

Kronik Total Oklüzyon Girişim Teknikleri

Prof. Dr. Ömer Göktekin
Bezmialem Vakıf Üniversitesi
Tıp Fakültesi

CTO Görüntülenmesi

- Stump ve distal giriş noktasının saptanmasında en iyi görüntülerin tanımlanması
 - Simultane Kontralateral Enjeksiyon
 - Kılavuz telin ilerletilmesinde biplane anjiyografi
-

CTO teknikleri

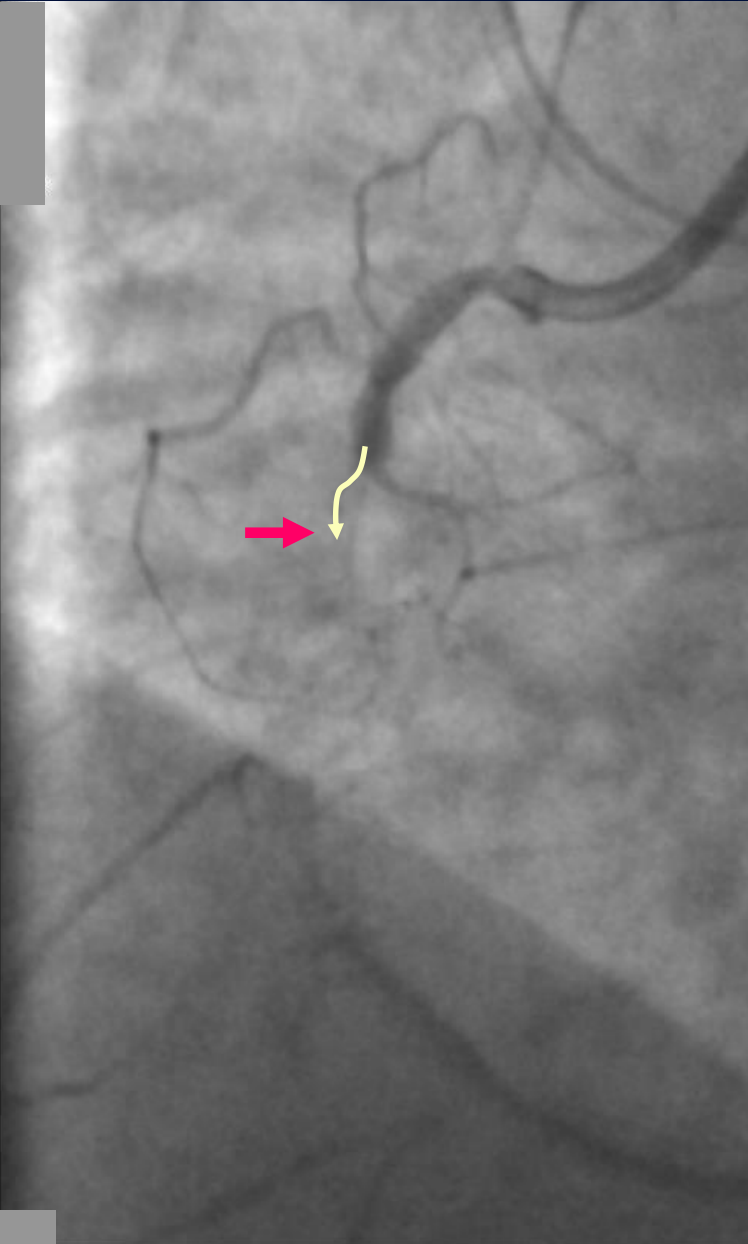
- 1. Antegrad teknikler**
- 2. Retrograd teknikler**
- 3. Yardımcı yöntemler**
 - Tornus
 - Rotablator
- 4. Özel cihazlar**
 - Lumend frontrunner
 - SafeCross

Kontralateral Enjeksiyonun İşlevi

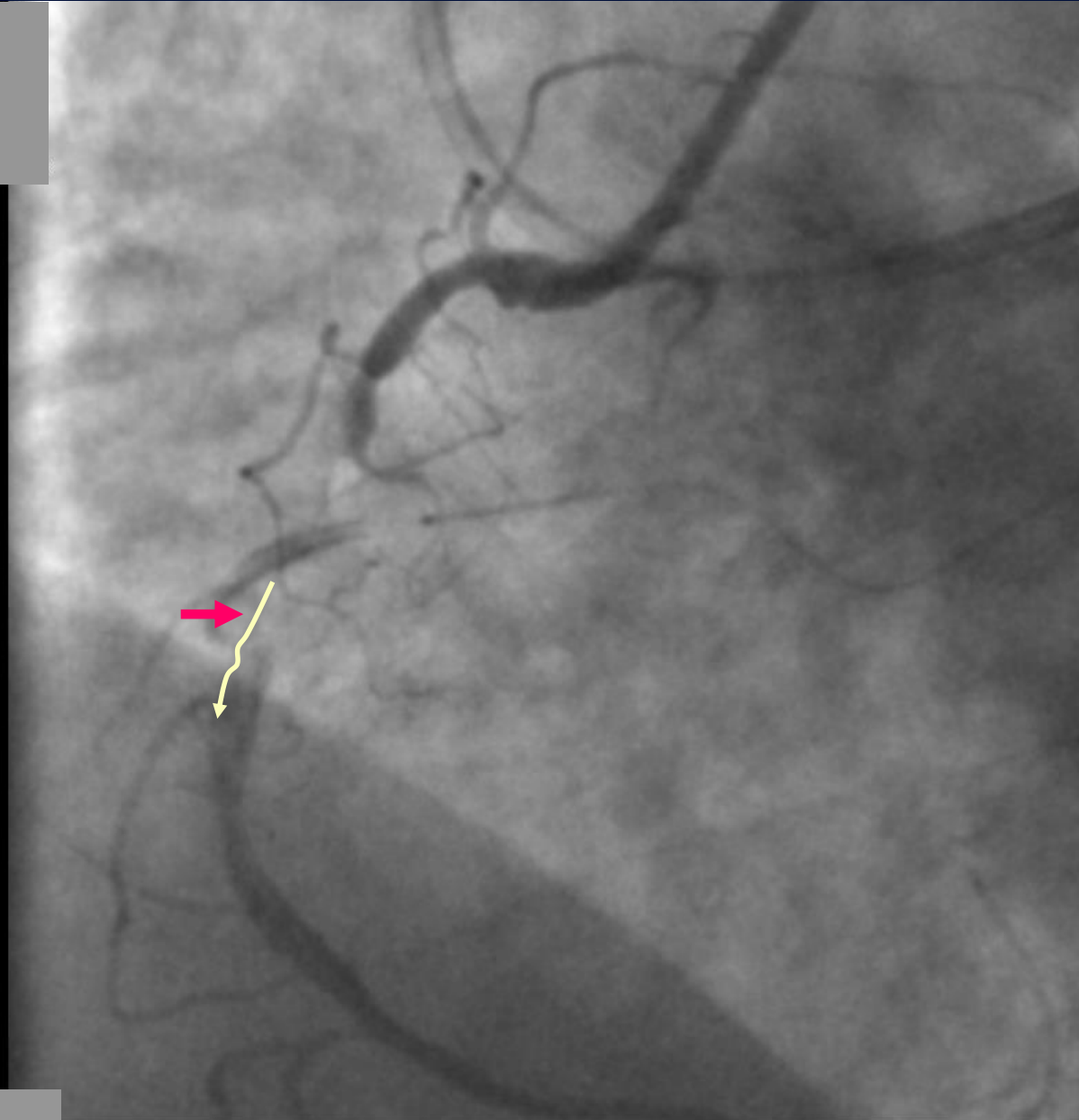
- CTO distali diğer koroner damardan kolletaral dolum gösteriyorsa, kontrallateral enjeksiyon gereklidir
- Super-selective kontralateral enjeksiyon daha net imajların alınması ve kontrast kullanımının azaltılması açısından çok faydalıdır.

Mikrokanallar belirlenmelidir

5
LAO:44
CRA:0



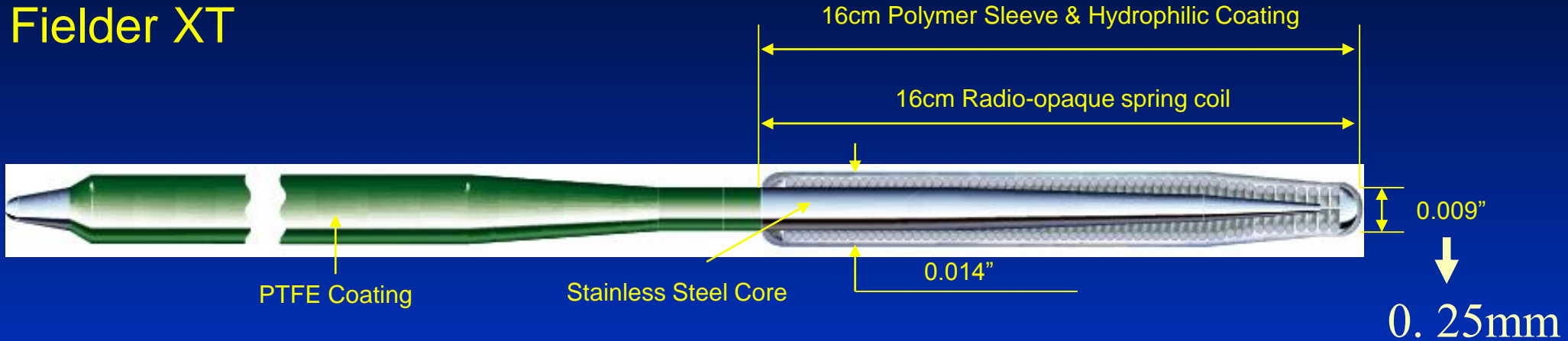
5
LAO:44
CRA:0



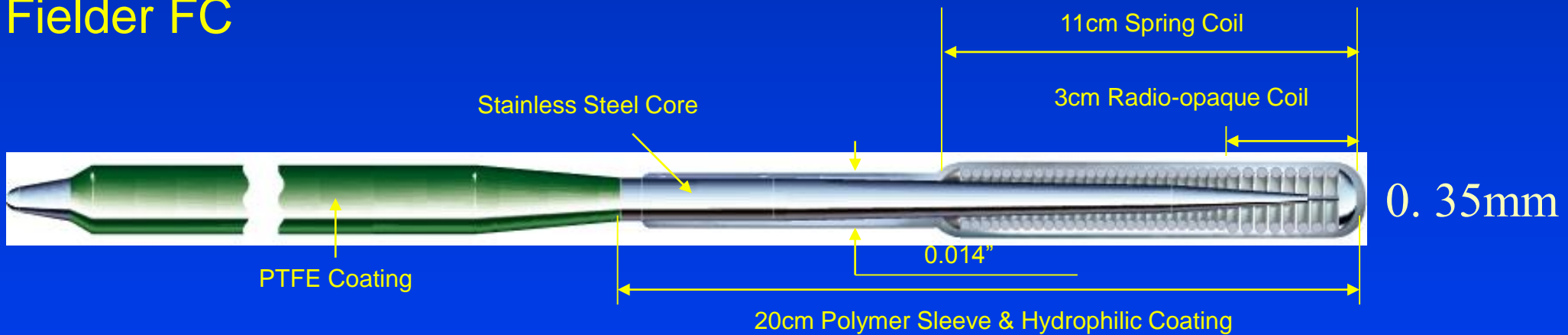
Stump olması antegrad mikrokanal varlığının önemli bir göstergesidir

Fielder XT and Fielder FC

Fielder XT



Fielder FC



Antegrad Mikro Kanallar

- **Patolojik antegrad mikro kanallar sıklıkla anjiyografide görünmezler**
- **Antegrad mikro kanallar her zaman gerçek distal lümenle devamlılık göstermezler. Bazen vaza vazorum ile ilişkilidirler**
- **Antegrad mikro kanallar mı ve köprü kolleteraller mi olduğuna karar vermek çok zor bir konudur**

Antegrad Mikro Kanalları Geçmek İçin Uygun Tel Seçimi

- **Tel antegrad mikrokanallardan kısa süre içinde geçebilmelidir**
- **Hiç antegrad mikrokanal yoksa, tel yalancı lümenine geçmemeli, gerçek lümen içinde kalmalıdır**

Antegrad Mikrokanal Yokluğunda Stump'ın Penetrasyonu

İlk İşlem (2002)



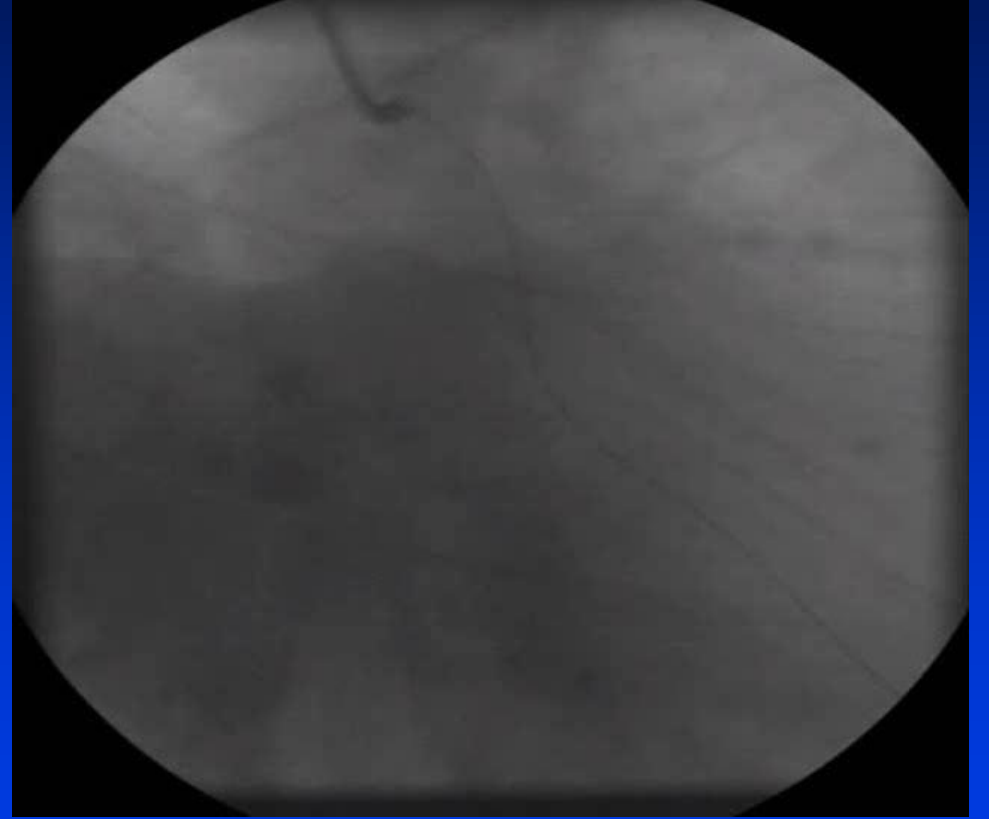
RAO Kaudal

Spider

İlk İşlemden Kontralateral Enjeksiyon Kullanılmaksızın Tel Manuplasyonu

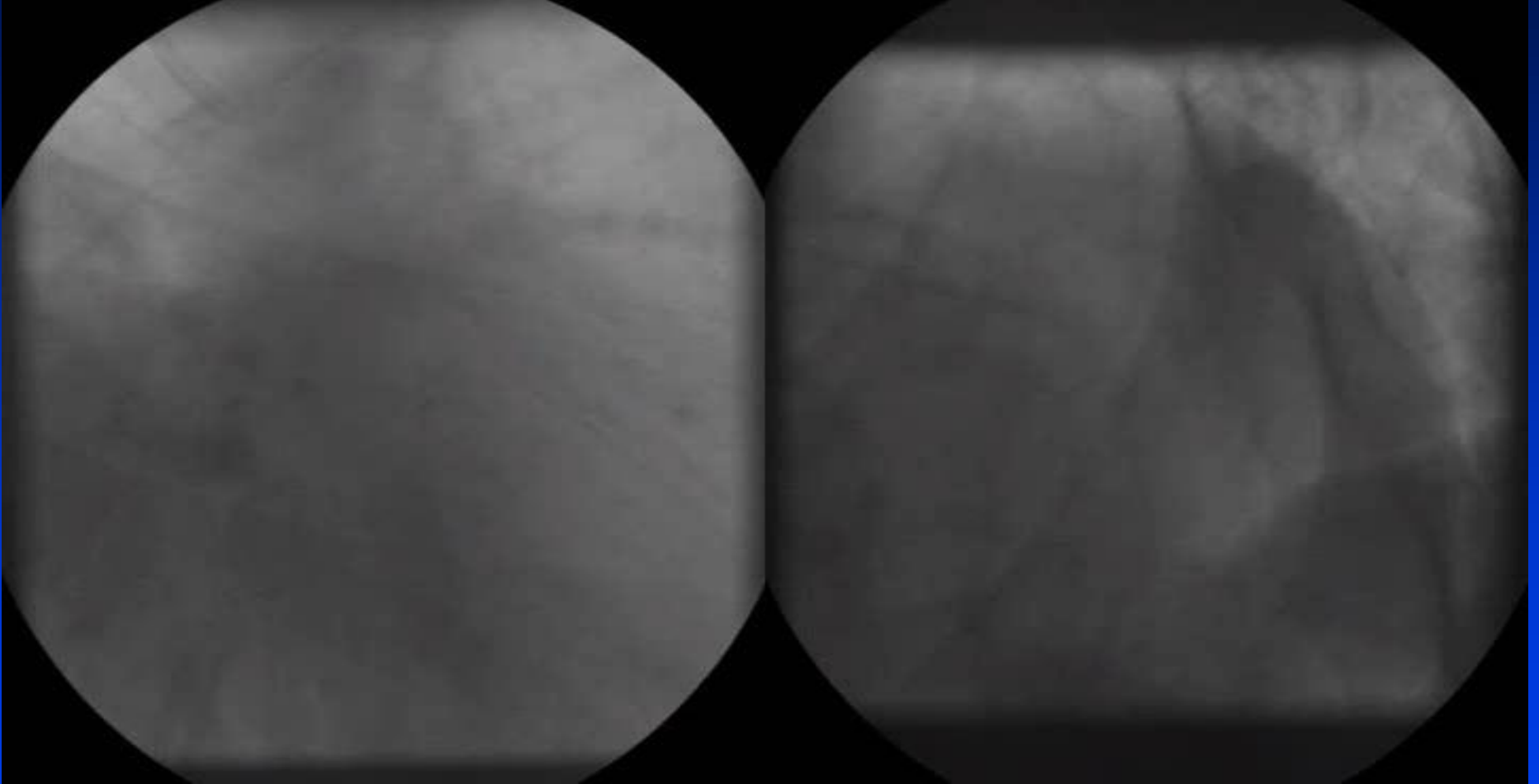


Teli ilerletme



Tel ilerletilmiş

Koroner Perforasyon Nedeniyle İşlemin Sonlandırılması



RAO kaudal:

Kontrast ekstravazasyonu

LAO Kaudal

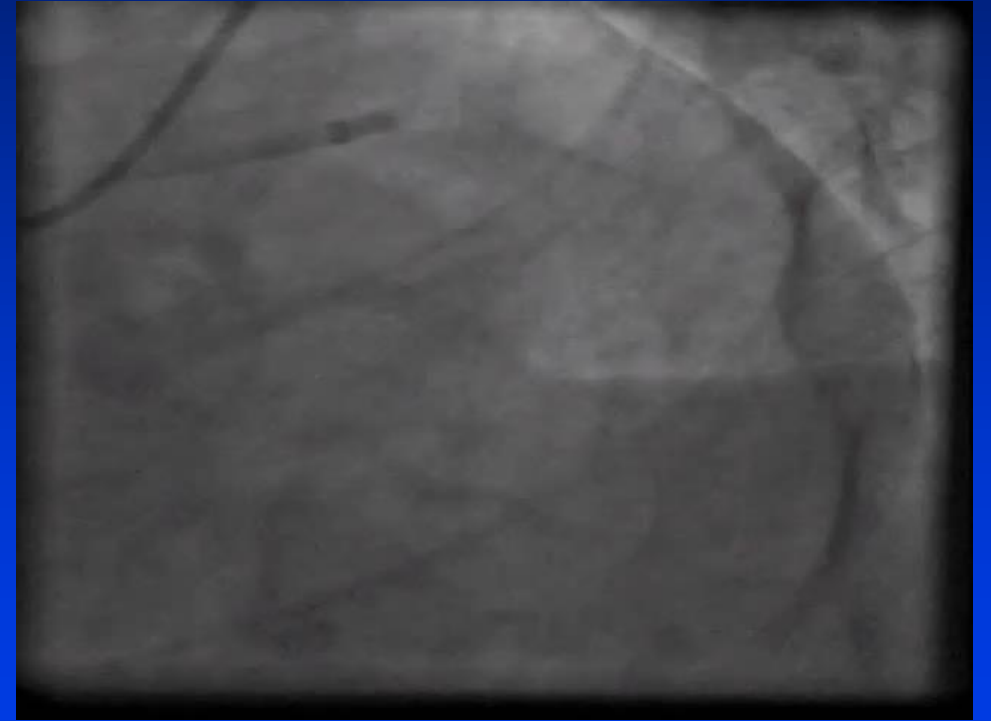
Kontrast ekstravazasyonu

İkinci İşlemden Kontralateral Enjeksiyon

55 yaş , semptomatik, (Evre II CCS)

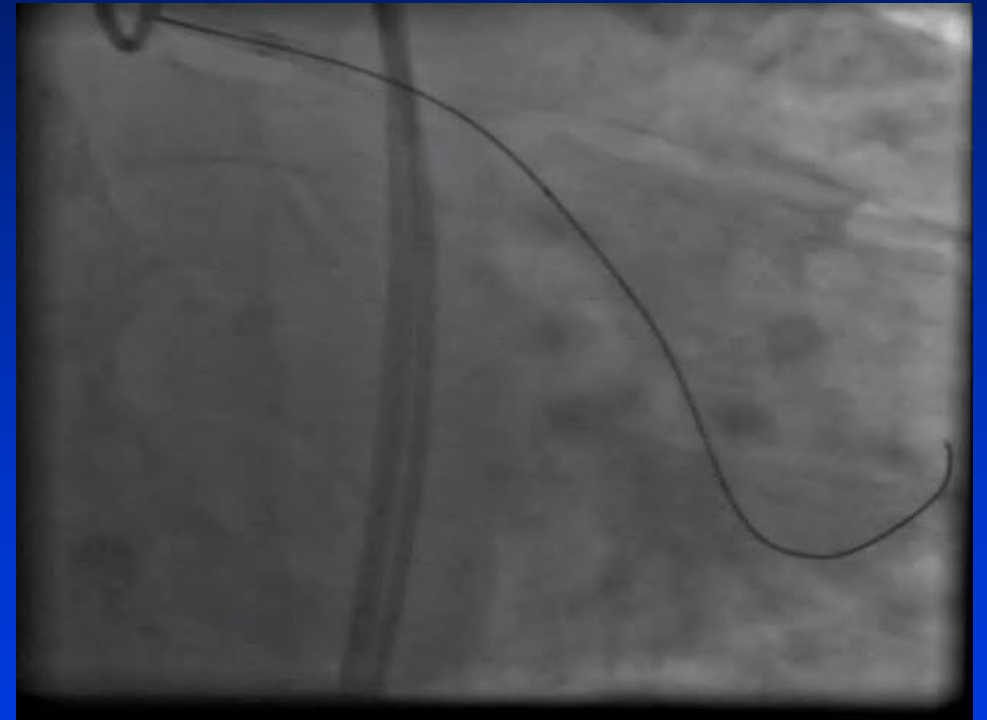
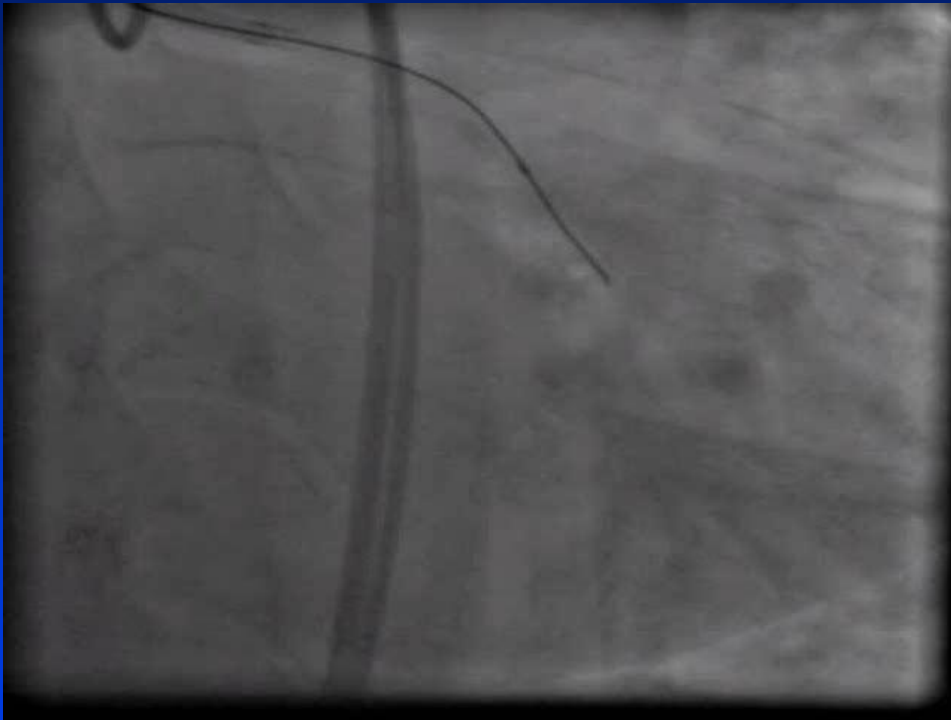


AP Caudal view



Spider view

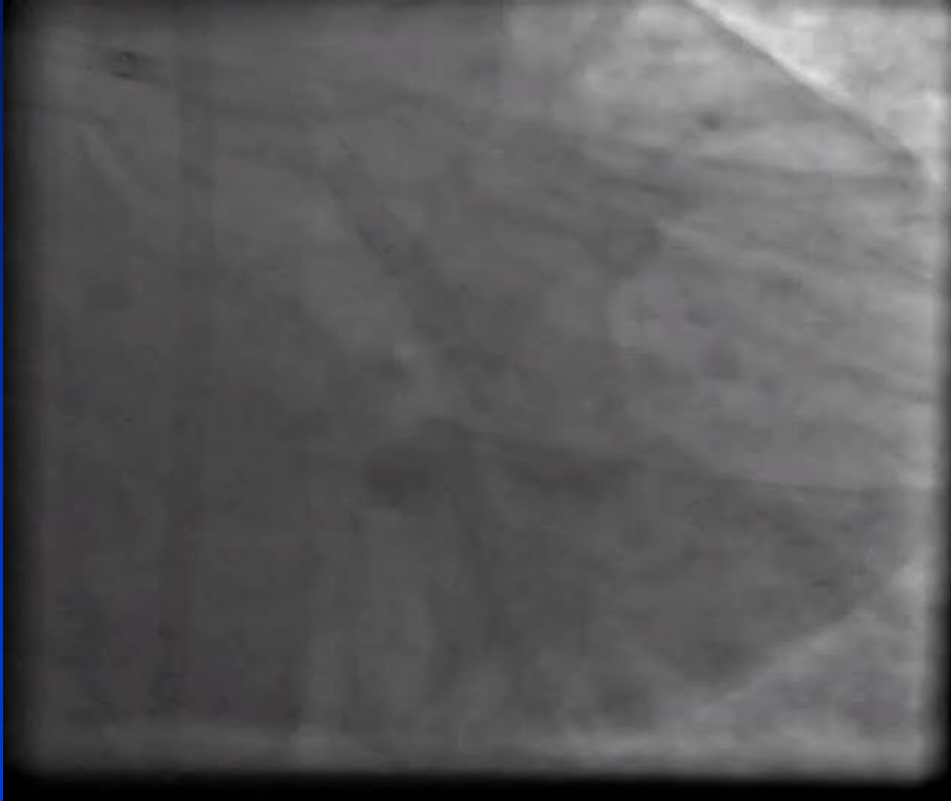
Tel Manuplasyonu



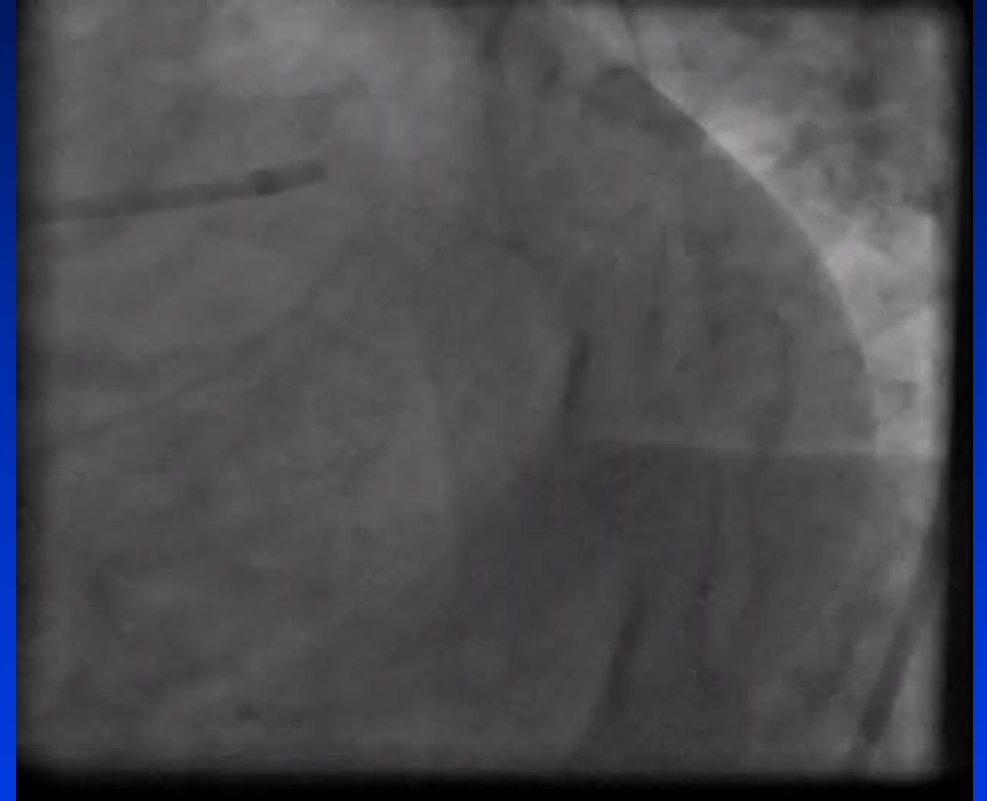
Asahi intermediate (Miracle 3.0)

Maverick 1.5 × 20 OTW balloon (Boston Scientific)

İşlem sonu



AP kaudal
Taxus 3.0 x 28 mm



Spider

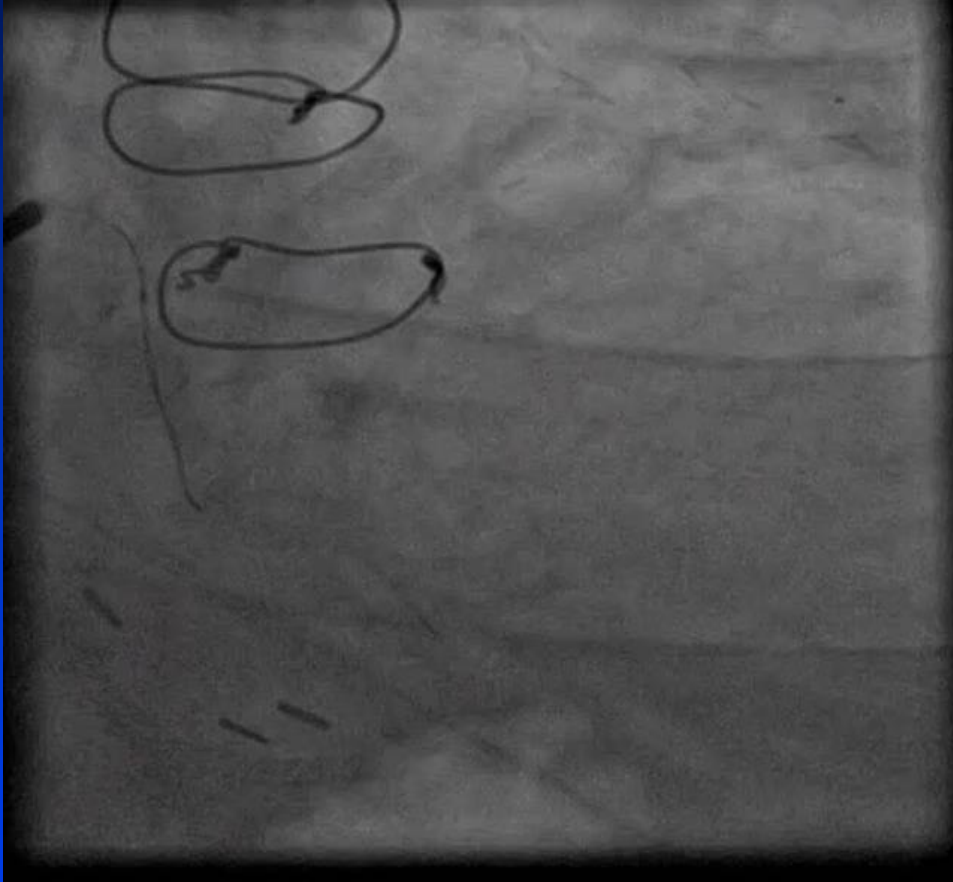
Vaka R.D: 56 Yaş Erkek

Persistan AP (CCS 2) talyumda lateral iskemi



22/Sep/2005

Rezidüel Lateral İskemi İçin Girişim

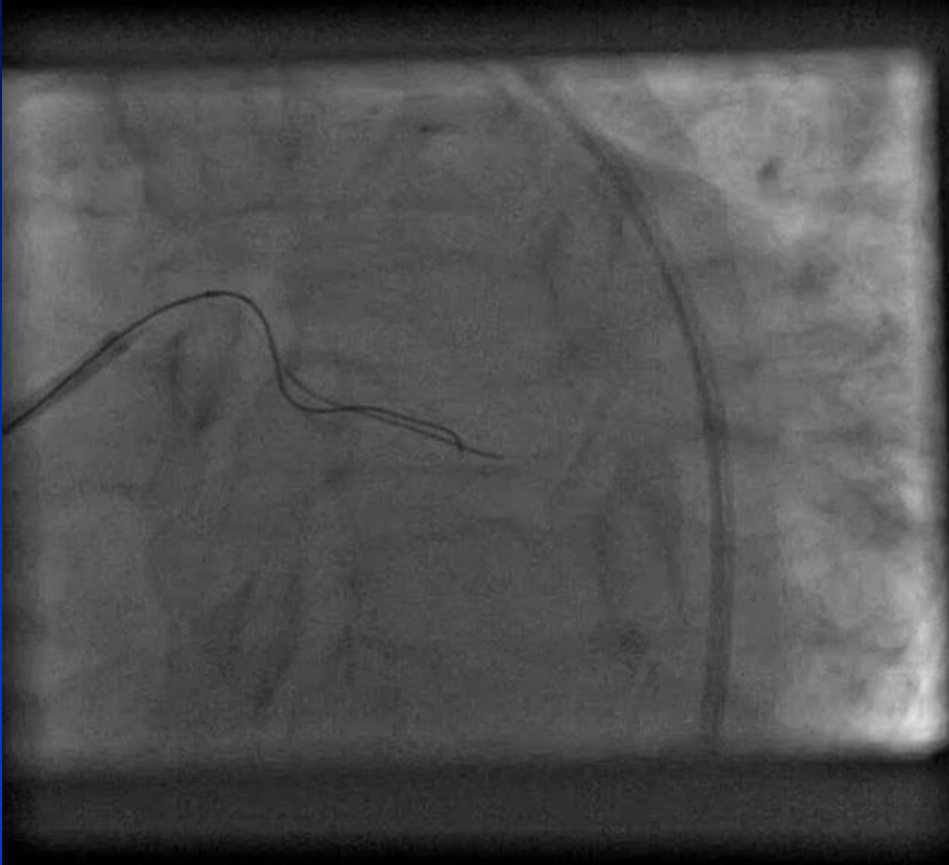


Taxus Liberté 2.25 × 24 Intermediate



Maverick OTW + Pilot 50

Rezidüel Lateral İskemi İçin Girişim

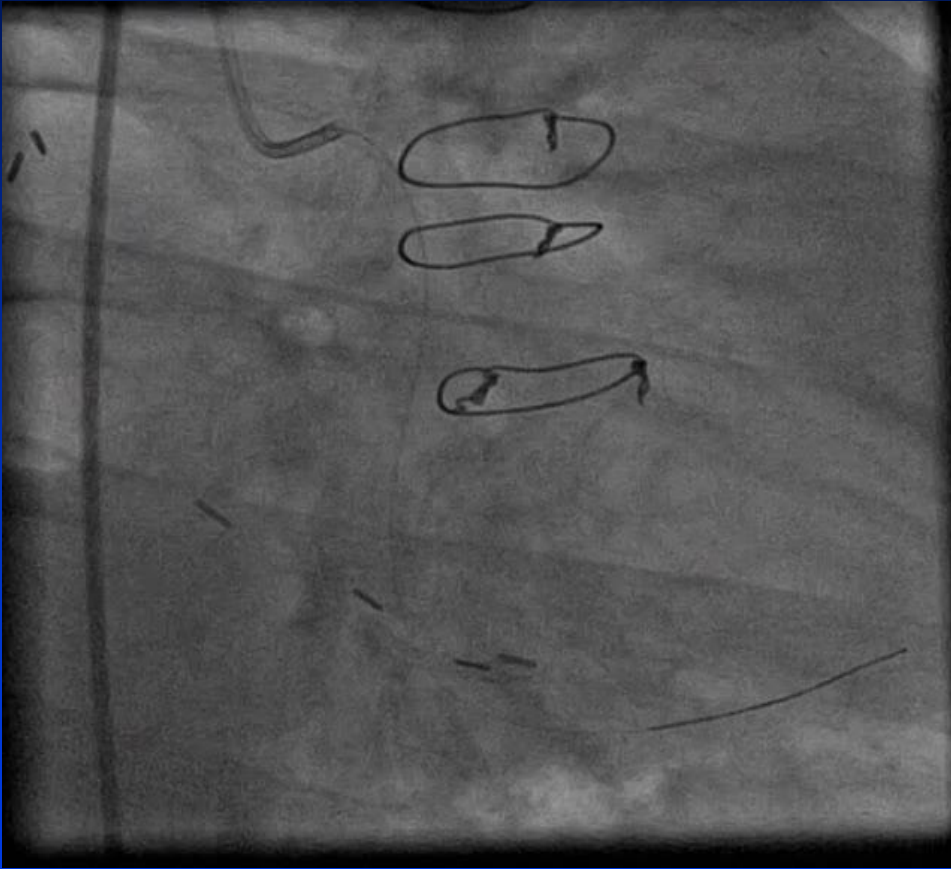


Parallel wire technique using
Maverick OTW + Miracle 3g and 12



Parallel wire technique using
Maverick OTW + Miracle 3g and **Miracle12g**

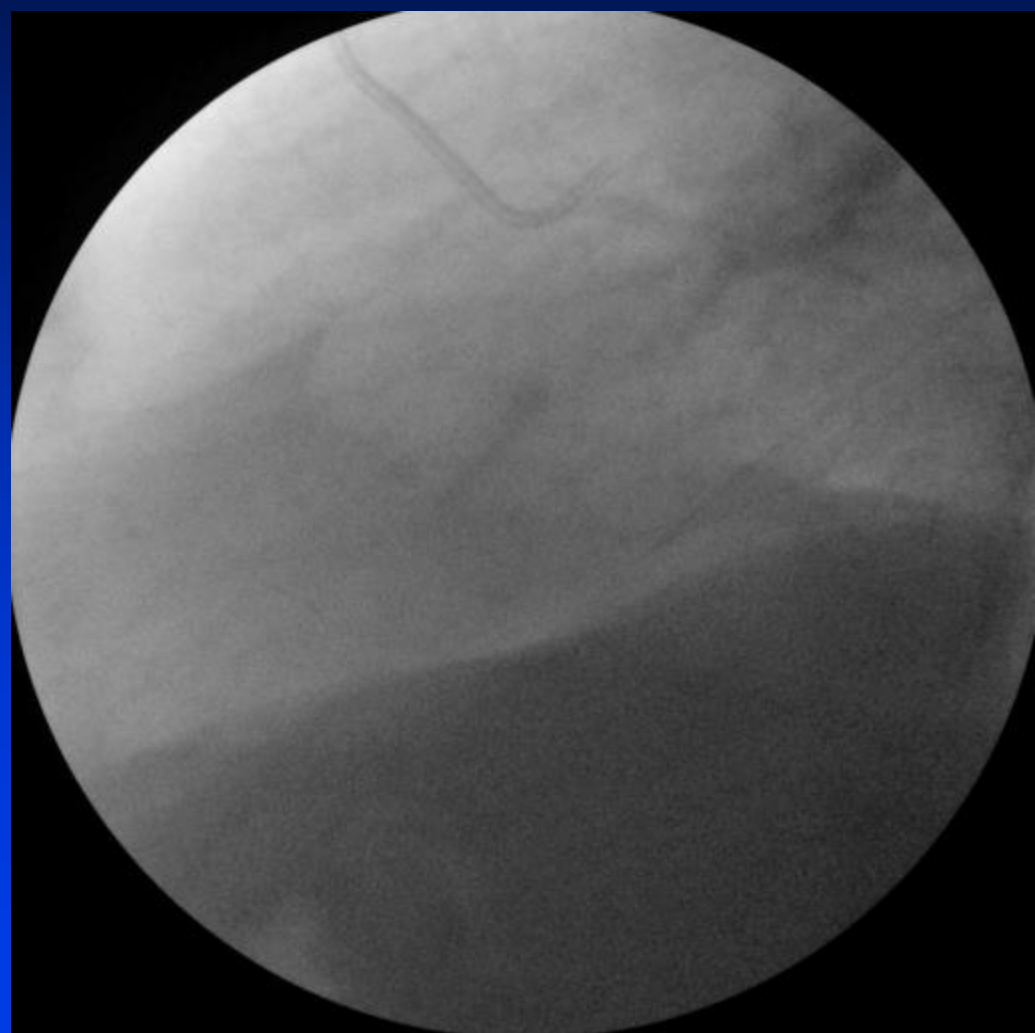
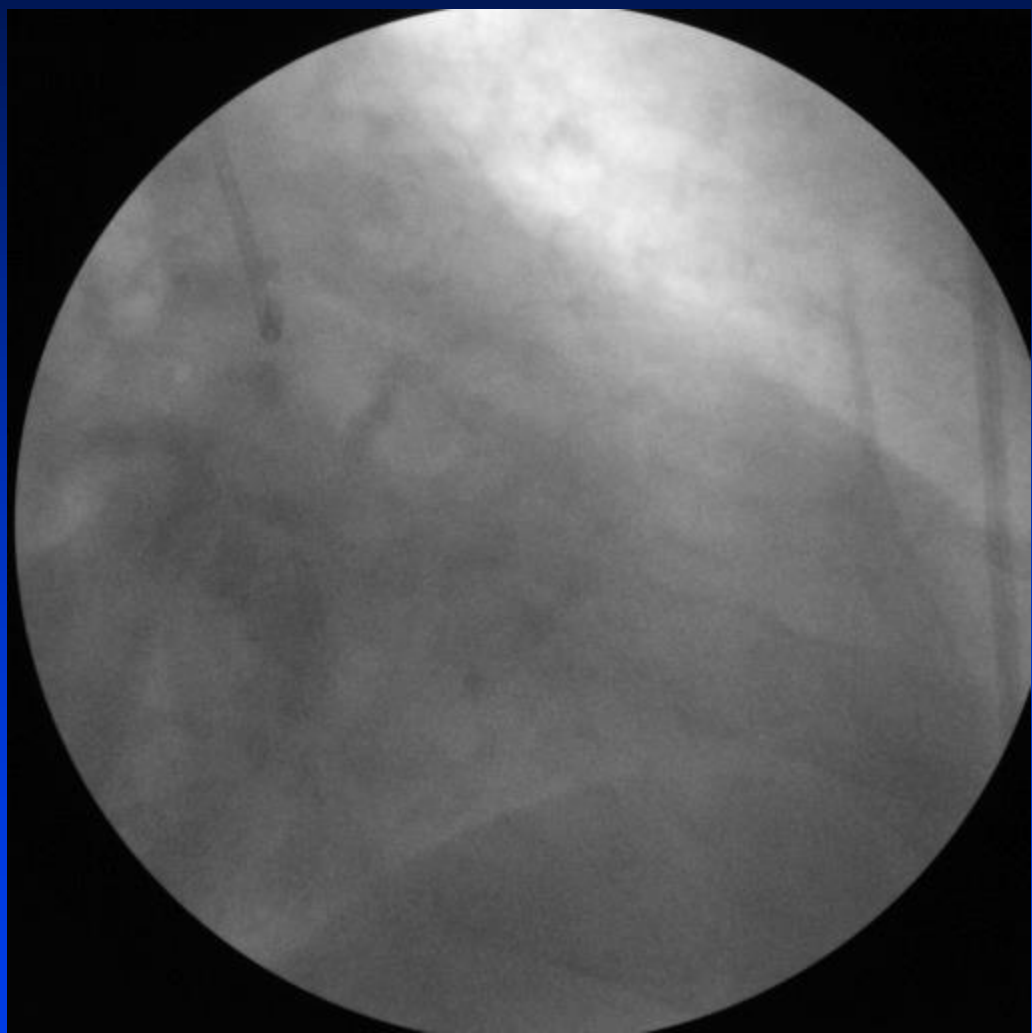
Lateral İskemi İçin Girişim



After tandem inflation and
exchange into conventional wire



Taxus 2.5/24+2.25/24



CTO - Milieu Considerations

- **Planned procedure – not “ad hoc”**
 - **Careful assessment of symptoms, and target site viability + ischemia (“righteous” indication)**
- **Proper diagnostic angiograms**
 - **Must visualize collaterals and distal parent vessel beyond the CTO segment (consider bilateral angiography during diagnostic procedure)**
- **Strong guiding catheter support**
 - **7-8 Fr, trans-femoral preferred for antegrade**
 - **Sideholes for RCA and small ostial LM**
- **Bilateral angiography from the outset in essentially ALL cases**
- **Obsessive management of radiation exposure and contrast volume**

CTO - Milieu Considerations

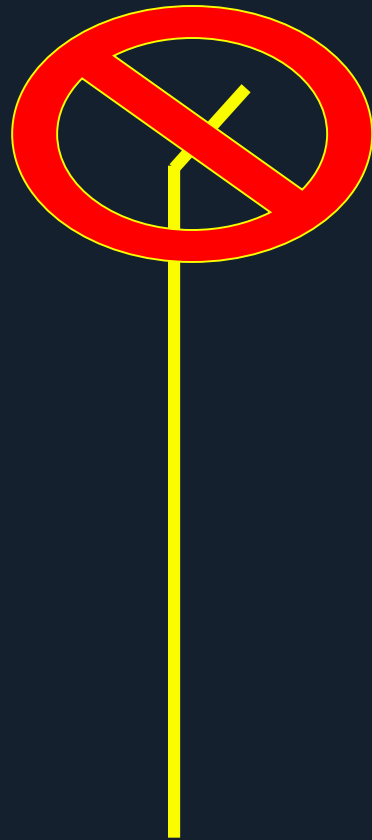
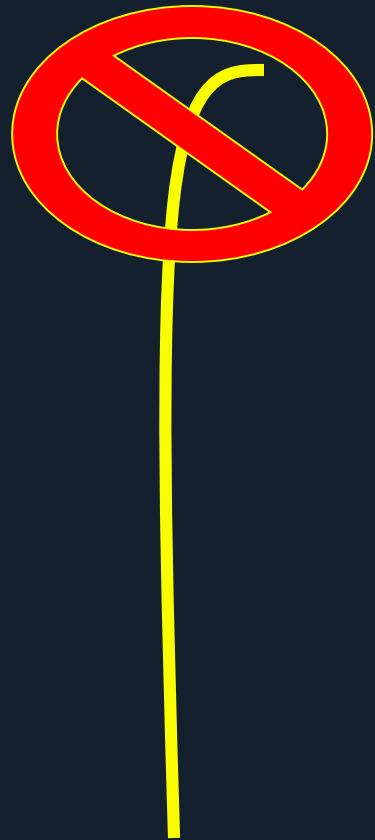
- **Heparin anticoagulation**
 - **No bivalirudin and keep ACTs 200-250 secs**
- **Patient comfort**
 - **Adequate sedation and foley catheter**
- **Other factors**
 - **Access issues (consider long sheaths)**
 - **Status of pericardium (post-CABG issues)**
- **ZEN philosophy**
 - **Spiritual adventure – you cannot be “beaten” by the vessel – persistence reigns supreme (consider 2nd attempts)**
 - **Patience, patience, patience...**
 - **Experience, experience, experience...**

Is There a Time NOT to Try ?

Maybe...

- **Long Tortuous CTO Segment Gap**
- **Severe Calcification**
- **Poor Distal Vessel Visualization**
- *Esp. when, no prospect for retrograde recanalization*

CTO Guidewires – Tip Shaping

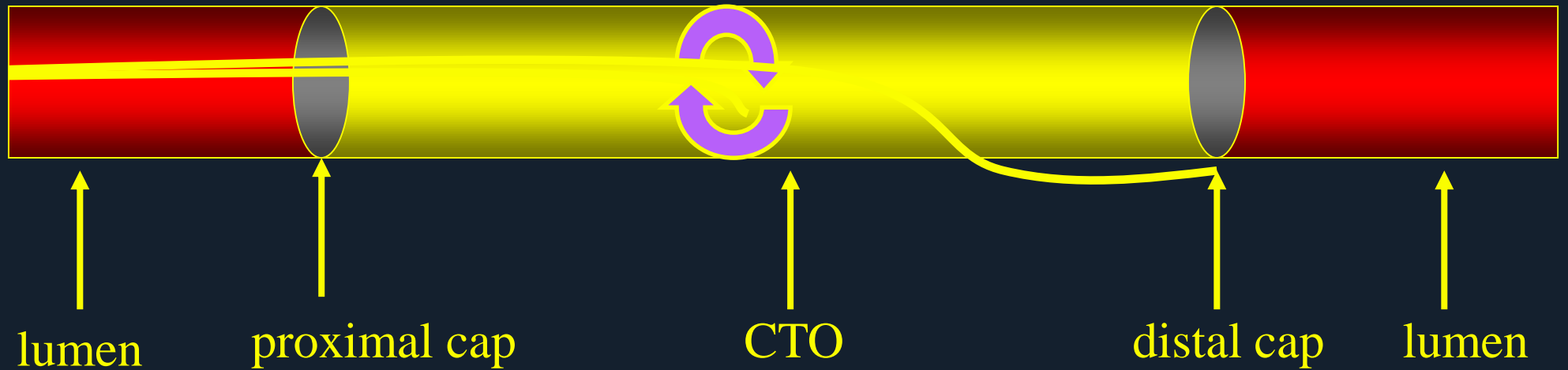


Primary bend ~ $<30^\circ$
1-2mm from tip



Secondary
bend ~ $10-15^\circ$

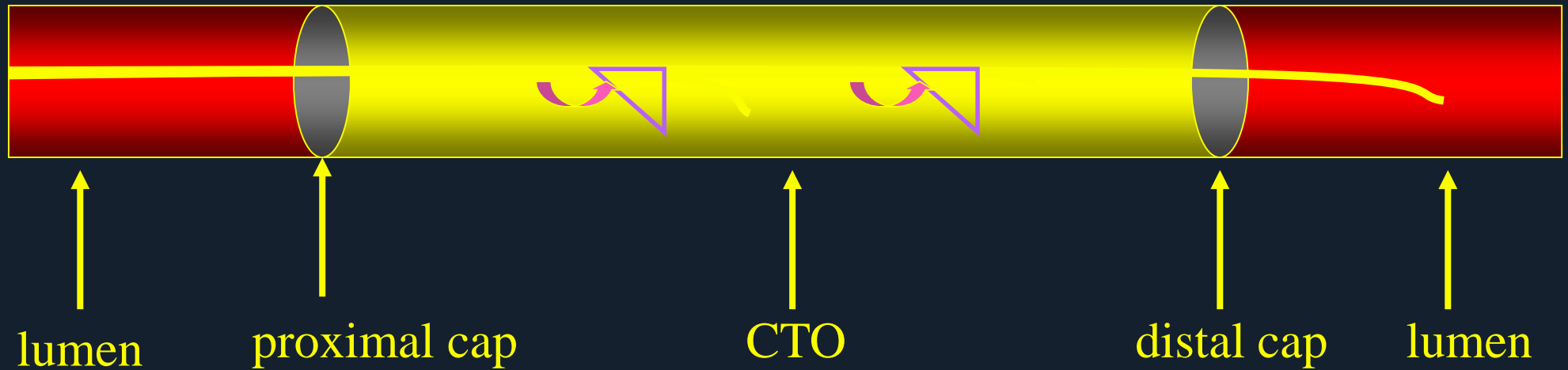
Antegrade CTO Wiring Techniques



Uncontrolled drilling

FAILURE!

Antegrade CTO Wiring Techniques



Controlled Drilling
(90 degree arc)

Guidewire Operator Techniques

DRILLING (controlled)

- Short tip curve (~ 2mm) at 30°; sometimes a proximal secondary curve at 10-15°
- Controlled rotational 90° arc tip motion with gentle forward probing
- Start with moderate stiffness tips and stepwise increases in tip stiffness
- Premium on tactile responses

CTO Guidewire Categories

DRILLING
(controlled)

- Abbott CROSS-IT wires (100, 200, and 300) **X**
- Asahi MIRACLE Bros wires (3-12 gm)
- Medtronic PERSUADER wires (3 and 6 gm)

Lesion-Specific CTO Approaches

DRILLING (controlled)

- Most CTOs with discrete entry point; after initial attempt with soft or hydrophilic wires
- “Workhorse” technique
- Parallel wiring technique

Antegrade CTO Wiring Techniques



lumen

proximal cap

CTO

distal cap

lumen

Penetration Technique

Guidewire Operator Techniques

PENETRATION

- Similar tip shape and curves as drilling technique
- Precise movements of the guidewire tip
- Minimal rotational tip motion with more aggressive directed forward probing
- Tip stiffness (+ taper) should penetrate even heavily calcified entry cap (9-12 gms)
- Reduced tactile responsiveness

CTO Guidewire Categories

PENETRATION

- Abbott CROSS-IT 400
- Asahi-Abbott CONFIENZA wires (regular and PRO)
- 9 and 12 gm
- Medtronic PERSUADER wire - 9 gm

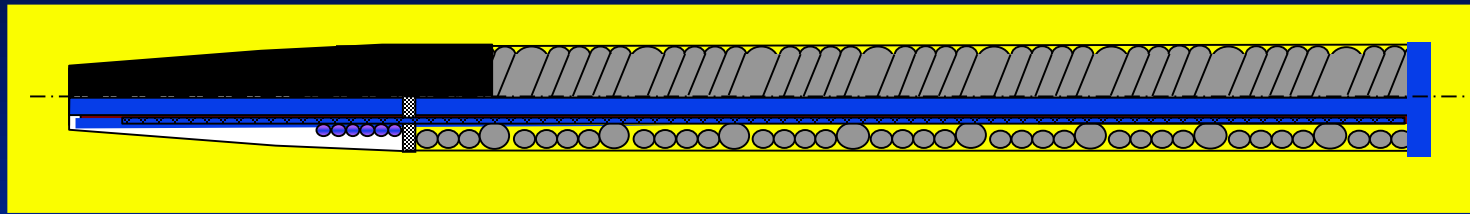
Lesion-Specific CTO Approaches

PENETRATION

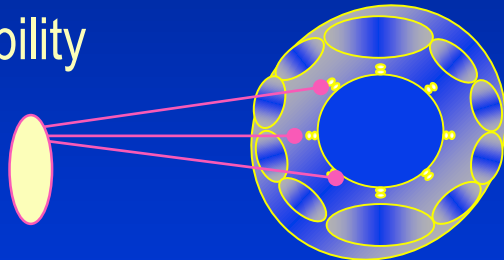
- Blunt entry point, short straight CTO segments
- Heavily calcified or resistant lesions
- Alternative to “drilling” after initial soft wire failure or after “drilling” wire failure
- Parallel wiring technique

Corsair Micro-catheter

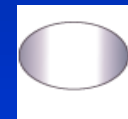
For crossing & dilating small vessels: SHINKA Shaft



Tungsten braids for visibility

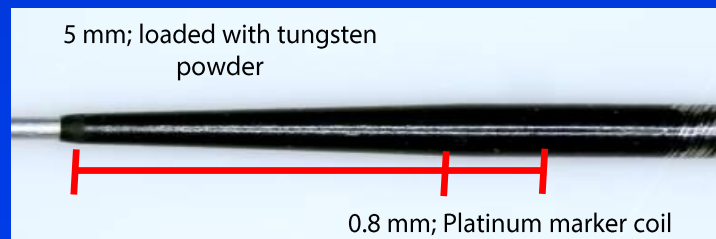


$\Phi 0.12$ mm x 2pcs



$\Phi 0.07$ mm x 8pcs

8 thin wires wound with 2 larger ones = pushability, trackability and support.



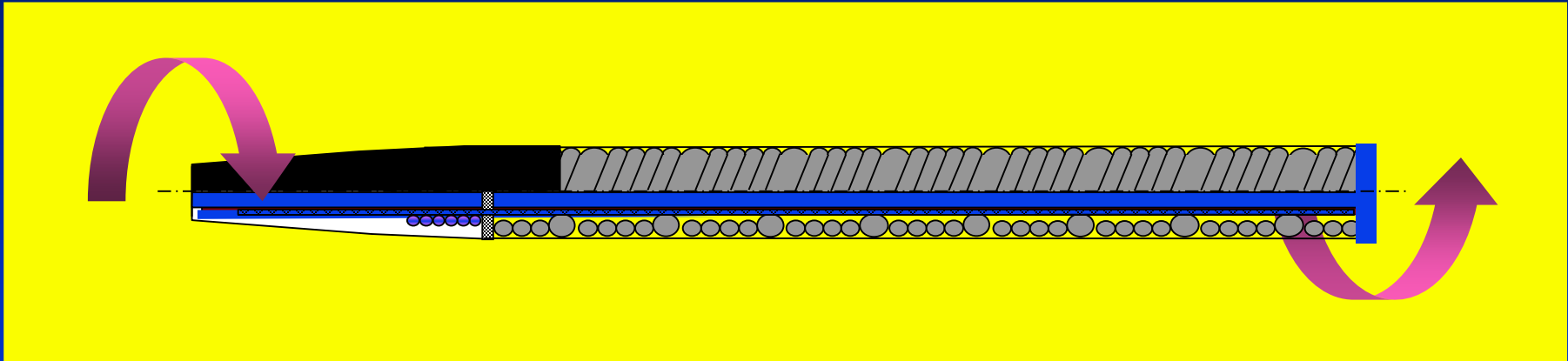
5 mm; loaded with tungsten powder

0.8 mm; Platinum marker coil

Corsair Micro-catheter

Also for antegrade crossing as support catheter

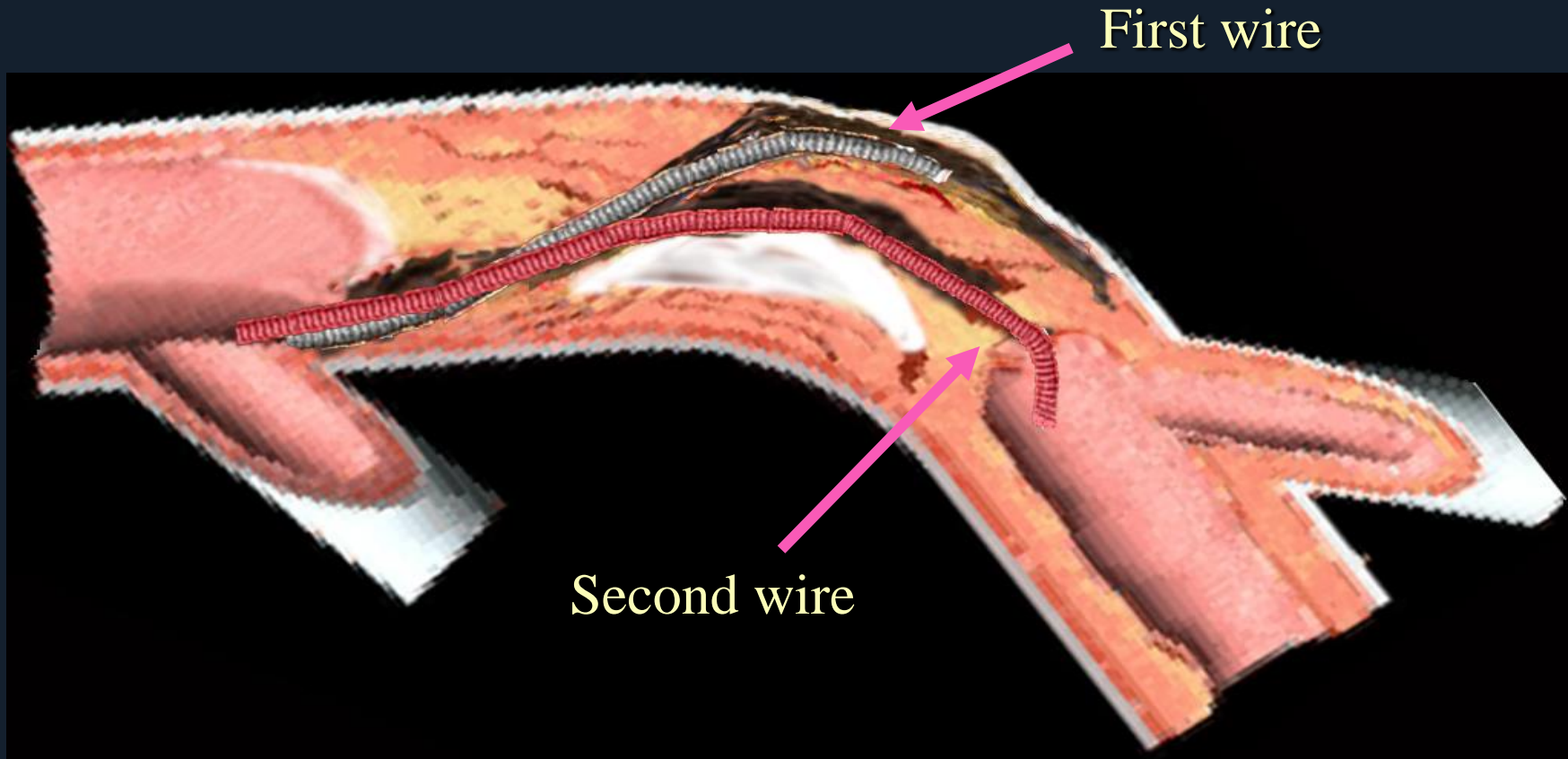
Rotation Resistance Reduction



SHINKA-Shaft's spiral structure transmits rotation to the distal tip. This rotation gives CORSAIR its crossing performance through tortuous channels.

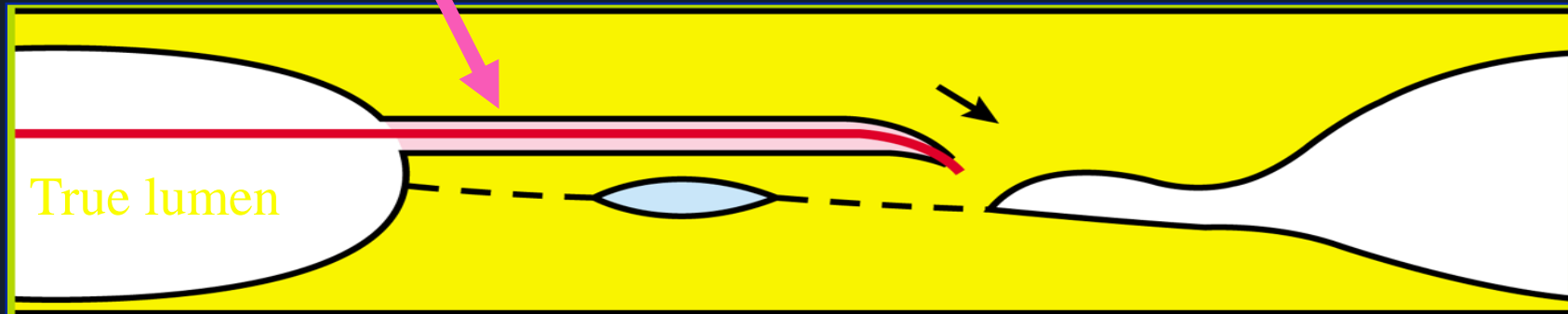
Antegrade CTO Wiring

Parallel wire technique



Guidewire Re-entry from Subintimal Space

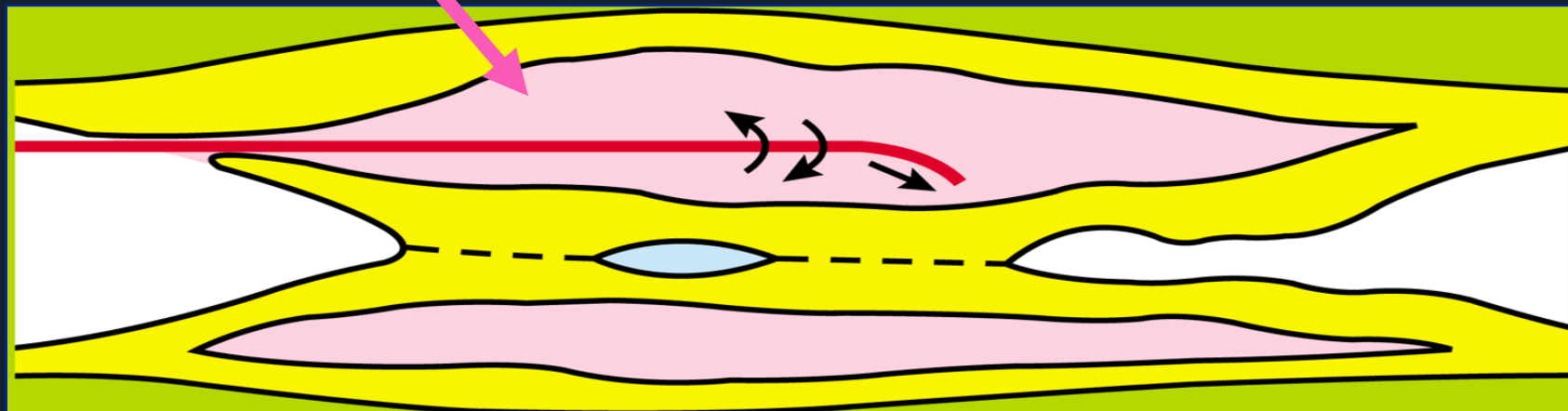
Small false lumen



True lumen

Easy to make re-entry

Large false lumen



Difficult to make re-entry

CTO Guidewires – Tip Shaping

For penetrating the entry point

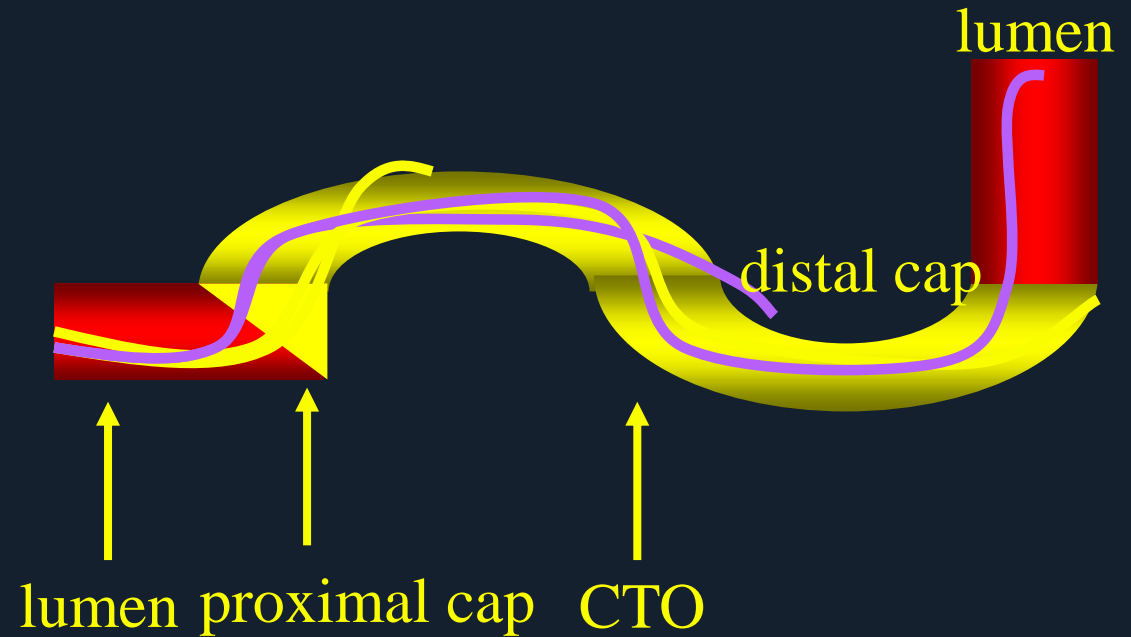
For reentering to the true lumen from the subintima



Antegrade CTO Wiring Techniques

Severe Tortuosity

Miracle 3
↓
Miracle 6, 12
↓
Parallel/See-saw wiring
with support catheters

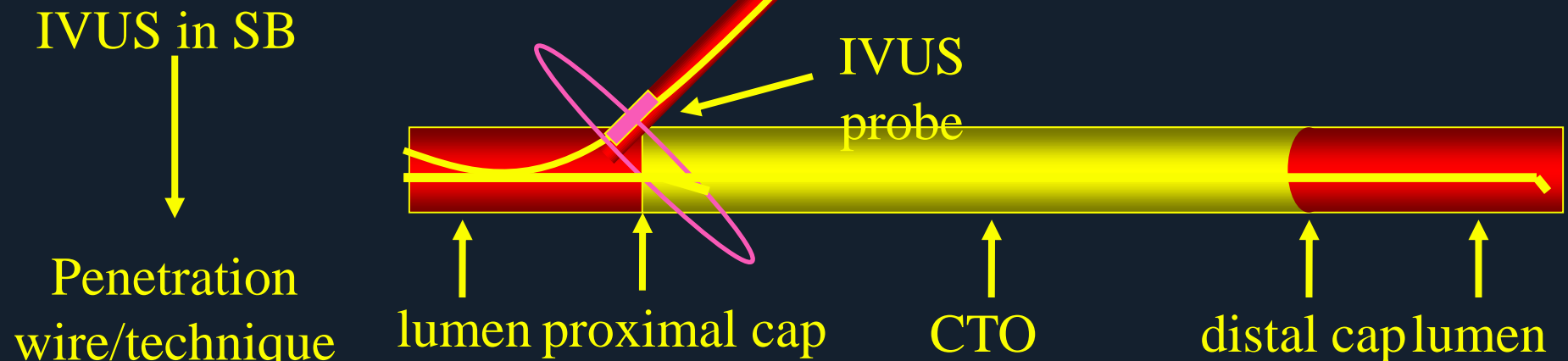


Inner curve less apt to dissect

Antegrade CTO Wiring Techniques

IVUS guidance

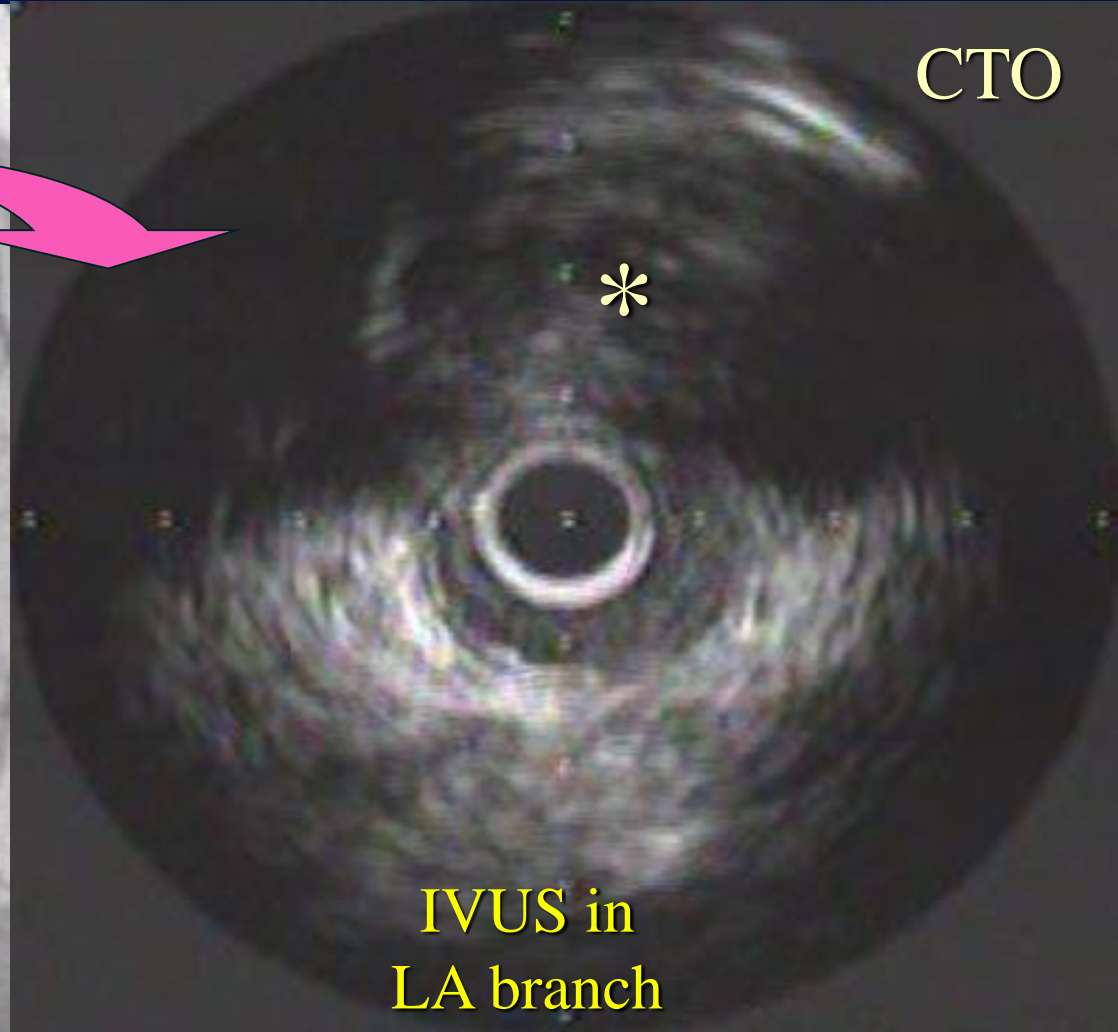
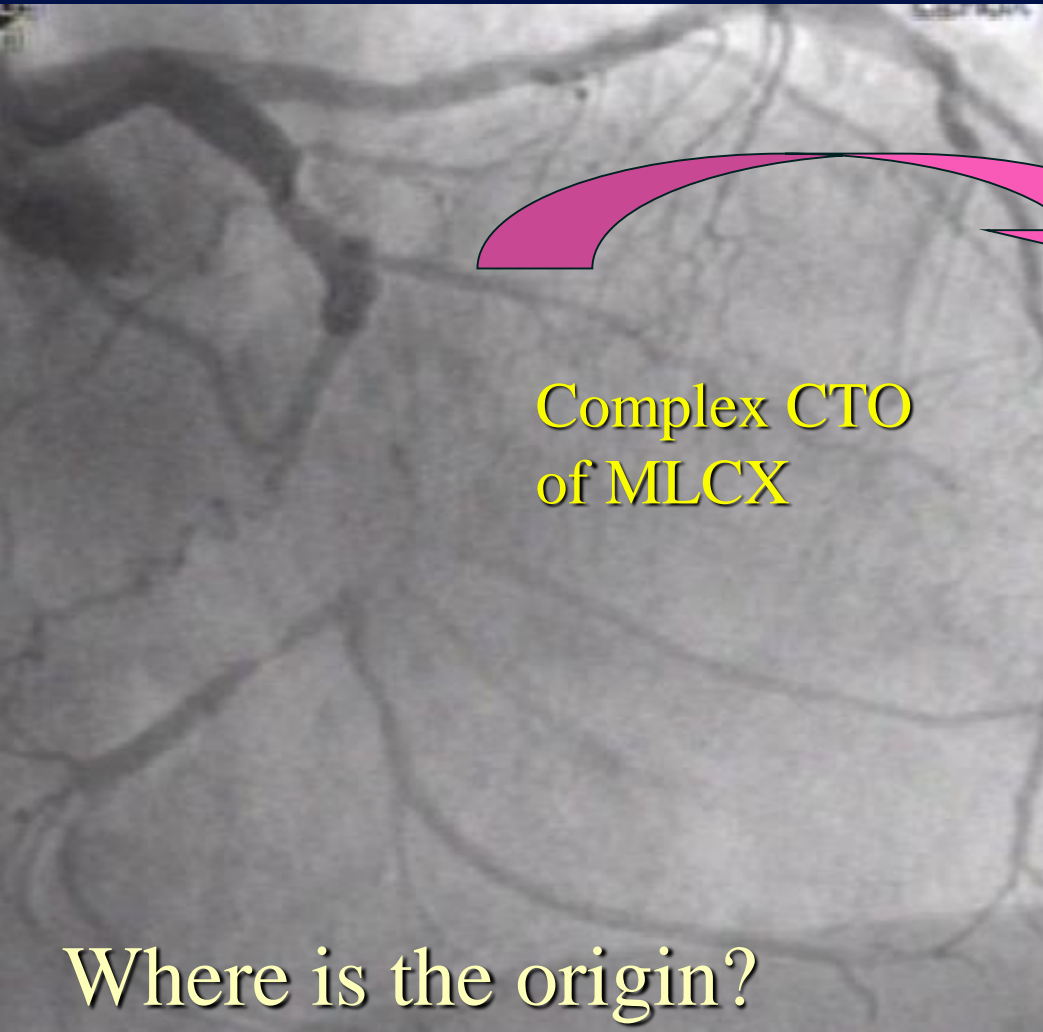
Blunt occlusion at sidebranch takeoff



Confianza

Alternatively, PTCA balloon in SB to help direct wire into proximal cap ---"open sesame"

IVUS Guided Technique for Finding the CTO Entry Point



CTO Wire *Escalation* Techniques

Drilling Strategy

Intermediate GW

↓ Not cross

Stiffer GW (0.014 inch)

↓ Not cross

Other stiffer GWs

↓ Not cross

Stiff Tapered GW

Penetrating Strategy

Intermediate GW

↓ Not cross

Stiff Tapered +/-
Hydrophilic coating

CTO Wire *Escalation* Techniques

“Hybrid” Drilling-Penetration Strategy

Intermediate GW

↓ Not cross

Stiff GW (0.014 inch – MB 3 gm)

↓ Not cross

Stiff tapered + hydrophilic coating
(Confianza pro 9, 12 gm)

CTO Wire *Escalation* Techniques

“Hybrid” Sliding-Drilling-Penetration

Hydrophilic GW (Fielder FC or XT)

↓ Not cross

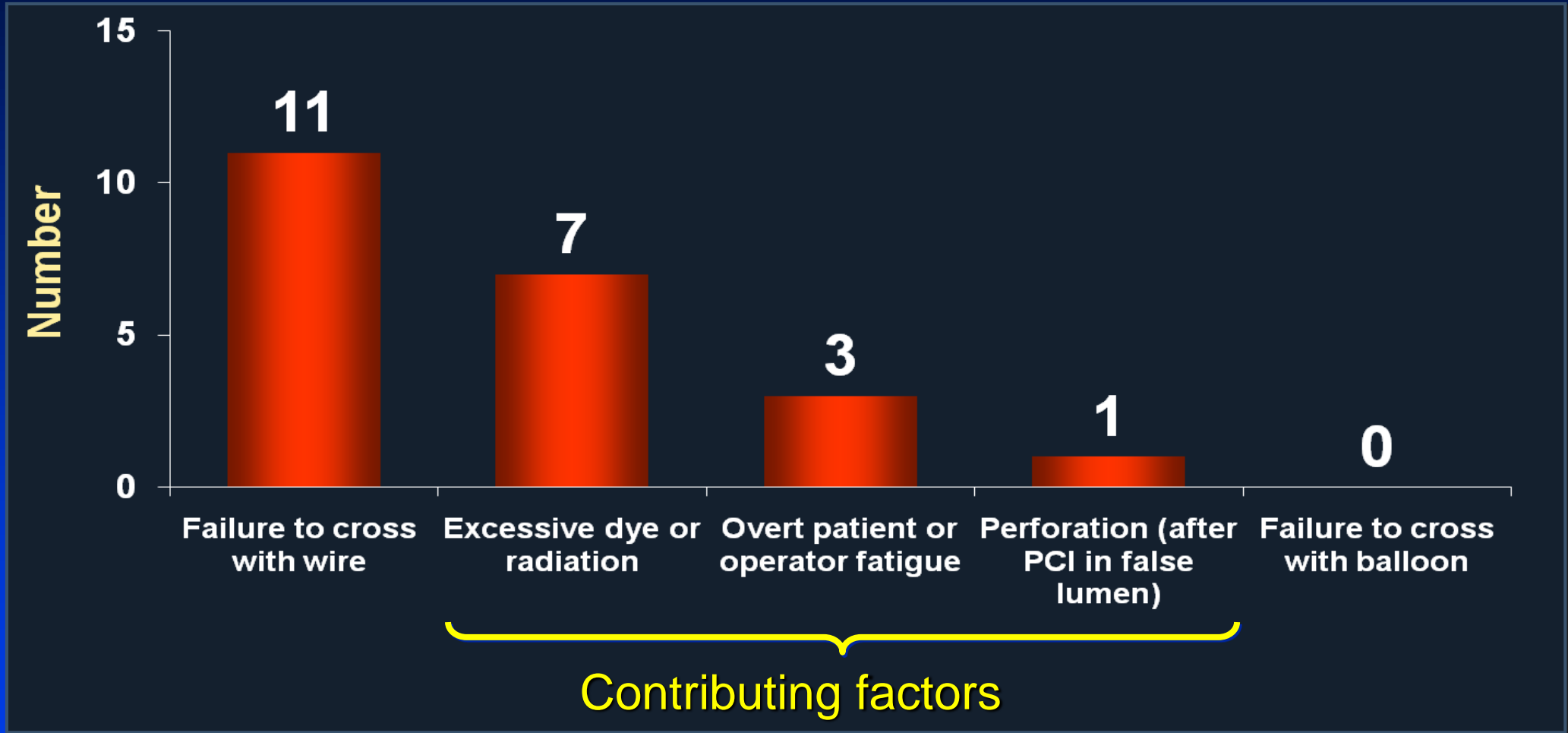
Stiff GW (0.014 inch – MB 3 gm)

↓ Not cross

Stiff tapered + hydrophilic coating
(Confianza pro 9, 12 gm)

Four CTO Summits (2004–2007)

Failure Modes (N=11)



CTO - Procedural Considerations

When You Can't Cross (wire)

- **Advanced wiring techniques**
 - **Escalate, penetrate, parallel, see-saw**
- **Advanced support techniques**
 - **Guiding catheters, micro-catheters (Finecross), anchor balloon, mother-in-child, Tornus**
- **IVUS guidance**
- **Retrograde technique**
 - **Evaluate feasibility during planning stages**
 - **Crossover sooner than later**

CTO - Procedural Considerations

When You Can't Cross (balloon)

- **Advanced PCI techniques**
 - **Buddy wire, lowest profile balloons, etc.**
- **Advanced support techniques**
 - **Guiding catheters, anchor balloons**
- **Crossing devices**
 - **Tornus or channel dilator (Corsair)**
 - **Excimer laser**
 - **Rotational atherectomy**
- **Retrograde technique**

CTO - Procedural Considerations

When to STOP!

- **Wire or device perforation with pericardial effusion**
- **Hemodynamic instability**
- **Collateral vessel compromise**
- **Extensive dissection compromising distal runoff**
- **Contrast threshold**
- **Radiation threshold**
- **“CSP” = CTO Saturation Point – futility threshold**
 - **Stage for second attempt**
 - **Refer to more experienced operator**

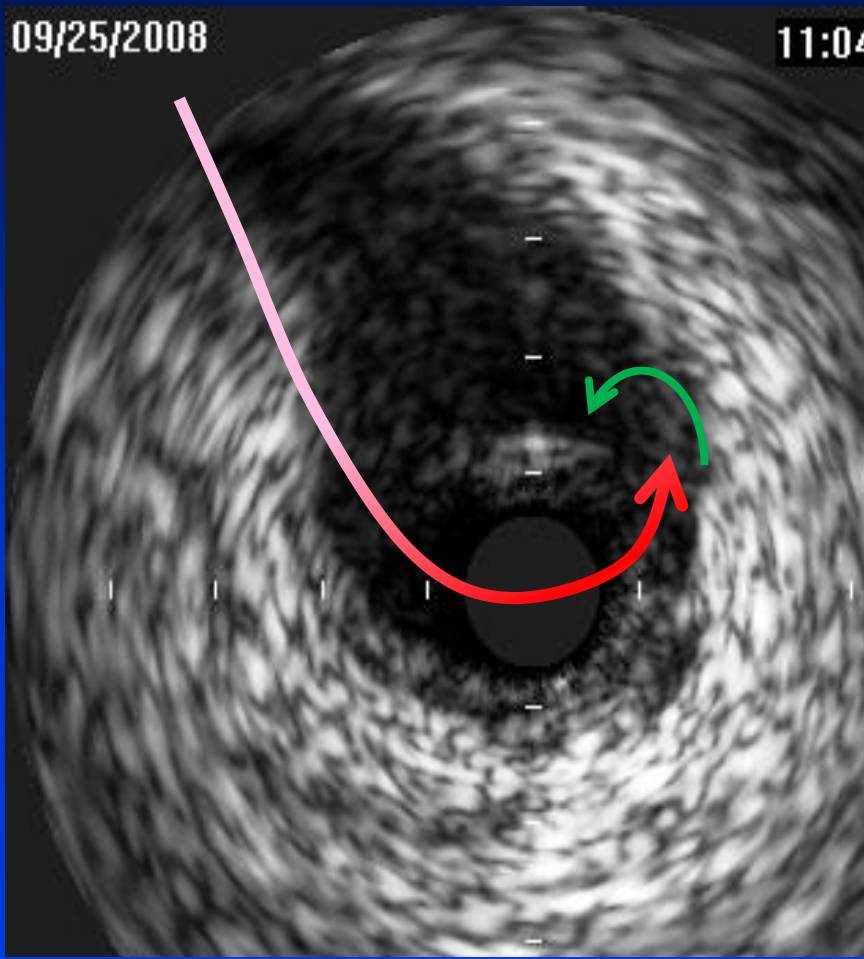
CTO - Procedural Considerations

Recent TRENDS

- **Increased use of early hydrophilic wires (Fielder)**
- **Rapid wire escalation (“hybrid” strategies)**
- **Anchor balloon techniques for support**
- **Use of Tornus and channel dilator**
- **IVUS assisted situations**
- **Early and more frequent initial retrograde approach**
- **CTA assistance (and co-registration – future)**
- **DES – DES – DES – under most circumstances**
- **2nd attempts are now commonplace**

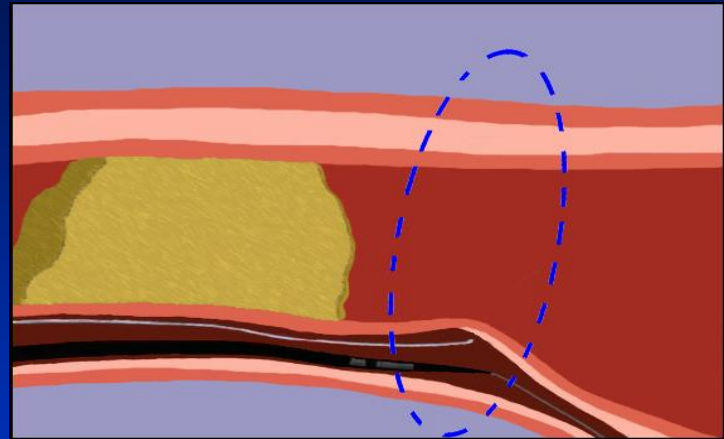
09/25/2008

11:04

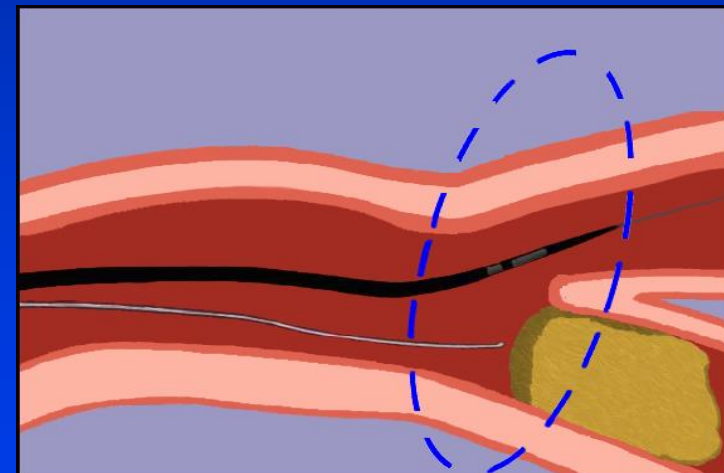


IVUS Guided Technique

Identification of re-entry
point from subintimal
space



Identification of the entry
site



Conclusions

- Perform good quality images to assess presence of microchannels
- Evaluate distal bed with bilateral coronary angiography
- Use multiple projections to visualize progression of guide wires
- Use appropriate guide wires for specific type of lesions, by the help of microcatheters & OTW support balloons
- Select the most easier reasonable technique to start
- Be ready to switch from one antegrade technique to another antegrade technique, as well as from antegrade to retrograde techniques or viceversa
- Be ready to adopt different techniques during the same procedure
- Take time and be Zen, and always follow carefully advices from your “Mentor”