

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

JANUARY 19-21 2017

MARRIOTT RIVE GAUCHE & CONFERENCE CENTER

PARIS, FRANCE



**Below the ankle diseases
Lessons from more than thousands
cases: technics, results**



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Disclosure

Roberto Ferraresi, MD

I have the following potential conflicts of interest to report: consulting, travel reimbursement, teaching courses, training, proctoring:

Medtronic, Boston Scientific, Abbott, LimFlow, Terumo, Cook, Biotronik, Asahi, Shire, Kardia, Orbus, Astra Zeneca

**Below-the-ankle diseases
Lessons from more than thousands
cases: technics, results**

**1. Importance of below-the-ankle
vessel disease in CLI**

**2. What current literature says us
about BTA vessel treatment**

3. Limits of BTA vessel angioplasty

Aggregated segments	Prevalence of disease (%)
ATG	9.8
SFA	45.5
P-TPT	46.3
Prox BTK	0 artery 14.3 1 artery 24.3 2 arteries 37.7 3 arteries 23.7
Dist BTK	0 artery 13.2 1 artery 25.5 2 arteries 44.9 3 arteries 16.4
BTA vessels	0 artery 27.9 1 artery 20.2 2 arteries 31.5 3 arteries 20.4
Arch	25,1

1915 pts with symptomatic PAD

183 claudicants



1732 CLI pts



> 50% 2-3 BTA vessel disease



25% arch disease

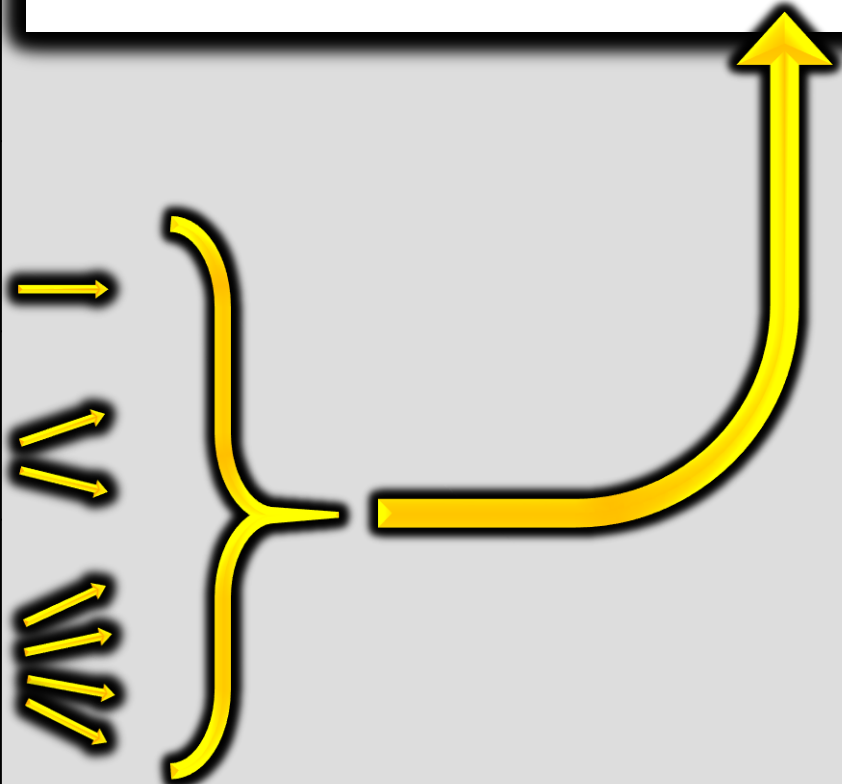
Aggregated segments	Risk factors for CLI Odds Ratio (95% CI)	
ATG	0.53 (0.26 - 1.1)	
SFA	0.51 (0.29 - 0.89)	
P-TPT	1.17 (0.68 – 2.01)	
Prox BTK	0 artery	ref.
	1 artery	1.7 (0.76 - 3.83)
	2 arteries	1.86 (0.72 - 4.83)
	3 arteries	4.84 (1.12 - 20.88)
Dist BTK	0 artery	ref.
	1 artery	1.69 (0.74 - 3.87)
	2 arteries	5.81 (1.91 - 17.62)
	3 arteries	5.71 (1.03 - 31.78)
BTA vessels	Any of BTA and Arch 13.25 (1.69 - 104.16)	
Arch		

1915 pts with symptomatic PAD

183 claudicants



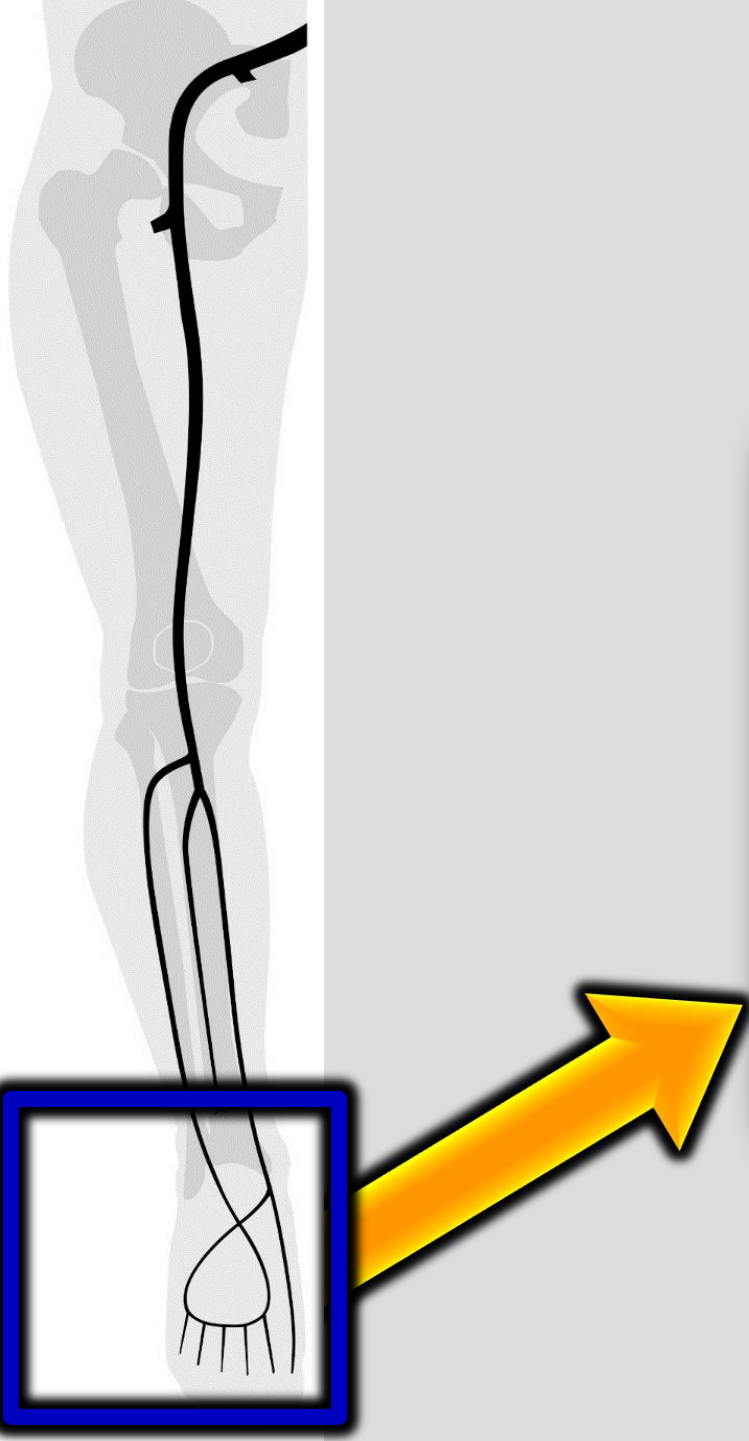
1732 CLI pts



Above-the-ankle vessel disease:
"Transmission failure"

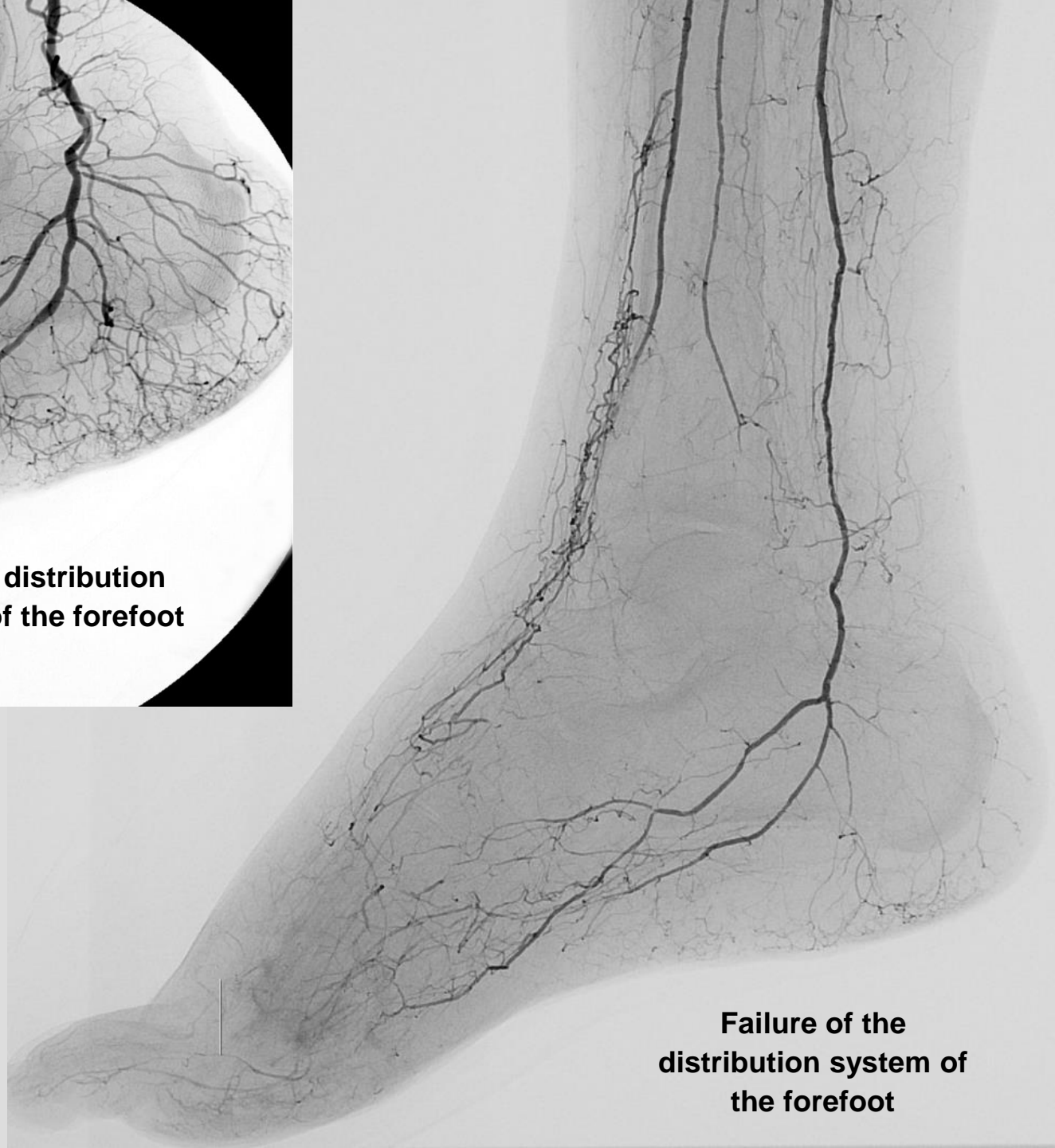


Below-the-ankle vessel disease:
"Distribution failure"

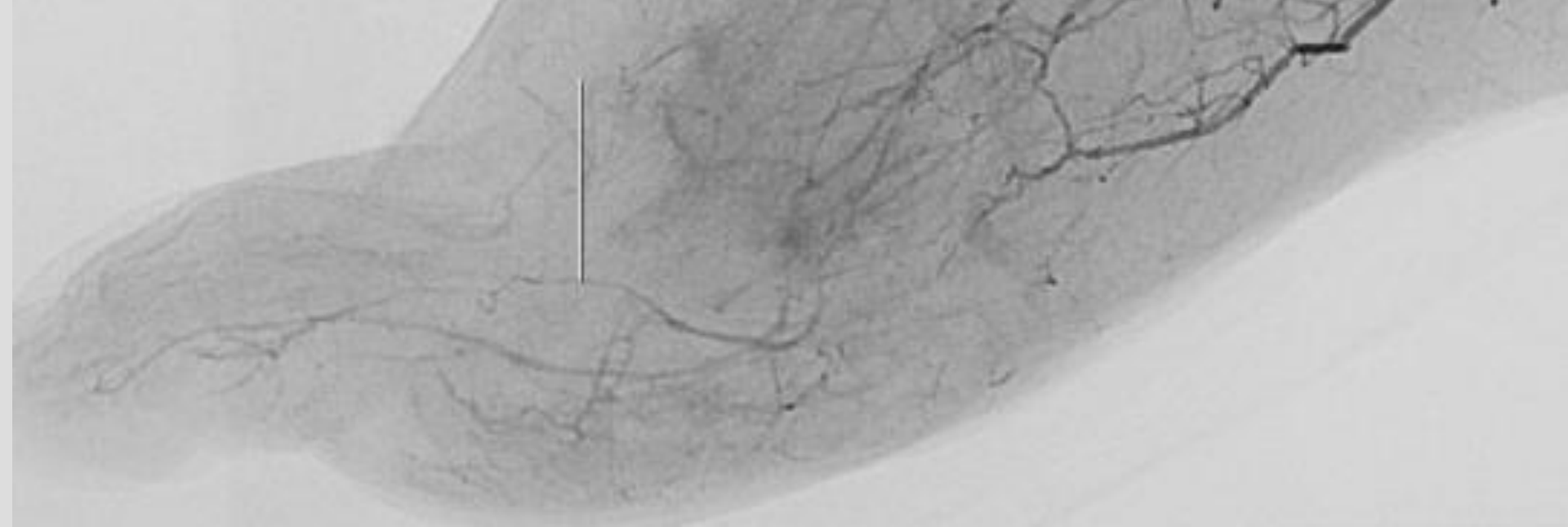
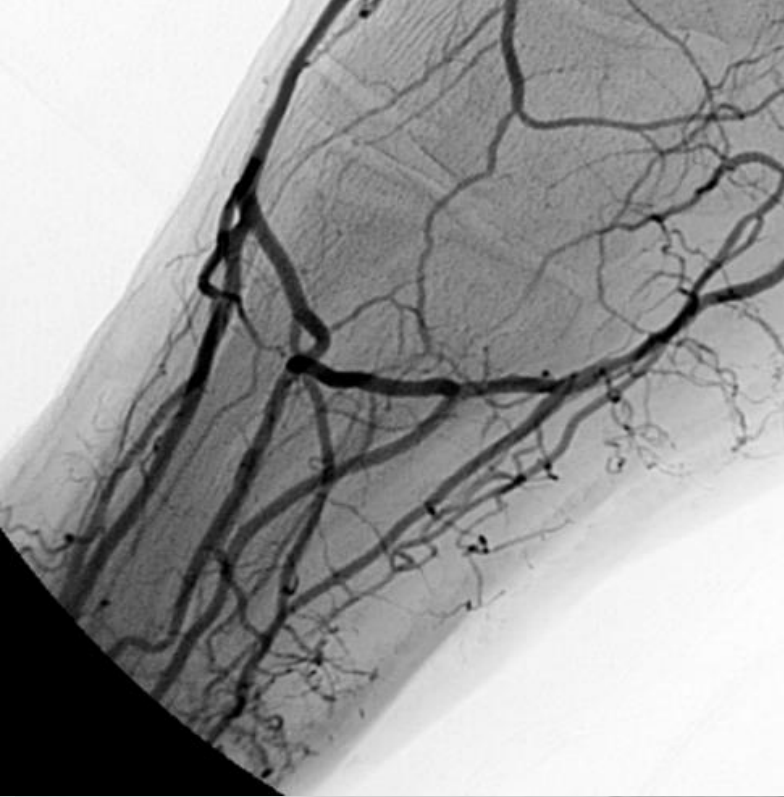




**Normal distribution
system of the forefoot**



**Failure of the
distribution system of
the forefoot**



Below-the-ankle vessel disease:
"Distribution failure"



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1° statement

**Below-the-ankle vessel
disease is a key factor in CLI**

**Below-the-ankle diseases
Lessons from more than thousands
cases: technics, results**

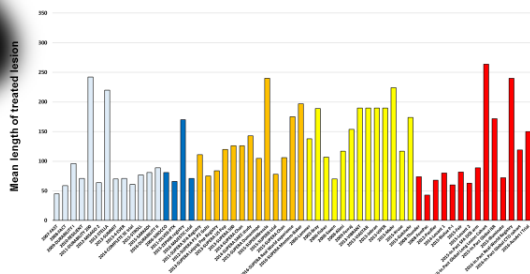
**1. Importance of below-the-ankle
vessel disease in CLI**

**2. What current literature says us
about BTA vessel treatment**

3. Limits of BTA vessel angioplasty

SFA-POP

Published studies on SF-POP ENDO treatment



>10.000 pts in published studies

BTK

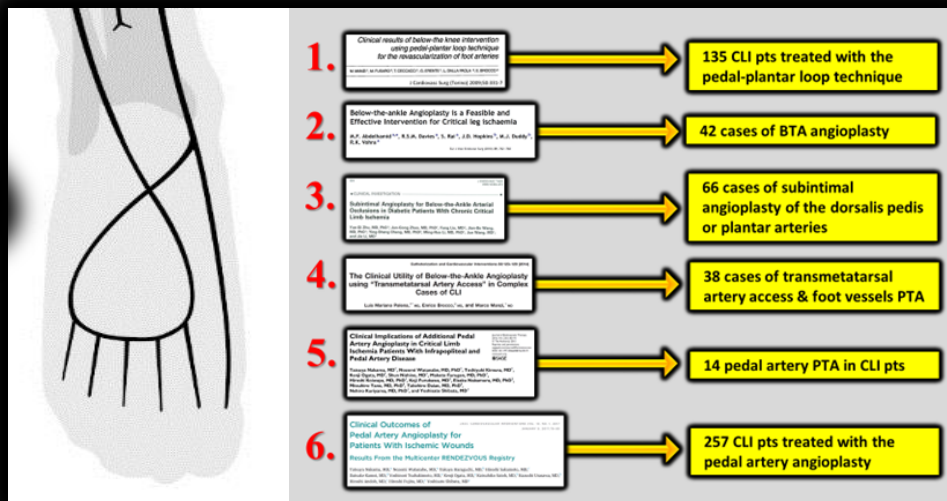
Percutaneous Transluminal Angioplasty in Patients With Infrapopliteal Arterial Disease Systematic Review and Meta-Analysis

J.A. Mustapha, Sara M. Finton, Larry J. Diaz-Sandoval, Fadi A. Saab and Larry E. Miller

DOI: <http://dx.doi.org/10.1161/CIRCINTERVENTIONS.115.003468>
Circulation: Cardiovascular Interventions. 2016;9:e003468
Originally published May 9, 2016

>5000 pts in published studies

BTA



<500 pts in published studies

1.

Clinical results of below-the knee intervention using pedal-plantar loop technique for the revascularization of foot arteries

M. MANZI¹, M. FUSARO², T. CECCACCI¹, G. ERENT¹, L. DALLA PAOLA³, E. BROCCO³

J Cardiovasc Surg (Torino) 2009;50:331-7

135 CLI pts treated with the pedal-plantar loop technique

2.

Below-the-ankle Angioplasty is a Feasible and Effective Intervention for Critical leg ischaemia

M.F. Abdelhamid^{a,*}, R.S.M. Davies^a, S. Rai^a, J.D. Hopkins^b, M.J. Duddy^b, R.K. Vohra^a

Eur J Vasc Endovasc Surg (2010) 39, 762–768

42 cases of BTA angioplasty

3.

104 J ENDOVASC THER 2009;16:664-672

CLINICAL INVESTIGATION

Subintimal Angioplasty for Below-the-Ankle Arterial Occlusions in Diabetic Patients With Chronic Critical Limb Ischemia

Yue-Qi Zhu, MD, PhD¹; Jun-Gong Zhao, MD, PhD¹; Fang Liu, MD²; Jian-Bo Wang, MD, PhD¹; Ying-Sheng Cheng, MD, PhD²; Ming-Hua Li, MD, PhD¹; Jue Wang, MD¹; and Jie Li, MD¹

66 cases of subintimal angioplasty of the dorsalis pedis or plantar arteries

4.

Catheterization and Cardiovascular Interventions 83:123-129 (2014)

The Clinical Utility of Below-the-Ankle Angioplasty using "Transmetatarsal Artery Access" in Complex Cases of CLI

Luis Mariano Palena,^{1,*} MD, Enrico Brocco,² MD, and Marco Manzi,¹ MD

38 cases of transmetatarsal artery access & foot vessels PTA

5.

Clinical Implications of Additional Pedal Artery Angioplasty in Critical Limb Ischemia Patients With Infrapopliteal and Pedal Artery Disease

Tatsuya Nakama, MD¹, Nozomi Watanabe, MD, PhD¹, Toshiyuki Kimura, MD¹, Kenji Ogata, MD¹, Shun Nishino, MD¹, Makoto Furugen, MD, PhD¹, Hiroshi Koiwaya, MD, PhD¹, Koji Furukawa, MD², Eisaku Nakamura, MD, PhD², Mitsuhiro Yano, MD, PhD², Takehiro Daian, MD, PhD¹, Nehiro Kuriyama, MD, PhD¹, and Yoshisato Shibata, MD¹

Journal of Endovascular Therapy 2016, Vol. 23(1) 83-91
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DOI: 10.1177/1546222115610119
www.jvot.org
SAGE

14 pedal artery PTA in CLI pts

6.

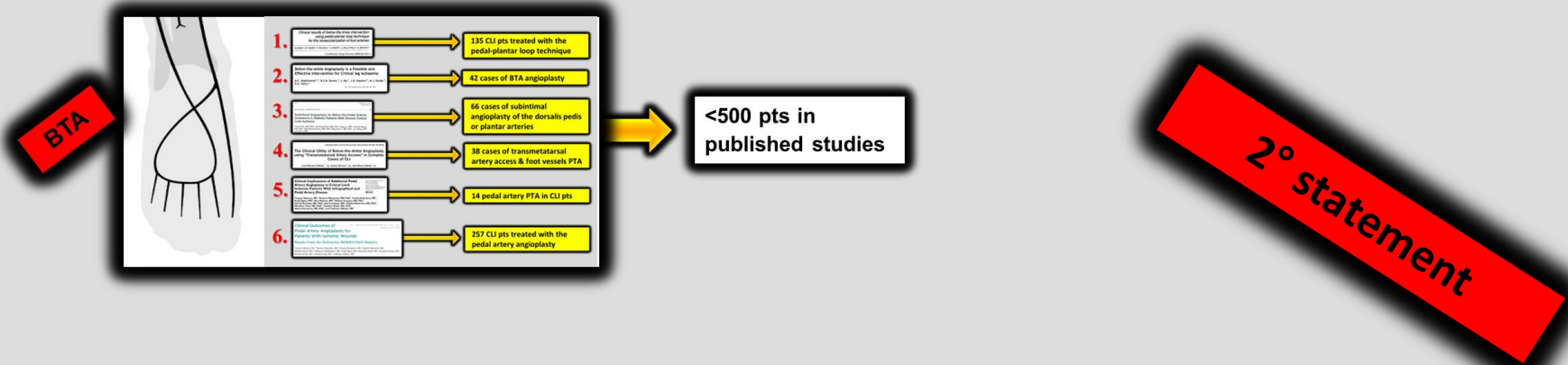
Clinical Outcomes of Pedal Artery Angioplasty for Patients With Ischemic Wounds

Results From the Multicenter RENDEZVOUS Registry

Tatsuya Nakama, MD,^a Nozomi Watanabe, MD,^a Takuya Haraguchi, MD,^b Hiroshi Sakamoto, MD,^c Daisuke Kamoi, MD,^d Yoshinori Tsubakimoto, MD,^e Kenji Ogata, MD,^a Katsuhiko Satoh, MD,^b Kazushi Urasawa, MD,^b Hiroshi Andoh, MD,^c Hiroshi Fujita, MD,^a Yoshisato Shibata, MD^a

JACC: CARDIOVASCULAR INTERVENTIONS VOL. 10, NO. 1, 2017
JANUARY 9, 2017:79-90

140 CLI pts treated with the pedal artery angioplasty



Foot vessel angioplasty in CLI pts is technically feasible and safe, and appears to provide positive clinical results in terms of

- ***Limb salvage***
- ***Wound healing***
- ***Time to healing***

at both acute and mid-term follow-up

However:

- ***All studies were retrospective***
- ***It is difficult to understand the criteria used to apply or not BTA PTA***
- ***Restenosis rate →***
- ***Long term FU →***

UNKNOWN !

UNKNOWN !

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about BTA vessel treatment**

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1.

Cardiovasc Intervent Radiol (2013) 36:926–935
DOI 10.1007/s00270-012-0514-x

CIRSE

CLINICAL INVESTIGATION

ARTERIAL INTERVENTIONS

Below-the-ankle Angioplasty and Stenting for Limb Salvage: Anatomical Considerations and Long-term Outcomes

Konstantinos Katsanos · Athanasios Diamantopoulos ·
Stavros Spiliopoulos · Dimitris Karnabatidis ·
Dimitris Siablis

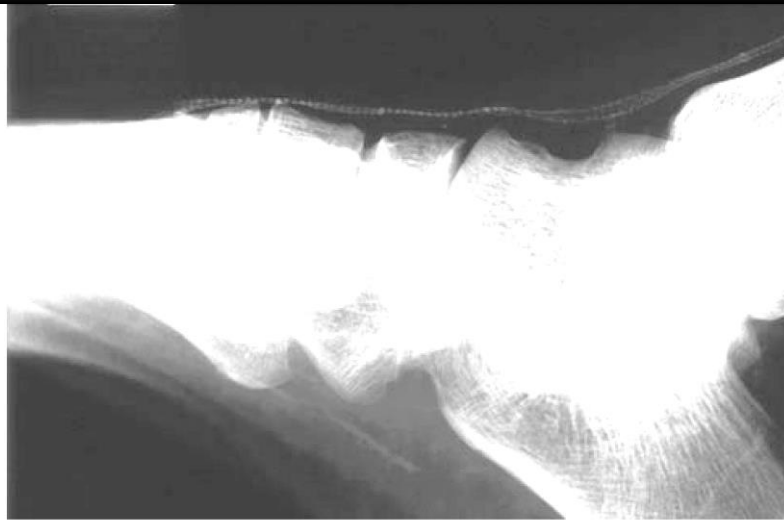


Fig. 4 Lateral foot x-ray shows complete stent collapse in the dorsalis pedis artery. The collapsed stent could not be recanalized, and the patient had to undergo a major amputation

- **Provisional stent placement in 19 lesions**
- **Mean lesion length 4.2 ± 1.4 cm**
- **1 year lesion binary restenosis rate = 64.1 %**
- **Self-expanding stents presented higher restenosis and poorer primary patency compared to POBA or balloon expandable DES**
- **Significant deformation and/or fracture of balloon-expandable stents were identified in 5 of 11**

2.

32

J ENDOVASC THER
2011;18:32-42

◆ CLINICAL INVESTIGATION ◆

Stent-Assisted Below-the-Ankle Angioplasty for Limb Salvage

Osami Kawarada, MD^{1,2}; Yoshiaki Yokoi, MD, PhD¹; Akihiro Higashimori, MD¹; Naoto Waratani, MT¹; Katsuhisa Waseda, MD, PhD²; Yasuhiro Honda, MD²; and Peter J. Fitzgerald, MD, PhD²

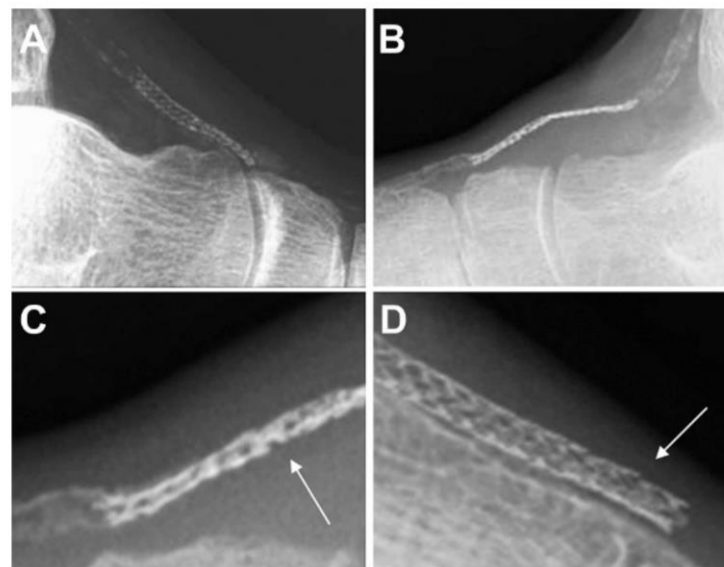


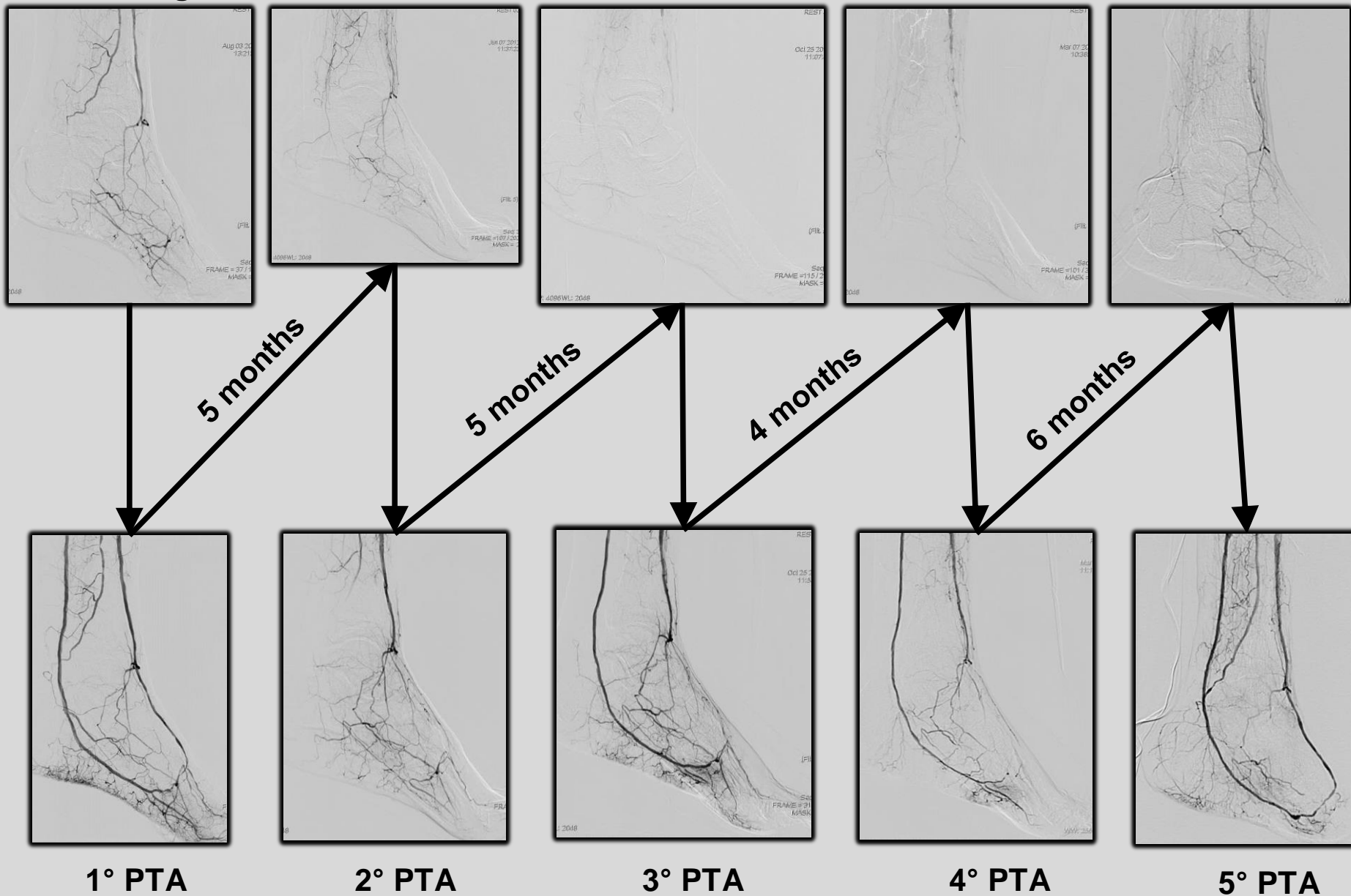
Figure 6 ◆ Samples of stent deformity. (A) Partial stent compression, (B) complete stent compression, (C) separate stent fracture, and (D) subluxation stent fracture.

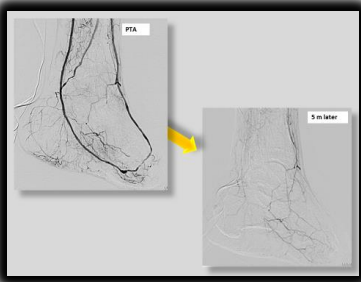
- 8 dorsalis pedis lesions treated with coronary BMS due to failed POBA
- 2 yy FU
 - 2/8 acute or subacute stent thrombosis
 - 4/8 symptomatic in-stent restenosis
 - 7/8 stents presented significant deformation of the stent mesh (compression, fracture, subluxation)

3.

Restenosis after POBA in BTA vessel → No data

Basal Angio

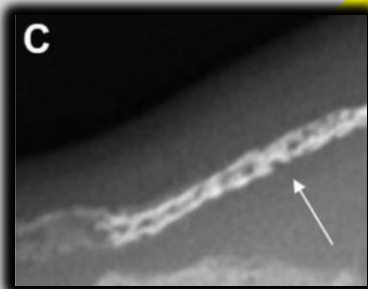




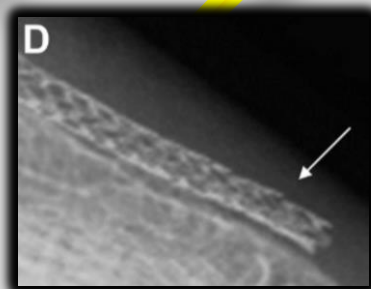
Courtesy O. Kawarada



Courtesy O. Kawarada



Courtesy O. Kawarada

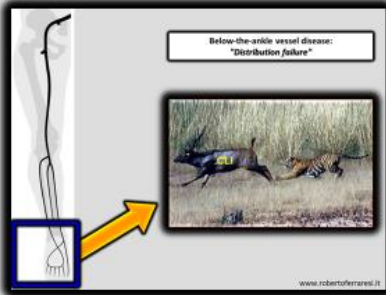


Courtesy O. Kawarada

3° statement

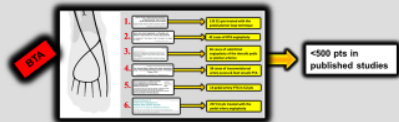
***Foot vessels are the cemetery
of POBA and stents***

***When we go BTA the reaction
of the vessel will be dramatic in
biological and mechanical
terms***



1st statement

Below-the-ankle vessel disease is a key factor in CLI



2nd statement

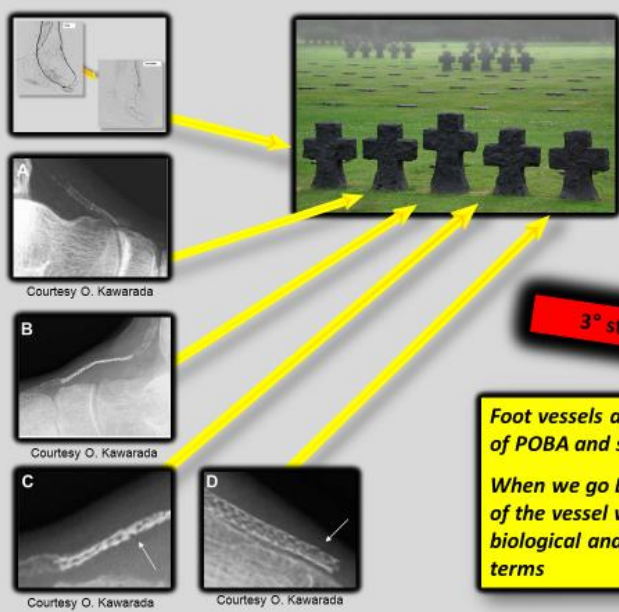
Foot vessel angioplasty in CLI pts is technically feasible and safe, and appears to provide positive clinical results in terms of

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at both acute and mid-term follow-up

However:

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- It is difficult to understand the criteria used to apply or not BTA PTA
- Restenosis rate → UNKNOWN!
- Long term FU → UNKNOWN!



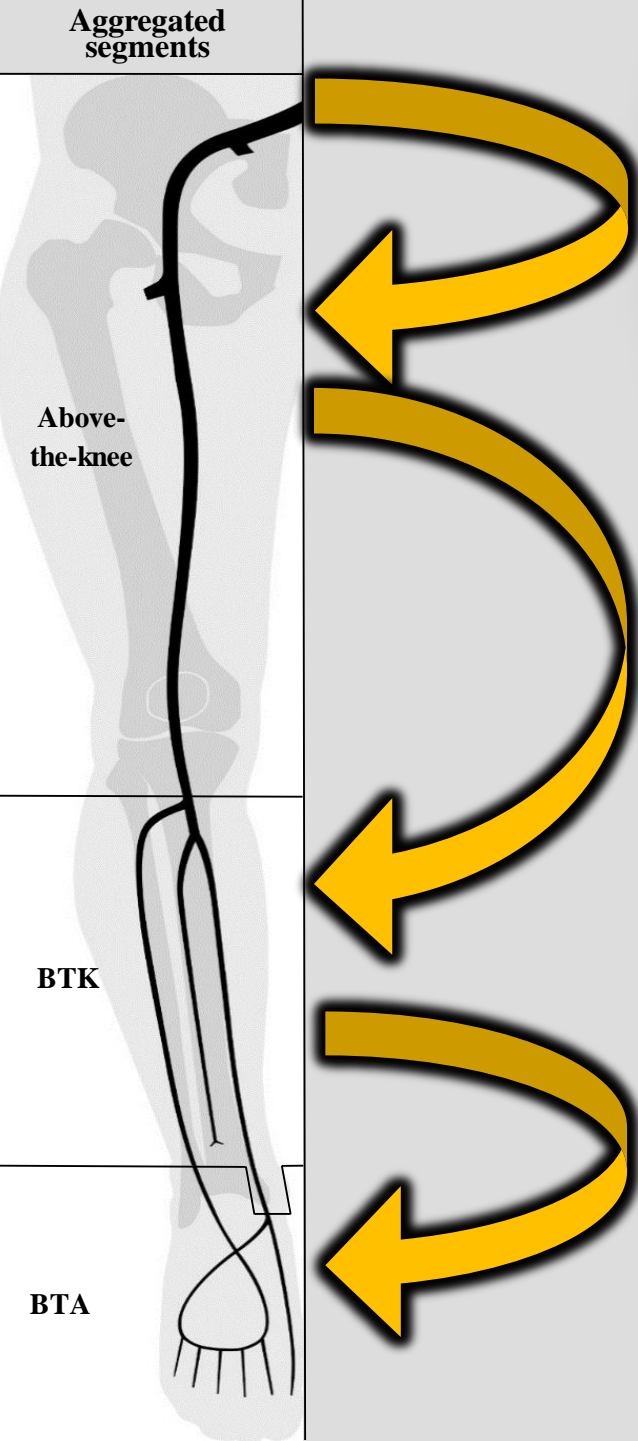
3rd statement

Foot vessels are the cemetery of POBA and stents

When we go BTA the reaction of the vessel will be dramatic in biological and mechanical terms

We have got a problem!

Whent to treat BTA vessels?



Outflow is the key word to understand the BTA world!

Outflow is the key concept in evaluating the feasibility of every type of revascularization

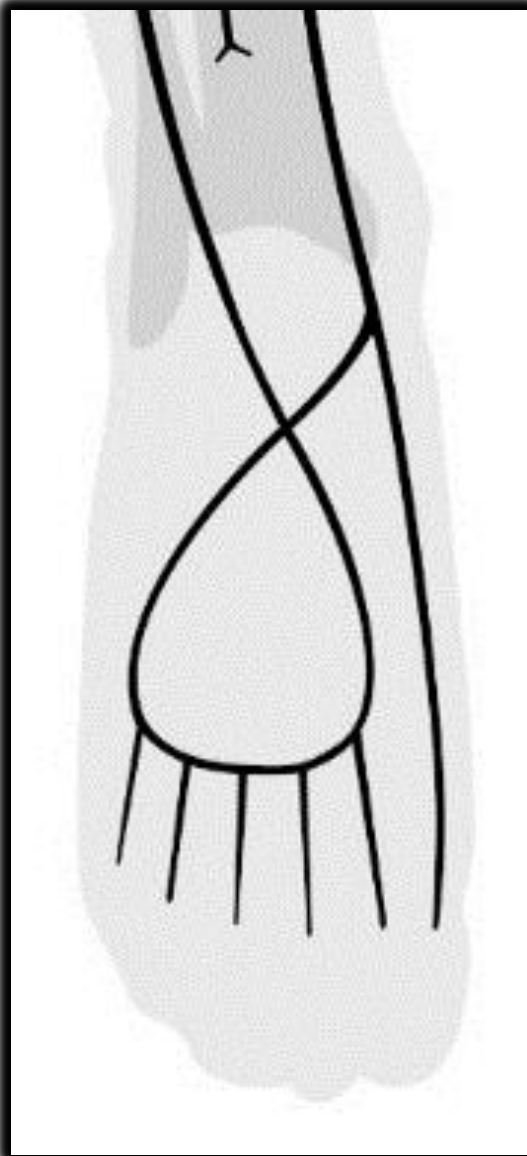
We do not perform any revascularization procedure, either surgical or percutaneous without carefully considering the outflow

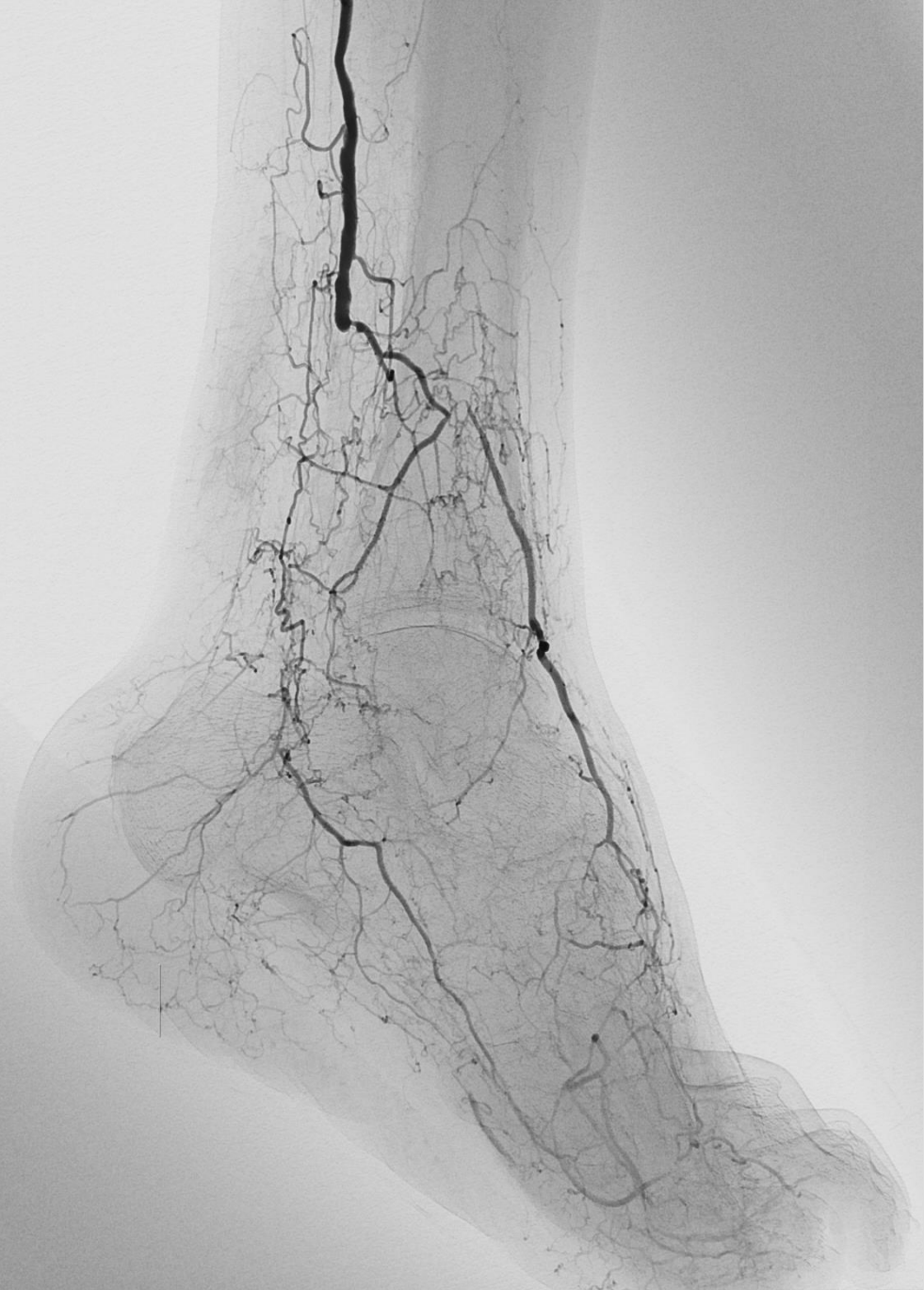
What is the outflow of BTA vessels?



Treatable BTA vessels are the last frontier between big and small vessels, two different domains in term of:

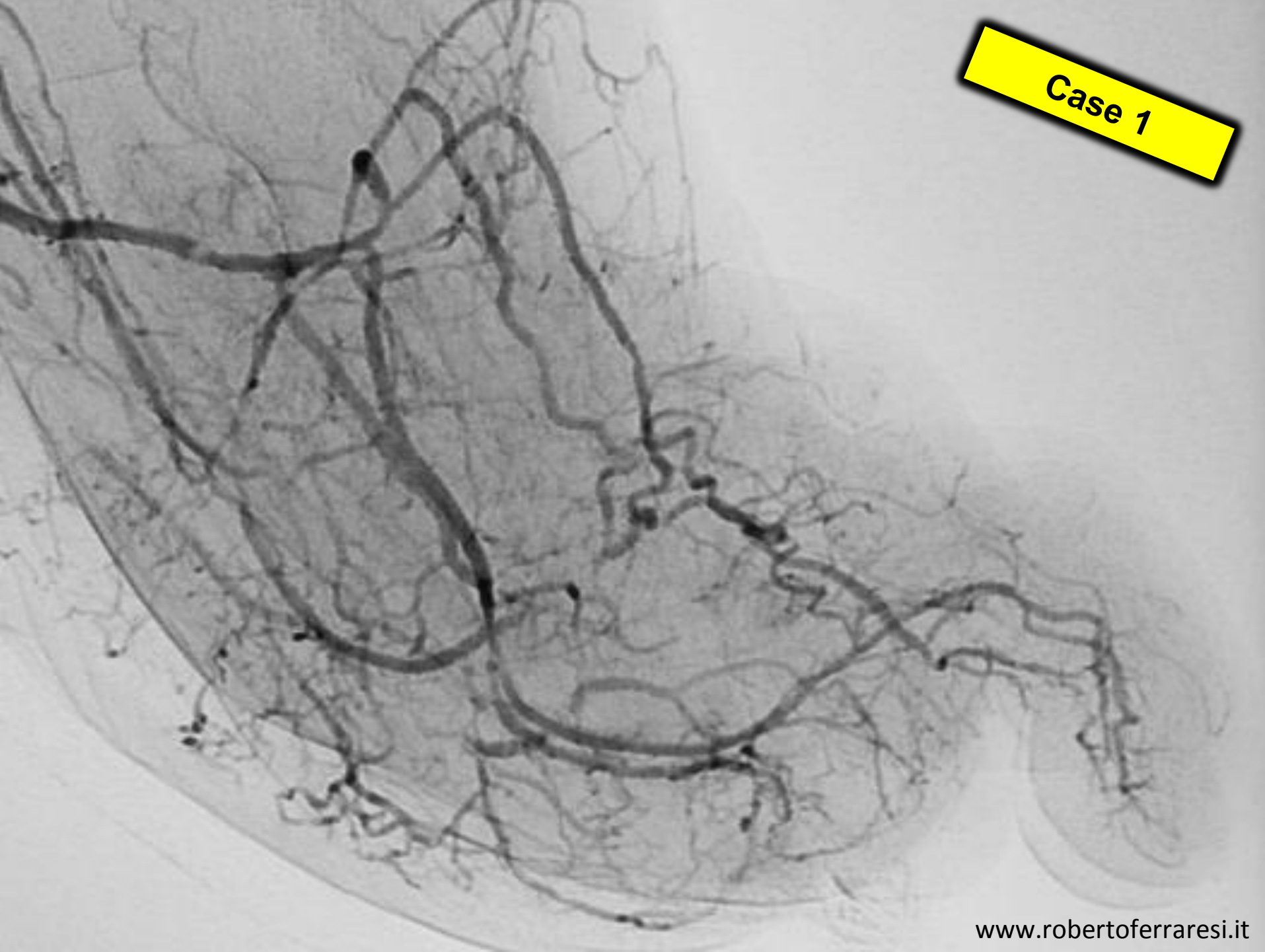
- **Size/geometry/function**
- **Pathophysiology**
- **Biological properties & risk factor for obstructive disease**
- **Etc. etc.**



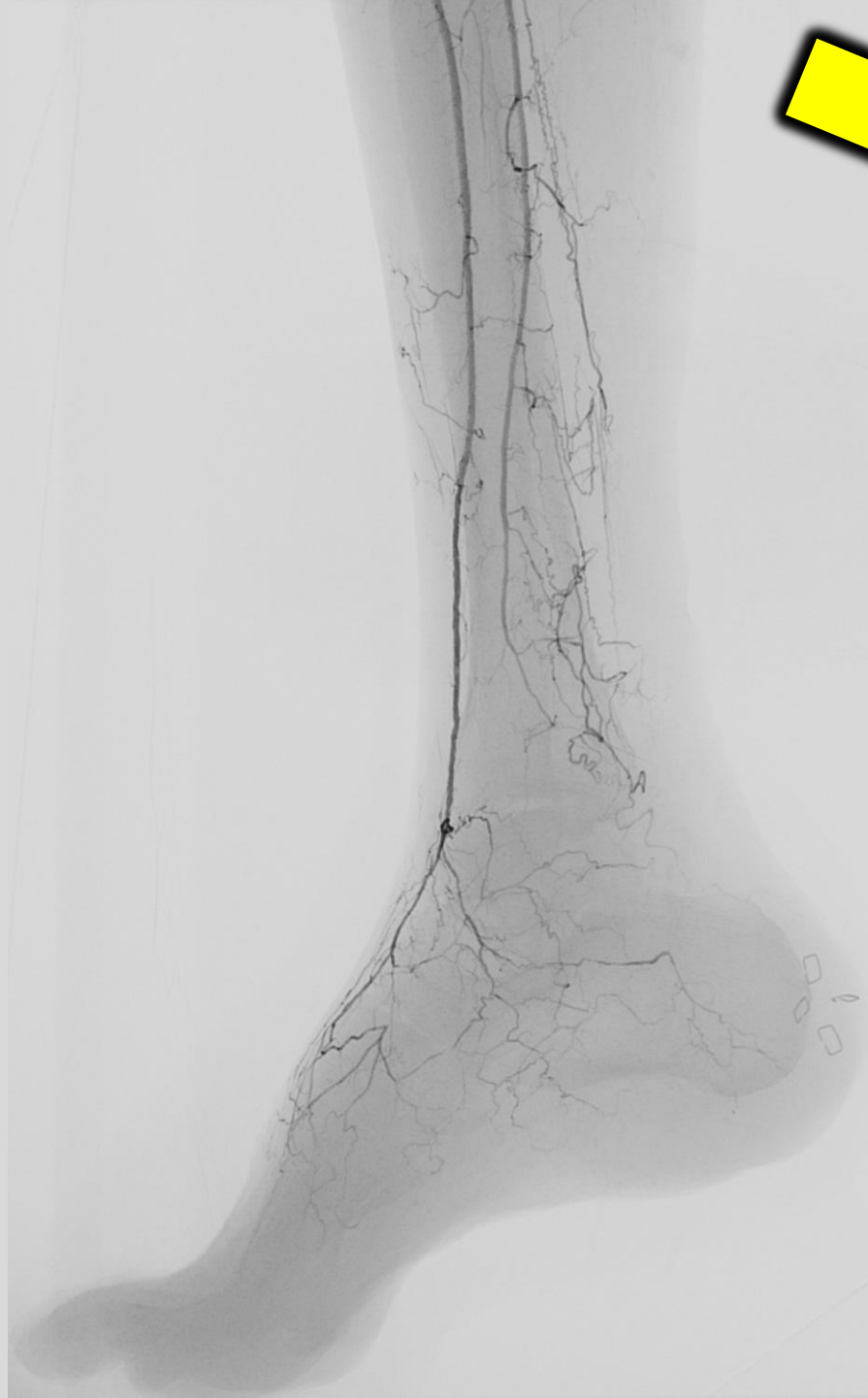


Case 1

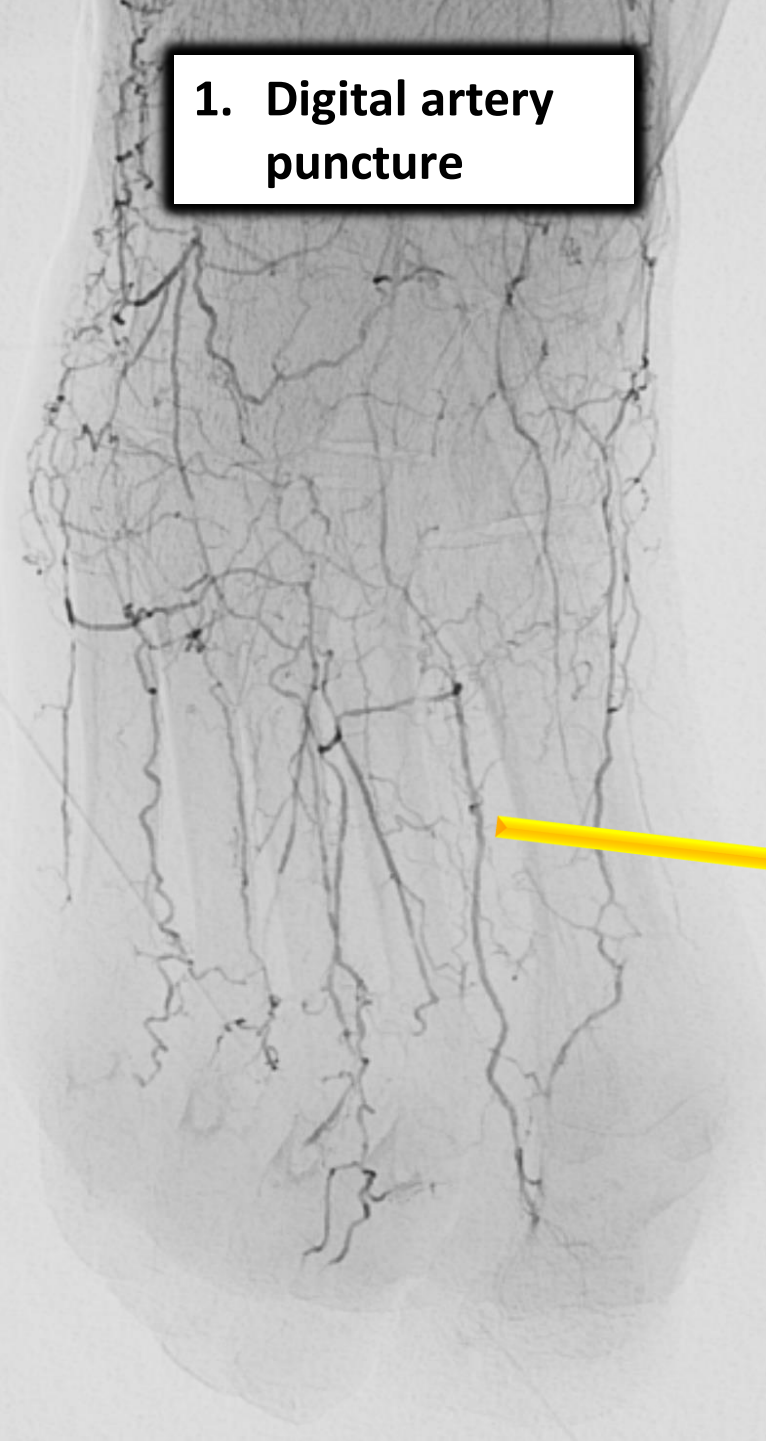
Case 1



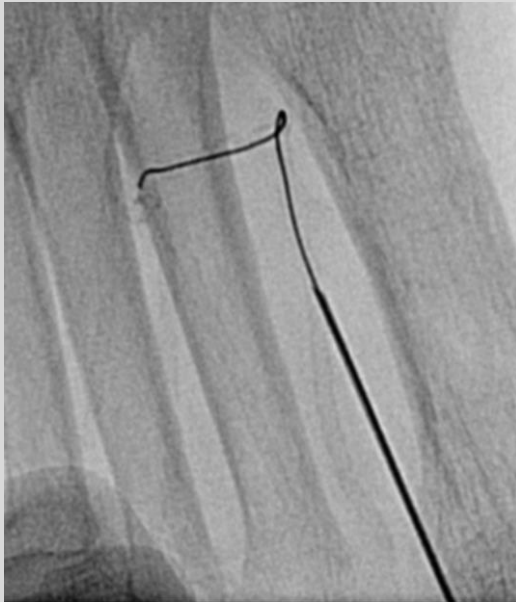
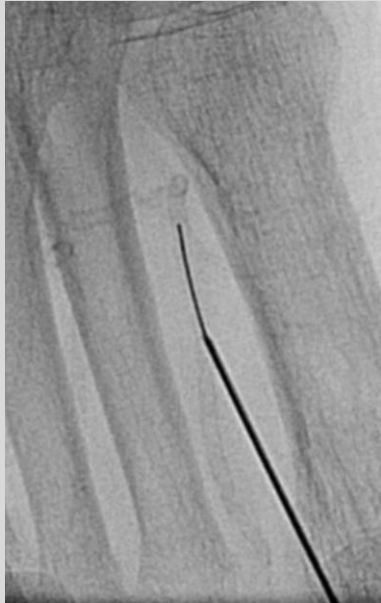
Case 2



1. Digital artery puncture



2. Wiring the Digital branch



3. Retrograde recanalization



4. PTA & Hemostasis

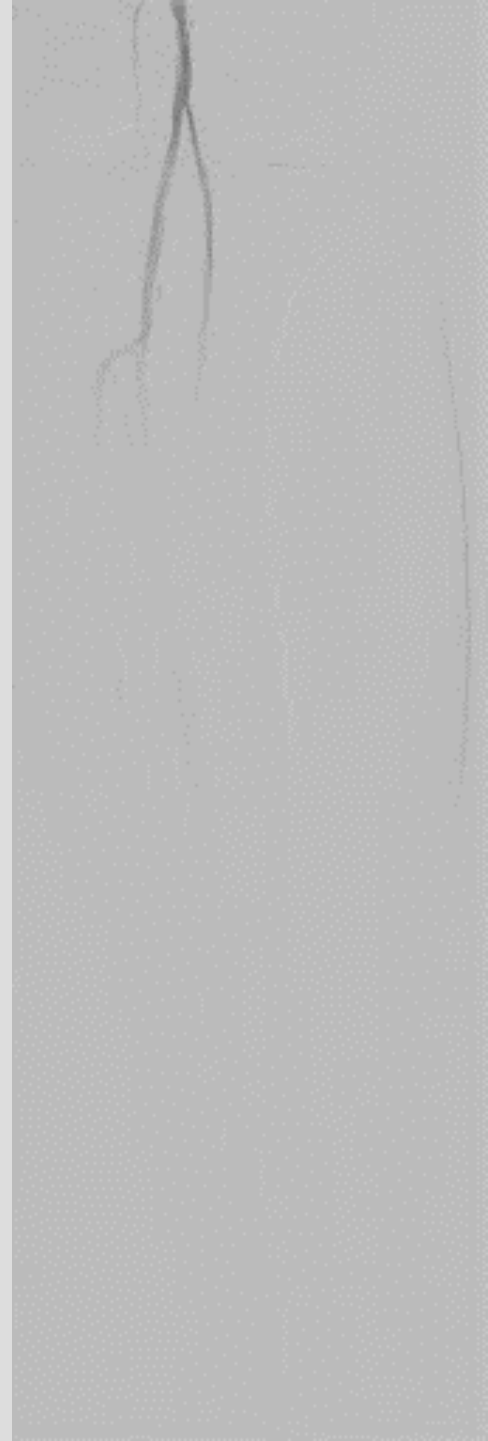






16 months!

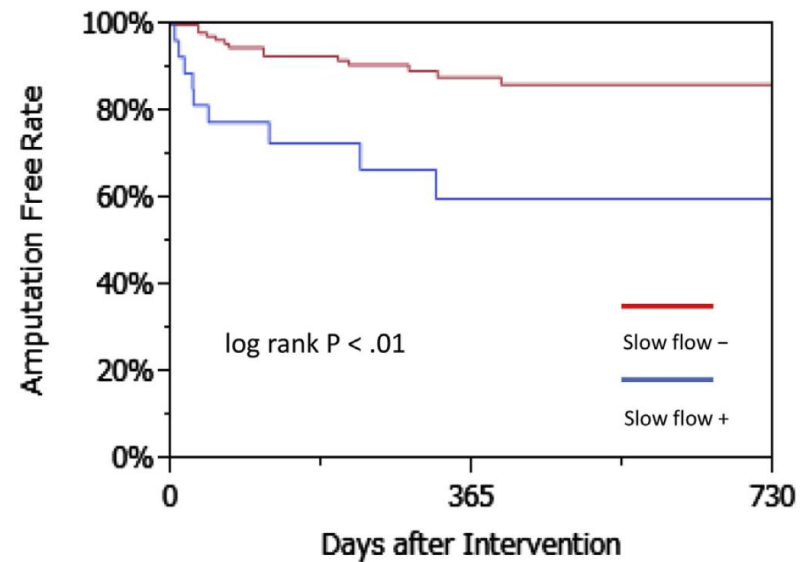
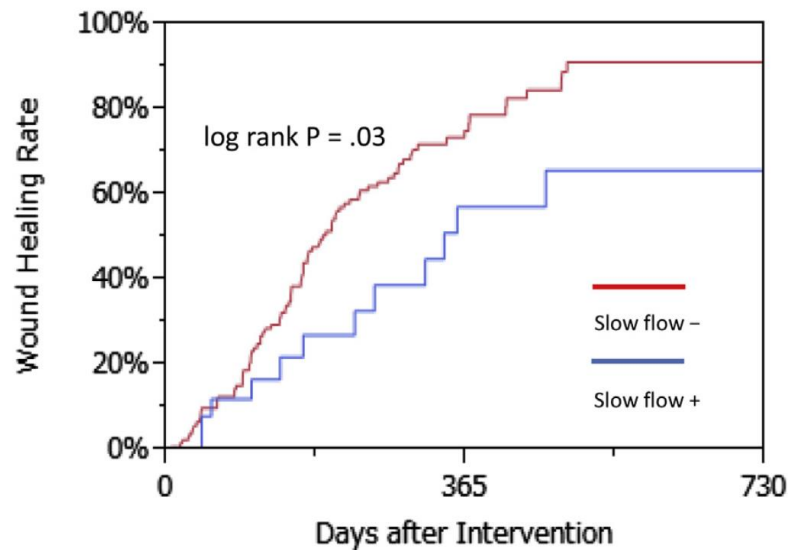






Incidence and clinical outcomes of the slow-flow phenomenon after infrapopliteal balloon angioplasty

Takahiro Tokuda, MD, Keisuke Hirano, MD, Yasunari Sakamoto, MD, Hideyuki Takimura, MD, Norihiro Kobayashi, MD, Motoharu Araki, MD, Masahiro Yamawaki, MD, PhD, and Yoshiaki Ito, MD, Yokohama, Kanagawa, Japan



Conclusion: The slow-flow phenomenon after infrapopliteal angioplasty occurred in 18.6% of limbs. This phenomenon may result in poor outcomes

We have not a clear classification of BTA vessel disease & outflow

- in some cases angioplasty is possible and useful***
- in other cases angioplasty is impossible or dangerous!***

4° statement

Go below-the-ankle:

- 1. Clear clinical indications: RTF 5-6 patients (not responders to standard ATK rev?)***
- 2. Clear pathophysiology: disease of the foot vessels with failure of the foot distribution system***
- 3. Clear limits: never touch what is, more or less, functioning, pay attention to calcium and no-reflow phenomenon***

