

Best candidate for CTO-PCI based on angiography

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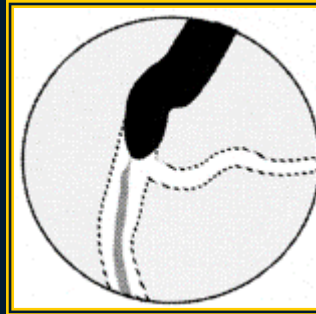


Patient Selection and Predictors of Success

Angiographic Lesion Morphology



Tapered Stump



Functional occlusion



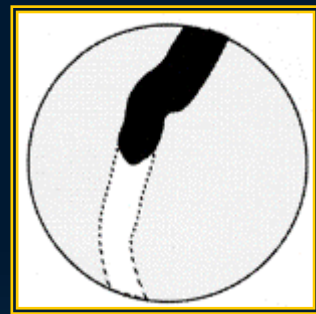
Stump absent



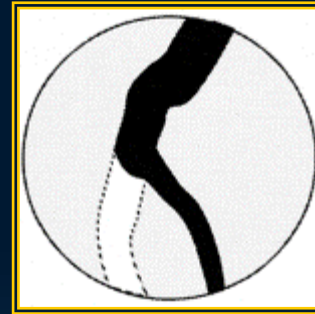
Total occlusion



Pre or Post-branch occlusion



Bridging collaterals absent



Occlusion at side-branch



Bridging collaterals present

Favor Procedural Success





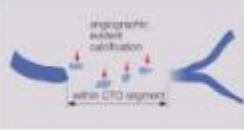

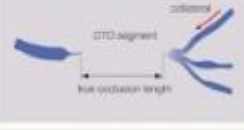
Does Not Favor Procedural Success

Complexity of CTO

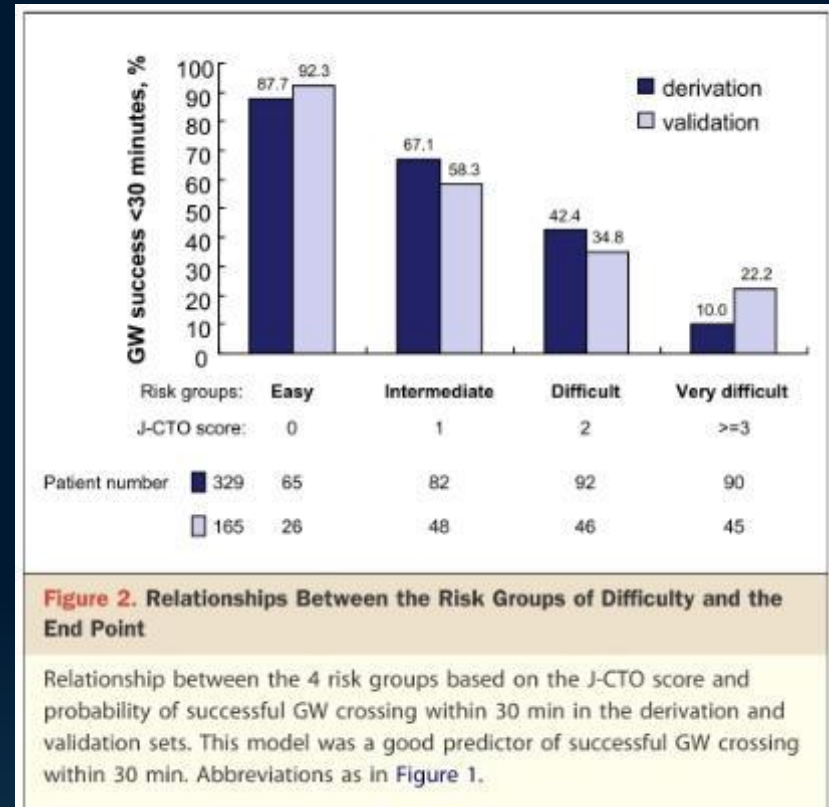
	Level of PCI complexity	
	Easy	Complex
Age of CTO	< 6 months	> 12 months
Occlusion length	< 20 mm	> 20 mm
Calcification at CTO	None/moderate	Severe
Occlusion Stump	tapered	Blunt or absent
Tortuosity at CTO	None/minimal	Moderate/severe
Visibility of the distal vessel	Good/excellent	Poor
Tortuosity proximal to CTO	Minimal/moderate	Severe
Ostial location	Yes	No
CTO at proximal/mid LCX	No	Yes
Expected guiding catheter support	Good	Poor
Renal insufficiency	Yes	No
Previous attempts	No	Yes
Expected patient tolerance	Good	Poor

Scoring systems

J-CTO score, 2011

Variables and definitions		
<p>Tapered</p> 	<p>Blunt</p> 	<p>Entry with any tapered tip or dimple indicating direction of true lumen is categorized as "tapered".</p>
		<p>Entry shape</p> <input type="checkbox"/> Tapered (0) <input type="checkbox"/> Blunt (1)
		point
<p>Calcification</p> 	<p>Regardless of severity, 1 point is assigned if any evident calcification is detected within the CTO segment.</p>	<p>Calcification</p> <input type="checkbox"/> Absence (0) <input type="checkbox"/> Presence (1)
		point
<p>Bending >45degrees</p> 	<p>One point is assigned if bending > 45 degrees is detected within the CTO segment. Any tortuosity separated from the CTO segment is excluded from this assessment.</p>	<p>Bending >45°</p> <input type="checkbox"/> Absence (0) <input type="checkbox"/> Presence (1)
		point
<p>Occlusion length</p> 	<p>Using good collateral images, try to measure "true" distance of occlusion, which tends to be shorter than the first impression.</p>	<p>Occl.Length</p> <input type="checkbox"/> <20mm (0) <input type="checkbox"/> ≥20mm (1)
		point
<p>Re-try lesion</p> <p>Is this Re-try (2nd attempt) lesion? (previously attempted but failed)</p>		<p>Re-try lesion</p> <input type="checkbox"/> No (0) <input type="checkbox"/> Yes (1)
		point
<p>Category of difficulty (total point)</p> <input type="checkbox"/> easy (0) <input type="checkbox"/> Intermediate (1) <input type="checkbox"/> difficult (2) <input type="checkbox"/> very difficult (≥3)		<p>Total</p> <p>points</p>

Predefined parameter
 “successful GW crossing within 30 minutes”



Multicenter (12) CTO registry of Japan, 2006.4 – 2007.11, n=465

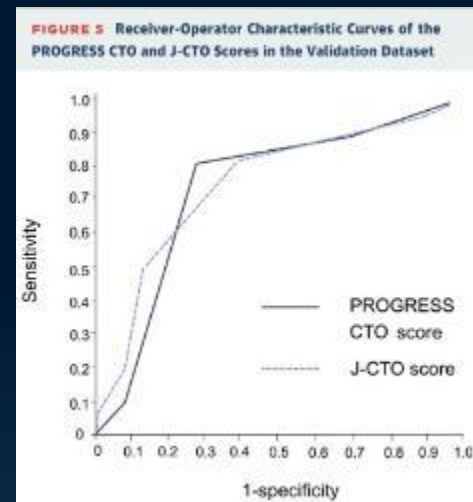
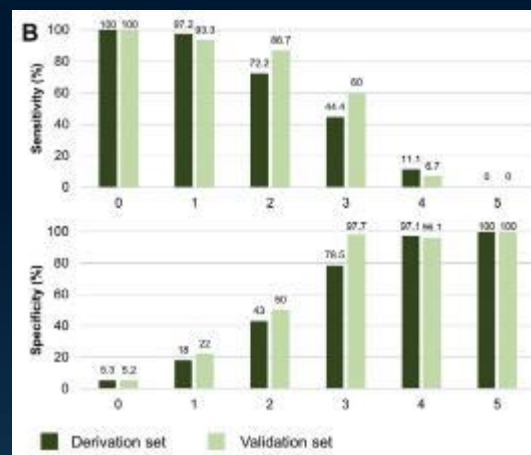
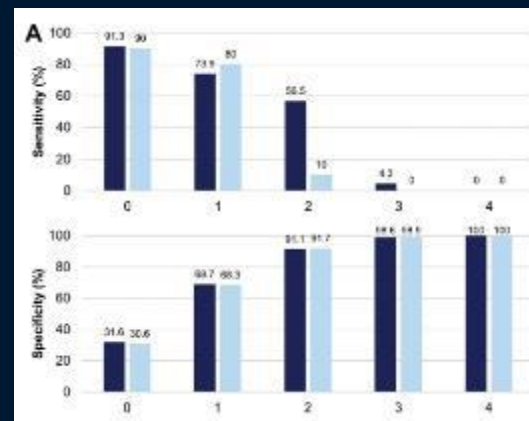
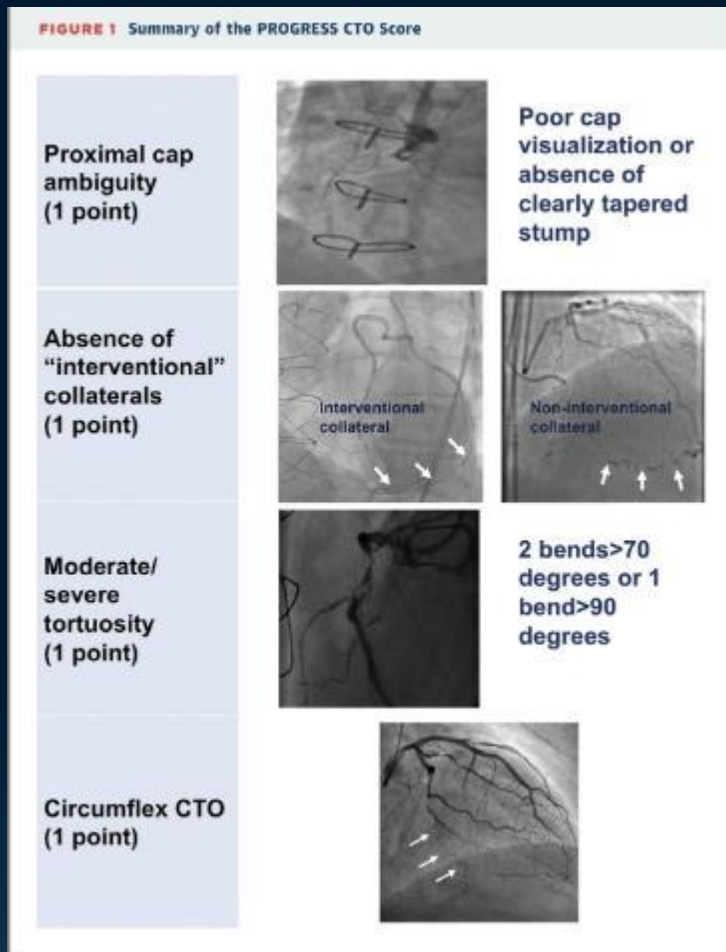
Scoring systems

Progress CTO score

Procedures performed with hybrid approach

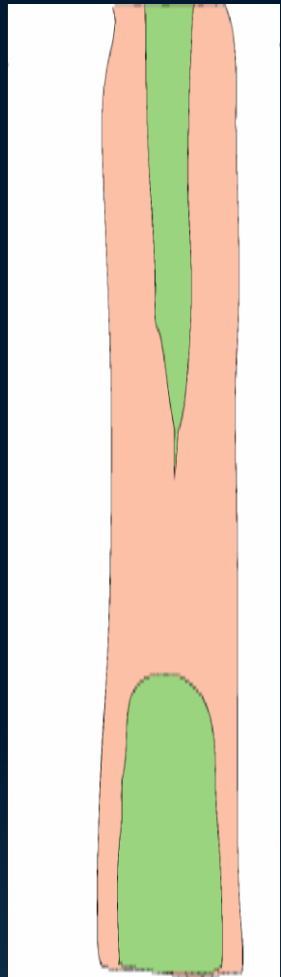
Predefined parameter

“Technical success”, RS <30%, TIMI 3

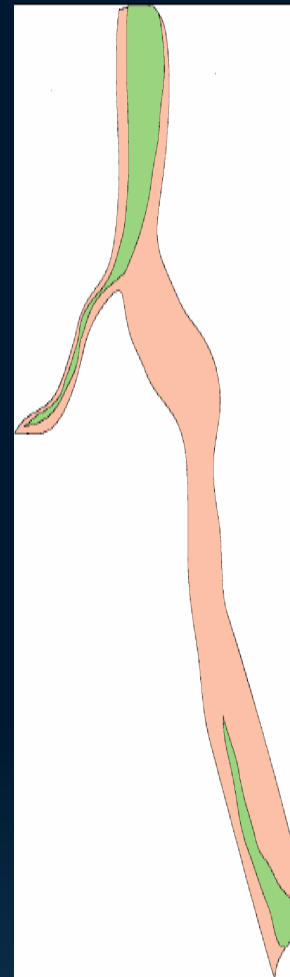


7 US center, 2012.1 – 2015.12, n=781

Easy vs. Hard CTO



- Straight vessel
- Stump present
- Visible microchannel
- Short lesion
- Tapered type
- None/mild Calcified lesion
- No or post side branch occlusion
- No bridging collaterals
- No circumflex CTO
- Good distal vessel
- Good interventional collateral
- Good side branch vessel for IVUS guided puncture
- Good expected guiding catheter support



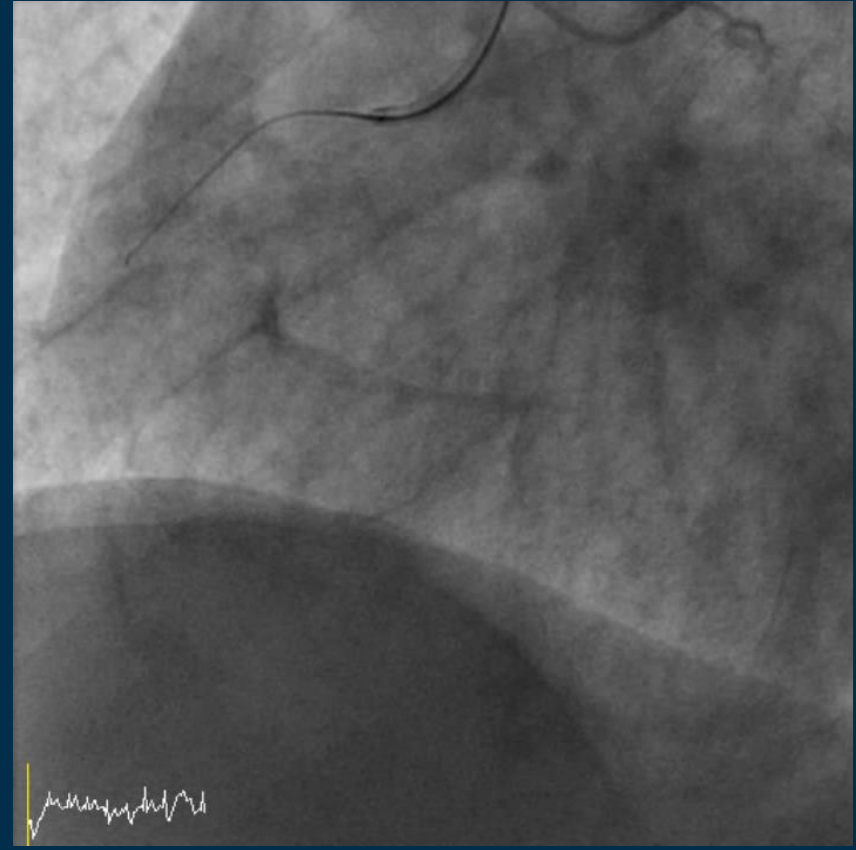
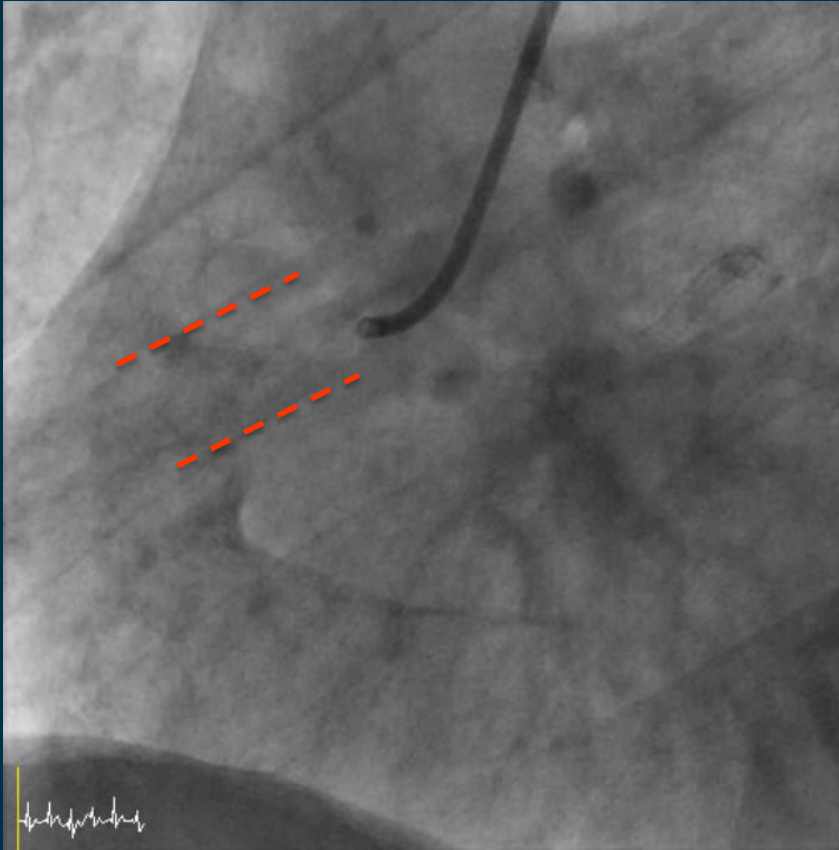
- Tortuous vessel
- No stump
- Non-visible microchannel
- Long lesion
- Abrupt type
- Moderate to severe Calcified lesion
- Pre side branch occlusion
- Occlusion at side branch
- Bridging collaterals
- Poor distal vessel
- Poor interventional collateral
- Poor side branch vessel for IVUS guided puncture
- Poor expected guiding catheter support

No clinical predictors !!!

Best candidate for CTO-PCI

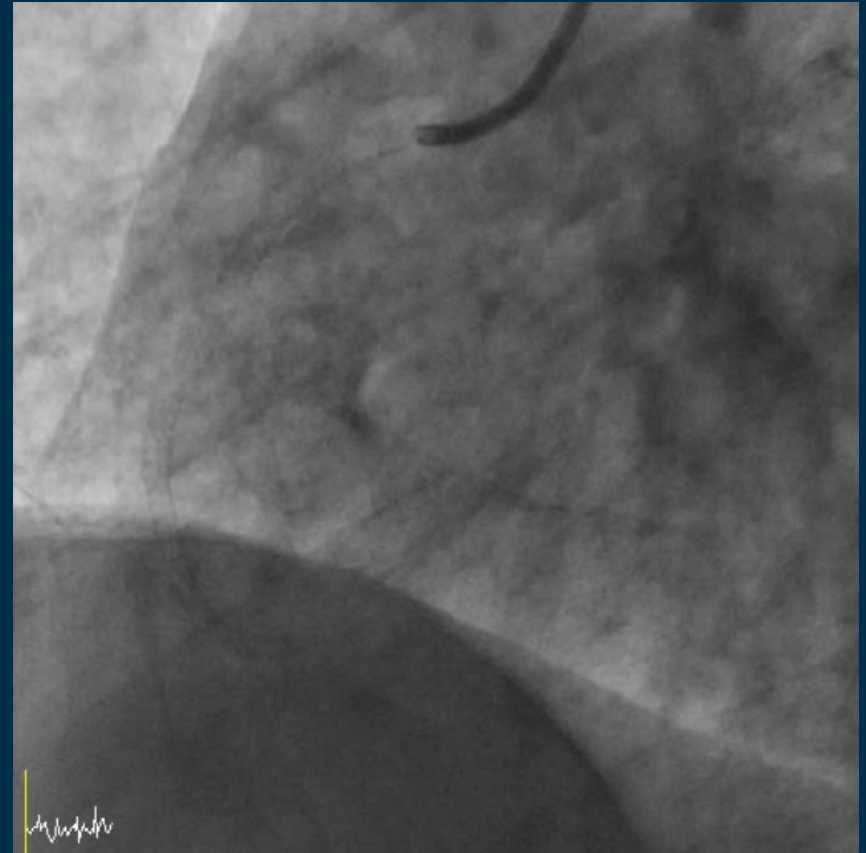
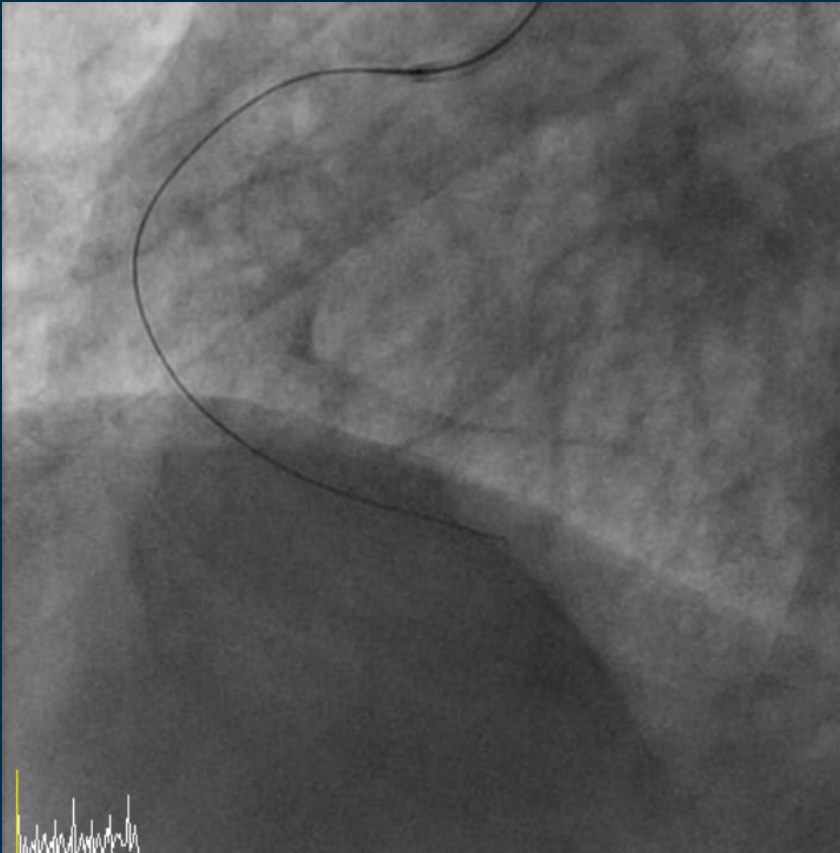


Case - Straight



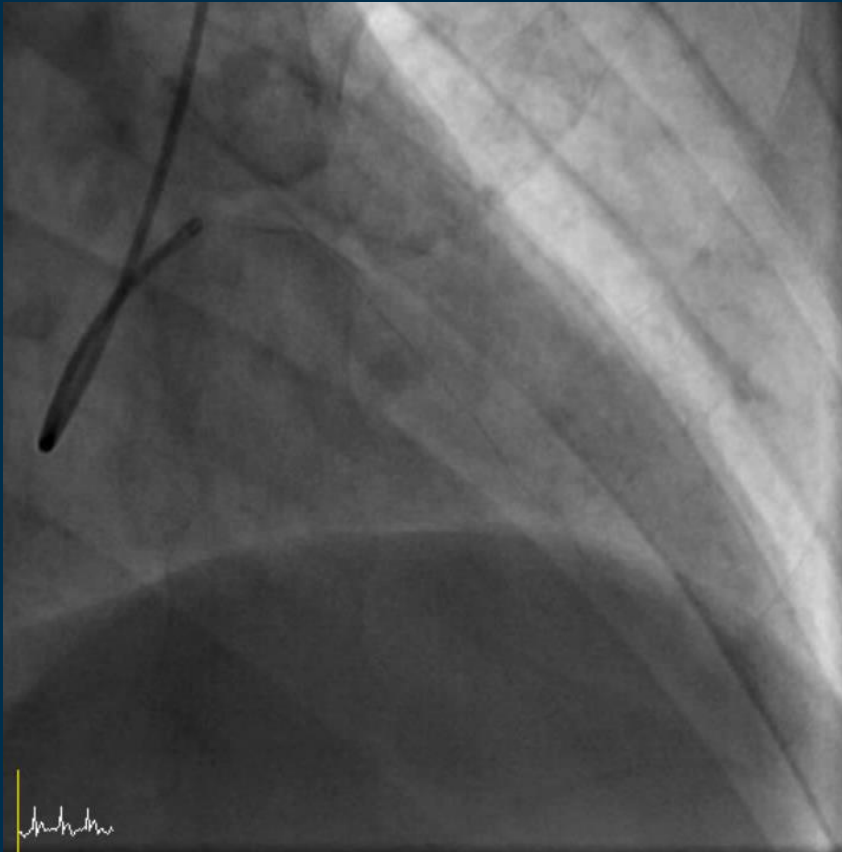
Bridging collateral but, straight vessel without pRCA curvature

Case - Straight



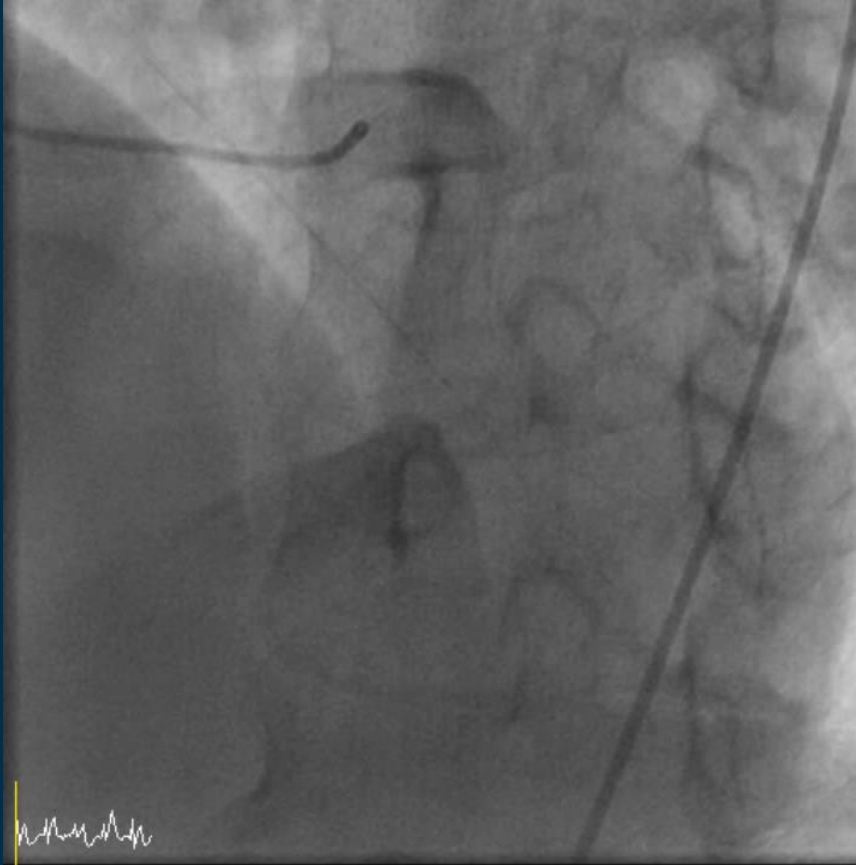
Gaia 2 wire passed with penetration technique

Case – post-SB occlusion



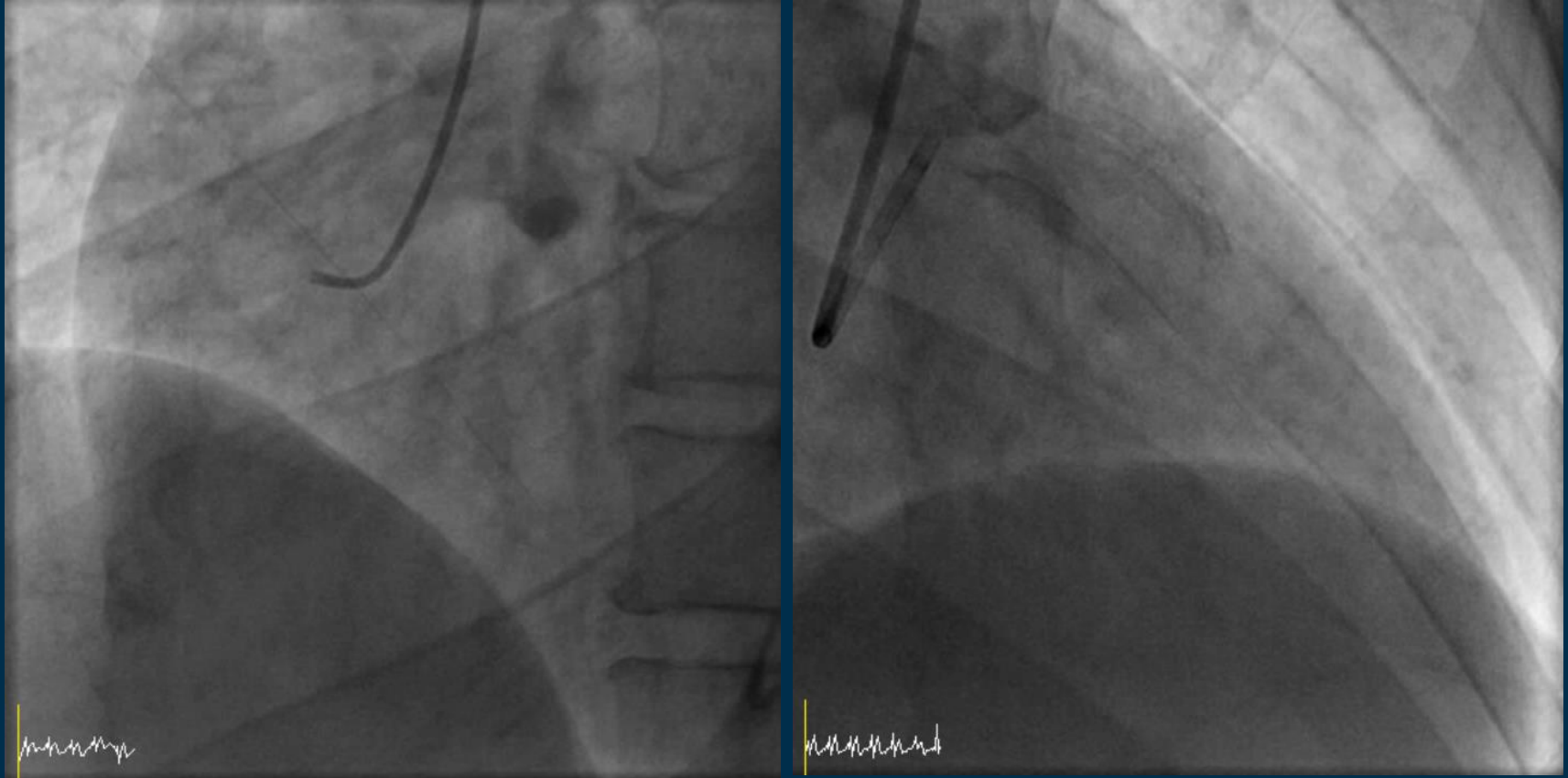
mLAD total occlusion with post-SB (Diagonal)

Case – post-SB occlusion



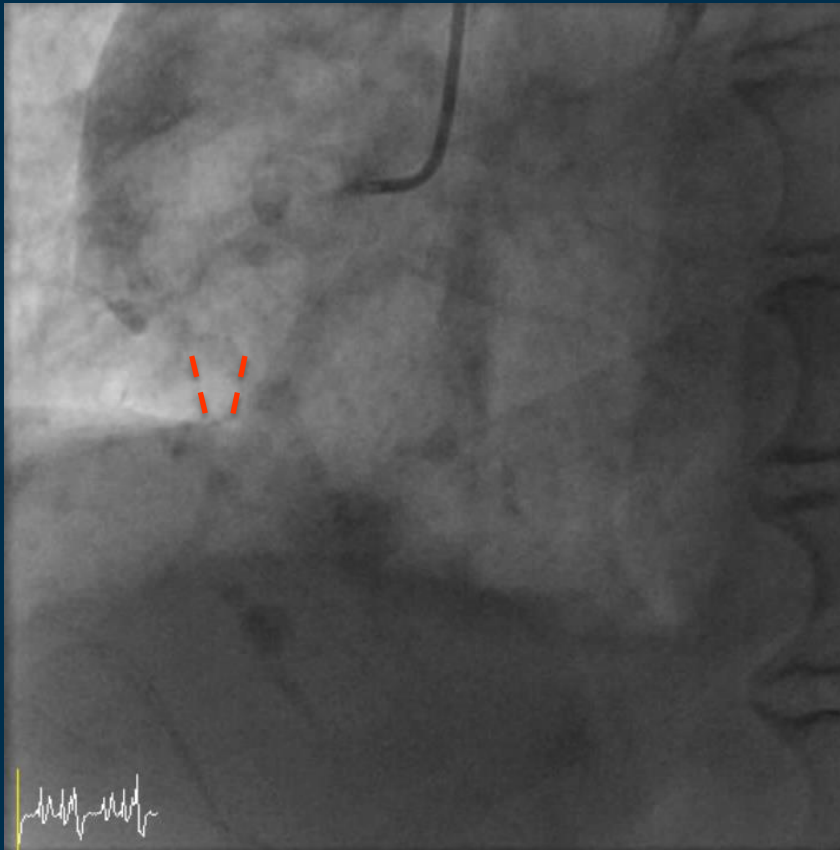
post-SB occlusion with tapered type proximal cap

Case – post-SB occlusion



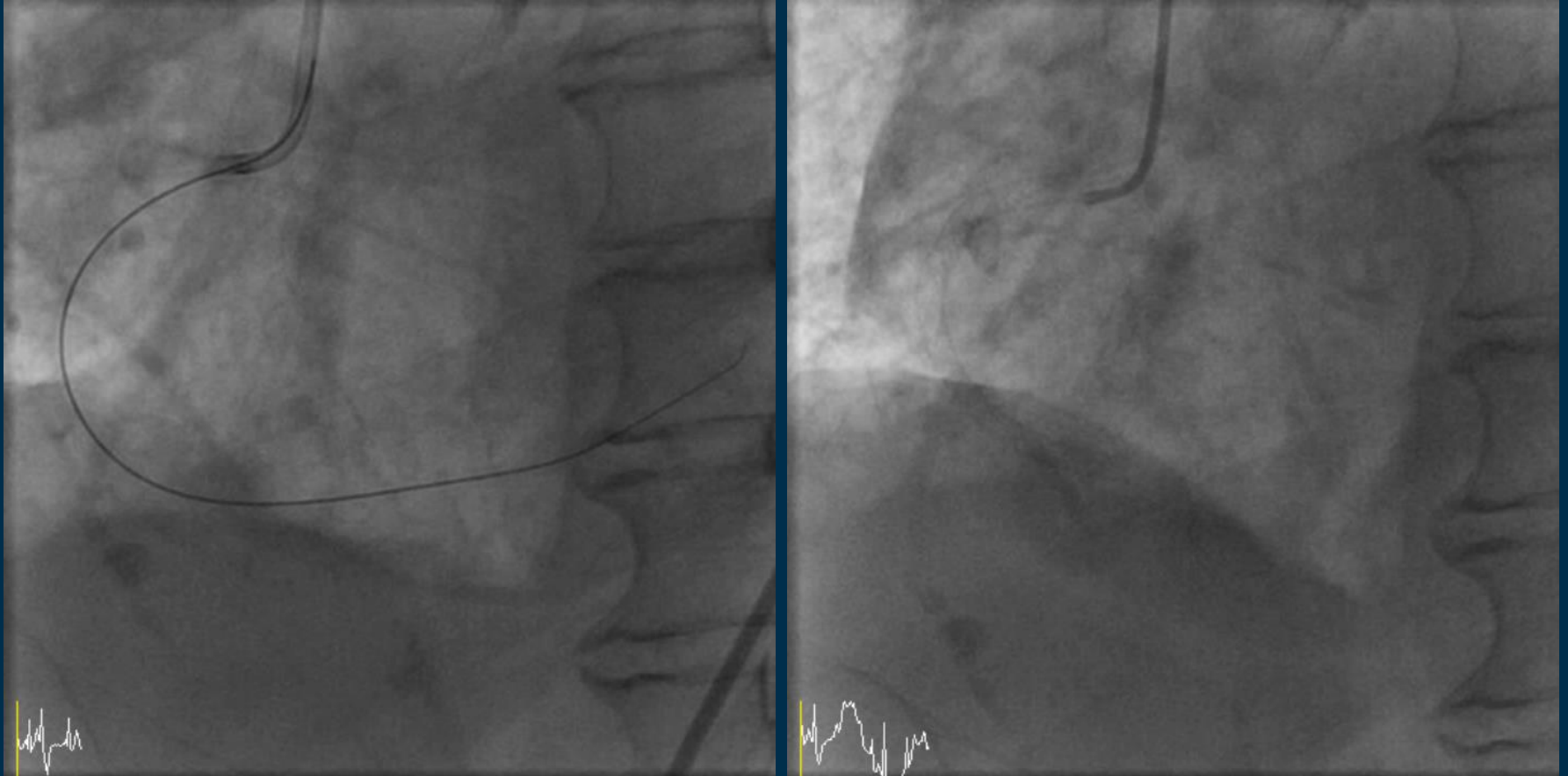
Fielder XT-A wire passed with collateral flow guided through radial JR diagnostic catheter

Case – Tapered stump



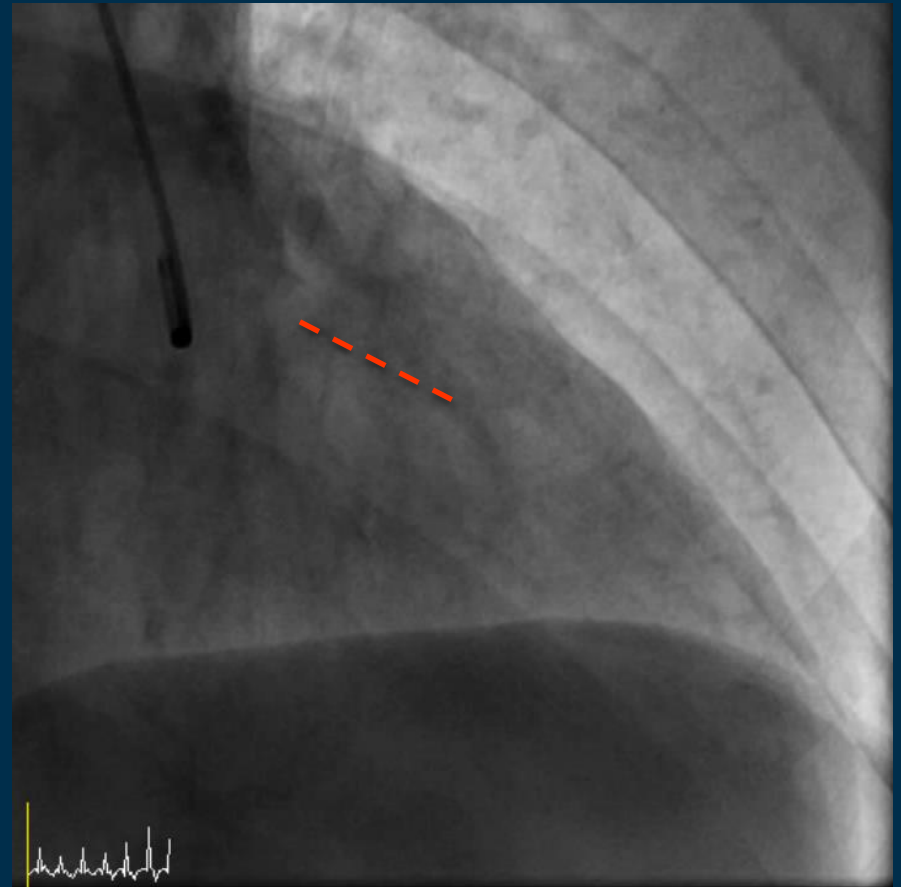
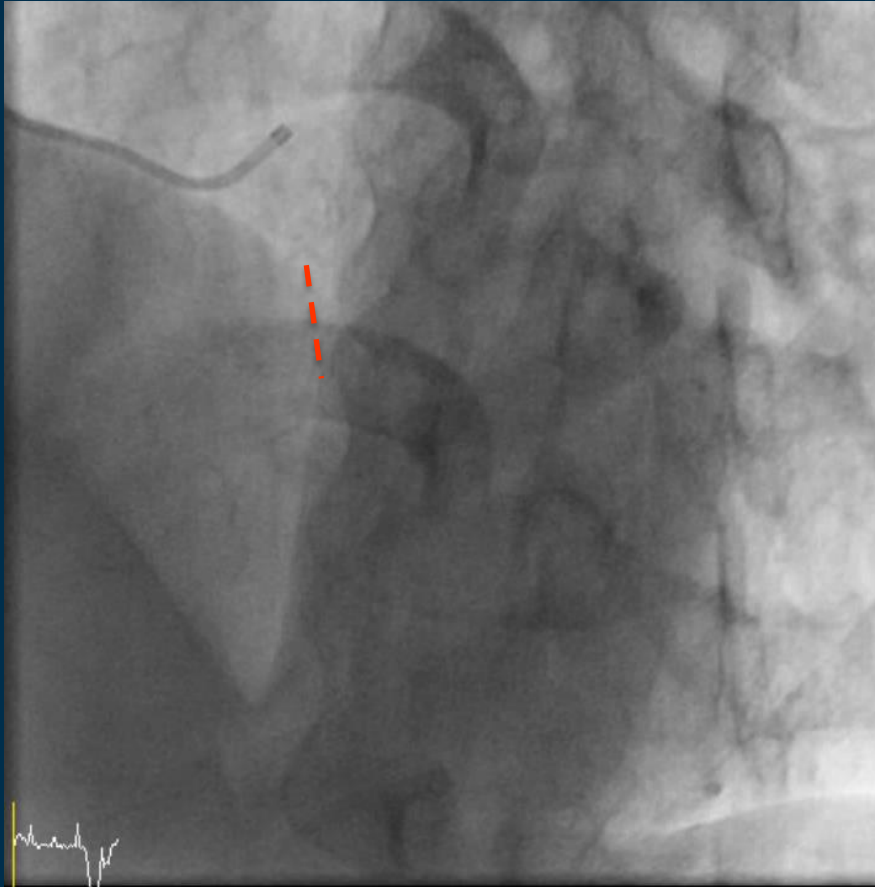
**mRCA occlusion with tapered stump and delayed image
coronary angiogram suggested micro-channel**

Case – Tapered stump



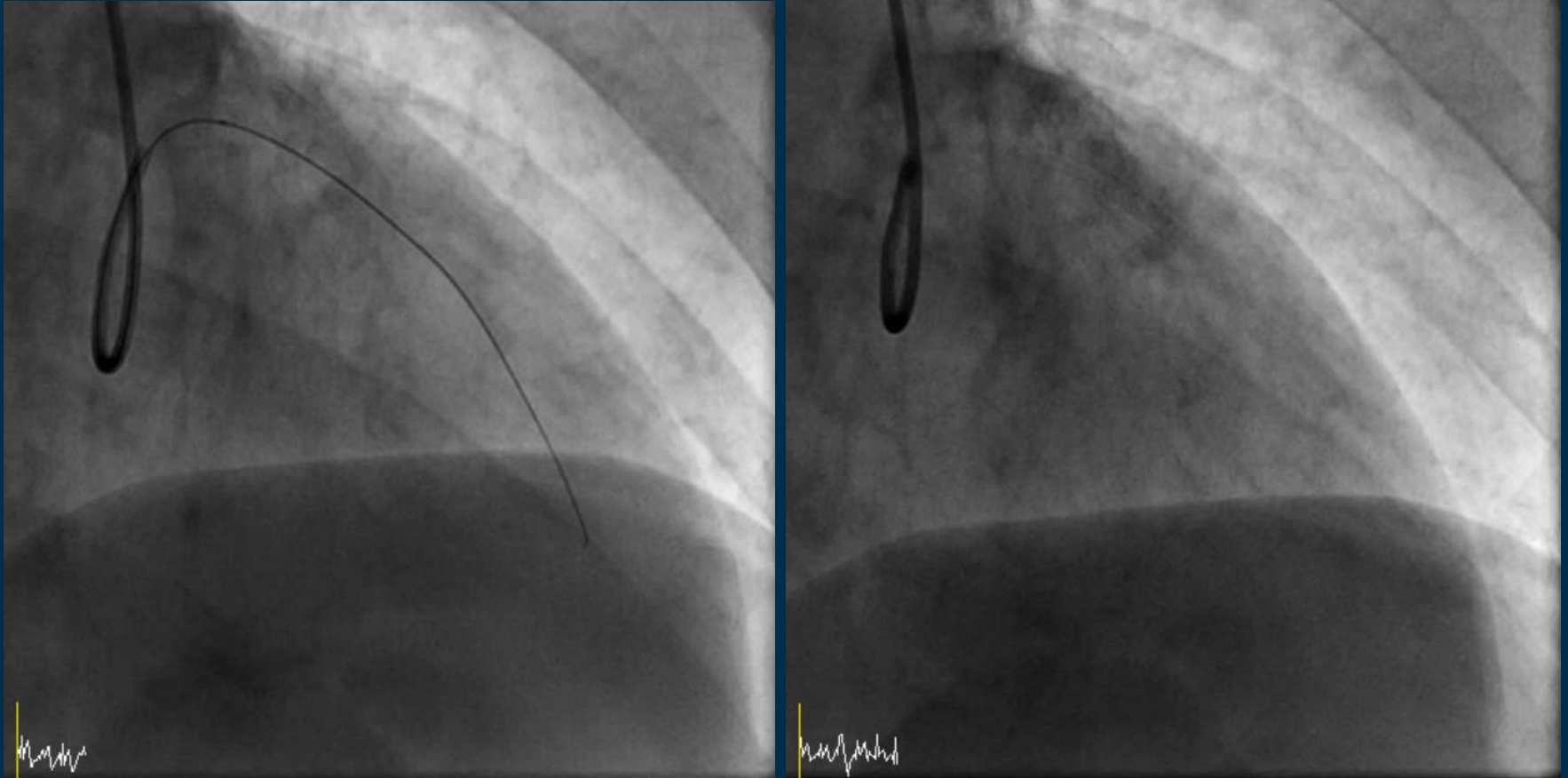
Fielder XT wire passed with sliding technique

Case – Microchannel



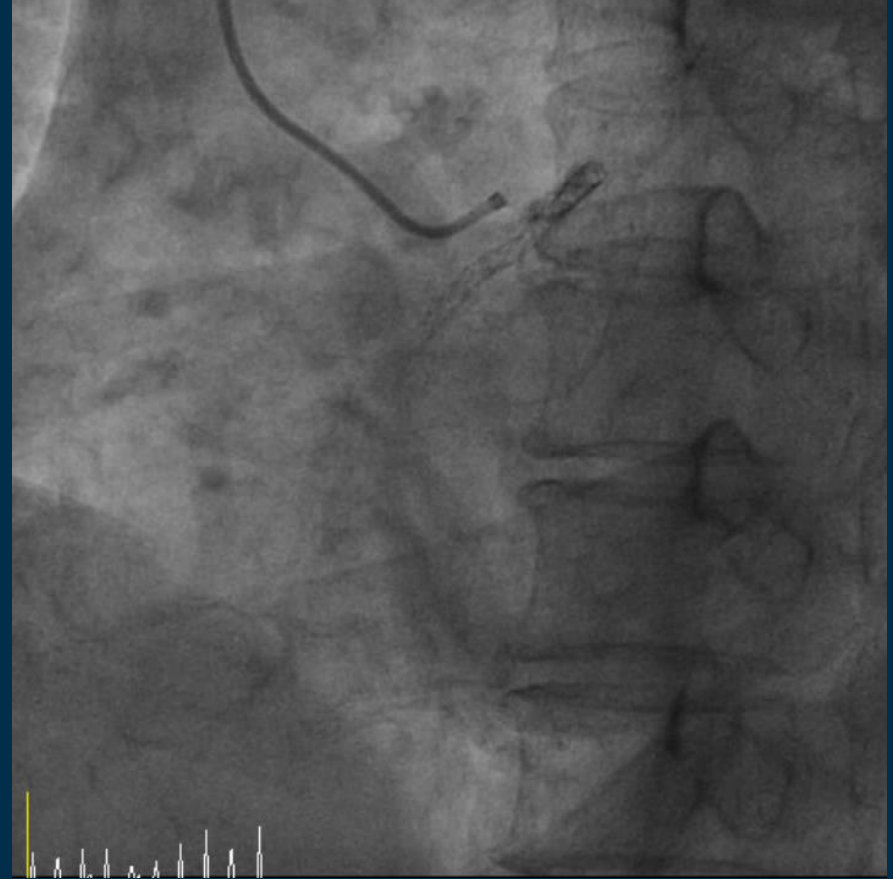
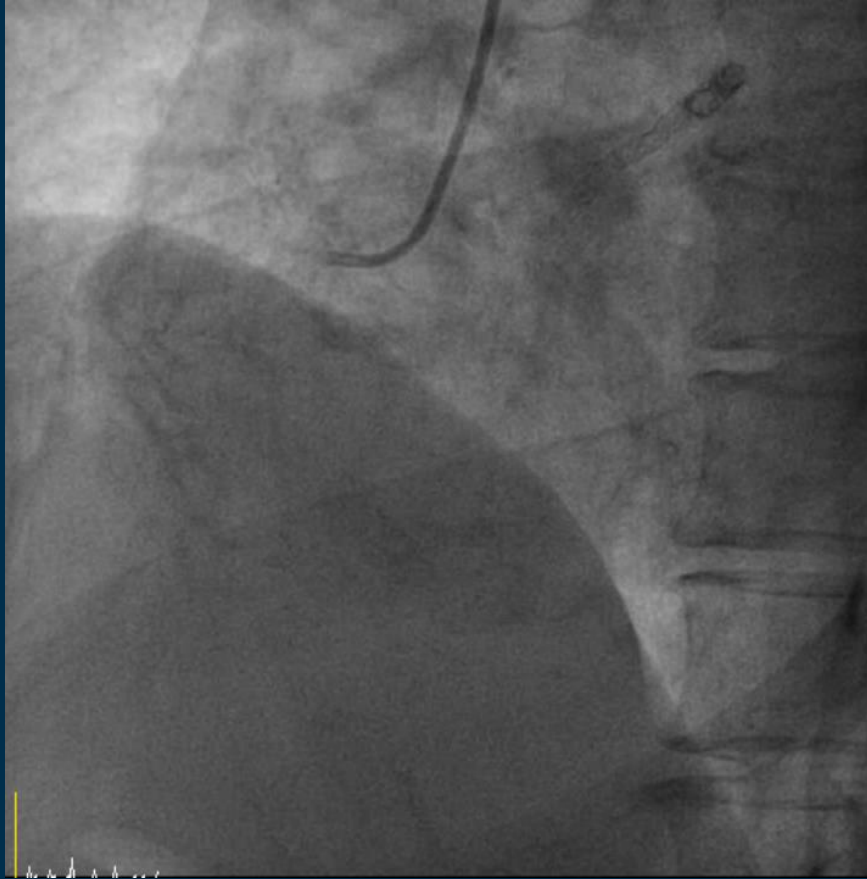
Visible microchannel on angiography

Case – Microchannel



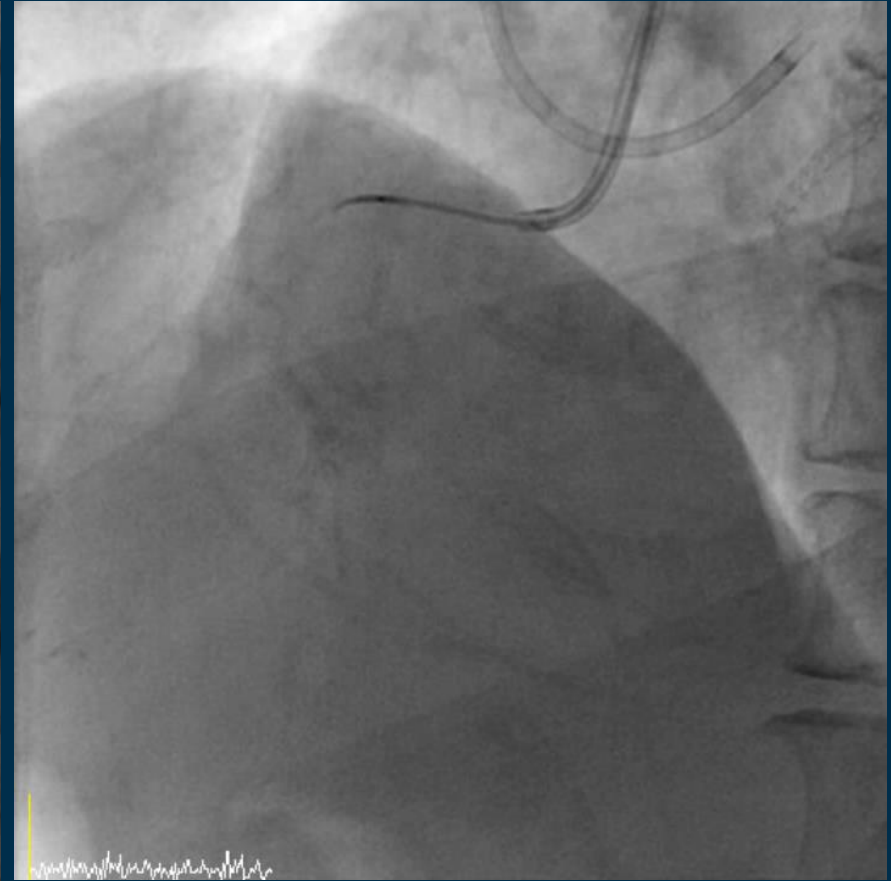
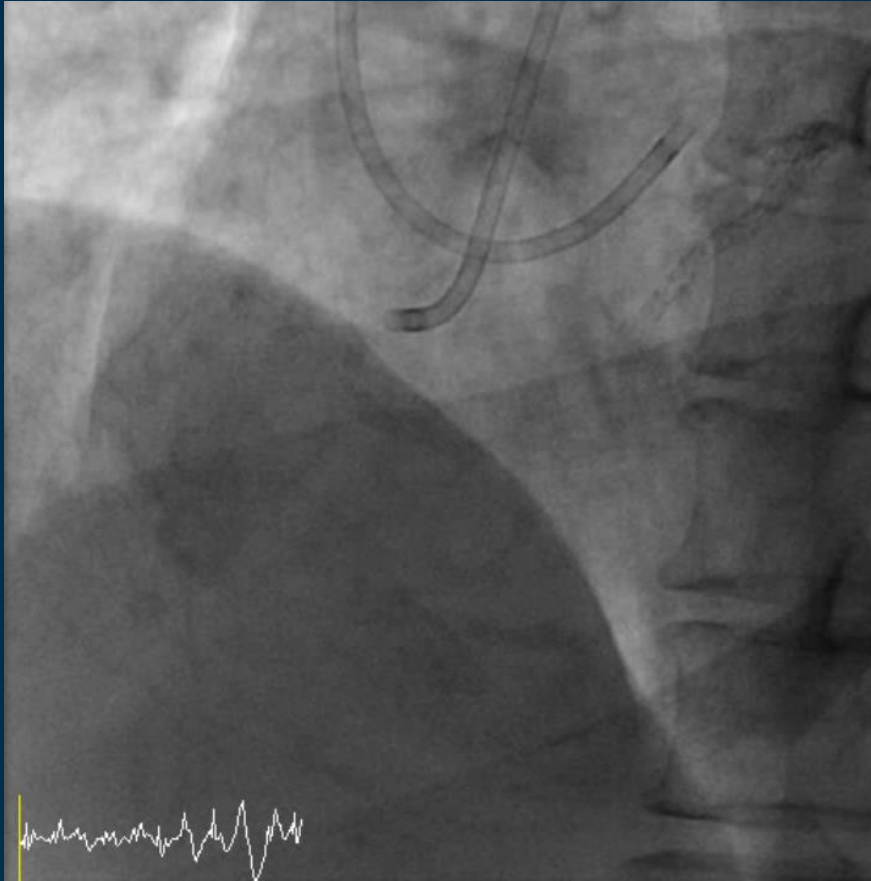
**Fielder XT wire passed with 1.25mm OTW
balloon supporting**

Case – Very short lesion with microchannel



pRCA CTO lesion without stump and epicardial collateral channel from LAD, no visible microchannel in conventional angiogram, lesion length was approximately 20mm.

Case – Very short lesion with microchannel



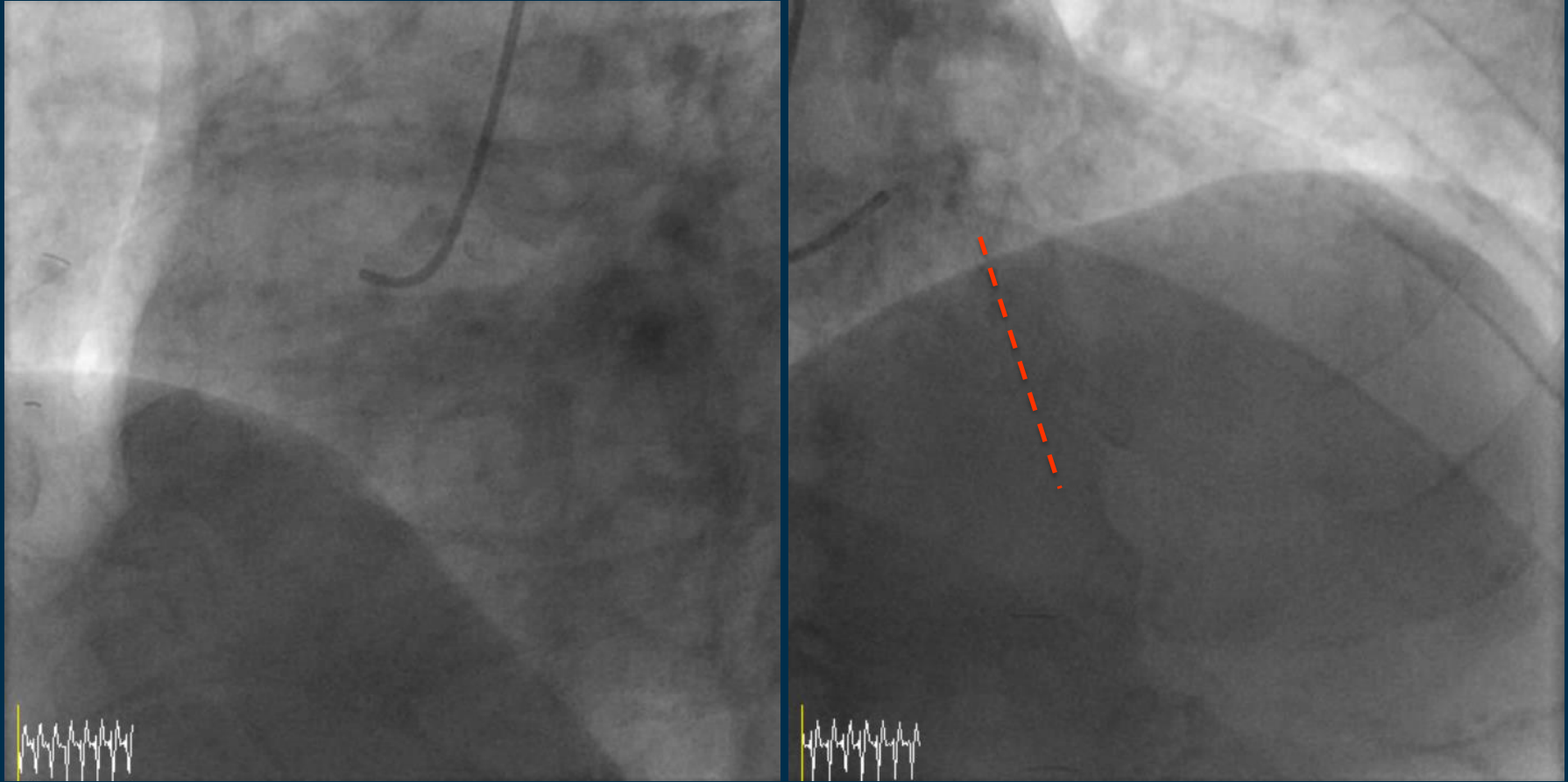
Bilateral angiography revealed that RCA CTO lesion length was very short, And tip injection suggested microchannel and CTO lesion looks like thrombotic.

Case – Very short lesion with microchannel



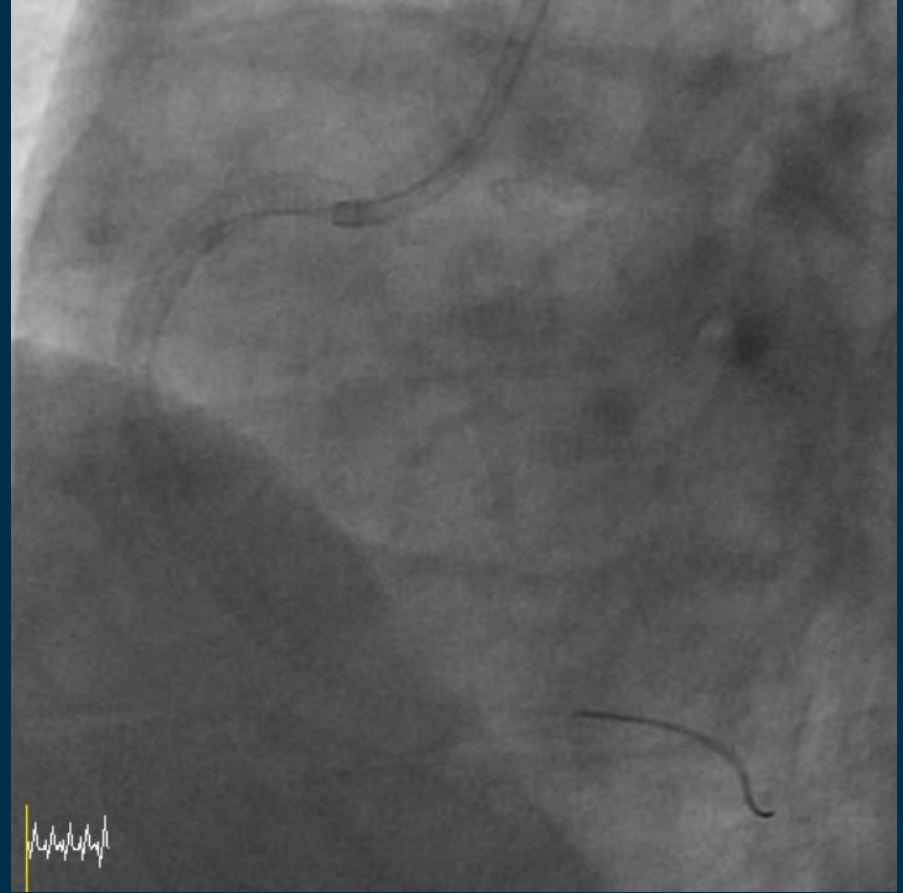
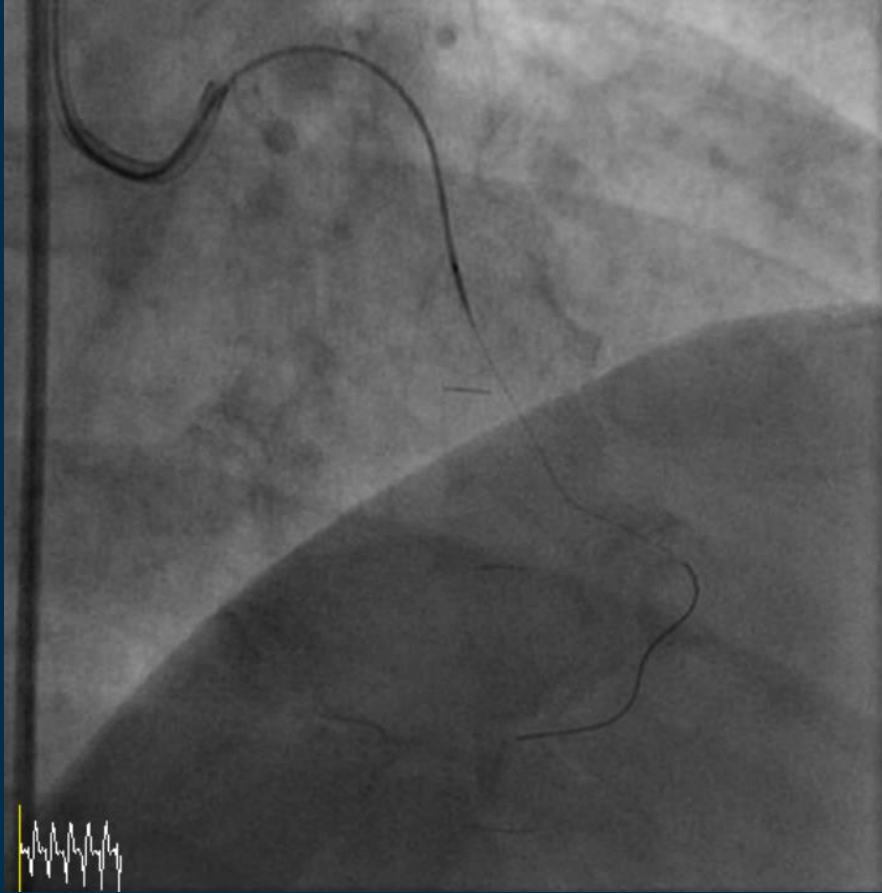
XT-R failed, but Gaia 1 wire passed CTO lesion. And Integrity 3.0x18mm stent implantation.

Case – Good collateral



pRCA total occlusion with blunted stump, but good interventional collateral channel (septal)

Case – Good collateral



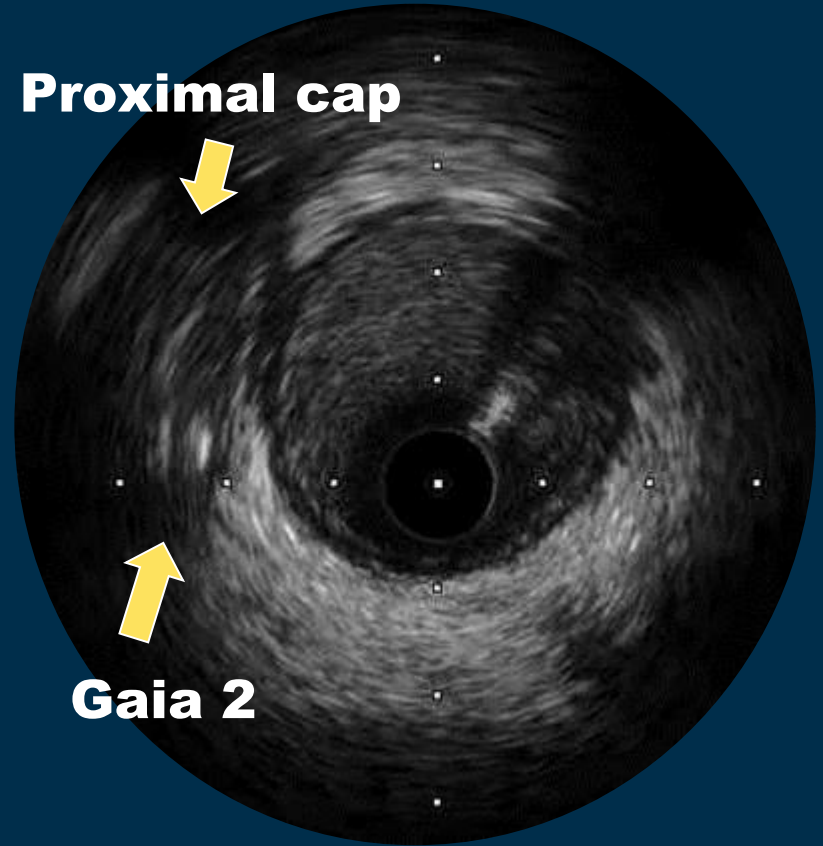
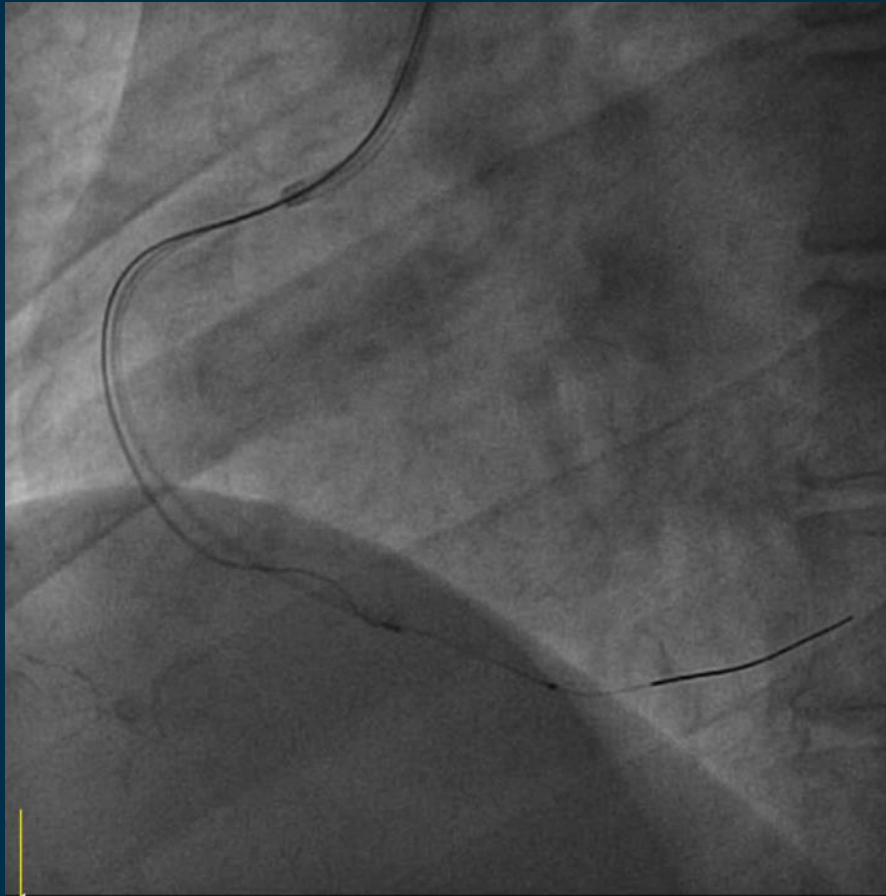
Successful retrograde approach with corsair and Sion wire was done

Case – Good SB position for IVUS



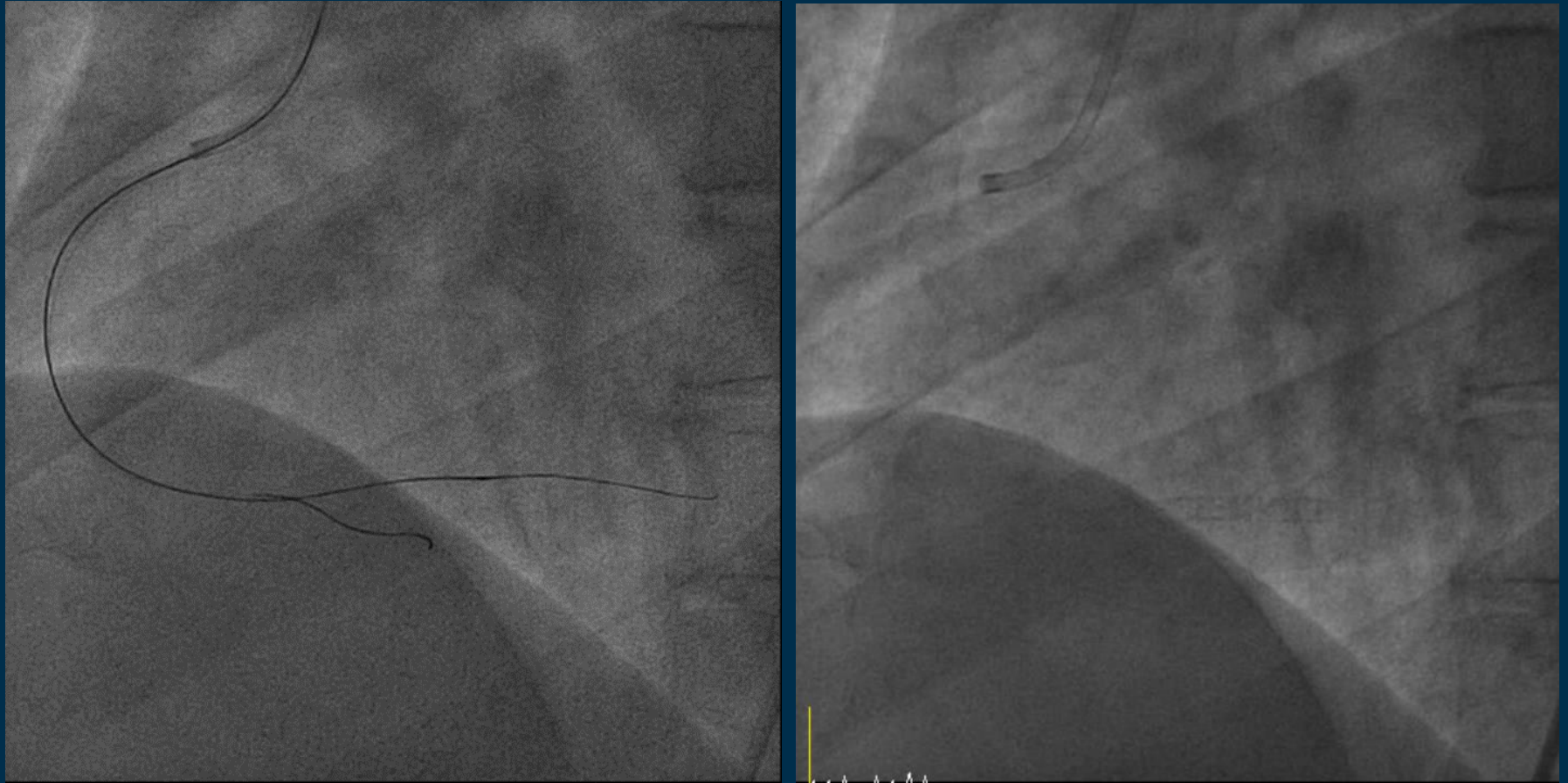
Stumpless PL total occlusion, but Good PDA position with narrow angle for IVUS guided proximal cap puncture

Case – Good SB position for IVUS



Real-time IVUS guided proximal cap puncture with Gaia 2

Case – Good SB position for IVUS

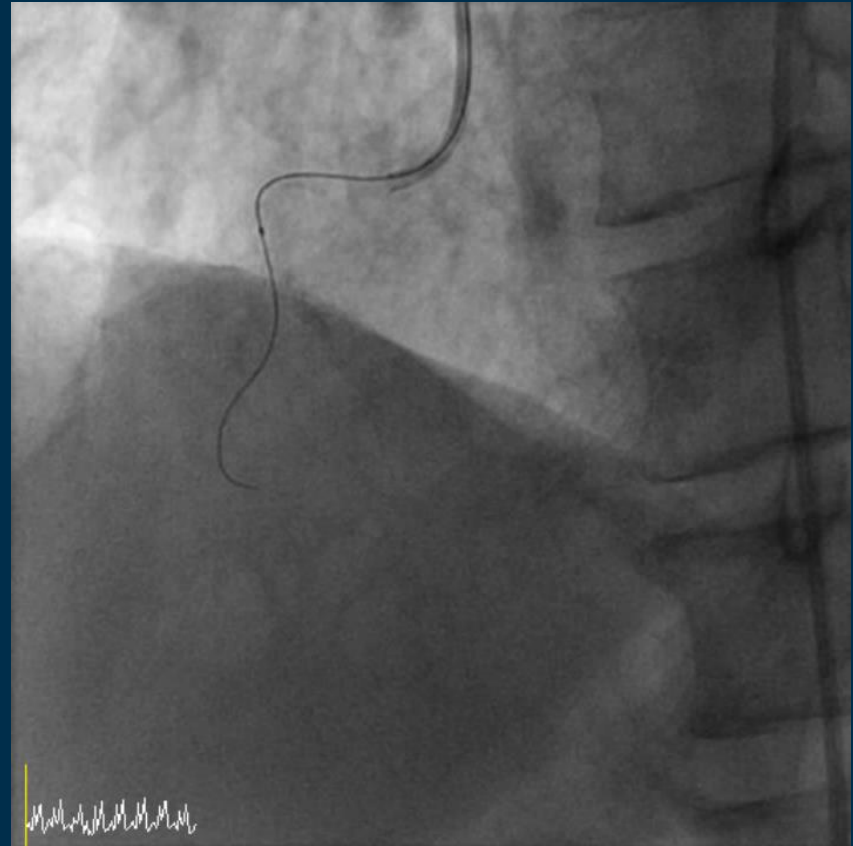
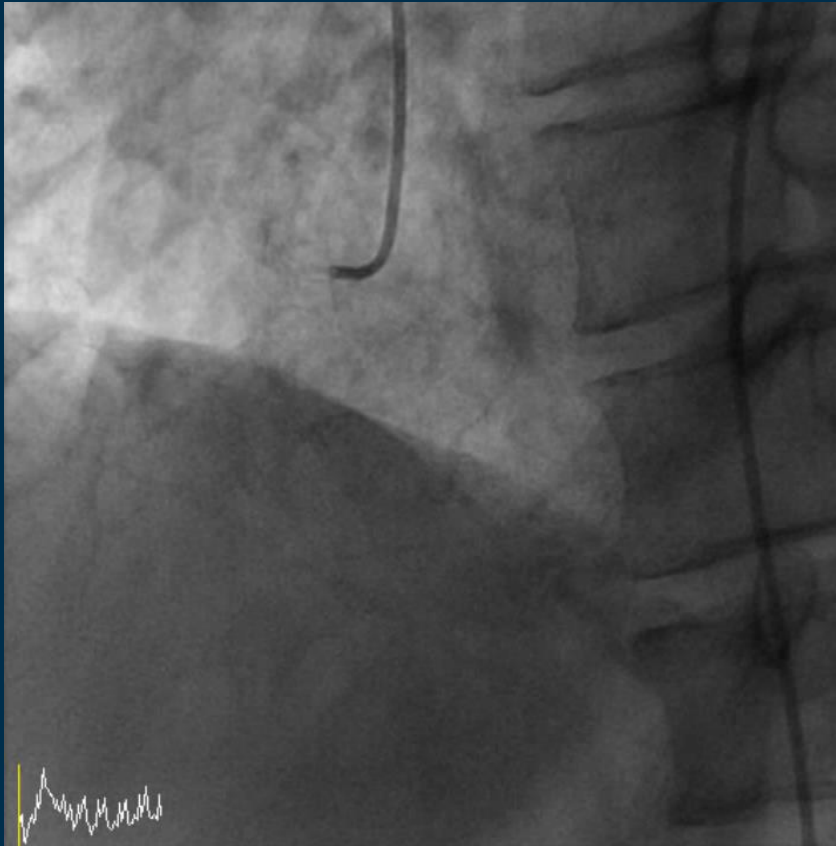


Successful CTO-PCI result using IVUS without dissection and hematoma

Worst candidate for CTO-PCI

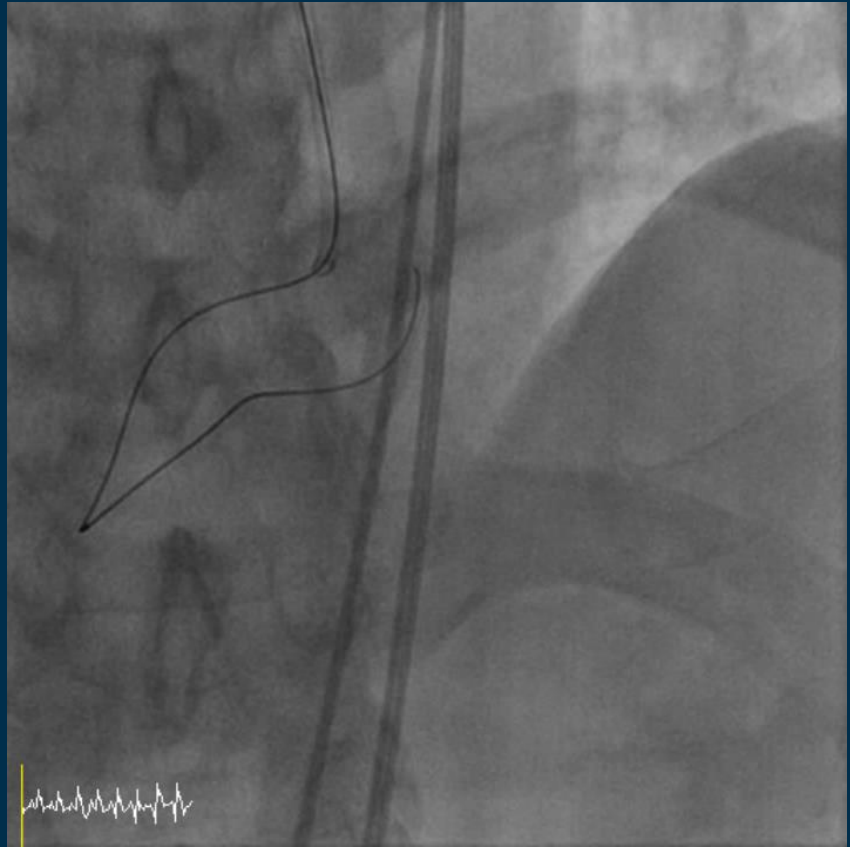


Case – Occlusion at SB



Stumpless total occlusion at SB has a high chance of the wire going to the subintimal space even though the lesion length was short.

Case – Long lesion



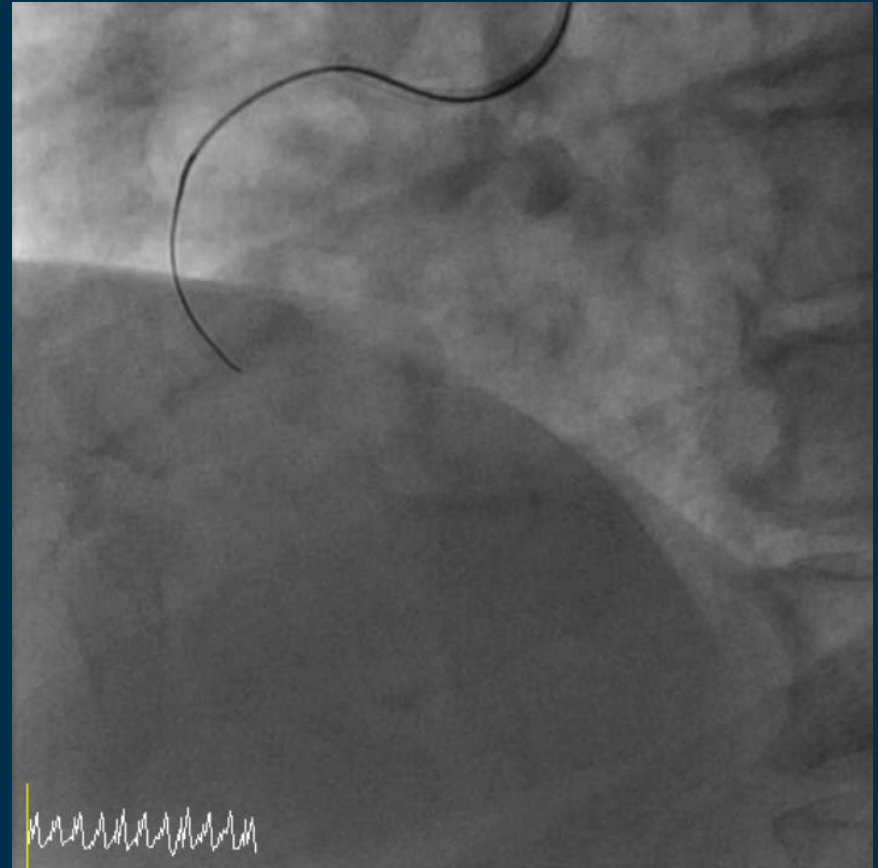
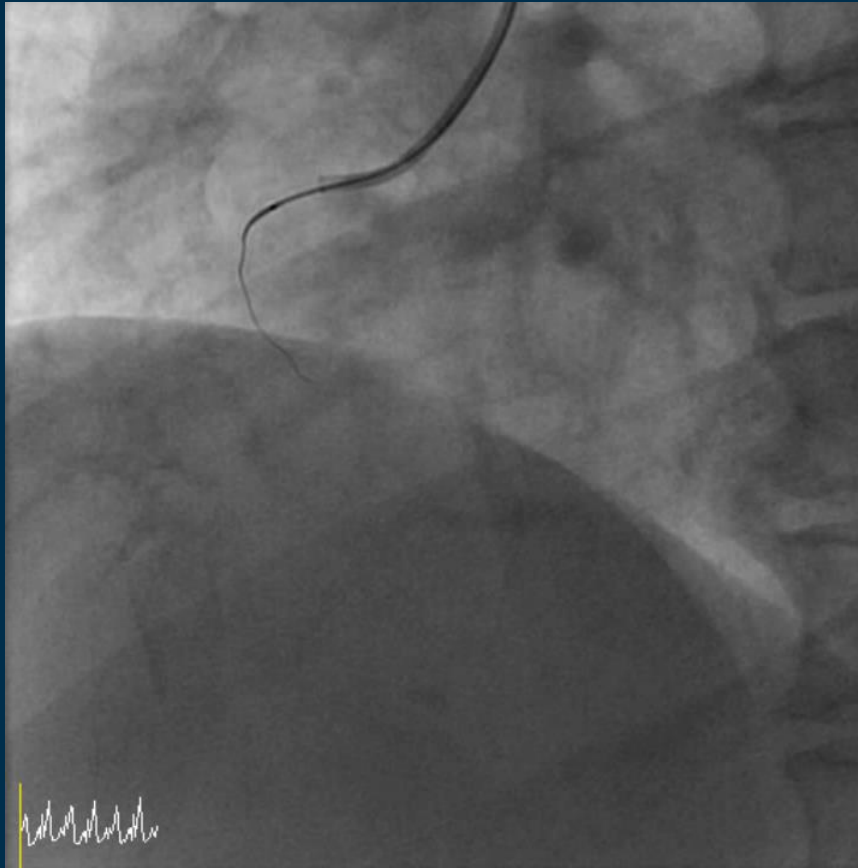
If the CTO length was long, there was a high chance of wiring to subintimal space unlike angiography.

Case – Bridging and Poor interventional collateral



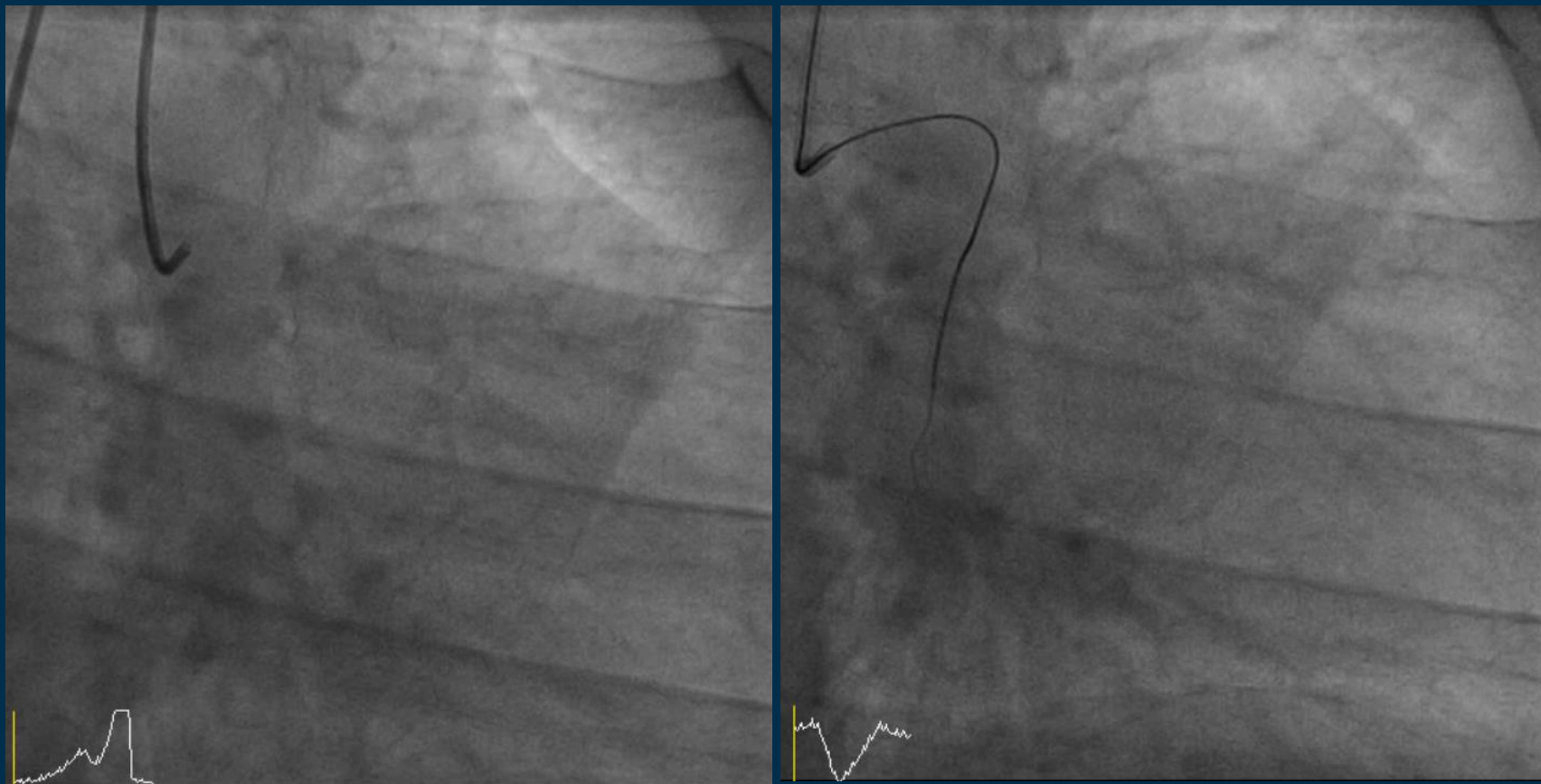
Bringing collateral and poor interventional collateral (tortuous epicardial channel from LCX)

Case – Bridging and Poor interventional collateral



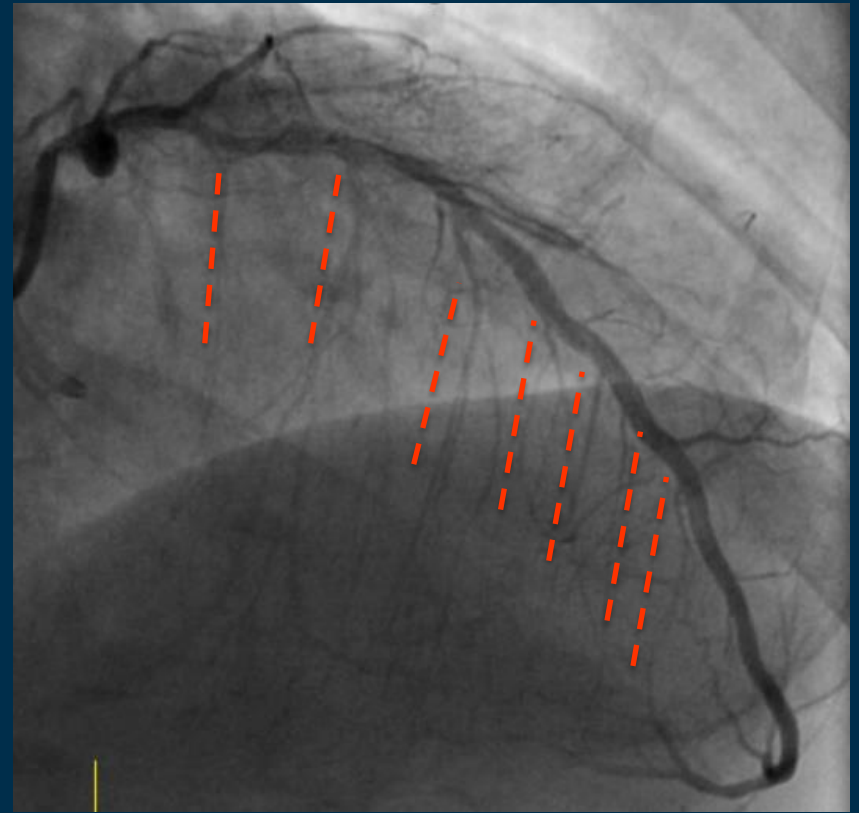
Because the lesion length was short and there are no interventional collateral, antegrade approach CTO-PCI tried with Fielder XT-R and Gaia 3, but failed.

Case – Circumflex CTO



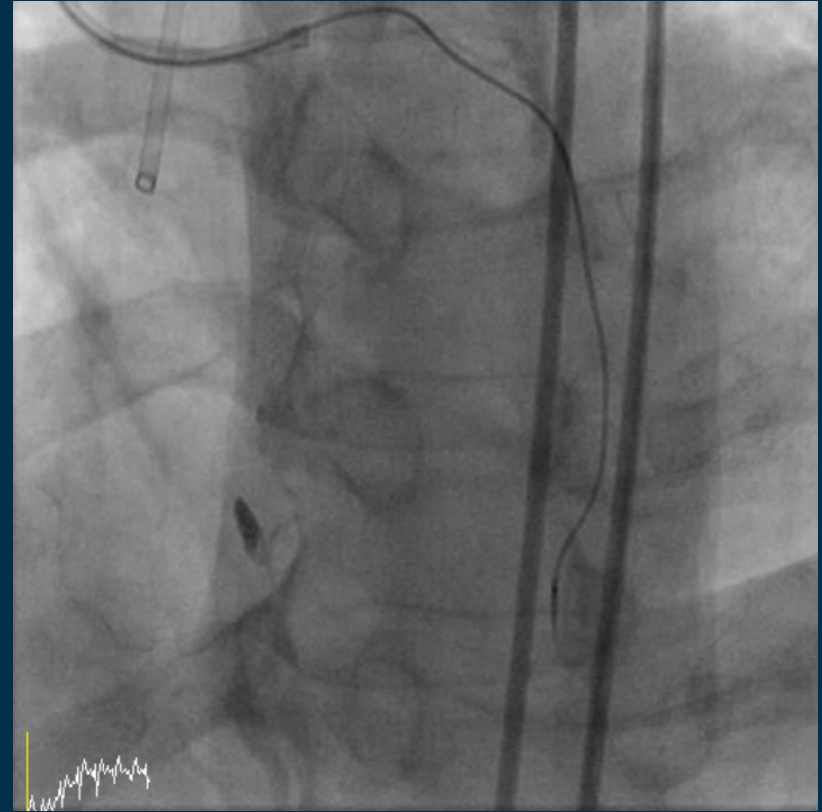
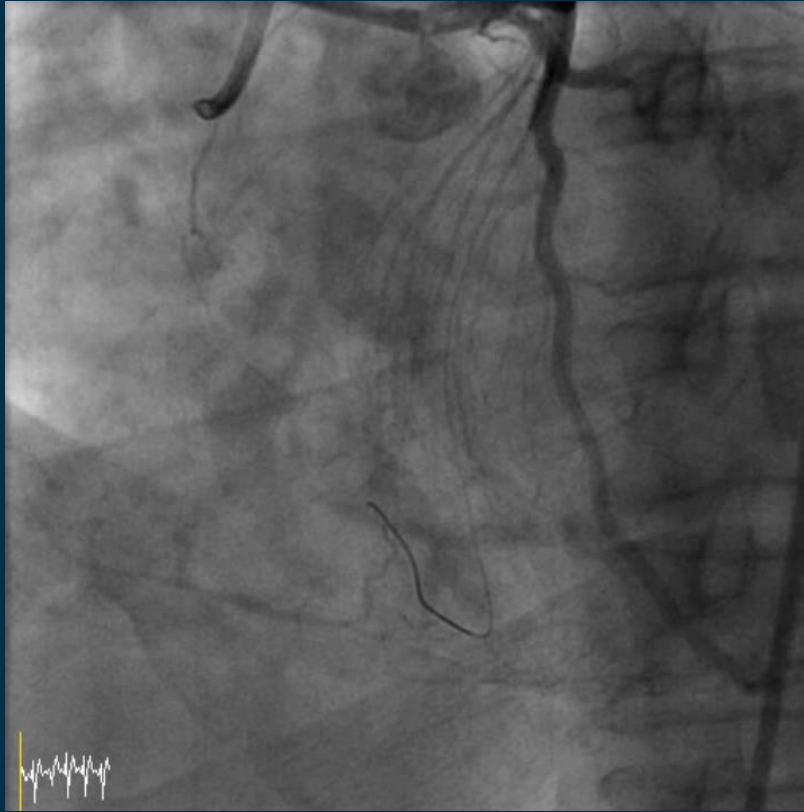
The LCX CTO might be poor collateral, and had severe angulation. Sometimes, LCX CTO-PCI was suddenly turns into a complex procedure.

Case – Poor interventional collateral



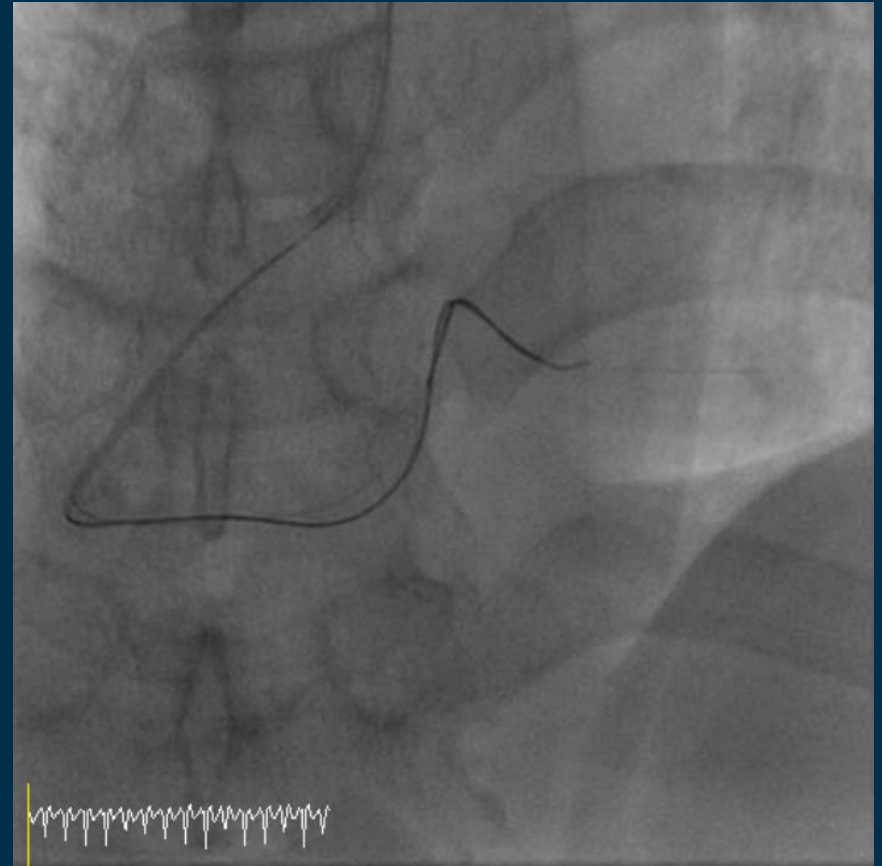
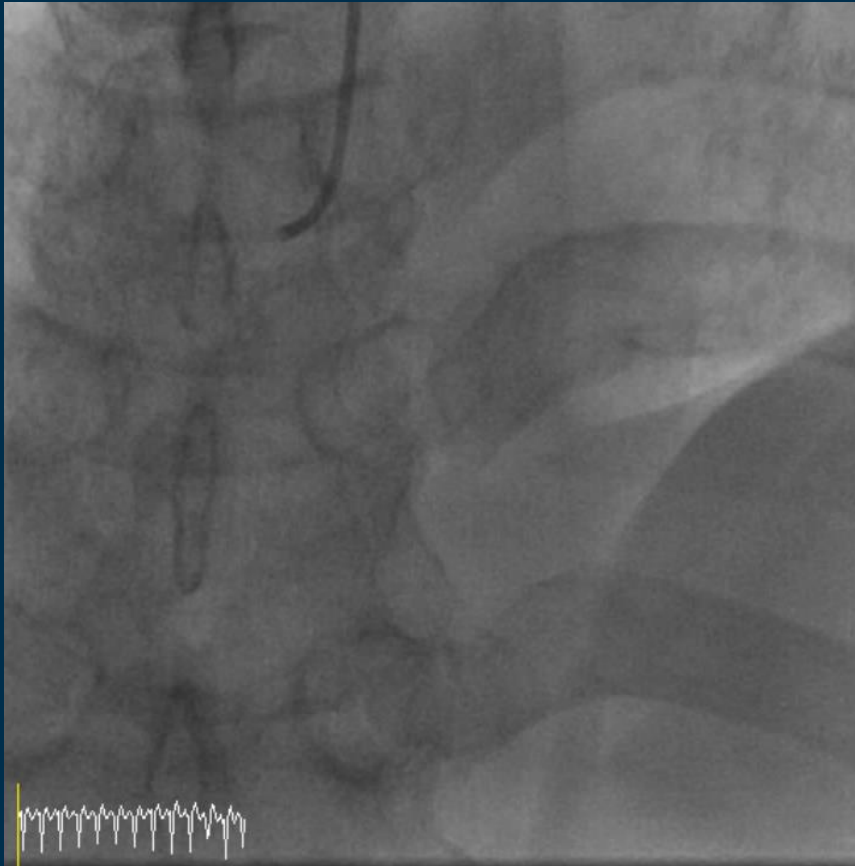
Sometimes, when there are many collateral channels like beard, there are no good interventional collateral.

Case – Poor interventional collateral



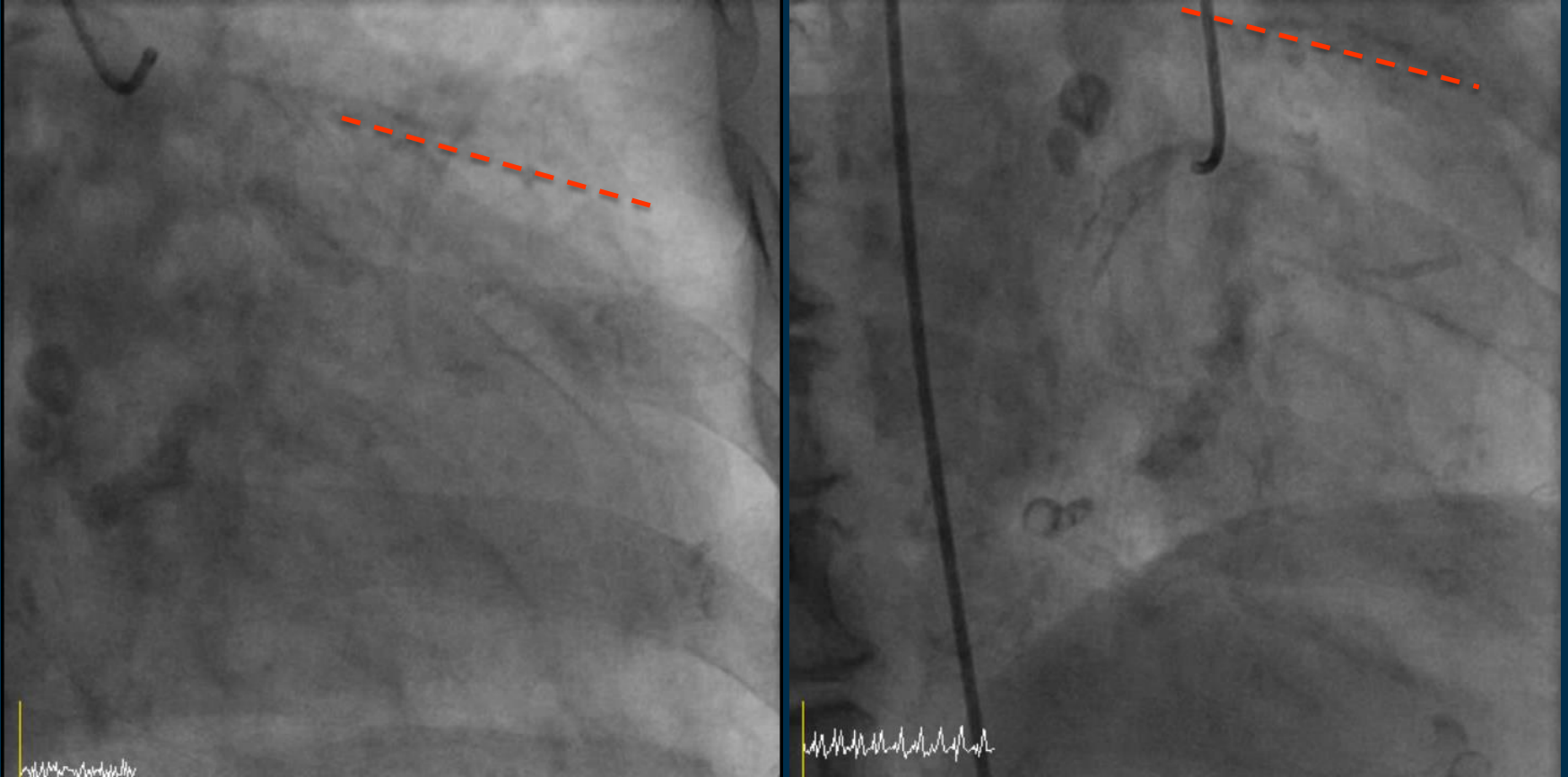
Several time retrograde wiring through another collateral channel, but we found only a septal hematoma after procedure.

Case – Angulation



In CTO-PCI, fine wire manipulation was required, but, angulation near the lesion interfered torque delivery.

Case – Calcification



The heavy calcified lesion is a challenging case in conventional PCI as well as CTO-PCI.

Conclusion

- **Observing coronary angiography closely before CTO-PCI helps to improve the success rate of the procedure by making decision for CTO-PCI treatment strategy.**
- **Appropriate treatment strategies can help patient safety, procedure time, and resource savings.**
- **Some cases might be the best candidate for CTO-PCI, but there was no easy CTO-PCI procedure. So we will always have a second and third plan before CTO-PCI procedure.**



Thank you for your attention

