

**Nicolaus Reifart
Main Taunus Kliniken
Bad Soden**

**CTO
Antegrade
Technique**



Antegrade Technique of Reopening

- Always identify distal vessel
- **Start OTW**
- Traverse curved vessel proximal to CTO with soft-tipped wire
- CTO in bends: softer, flexible (Miracle 3-6g/Pilot)
- Straight/calcified: hard, tapered (Confianza 9/12 /pro /Miracle 12g)

Manufacturer	Wire	Diameter tip & stiffness	Coating characteristics
Guidant	HT Intermediate	0.014 " 2 g	Hydrophilic with moderate lubricity
	HT Standard	0.014 " 4 g	Hydrophilic with moderate lubricity
	Crossit 100-200-300-400	0.014-0.010" 2-3-4-g (tapered tip)	Hydrophilic with moderate lubricity
	Whisper LS, MS Pilot 50, 150, 200	0.014" 1g 0.014 " 2-5 g	Polymer coated Polymer coated
Boston Scientific	Choice PT2	0.014 " 2 g	Polymer coated
	PT Graphix	0.014 " na	
Medtronic	Persuader	0.014 " 3,6,9 g	Hydrophilic
Asahi	Intermediate	0.014 " 3 g	Non hydrophilic
	Miracle 3, 4.5, 6, 12	0.014 3-6-12 g	Non hydrophilic
	Conquest/ Confianza Pro 9, 12	0.009-0.014" 9-12g (tapered tip)	Hydrophilic except tip and non lubricious shaft
	Conquest/ Confianza Pro 8-20 Fielder	0.008-0.014 " 8-20g (tapered tip) 0.014 " 1g	Hydrophilic except tip and non lubricious shaft Polymer coated
Cordis J&J	Shinobi	0.014 " 2g	Polymer coated
	Shinobi plus	0.014" 4g	
Terumo	Crosswire	0.014 " na	Polymer coated
	Crosswire NT	0.014" 12g	Polymer coated
	Runthrough NS	0.014 " 1-3 g	Hydrophilic coated

CTO wires: get used to some, not all

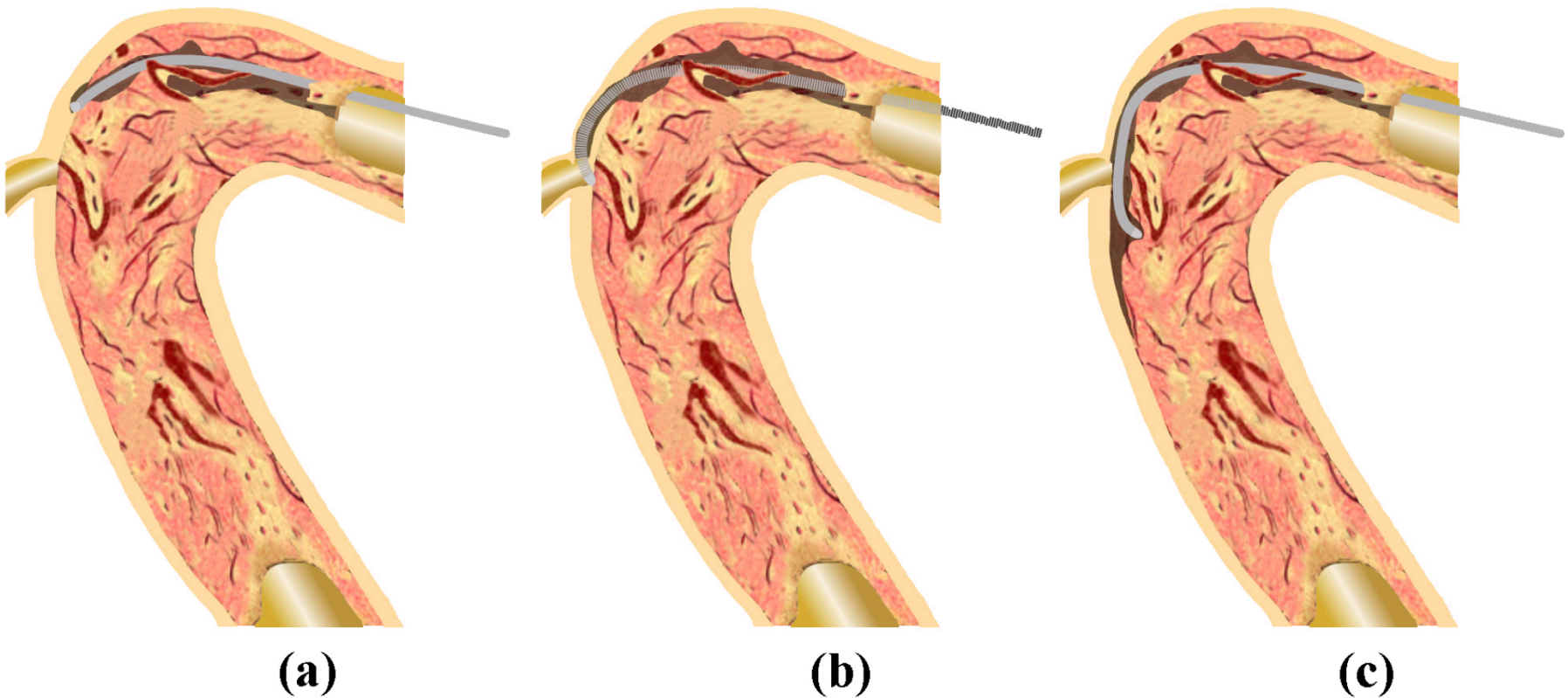
Simple: Crossit 100, Miracle 3g, Pilot 50

Severe: Confianza 9 and 12 Pilot 150

Antegrade Technique of reopening

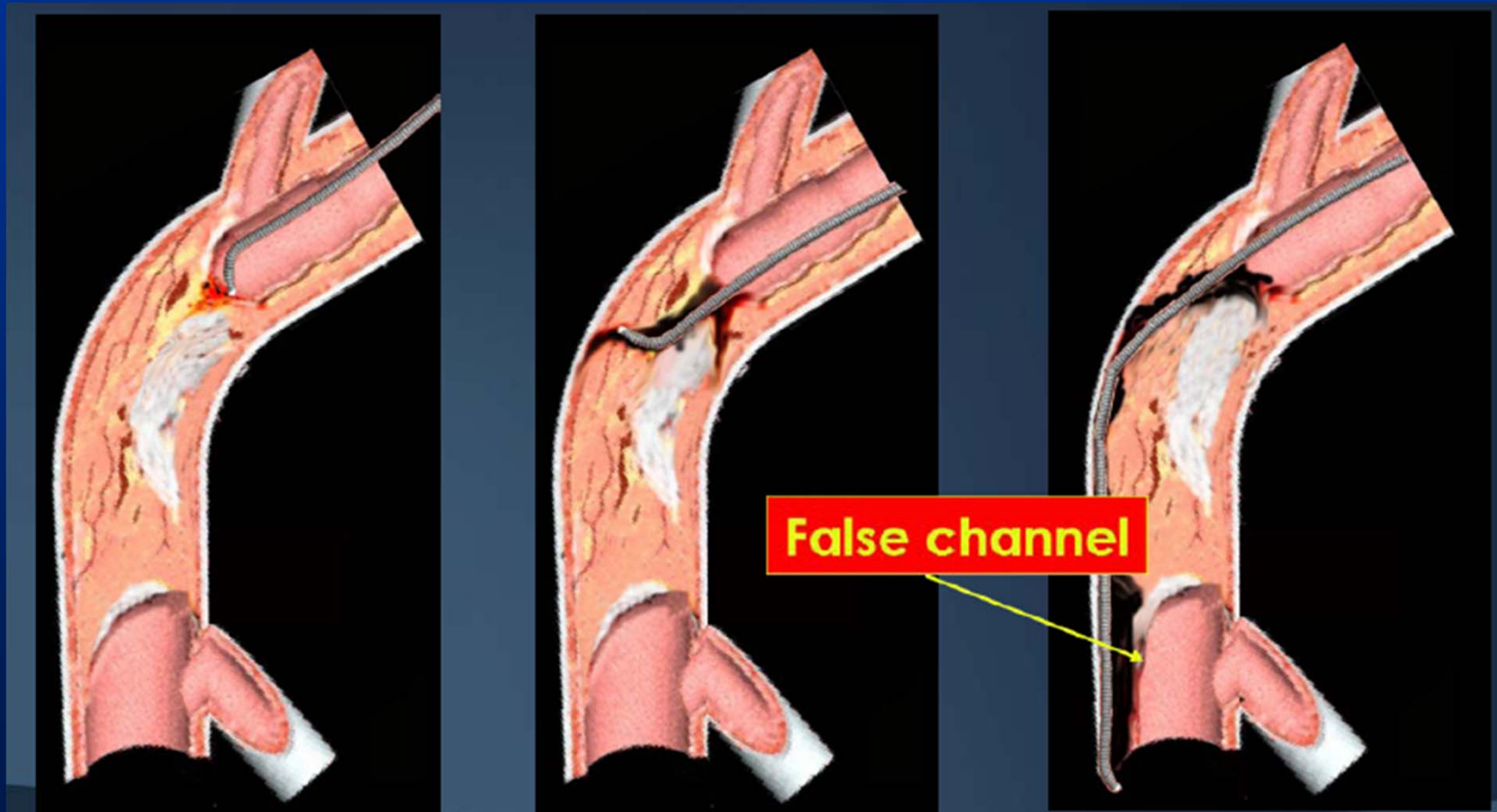
- Cautious drilling , pushing and feeling
- **No Ramboplasty**
- Parallel wires early if channel is
WRONG (N.Reifart 1995 O. Katoh 1996)
- No Intra-OTW- injections
- After crossing exchange hard wire
against soft-tipped wire

Select inner curve (towards Myocardium) !



RCA

And when you are in a false lumen ?

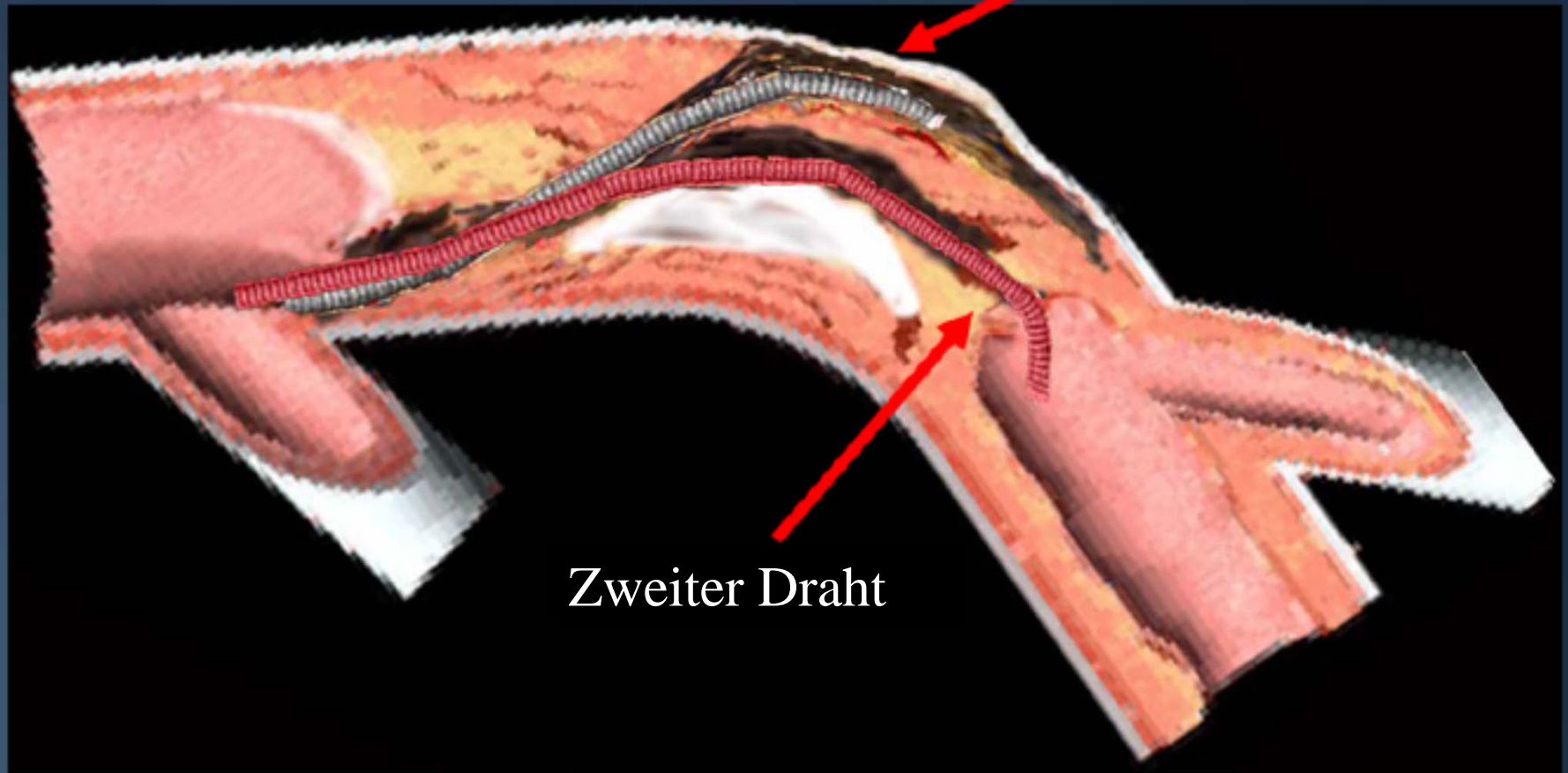


Wire in the wrong lumen...

- Leave it there, pull OTW via flush-exchange
- 2nd wire (e.g. Confianza 6/9) through OTW and parallel to 1st wire
- Wrong exit with tapered stiff wire is not risky
- Never forcefully advance balloon or exchange catheter unless you are surely in the correct distal lumen (CAVE: huge perforations)

Parallelwire-technique

Erster Draht

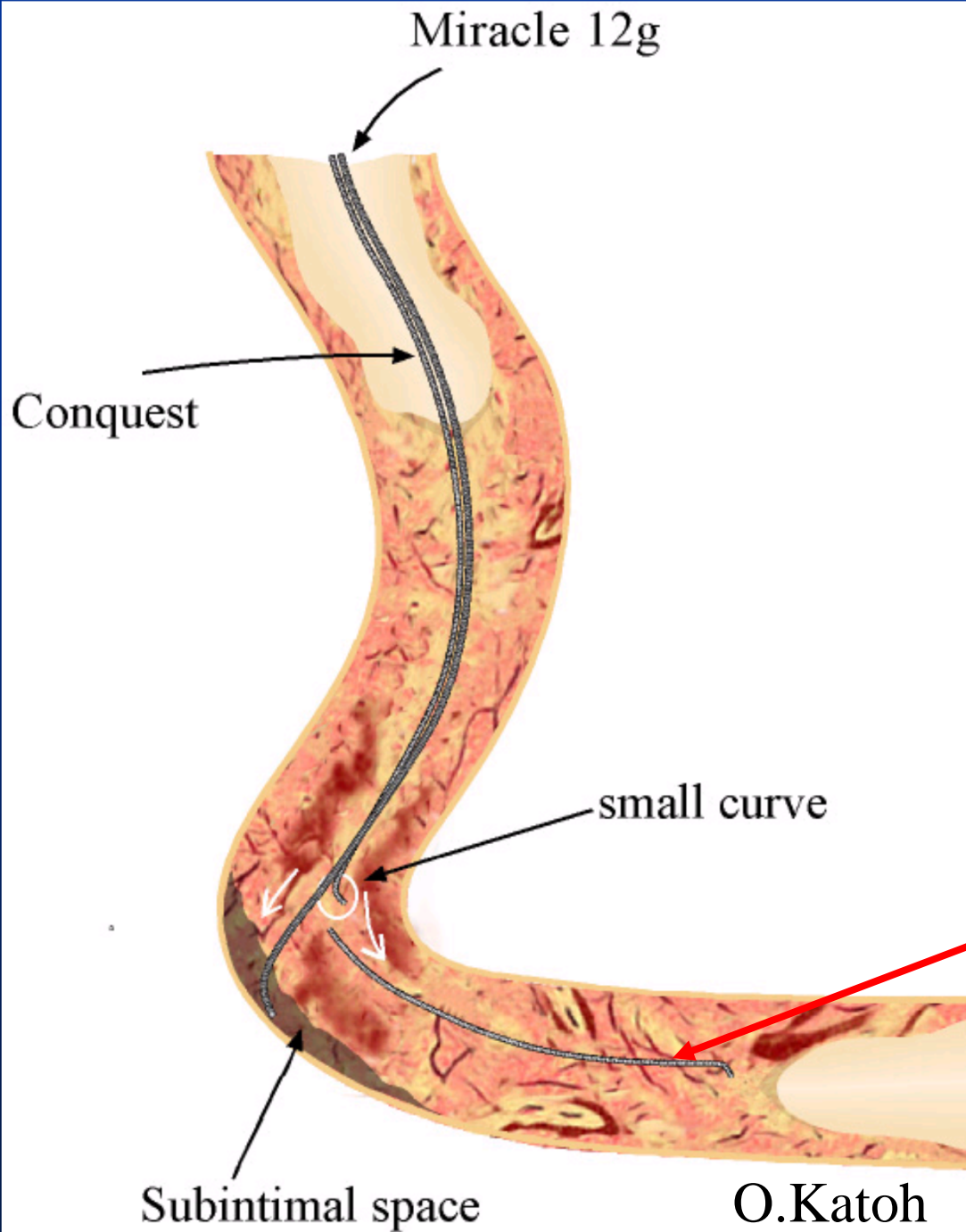


Zweiter Draht

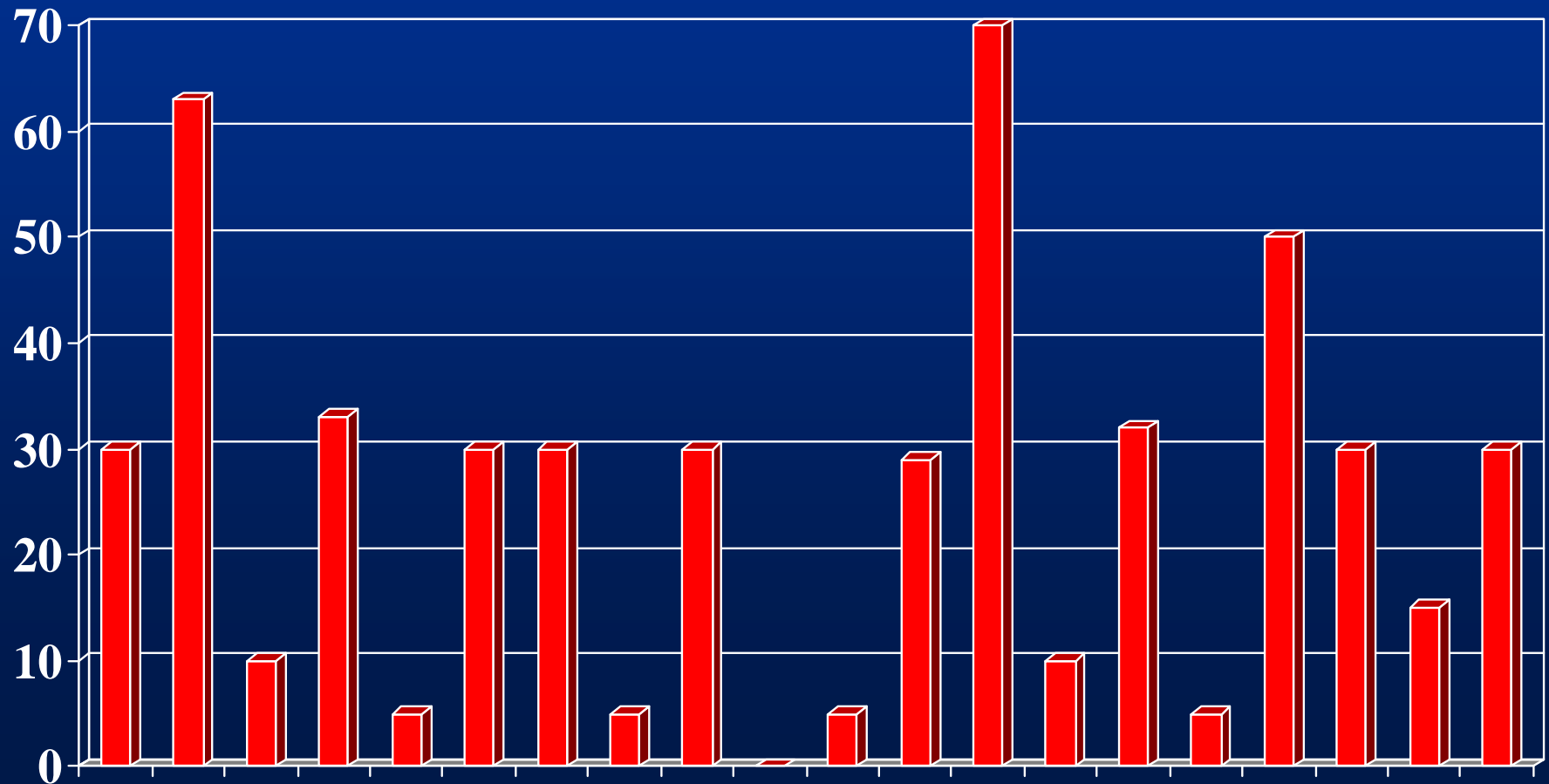
(N.Reifart/O.Katoh 1995/96)

Parallelwire- technique

(N.Reifart/O.Katoh
1995/96)

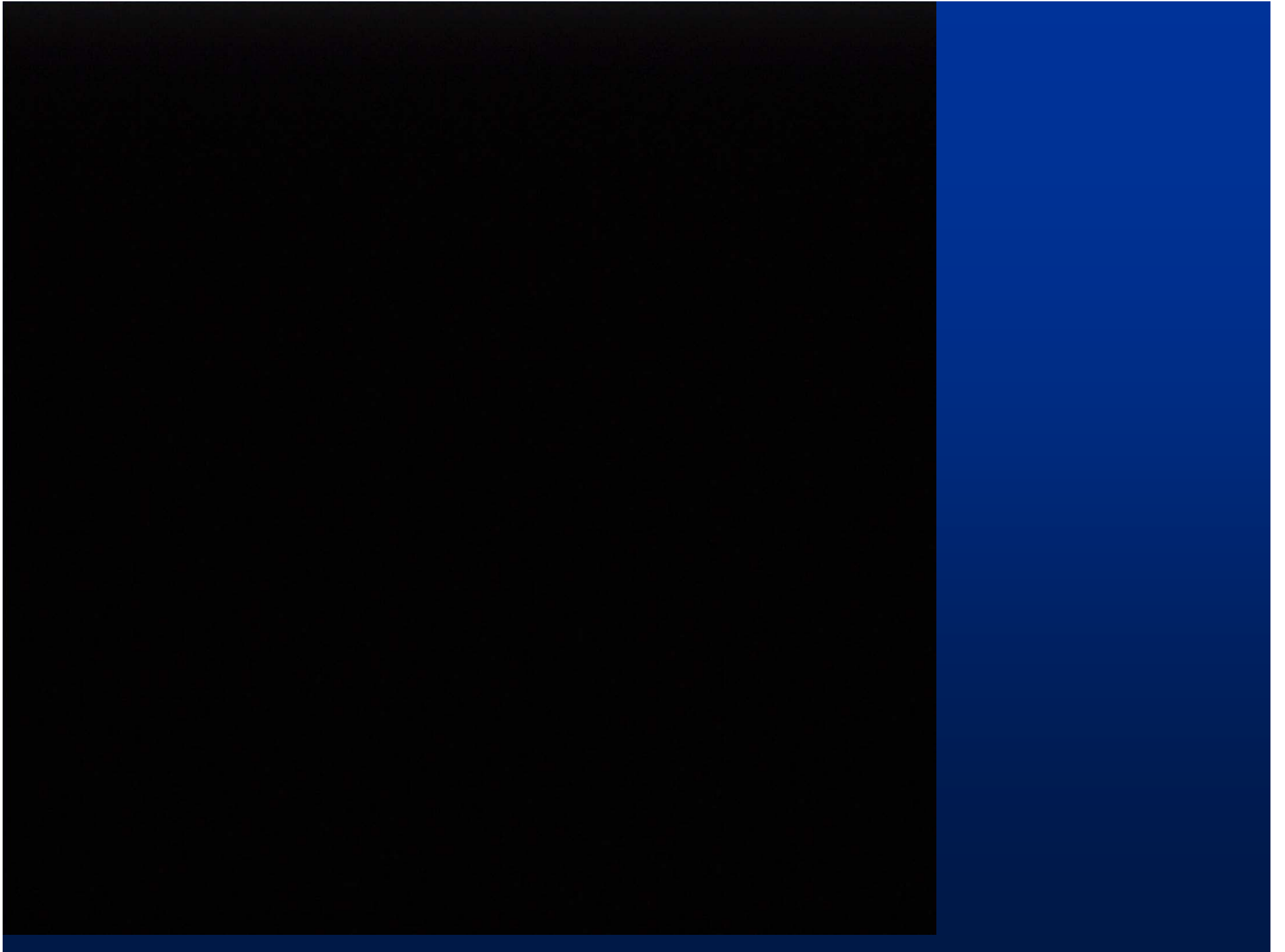


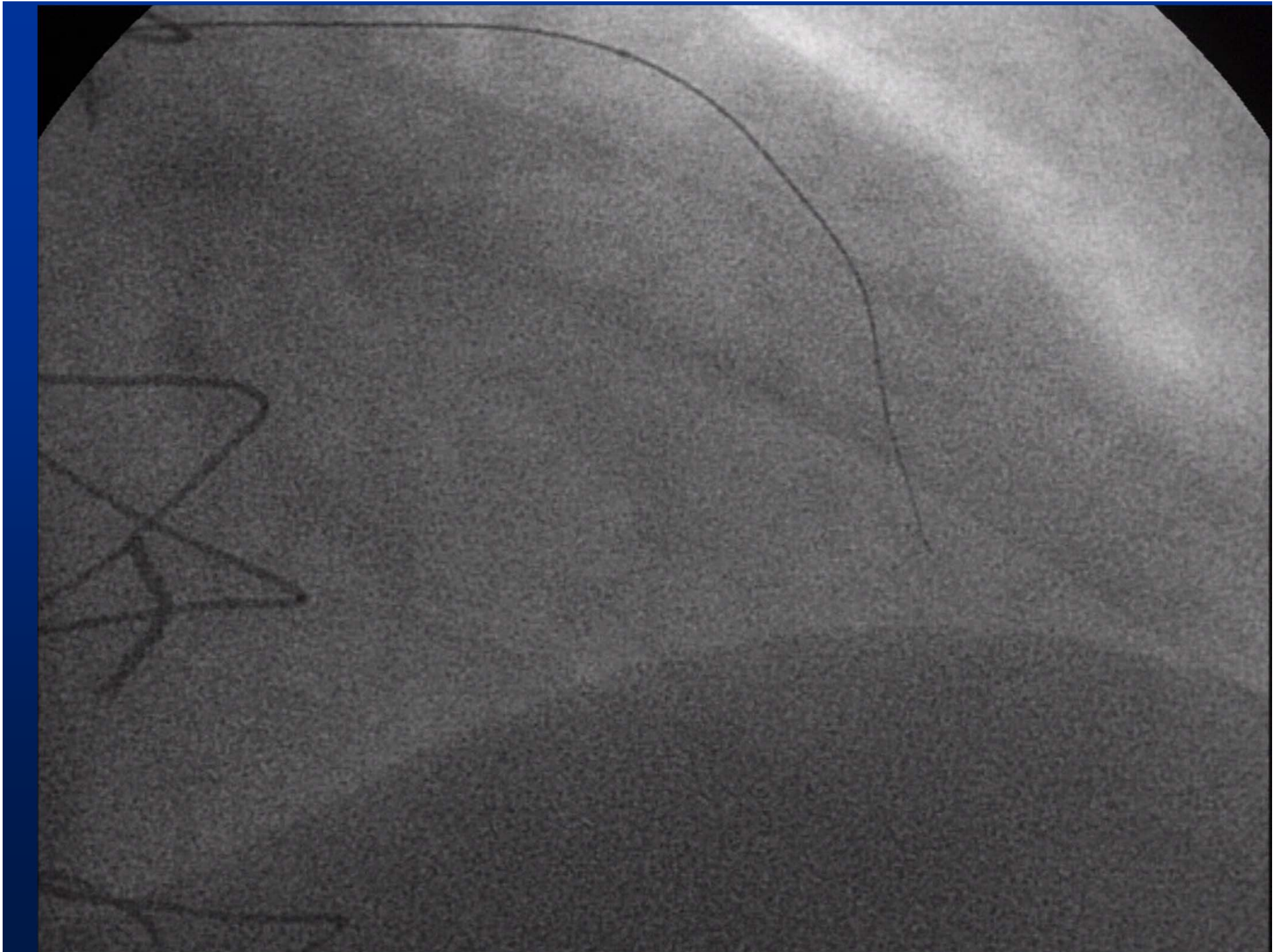
Parrallel wire 2007 Mean: 25.6%



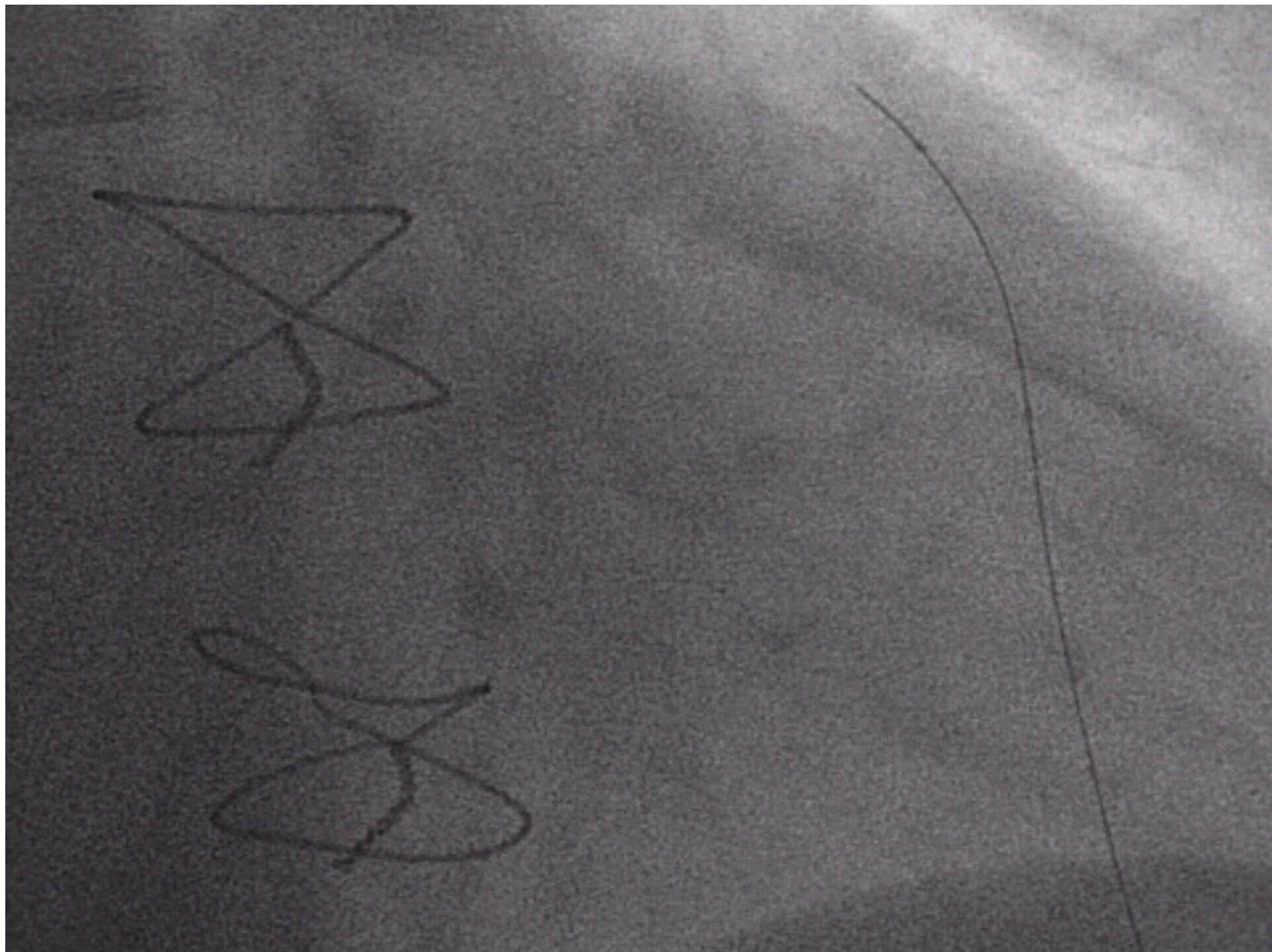
Pat. T.S. Angina CCS 3

- **LAD occlusion since CABG 12 years ago; occlusion length 4,5 cm**
- **BP LAD, RCA occluded**
- **Large inferior , small anterior scar**
- **EF < 40%**









Handwritten scribble or signature in the upper left quadrant.

Handwritten scribble or signature in the lower left quadrant.

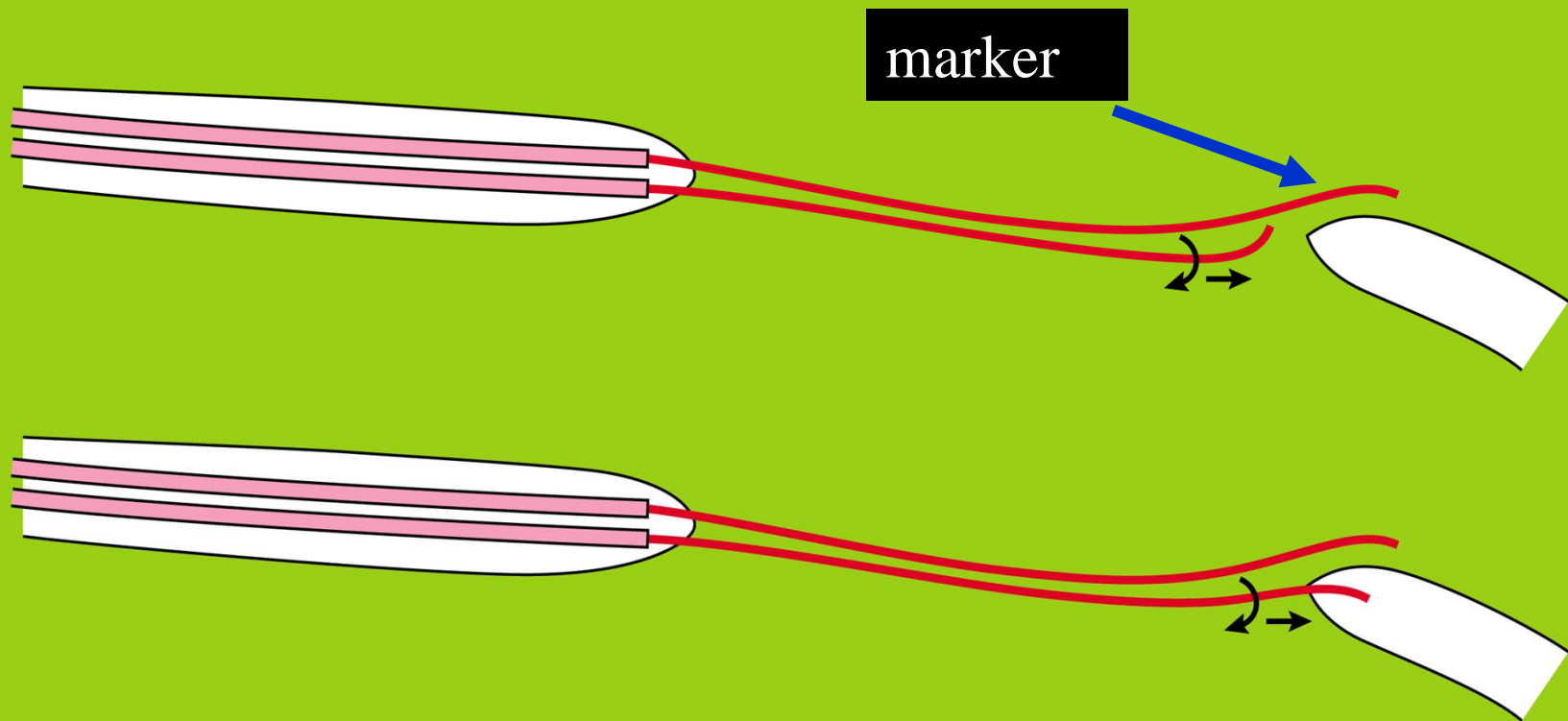


Seesaw: modified parallel wire technique

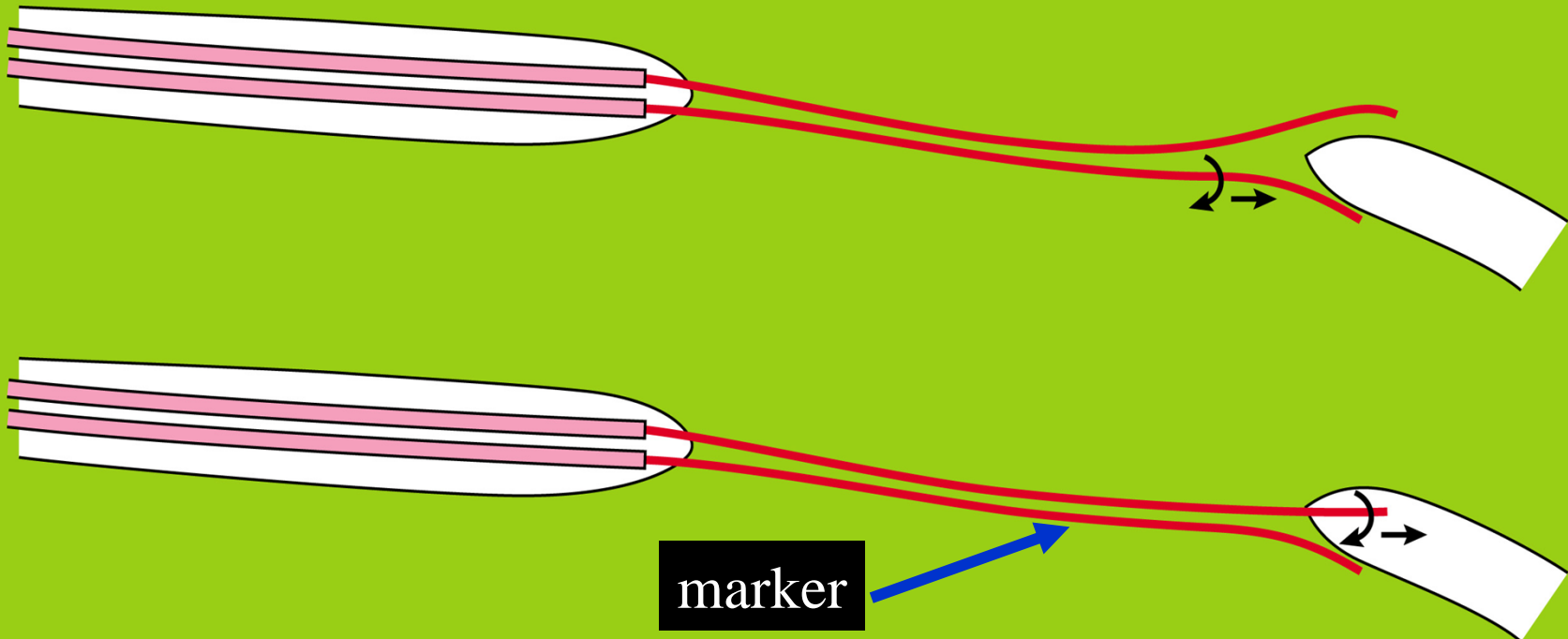
- 8 F guide
- 2 OTW balloons /catheters
- 2 wires slide parallel and are advanced in an alternating manner

Seesaw Wiring

Parallel Wire Method with Double Support Catheters



Seesaw Wiring



*guide wires can exchange
their roles as marker or penetrator*

Seesaw & Triple parallel wires

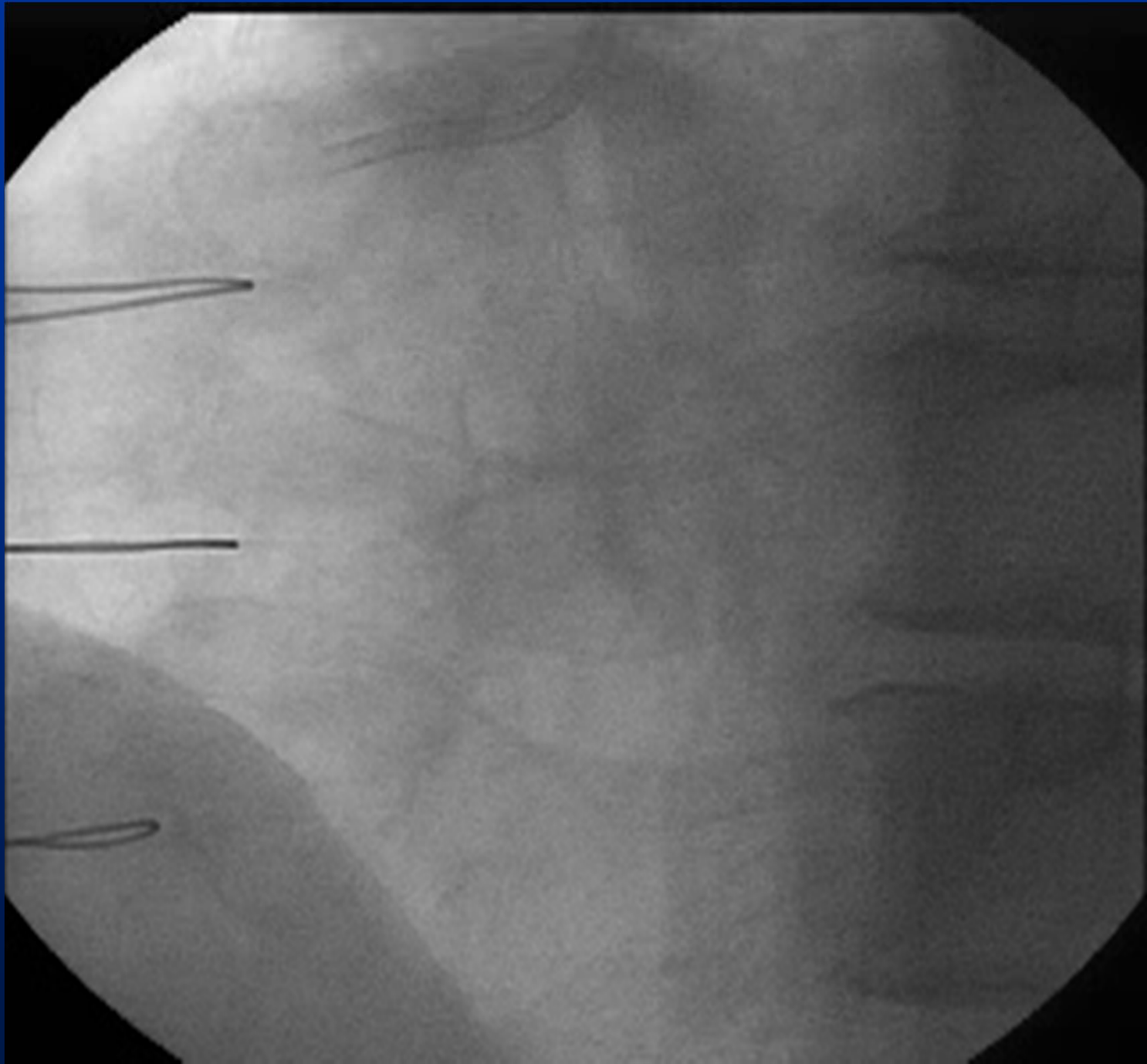
In case the 2nd wire enters also false lumen (seesaw not successful)

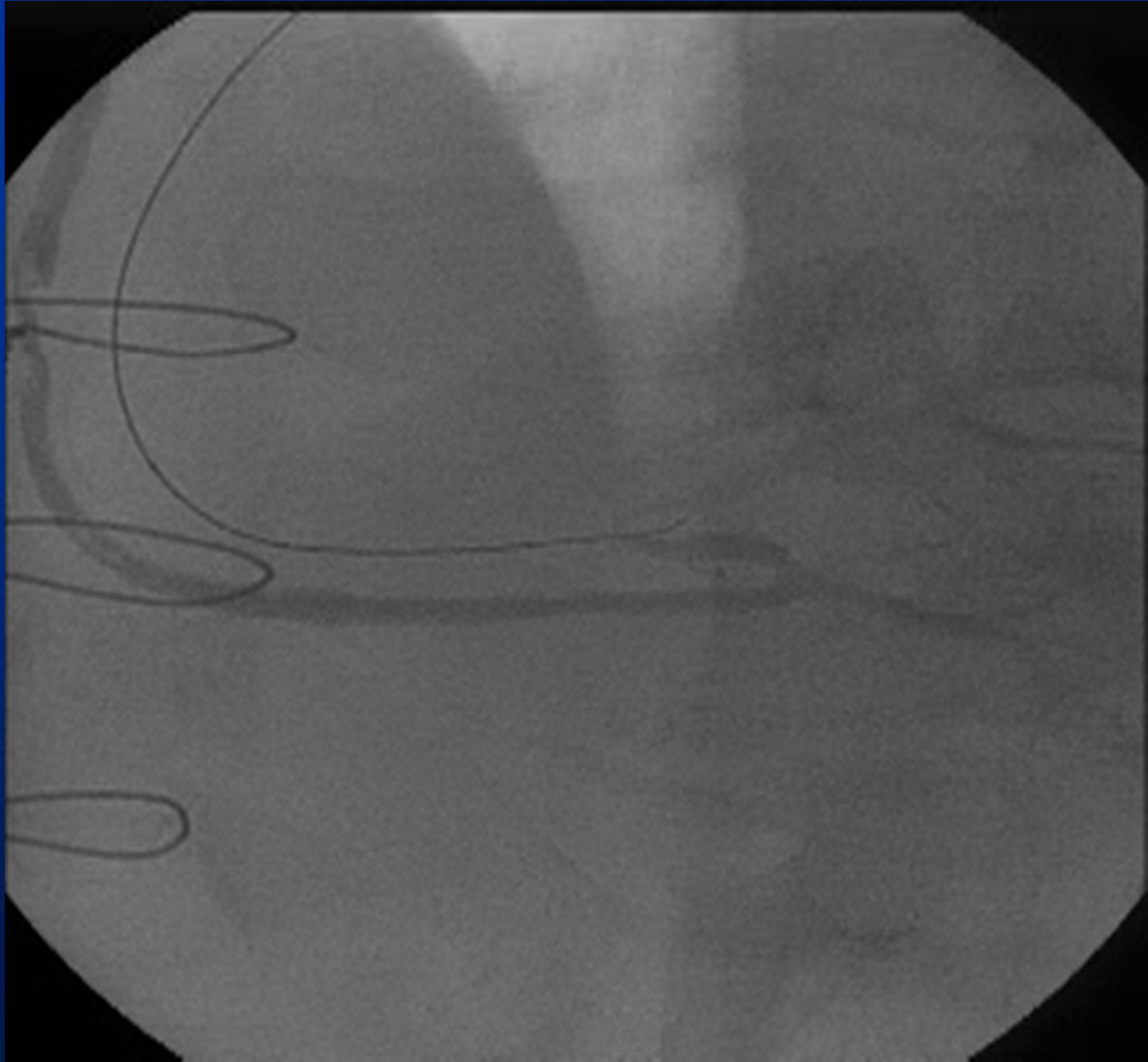


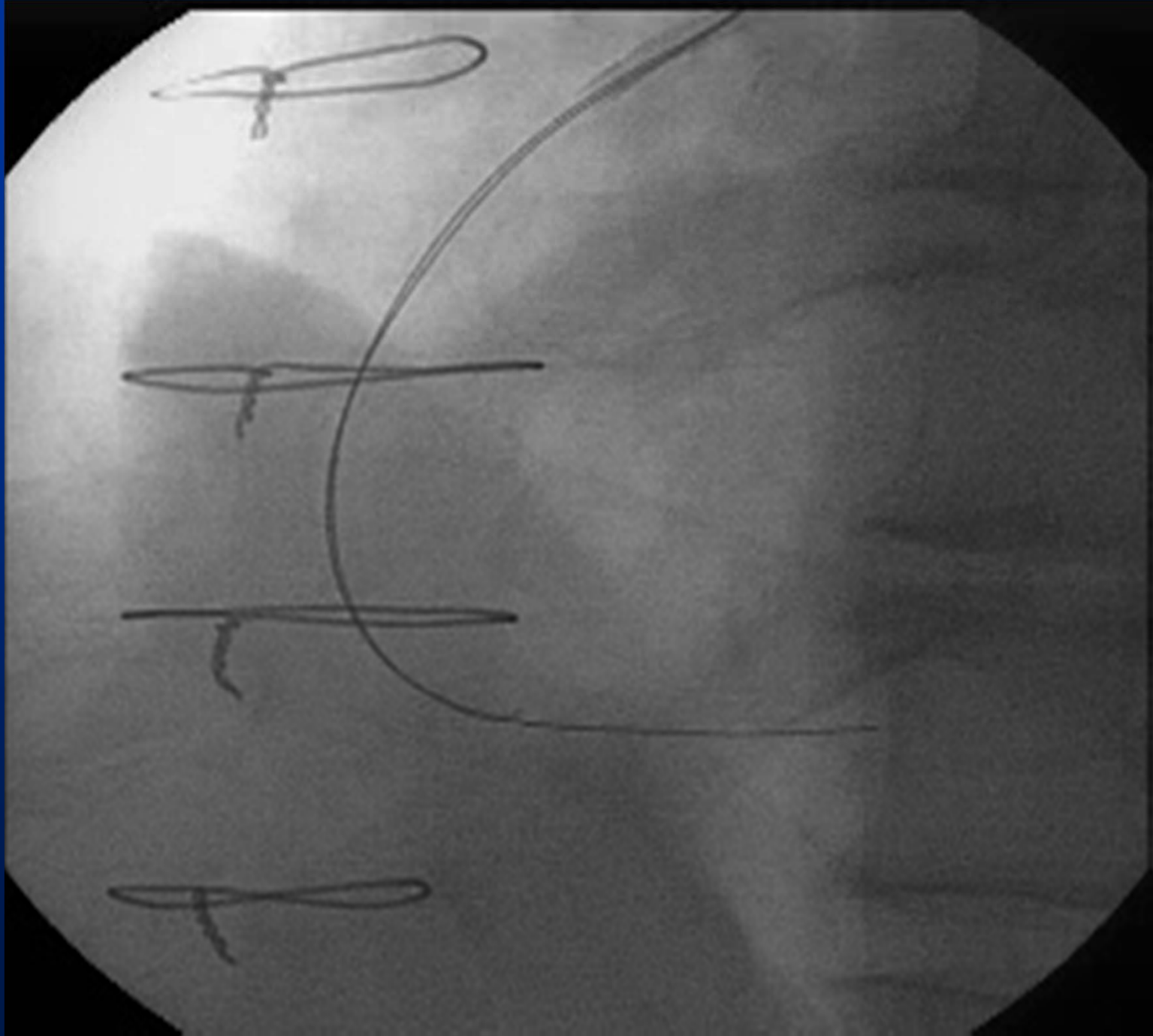
RCA
CTO 8
years

ACS

SVG
throm-
botic



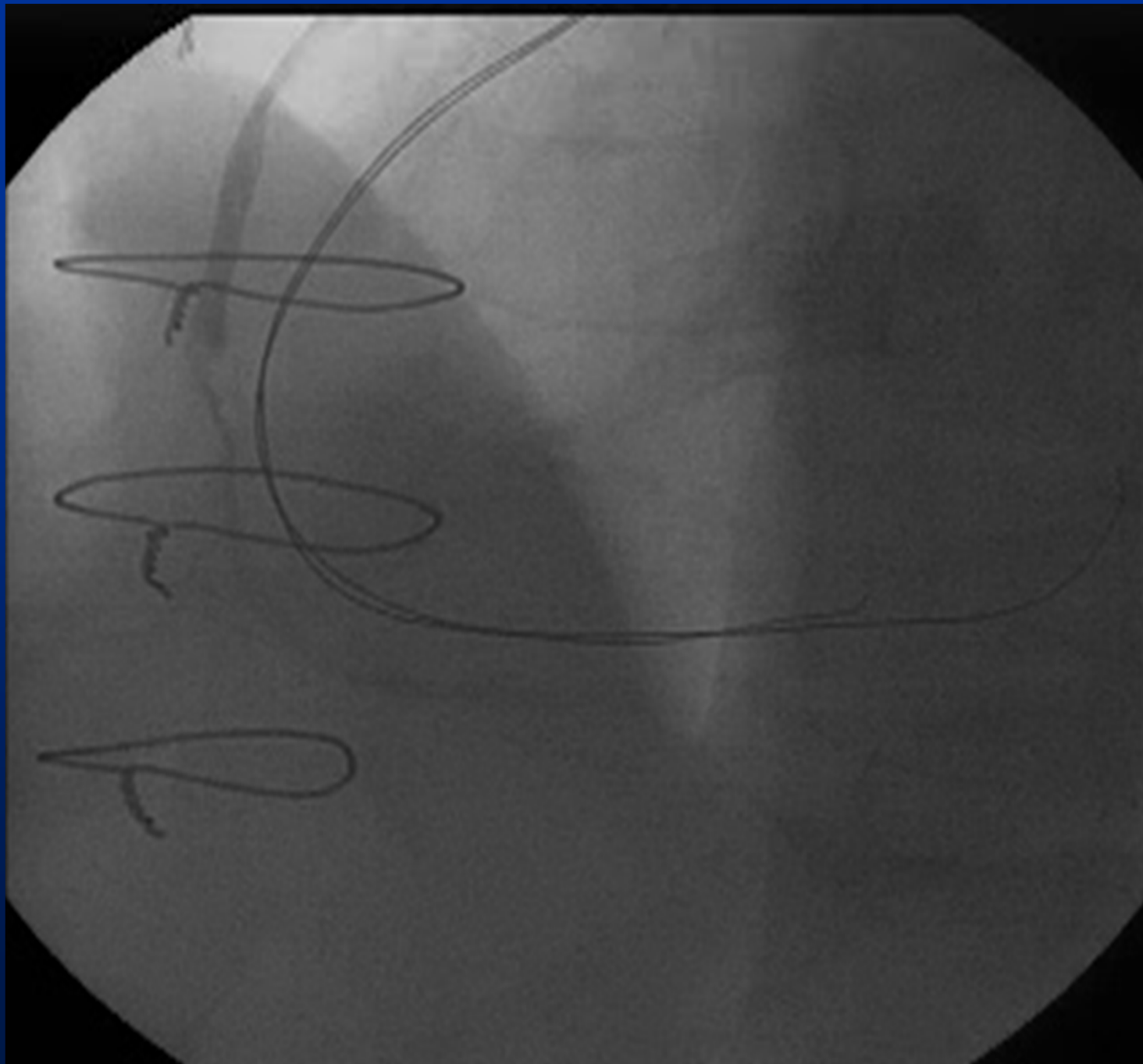




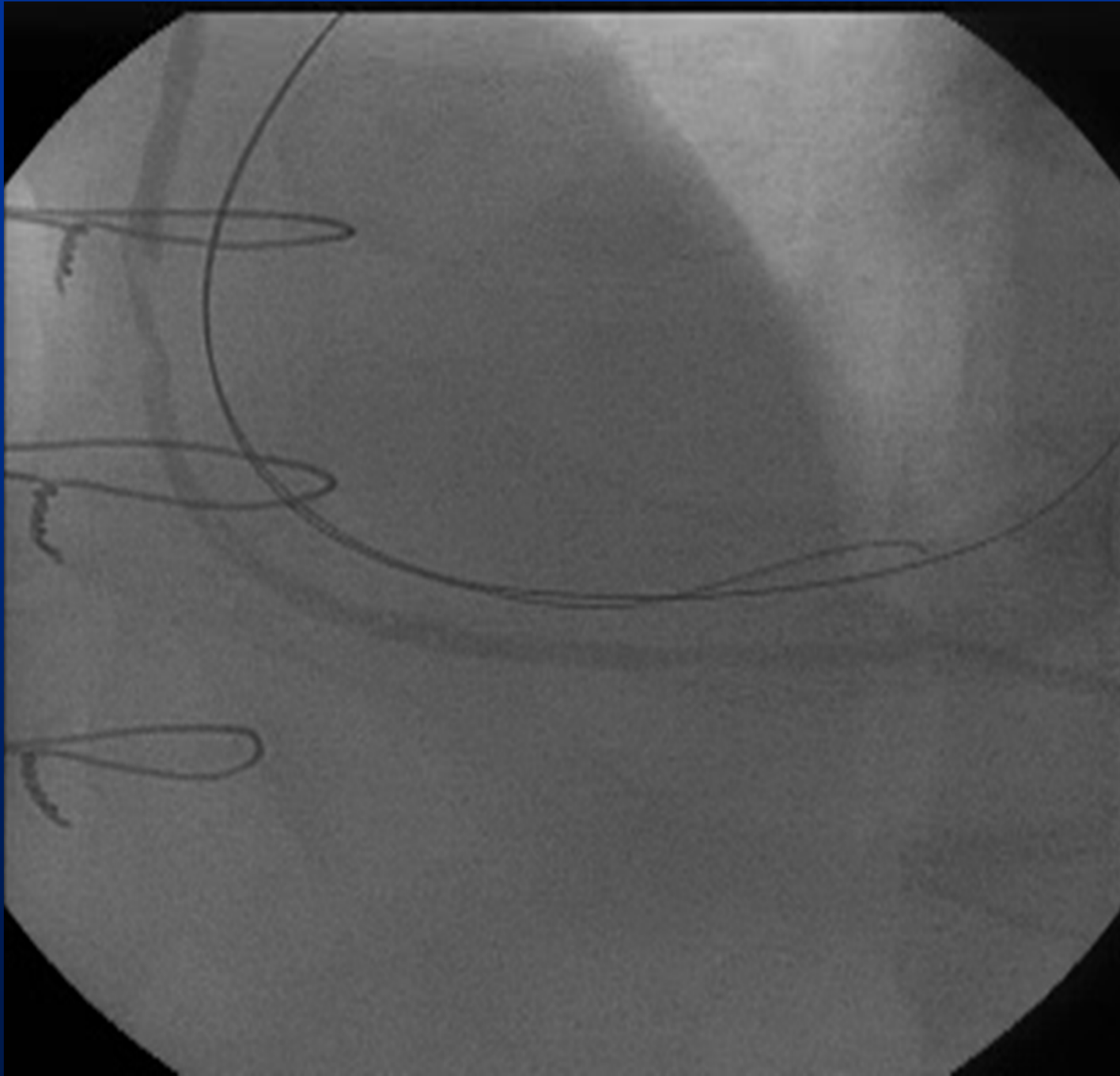




Seesaw

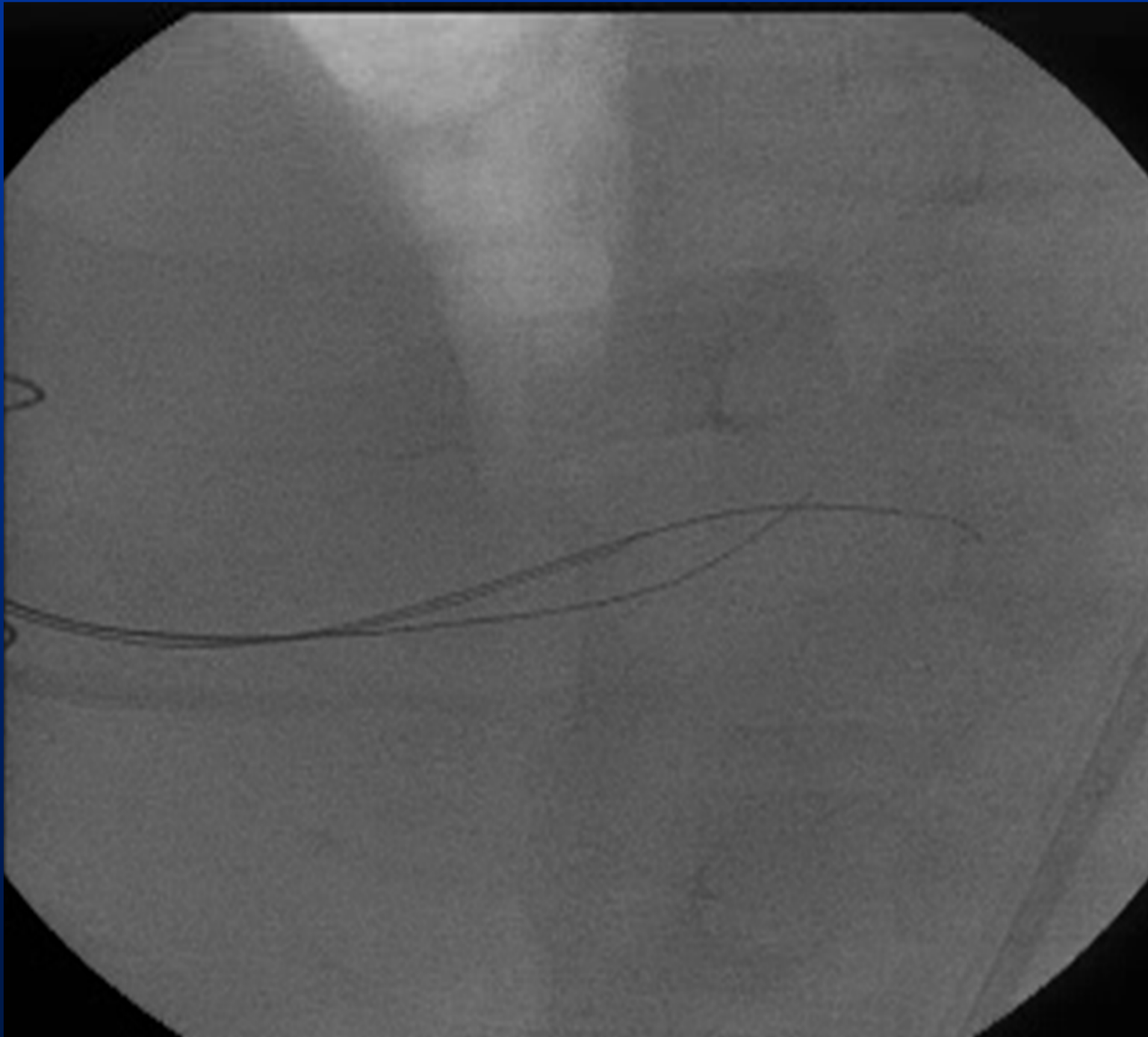


Seesaw

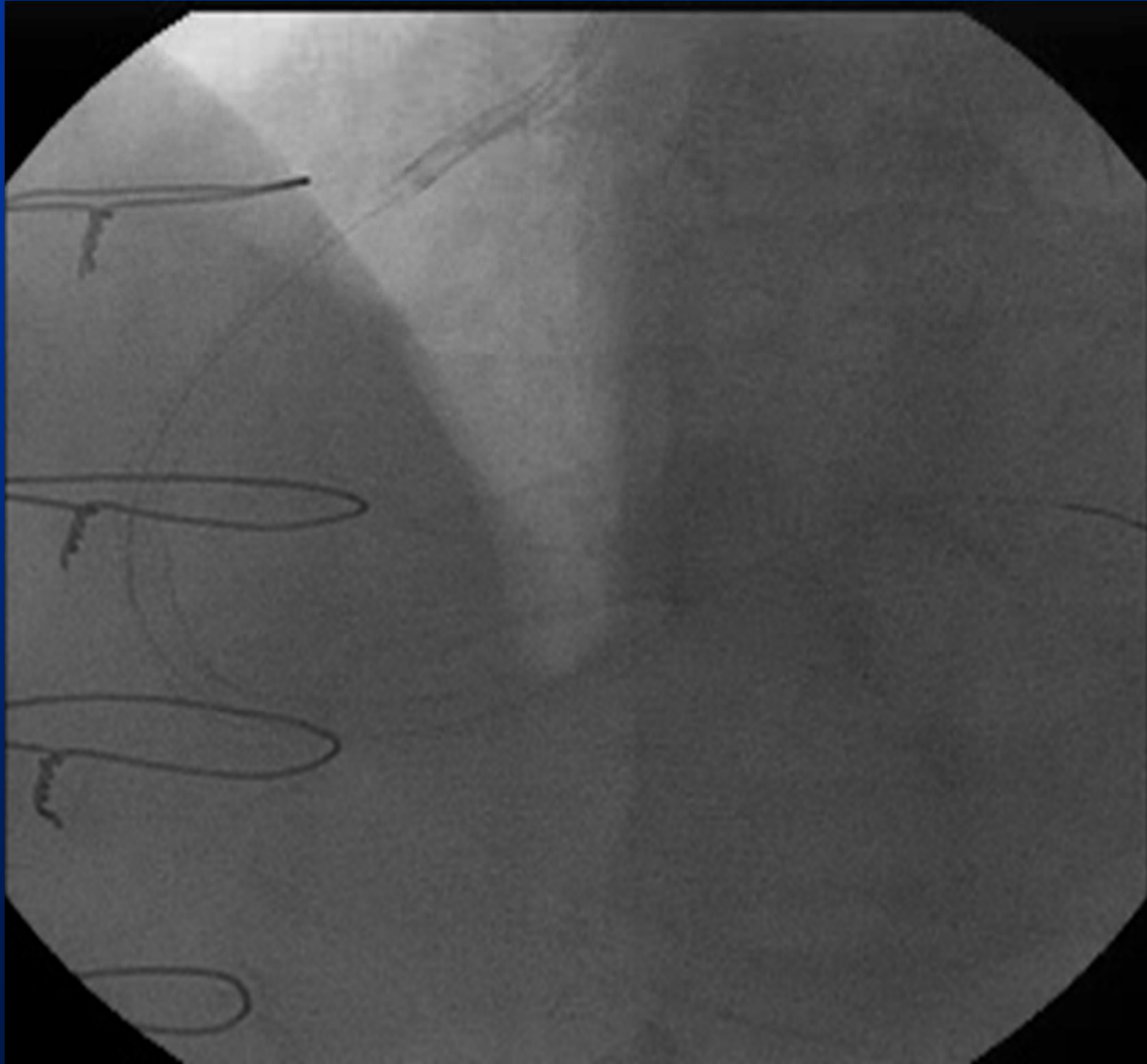


Seesaw
not
successful





Seesaw
with 2nd
and 3rd
wire

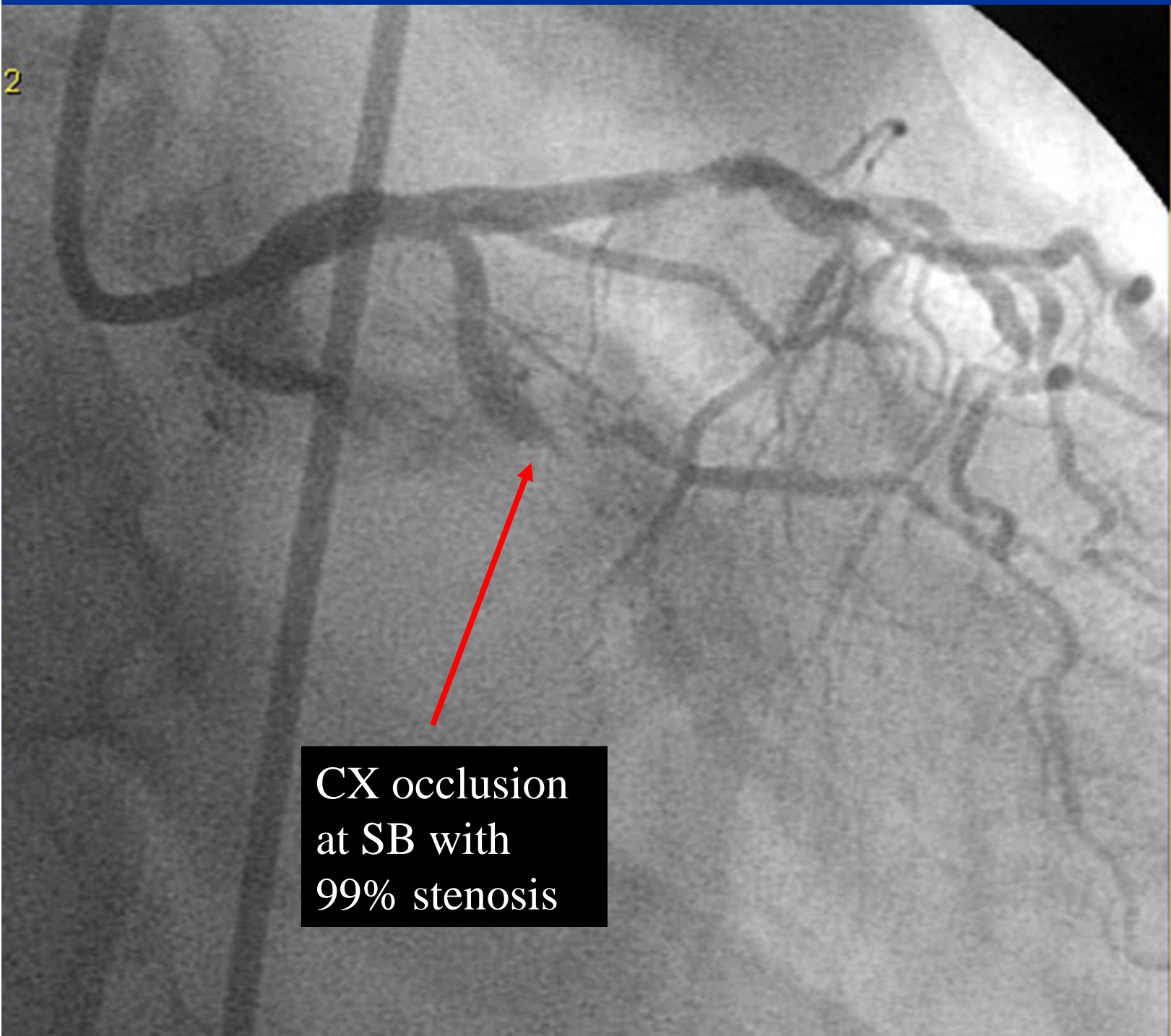


Final

CTO at branch:
Sesame open (Saito)

And entry can still not be
found:
Sidebranch technique (Katoh)

2



CX occlusion
at SB with
99% stenosis

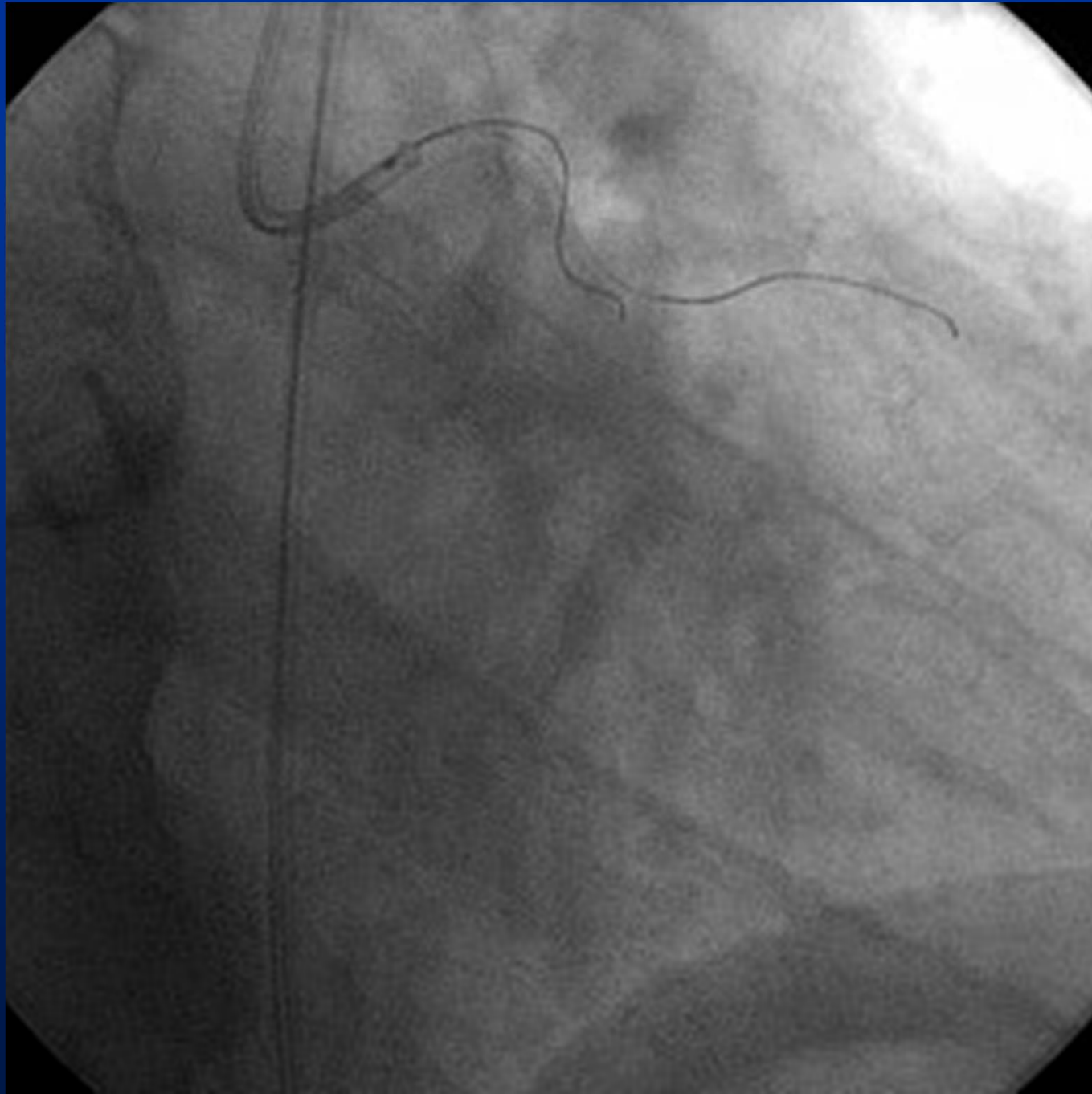
CX
CTO

After
several
attempts of
wireing
distal CX:

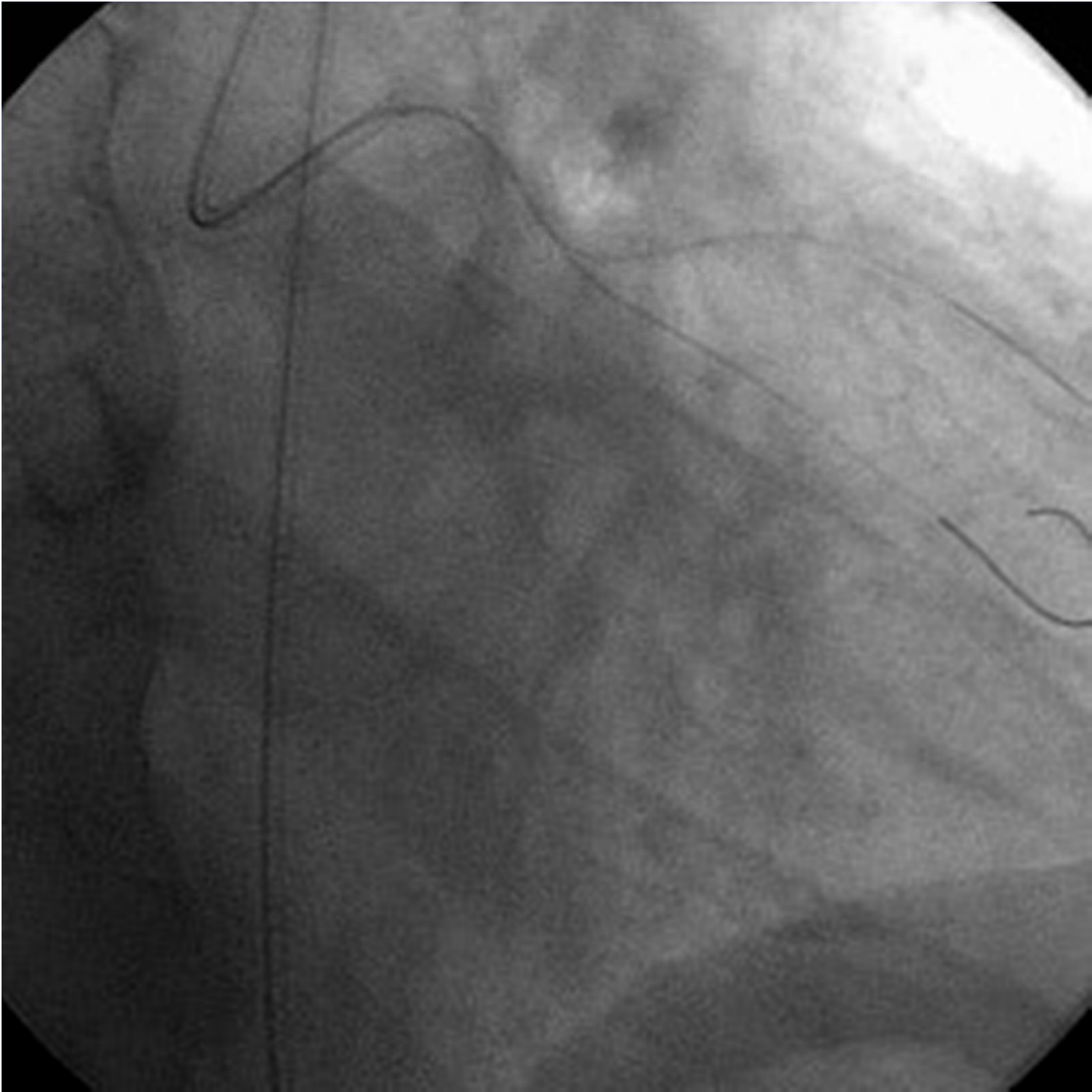


Occlusion of marginal
and CX

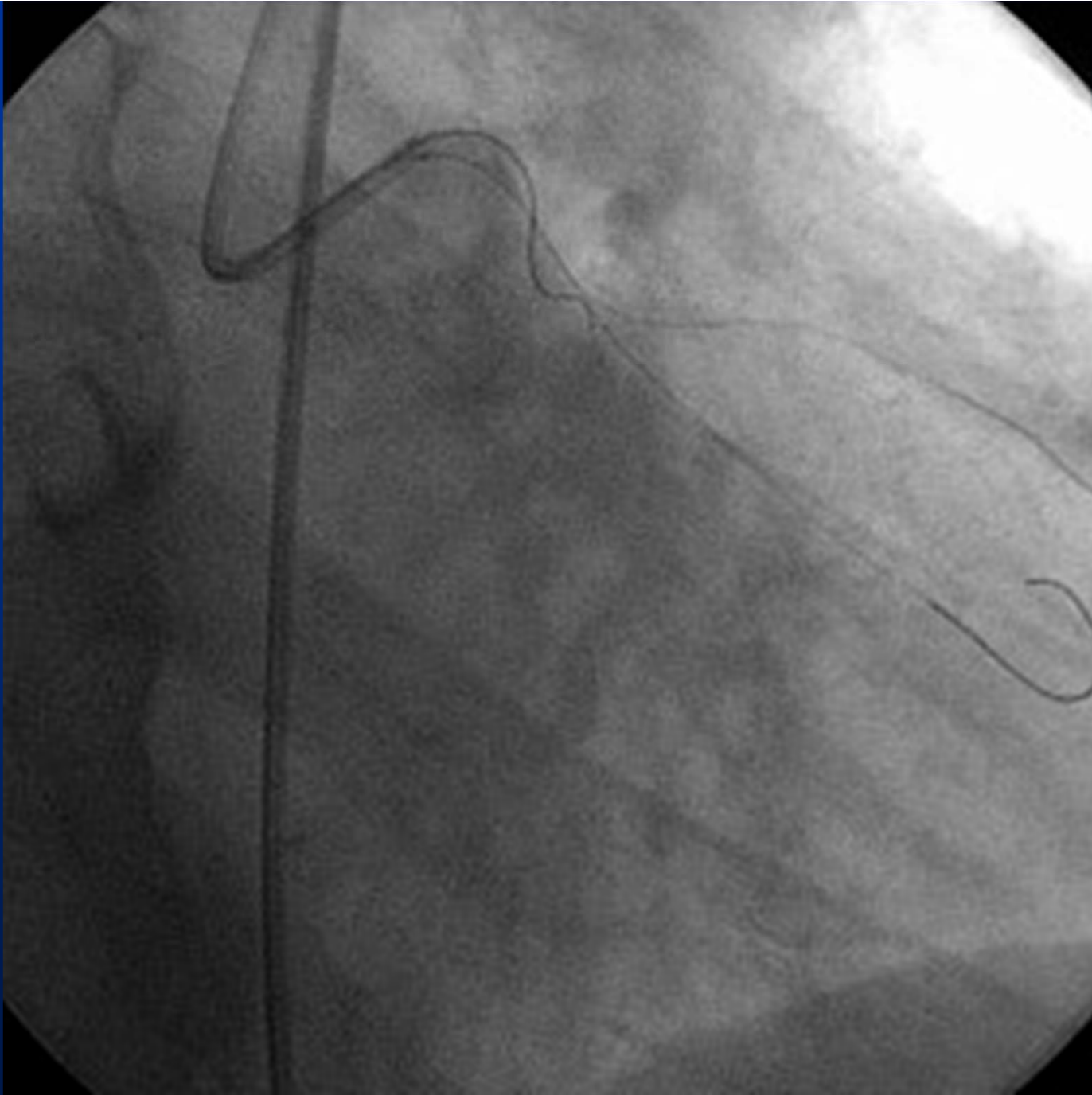
The image is a grayscale angiogram of a coronary artery system. A prominent horizontal vessel, likely the circumflex artery (CX), runs across the upper middle. Below it, a network of smaller vessels is visible. Two white arrows originate from the bottom center and point upwards towards a specific area where the vessel lumen appears narrowed or blocked. The overall image has a grainy, high-contrast appearance typical of medical X-ray angiography.



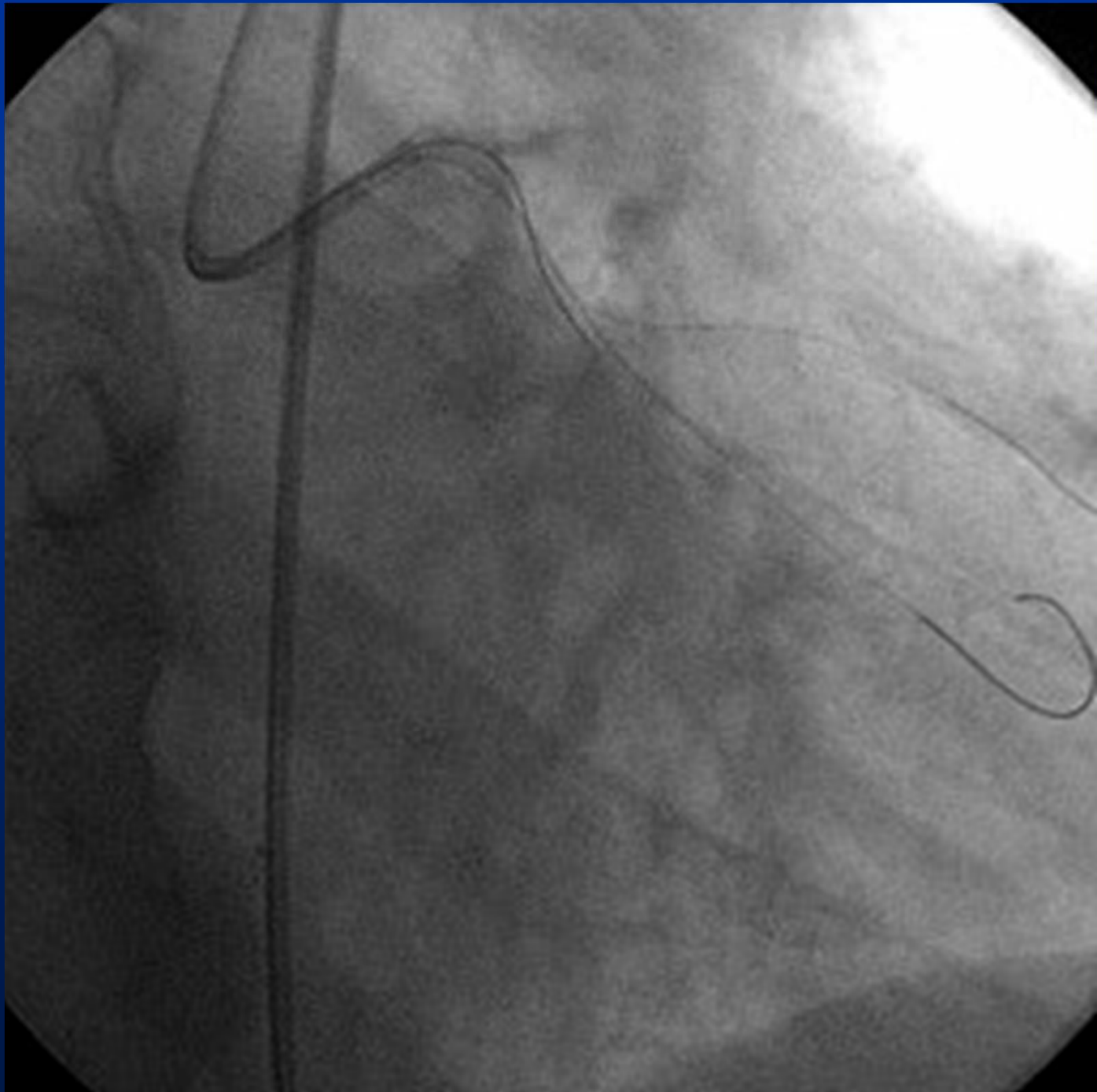
Sesame
open

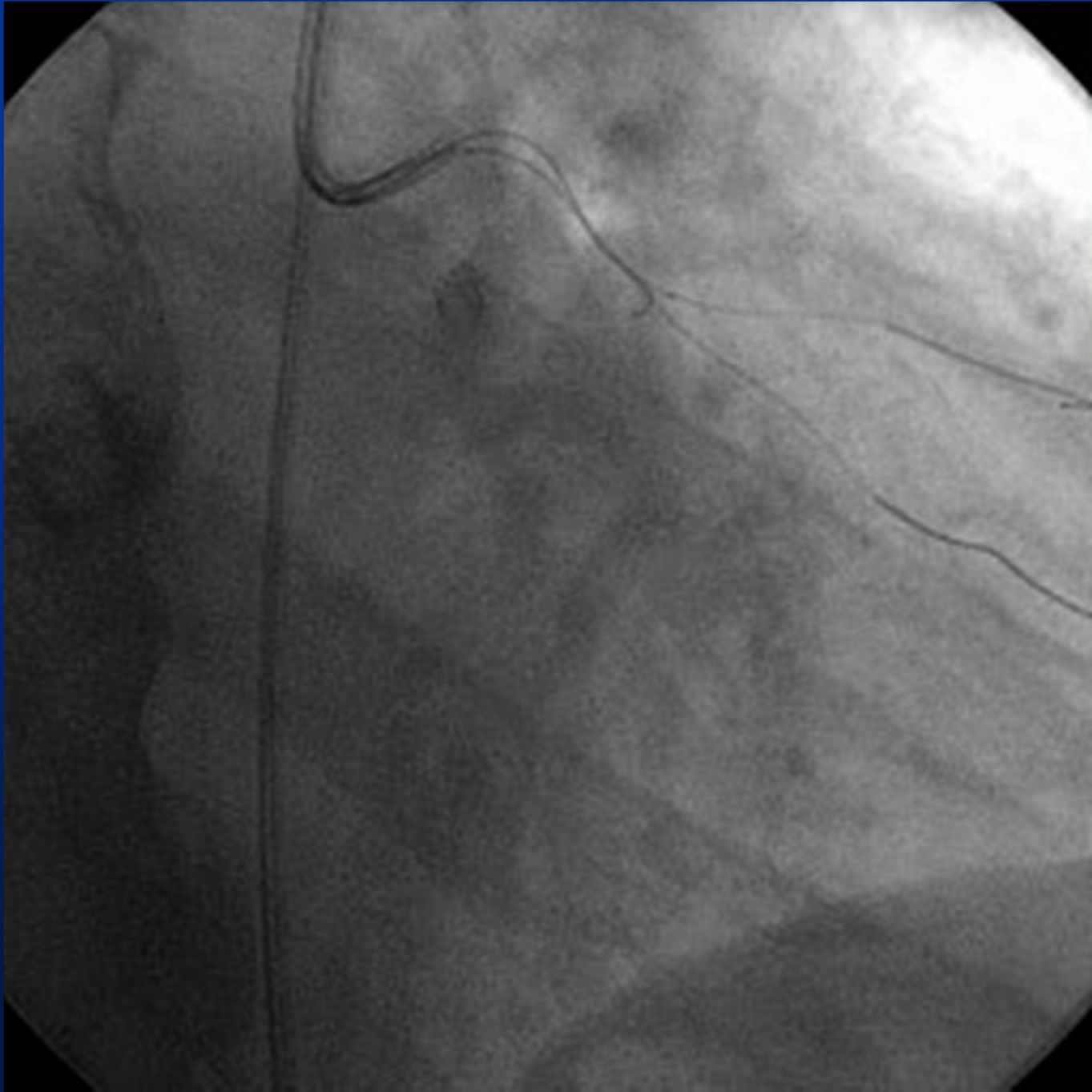


M1,
M2



All attempts
to wire CX
fail

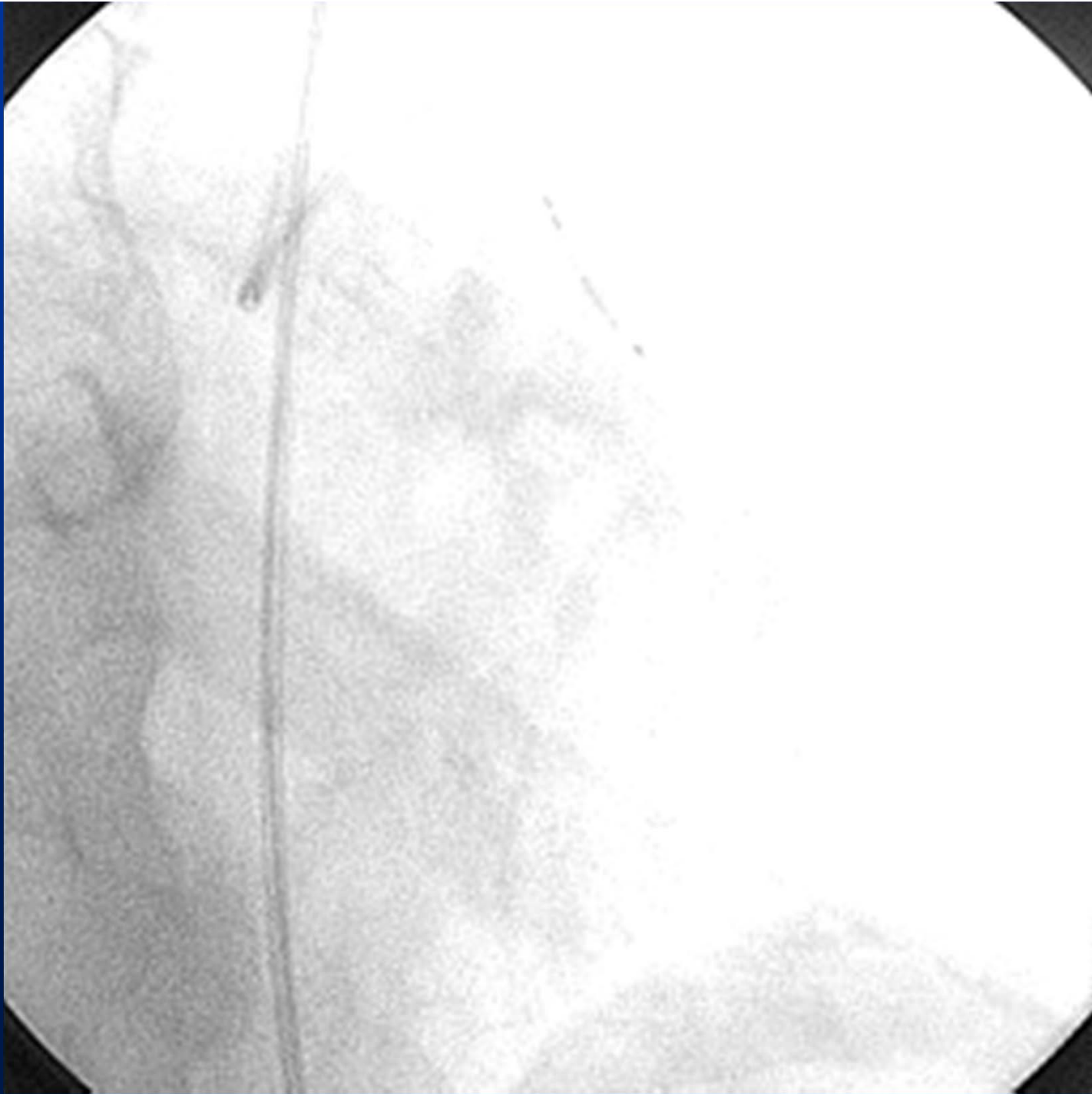




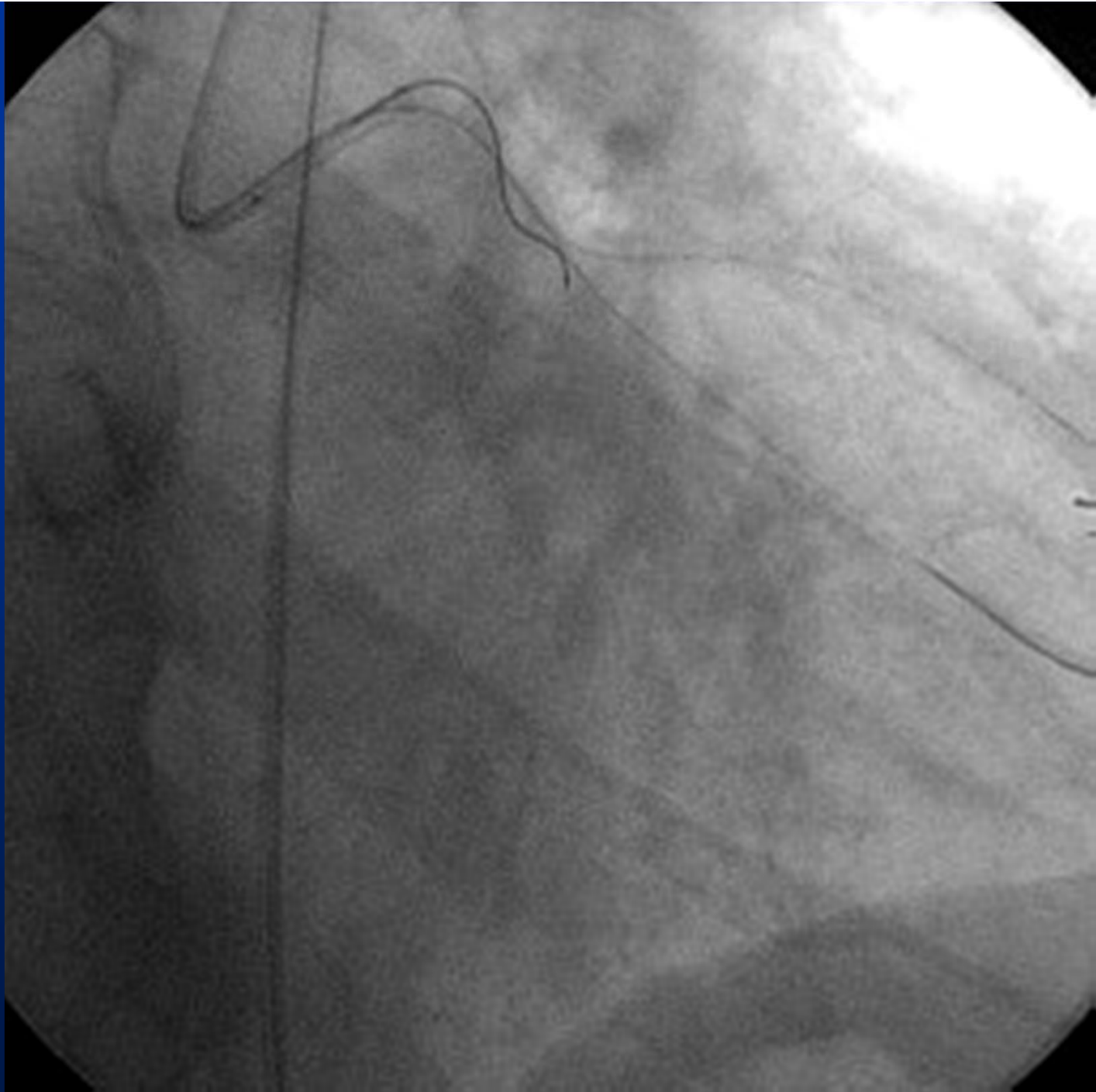
Sidebranch technique

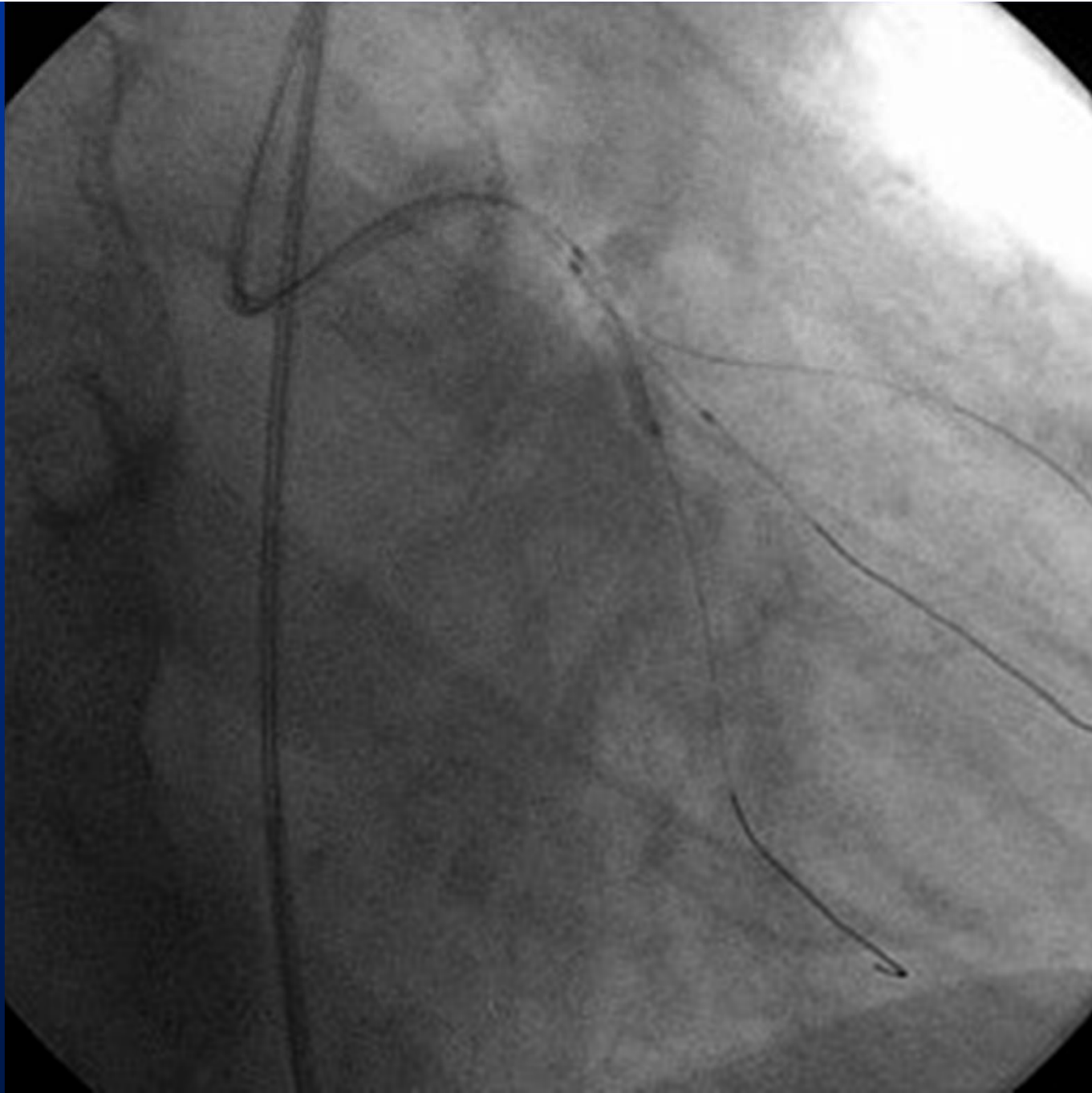


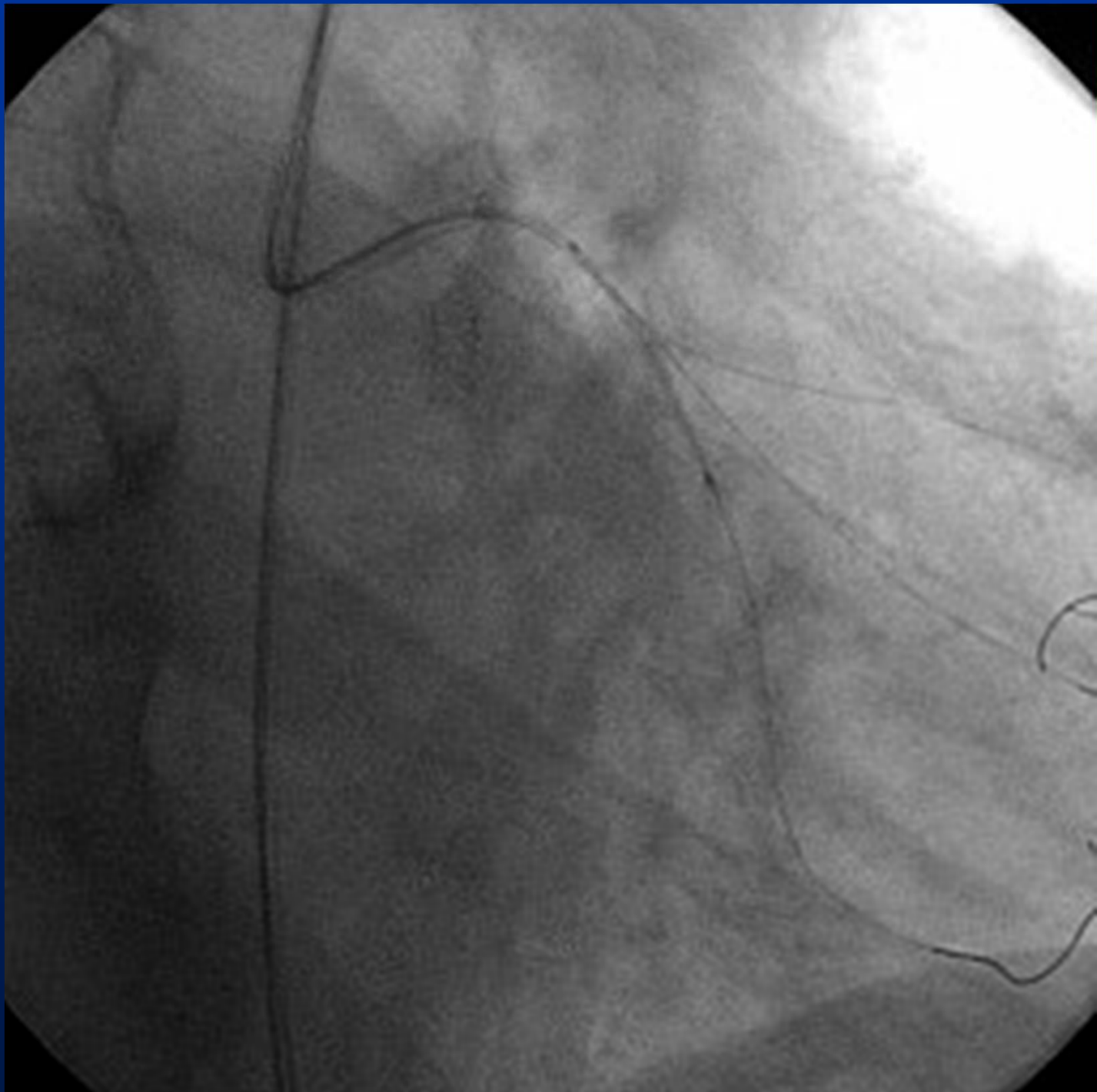
O. Katoh



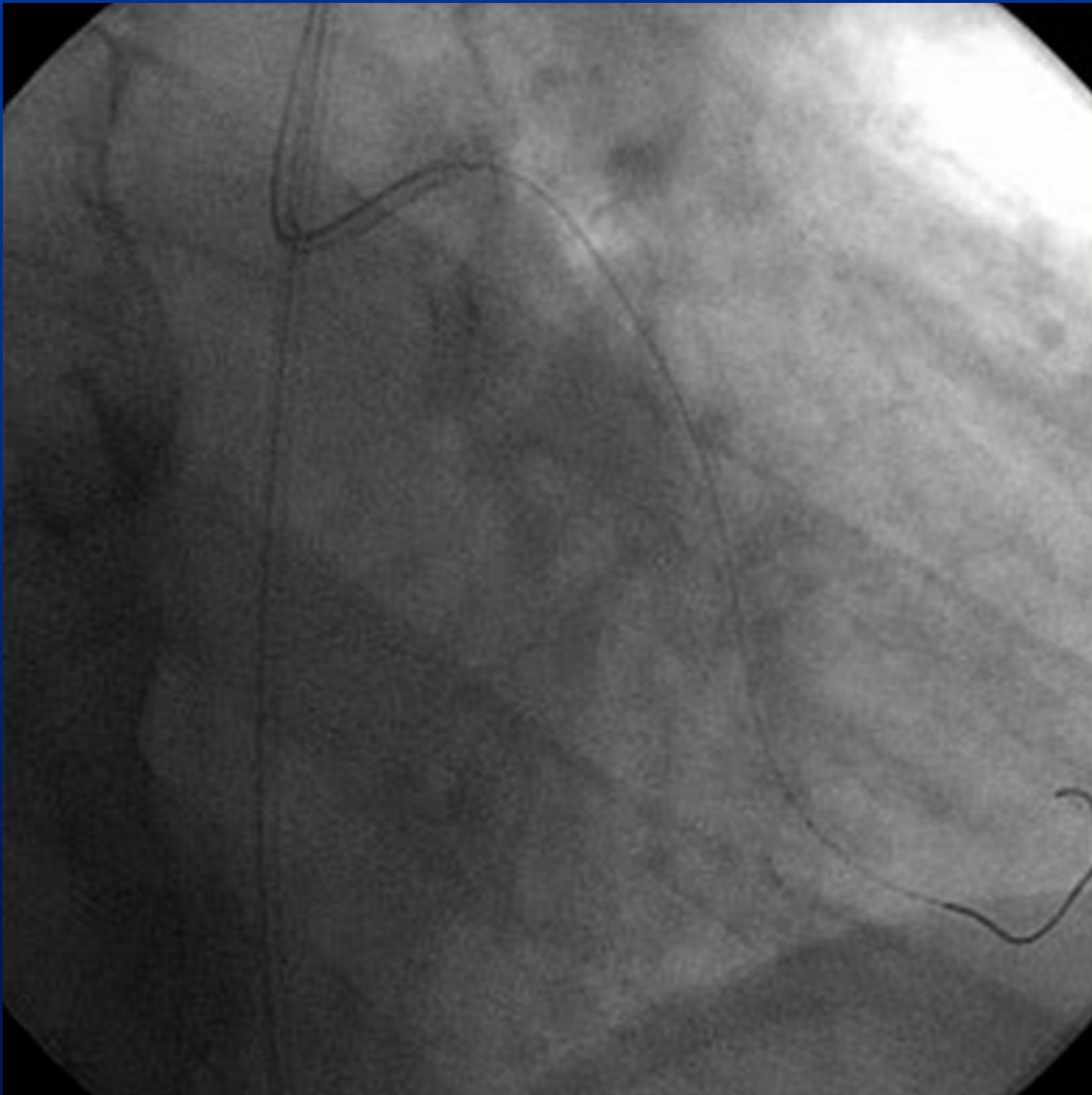
SB-
tech-
nique







Taxus-
Stent



Final result
w.o.further
ballooning

Reasons for failed CTO-PCI

EuroCTO Club 2006

(n=1659 CTO by 16 operators)

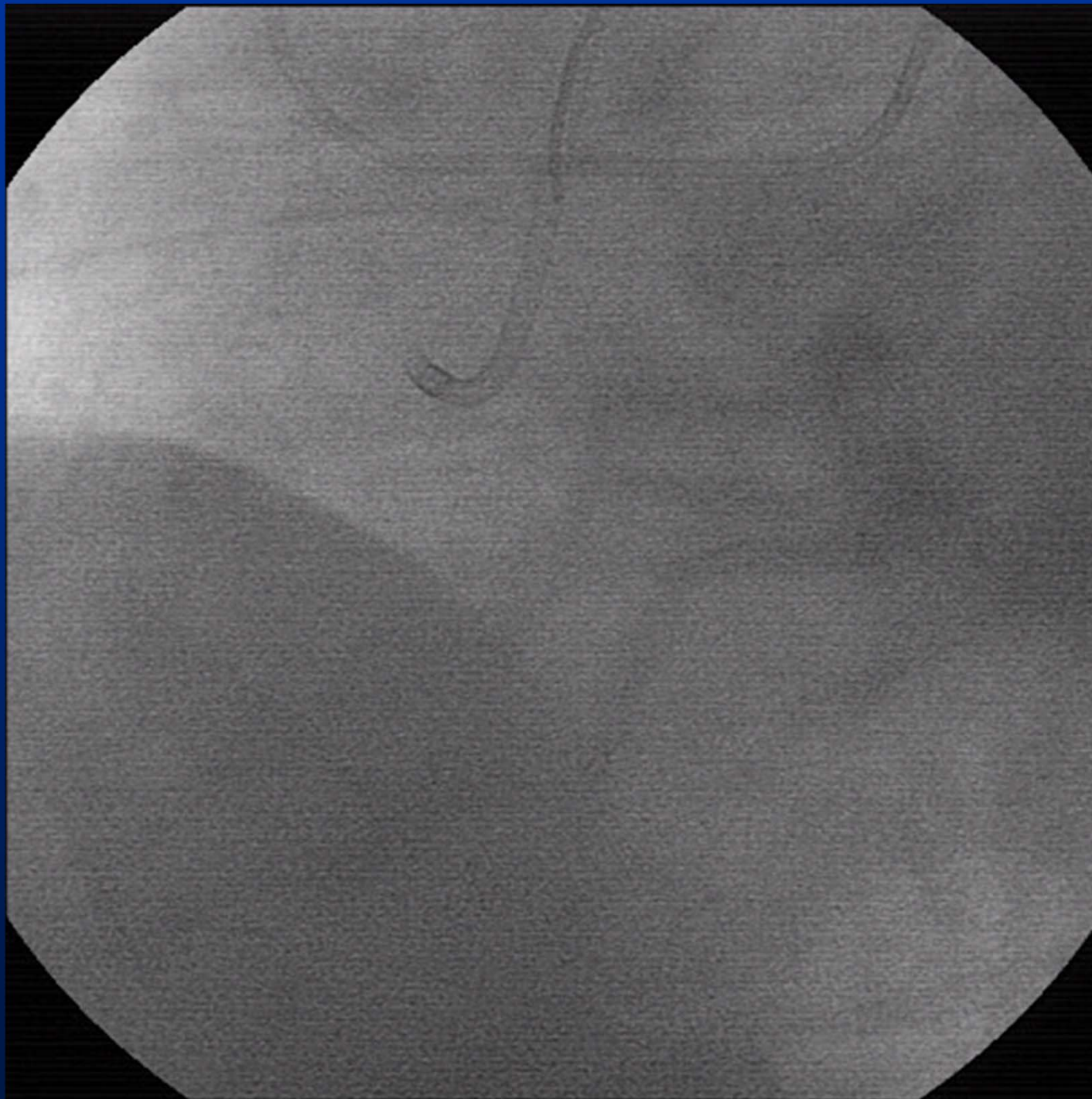
- Wire did not cross (89%)
- Balloon did not cross (4%)
- Stent could not be placed (2%)
- Severe complication (0.5 %)
- Other (e.g fatigue, limit of dye, no flow)
(4.5%)

Helpful easy techniques & devices if balloon fails

- Anchor wire (Ironman)
- Anchor balloon
- 2nd strictly parallel wire (Plaque crush)
- Tornus
- Laser Rotablator

CTO RCA

- 3 years CTO
- Angina CCS III caused by progression (CX)
- PCI failed 3 weeks ago (Balloon did not follow wire)



7F IMA

OTW 1.5

Crossit
100

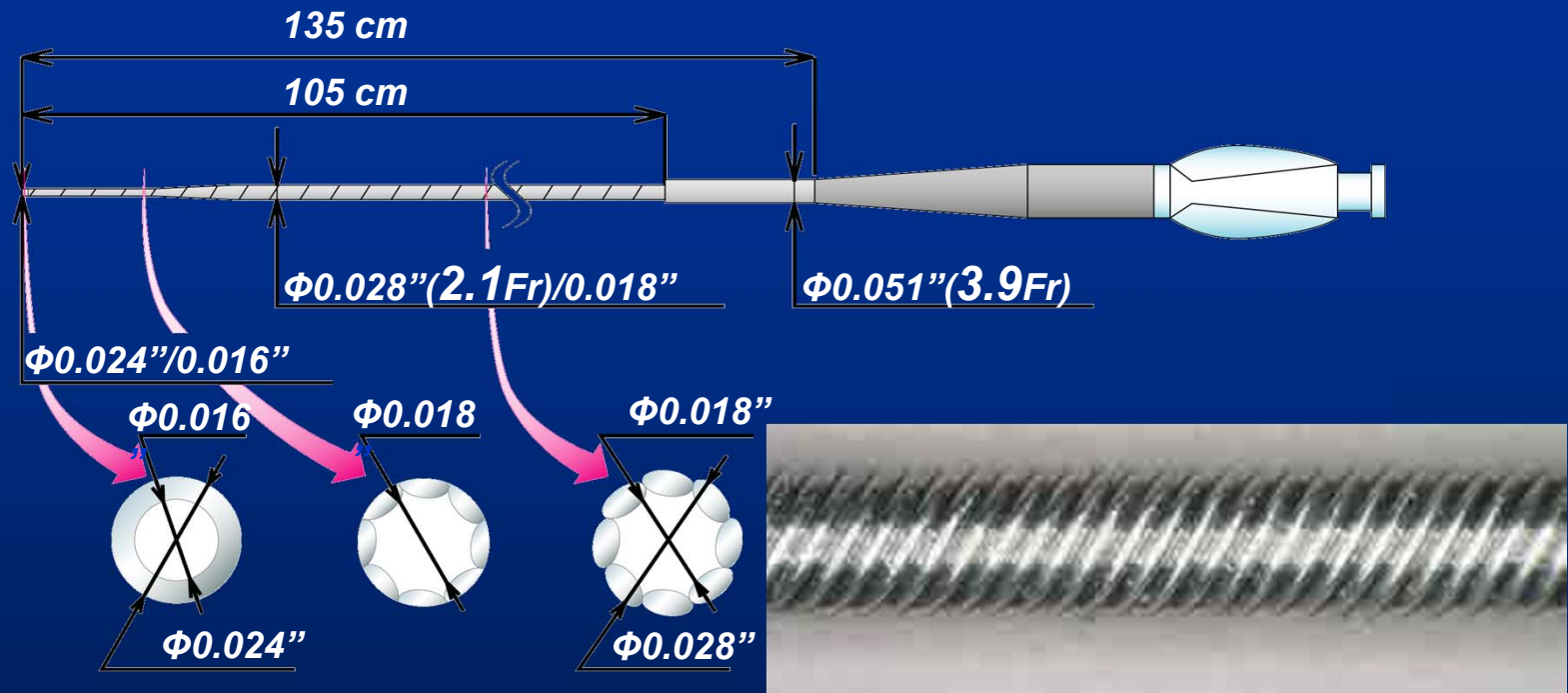
Contra-
lateral
injections



1.5
Maverick
does not
cross
despite
Ironman
for better
backup

Tornus “exchange” catheter (2.1 and 2.6 F)

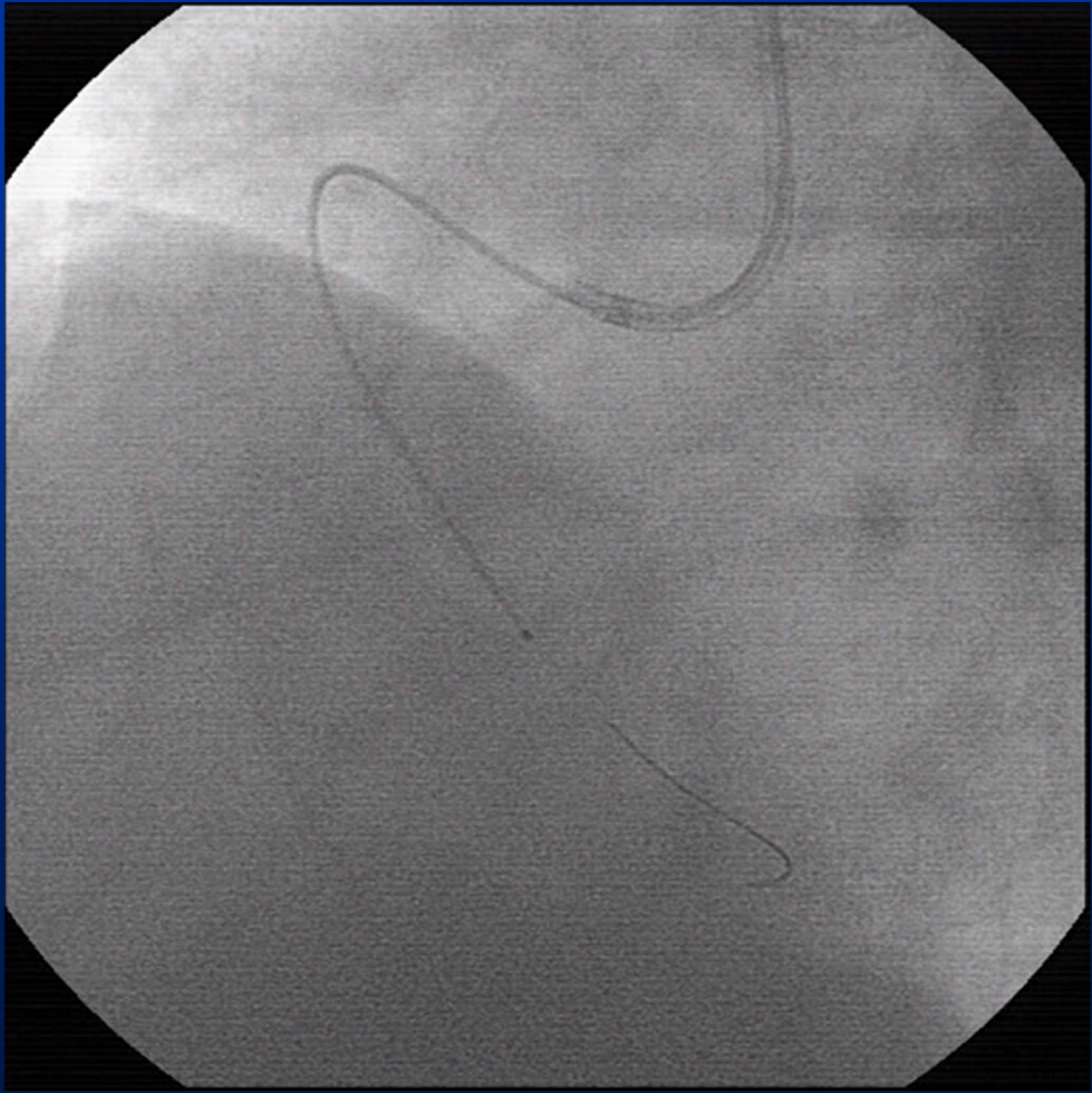
- Metal catheter with 8 stainless steel wires of spiral structure.

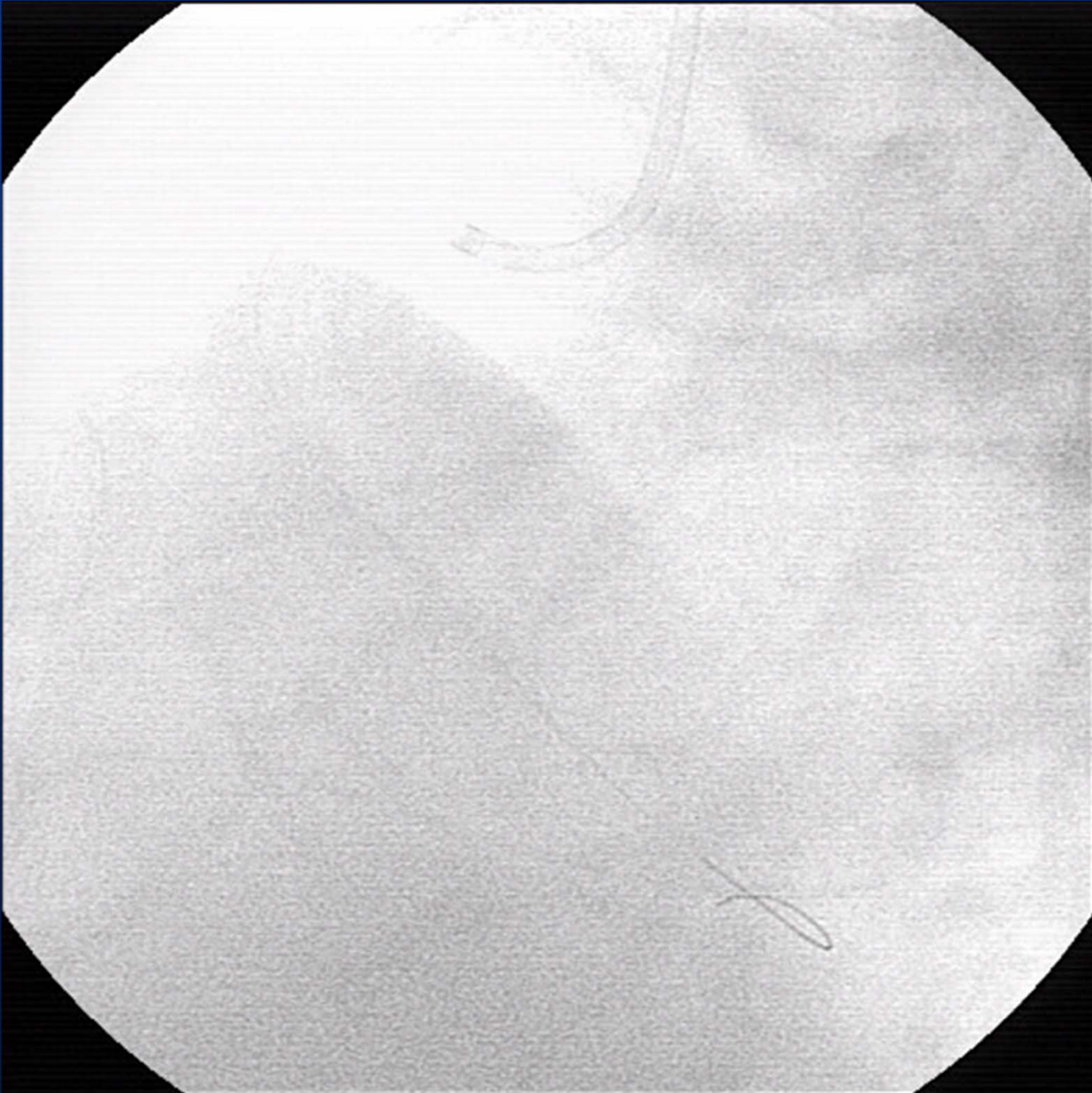


- **Spiral structure provides Screw motion.**

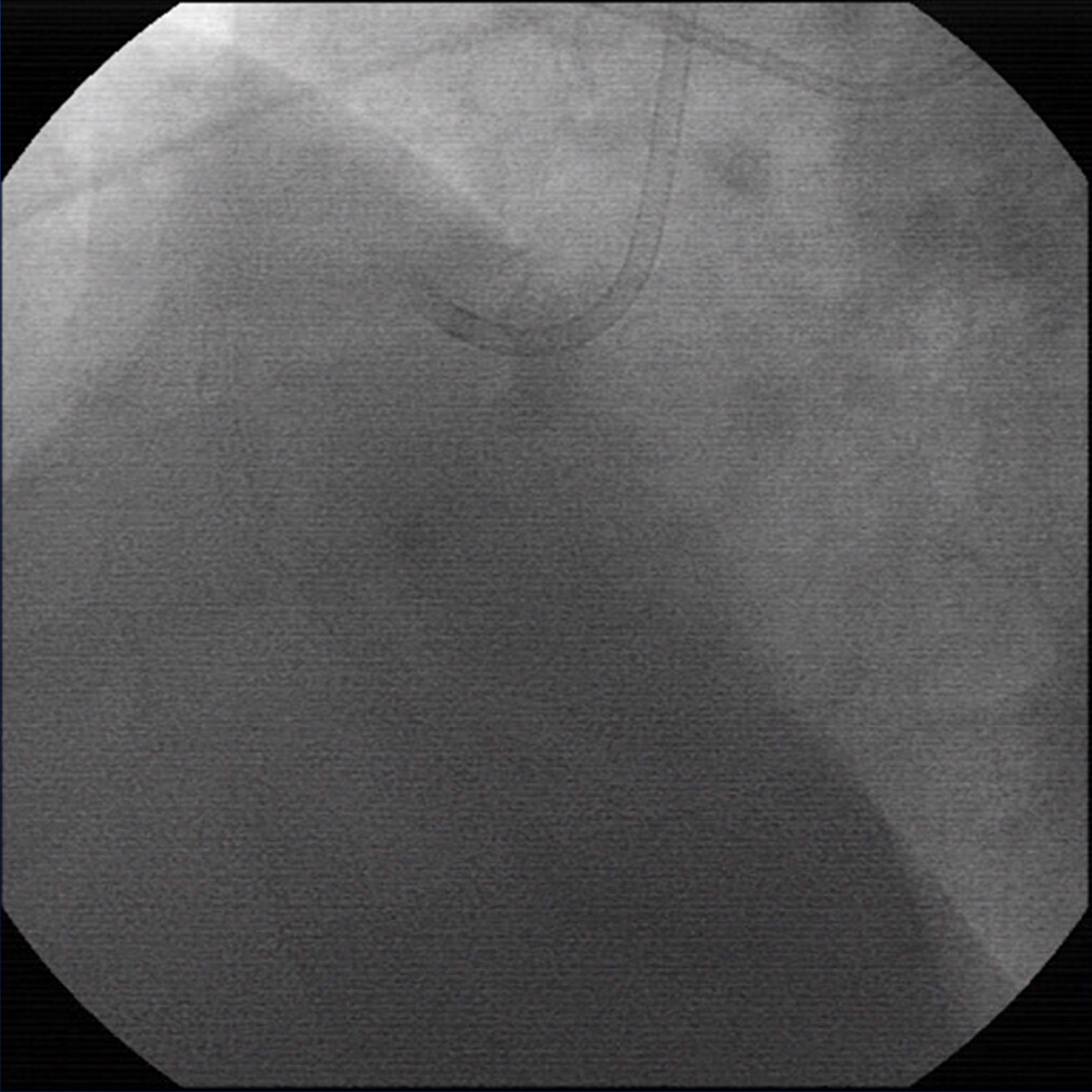
*Flushing is not possible because of clearance gaps between each single wire.

Tornus 2.6 F





After
Tornus



2
CURA
3.0x 28
mm

A novel penetration catheter (Tornus) as bail-out device after balloon failure to recanalise long, old calcified chronic occlusions

Nicolaus Reifart*, MD FESC, FACC; Darius Enayat, MD; Kiriakos Giokoglu, MD

Kliniken des Main Taunus Kreises and Kardiologische Praxis Prof. Reifart & Partner, Bad Soden, Germany

Results of Tornus* in CTO Balloon Failures (44/421)

- Tornus passed completely 35 (79.5%) and 5 incompletely
- Overall T-enhanced success 91%
- No complications

* Not yet available in Europe



Stop when...

- When you **shut off collaterals** by enlarging false lumen (worth a 2nd try)
- You tried **all options** (> >2 hours)
- Excessive **dye** consumption (GFR)
- Consider staged retrograde PCI



EURO CTO CLUB

THE EXPERTS “LIVE” WORKSHOP 2009

Taormina
Sicily
Italy

October 30-31 2009

- 150 participants
- State of the art lectures
- Highly teaching taped cases from the club-members
- A lot of discussion

Problem: alte In Stent Okklusion

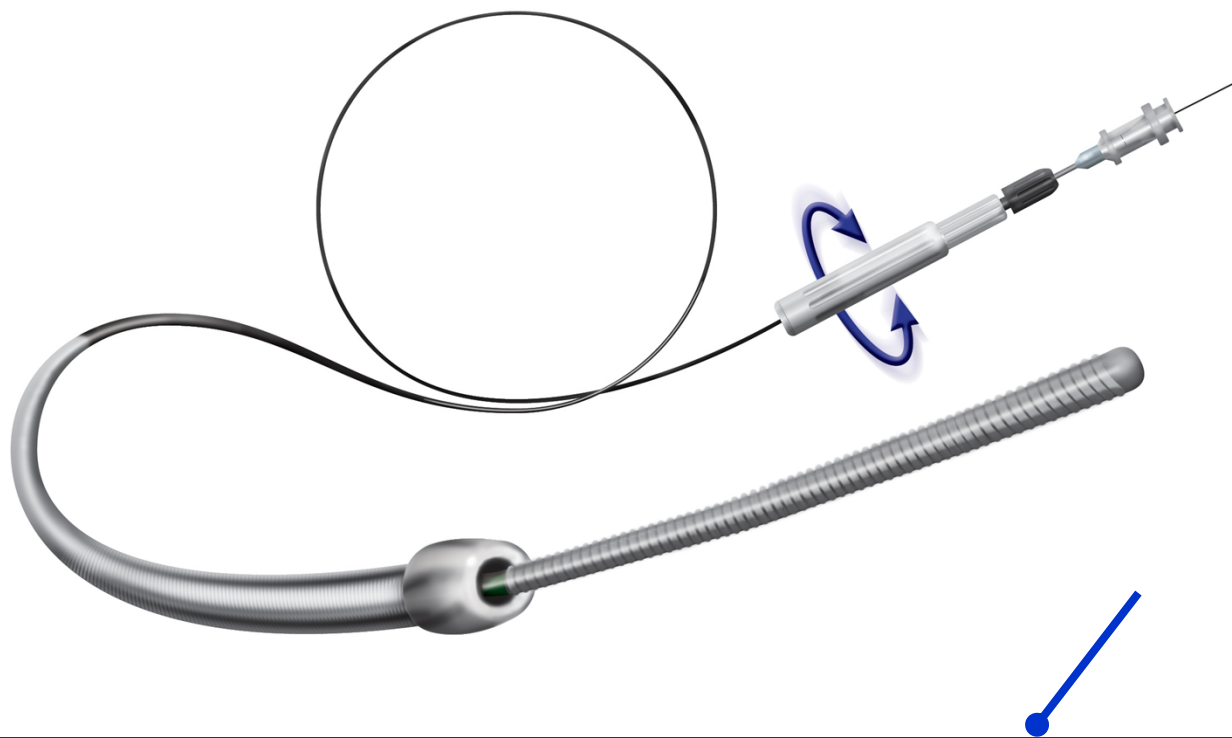
- Draht verhakt sich unter Struts
- Gefäßlumen (Eintritt) distal des Stents oft nicht gut erkennbar
- Draht leicht parrallel zu Stent in falschem Lumen, dann Austritt subintimal
- Mögliche Lösung: CrossBoss

The CrossBoss™ CTO Catheter Design

Tracks via *FAST Spin* Technique

- Highly torqueable coiled-wire shaft
- FAST Spin reduces push required to cross CTO

0.014" guidewire compatible (OTW)



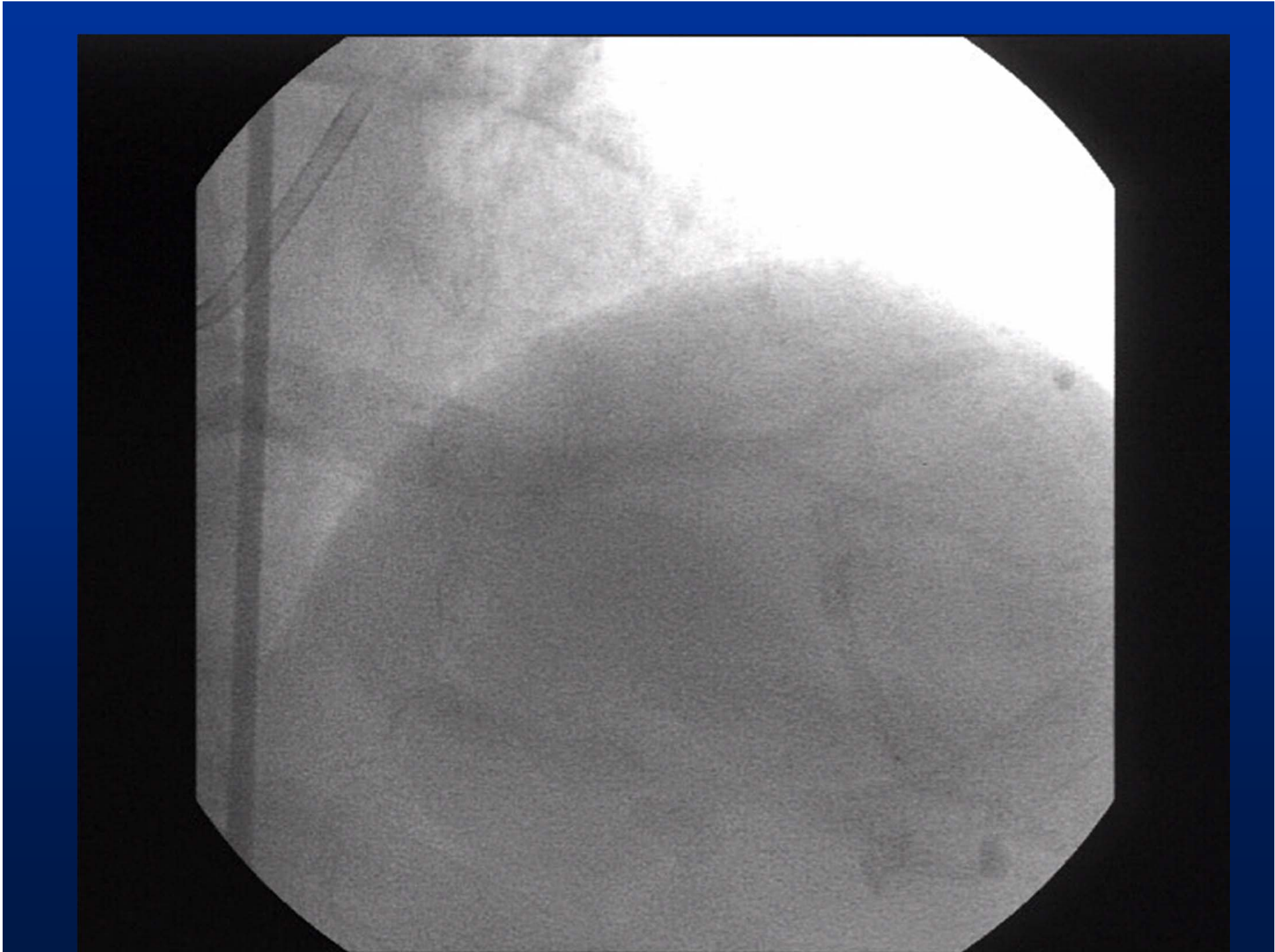
Atraumatic 1mm rounded distal tip

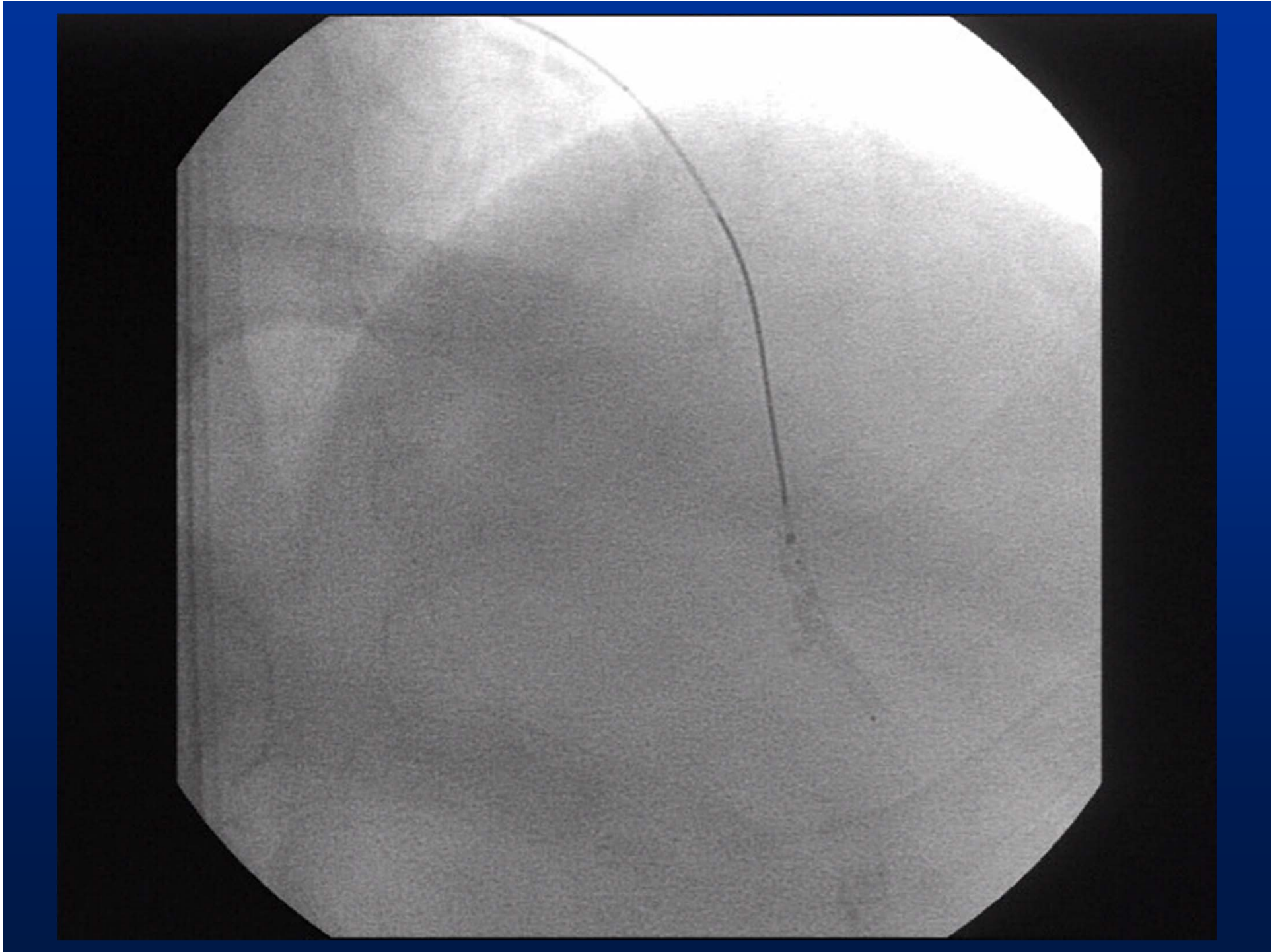
Caution: Investigational Device, Limited by US Law to Investigational Use

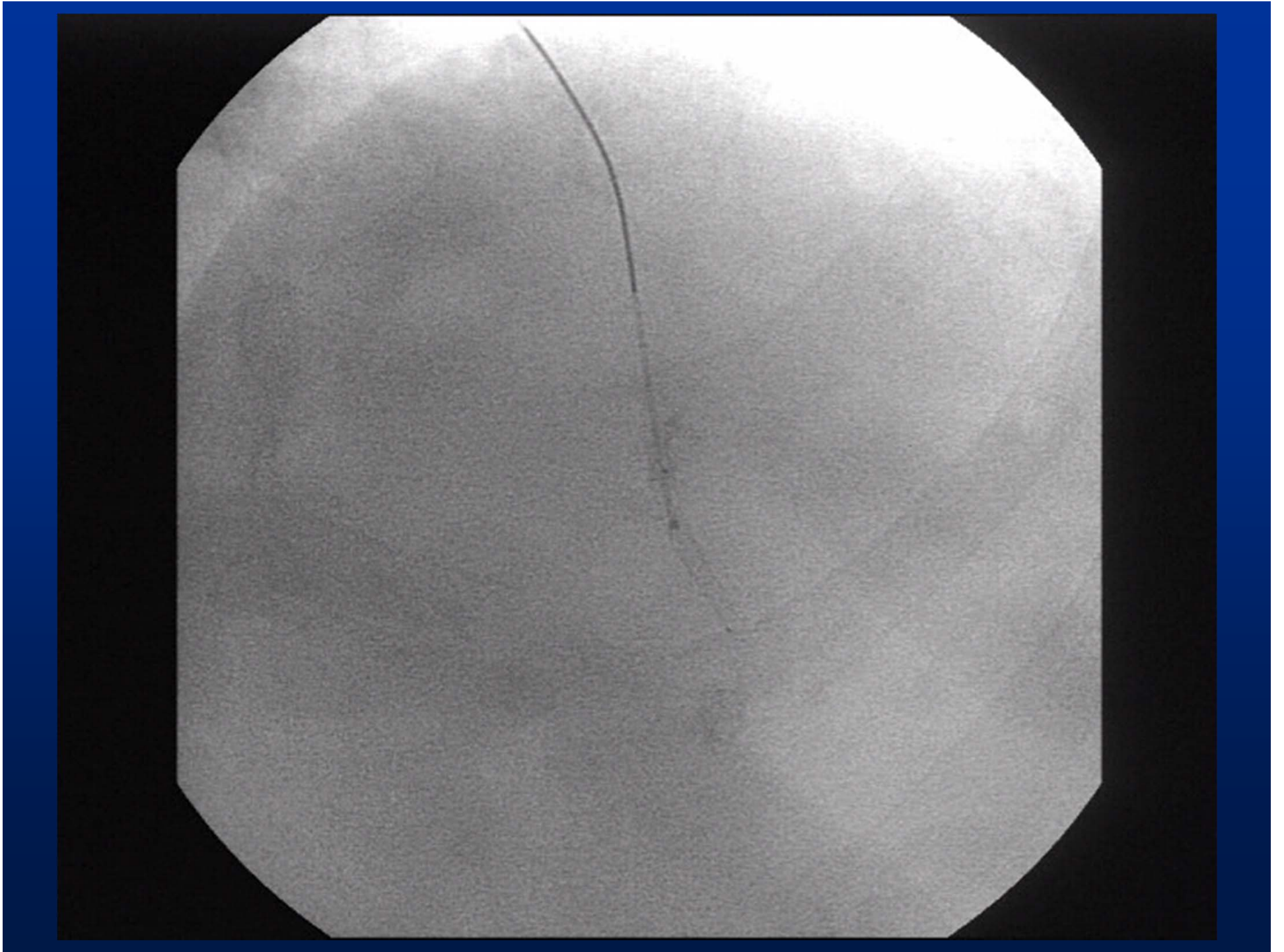


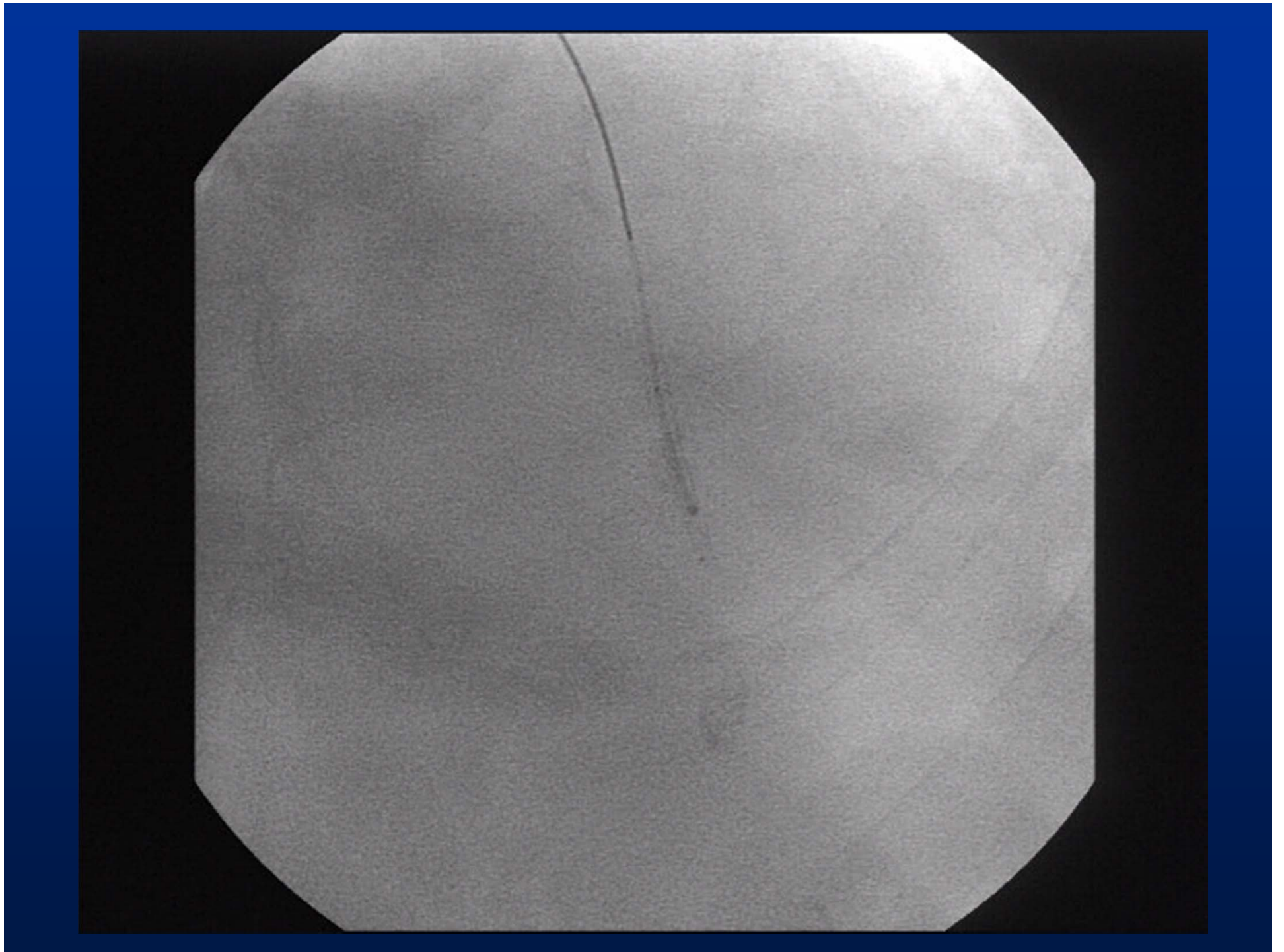
Instant CTO (5044237)

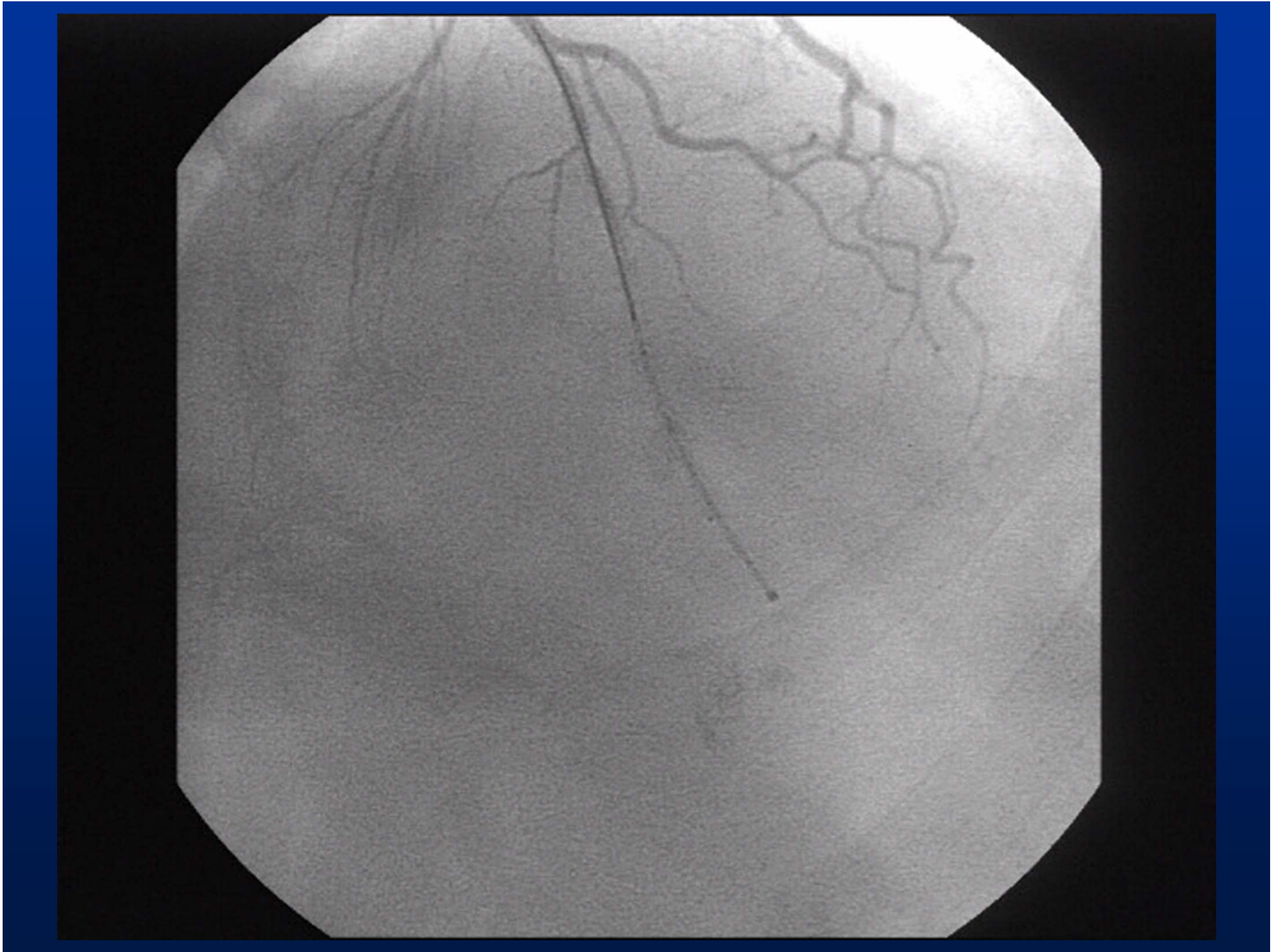
- LAD IS CTO – about 2 years old
- LV normal
- Angina CCS 2

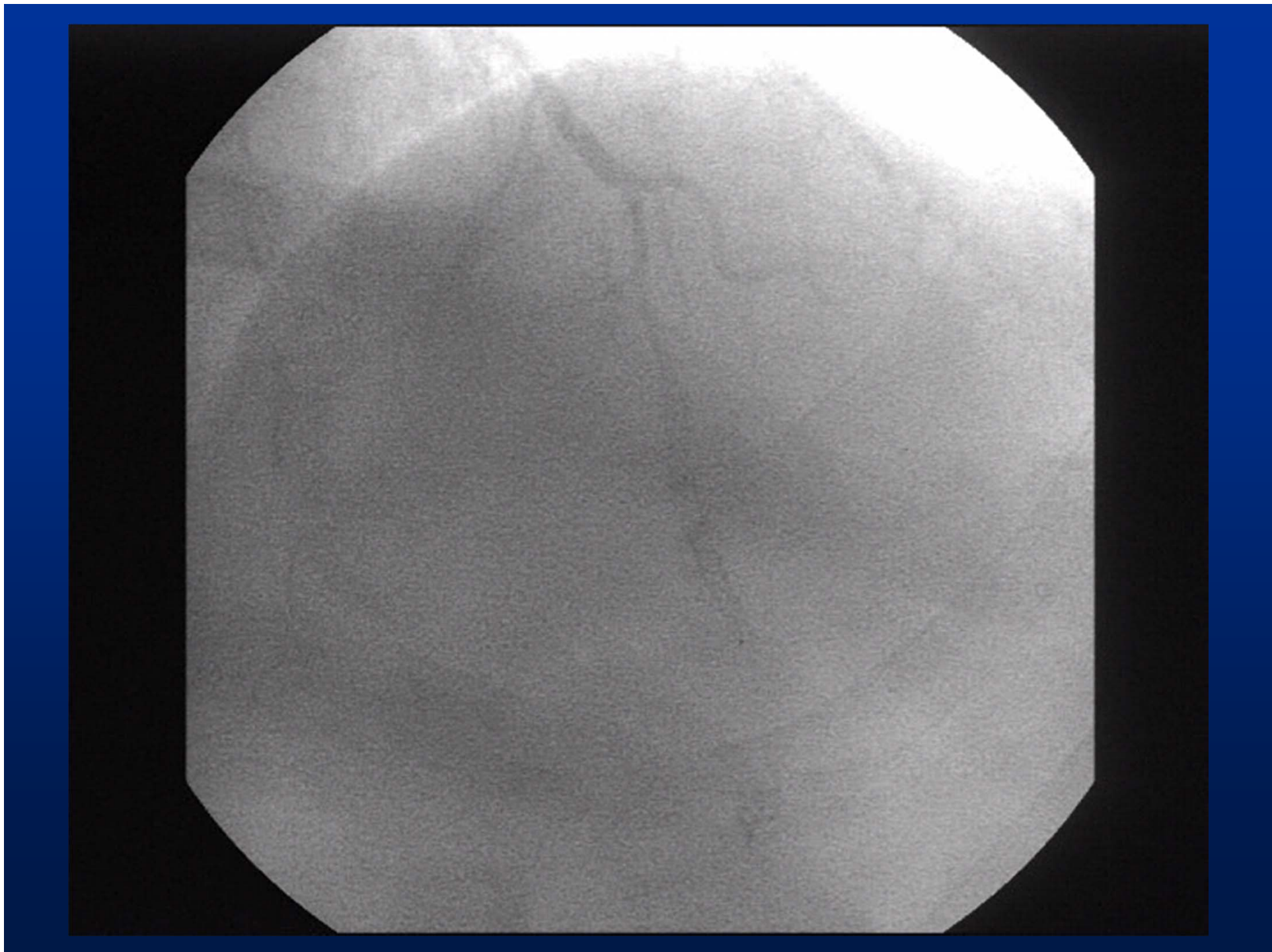




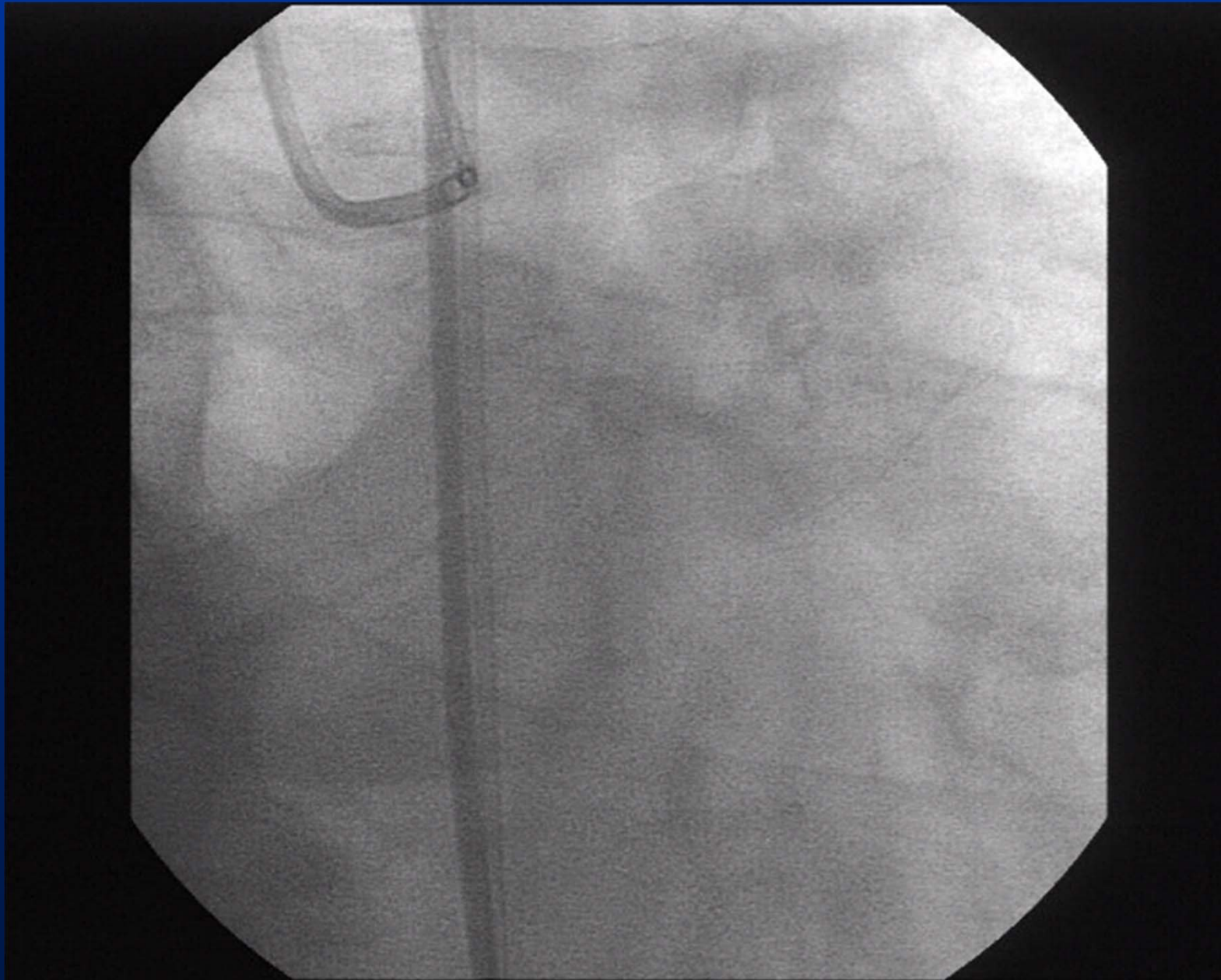




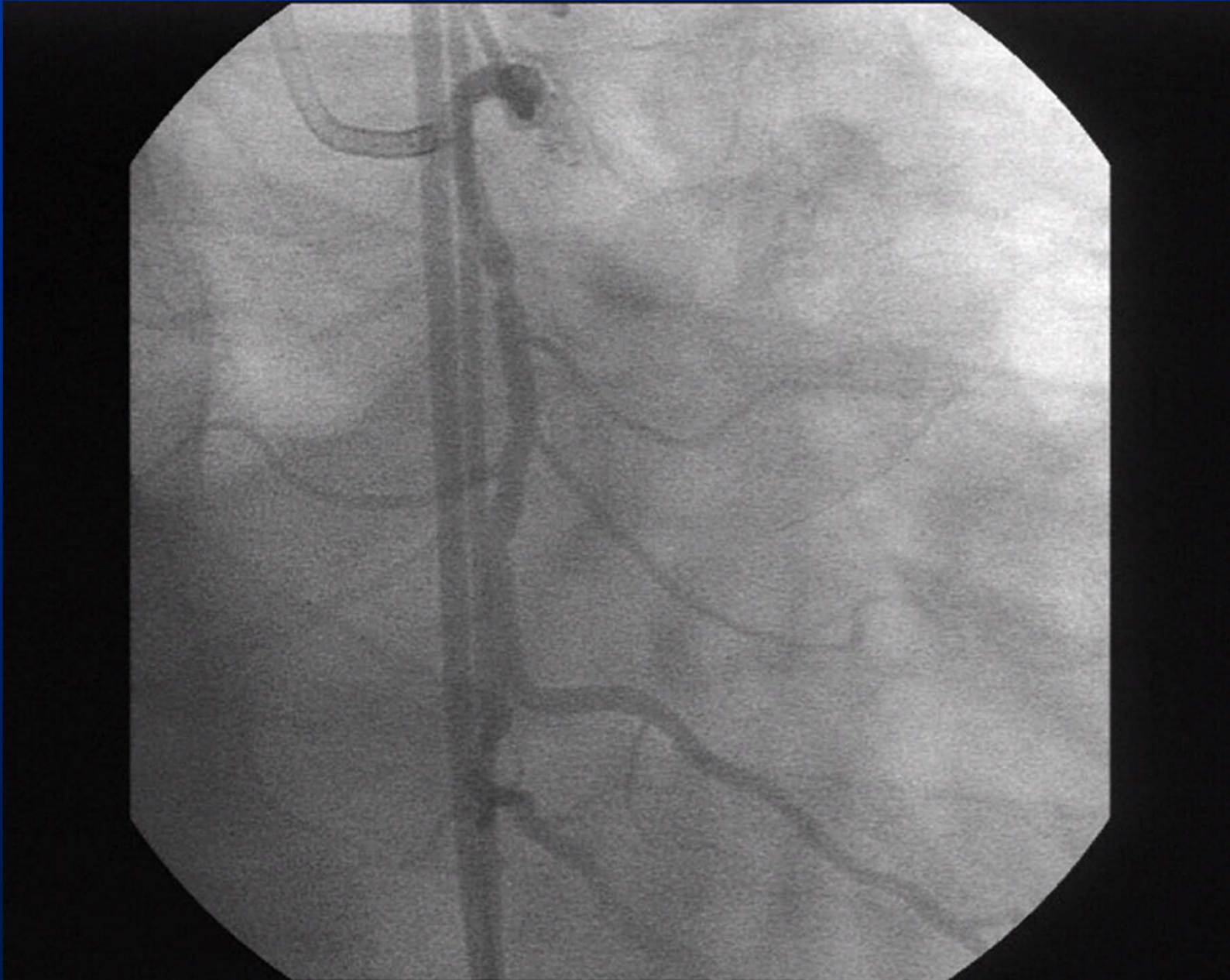


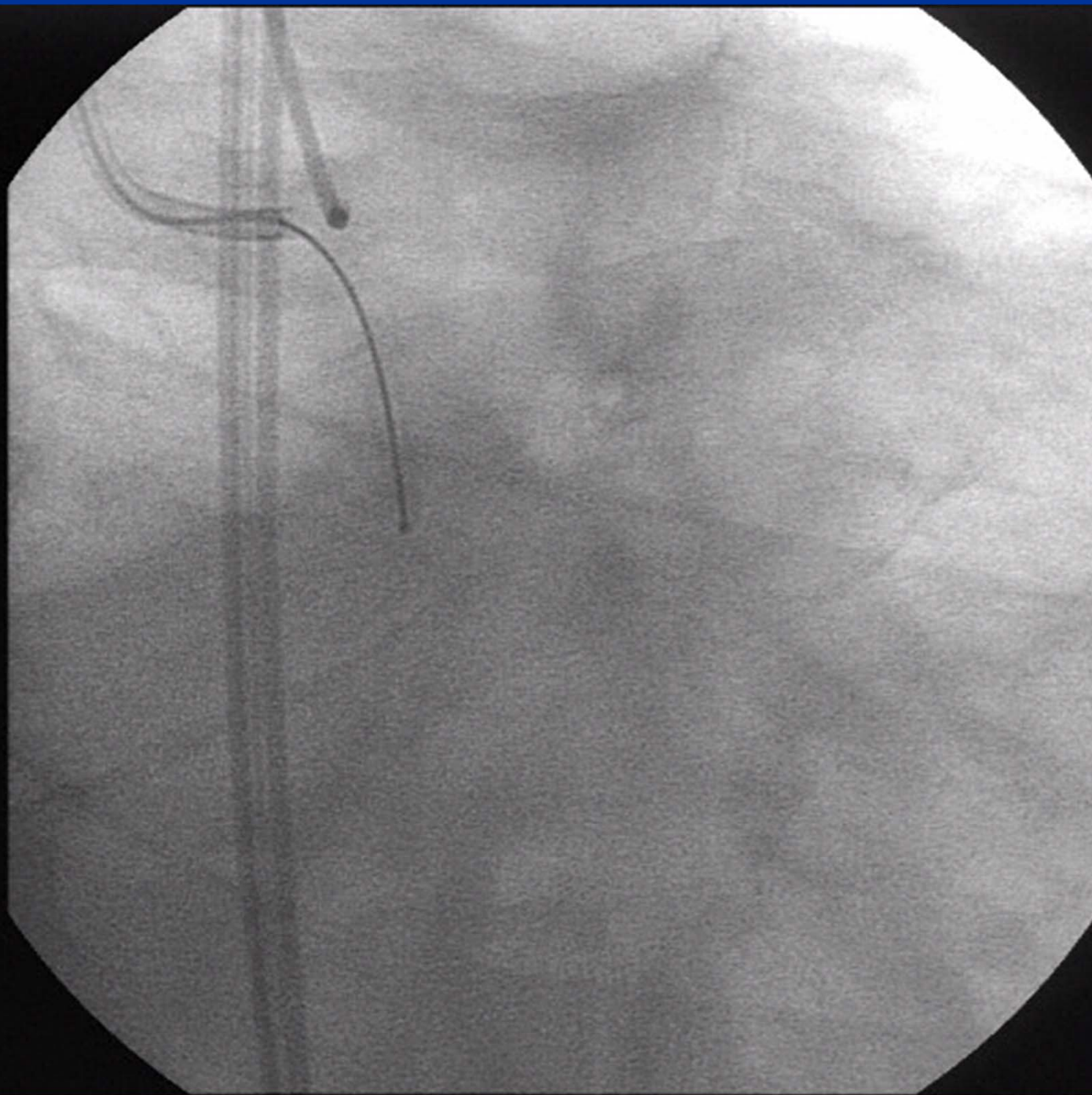


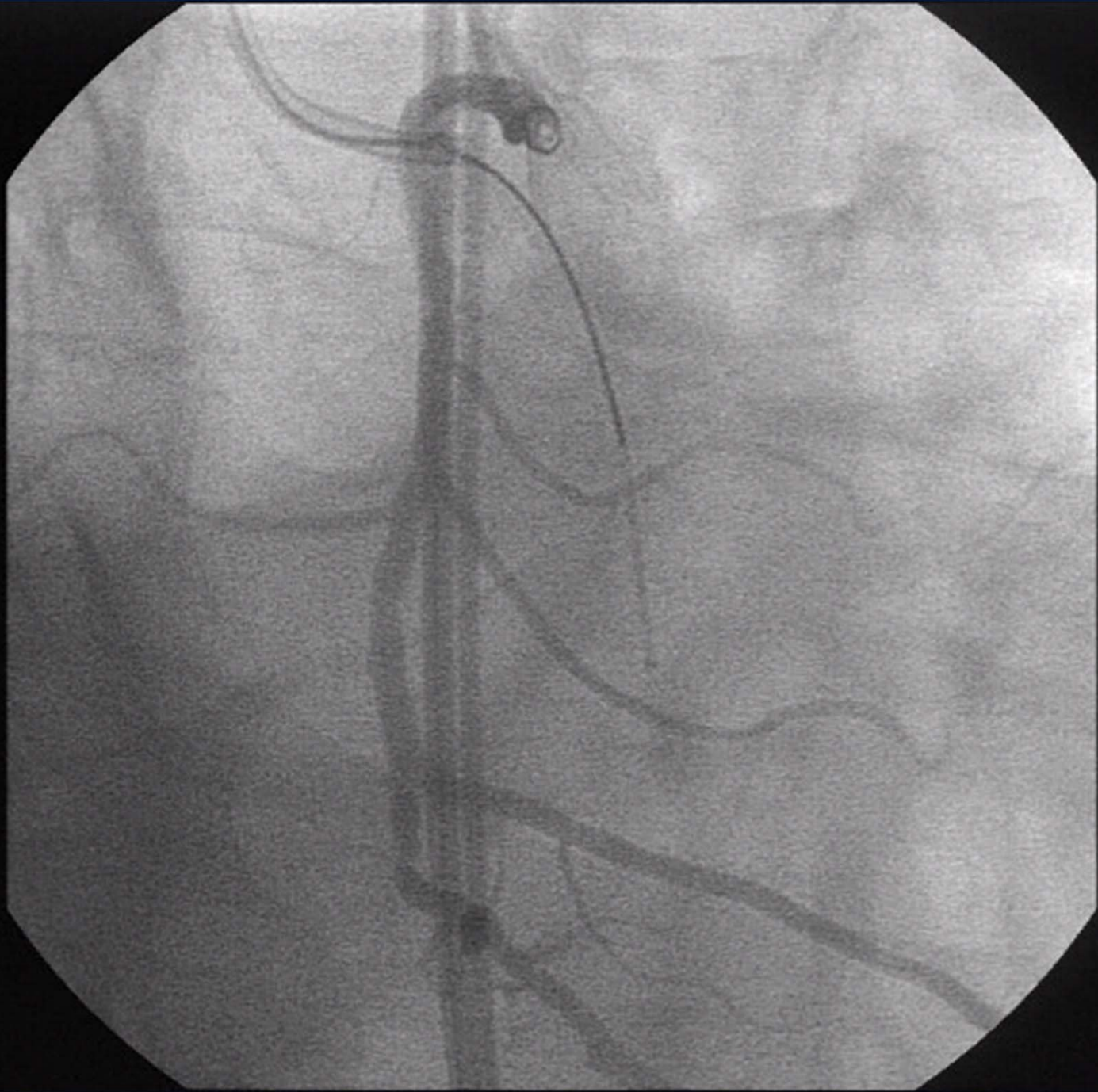
In Stent Okklusion 4 Jahre alt

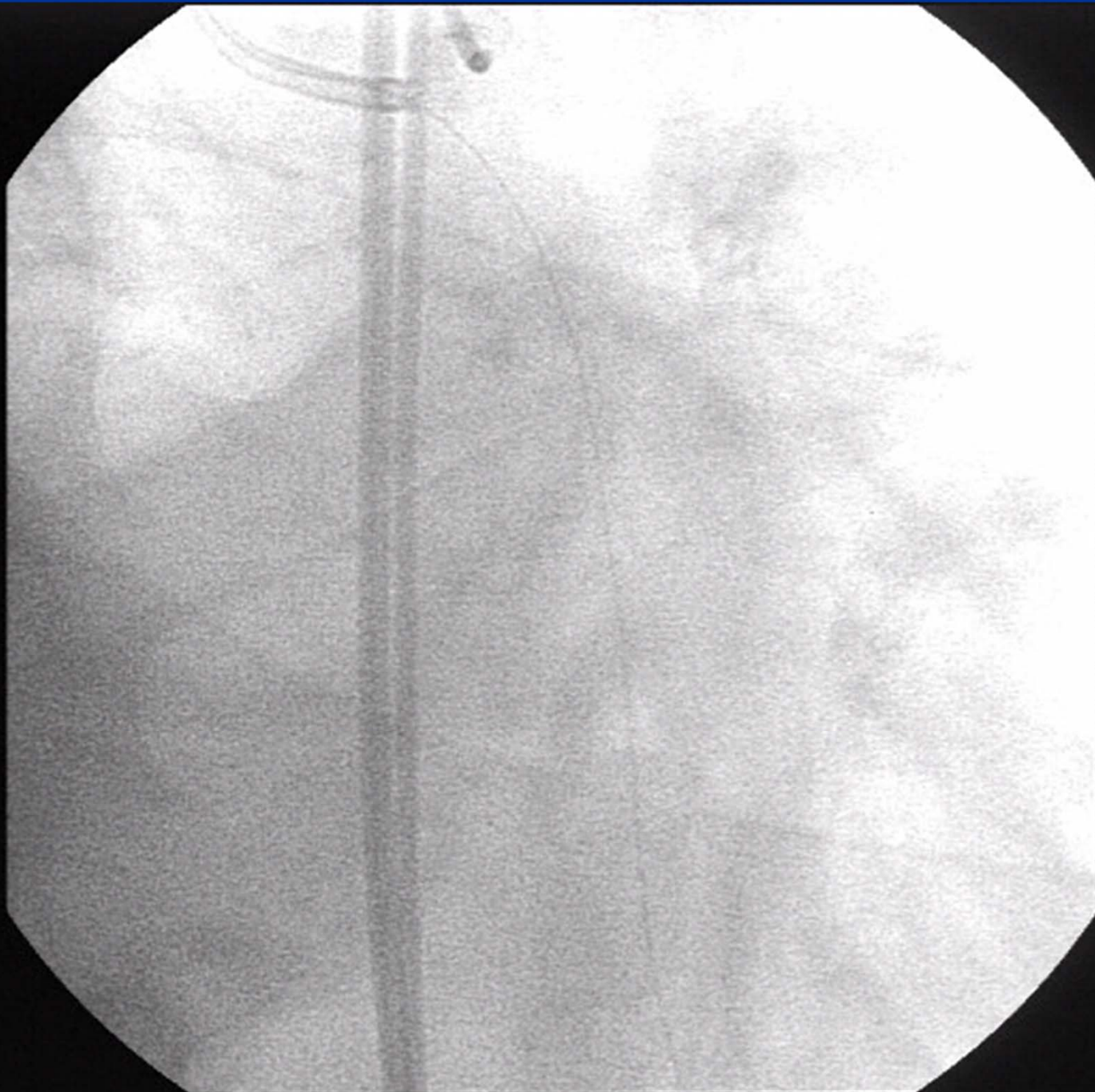


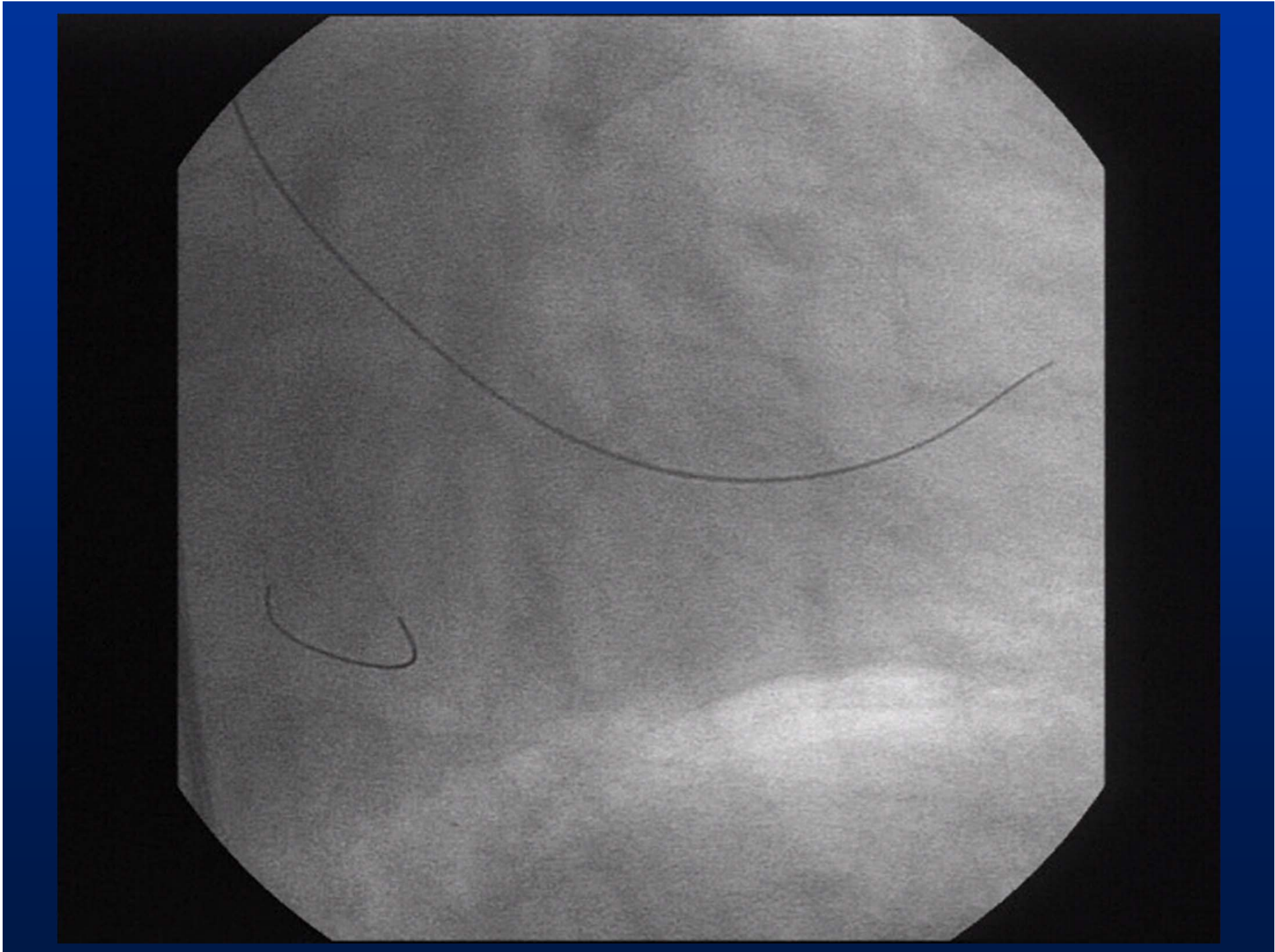
ca 35 mm lang....

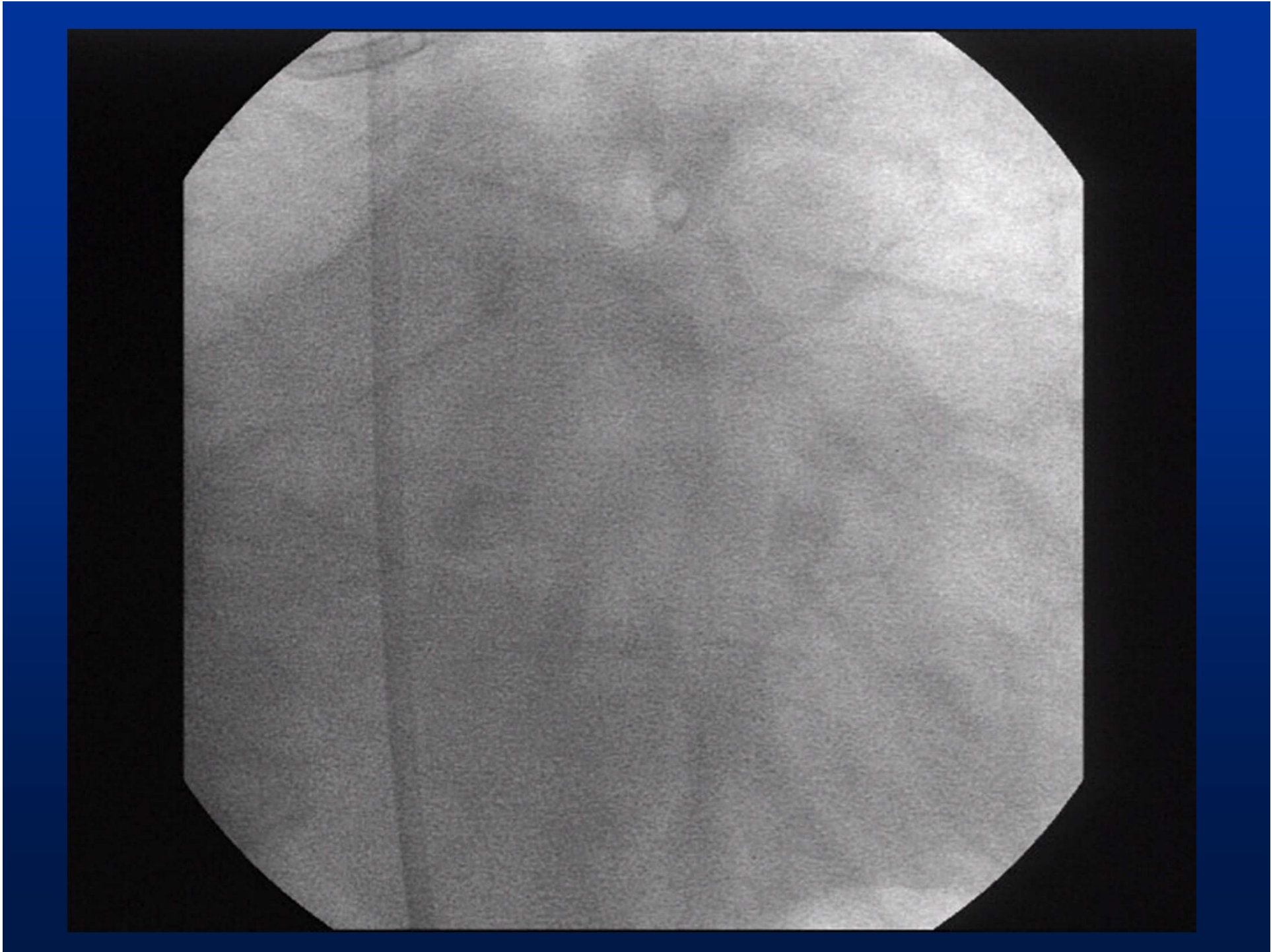












CrossBoss

- Leichte, intuitive Handhabung
- Erleichtert Stentpassage
- Atraumatische flexible Spitze verhindert subintimalen Eintritt in Gefäßlumen

Das CTO-Problem Subintimale Passage

- Mit Parralleldraht neuen Kanal suchen
- STAR-Technik (antegrade Dissktion mit der Hoffnung eines Reentry)
- IVUS-kontrollierte Suche des korrekten Lumens (erweitert falschen Kanal und komprimiert korrekten Kanal)
- Retrograde Techniken (aufwändig)
- StingRay gezieltes Reentry

The Stingray™ CTO Re-Entry System Design

Compatibility:
6Fr. Guide/0.014" Wire

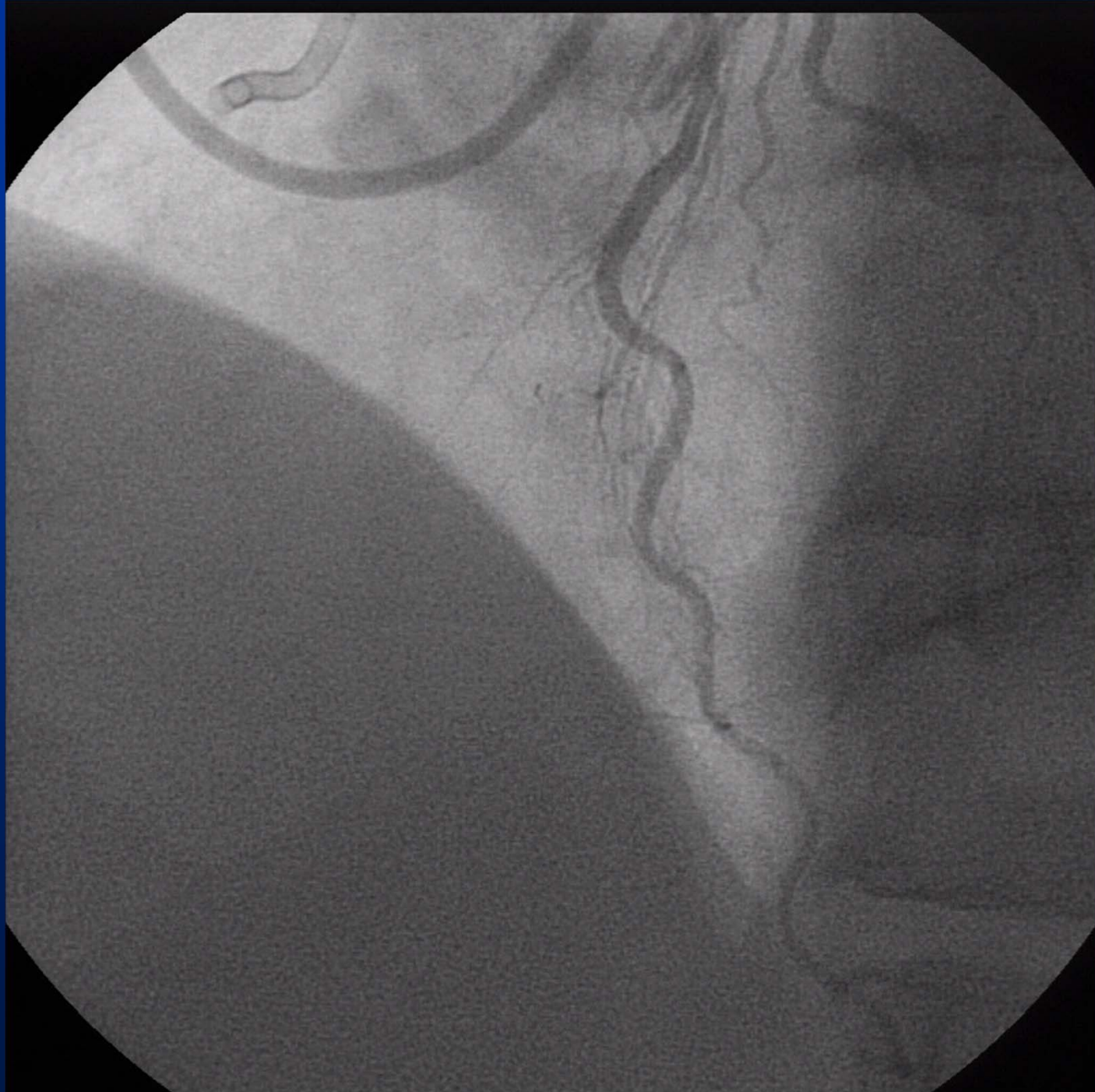
Unique self-orienting
balloon has a flat shape

180° opposed and offset
exit ports for selective
guidewire re-entry

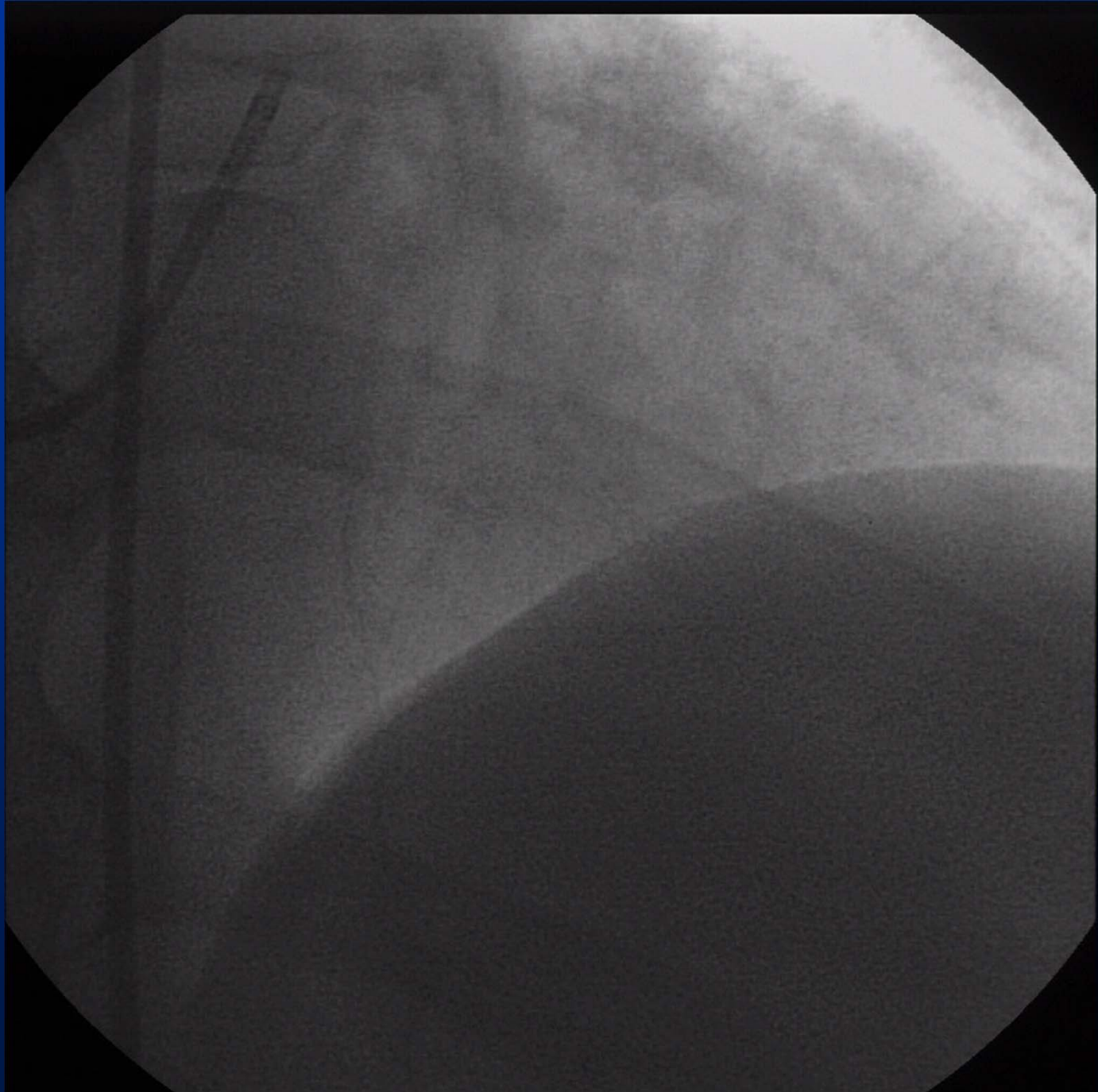
0.020" crossing
profile

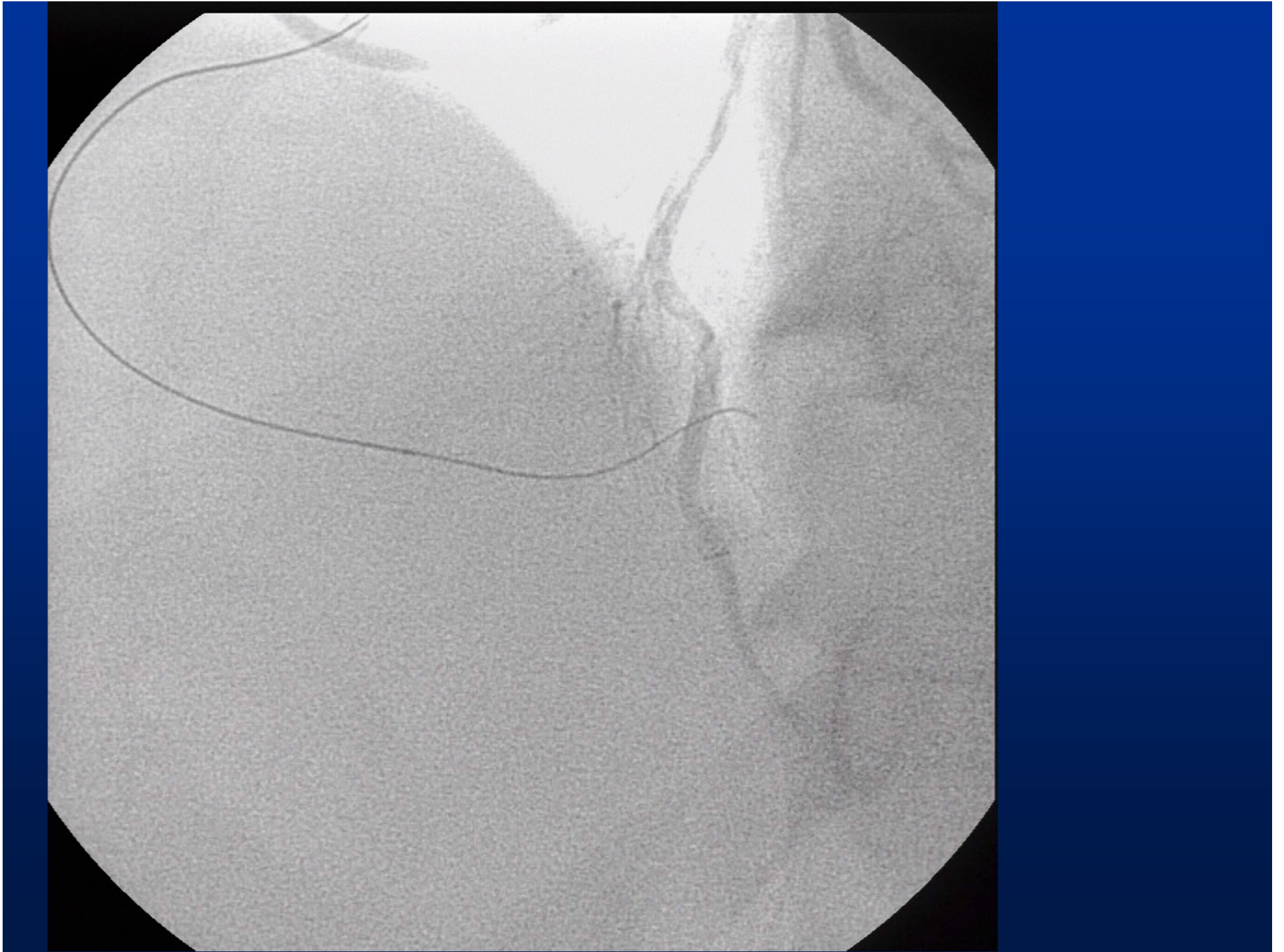
Re-entry probe at
guidewire tip

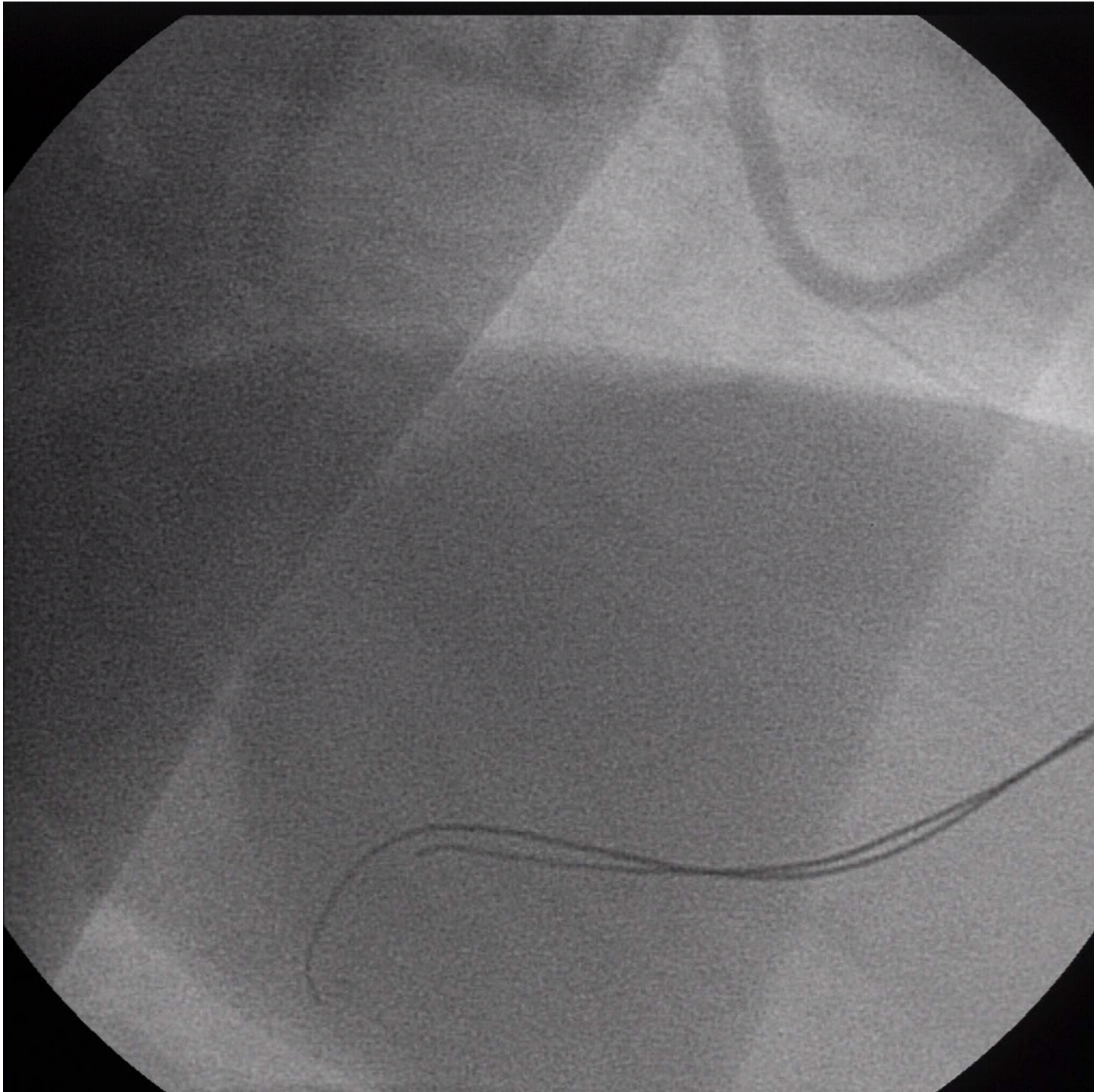
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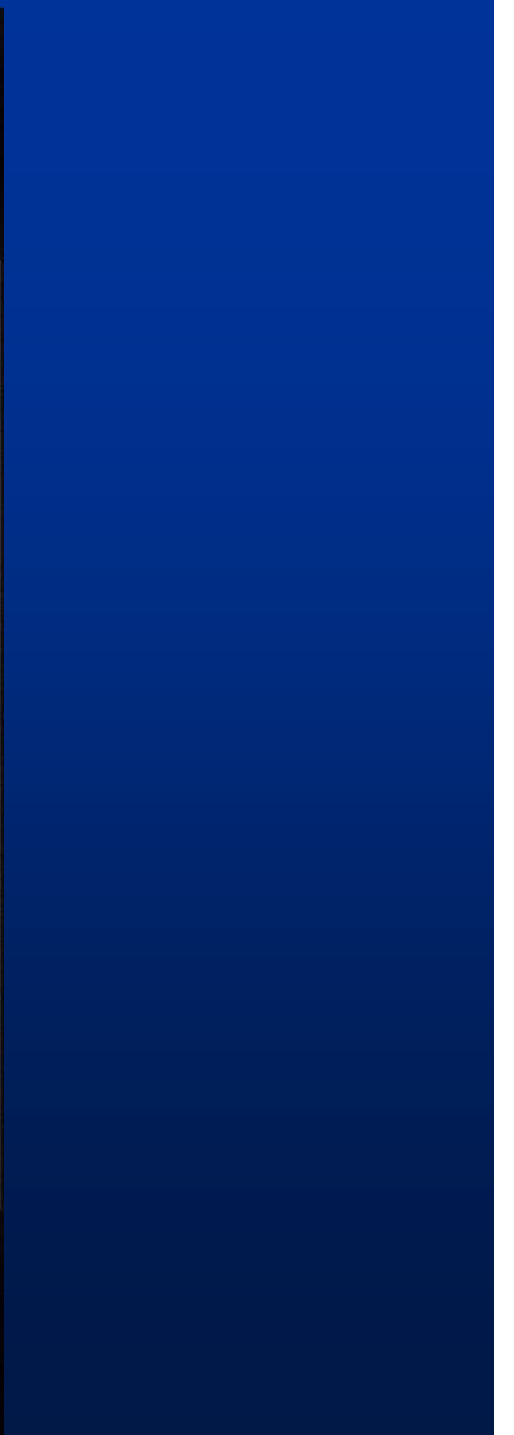
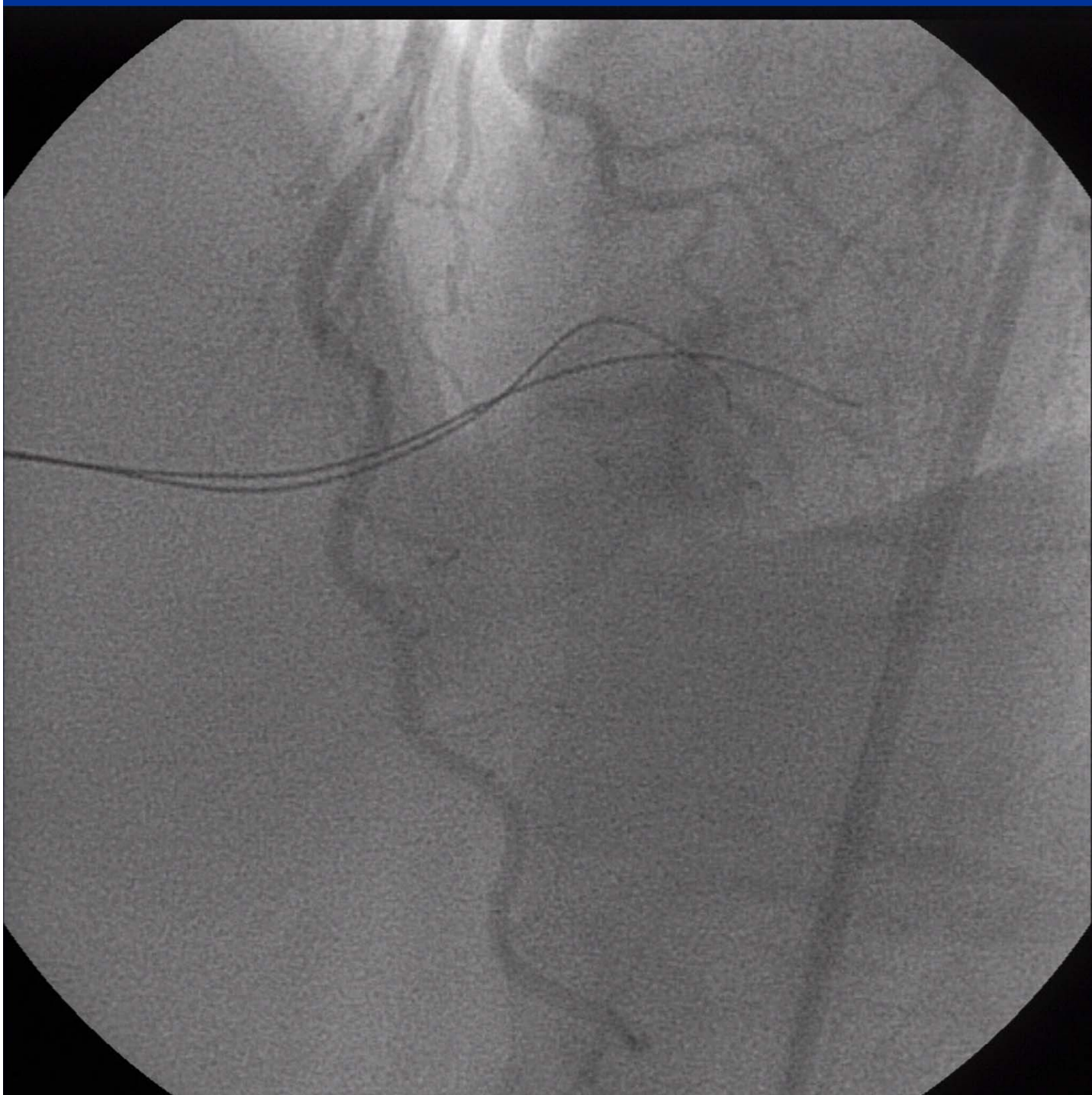
Ca 45 mm
lange RCA
CTO , > 36
M alt, 1
Fehlversuch

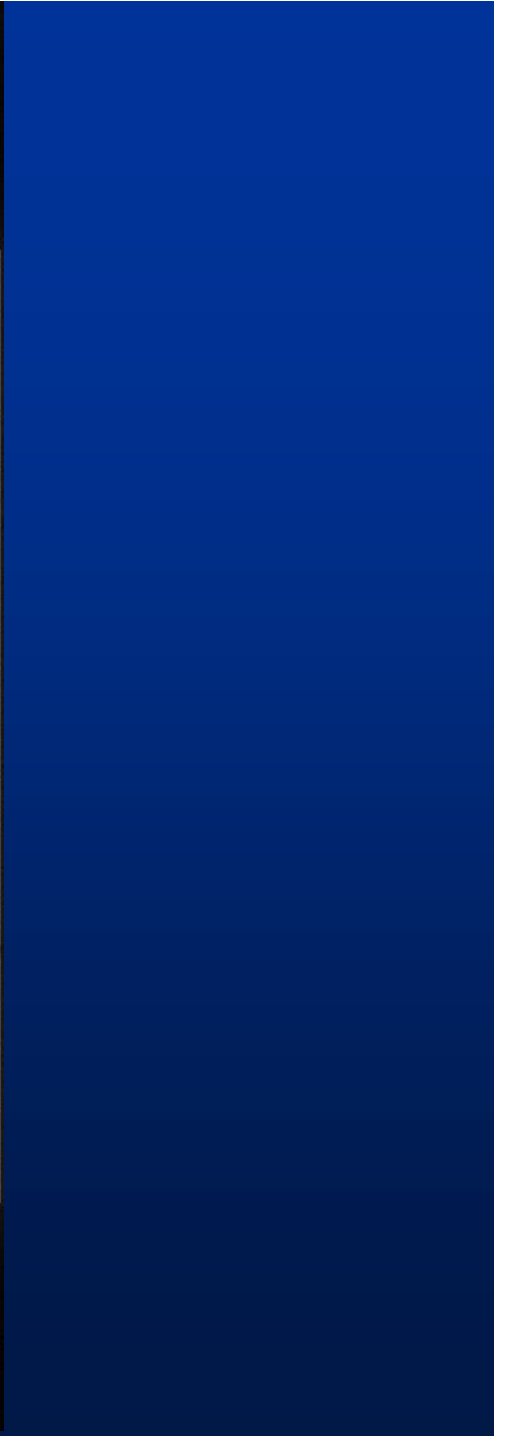
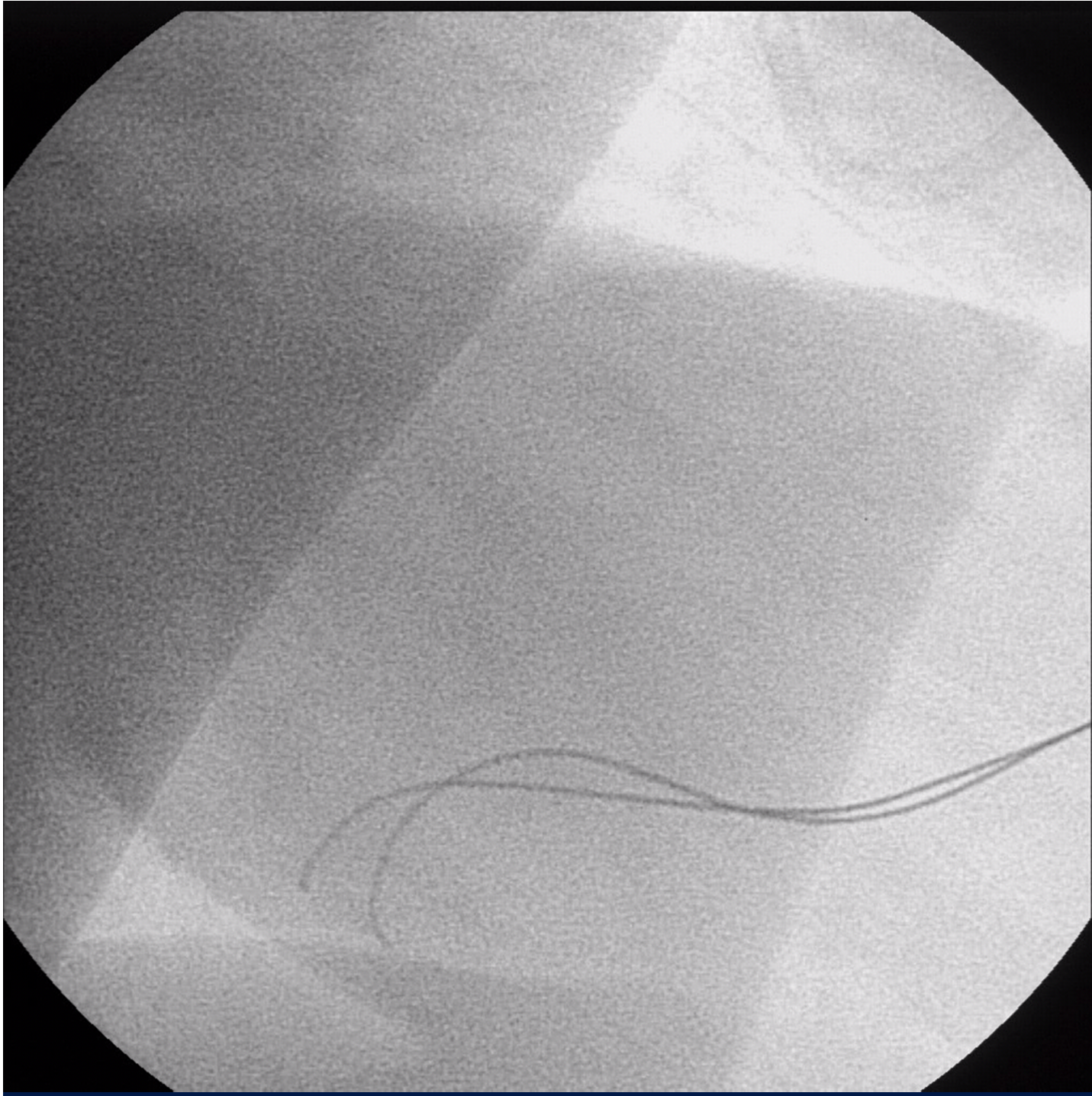




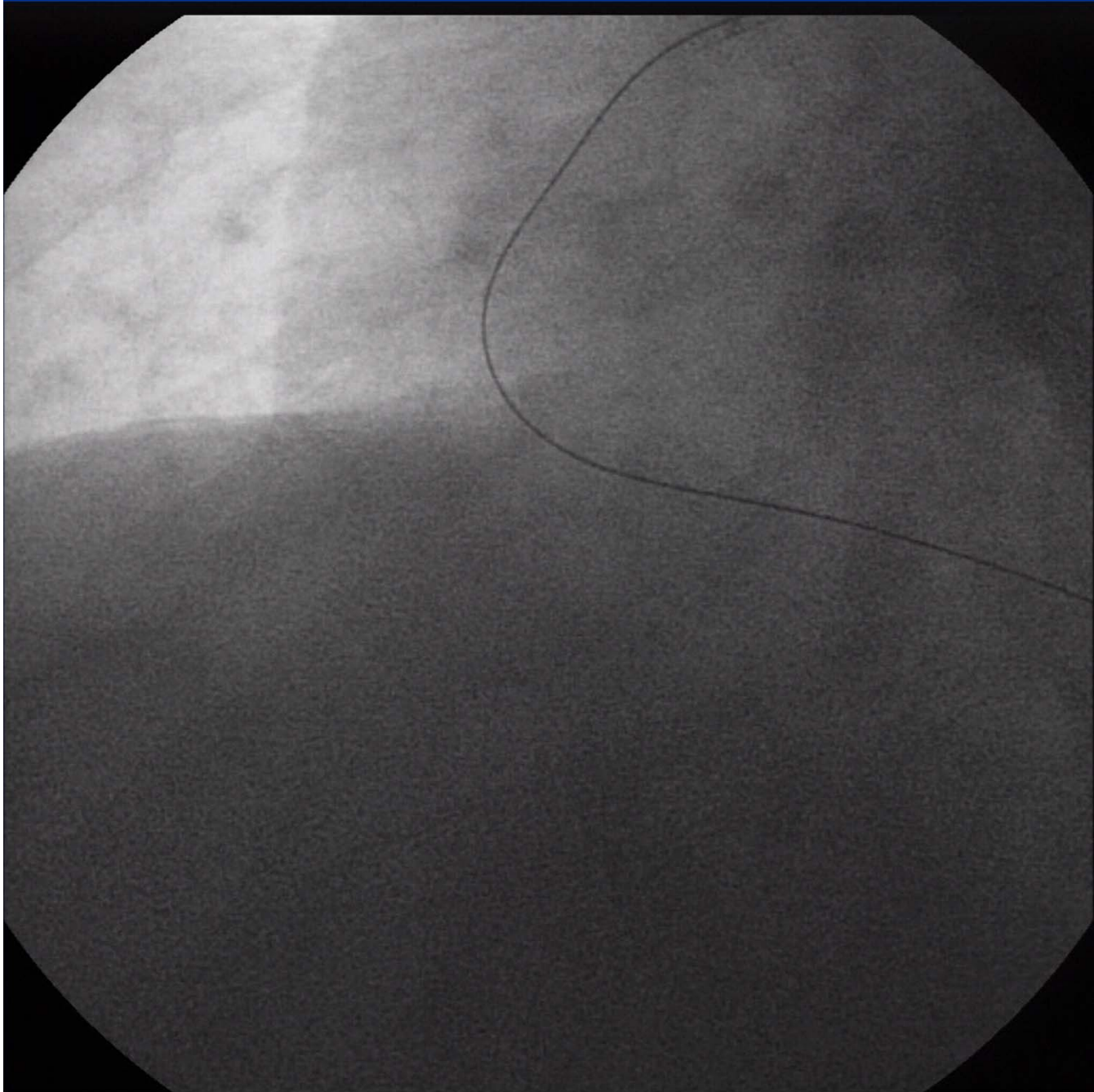


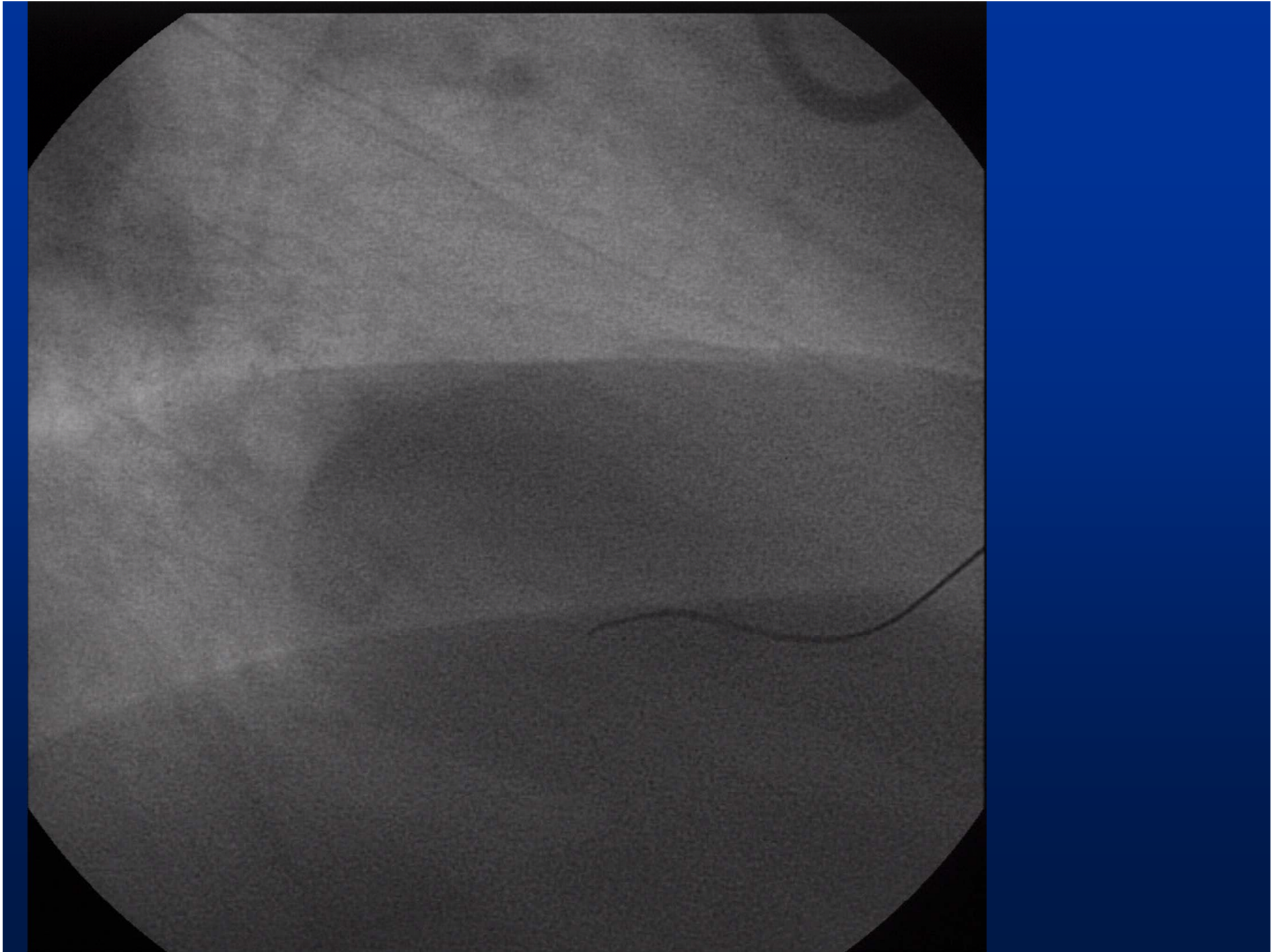
Parralleldraht

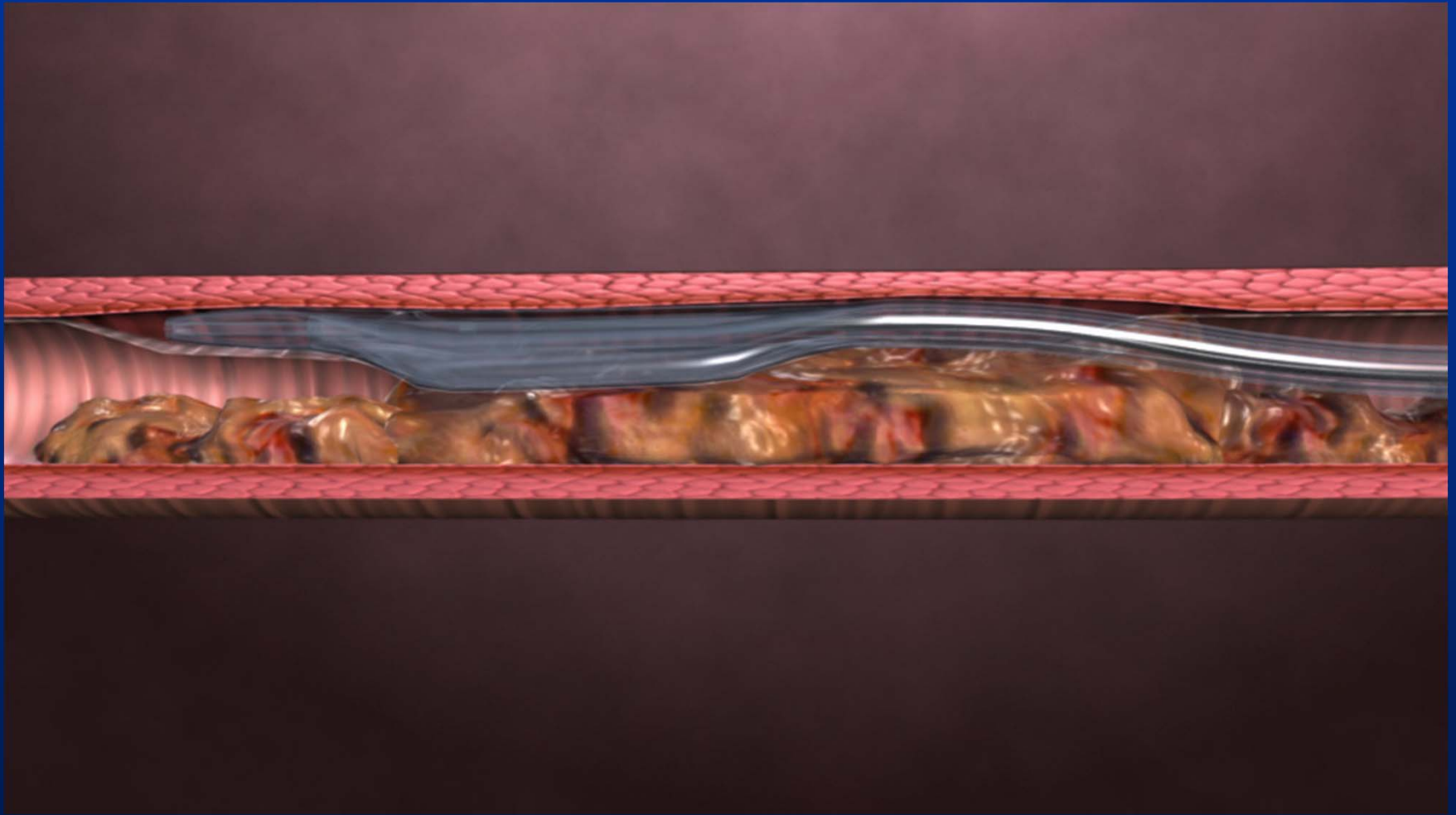


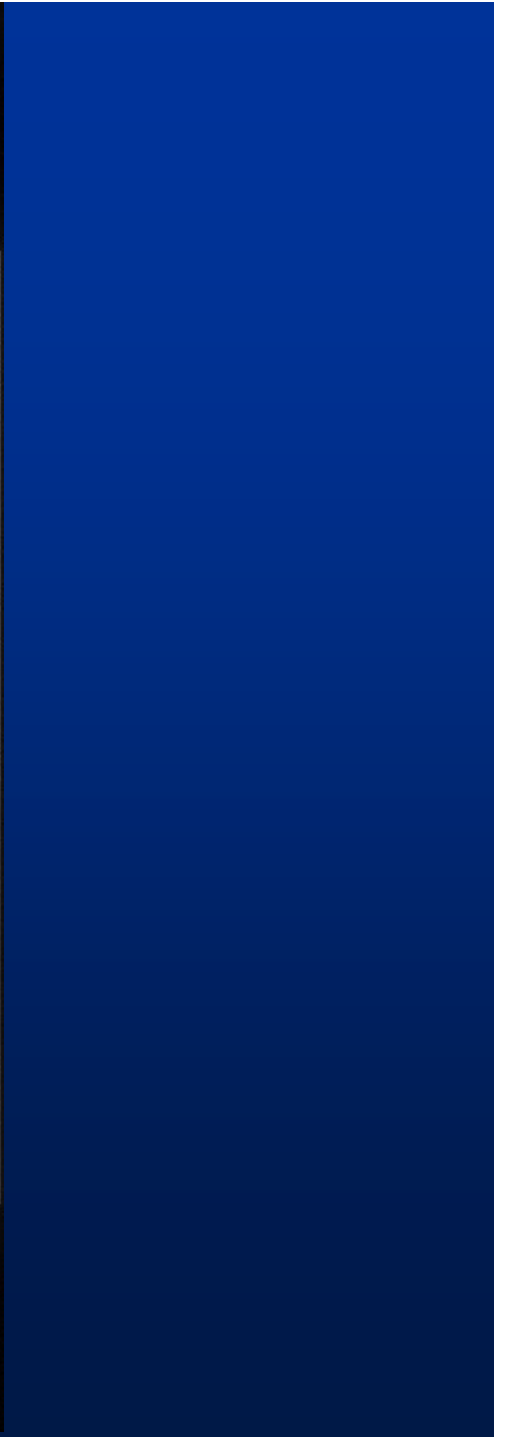
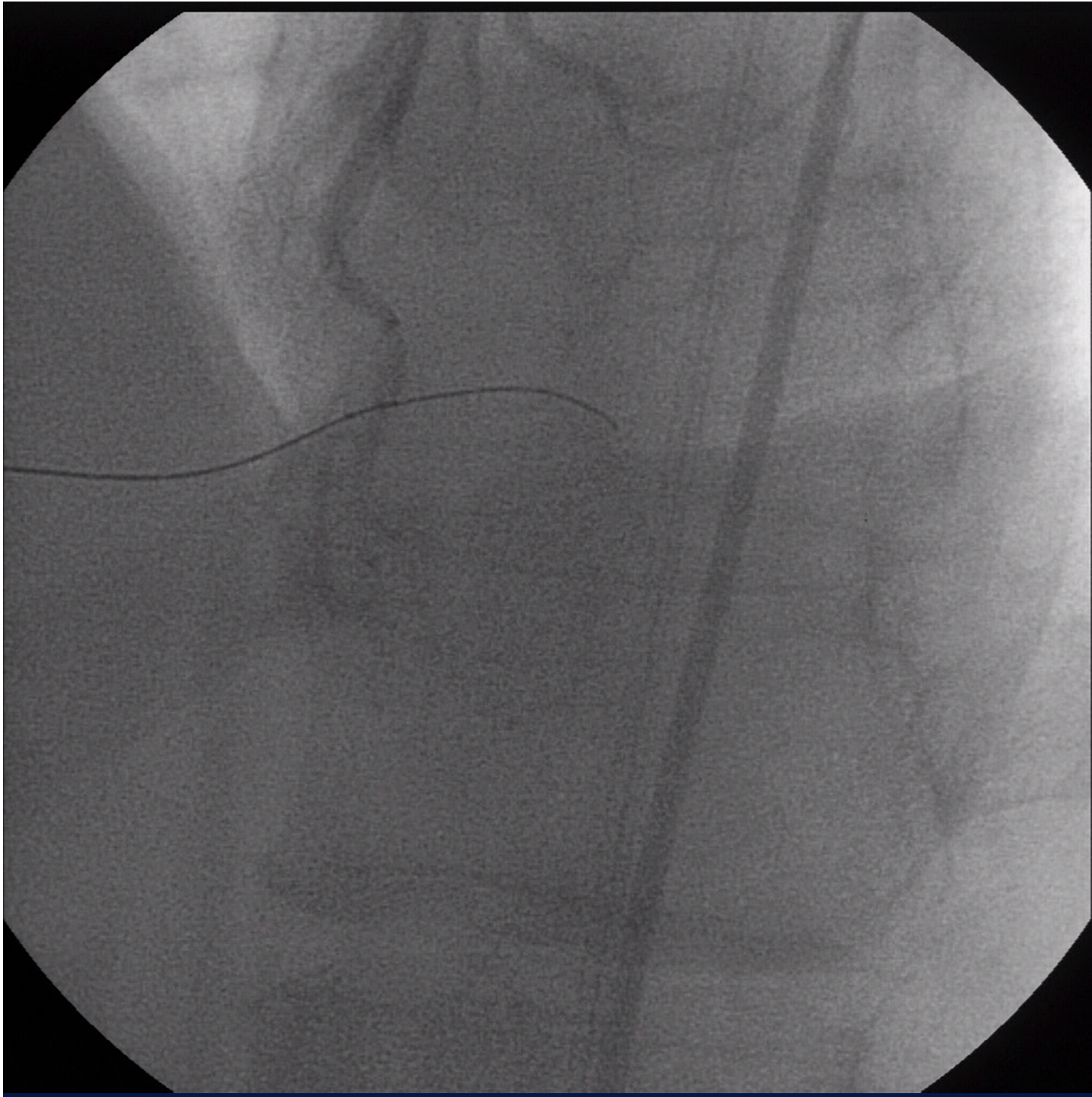


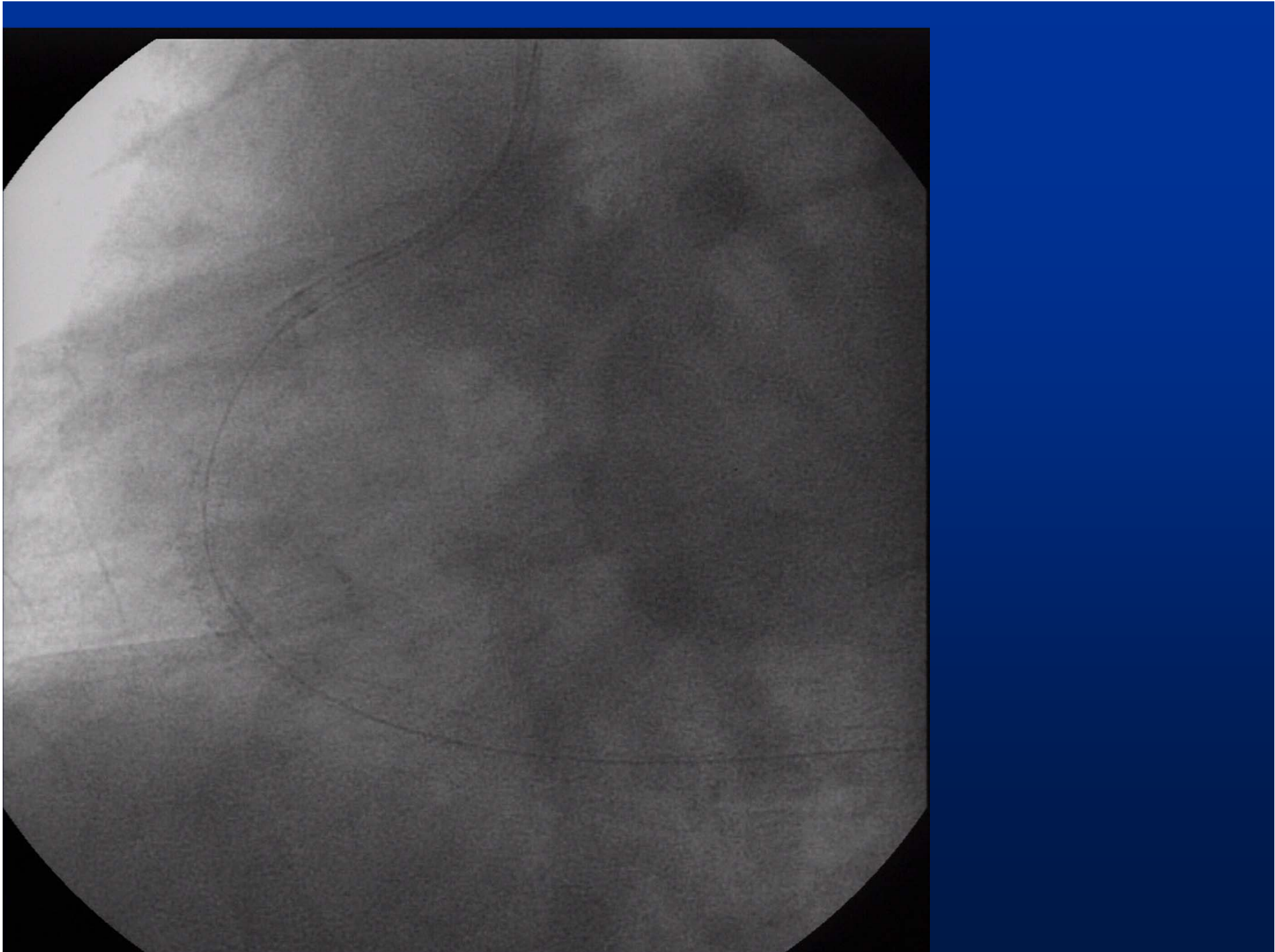












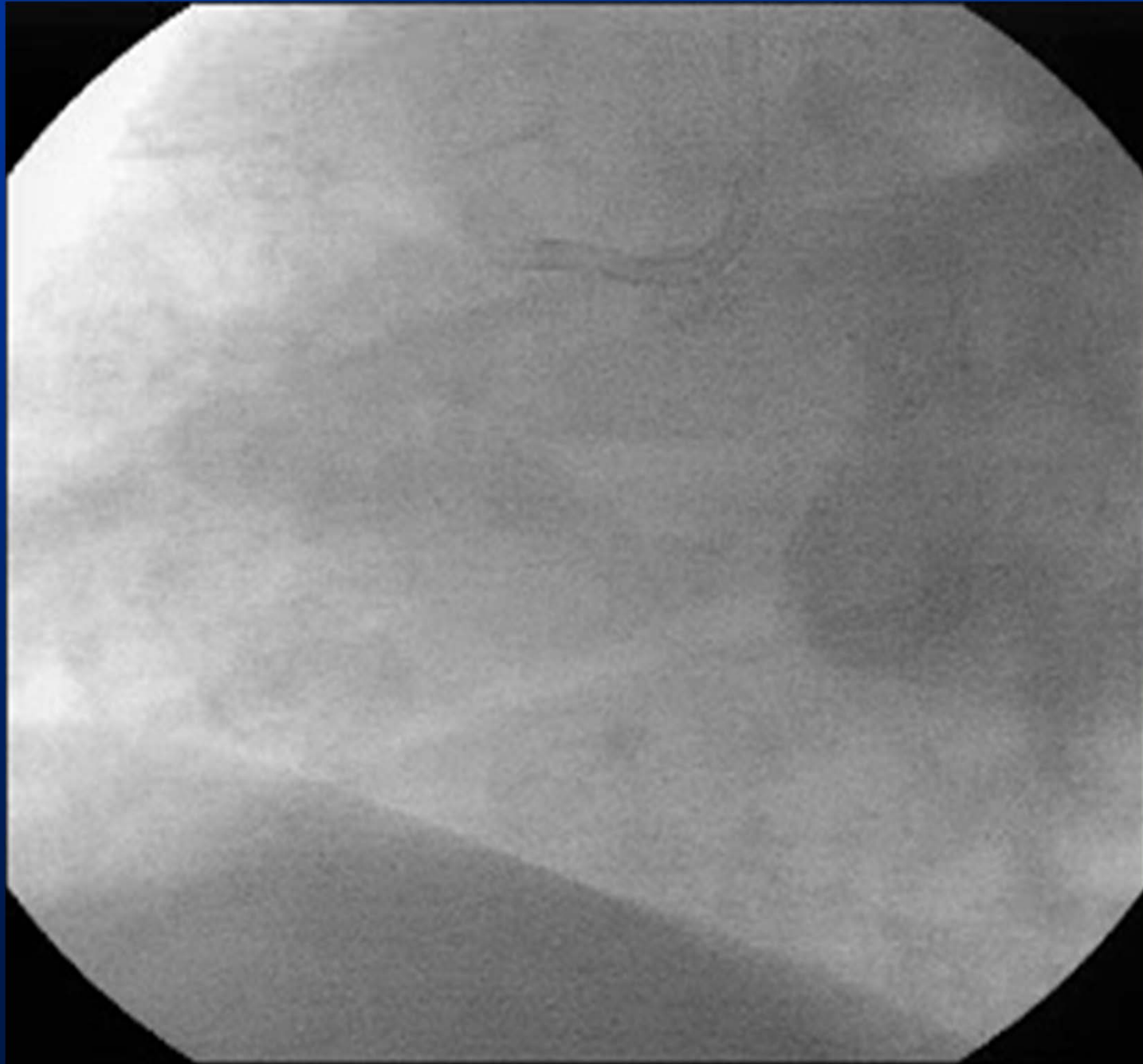
StingRay

- Flacher Ballon parallel zur Gefäßwand mit 3 Exits, davon 1 seitlicher in Richtung Innenlumen
- Zur gezielten Punktion des wahren Lumens von subintimal

Schlussfolgerung Spezifische CTO Materialien

- Die meisten ohne erkennbaren Wert
- TORNUS ® aussichtsreich bei Ballonversager
- CrossBoss Alternative bei IS-CTO
- StingRay zum Reentry aus falschem lumen





RCA

Seesaw

