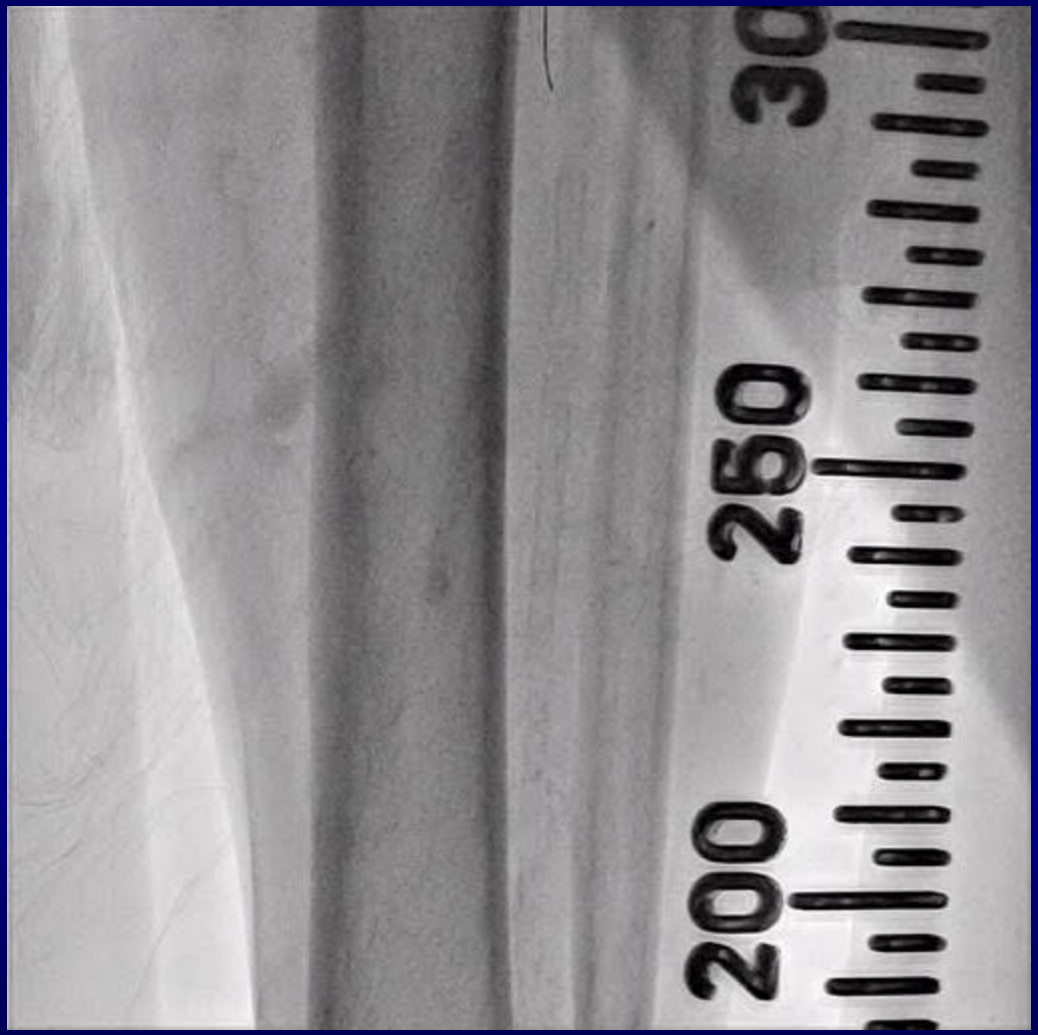
Stent-in-stent not desired

PTA-Final Image

Peroneal Baseline



Peroneal Wiring

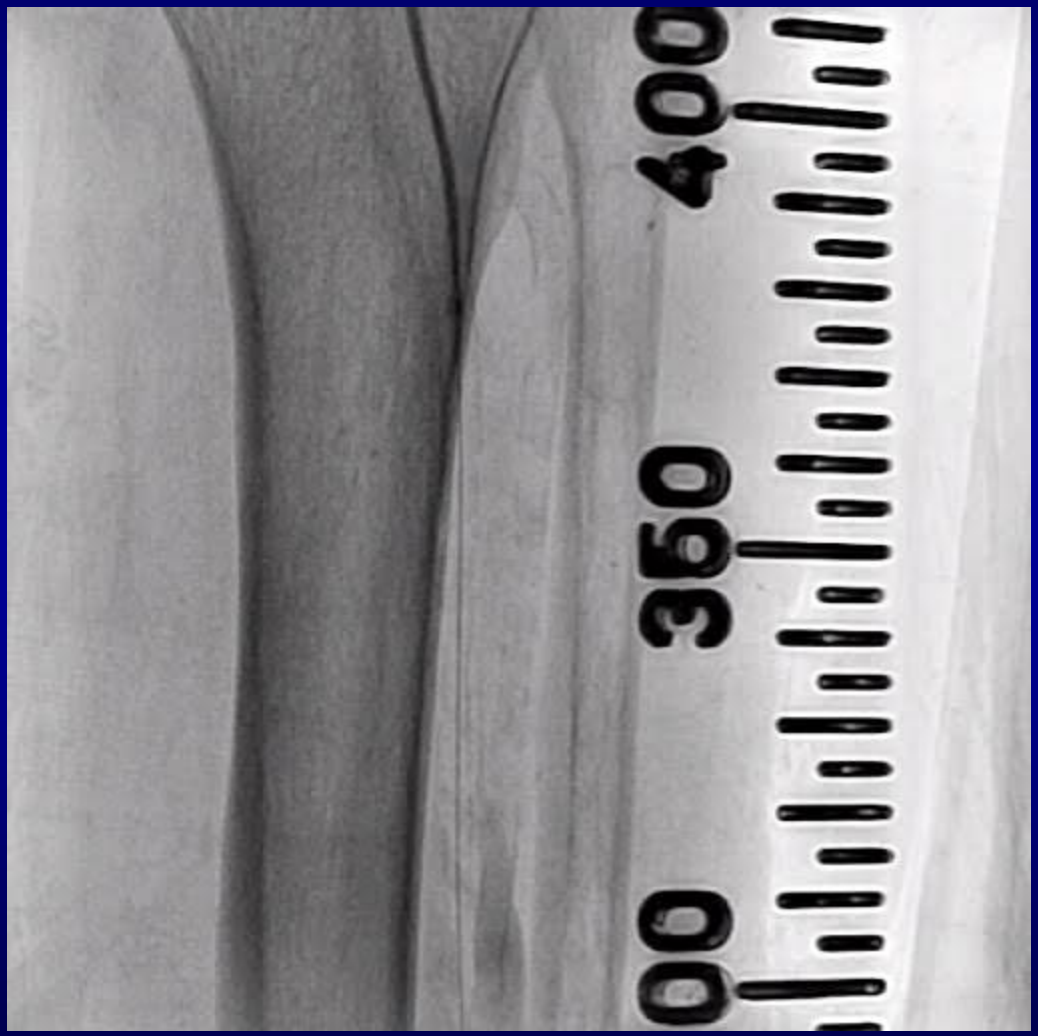


5F Heartrail catheter, 014 Command ES

Peroneal POBA

Sleek 2.0 & 2.5 X220mm

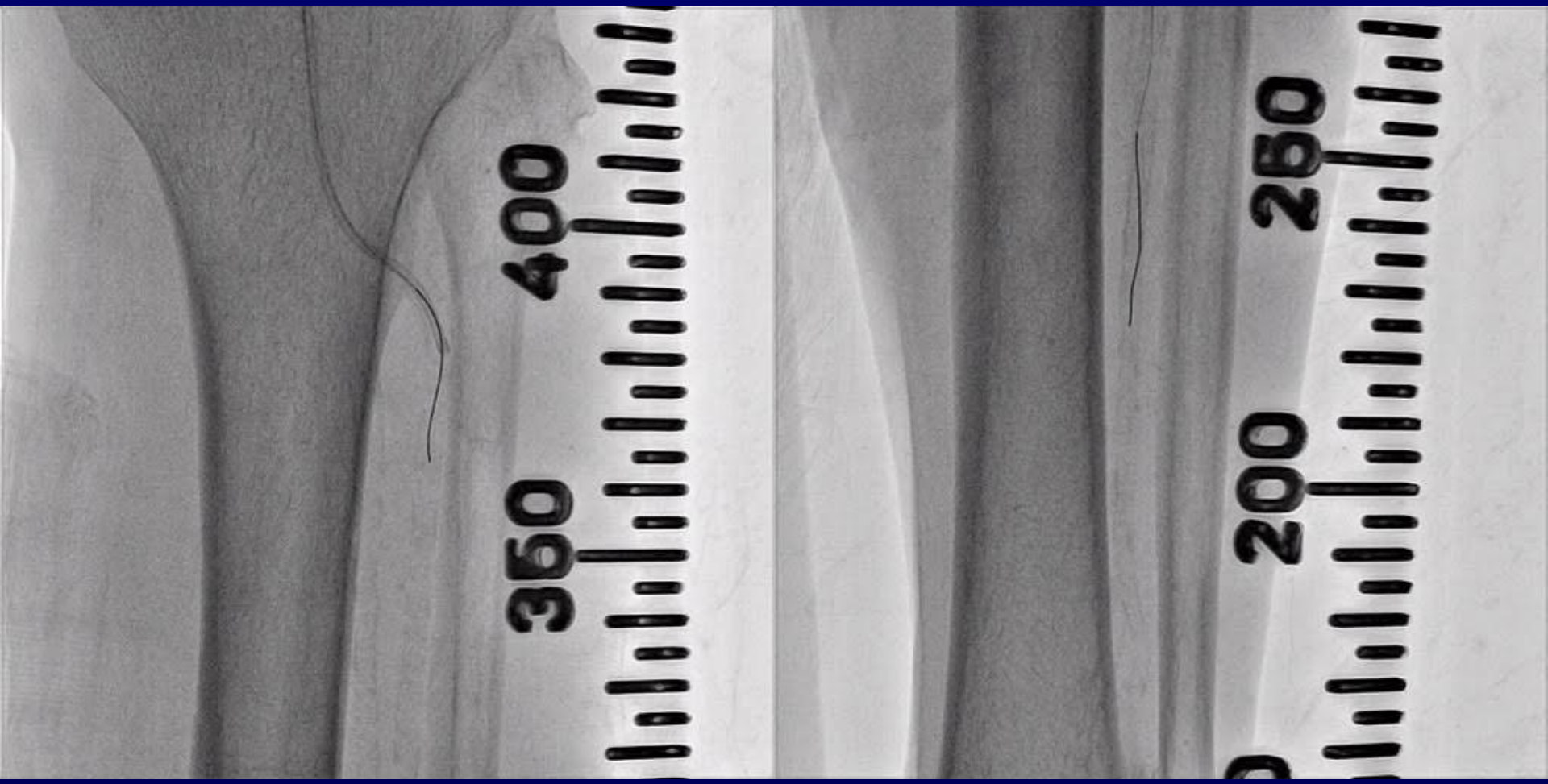
Peroneal Final Image



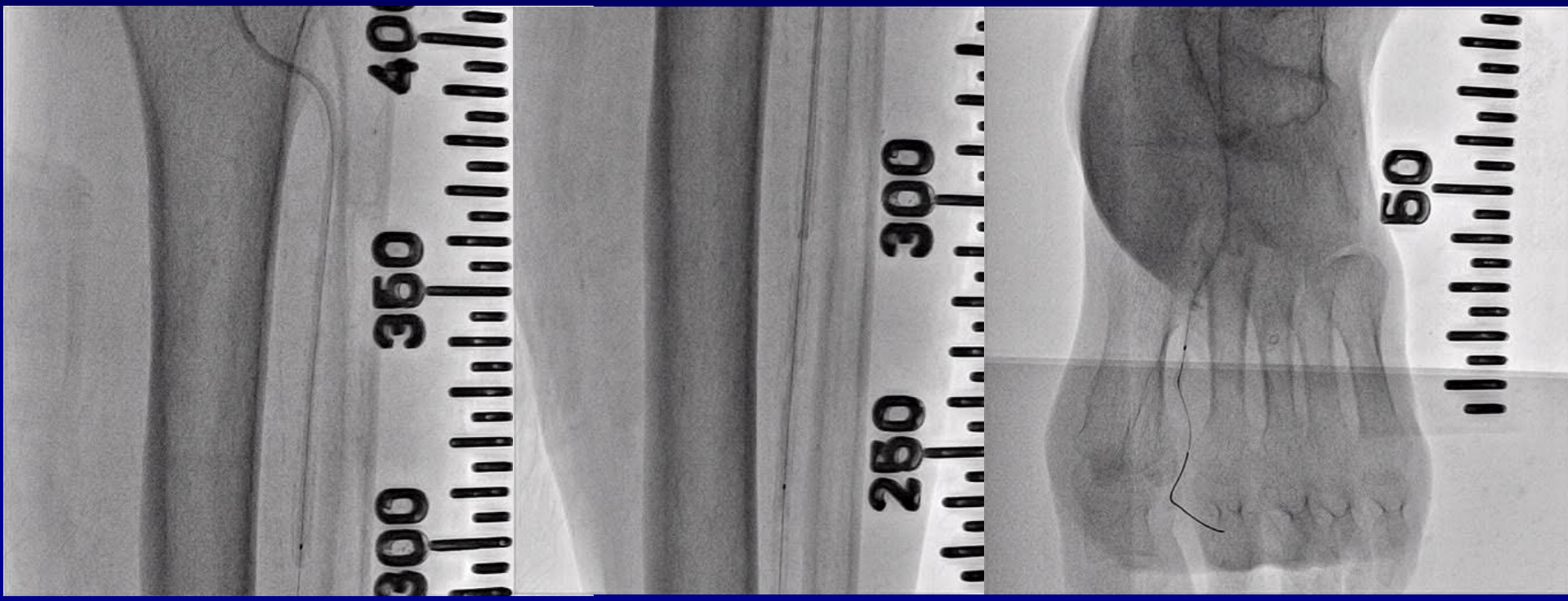
ATA Baseline & Engagement

Stent balloon 2.75X30mm, 5F Heartrail by Anchor balloon technique

ATA Wiring



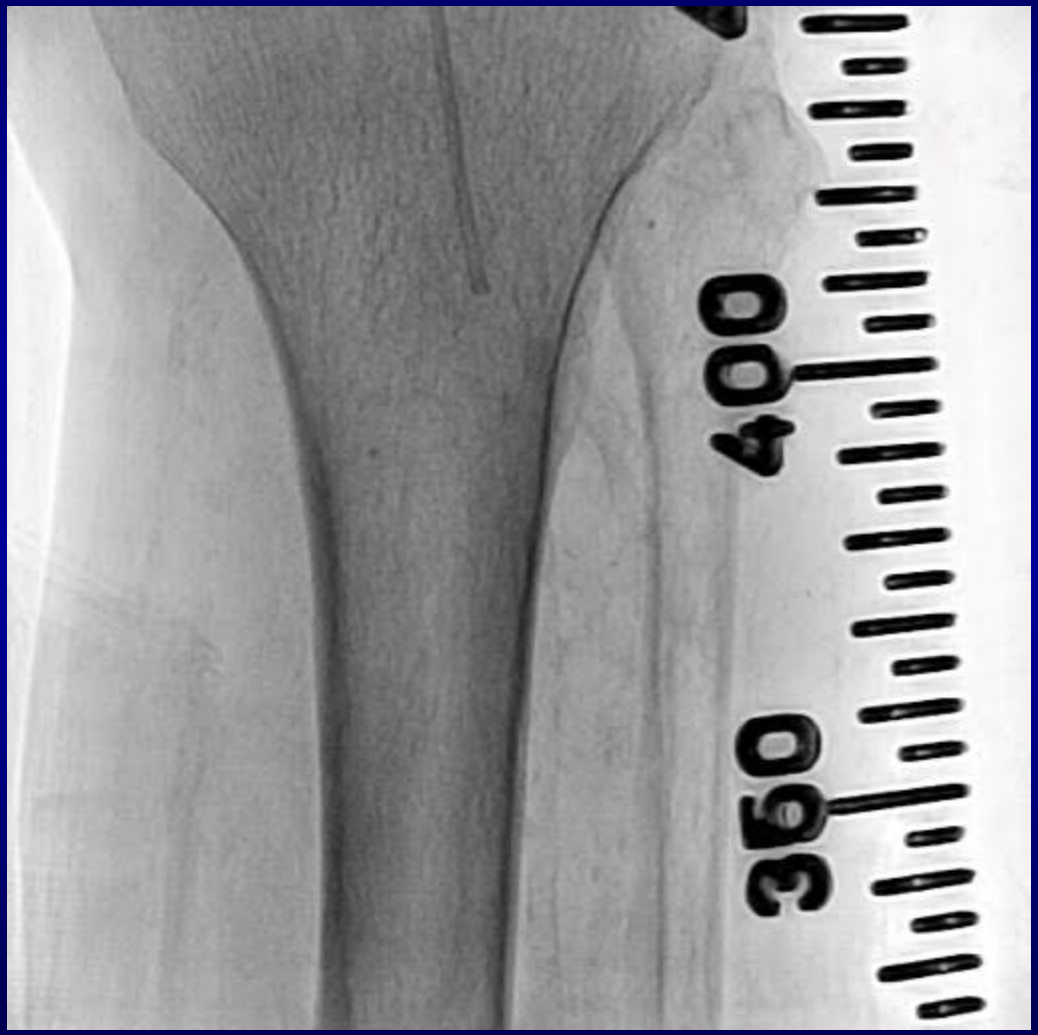
ATA POBA under Heartrail Support



1. Prevent acute recoil and acute thrombosis
2. Calm down balloon induced intimal dissection
3. Stronger back up support
4. Can reduce contrast amount with clearer image

ATA-Post POBA

BTK-Final Angiography



Why I open up all the infrapopliteal arteries?(1)

1. Because this patient is in CLI and high risk of major/minor amputation.

2. Because the long-term patency following PTA is not good ; you have higher chance of reocclusion even you have an excellent PTA results.

3. Because the patient has significant multiple risk factors for cardiovascular disease, suggesting higher chance of recurrent CLI or progression in other de novo lesions.

Why I open up all the infrapopliteal arteries? (2)

3. Because I don't believe the collaterals alone

; collateral is collateral and can not superior than native routes.

4. Because I agree with 'angiosome concept' but that can not guarantee complete recovery from the CLI nor recurrence.

5. Because full revascularization is technically feasible.

1) more accumulated PTA techniques

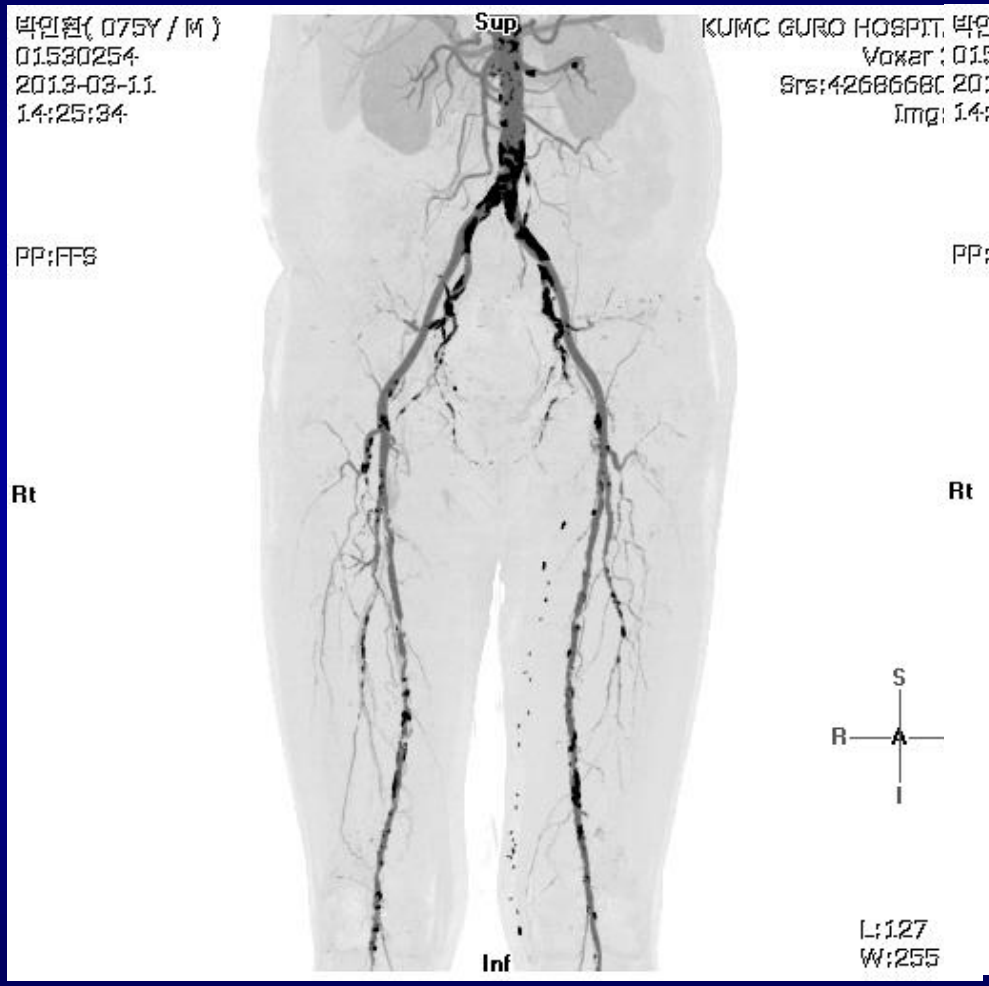
2) more developed new devices

3) can open the invisible channels and distal stumps

Contents

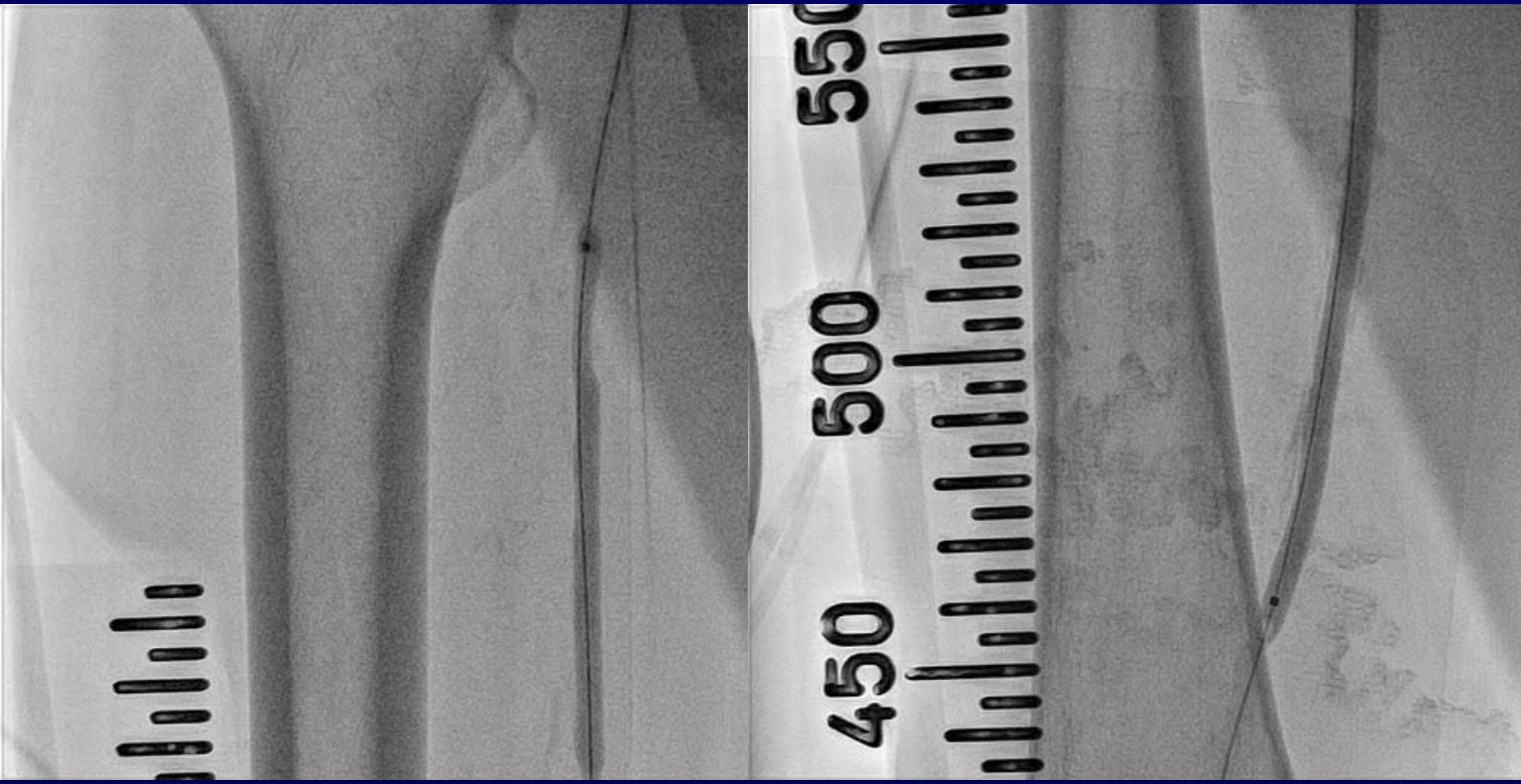
1. BTK & BTA-Intraluminal Angioplasty
2. BTK & BTA-Subintimal Angioplasty
   (035 & 014 system)
3. BTK-IVUS guided Stenting Case
4. BTK & BTA-retrograde pedal approach & Transcollateral approach
   (Next lecture…due to limited time)

Baseline CT Angiography

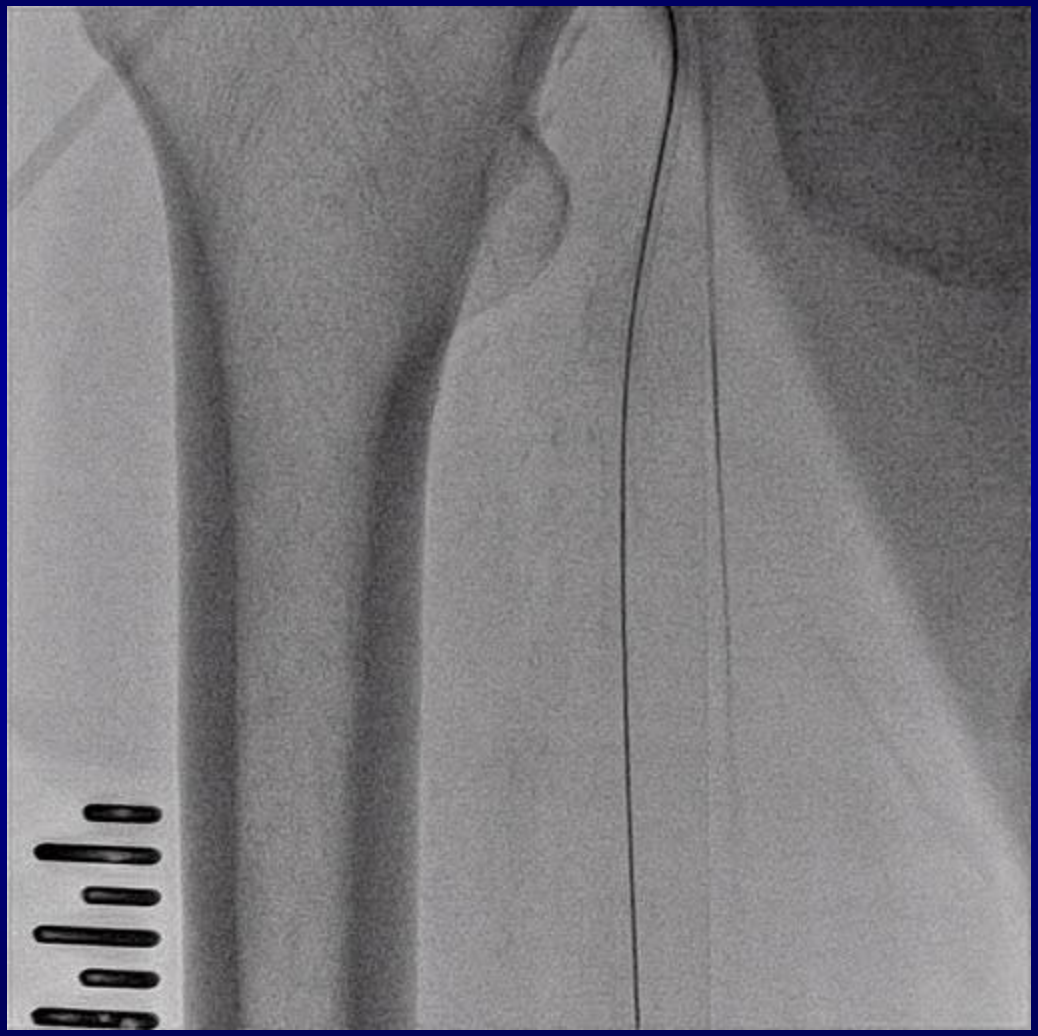


Baseline Angiography

SFA-POBA



SFA-Post POBA



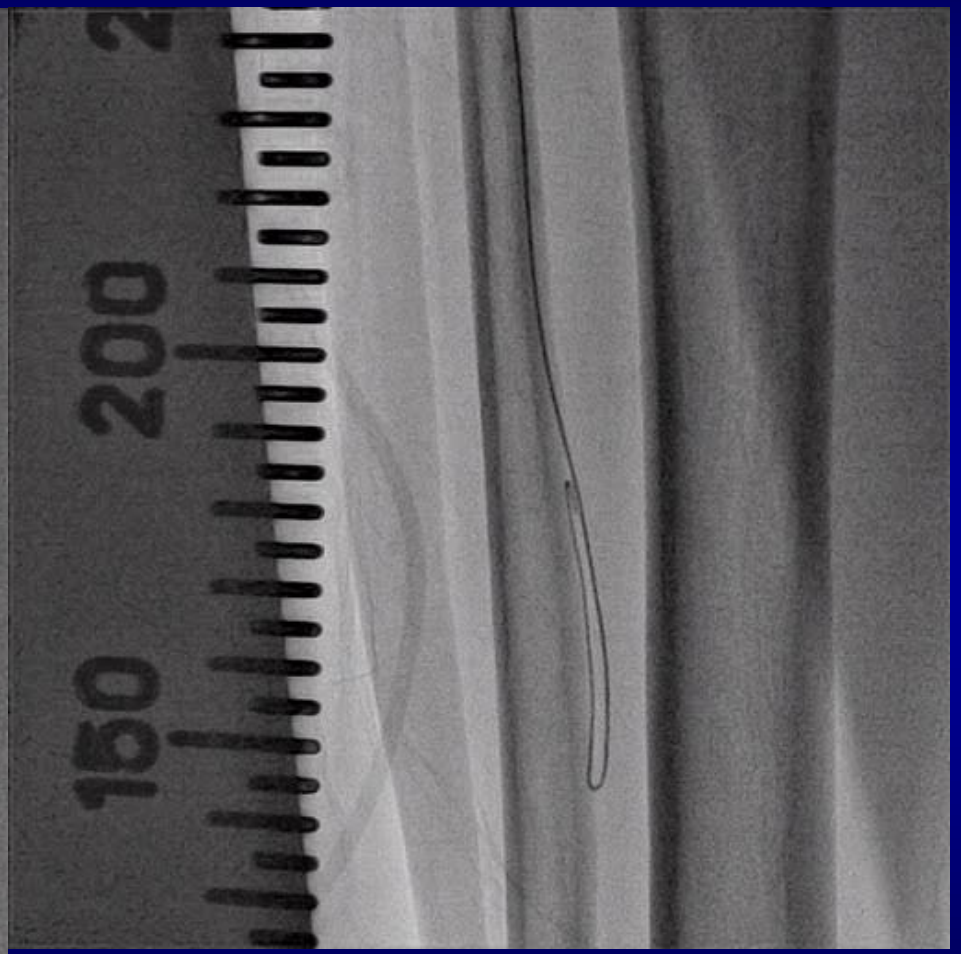
If possible, no SFA stent before BTK intervention

BTK-Baseline Angiography

MP-1 Delivery for Support

035 angled Terumo guide, 5F MP-1 or 4-5F Glide catheter support

035 Subintimal Angioplasty



- 1.5J curve 035 Terumo wire (angled Terumo is not recommended!)
- Try to make a small distal loop with catheter support

Proximal Ballooning

To deliver the 5 F Heartrail catheter

Dr Rha's Flushing Technique

* Indication; Negotiation from Subintimal space to True lumen when distal stump is not visible.

*Spontaneous Reentry by forceful hydrostatic pressure; NTG 200μg+NS 100cc

1) Selective CTO wiring; Winn80 or
2) 014 Subintimal wiring in below the ankle

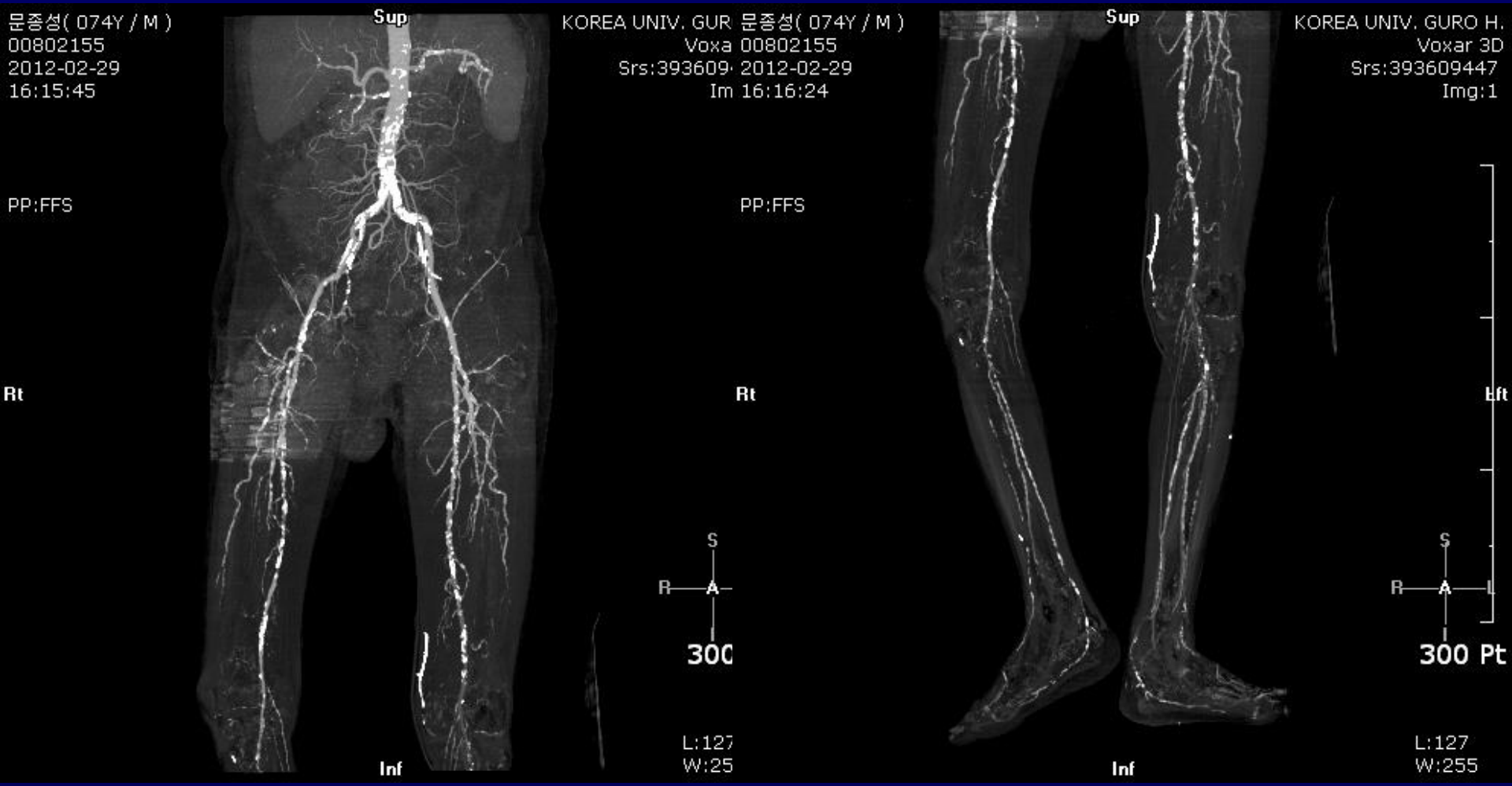
BTA-014 Subintimal Wiring

Final Angiography

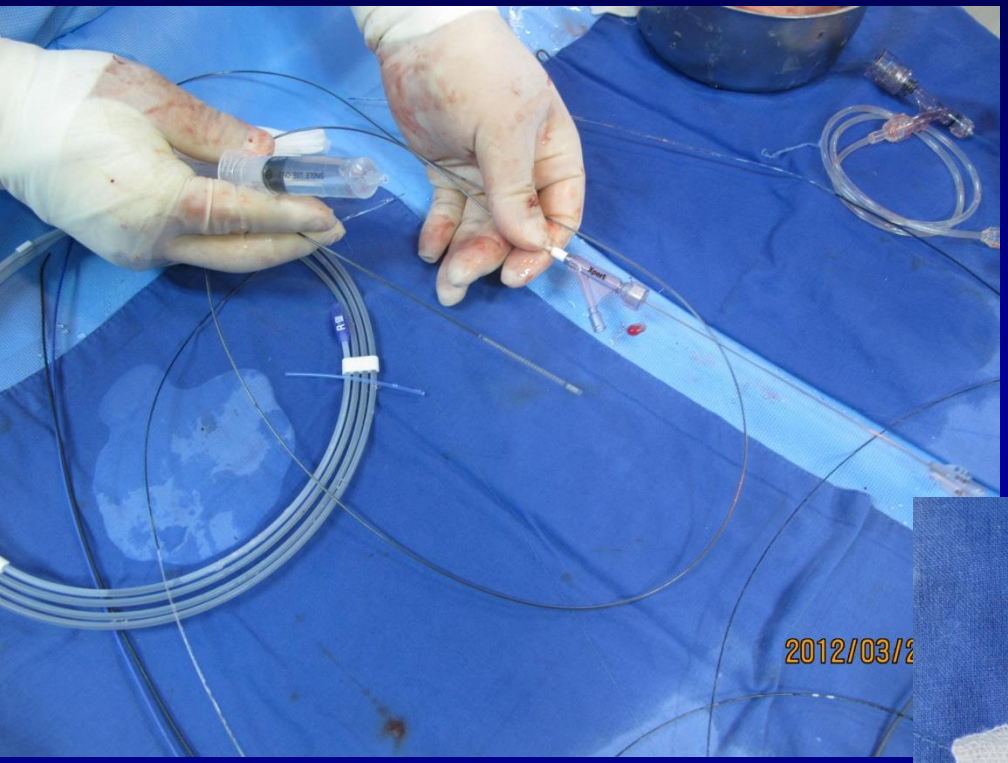
Contents

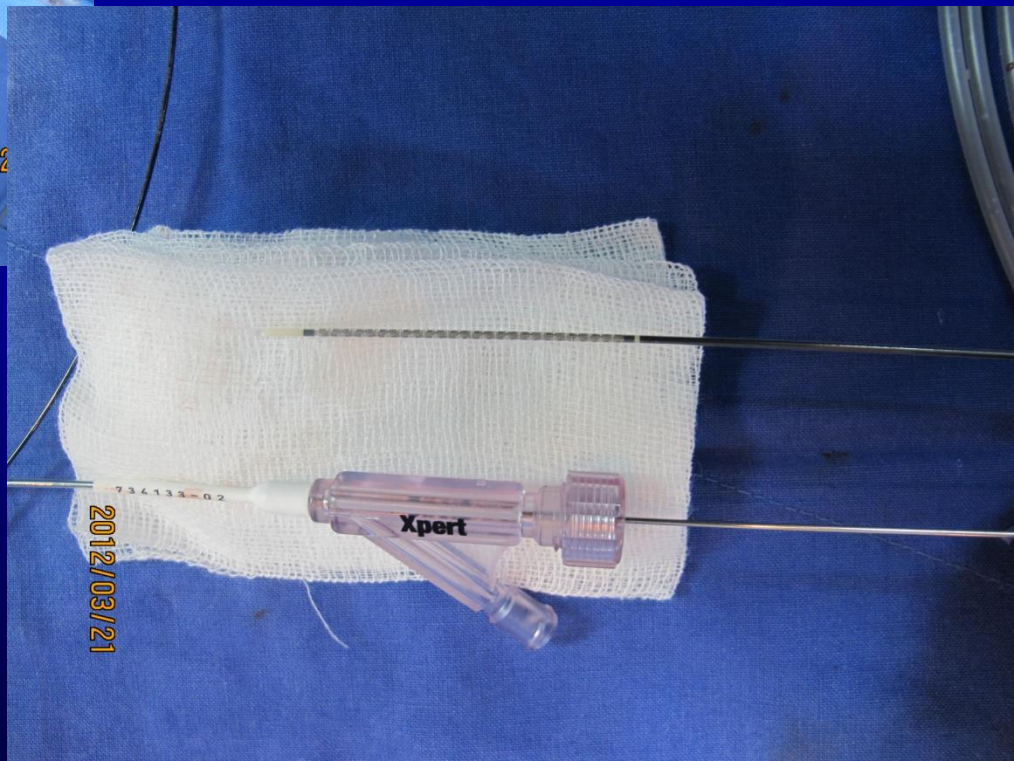
1. BTK & BTA-Intraluminal Angioplasty
2. BTK & BTA-Subintimal Angioplasty
   (035 & 014 system)
3. BTK-IVUS guided Stenting Case
4. BTK & BTA-retrograde pedal approach & Transcollateral approach
   (Next lecture…due to limited time)

CT Angiography

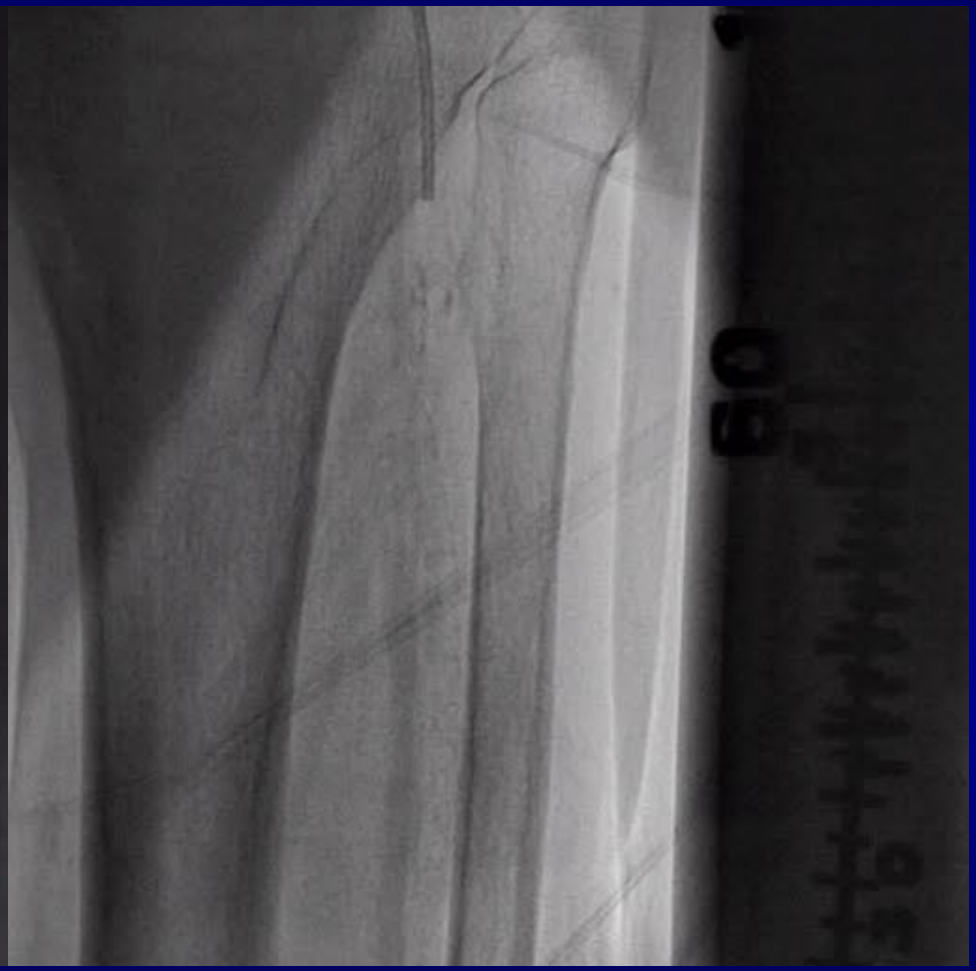


Xpert Stent (Abbott)





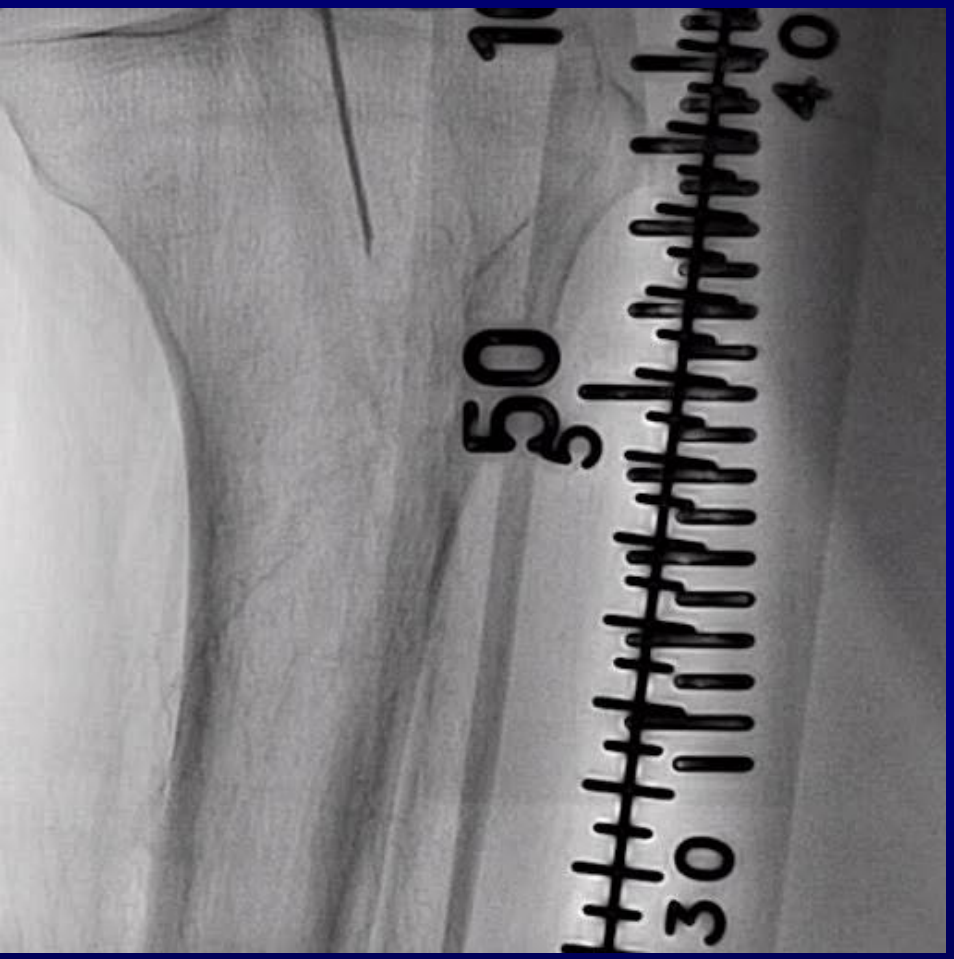
BTK-Baseline Angiography



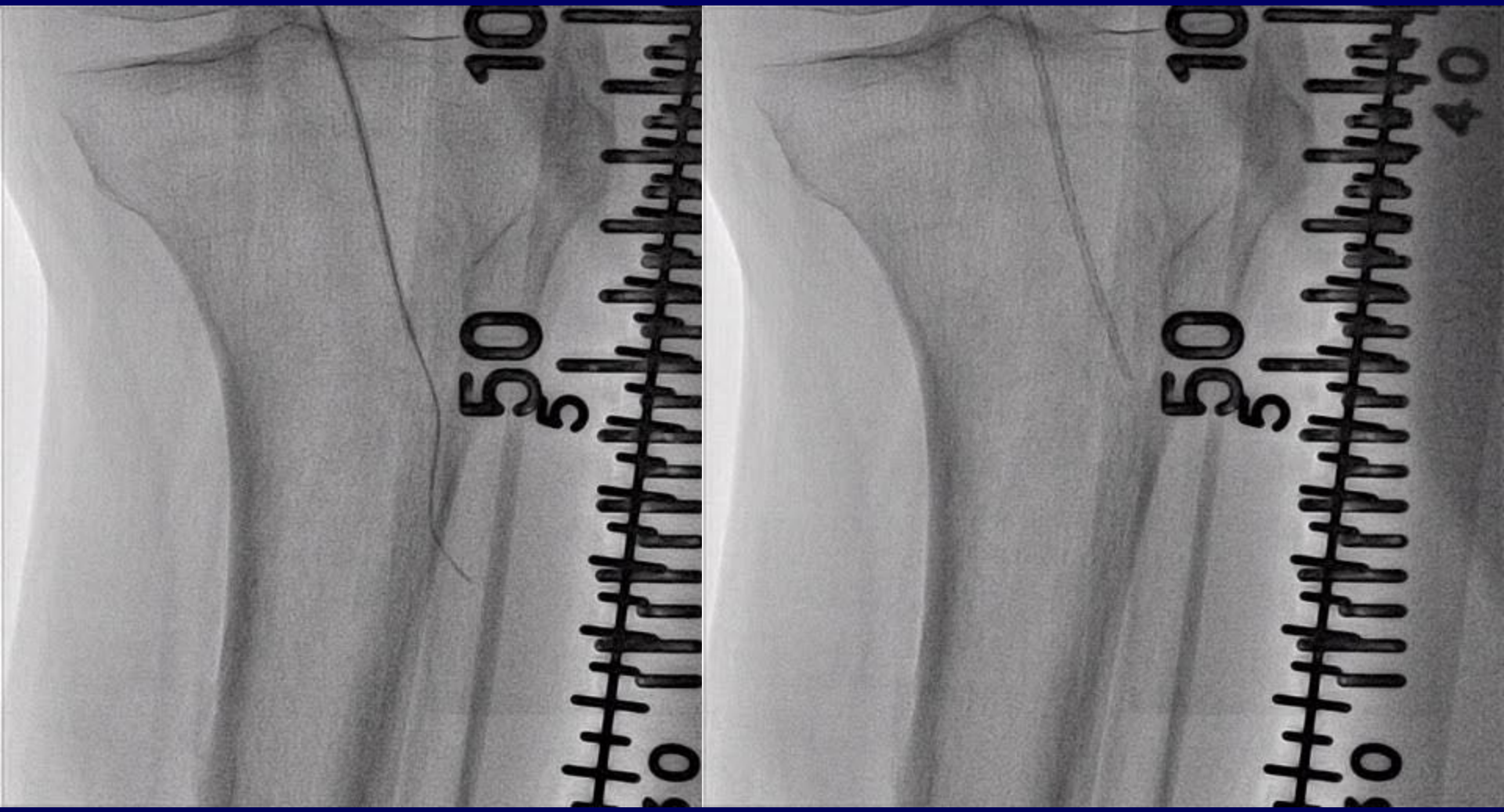
Ipsilateral Anterograde, 5F Sheath, 5F MP-1 catheter

Rotating angiography is helpful to understand clear anatomy

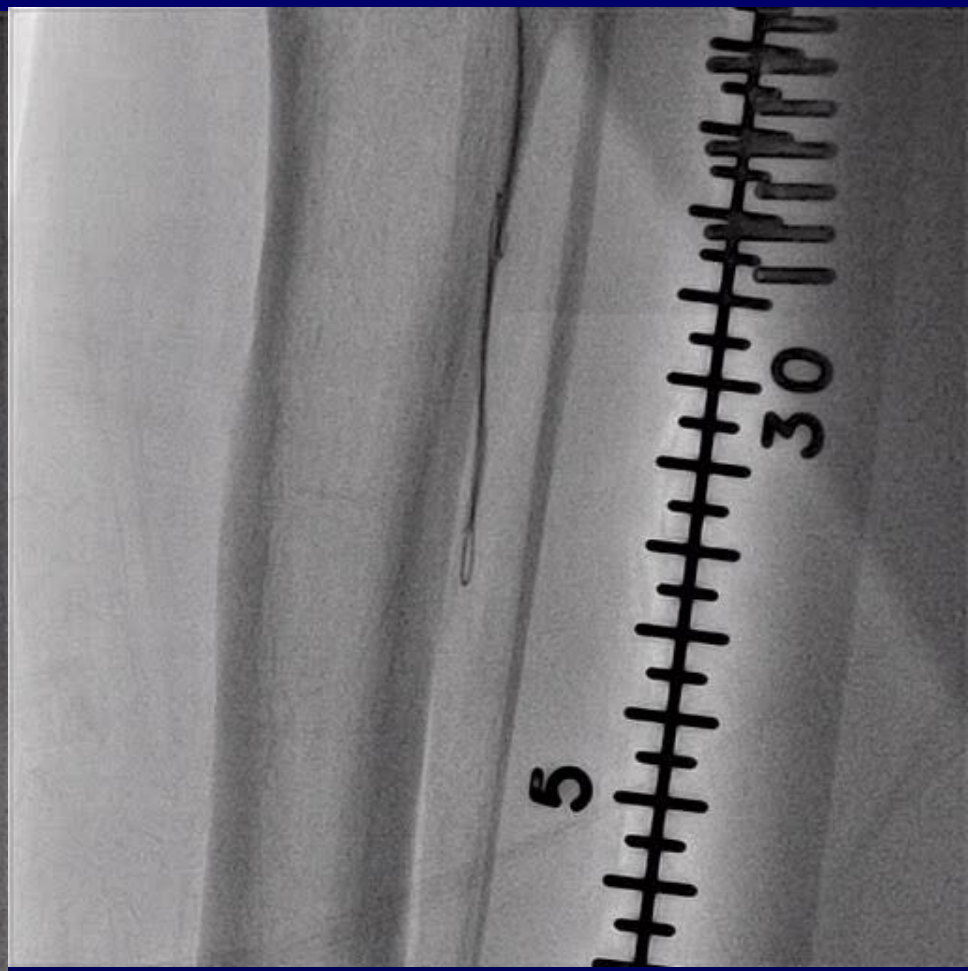
BTK Baseline Angiogram and 035 Wiring



ATA Selection and Selective Angiography

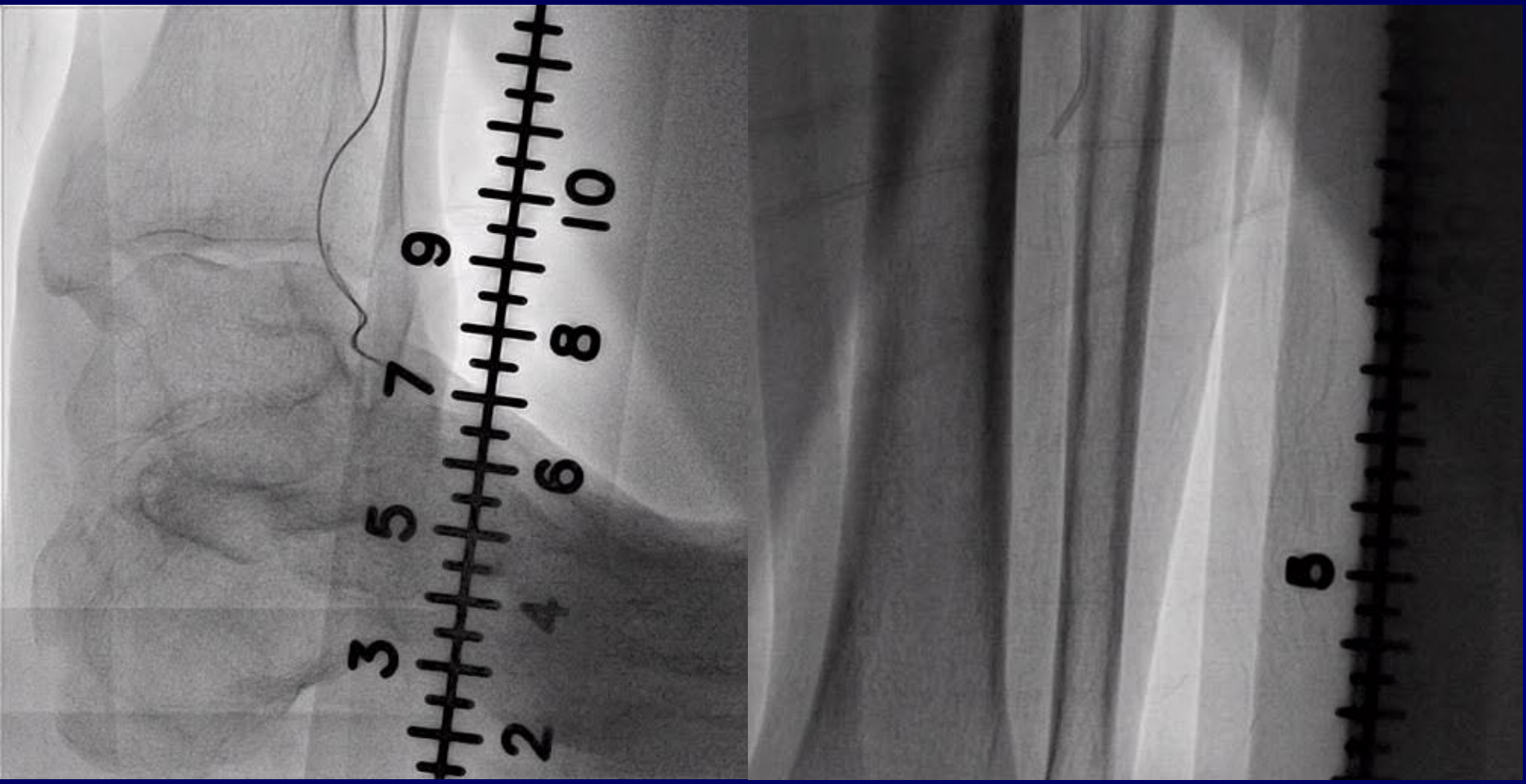


Subintimal Wiring



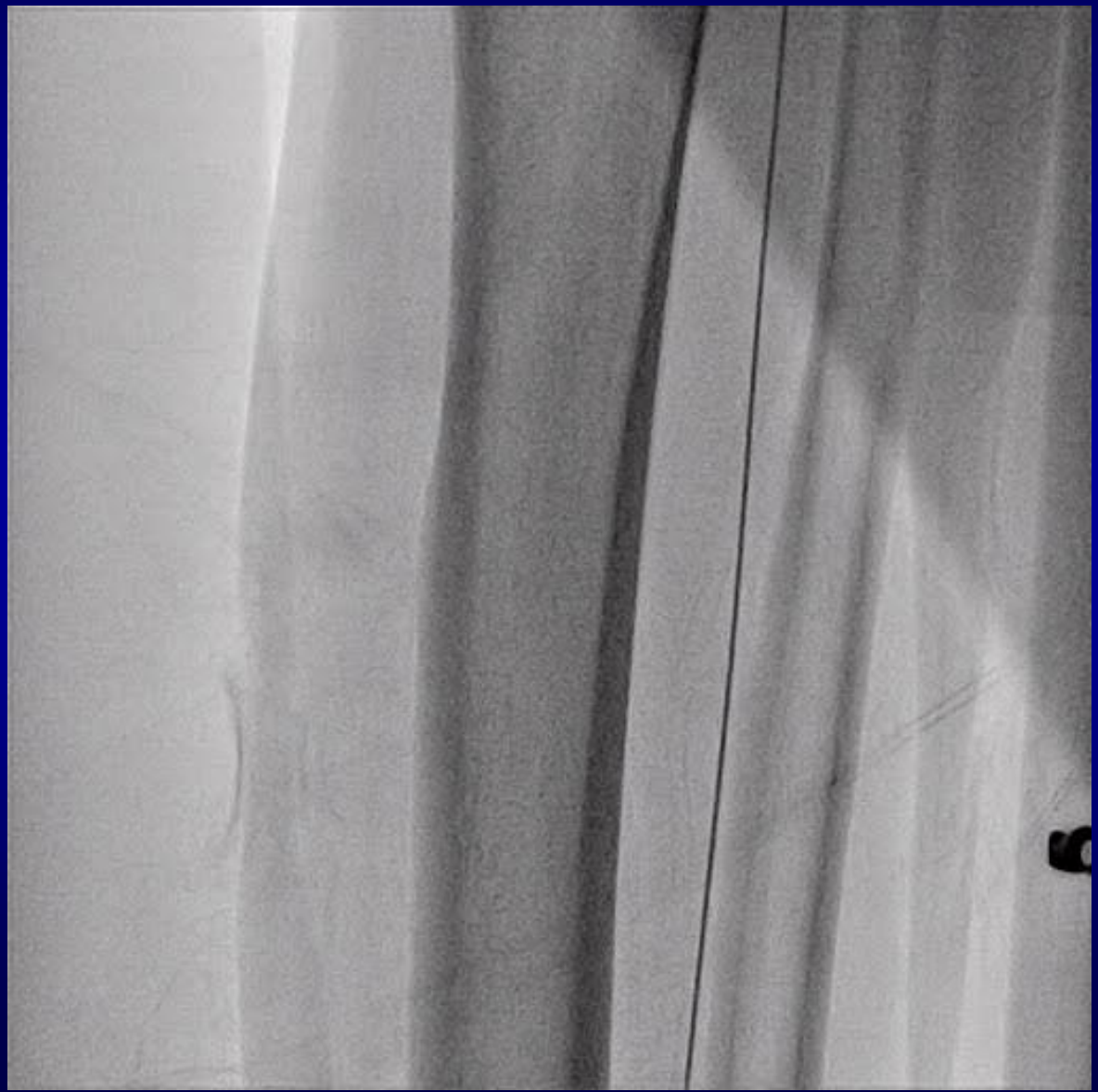
5F MP-1, 035 soft long Terumo (1.5J)

Post Subintimal Wiring



Below the ankle subintimal wiring without obvious big distal stump is dangerous! (Risk of perforation or rupture of BTA arteries)

Exchange to 014 System with 5F Heartrail Catheter



Balloon Angioplasty

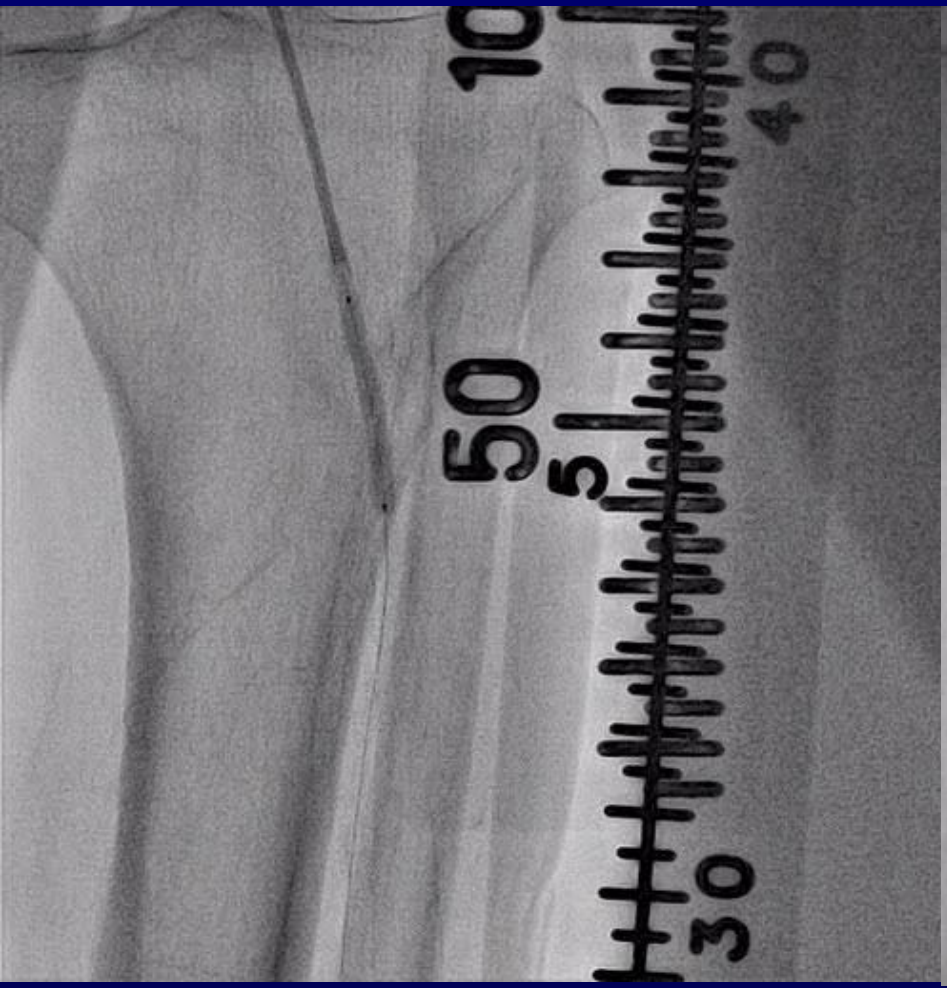
014 Runthrough Wire

Sleek 2.5X220mm

Post Balloon Angioplasty

Nitroglycerin 200 μg, Heparinized Saline Irrigation

Stent Balloon 3.0X24mm

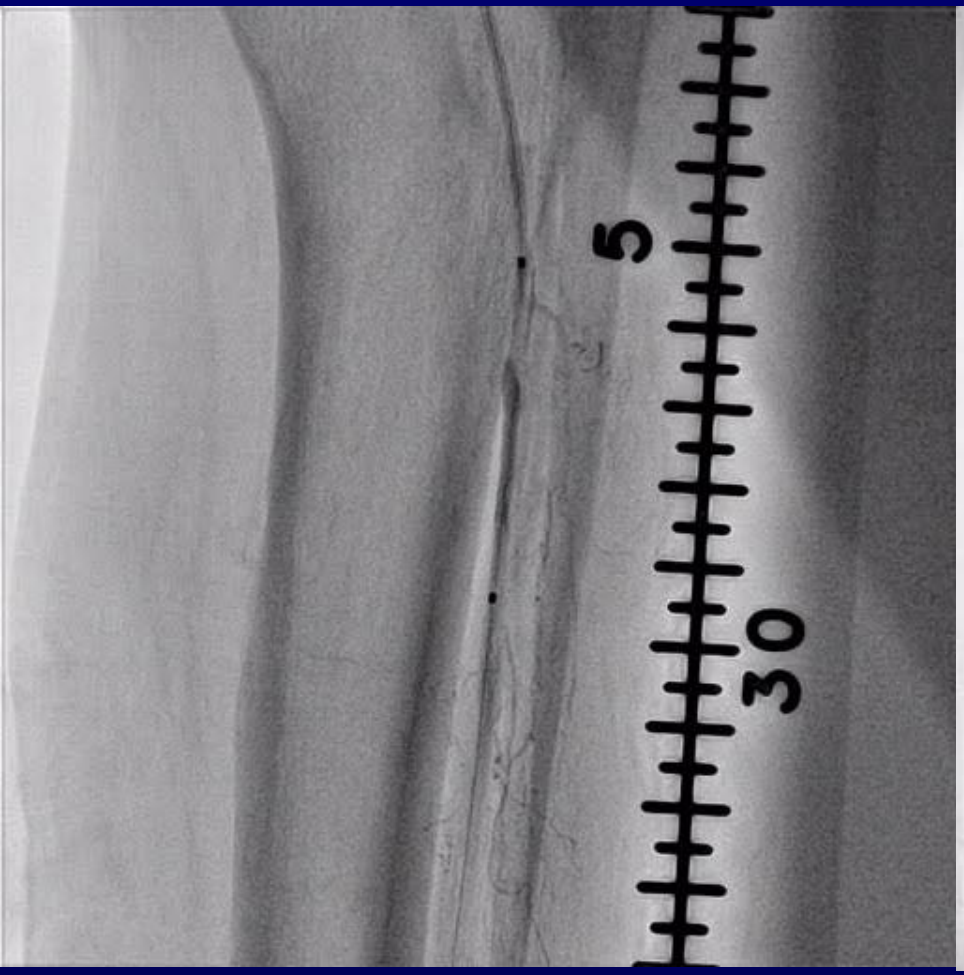


Shorter coronary balloon is preferred!

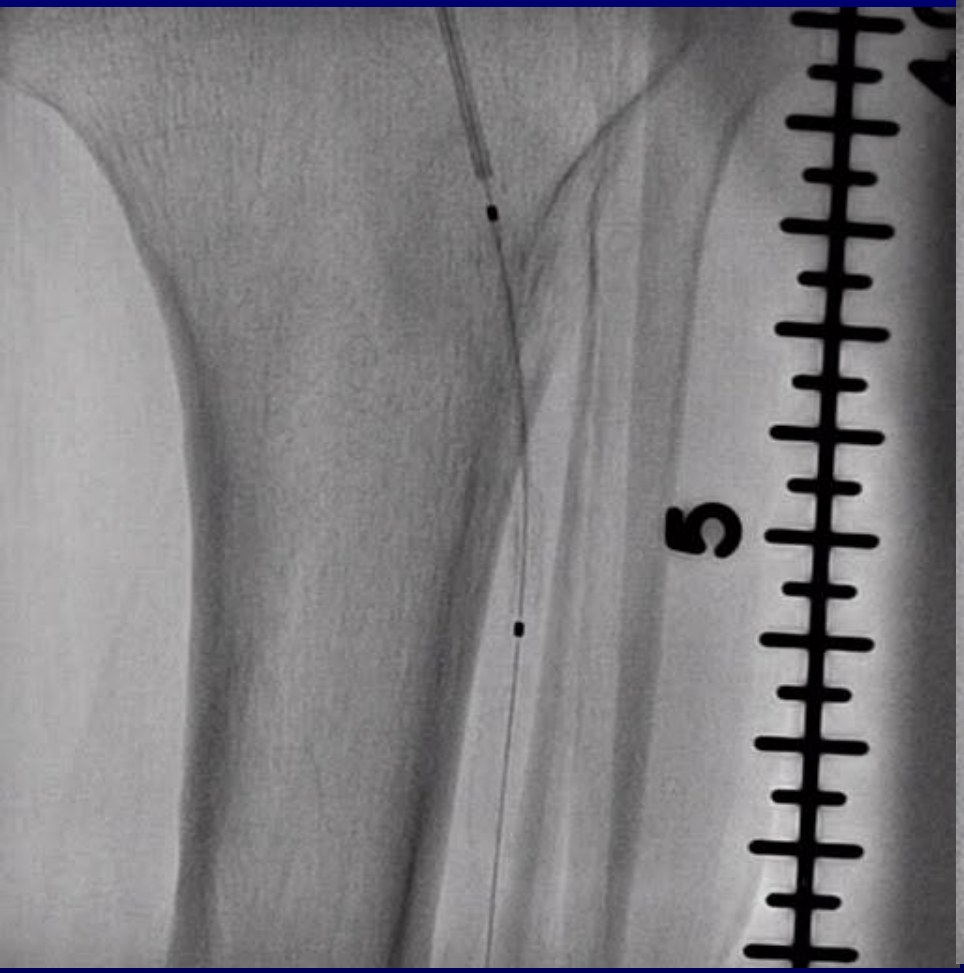
Stent Positioning and Wiring

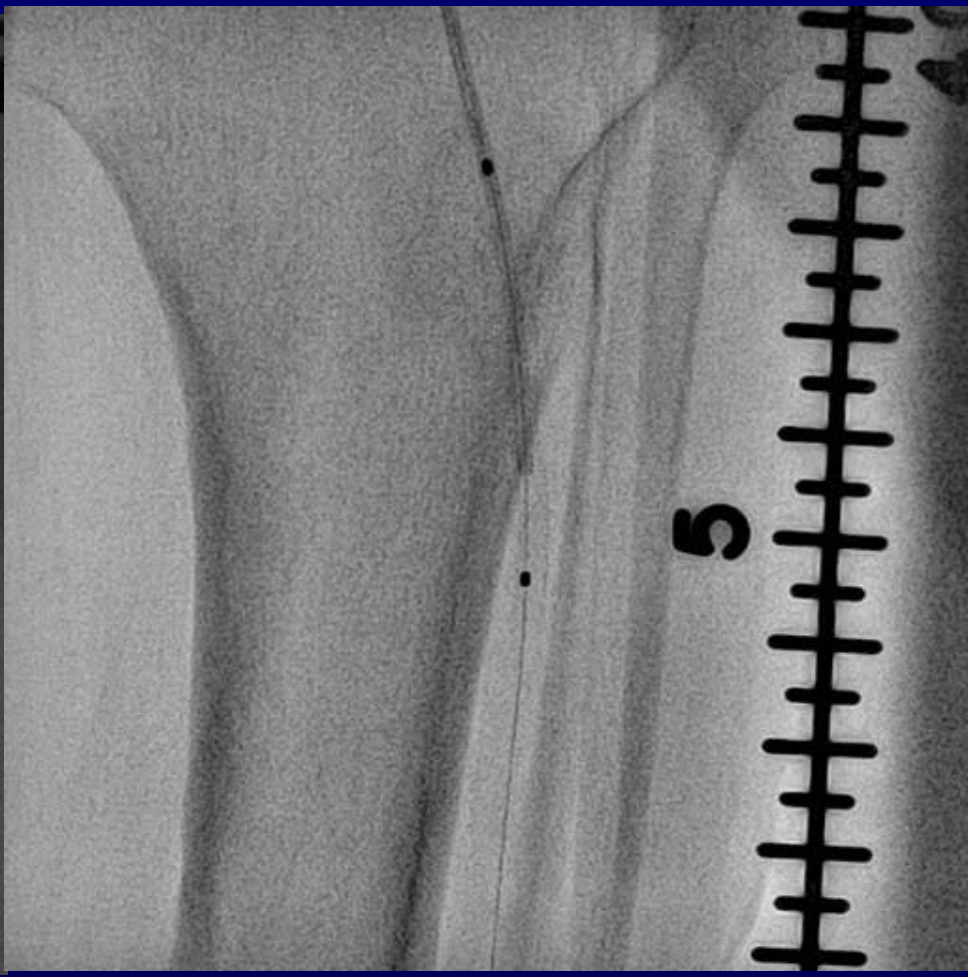
Xpert 3.0X40mm, 5F Heartrail protection with 014 short wire

Stent Positioning



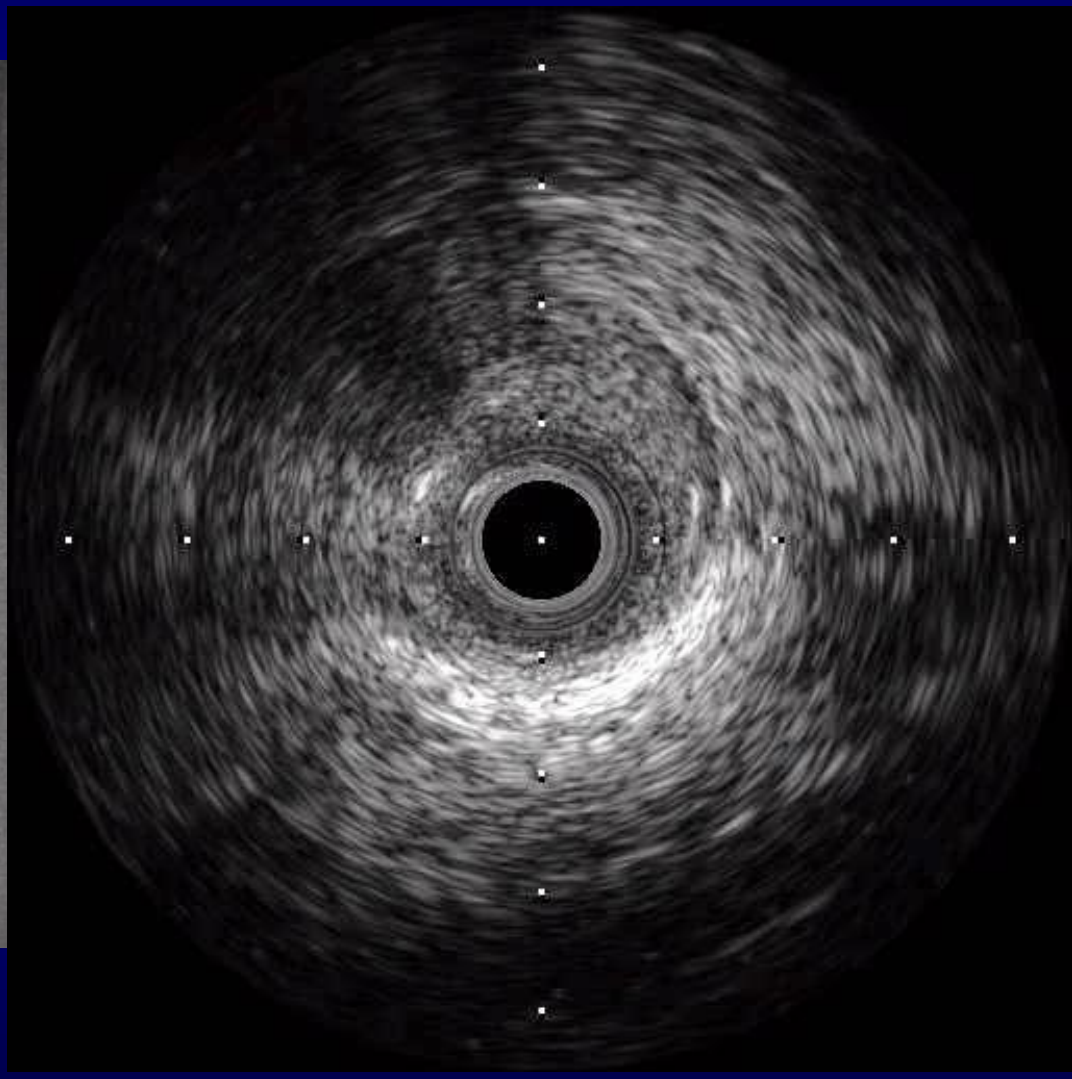
Stenting & Retrieve the delivery catheter



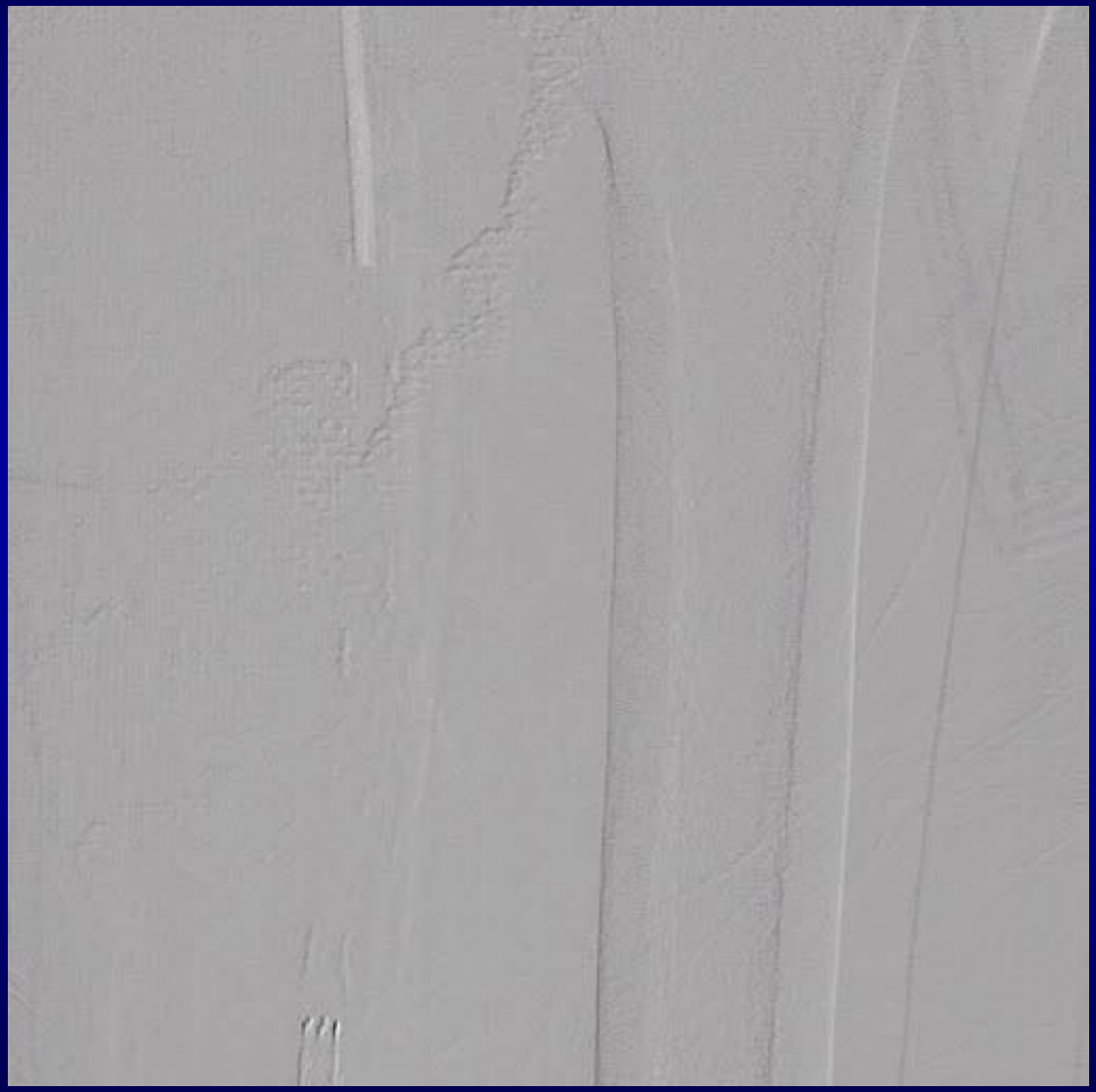


Xpert 3.0X40mm

Post Stenting Angiography and IVUS



Final Angiography by Bolus Chase Image



Stents for PTA

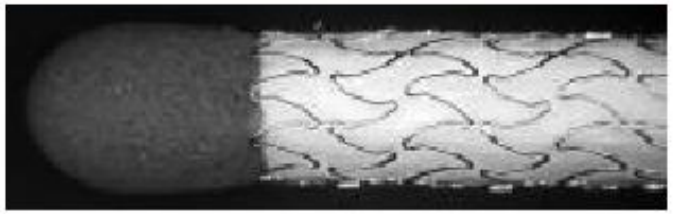
	014	035
Abbott	Xpert (SES)	Absolute Pro Omnilink (BES)
Bard		Life
Cordis	Precise (SES)-Carotid Palmaz Blue/Genesis (BES)-Renal	*Smart*
Gore		Viabahn (Stentgraft)
Cook		Zilver, Zilver PTX (DES)
Medtronic	Maris deep (SES);014 & 018 Chromis Deep (BES)	Complete SE Scuba (BES)
Boston		Wall Stent, Epic, Inova
Covidien		Protege

*SES; Self-expanding stent, BES; Balloon-expandable stent,
DES; Drug-eluting stent

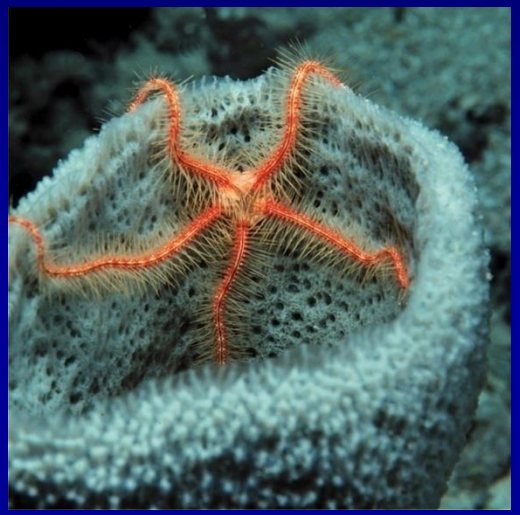
Xpert Stent (Abbott Vascular)

Xpert stent system
The one and only

Sleek, flexible, balanced



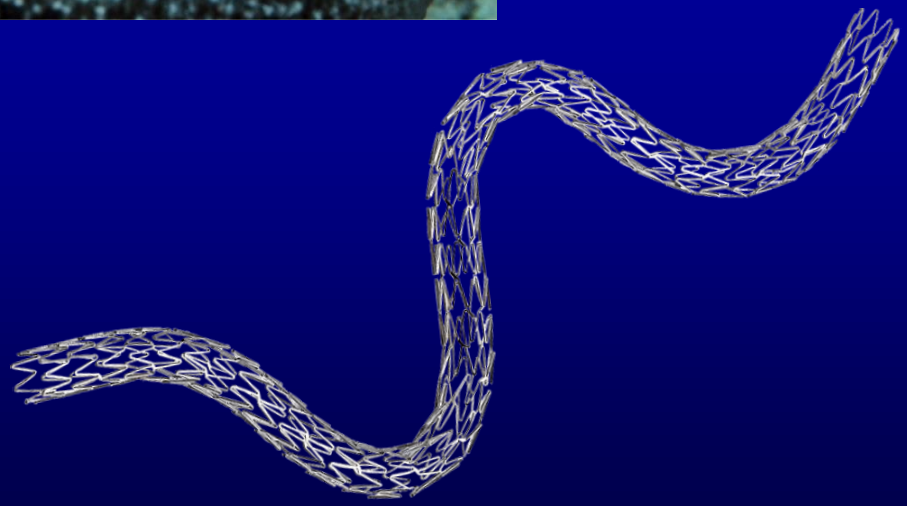
Xpert stent system



MARIS DEEP

Infrapopliteal Self-Expanding Stent System

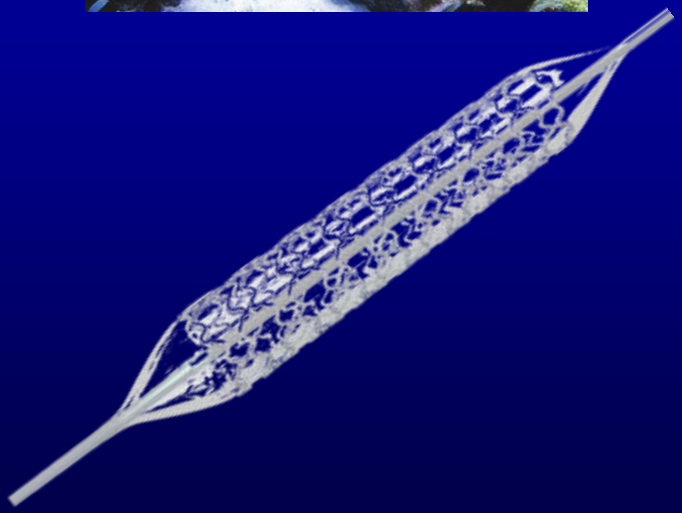
Go Deep with the world's smallest self-expanding stent system



CHROMIS DEEP

Infrapopliteal Balloon-Expandable Stent System

Dedicated 0.014” Co-Cr System for BtK Stenting

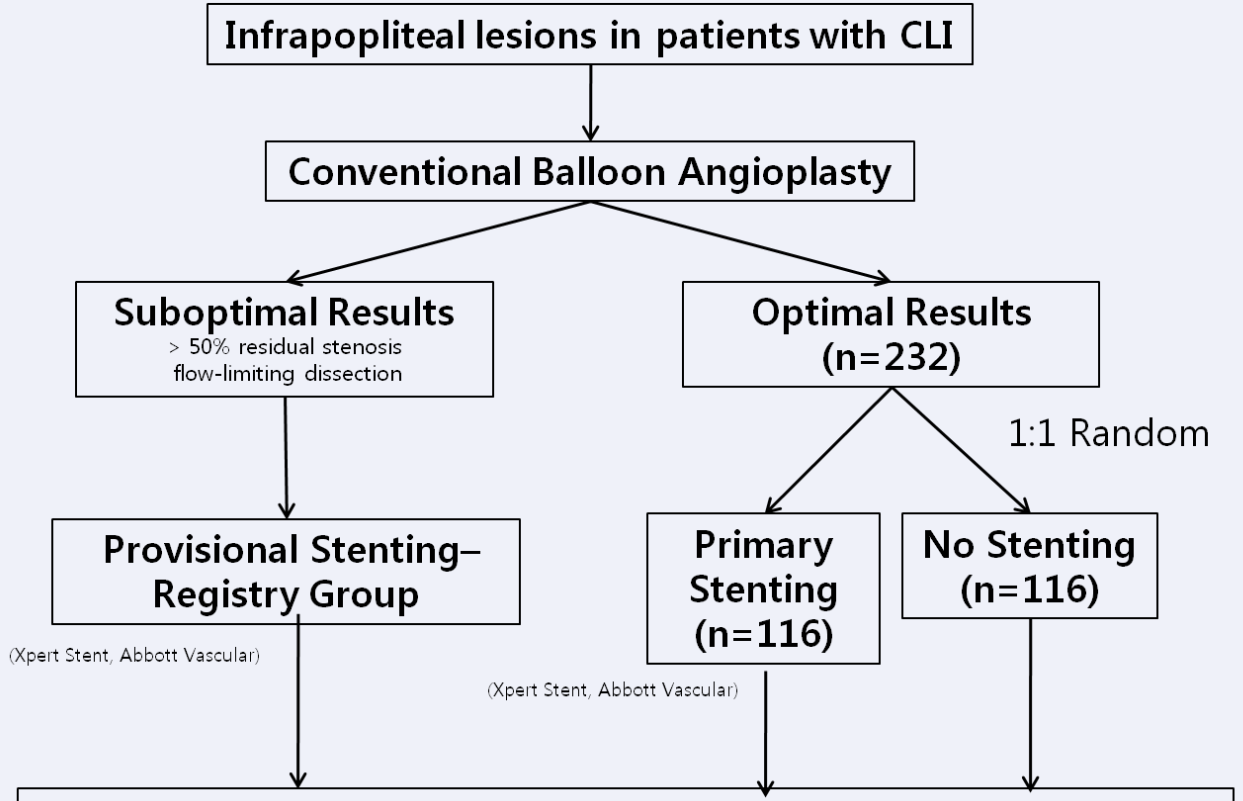


Efficacy of **S**elf-**E**xpanding **N**itinol **S**tent versus Balloon Angioplasty Alone for the **B**elow **T**he **K**nee Arteries following Successful Balloon Angioplasty Trial (**SENS-BTK** trial)

무릎 밑 동맥에서 자기 확장 스텐트를 이용한 혈관성형술의 효과에 대한 한국 다기관 연구 (전향적 다기관 무작위 연구)

Clinical Trial Reg No; NCT00546845

PI; Seung-Woon Rha



Angiography at 12 months

Primary endpoint

- Angiographic binary restenosis rate at 12 months
  - >50% re-obstruction of the target lesion as assessed by quantitative angiography

Secondary endpoints

- Mortality during follow-up
- Major amputation rate
- Distribution of clinical stages (according to Rutherford classification)
- Sustained clinical improvement
  - healing of all skin lesions and resolution of ischaemic rest pain
- Repeated target lesion revascularization (TLR) rate
- Repeated target extremity revascularization (TER) rate
- Total re-occlusion rate
- Anigoraphic variables (Late loss, % restenosis)
- Ankle-brachial index (ABI)

Inclusion Criteria

- **Clinical criteria**
  1. Age 20 years of older
  2. Symptomatic critical limb ischemia, Rutherford 4 - 6
  3. Informed consent
- **Anatomical criteria**
  1. Target lesion length < 8 cm by angiographic estimation
  2. Stenosis of >50% or occlusive atherosclerotic lesion of the ipsilateral infrapopliteal artery
  3. Reference vessel diameter should be 2.0–4.5 mm
  4. Single vessel, single lesion, short lesion (<8cm)

Study Endpoints

1. Primary endpoint

:Binary Restenosis at 12 months

* binary restenosis : >50% re-obstruction of the target lesion as assessed by quantitative angiography

2. Secondary endpoints

1) Target lesion and vessel revascularization (TLR, TVR)
2) Target extremity revascularization (TER)
3) Limb salvage rate: free from amputation
4) Major cardiovascular adverse event : death, MI, Stroke
5) Angiographic parameters; Binary restenosis, FU MLD, LL, % restenosis

SENS-BTK Centers (2014.12)

번호	병원명	Investigator	PTA Random		Registry	Week	Month	Total	Excluded
			Stenting	Alone					
1	고대구로병원	나승운	30	31	0	0	0	61	1
2	관동의대 명지병원	조윤형	0	1	0	0	0	1	1
3	건국대 충주병원	최웅길	1	0	0	0	0	1	0
4	순천향대 천안병원	박상호	8	9	0	0	0	17	6
5	신촌세브란스병원	고영국	0	0	0	0	0	0	0
7	광주보훈병원	조상철	0	0	0	0	0	0	0
8	가천의대길병원	서순용	0	0	0	0	0	0	0
12	세종병원	최락경	0	0	0	0	0	0	0
13	인천사랑병원	김기창	2	1	0	0	0	3	0
15	건양대병원	배장호	0	0	0	0	0	0	0
16	강원대병원	김용훈	0	0	3	0	0	0	0
17	전남대병원	김주한	0	0	0	0	0	0	0
19	서울대보라매병원	정우영	0	0	0	0	0	0	0
21	대전성모병원	허성호	0	0	0	0	0	0	0
23	부천순천향병원	서존	1	1	0	0	0	2	0
27	창원한마음병원	김민웅	1	1	0	0	0	2	0
28	춘천성심병원	박상민	0	0	0	0	0	0	0
29	서울아산병원	이승환	0	0	0	0	0	0	0
30	순천향대 구미병원	안지훈	0	0	0	0	0	0	0
Total			43	44	3	0	0	87	8

Enrollment 90/232=38.8%

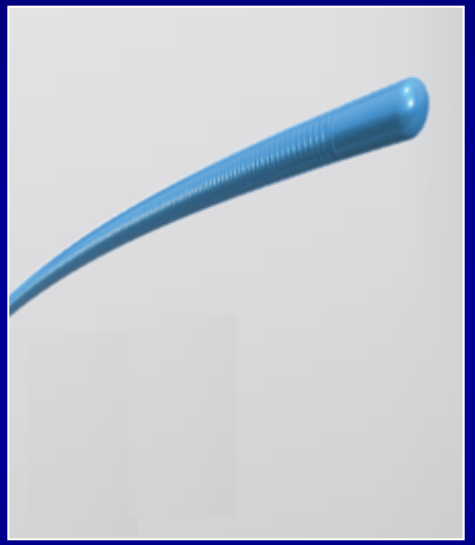
Contents

1. BTK & BTA-Intraluminal Angioplasty
2. BTK & BTA-Subintimal Angioplasty
   (035 & 014 system)
3. BTK-IVUS guided Stenting Case
4. BTK & BTA-retrograde pedal approach & Transcollateral approach
   (May be next lecture…due to limited time)

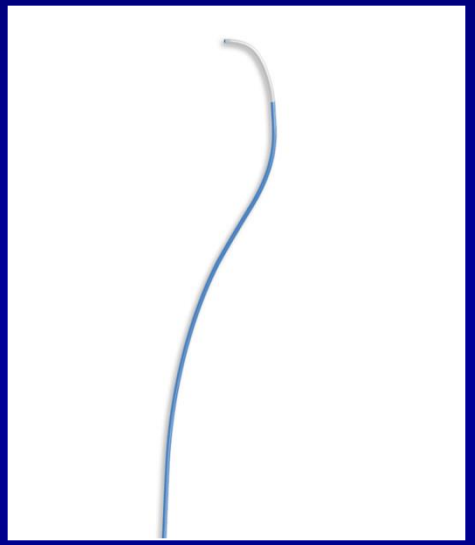
Micro–puncture SET (Cook)

Micro - catheter
(21G puncture needle)
(3F sheath)

Micro–catheter
(CXI, CXC)



CTO wire
(V-18)



JR (5F)

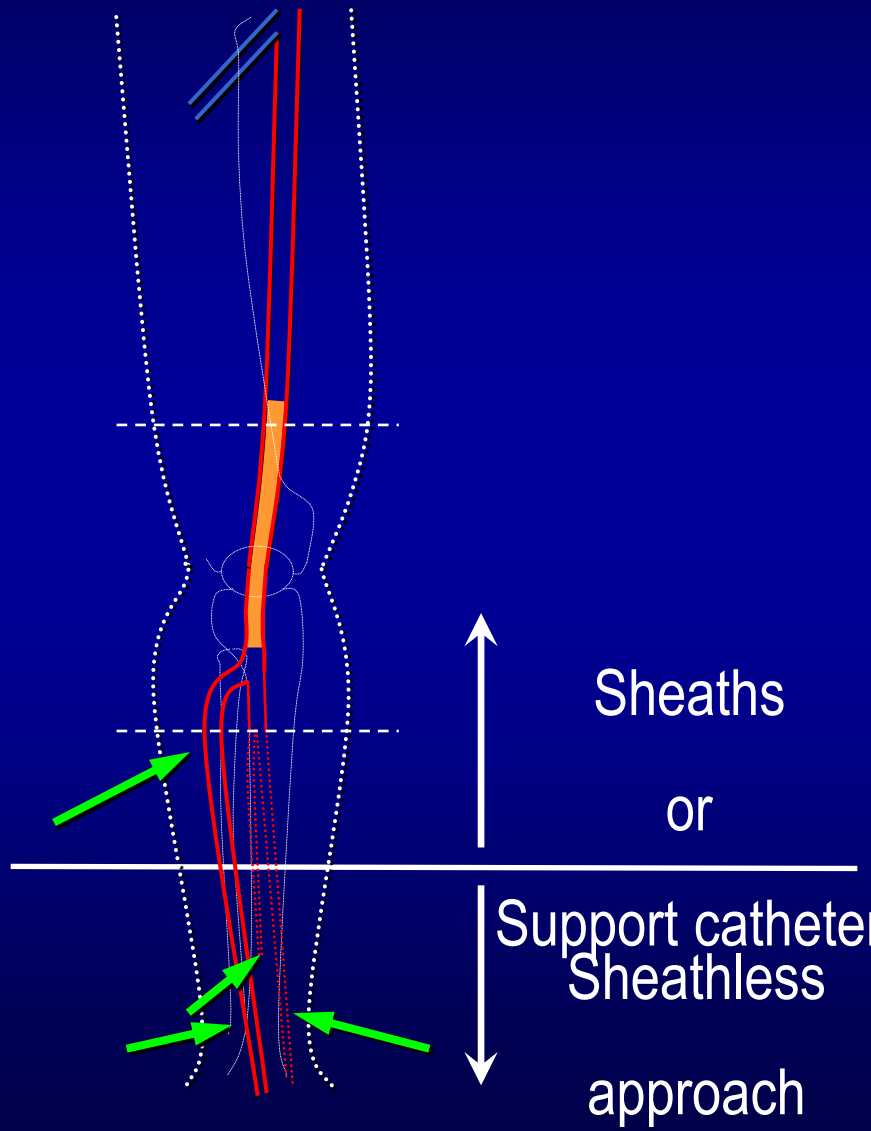
Retrograde Approach

1. Puncture needle
   1) Pedal approach; 4cm length
   2) Prox tibial approach; 7cm
   3) Distal SFA approach; 9cm

2. Supporting catheter
   1) Cook; CXI (018), CXC (014)
   2) Boston; Rubicon (018, 014), Renegrade
   3) Covidien; Trailblazer (018, 014)

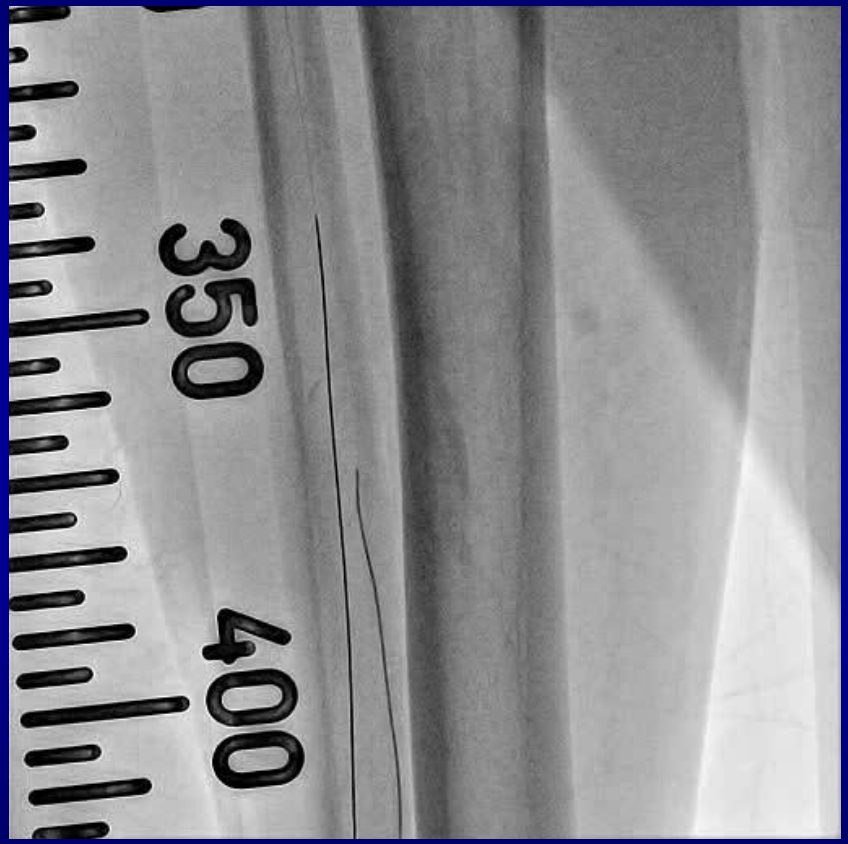
3. Retrograde Wires
   ; 018 (V-18, Connect, Treasure..), 014 (V-14, Command…)
4. Externalization; 4-5F JR4

Retrograde approach



Retrograde approach

Retrograde puncture

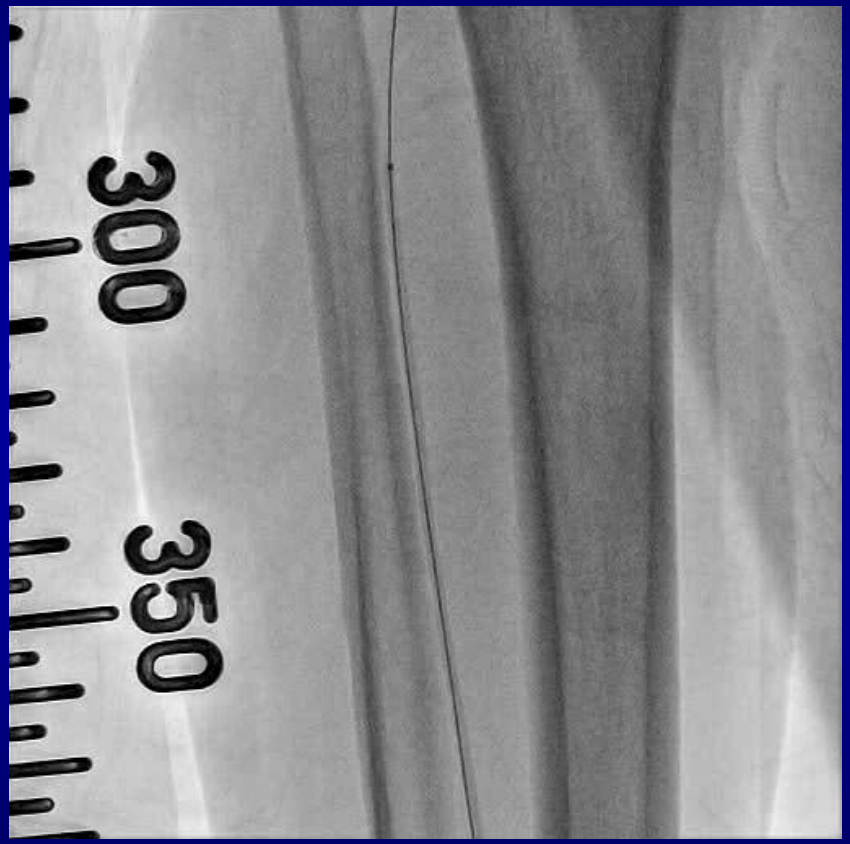


Backup surpport – CXI+ v18 wire

Retrograde approach

Advance V-18 wire into JR(5fr)

Retrograde approach



018’ balloon(Fox SV) ballooning

Wire exchange to floppy wire

And then finalize antegrade ballooning

고려대학교구로병원
KOREA UNIVERSITY GURO HOSPITAL

Cordis
a Johnson & Johnson company

CCI Program

Complex Cardiovascular Intervention Program

Cardiovascular Center,
Korea Univ. Guro Hospital,
Seoul, Korea

March~, 2011

Seung-Woon, Rha MD.PhD

COURSE DIRECTOR

Seung-Woon Rha, MD., PhD.
FACC, FAHA, FSCAI, FESC, FAPSIC.

Associate Professor, Dept. of Internal Medicine, Medical College, Korea University
Director, Cardiovascular Intervention and Research,
Director, Cardiac Catheterization Laboratory,
Cardiovascular Center,
Korea University Guro Hospital, Seoul, Korea

- CTO Summit, Course Director
- TCT AP (Angioplasty Summit) and Encore Seoul, Scientific Committee & Faculty
- KSC, KSIC, CCT, CVIT, TOPIC, CTO club meeting, Faculty
- Proctor and Faculty in Korean CTO club, TRI club and VIS (Vascular Intervention Seminar)

When	Every Tuesday & Thursday for / Mar.11, 2011 ~
Where	Korea University Guro Hospital, Seoul, Korea
Advisory Instructo	Dong-Joo Oh MD.PhD, FACC
Course Instructor	Seung-Woon Rha MD.PhD, FACC
Invited Mentors	1. Chael-Ung Choi (Korea Univ. Guro Hospital) 2. Sang-Ho Park (Soonchunhyang Univ. Hospital Cheonan) 3. Yun-Hyeong Cho (Kwandong Univ. College Of Medicine Myongji Hospital) 4. Amro Elnager (Benha Univ. Egypt)

COURSE OVERVIEW

1. Technical improvement in Complex Coronary & Peripheral Intervention
2. Clinical Research in Cardiovascular Field

LEARNING OBJECTIVES

1. Complex coronary & Endovascular Intervention
   - A. Complex coronary intervention : LM, CTO, Bifurcation, Diffuse long Muti-vessel disease, Small vessel disease, FFR, Coronary Anormaly
   - B. Complex Endovascular : Carotid, Subclavian, Renal, Iliofemoral, BTK, Mesentry, Vein Intervention, Aortic Aneurysm
2. Hands-on experience as an operator with mentors
3. Free discussion with experts
4. Clinical research program and paperwork
5. Visiting professors' activities : Lectures, Interesting case discussion
6. Challenging new devices and experiencing cutting edge technology
7. Improving English Proficiency

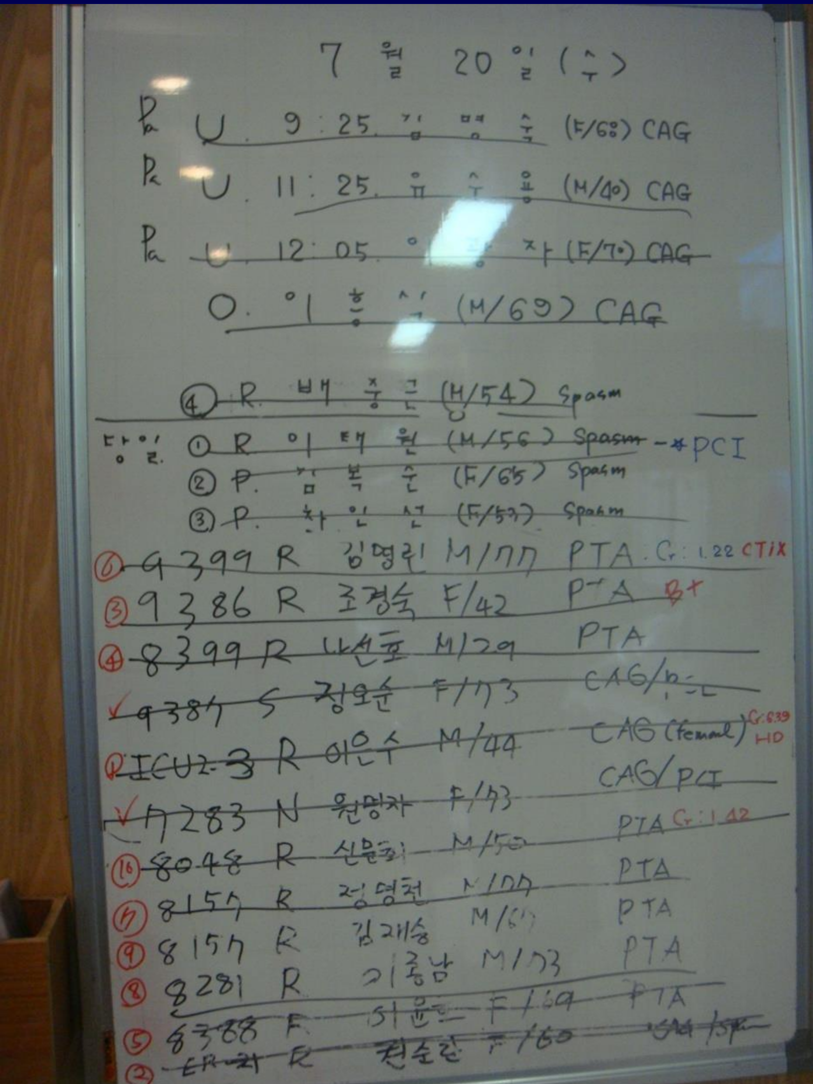
AGENDA

08:30 - 08:45	Opening Remarks & Introduction
08:45 - 12:30	TRA & TRI Session
12:30 - 13:30	Lunch
13:30 - 14:00	Round Table Meeting Topic review and Clinical Research Discussion
14:00 - 18:00	Complex Coronary & Peripheral Joint Live I
18:00 - 18:30	Dinner
18:30 - 19:00	Discussion for case of the day Meet the experts
19:00 -	Complex Coronary & Peripheral Joint Live II : Until Tired

CANDIDATE SELECTION CRITERIA

1. Current active academic position as a faculty in cardiovascular intervention field (Interventional Cardiology, Vascular Surgeon and Interventional Radiology)
2. Weekly for at least 6 – 12 months will be preferred
   1) 6-12 month : Chance of real practice
   2) <6 months : Mainly assisting job and Hand-on Experiance
   3) Single Visit : Observation

Never give up & Until tired or expire…


7월 20일 (수)
U. 9:25 김명숙 (F/68) CAG
U. 11:25 유수용 (M/40) CAG
① R 이태원 (M/56) Spasm → PCI


10000 ms
12000 ms
4:13:52 AM
7/21/2011
17.6 Days
4.1 GB

The 1st CCI Guro Live 2014

Complex Cardiovascular Intervention *for Young and Ambitious Doctors*

Date **October 24(Fri)~25(Sat), 2014**
Venue **Korea University Guro Hospital, Seoul, Korea**

Organized by **CIRI (Cardiovascular Intervention Research Institute), Korea University Guro Hospital**
Sponsored by **Cardiovascular Center, Korea University Guro Hospital**

Complex Cardiovascular Intervention

Save the Date !!

CCI Guro Live 2015

October 23~24, 2015

다음 SENS & AMI 연구자 모임: 2015.5.13

Summary and Discussion

1. For complex BTK & BTA intervention, multiple devices and strategies should be ready.
2. Multiple vascular access should be considered in complex BTK & BTA revascularization.
3. Operator's attitude for limb salvage is important for limb salvage

; perseverance and endurance…

'Never give up spirit'

심혈관 중재시술연구소 (Cardiovascular Intervention Research Insitute; CIRI)

http://ciri.or.kr swrha617@yahoo.co.kr

Thank You for Your Attention!