How to manage balloon-uncrossable CTO lesion

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☐ **I have the following potential conflicts of interest to report:**

- ☐ Research contracts
- ☐ Consulting
- ☐ Employment in industry
- ☐ Stockholder of a healthcare company
- ☐ Others

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

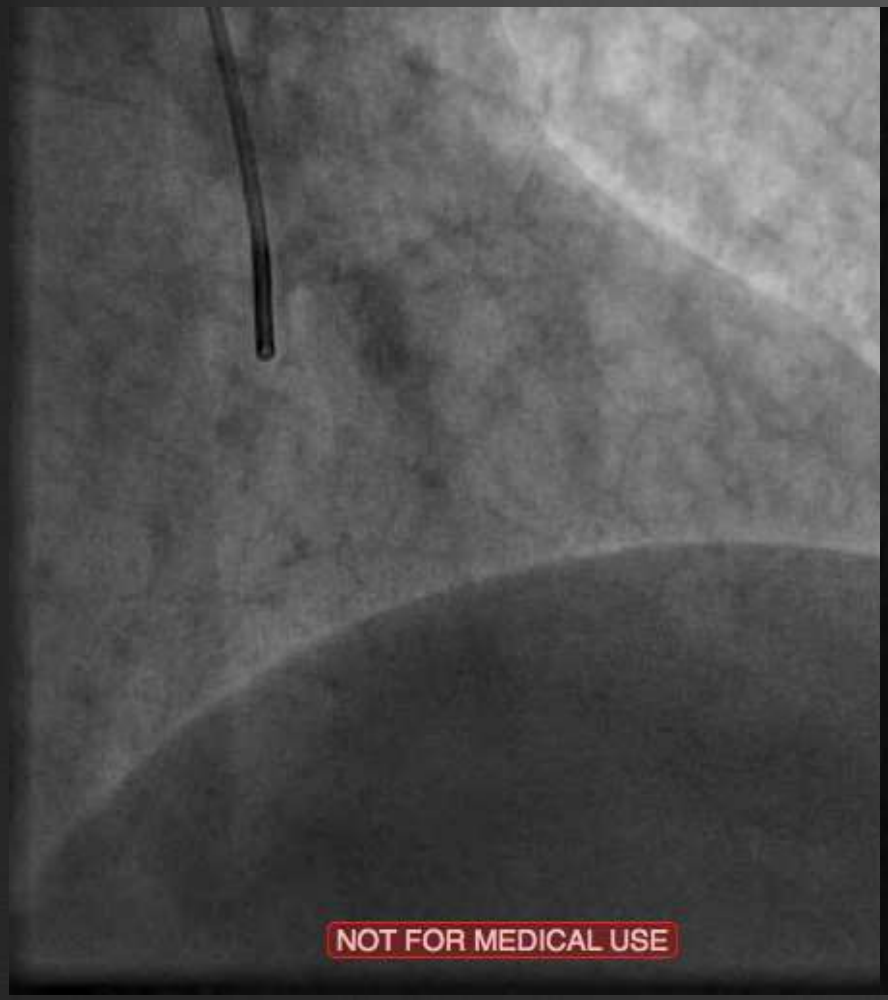
Introduction

- PCI CTO presents unique challenges and potential complications
- Two most common failure modes :
  - Inability to cross the lesion with a guidewire
  - Failure to cross the CTO with a balloon after successful guidewire crossing ("balloon-uncrossable" CTO)

Case 1

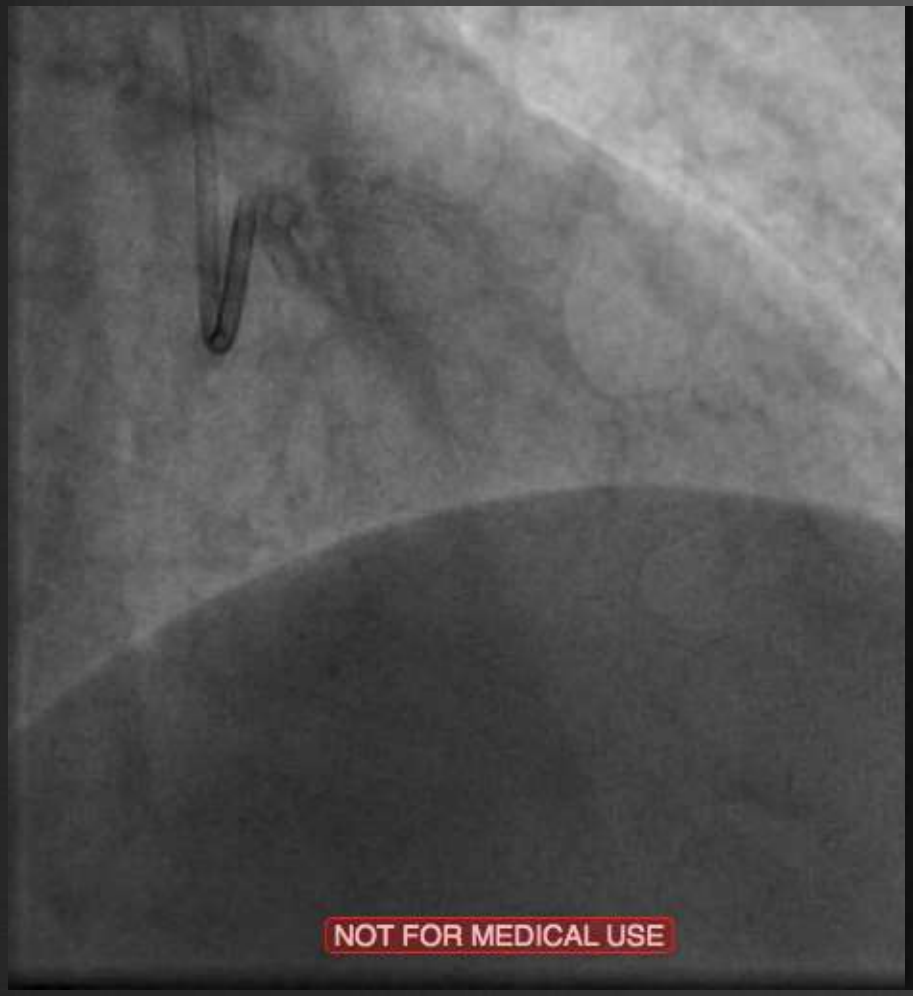
- Male, 72yo hypertensive patient
- Stable angina CCS II, CKD (CCT 35)
- Echo: EF 63%, global normokinetic
- SPECT: Ischemic burden LAD and RCA territory

Left coronaries



CTO RCA

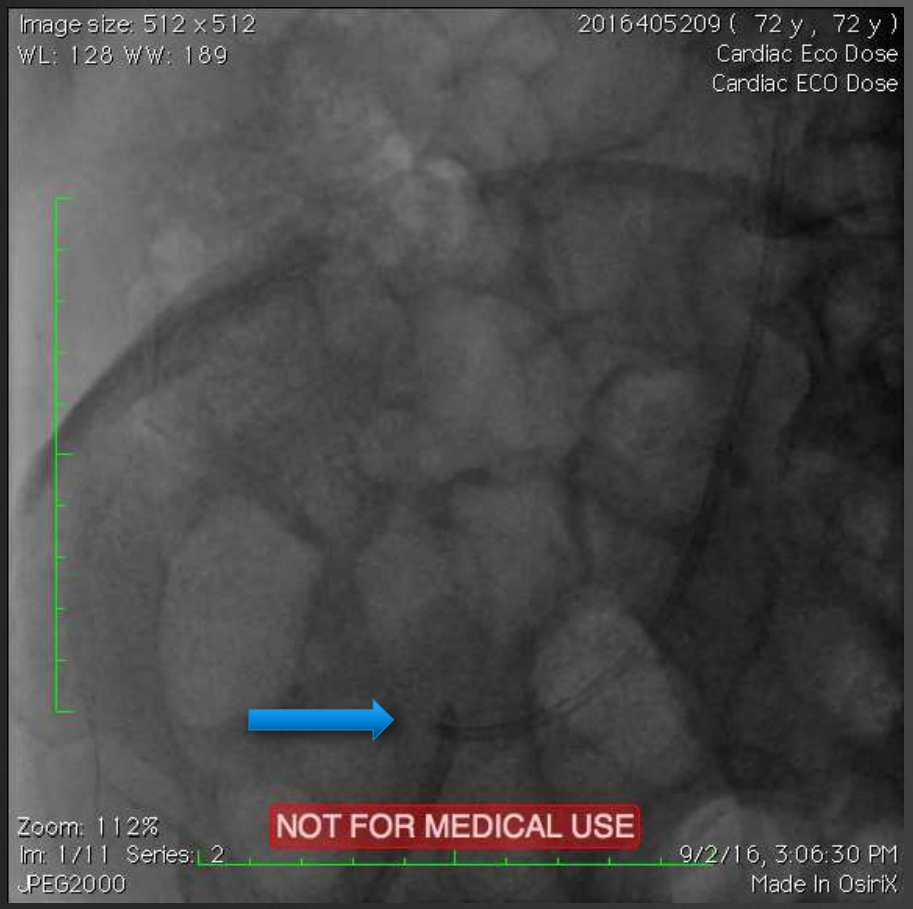
Stented LAD (3.5/15mm) and LCx (2.75/18mm)

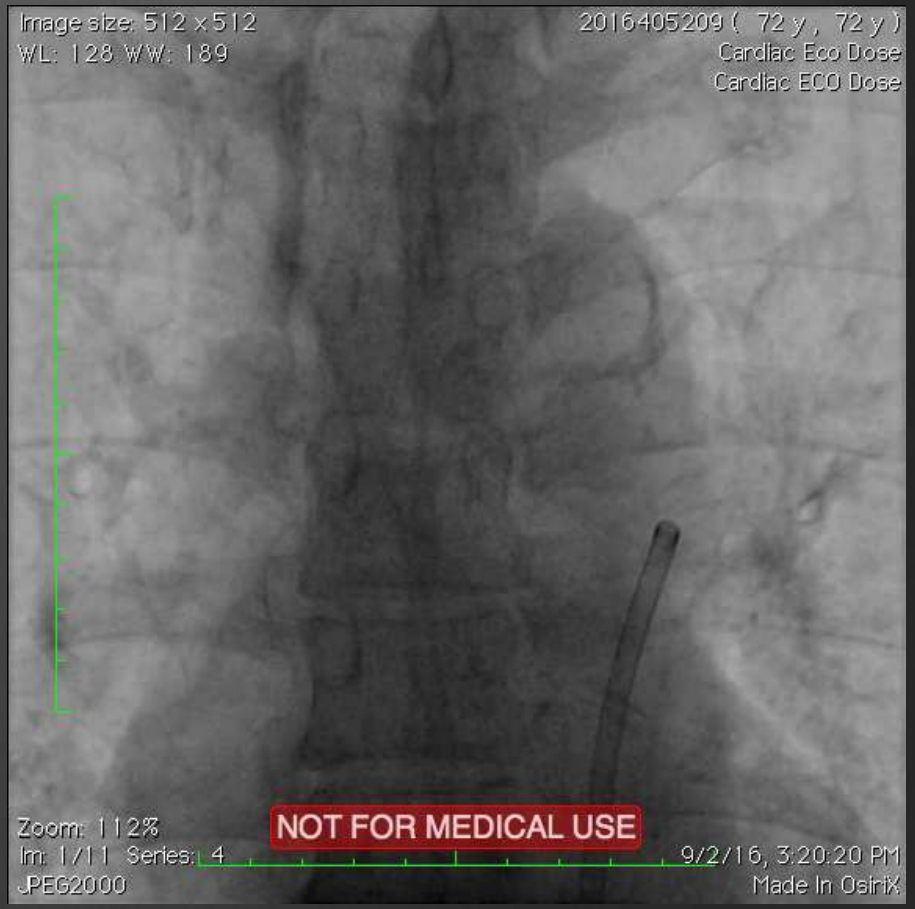


Our strategy

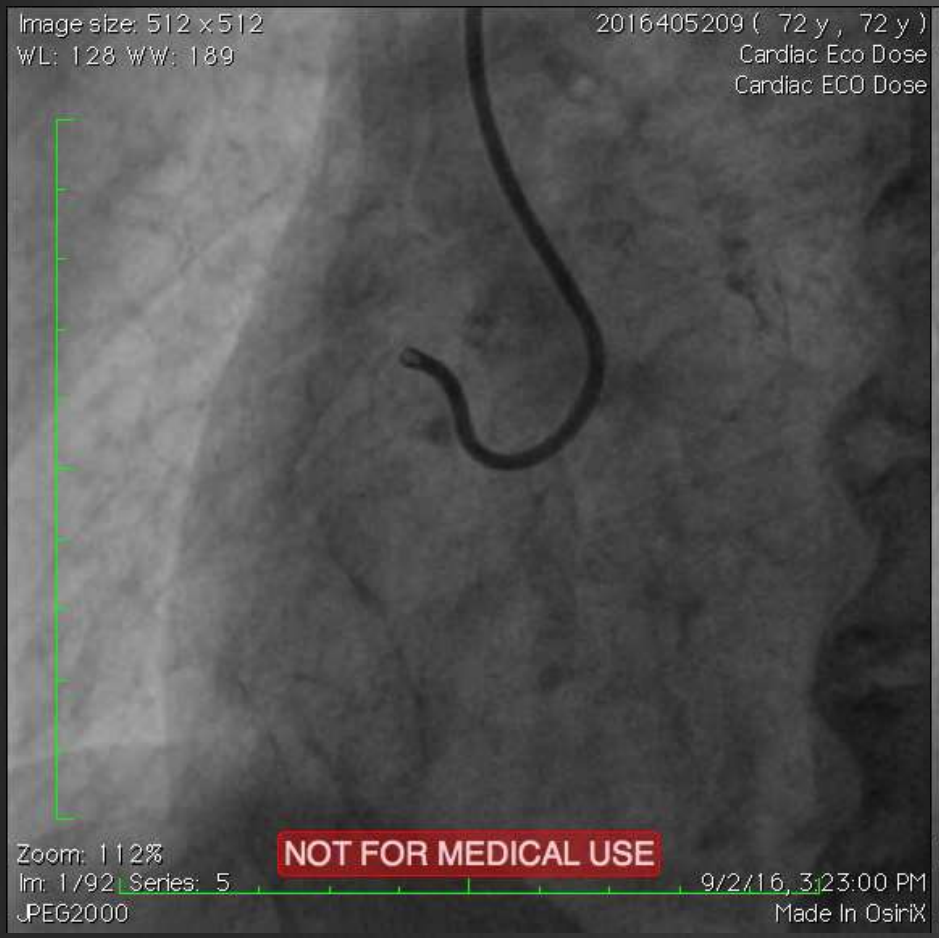
- Single femoral approach
- No need contralateral injection
- Anticipate iliofemoral tortousity
- Antegrade wire escalation

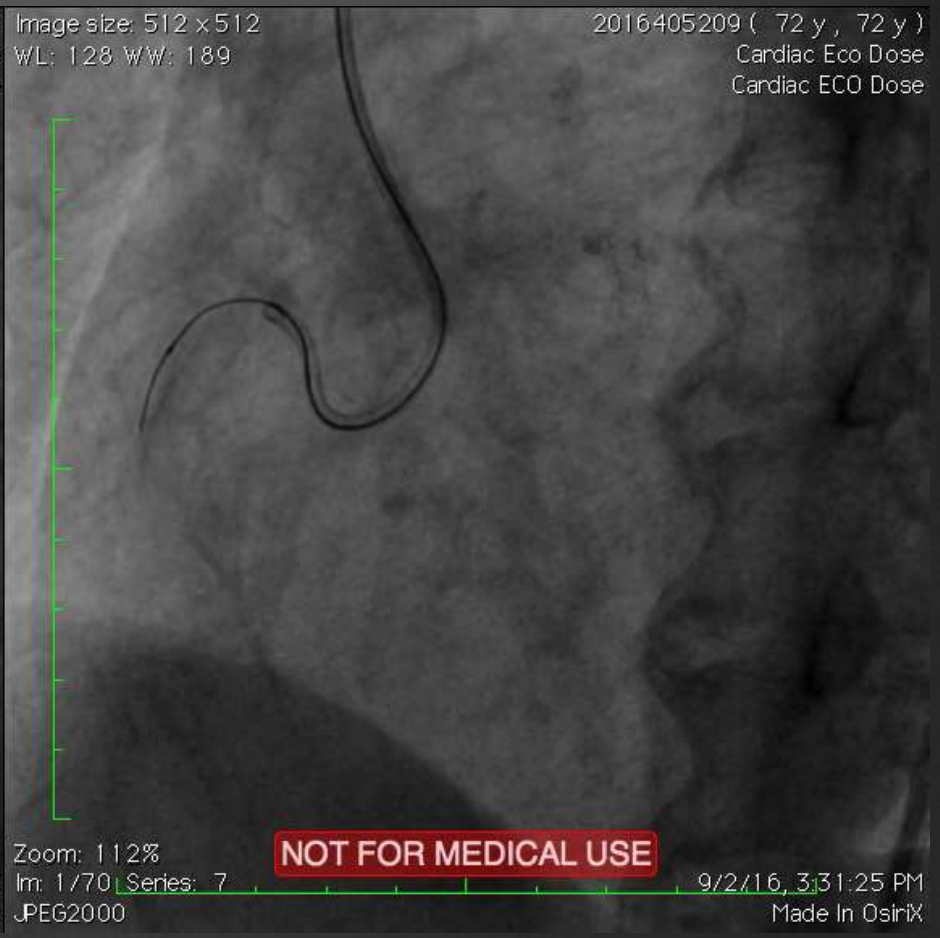
Tortous iliofemoral, 8Fr long sheath



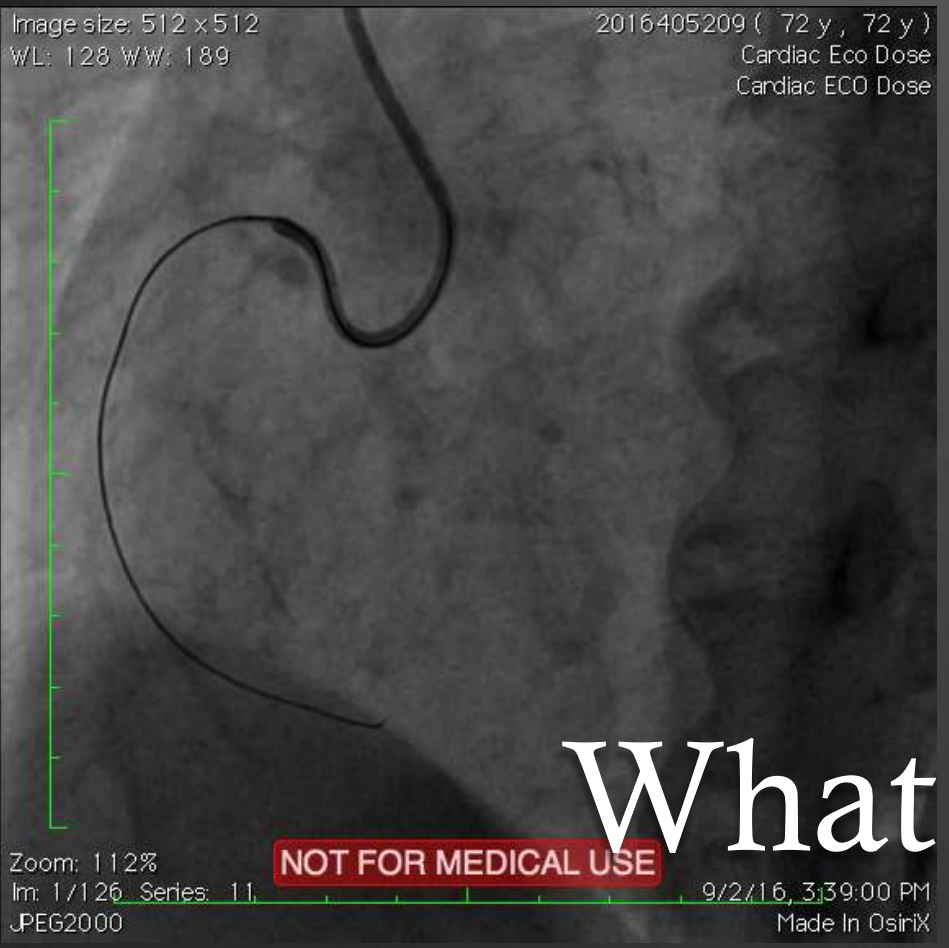


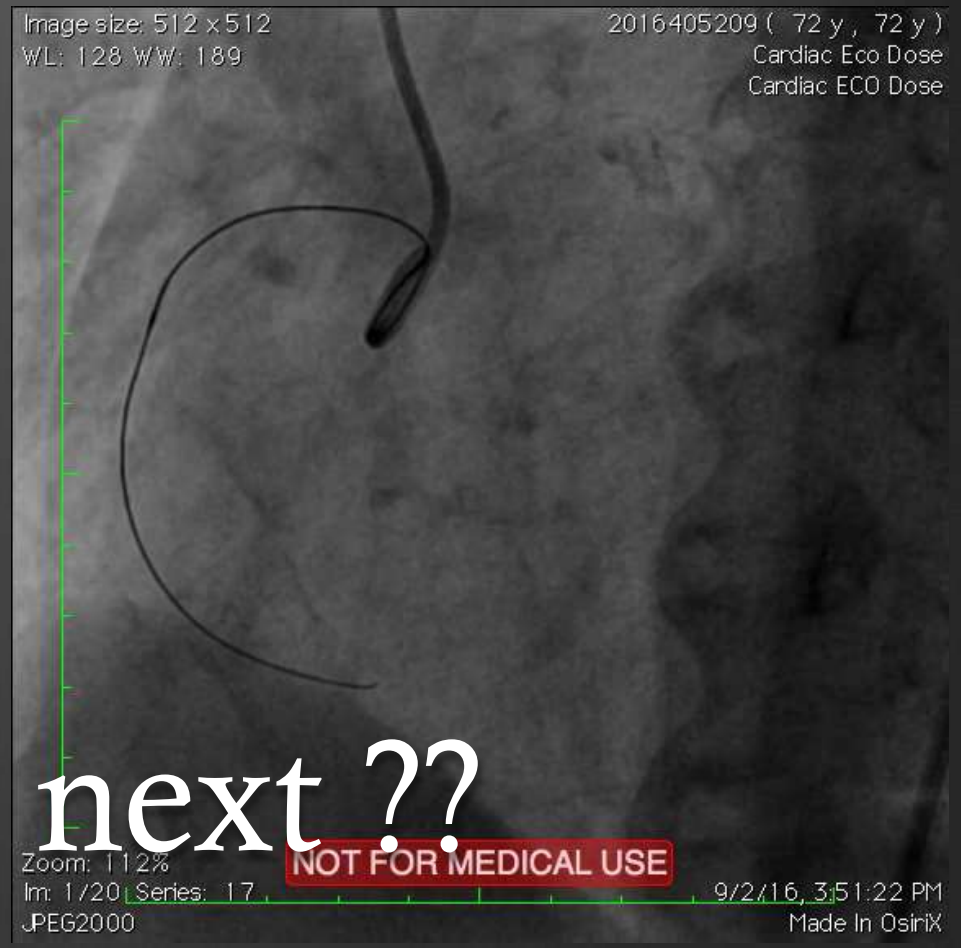
AL1/6Fr with Fielder XT-A wire & 1.25/15mm balloon support





Escalate to Gaia 2nd and crossed, 1.00 mm balloon & microcatheter couldn't





What next ??

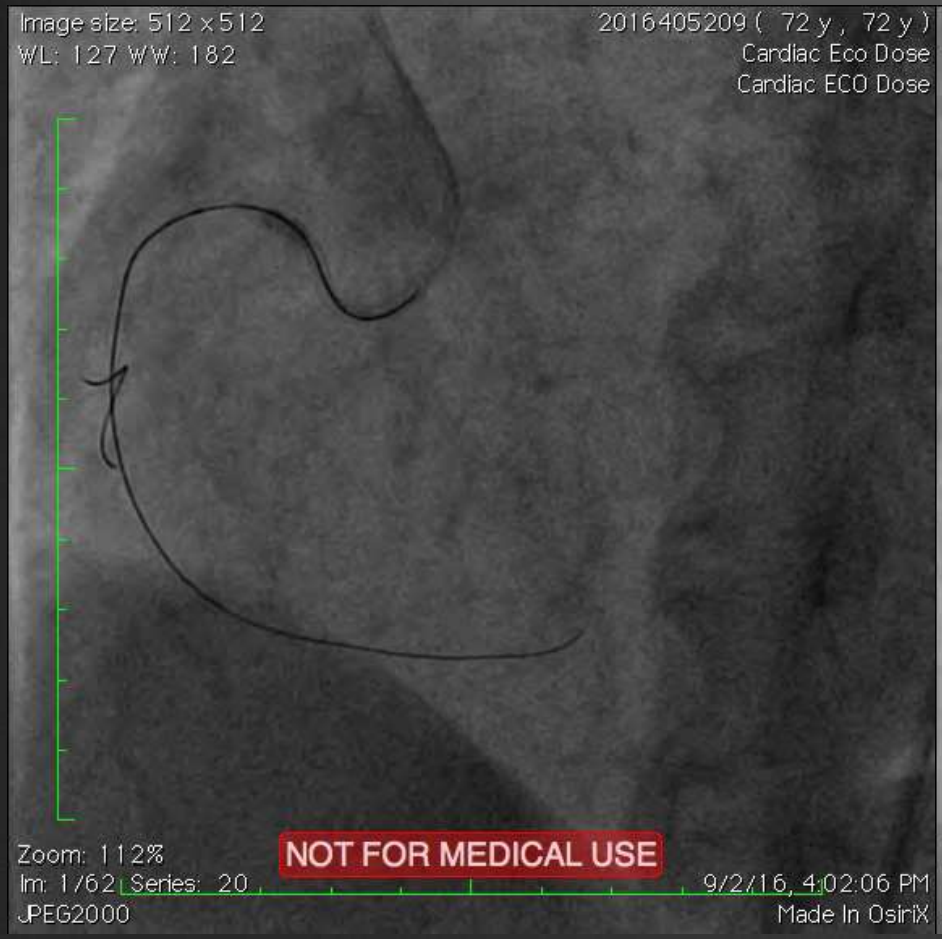
Balloon-uncrossable CTO lesion

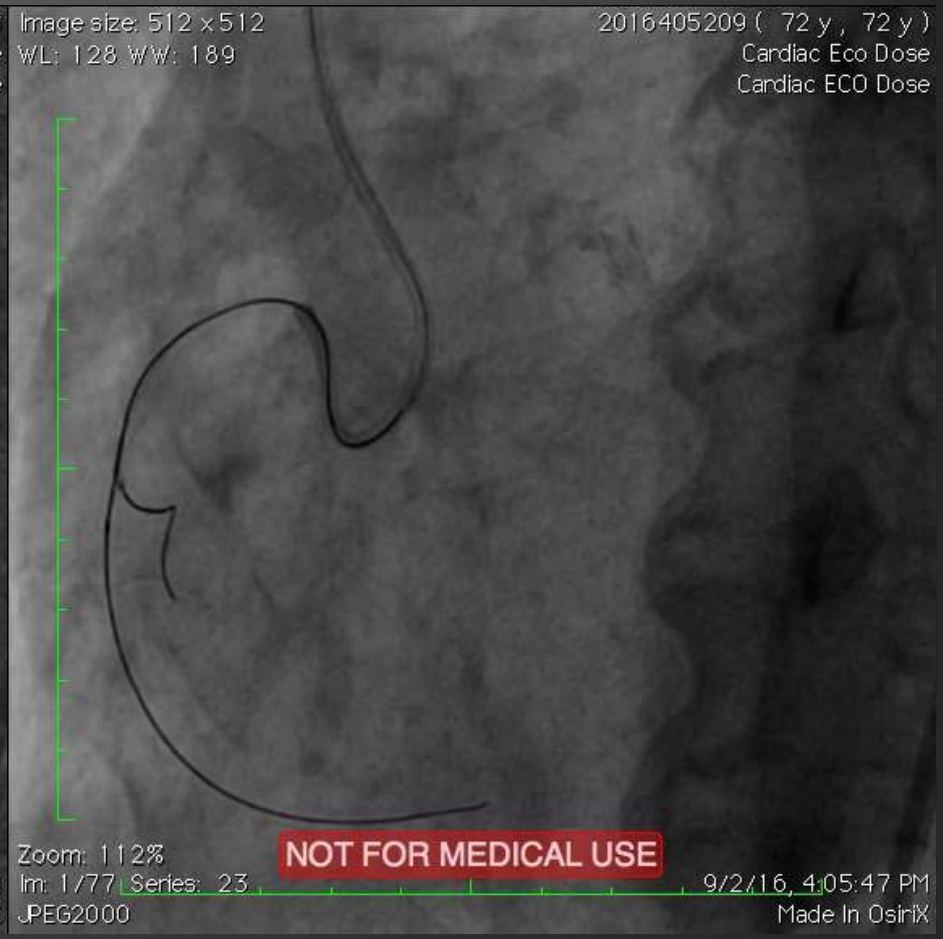
Can be approached with 2 techniques:

1. Modify the lesion (such as Tornus catheter, laser, and rotational atherectomy)
2. Increase guide catheter support (such as guide catheter extension and anchoring techniques)

PCI for CTO; The hybrid approach. Rinfret S. 2016

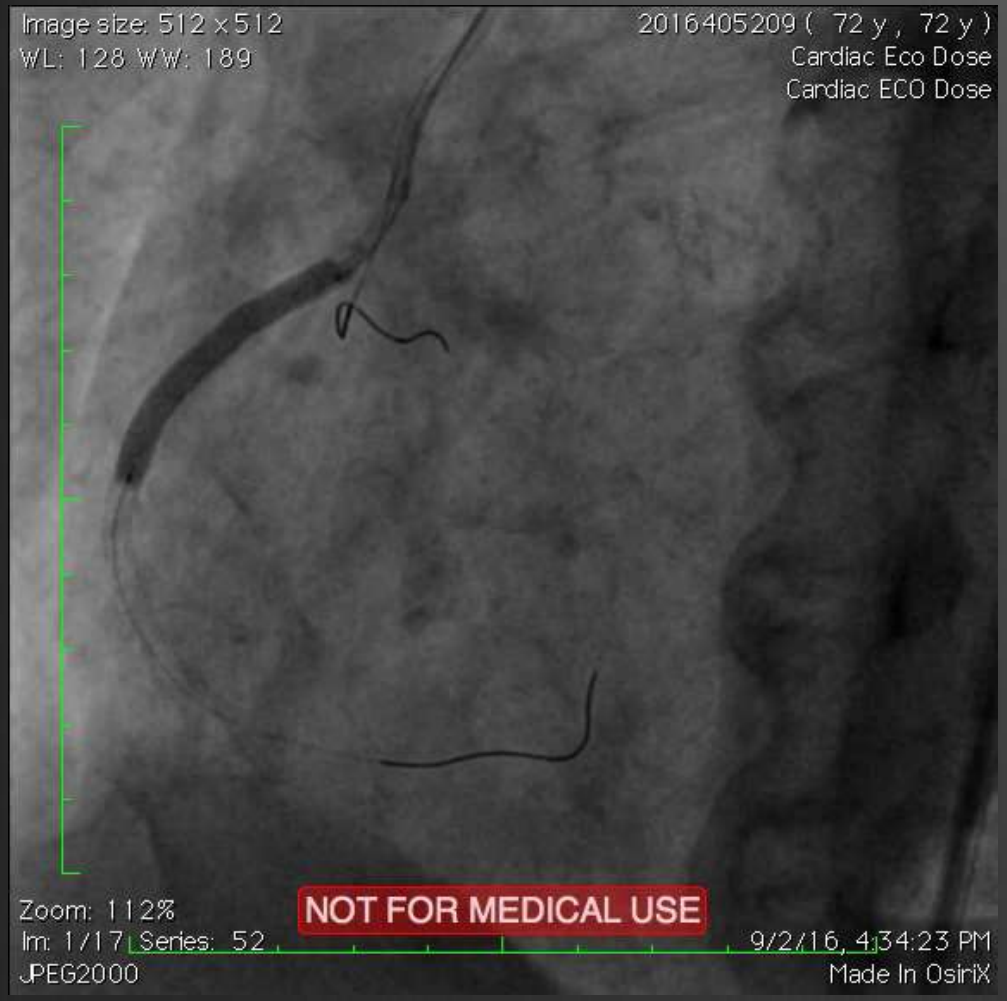
Wire-anchor and balloon-anchor



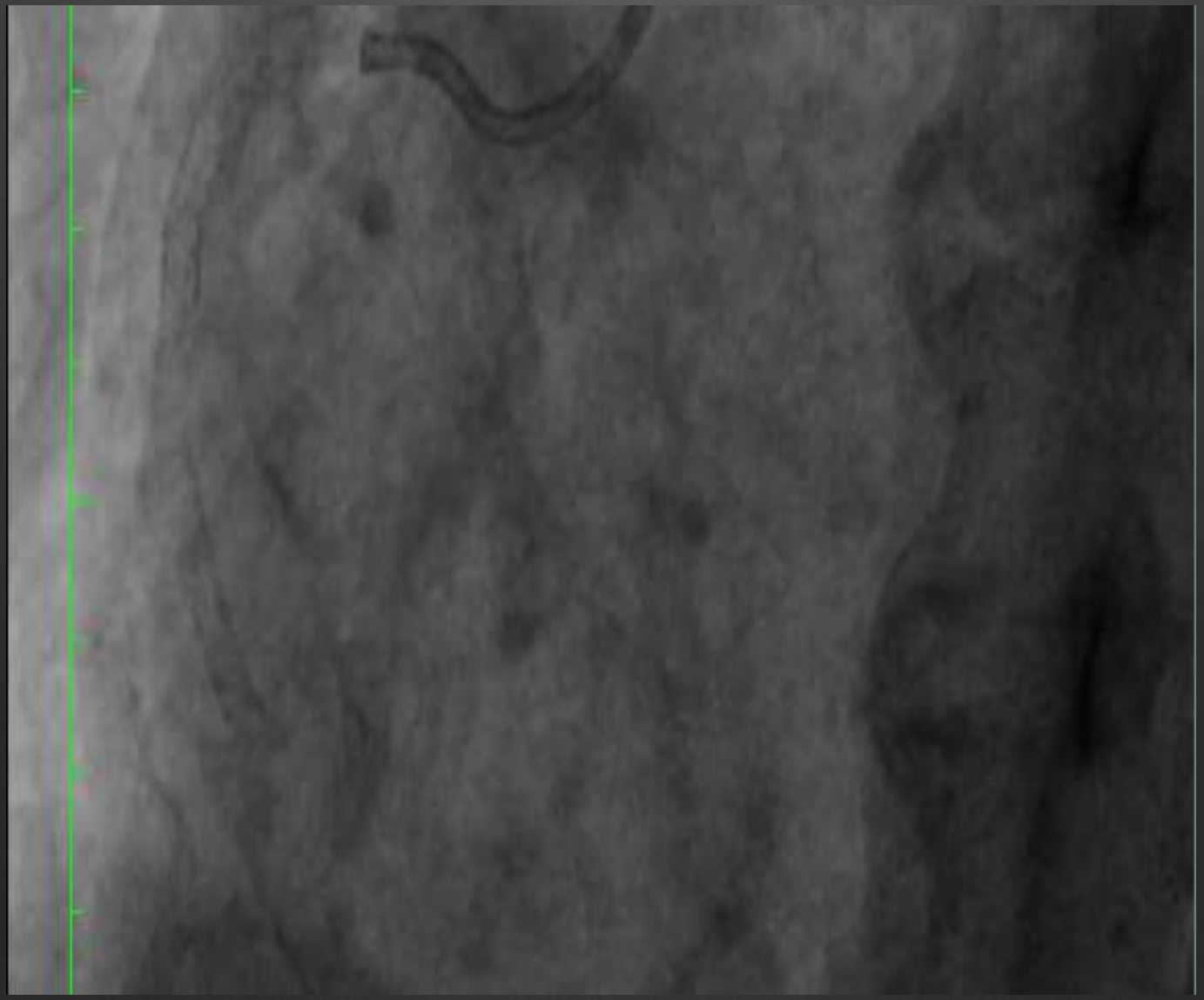


1st Stenting (3.0/38mm)

2nd stenting (3.5/33mm)



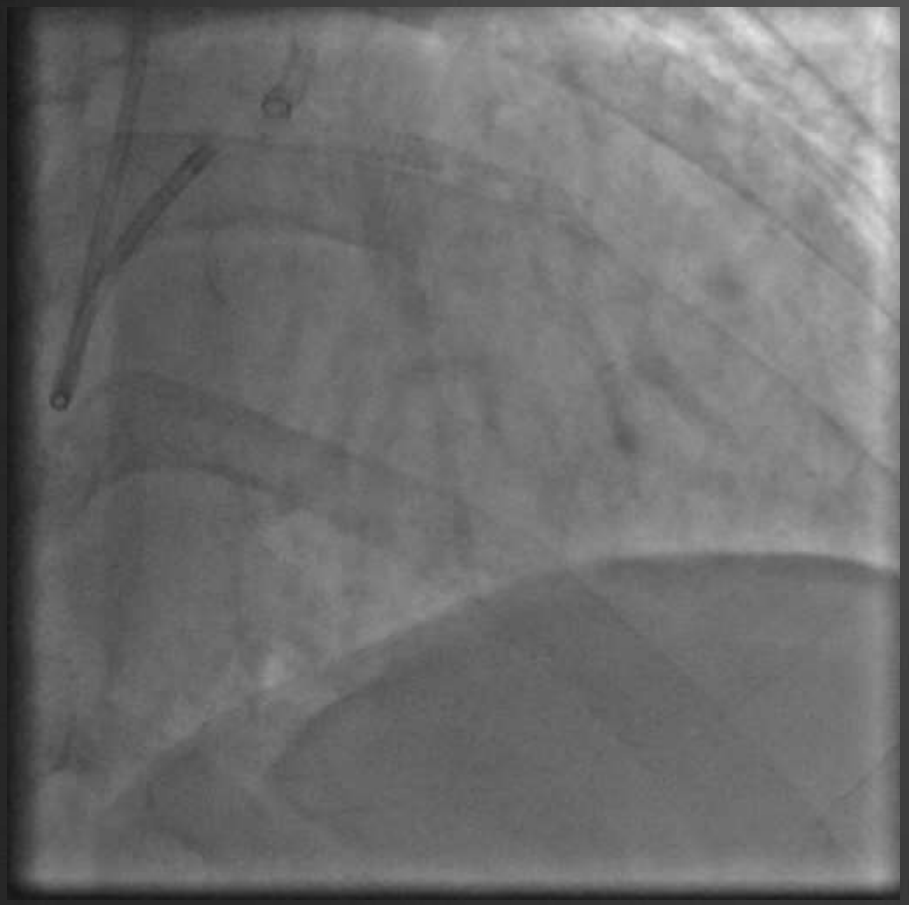
Final Result

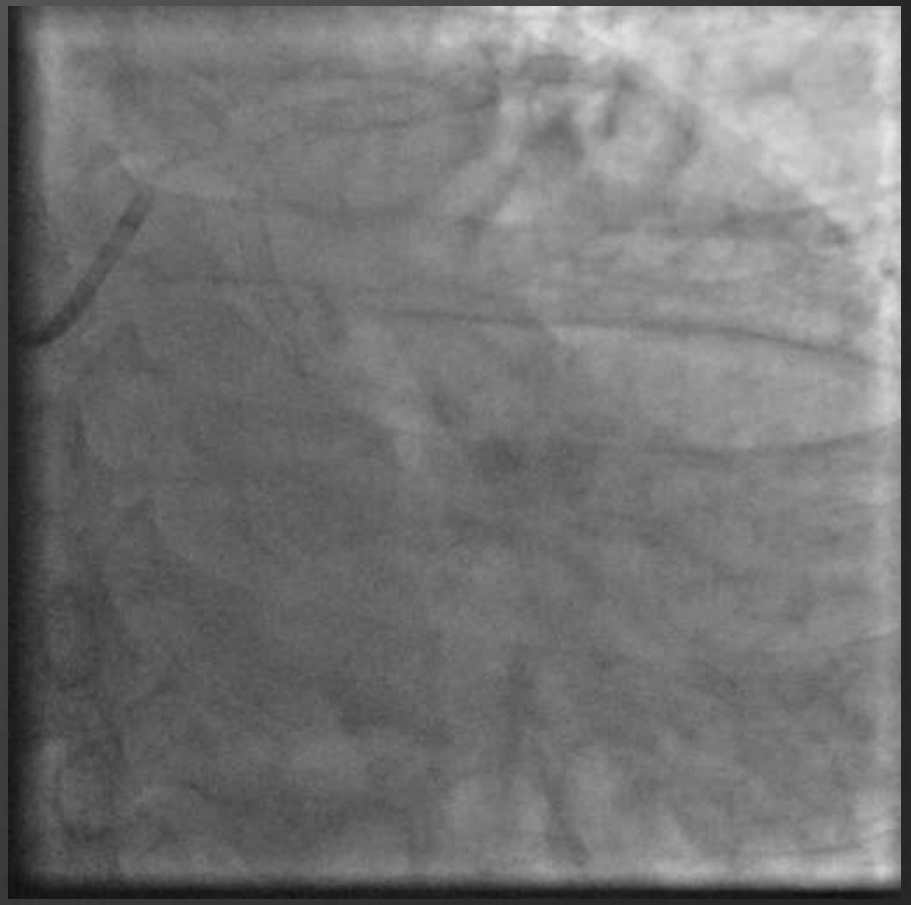


Case 2

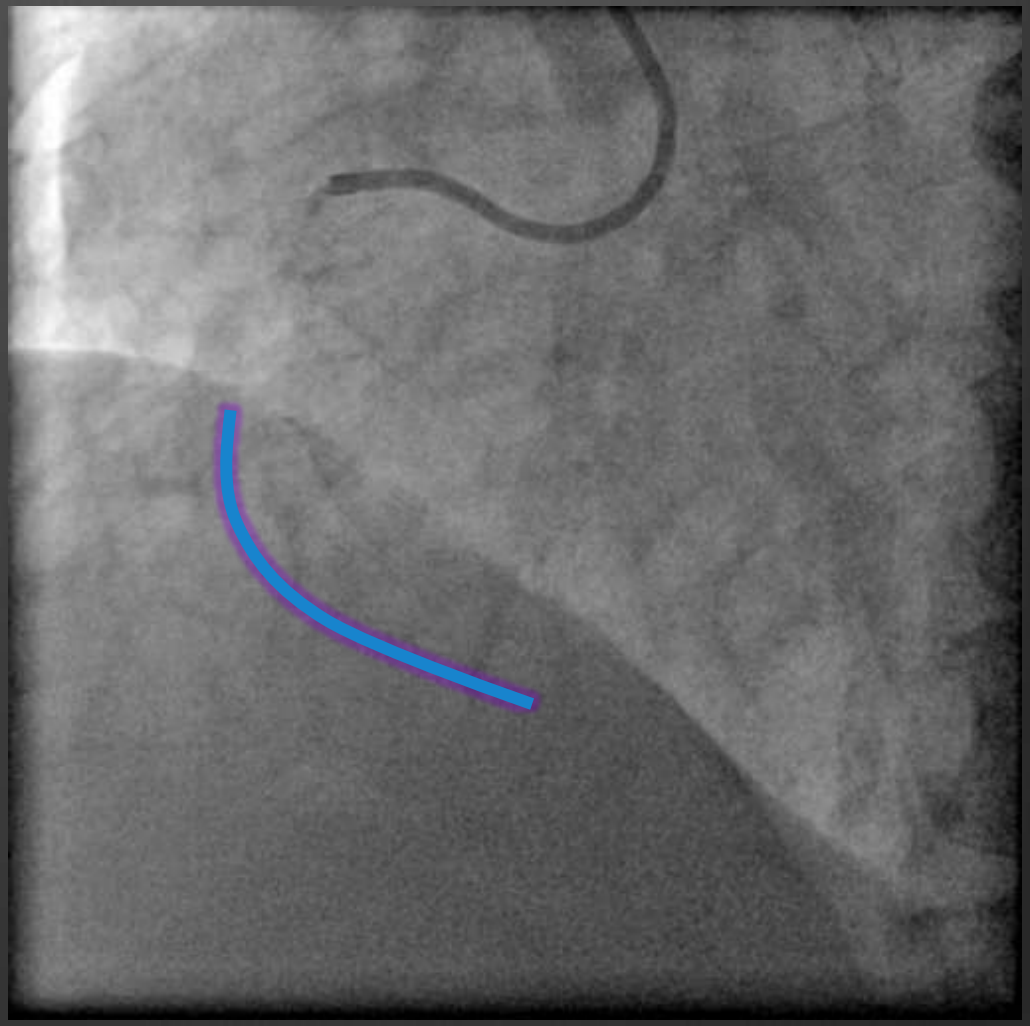
- Male, 61 years old with CCS III Angina
- s/p PCI 2 DES @ LAD April 2017;
- Failed attempt CTO RCA in other hospital
- Risk Factors :
  - Hx of Hypertension, Dyslipidemia
- Physical Exam :
  - BP 120/80 mmHg, HR 78 bpm
  - Others wnl
- Laboratory : Ur 31.2 Cr 1.17 (eGFR 61)

Angiography_LCA





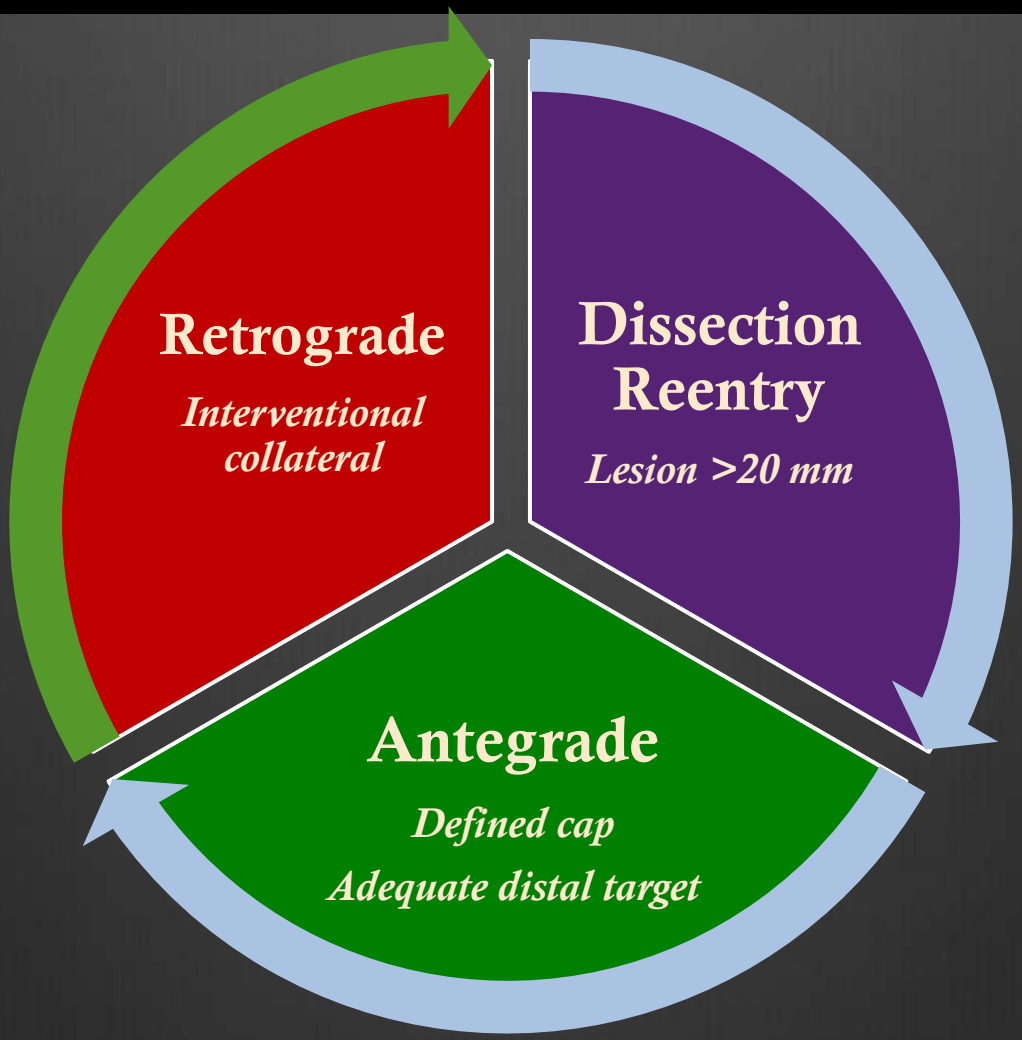
Angiography_RCA



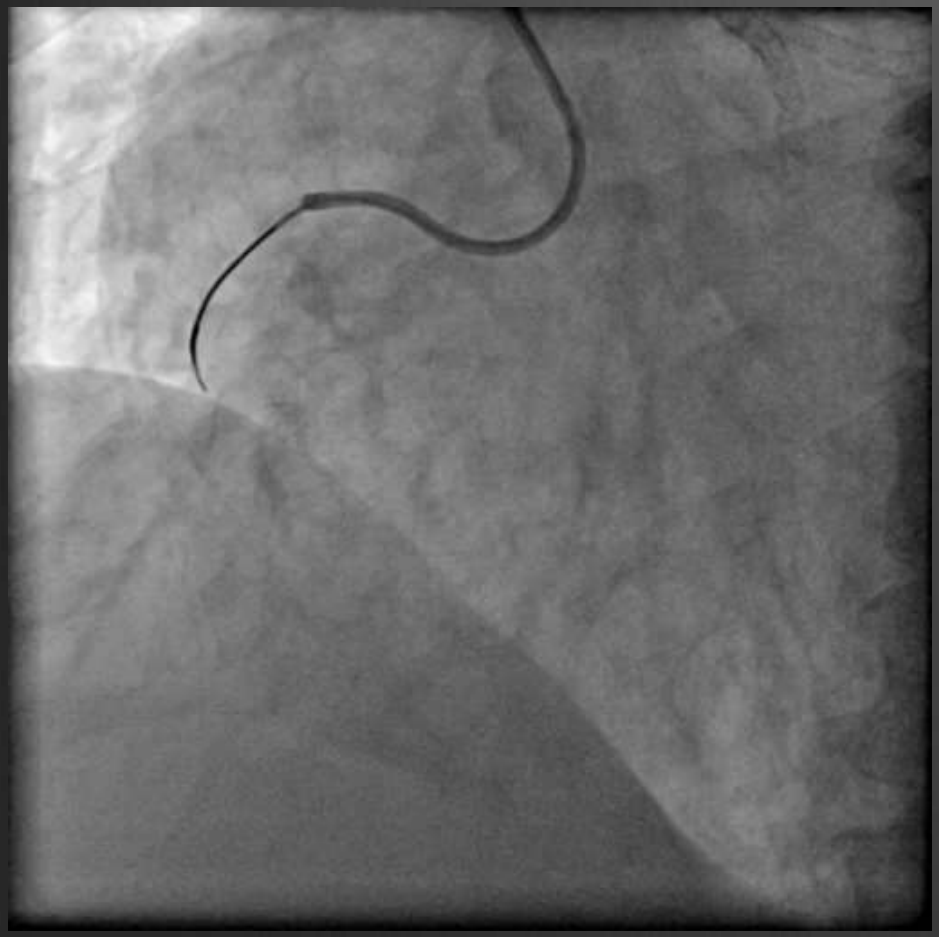
The question is:

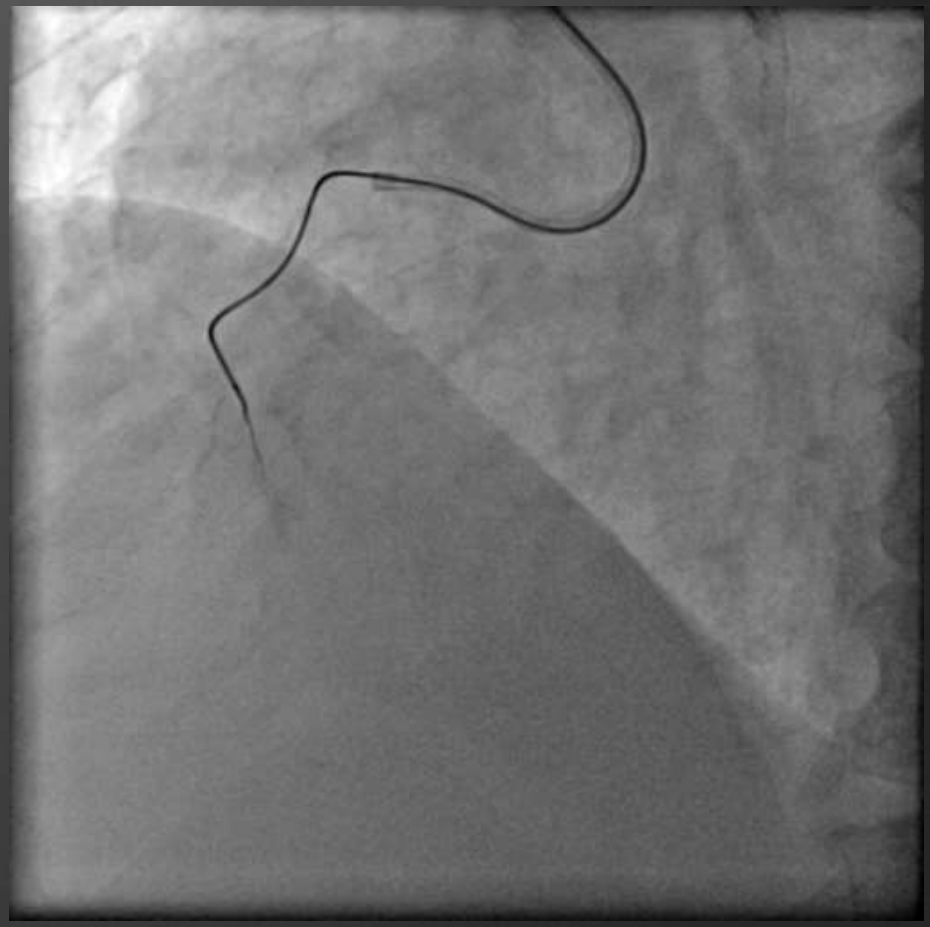
Recanalization of long RCA CTO lesion;
Antegrade wire escalation still has a role?

Hybrid Strategies

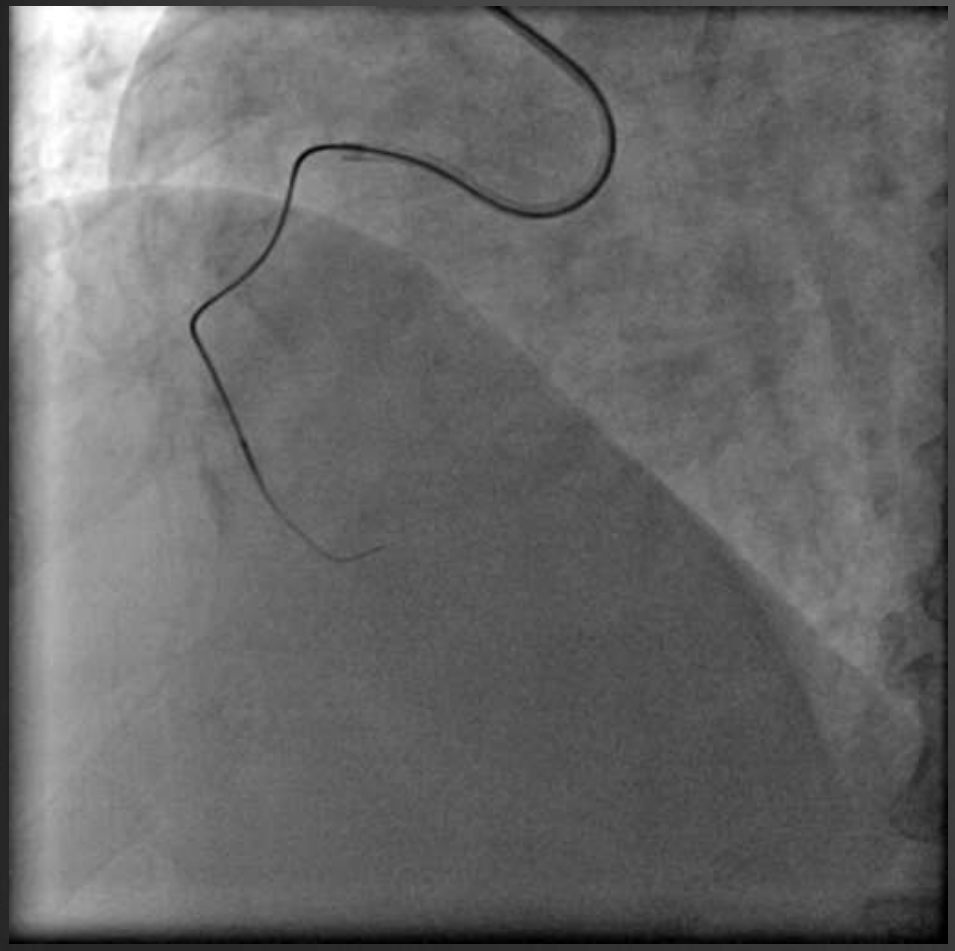


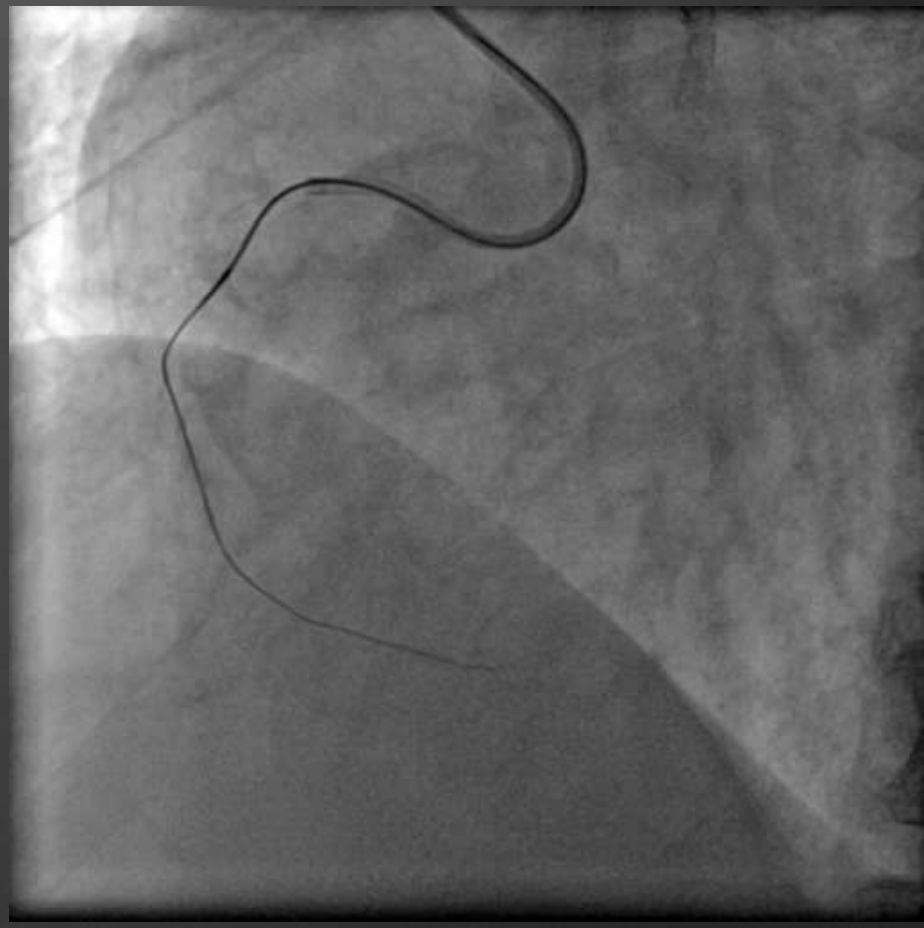
AL 1/6 Fr, Fielder XT-A with Corsair





Wire escalated to Gaia 2nd





Corsair and small balloon couldn’t be advance after wire crossed R-PDA

What next?

Balloon uncrossable lesions represented

9% of all CTOs

(US CTO Registry, 2016)

MANUAL OF CORONARY CHRONIC TOTAL OCCLUSION INTERVENTIONS

A STEP-BY-STEP APPROACH

EMMANOUIL BRILAKIS

8 "Balloon Uncrossable" CTOs

Goal: Cross the chronic total occlusion (CTO) with a balloon after successful guidewire crossing.

The main reason for failure of CTO interventions is inability to cross the occlusion with a guidewire. However, in few cases a balloon cannot cross the lesion after successful guidewire crossing and confirmation of guidewire placement into the distal true lumen. Such lesions are called "balloon uncrossable" CTOs. Figure 8.1 outlines a step-by-step algorithm for approaching such lesions.

Step 1 Advancing/Inflating a Small Balloon

How?

a. Use single marker, rapid exchange balloons with low-crossing profile (1.20, 1.25, and 1.5 mm in diameter) and long length (20–30 mm). The balloon profile is highest at the marker segment; hence, longer balloons may allow deeper lesion penetration before the balloon marker reaches the proximal cap of the CTO.
b. If the balloon stops advancing, it can be inflated while maintaining forward pressure. This may dilate the proximal cap and allow lesion crossing, sometimes even with the same balloon.
c. If the balloon fails to advance after inflation, one can try with a new small balloon (since balloons do not return to their original profile after inflation), or one manufactured by another company, as different crossing profile and tip confirmation may assist in crossing. Rapid exchange balloon catheters allow more pushability into the stenosis.
d. Alternatively, one can attempt crossing with a larger 2.5–3.0-mm diameter rapid exchange balloon. Sometimes inflation with a larger diameter balloon just proximal to the CTO lesion will disrupt the architecture of the proximal CTO cap enough to allow subsequent passage of a small profile balloon.

What can go wrong?

- Guide catheter and guidewire position can be lost during attempts to advance the balloon. Watch carefully the guide catheter position and stop advancing if the guide catheter starts backing out of the coronary ostium or if the distal wire position is being compromised.
- Injury of the distal target vessel can occur (dissection or perforation) in case of significant distal guidewire movement ("see-saw" action of wire with forward push of balloon and retraction of force), especially when stiff (such as Confianza Pro 12) or polymer-jacketed (such as the Pilot 200) guidewires are used.

Manual of Coronary Chronic Total Occlusion Interventions. DOI: http://dx.doi.org/10.1016/B978-0-12-420129-3.00008-8
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APPROACH FOR UNCROSSABLE LESION

- *Modify the Lesion*

- *Improve Support*

Approach to “balloon uncrossable” CTO

“Balloon Uncrossable” CTO

- Inflate 1.20-1.5 mm balloon, Threader, Glider
- Rupture balloon in vessel (grenadoplasty)

1st line

- Tornus, Corsair, Finecross
- Wire “cutting”

- Guide catheter extensions
- Anchor balloon strategies

2nd line

combinations

- Laser
- Rotational atherectomy

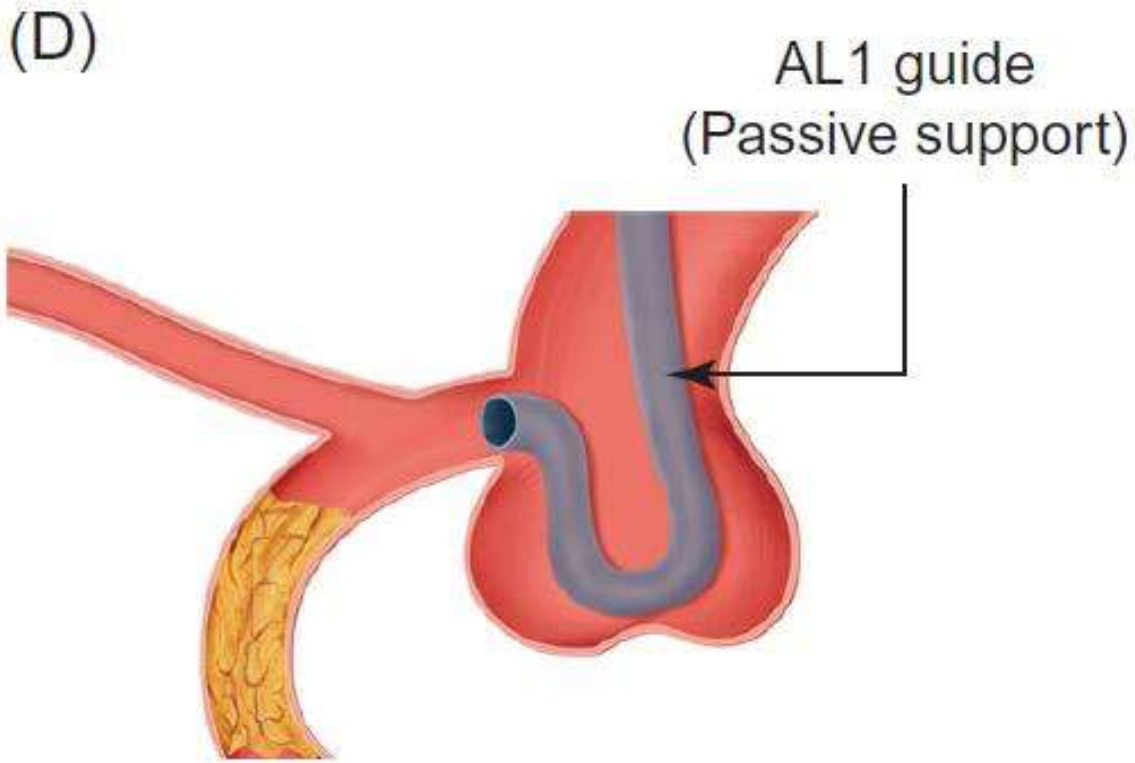
3rd line

- Subintimal: external “crush” - retrograde
- Subintimal: distal anchor

4th line

Brilakis ES. Manual of coronary CTO interventions. Elsevier 2013

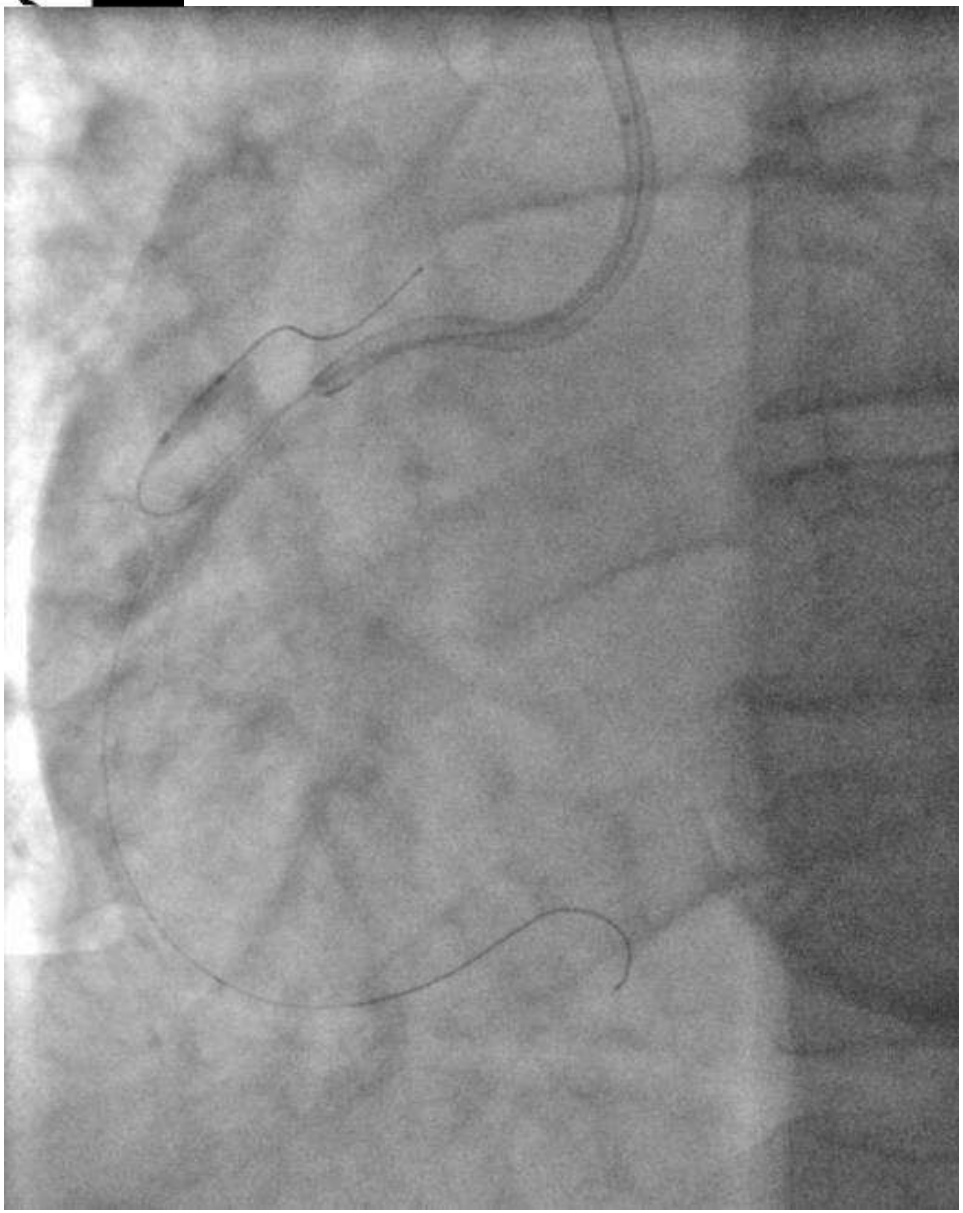
Guide catheter support

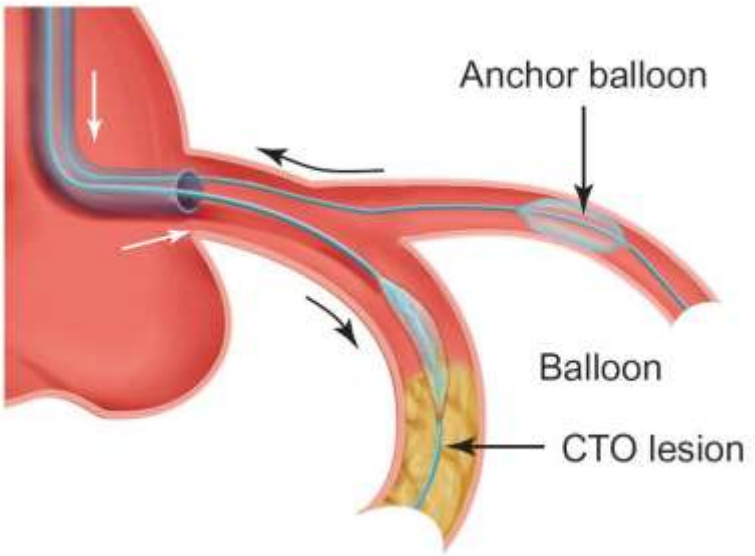


If you want peace, prepare for war!!

Brilakis ES. Manual of coronary CTO interventions. Elsevier 2013

Side branch anchor





Brilakis ES. Manual of coronary CTO interventions. Elsevier 2013

Grenadoplasty or BAM technique

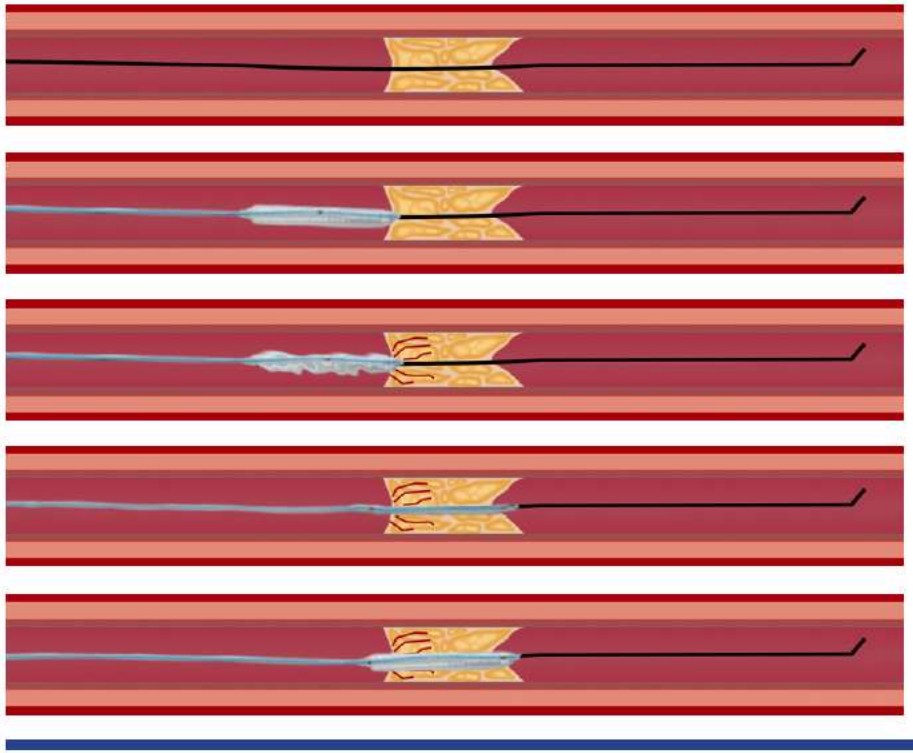


FIGURE 1. The balloon-assisted microdissection (BAM) technique. (A) Successful wire crossing of occluded segment. (B and C) Small, low-profile, compliant balloon is advanced against proximal cap. Balloon is then inflated until it ruptures to cause microdissections to weaken the lesion and its cap. (D and E) Subsequent delivery of balloons into the lesion for successful treatment.

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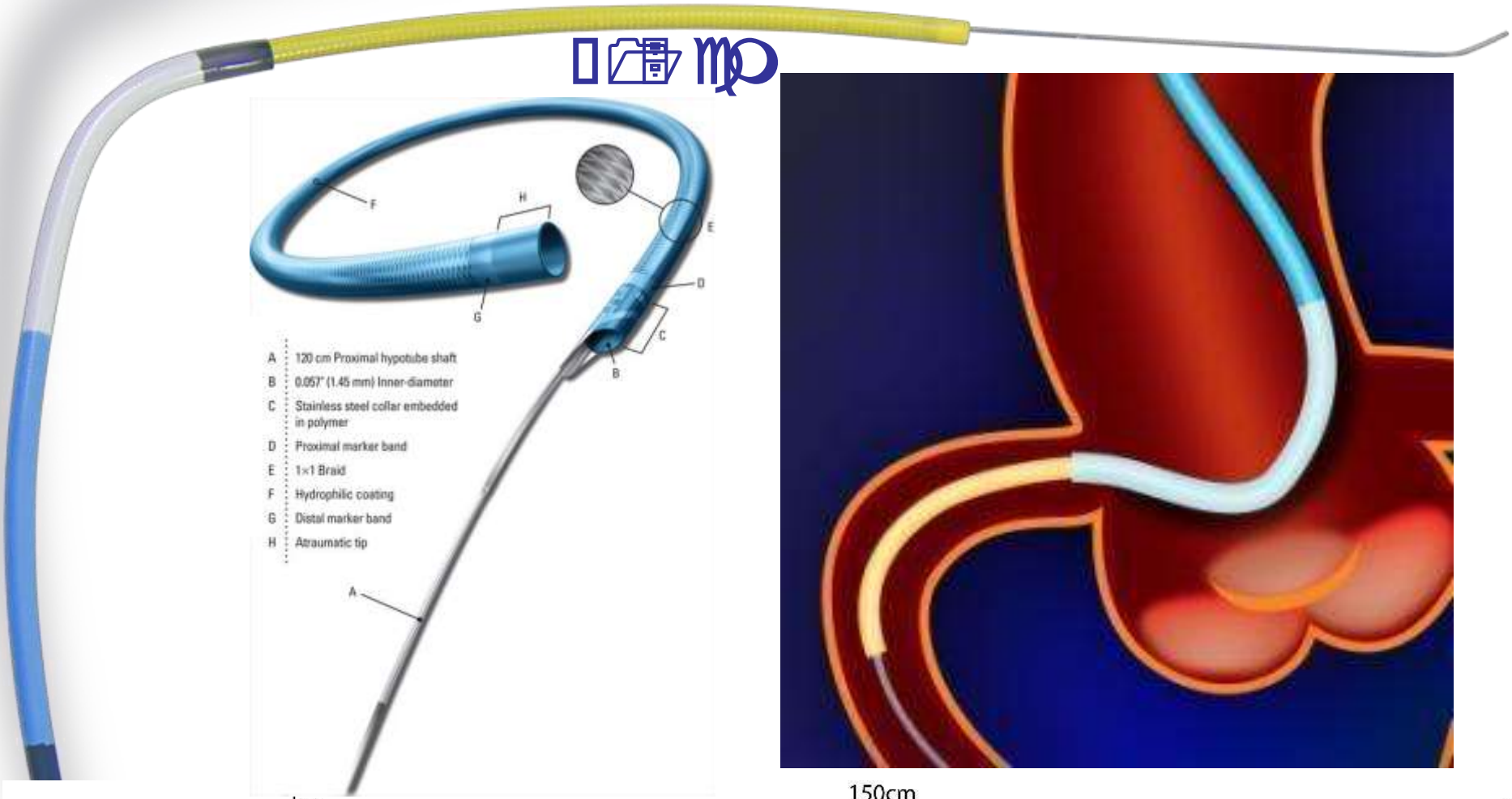
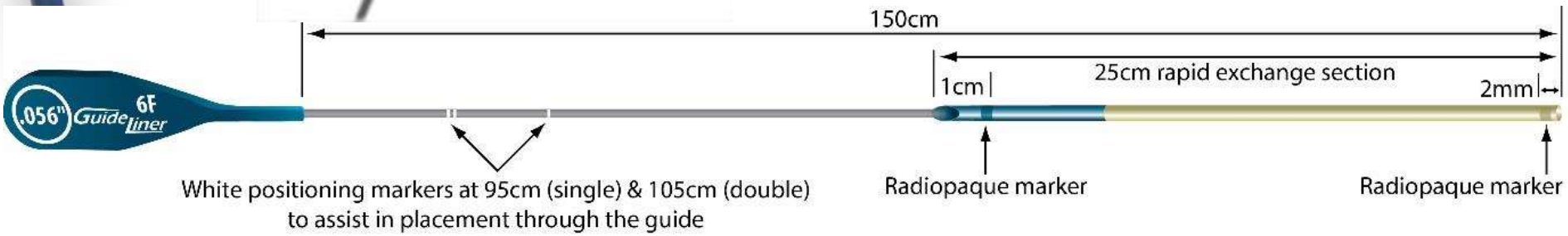
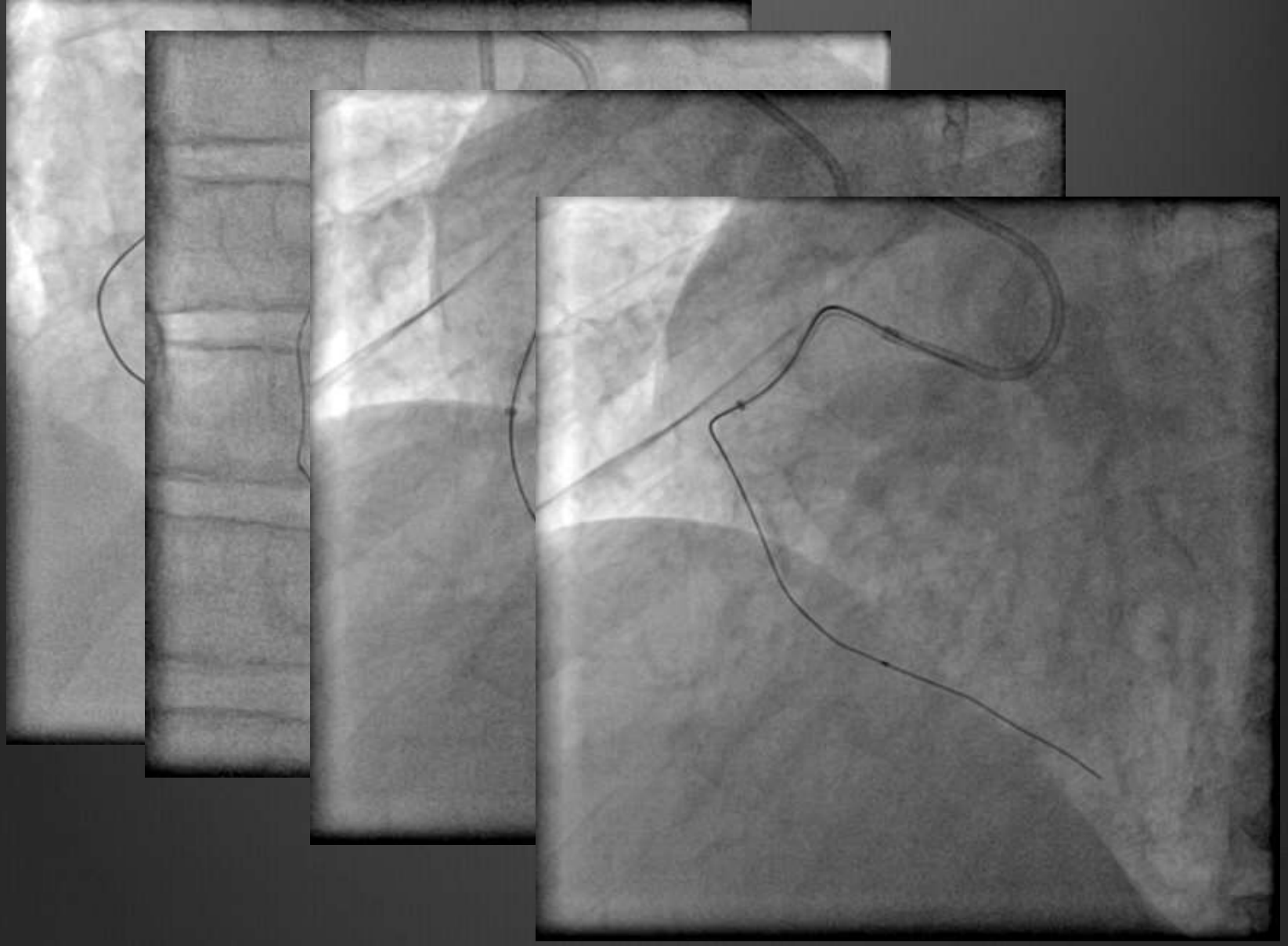
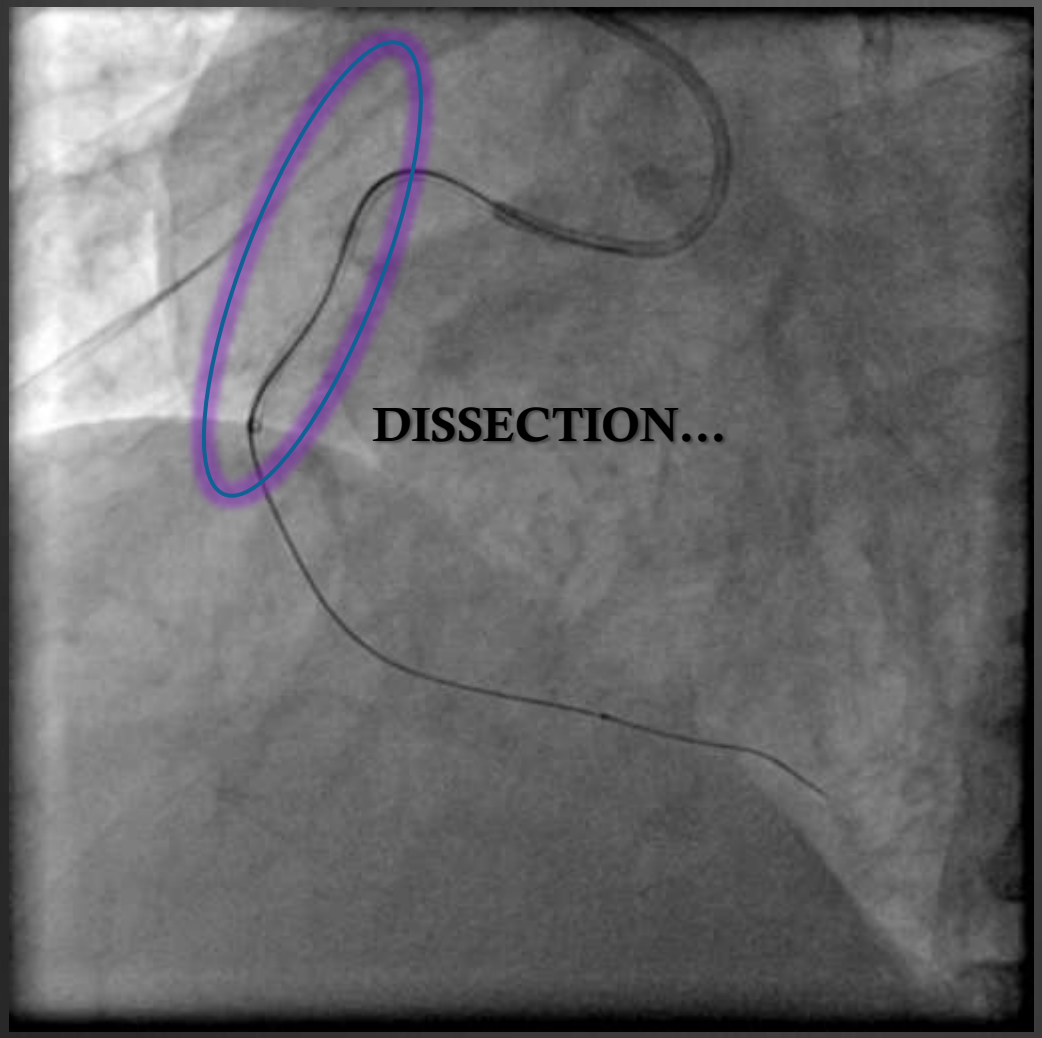
Guide catheter extensions

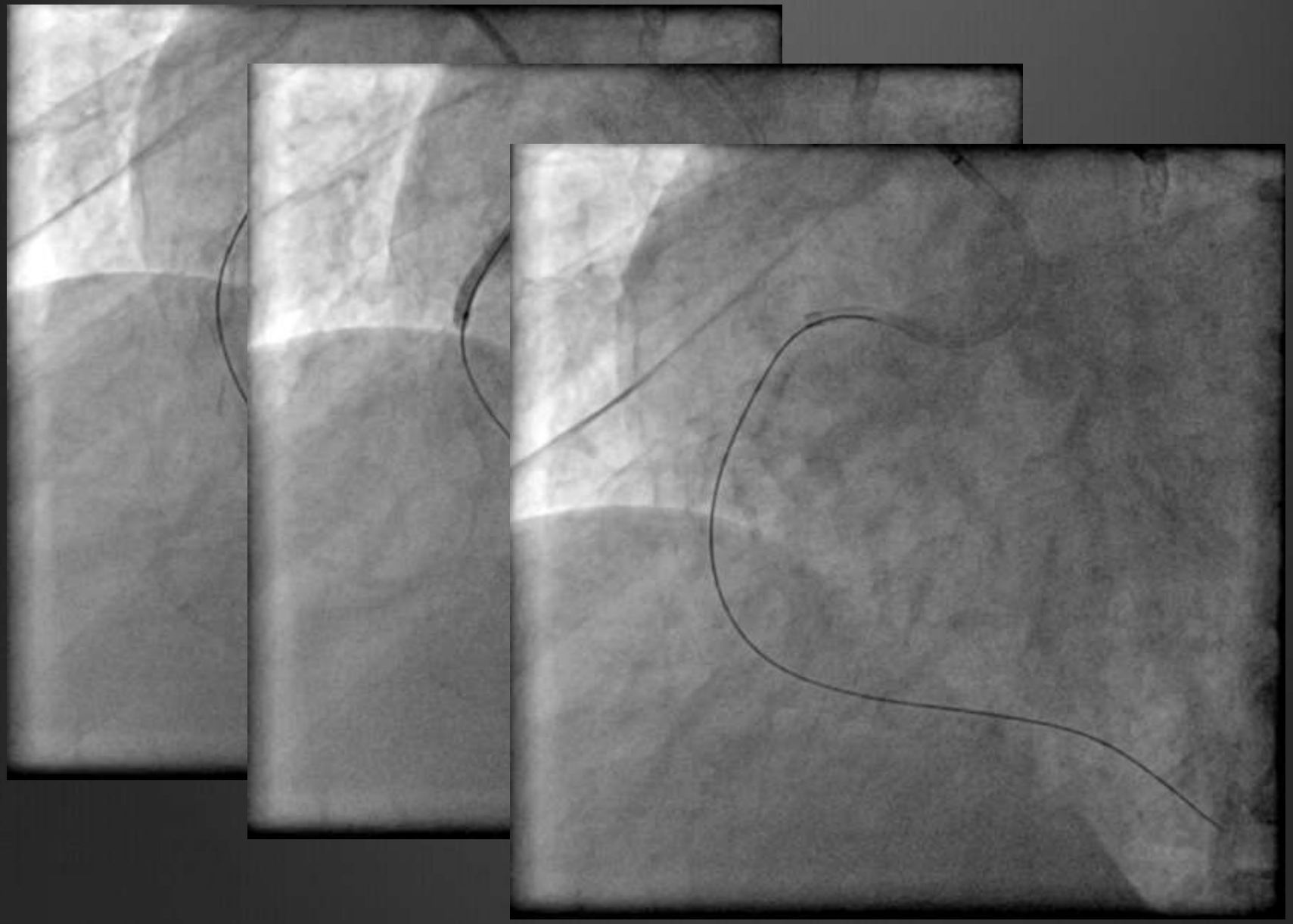




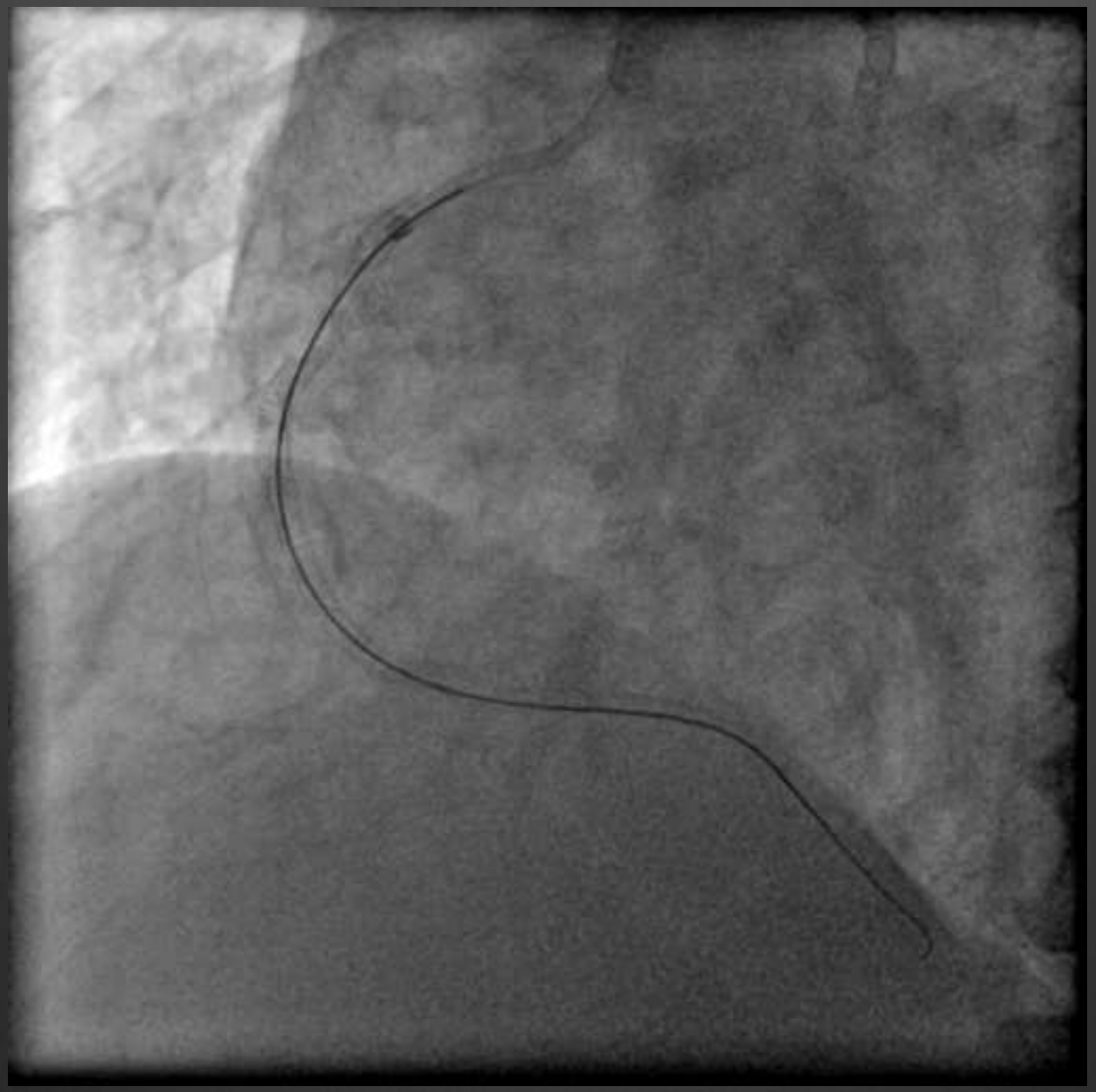


Balloon-anchoring technique was unsuccesful.
Mother-and-child with Guidezilla managed to push the balloon distally


DISSECTION…

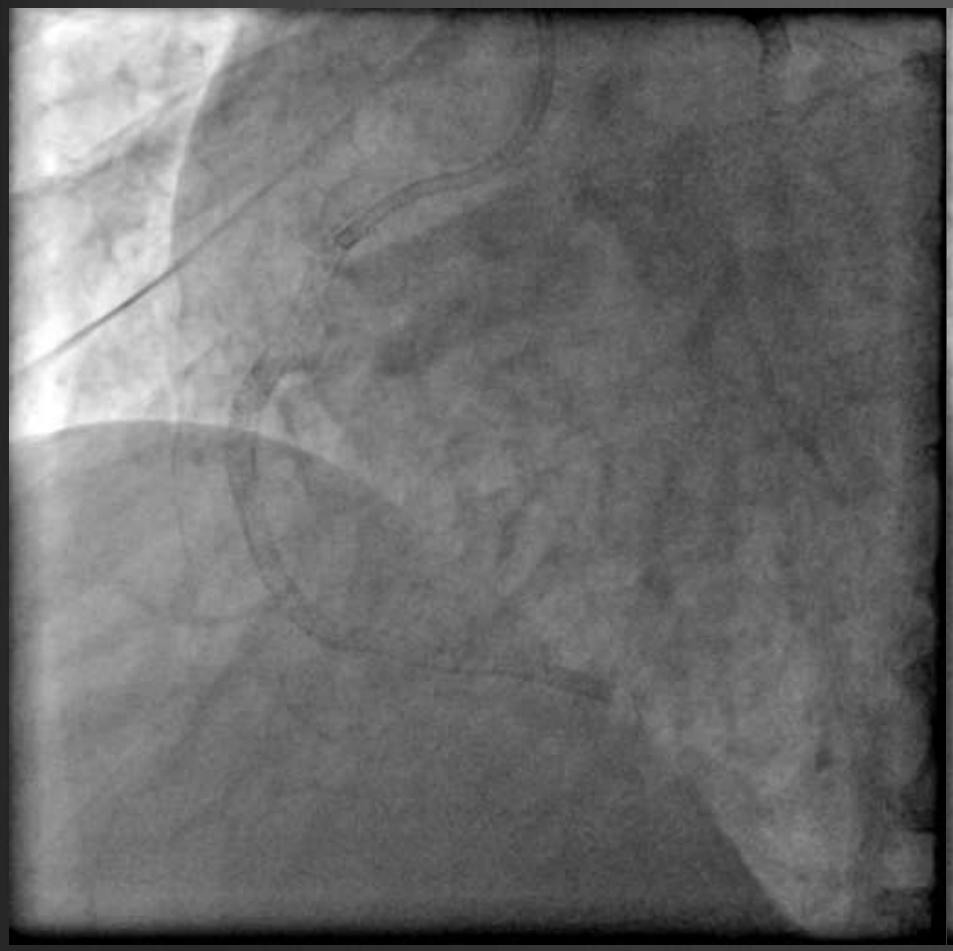


Predilate all the way with 2.5 mm balloon



DES 2.5/28 mm, 3.0/38 mm and 3.5/24 mm

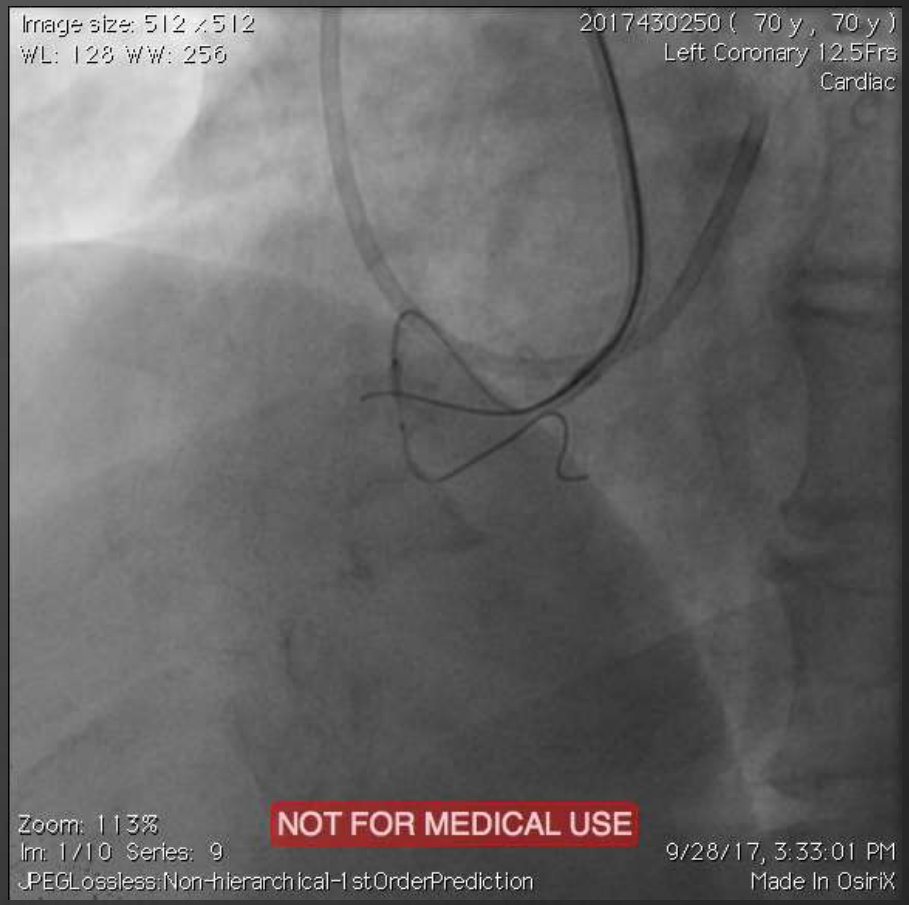
Final shot



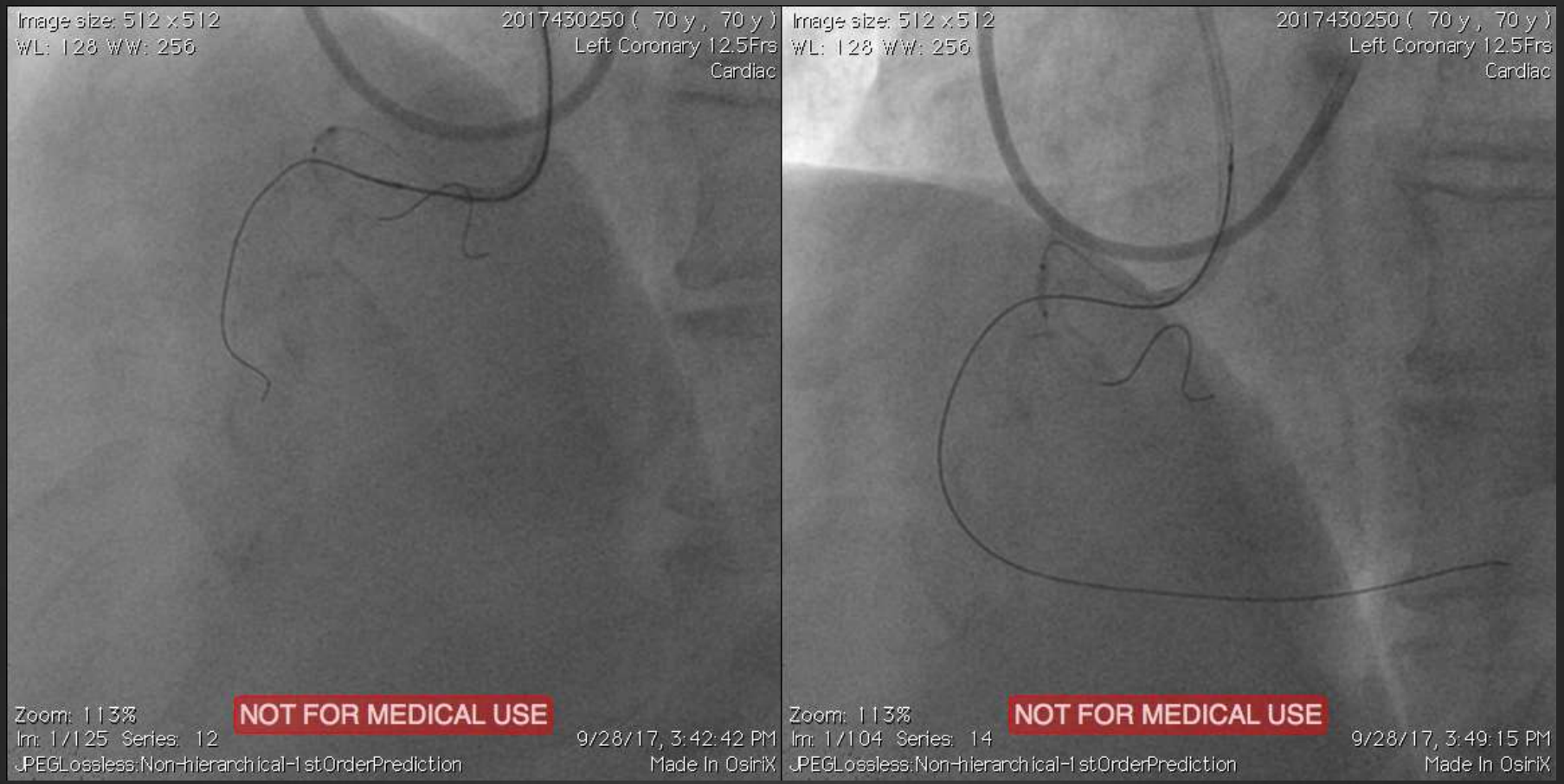
Case 3- Mr IS

- 70 yo
- Stable angina CCS 2
- Hypertension
- CTO RCA

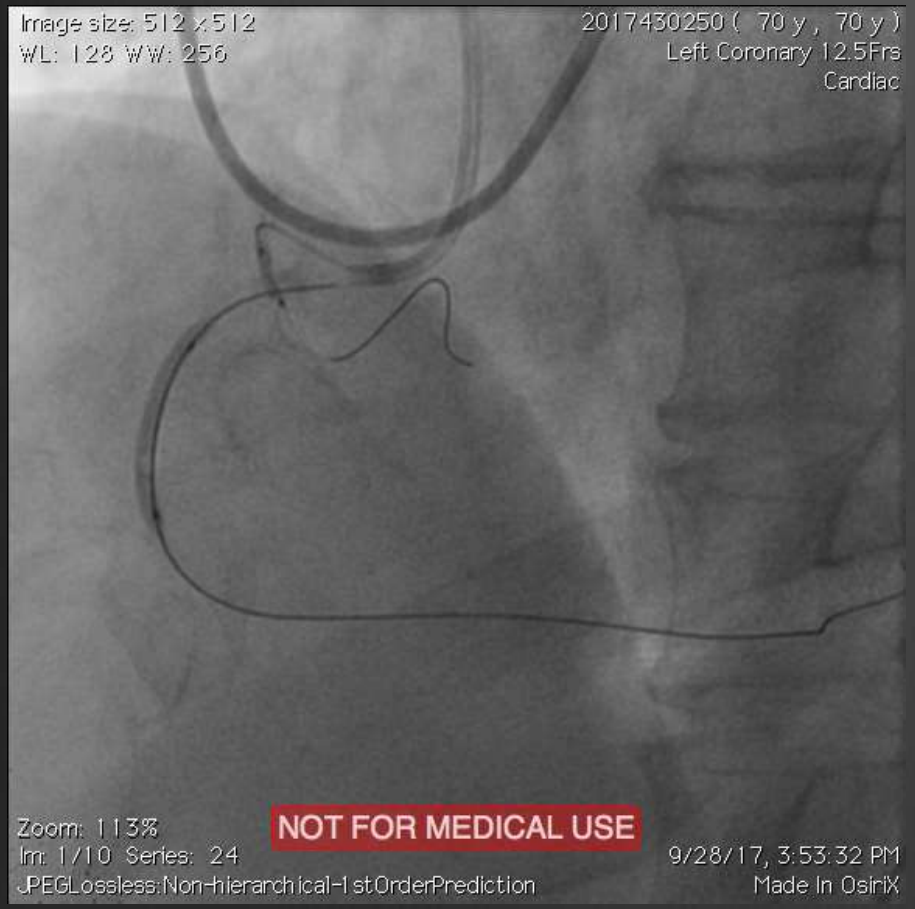
RCA CTO, From AL1 to JR

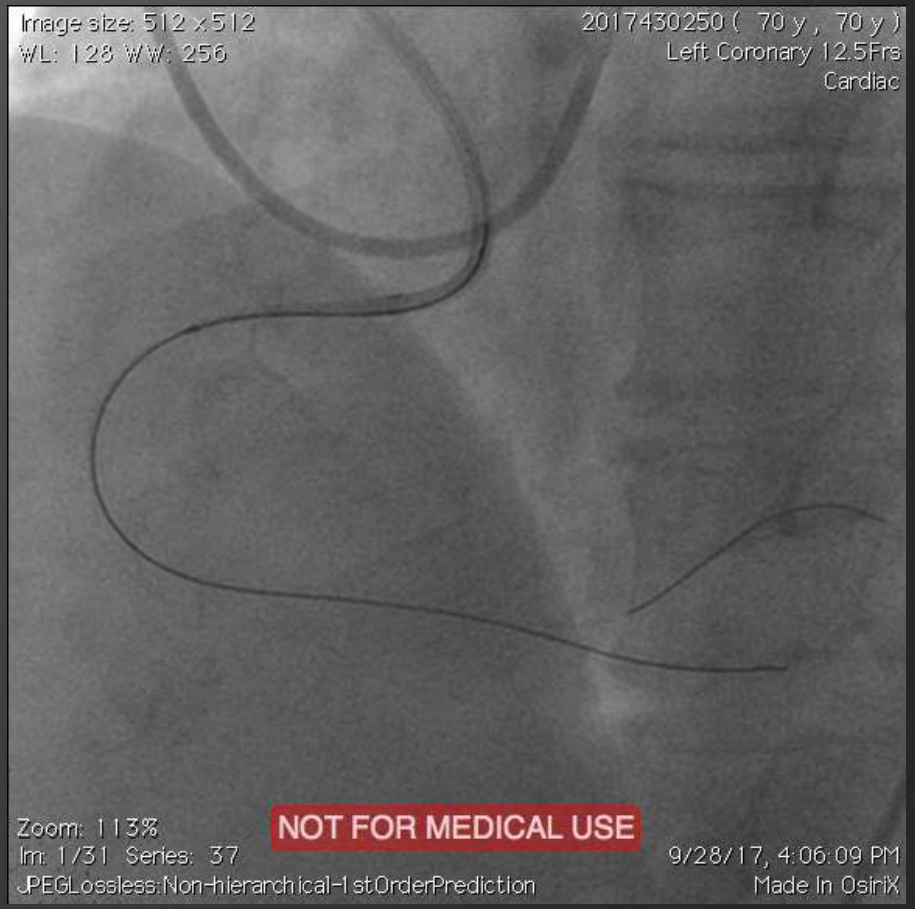


Balloon-anchor



Predilate and stenting





Final


Image size: 512 x 512
WL: 128 WW: 256
2017430250 (70 y , 70 y)
Left Coronary 12.5Frs
Cardiac
Zoom: 113%
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JPEGLossless:Non-hierarchical-1stOrderPrediction
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2017430250 (70 y , 70 y)
Left Coronary 12.5Frs
Cardiac
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Prevalence

Coronary Chronic Total Occlusions

Siddharth M. Patel, BS; Nagendra R. Pokala, BS; Rohan V. Menon, BS; Anna P. Kotsia, MD; Vijay Raja, MD; George Christopoulos, MD; Tesfaldet T. Michael, MD, MPH; Bavana V. Rangan, BDS, MPH; Daniel Sherbet, MD; Vishal G. Patel, MD; Shuaib A. Abdullah, MD; Jeffrey Hastings, MD; Jerrold M. Grodin, MD; Subhash Banerjee, MD; Emmanouil S. Brilakis, MD, PhD

ABSTRACT: Background. The frequency and outcomes of "balloon-uncrossable" coronary chronic total occlusions [CTOs] have received limited study. **Methods.** We retrospectively examined 373 consecutive CTO percutaneous coronary interventions [PCIs] performed at our institution between 2005 and 2013 to determine the frequency and treatment of balloon-uncrossable CTOs. **Results.** Mean age was 63.7 ± 8.3 years and 98.9% of the patients were men. Twenty-four patients [6.4%, 95% confidence

From US CTO Registry

The most commonly used techniques for uncrossable CTO were:

1. Grenadoplasty (23%),
2. Laser (18%),
3. Rotational atherectomy (16%),
4. Others: Use of various micro-catheters and anchoring technique

Take home messages (1)

- Femoral access and long sheath is preferable for most CTO intervention
- Supportive shape guide (Amplatz) is much help for RCA CTO intervention
- Balloon-anchoring technique is cost-effective for initial attempt to increase catheter support

Take home messages (2)

- Grenedoplasty (BAM) and guiding extension catheter are the second line attempt if balloon-anchor failed
- Mastering antegrade approach for CTO intervention is an initial step to go further to hybrid approach

Thank You