



Optical Coherence Tomography and Fractional Flow Reserve in Below-the-Knee Percutaneous Transluminal Angiography



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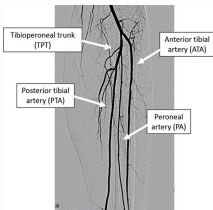





Disclosures

- Research grant Artivion
- Research grant Abbott



Digital Subtraction Angiography (DSA)




Study: Inter- and Intraobserver variability in BTK angiography

- 7 observers
 - 4 vascular surgeons
 - 3 vascular surgical residents
- 15 angiographies (twice)
 - Diameter
 - Degree of stenosis
 - Treatment type and sizing

Variability in DSA assessment: results



Stenosis %	ICC	95% Confidence Interval	Interpretation
Inter-observer	0,72	0,51 – 0,88	Moderate
Intra-observer	0,76 (lowest) 0,87 (highest)	0,53 – 0,90 0,72 – 0,95	Good Good
Diameter	ICC	95% Confidence Interval	Interpretation
Inter-observer	0,62	0,43 – 0,82	Moderate
Intra-observer	0,62 (lowest) 0,80 (highest)	0,32 – 0,84 0,60 – 0,92	Moderate Good
Treat?	Kappa	95% Confidence Interval	Interpretation
Inter-observer	0,53	0,13 – 0,94	Moderate
Intra-observer	0,55 (lowest) 1,00 (highest)	0,17 – 0,92 1,00 – 1,00	Moderate Excellent
Diameter balloon	ICC	95% Confidence Interval	Interpretation
Inter-observer	0,21	0,00 – 0,42	Poor
Intra-observer	0,07 (lowest) 0,57 (highest)	-0,21 – 0,36 -0,01 – 1,14	Poor Moderate



Variability in BTK angiography assessment:

conclusion :

need for more objective diagnostic modalities

Circulation CURRENT ISSUE | ARC

REVIEW ARTICLE | Originally Published 9 December 2021 | Check for updates

2021 ACC/AHA/SCAI Guideline for Coronary Artery Revascularization: A Report of the American College of Cardiology/American Heart Association Joint Committee on Clinical Practice Guidelines

Jennifer S. Lawton, MD, FAHA, Chair, Jacqueline E. Tama-Holland, MD, FAHA, FACC, FSCAI, Vice Chair, Sripal Bangalore, MD, MHA, FACC, FAHA, FSCAI, Eric R. Bates, MD, FACC, FAHA, Thomas M. Brucke, PhD, FAHA, James M. Burchart, MEd, John A. Bittl, MD, FACC, ... [BIBLIOMED & ARTICLES](#)

and Brittany A. Zetscherberger, MD [AUTHOR INFO & AFFILIATIONS](#)

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Recommendations for the Use of Coronary Physiology to Guide Revascularization With PCI
Referenced studies that support the recommendations are summarized in

COR	LOE	Recommendations
1	A	1. In patients with angina or an anginal equivalent, undocumented ischemia, and angiographically intermediate stenoses, the use of fractional flow reserve (FFR) or instantaneous wave-free ratio (iFR) is recommended to guide the decision to proceed with PCI. ^{1,4}
3: No benefit	B-R	2. In stable patients with angiographically intermediate stenoses and FFR >0.80 or iFR >0.89, PCI should not be performed. ⁷⁻¹⁰

Recommendation for Intravascular Ultrasound to Assess Lesion Severity
Referenced studies that support the recommendation are summarized in

COR	LOE	Recommendation
2a	B-NR	1. In patients with intermediate stenosis of the left main artery, intravascular ultrasound (IVUS) is reasonable to help define lesion severity. ³⁻⁵

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Fractional Flow Reserve (FFR)

Pressure pre- and post-stenosis

physiological significance of stenosis

Hyperemic state using papaverine

Cardiology: cut-off 0.80

Definition of FFR: $\frac{P_d \text{ blood flow in stenotic coronary artery}}{P_a \text{ blood flow in the same artery without stenosis}}$

P_a (AO pressure via guide catheter)
 P_d (PressureWire™ X Guidewire)

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Optical Coherence Tomography (OCT)

Optical analogue of intravascular ultrasound (IVUS)

Ultrasound → near-infrared light (1300nm)

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Optical Coherence Tomography (OCT)

CT Angiography	Angiography	IVUS	OCT
Resolution: 600µm	200µm	100µm	10µm

OCT provides more detail with a 10 micrometers resolution

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OCT and FFR below-the-knee study

Prospective proof of principle study

OCT/FFR results evaluation post-procedure (Abbott)

Primary outcome measure: Safety and feasibility

Secondary outcome measures: Change in treatment plan?


Inclusion goal: 10 patients

Inclusion criteria: Critical limb ischemia (Rutherford 4-6)

Indication for BTK endovascular intervention

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Case 1: 80 Year old male





Relevant history:

- HT, DM, AF, CVA


Systolic toe pressure: 0 mmHg
Ankle/Brachial index not measurable, monophasic signal

PTA + Supera stent left SFA
Amputation left hallux


Non-healing ulcers

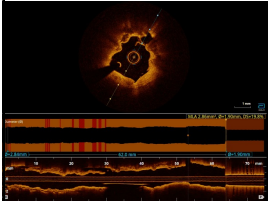
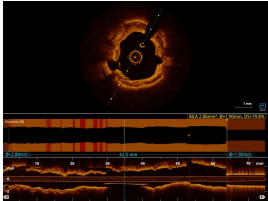
Case 1 – FFR





- FFR pre = 0.91
- FFR post = 0.97



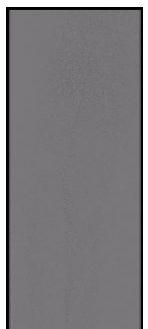
Case 1 – OCT

Pre-PTA Post-PTA

Case 2 – 71 year old male





History: iCVA

Clopidogrel, Carbasalate calcium

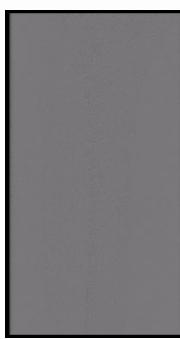
Previous vascular procedures

- PTA TFF (07-2022) and ATP right side
- DSA: High-grade stenosis proximal fibular artery and origin ATA


Foot ulcers

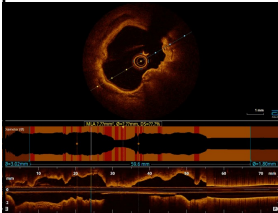
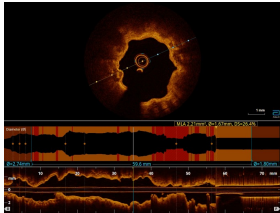
Case 2 – Angiography post-PTA





- FFR pre = 0.52
- FFR post = 0.61



Case 2 – OCT pre-PTA

Pre-PTA Post-PTA

OCT and FFR below-the-knee study

9 patients included

- Primary outcome measure
 - No adverse events
- Secondary outcome measure
 - In 7/9 patients (71,4%) change of treatment plan
 - 3 patients → no treatment
 - 4 patients → more extensive treatment dissection/thrombus/persistent stenosis



Preliminary conclusion

- OCT and FFR seem to be safe to use in BTK
- Seems to providing valuable additional information
- May cause alterations in perioperative decision-making



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