

Ankara, 07 Temmuz 2009

CTO: Antegrad Teknik

Prof. Dr. Ömer Göktekin
Eskişehir Osmangazi Üniversitesi Tıp Fakültesi

CTO Görüntülenmesi

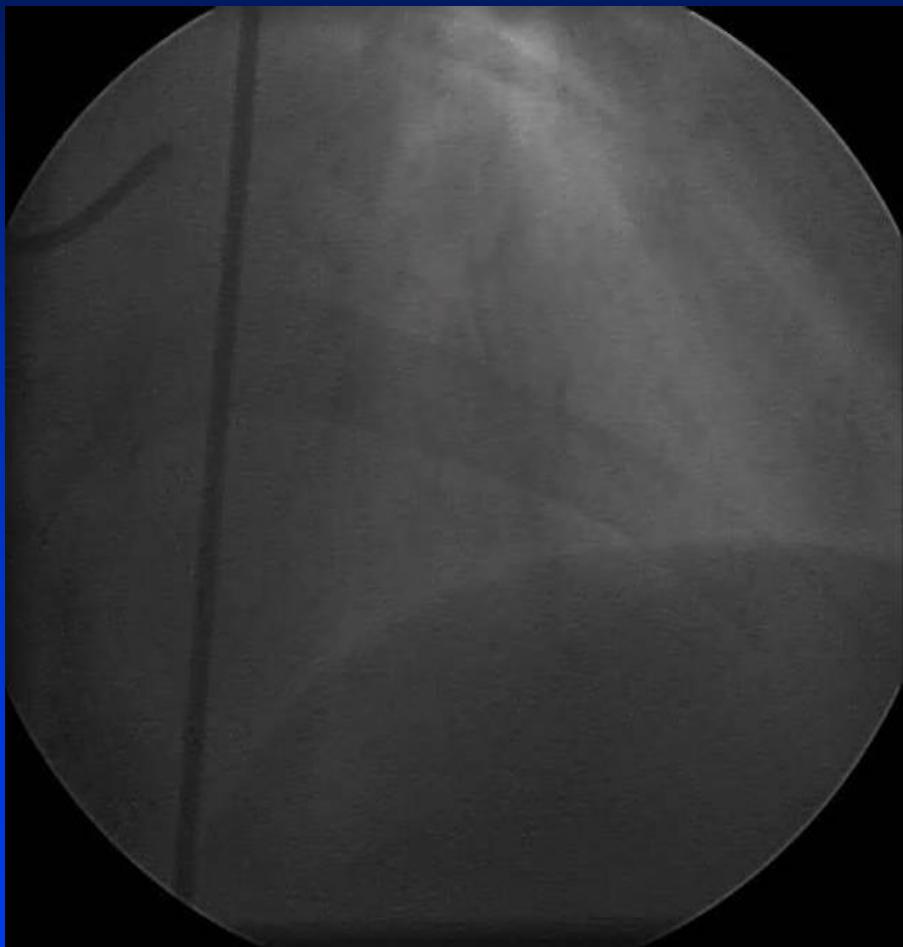
- Stump ve distal giriş noktasının saptanmasında en iyi görüntülerin tanımlanması
- Simultane Kontralateral Enjeksiyon
- Kılavuz telin ilerletilmesinde biplane anjiyografi

CTO teknikleri

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

Vaka A.A: 61 Yaş Erkek

CCS Evre 2 AP, LV Duvar Hareket Bozukluğu Olmaksızın
LAD orta segmentte bifurkasyon oklüzyonu: Yaklaşık 17 Aydır İstirahatte Olan Göğüs
Ağrısı

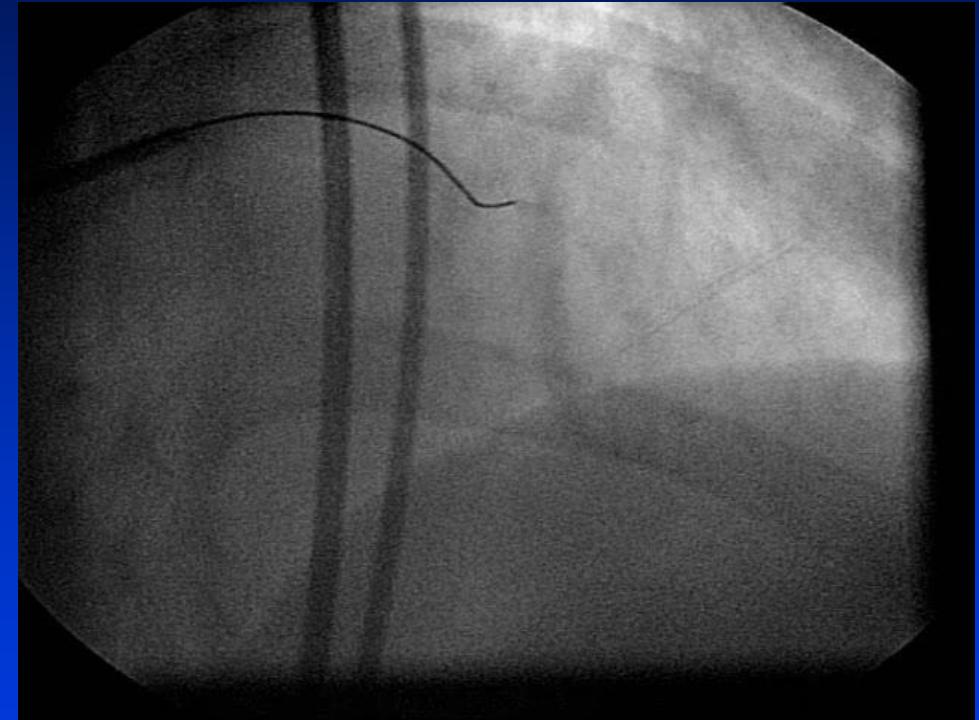


AP cranial view



RAO view

LAD orta segmentte bifurkasyon oklüzyonu



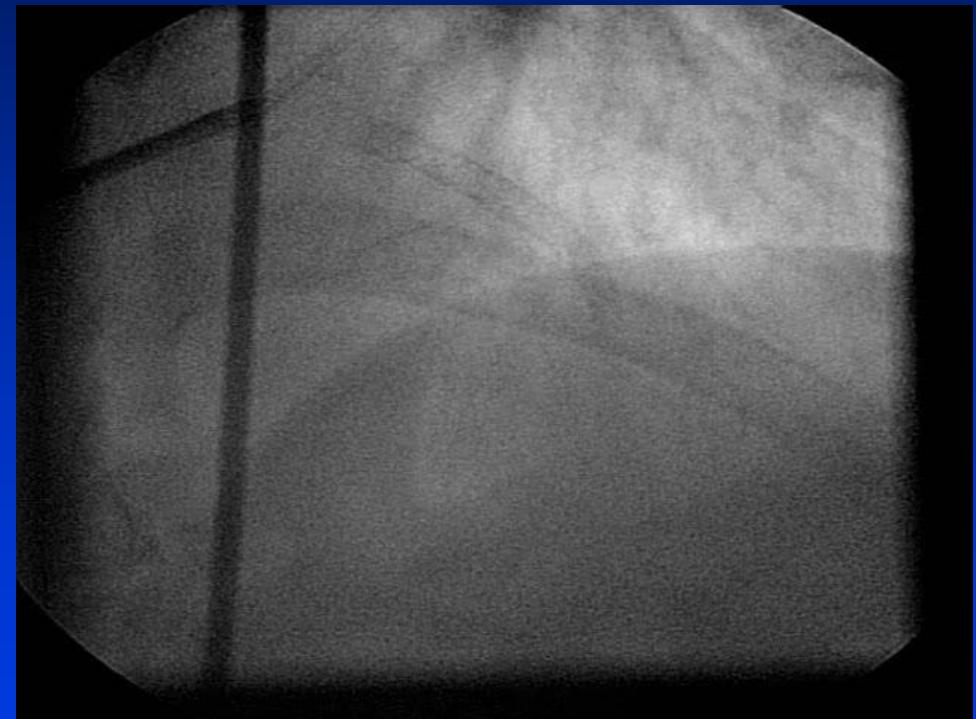
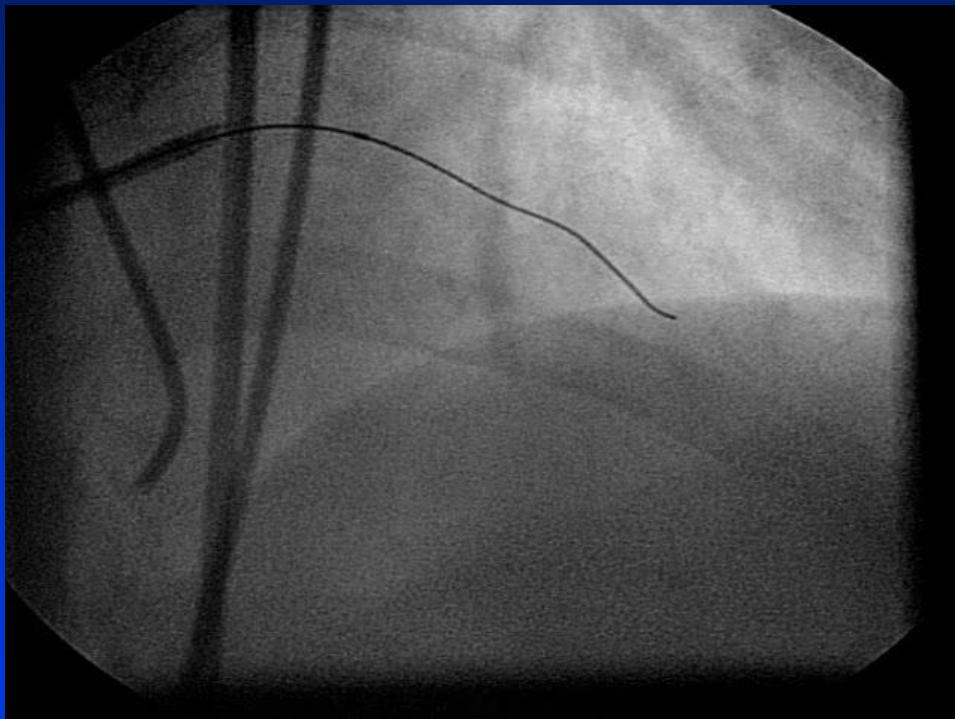
Simultan kontralateral injeksiyon

Maverick OTW balloon + Pilot 50 –başarısız-
Miracle 3g (Asahi-Intecc)

LAD orta segmentte bifurkasyon oklüzyonu

Telin konumunu belirlemek için
kontralateral enjeksiyon

Son görüntü



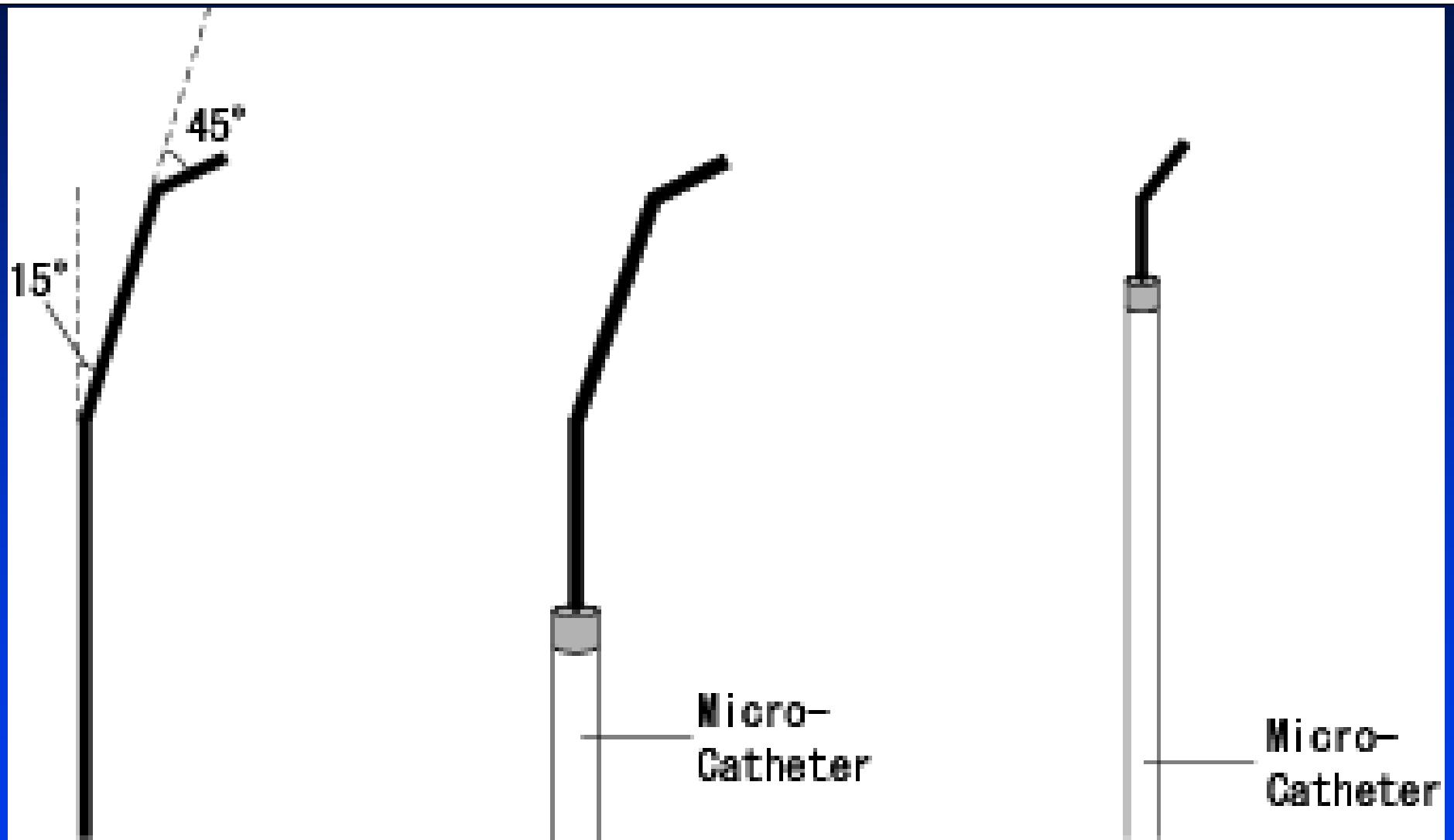
iki Cypher (3.0/18, 2.75/18mm)

Vaka: 52 Yaş Erkek

- CRF: Pozitif Aile Öyküsü, Hipercolesterolemİ, Sigara
- Mart 2002 den beri CCS Evre II Angina
- KAG: SVD, LCx orta segmentte oklüzyon
- LV: Normal LV fonksiyonu

Elektif LCx Rekanalizasyonu (Haziran 2002)

Telin Şekli

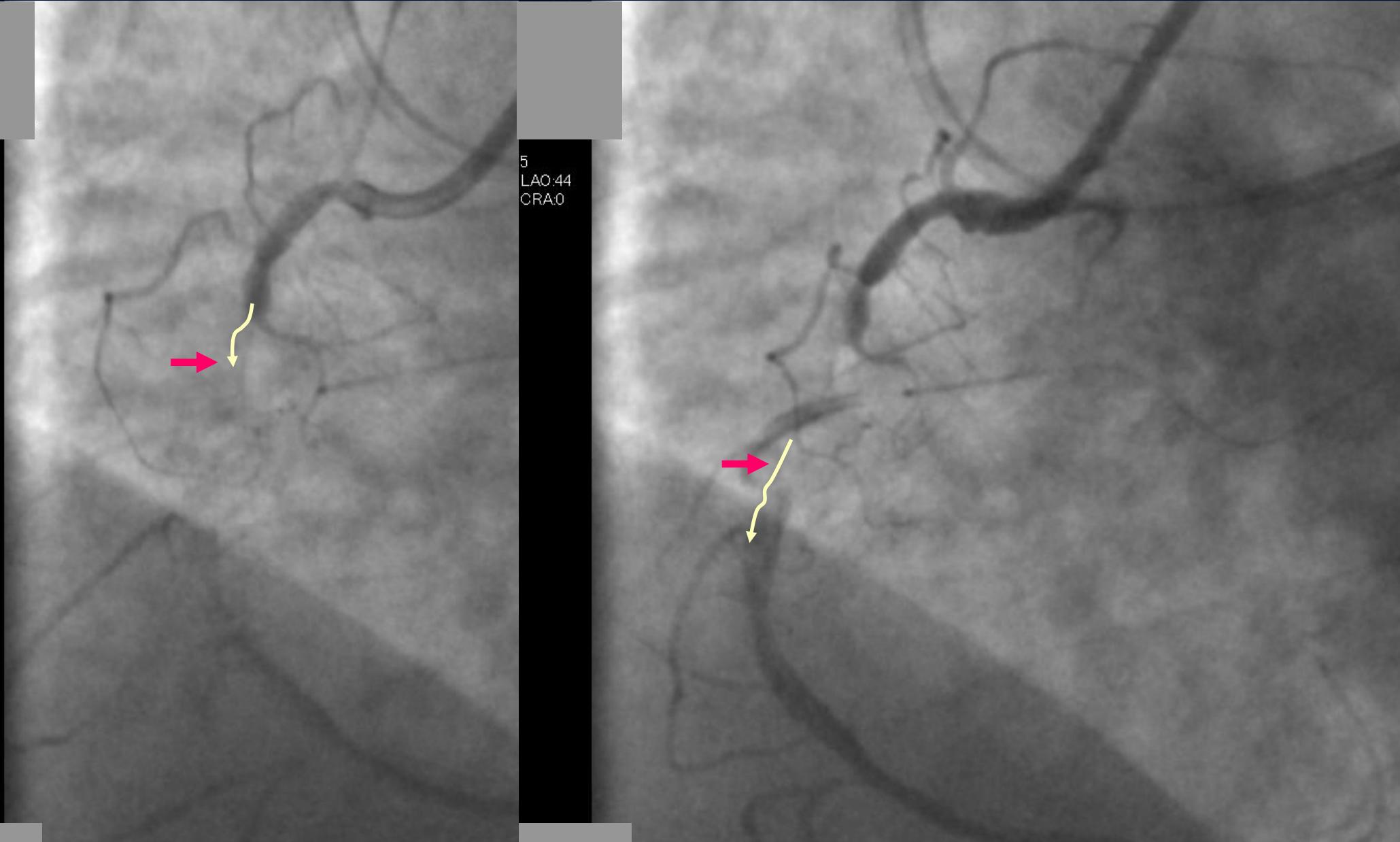
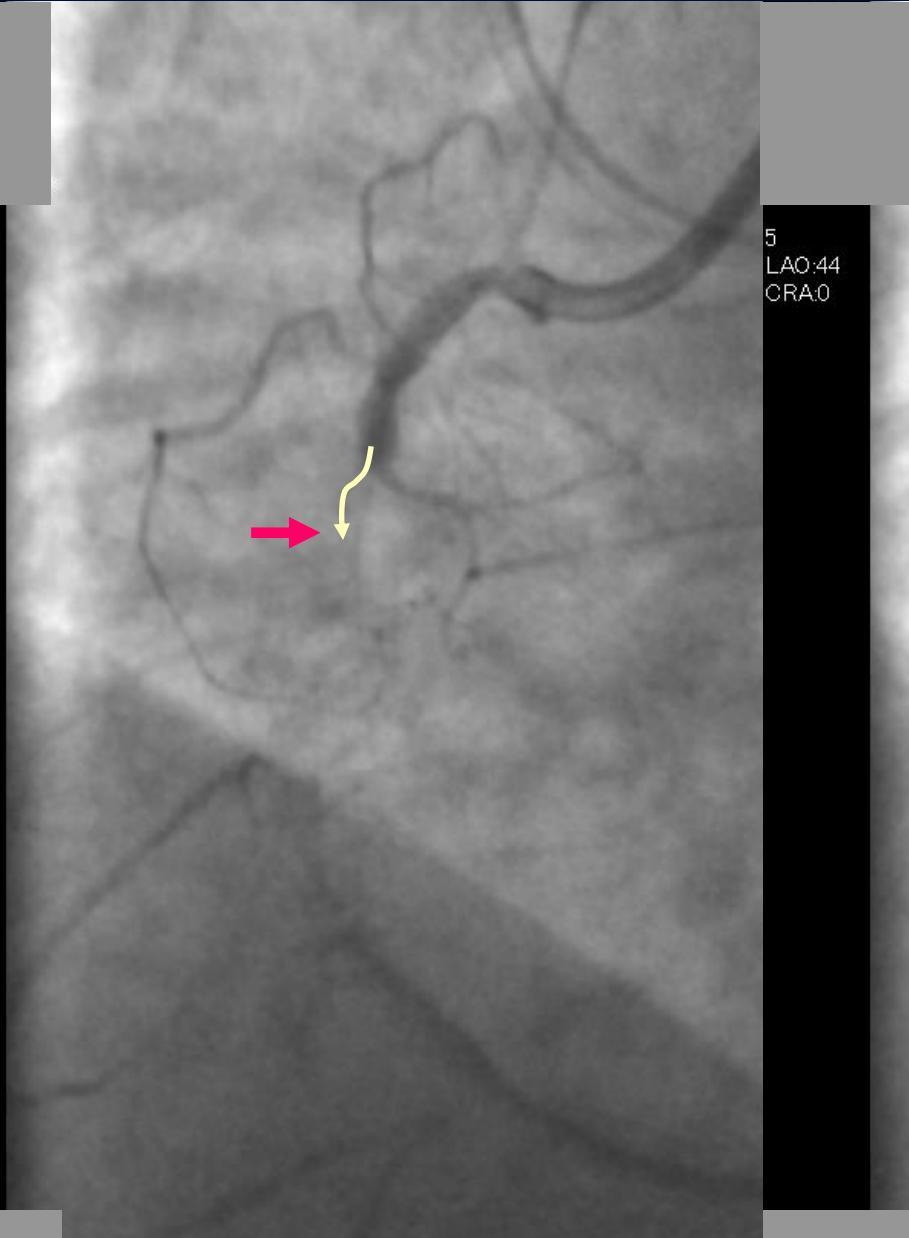


Kontralateral Enjeksiyonun İşlevi

- 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.

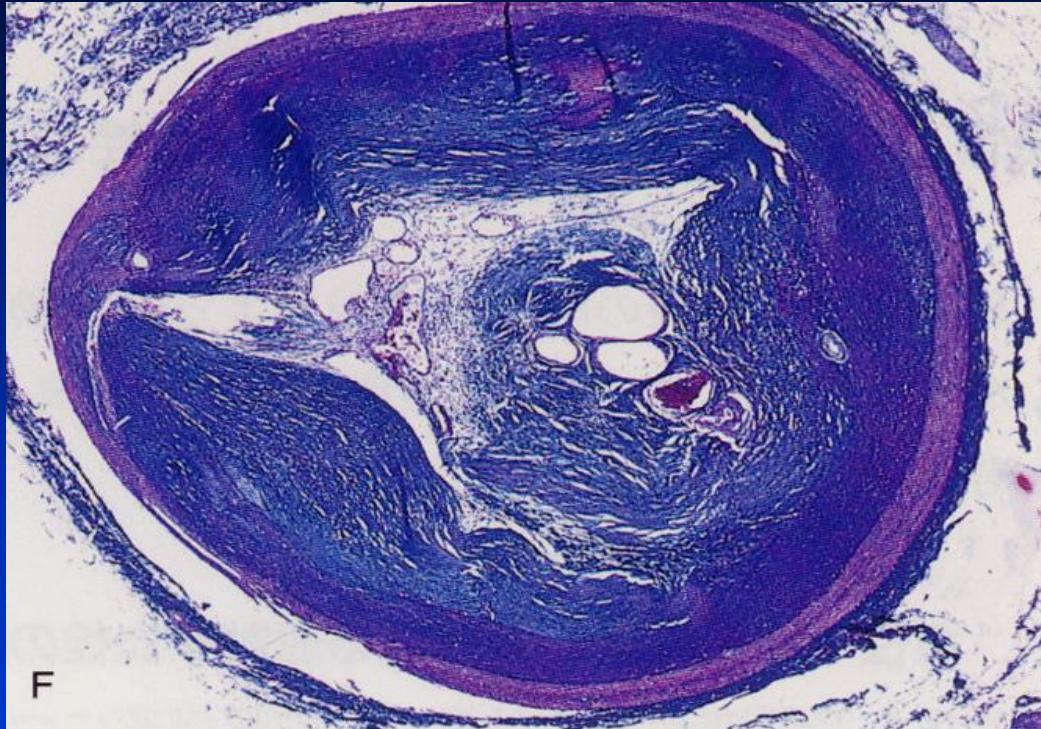
Mikrokanallar belirlenmelidir

5
LAO:44
CRA:0

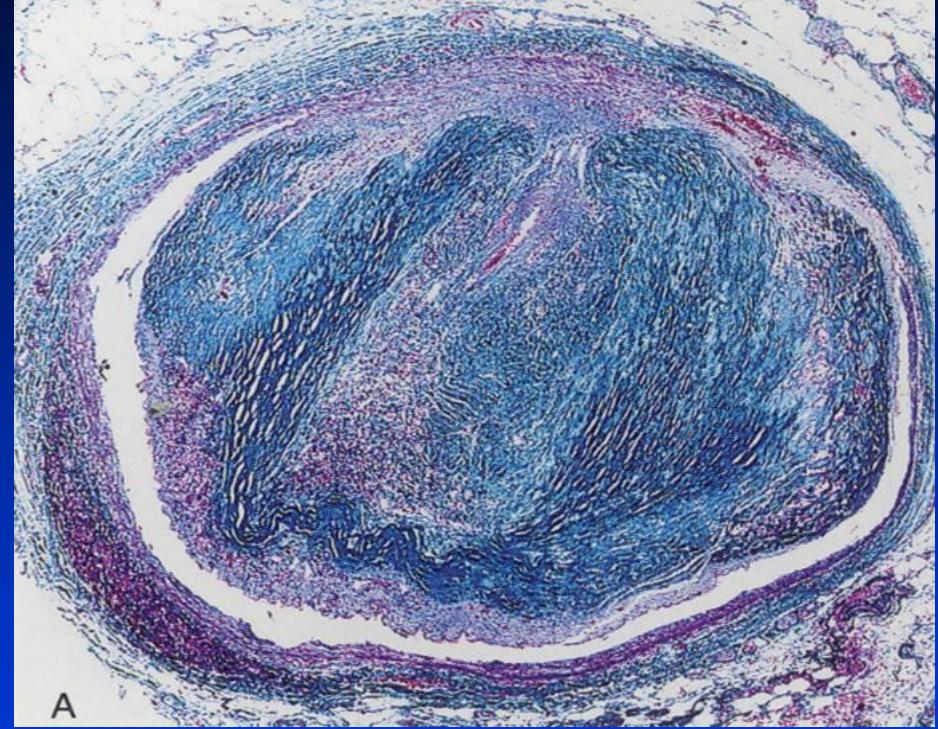


Stump olması antograd mikrokanal varlığının önemli bir göstergesidir

CTO Patolojisi



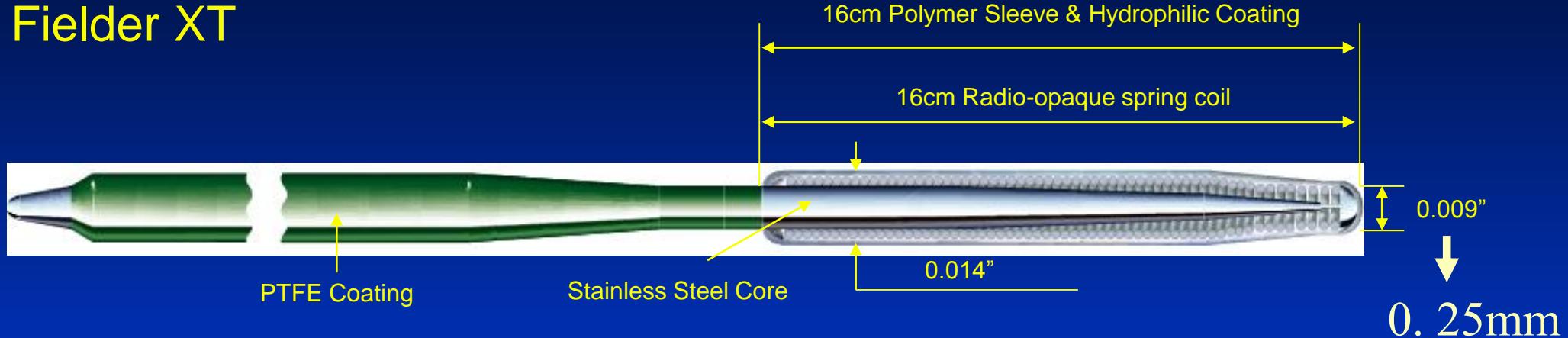
%40 in üzerinde mikro kanalların bulunması başarıyı artırır.



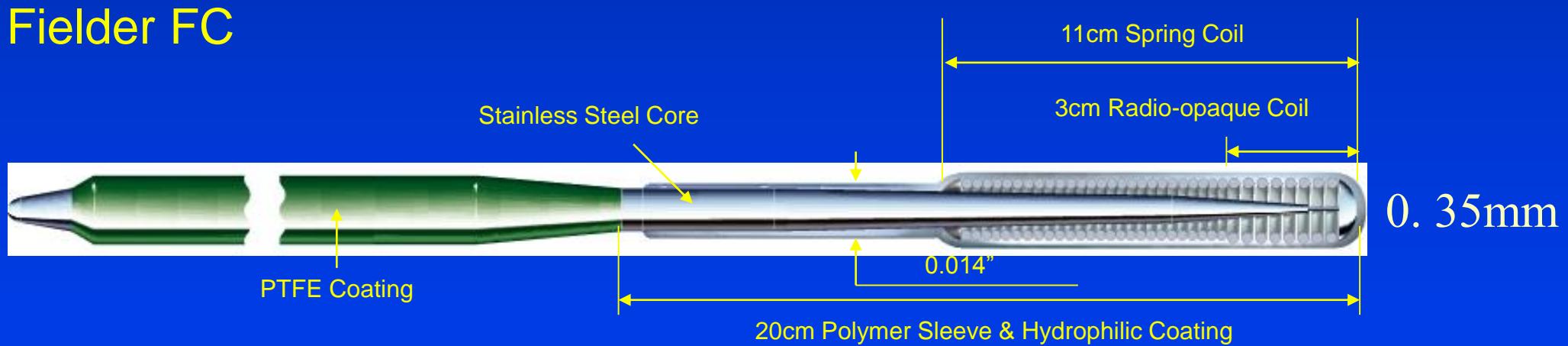
Homojen sıkı plaklar
Daha düşük başarı oranına sahiptir

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**

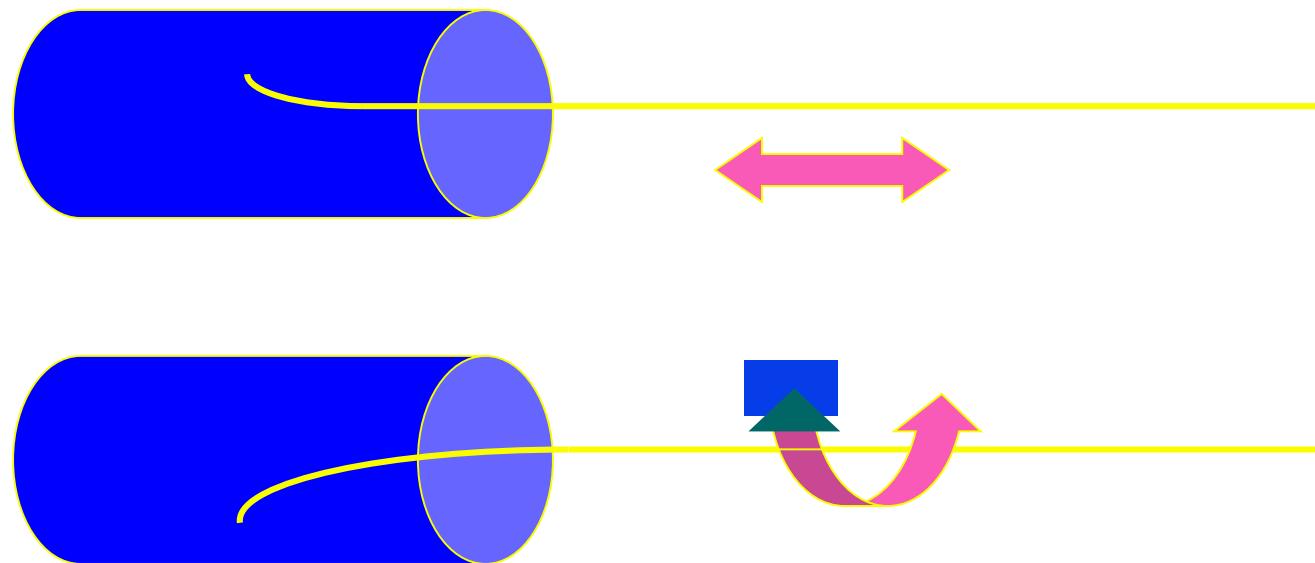
Antegrad Mikro Kanalları Geçmek İçin Uygun Tel Seçimi

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

Antegrad Mikrokanal Yokluğunda Stump'ın Penetrasyonu

Tel Manuplasyon Tekniği

- **Penetration vs. Kontrollü delme**



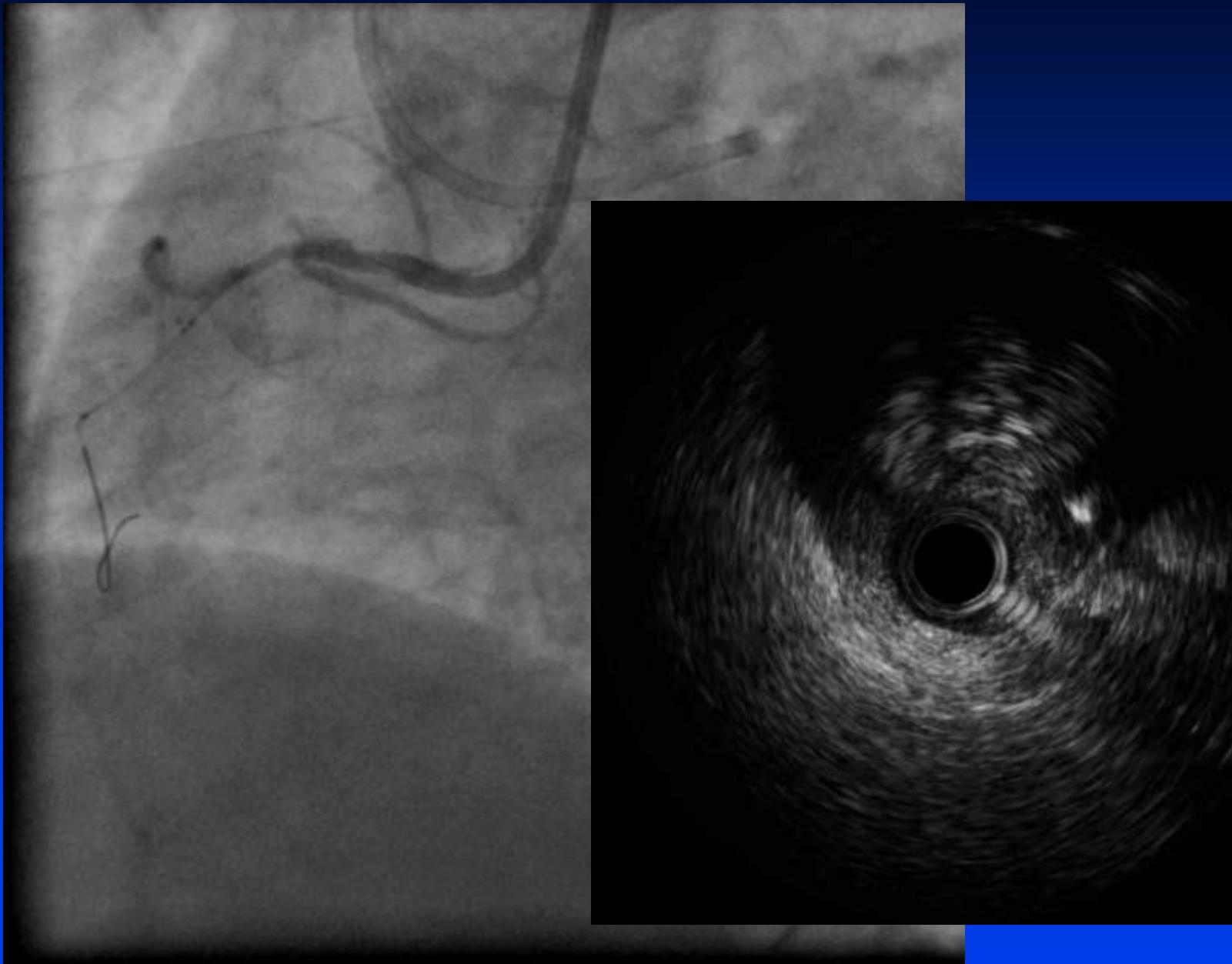
“Penetrasyon” için **tel ucunun yön kontrolü** daha uygundur.

“Kontrollü delme” ile **tel ucunun ilerletilmesi** daha kolaydır.

Antegrad Mikrokanal Yokluğunda Proksimal Kısmın Penetrasyonu

- CTO ya giriş noktası telin yalancı lümene kolaylıkla girebildiği yerdir.
- IVUS probu için yeterli genişlikte bir yan dalın varsa, IVUS rehberliği gereklidir.
 - Volcano Eagle Eye > Boston Atlantis Pro
 - 8Fr guiding catheter gereklidir.

IVUS İçin Proximal RCA Dilatasyonu



Distal cap'ın Penetrasyonu

Parelel Tel tekniğini ne zaman kullanalım?

- Eğer ilk tel yalancı lümendeyse, Confianza Pro 9 veya 12gr ile parellel tel tekniğini kullanmak gereklidir.
- Eğer birinci teli uzun bir süredir manupl ediyorsanız, intramural hematomun basısına bağlı olarak distal damarı görüntüleyemeyebilirsiniz.

Distal Başlık Penetrasyonu

- Eğer hiç antegrad mikrokanal belirtisi yoksa veya tıkalı damar segmenti >20mm den uzunsa, **parel tel teknigi bazen yeterli olmaz ve IVUS eşliğinde yeniden giriş gerekebilir.**
- **IVUS eşliğinde yeniden girişimin en önemli noktası, yalancı lümende olsa bile teli damarın içinde tutmaktadır.**
- - Tapered stiff telden, özellikle Confianza Pro 12gr or 20gr, kaçınılmalıdır. (Miracle 3gr daha iyi bir seçim olabilir.).

Distal damara ulaşmak için Confianza Pro
dan farklı bir tel sıklıkla gereklidir.

- CTO yapısının net bir şekilde anlaşılması prosedurlerin kendisi kadar önemlidir. CTO na girişim için çoklu görüntüleme methodlarına (kontralateral enjeksiyon, MSCT ve IVUS) başvurulabilir.
- Trapping teknik kullanılarak çeşitli OTW cihazlarının değişimi yerine , CTO guiding kateteri 7Fr den daha geniş seçilmelidir. IVUS eşliğinde tel yerleştirecekseniz kateter 8Fr olmalıdır.

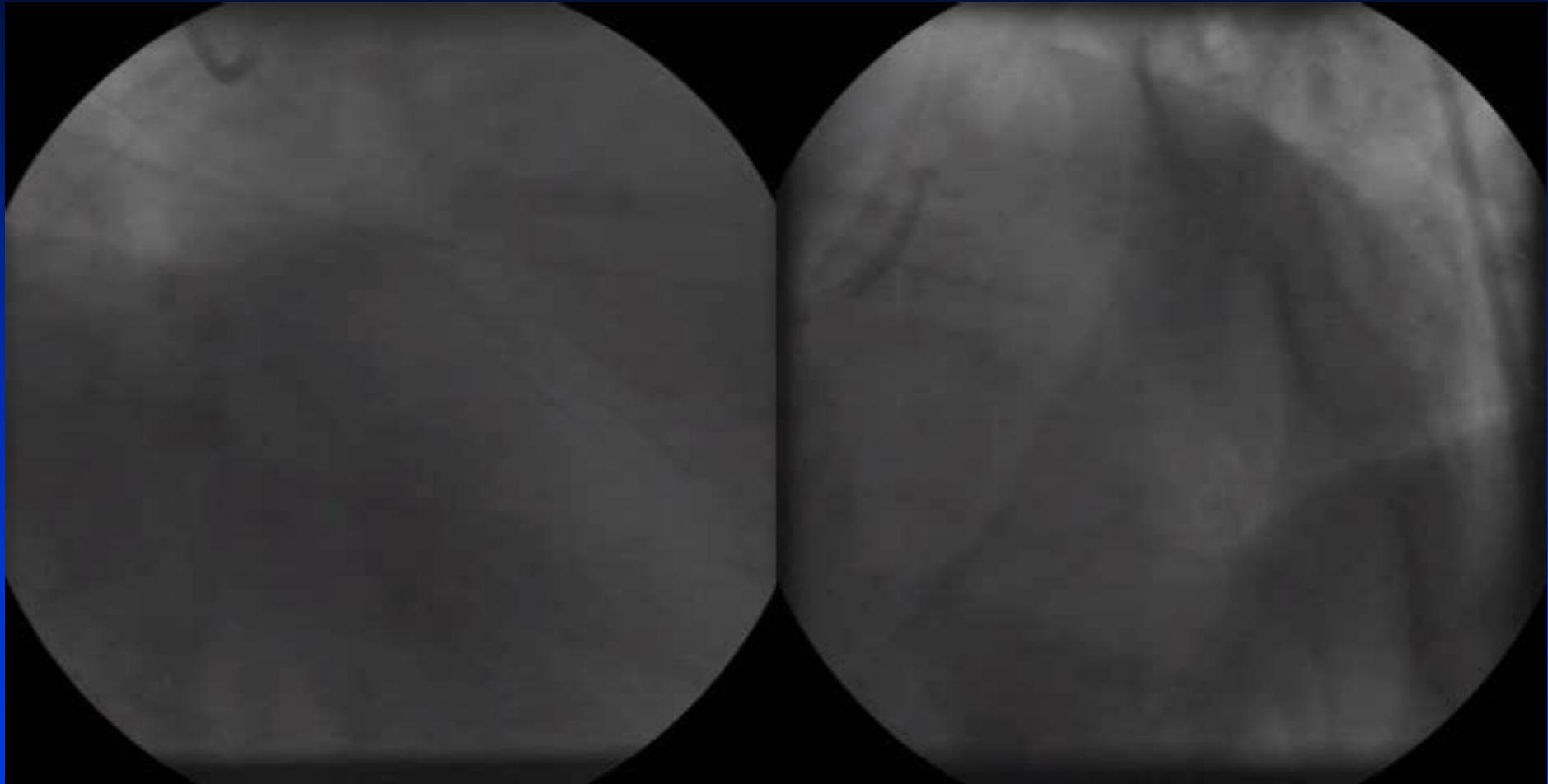
CTO nun Görüntülenmesi

Güdük ve distal giriş noktasının saptanmasında en iyi
görüntülerin tanımlanması

Simultane Kontralateral Enjeksiyon

Kılavuz telin ilerletilmesinde biplane anjiyografi

İlk İşlem (2002)



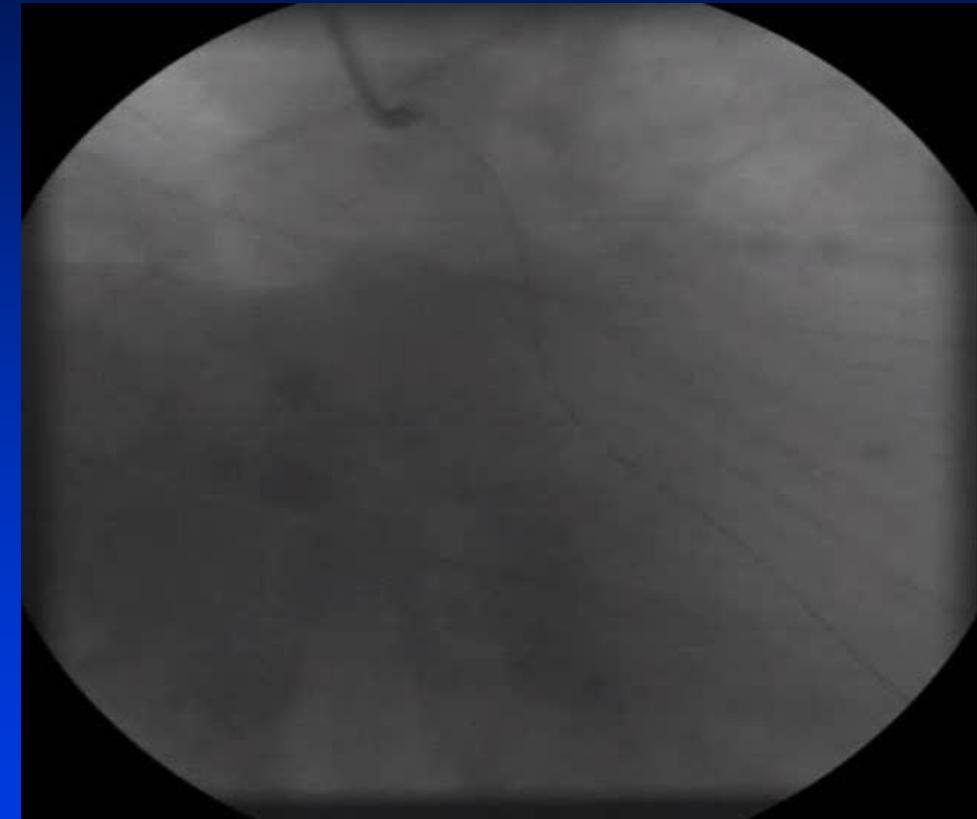
RAO Kaudal

Spider

İlk İşlemde Kontralateral Enjeksiyon Kullanılmaksızın Tel Manuplasyonu (2002)

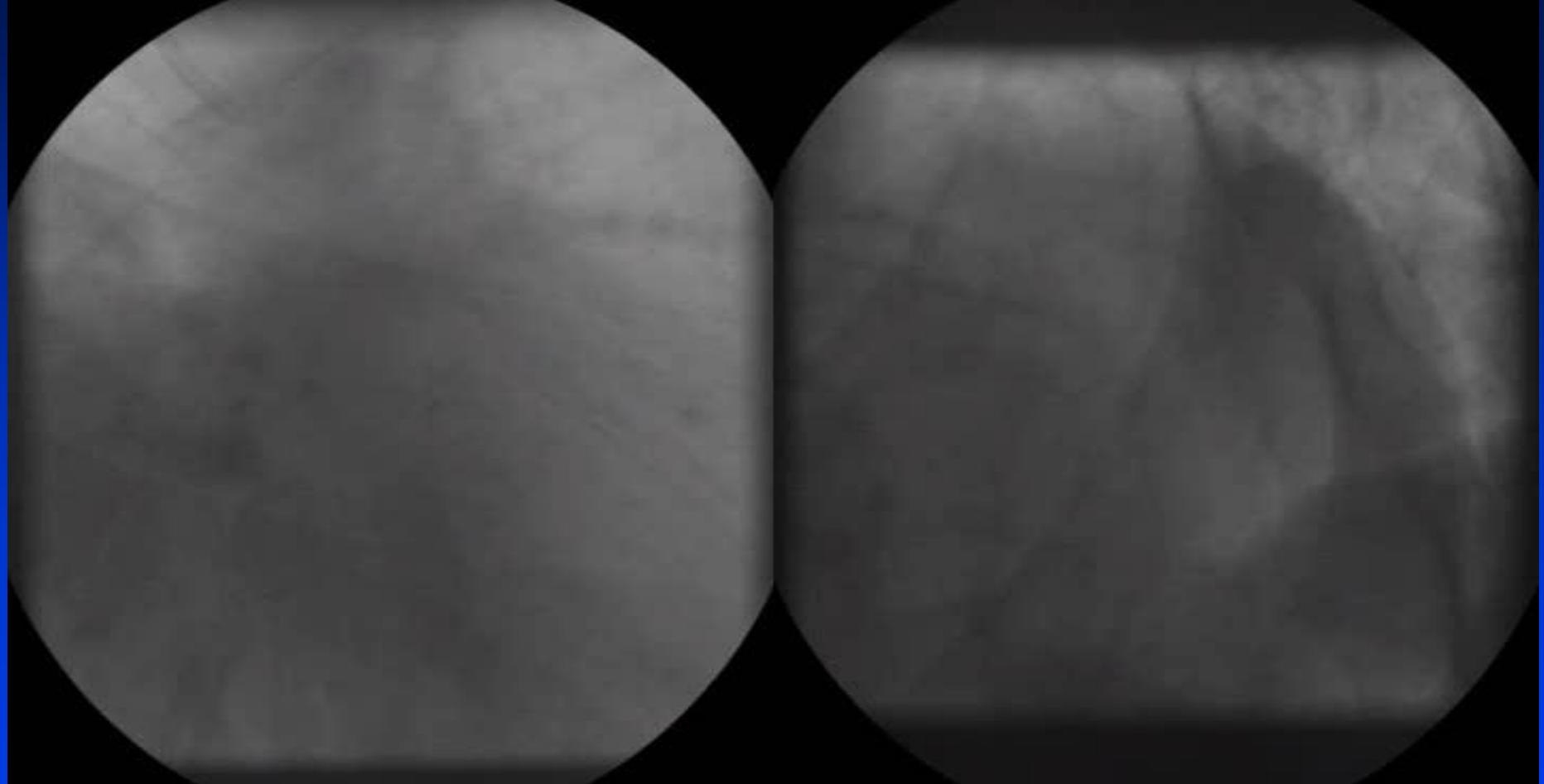


Teli ilerletme



Tel ilerletilmiş

Koronер Perforasyon Nedeniyle İşlemin Sonlandırılması (2002)



RAO kaudal:

Kontrast ekstravazasyonu

LAO Kaudal

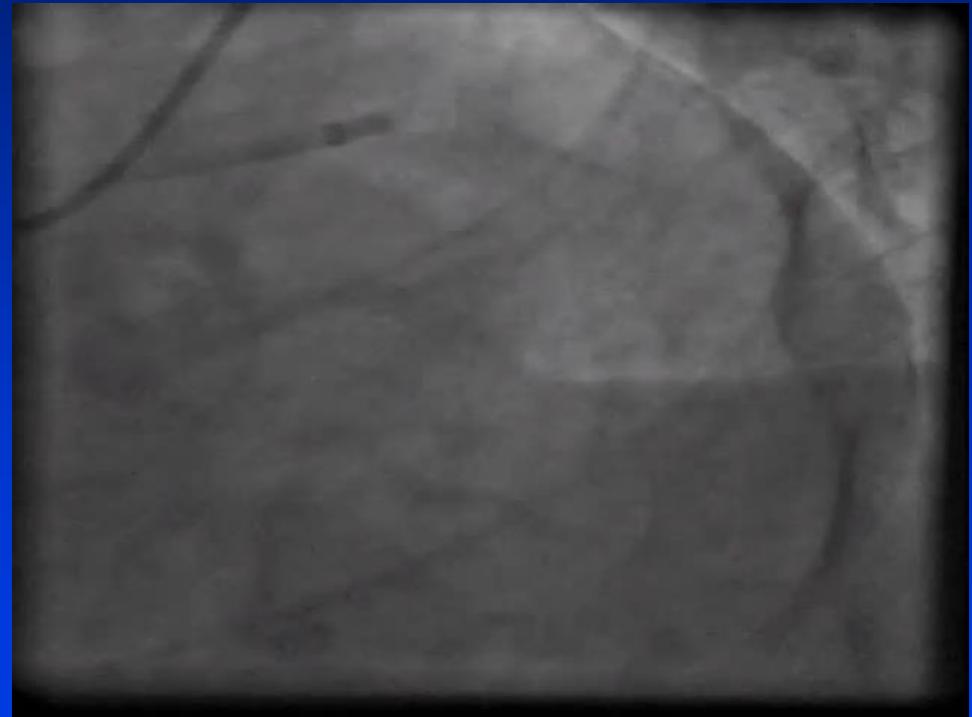
Kontrast ekstravazasyonu

İkinci İşlemde Kontralateral Enjeksiyon (Şubat 2005)

55 yaş , semptomatik, (Evre II CCS)
atenolol, nicorandil, nitrat tedavisi alıyor

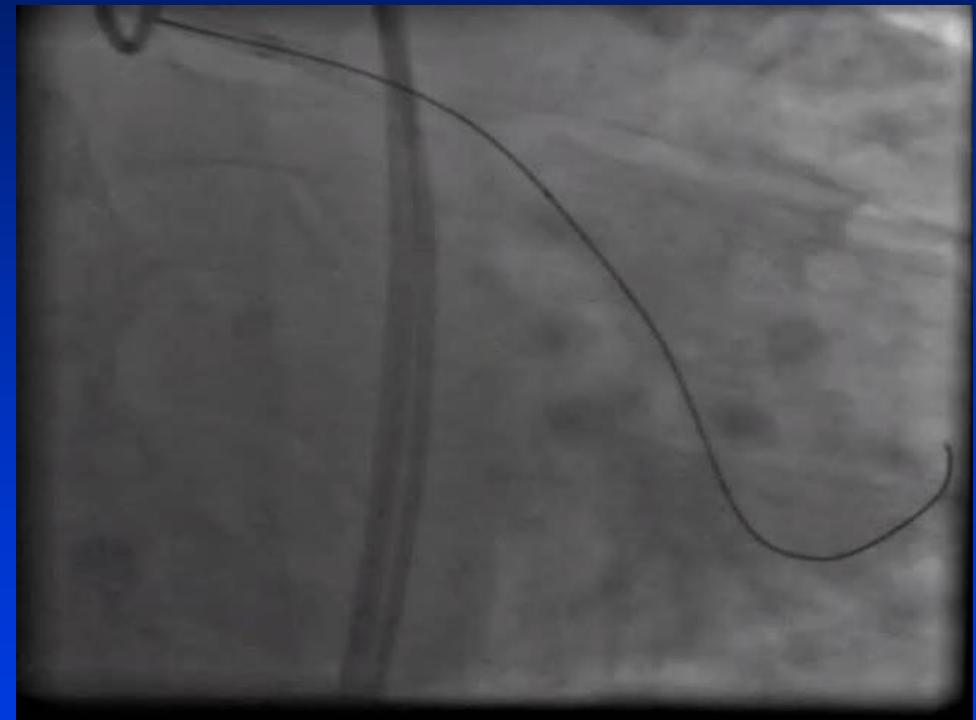
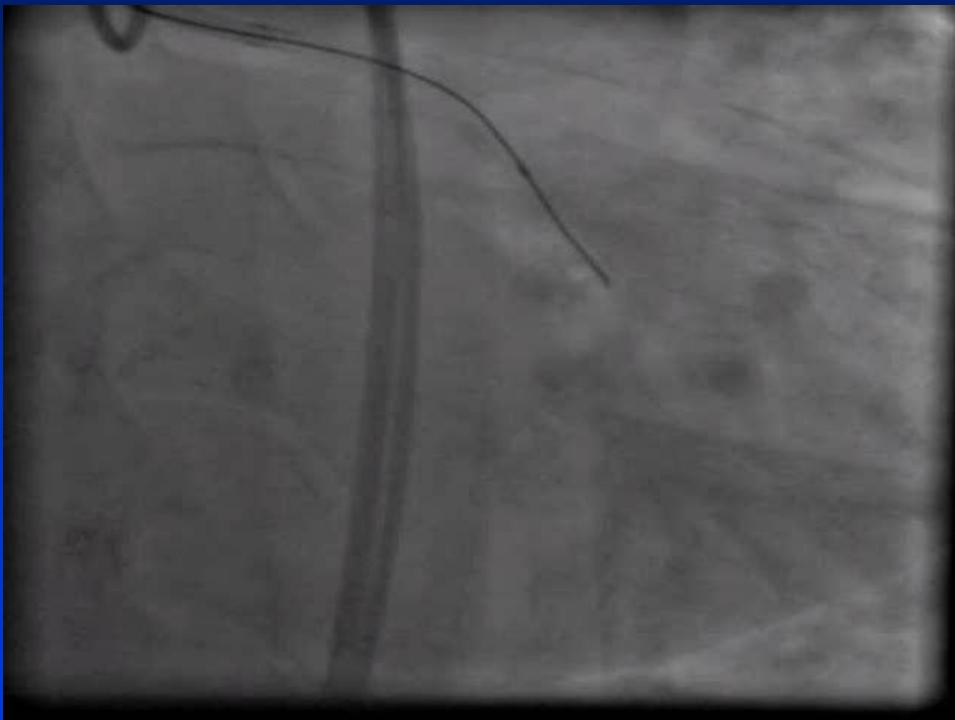


AP Caudal view



Spider view

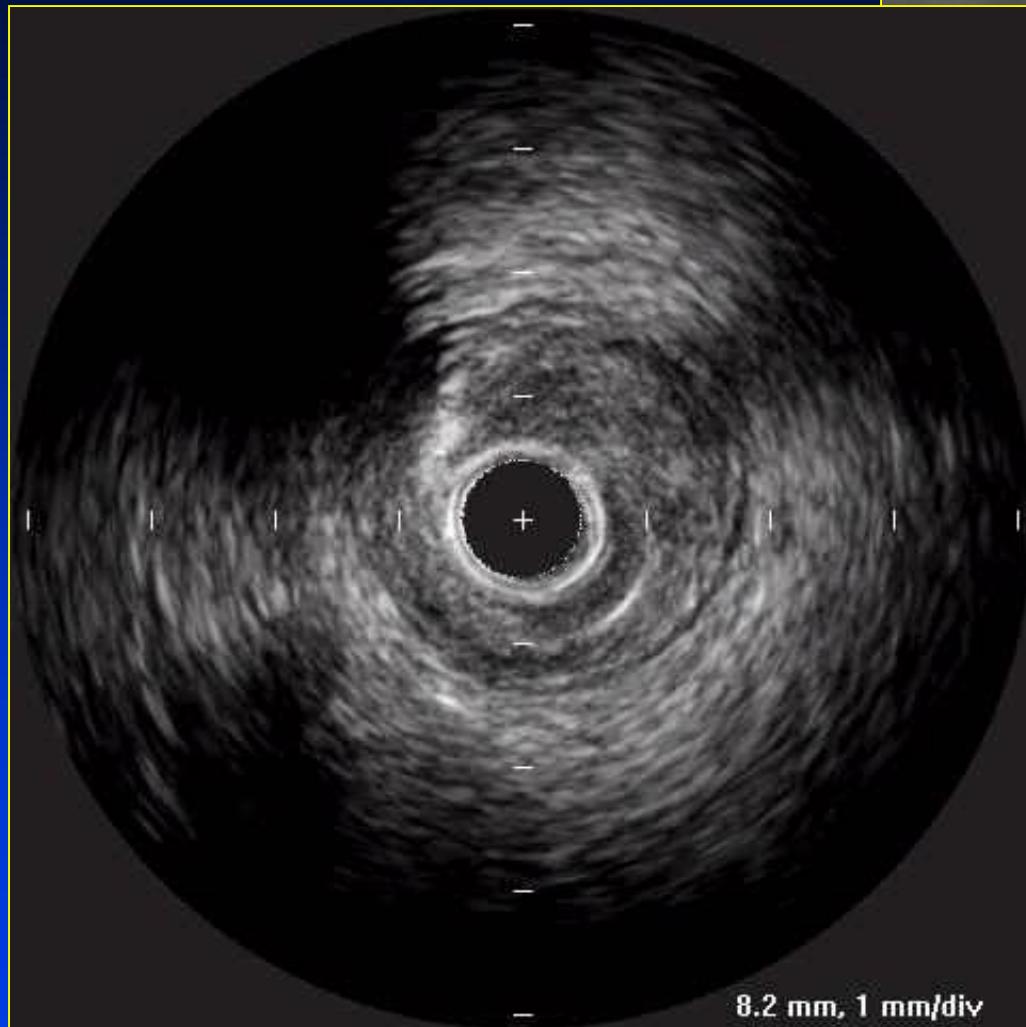
Tel Manuplasyonu



Asahi intermediate (Miracle 3.0)

Maverick 1.5 × 20 OTW balloon (Boston Scientific)

IVUS after Crossing

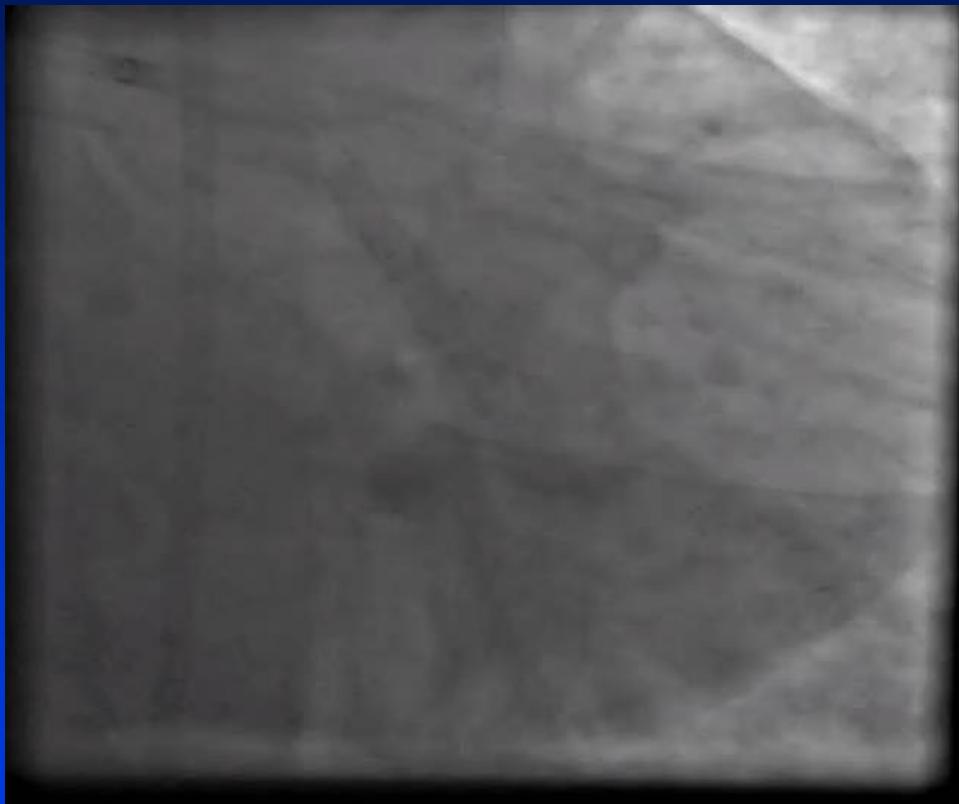


IVUS

40MHz Atlantis IVUS catheter (Galaxy II, Boston Scientific)

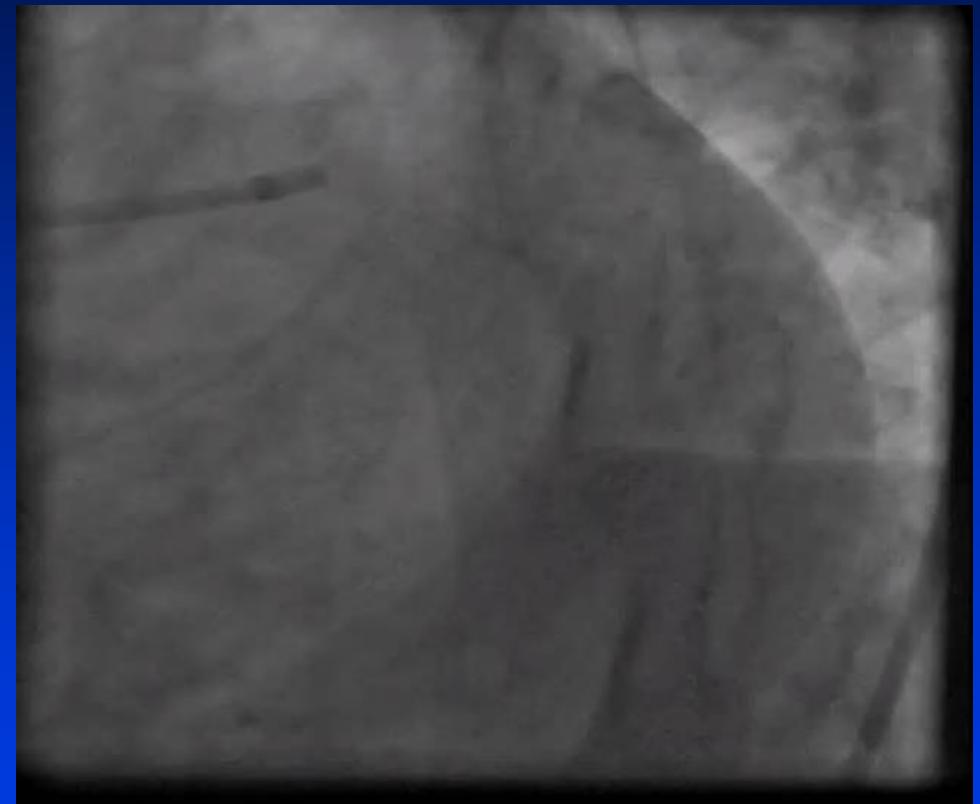
Son Görüntü

Ağustos 2005 te Taburecu. Hasta tamamıyla asemptomatik,
Evre 4 Bruce protokollü eforda normal ECG



AP kaudal

Taxus 3.0 x 28 mm



Spider

Destek

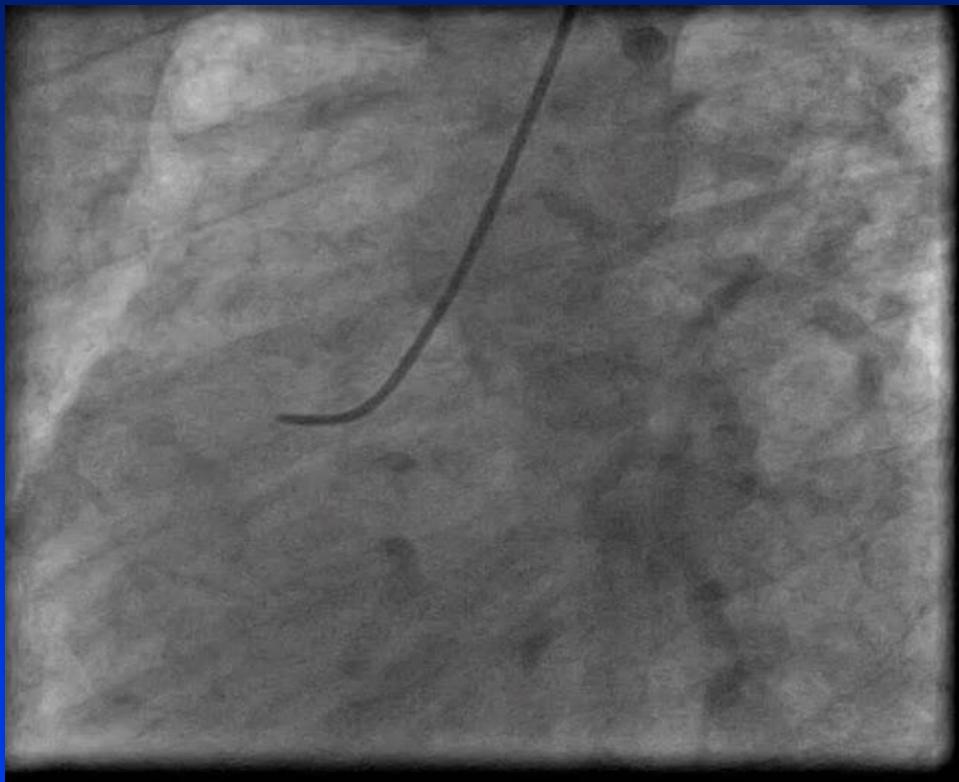
- Hiçbir zaman Sol Judkins kateterleri (EBU, Voda, Amplatz) kullanmayınız ; RCA için Amplatz düşünülebilir ancak osteal diseksiyonlar konusunda dikkatli olunmalıdır
- SH kateterler ? ; Destek için 7 Fr GC seçilebilir. Benim tercihim derin entübasyona izin verdiği için genellikle 6 Fr tir.
- CTO için stabil guiding kateterler, distaldeki tortuosite veya uzun fibrokalsifik lezyonları telin geçmesi konusunda yeterli olmayabilir (Anchor balloon, 5 in 6)

Vaka B.F.T: 43 yaş Erkek

Asemptomatik, Pozitif Treadmill testi,

Talyum sintigrafisinde

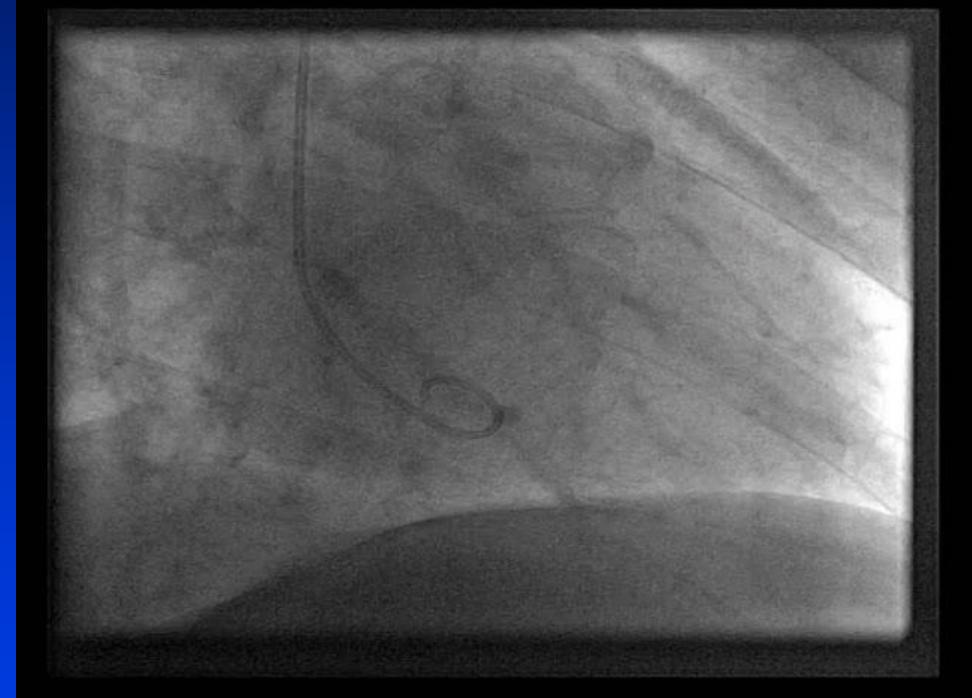
inferolateral geri dönüşlü iskemi



Orta LCx ve D1 ostium lezyonları ile Uzun RCA-CTO

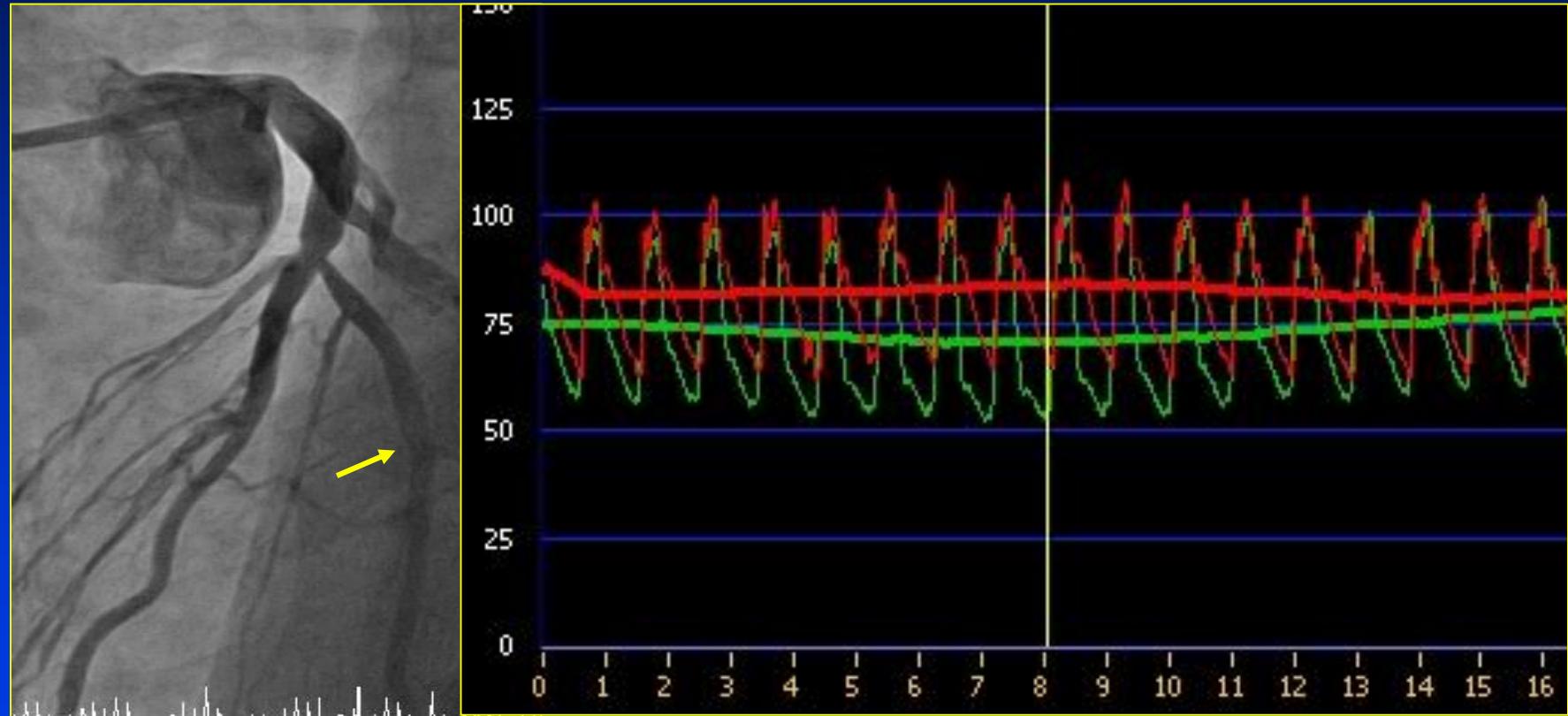


Orta LCx and D1 ostium lezyonları ile Uzun RCA- Siz ne yapardınız?

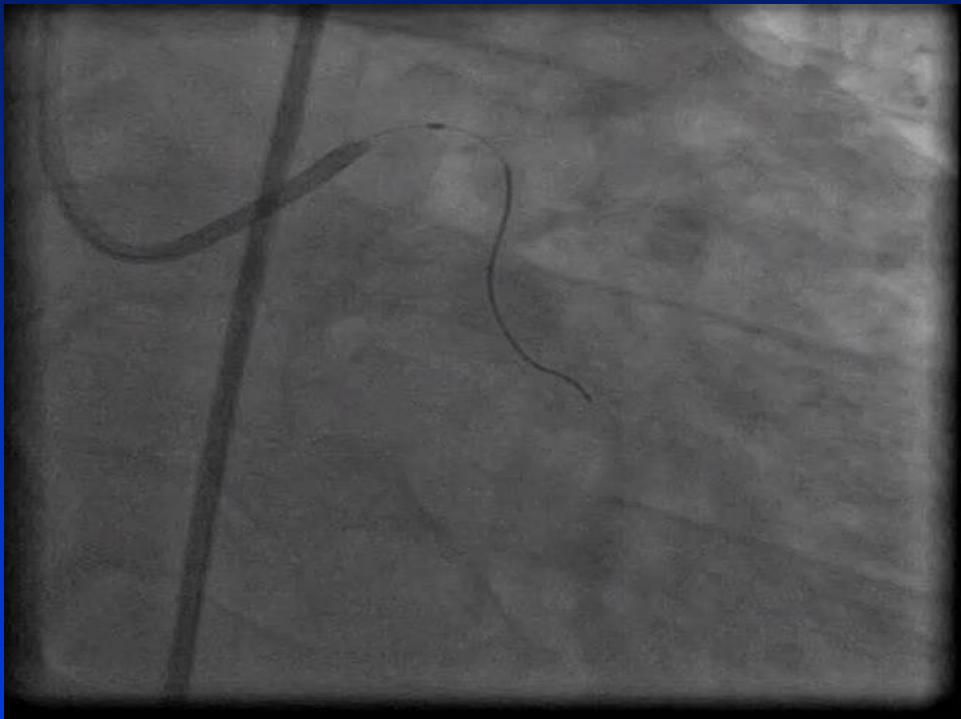


Radi PW5 Diagonal Dal + 96 µg Adenosine

FFR= 0.84 (tekrarlanan üç ölçümde)



Suboklüde LCx Lezyonu Girişimi

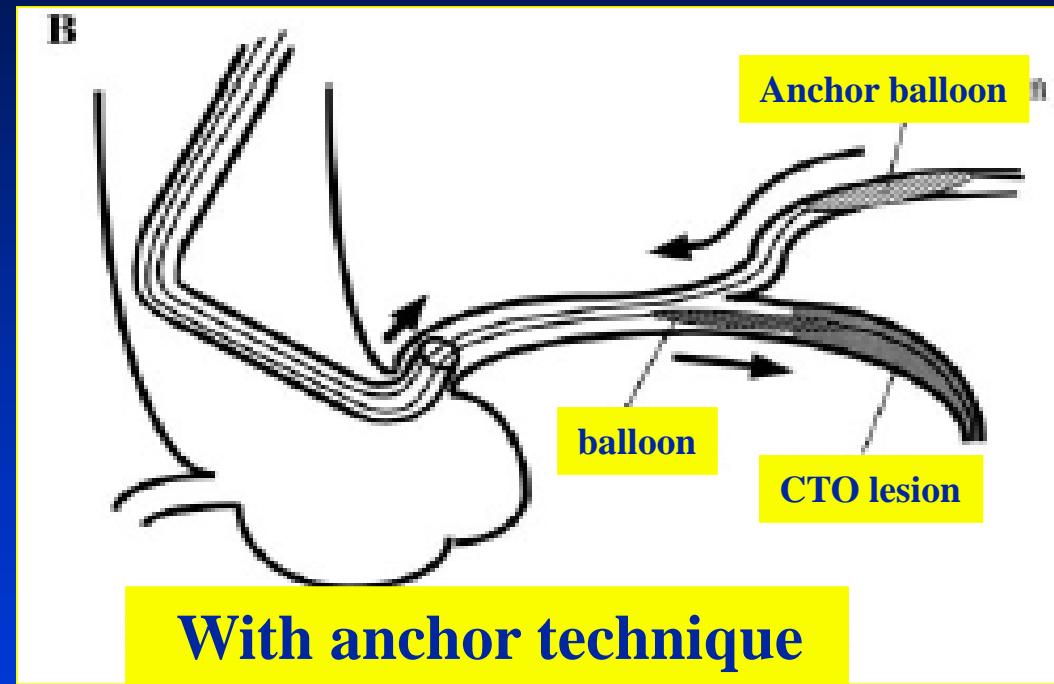


EBU 4.0 Maverick OTW balloon + Pilot 50



Tel geçmesine rağmen balon geçmedi.

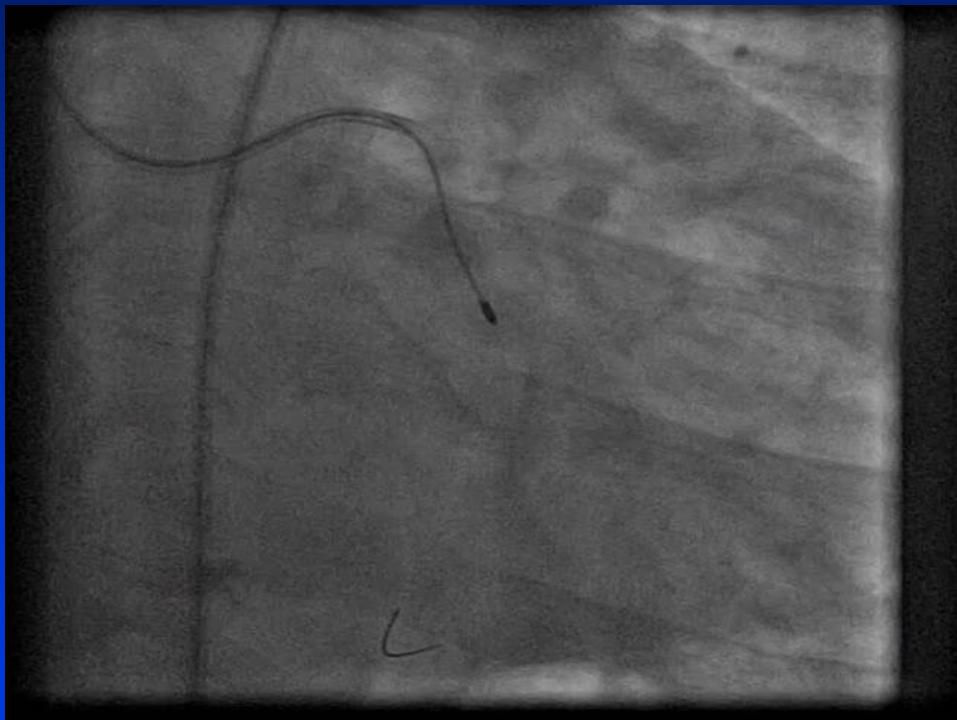
Suboklüde LCx Lezyonu Girişimi



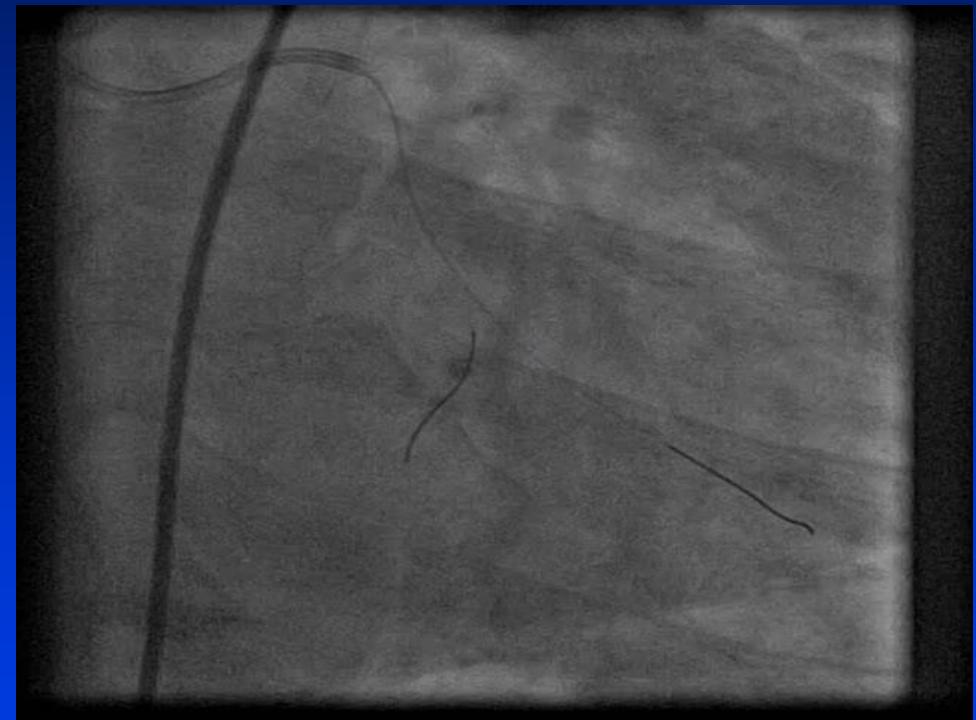
With anchor technique

*Tamai et al. Catheter
Cardiovasc Interv. 2003 Aug;59:482-8*

Suboklüde LCx Lezyonu Girişimi

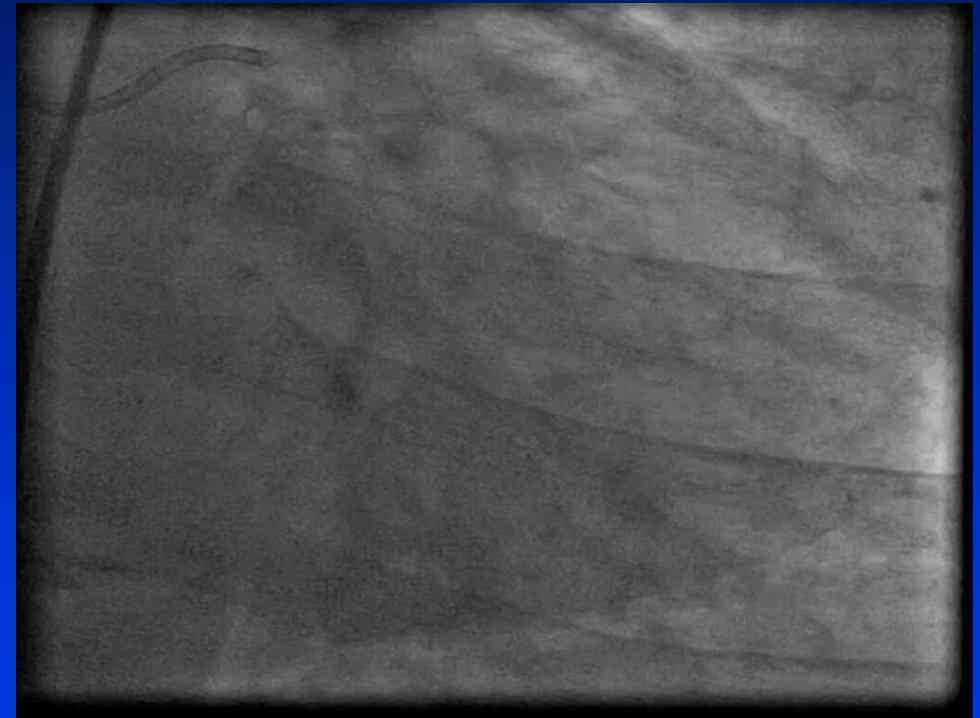
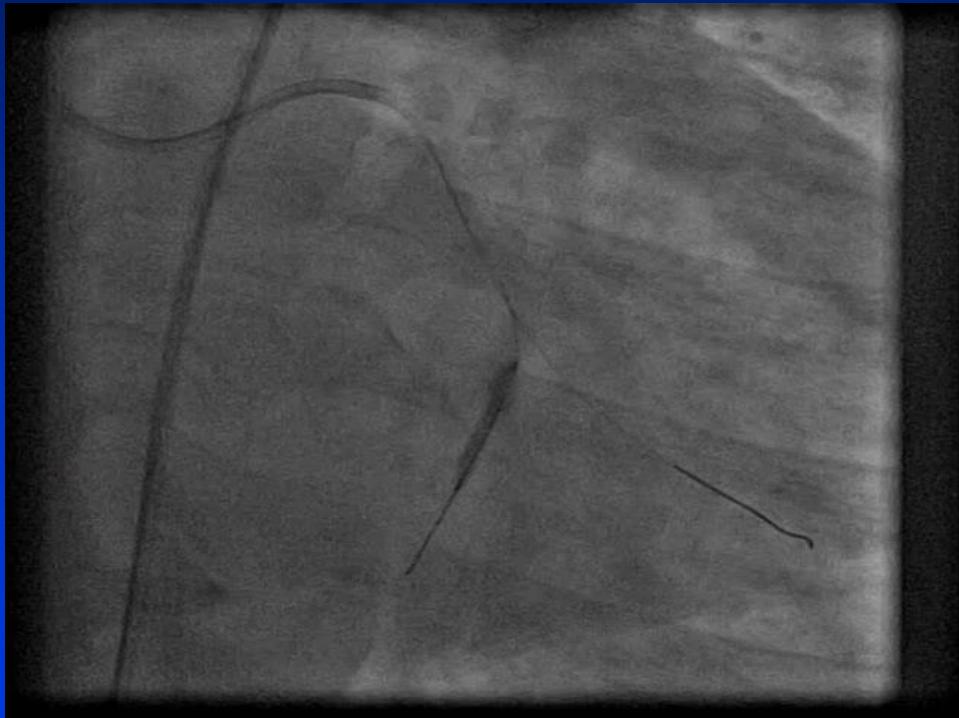


Switched to Amplatz GC
1.5 mm Rotablator



Contained Vessel Rupture

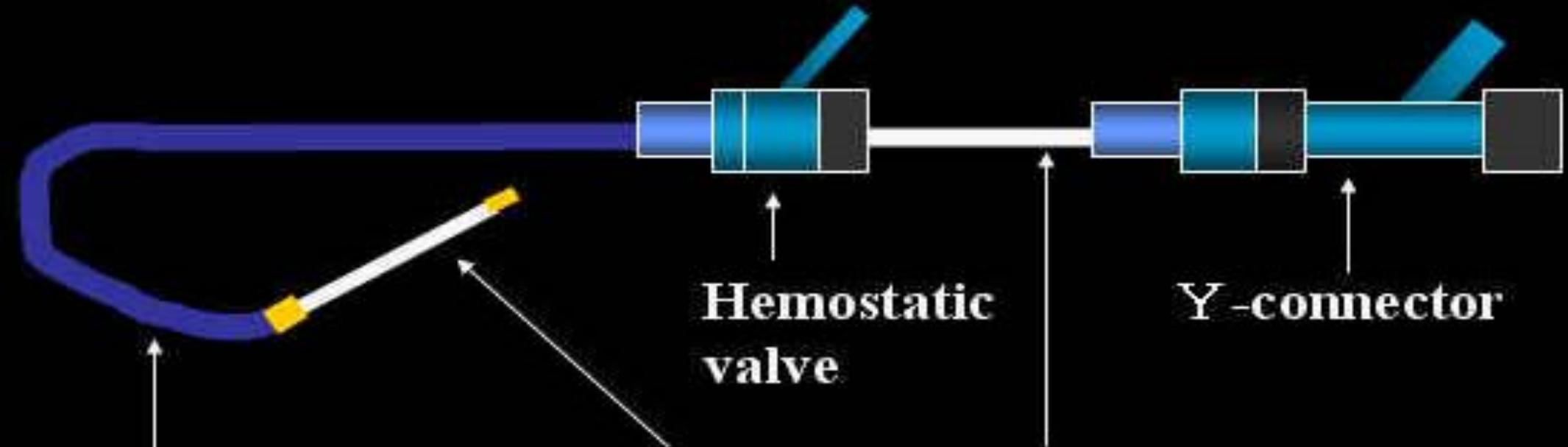
Suboklüde LCx Lezyonu Girişimi Son Görüntü



Prolonged Balloon Inflation

2.5 mm + 3.0 mm Cypher Stents

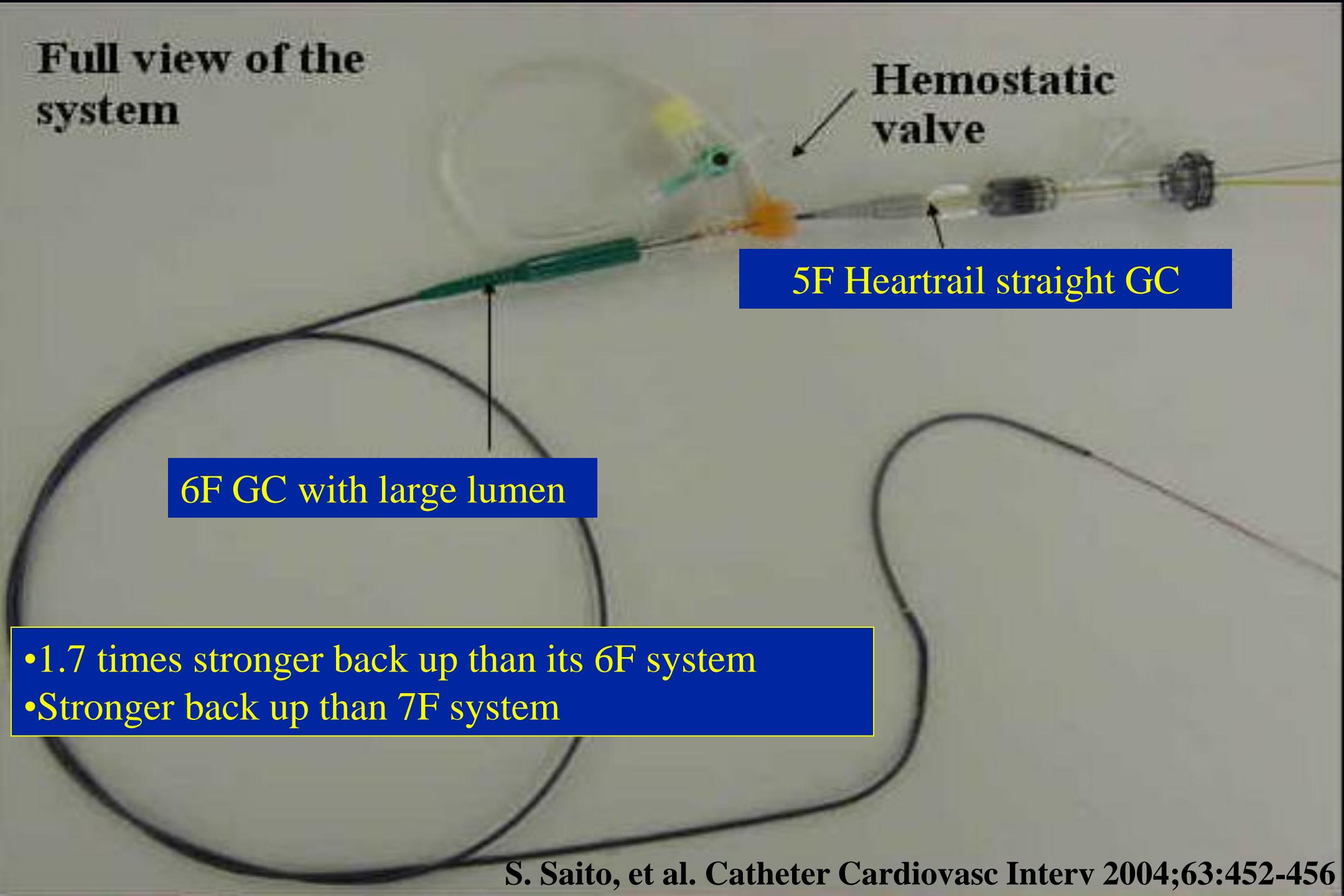
Five-in-six system



5F Heartrail, 120cm, OD 0.068 inches, LD 0.059 inches (Terumo)

6F Guiding catheter with large lumen (0.071 inches), 100cm
e.g.: Launcher (Medtronic), Heartrail, Radiguide (Terumo)

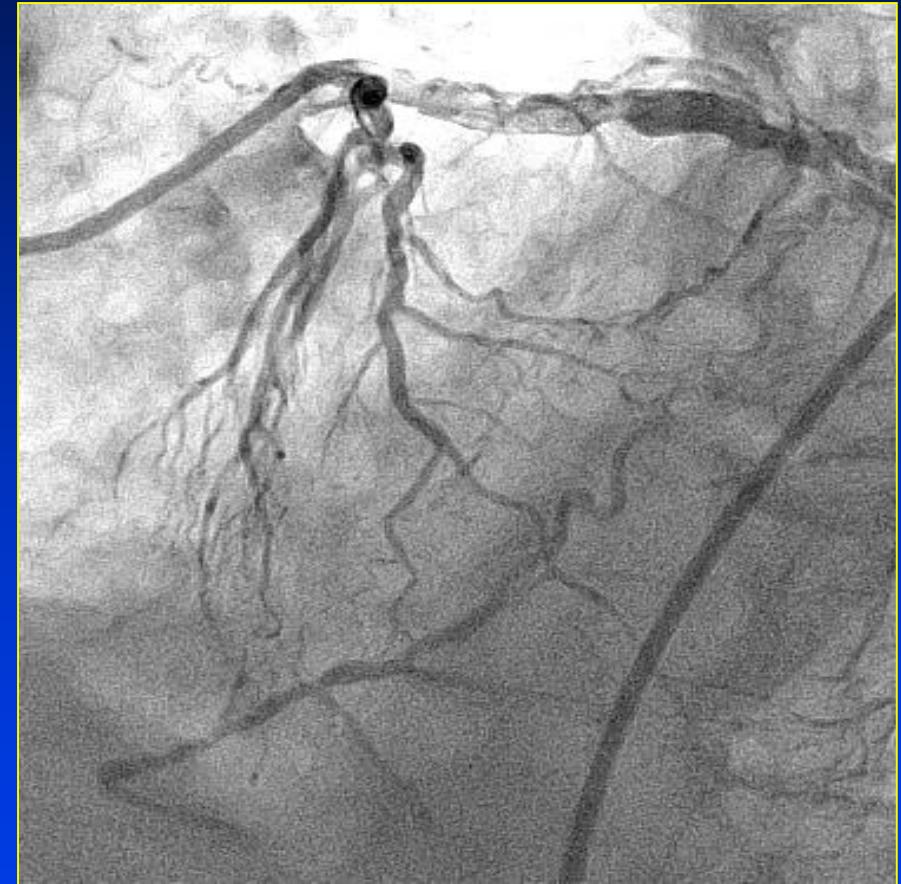
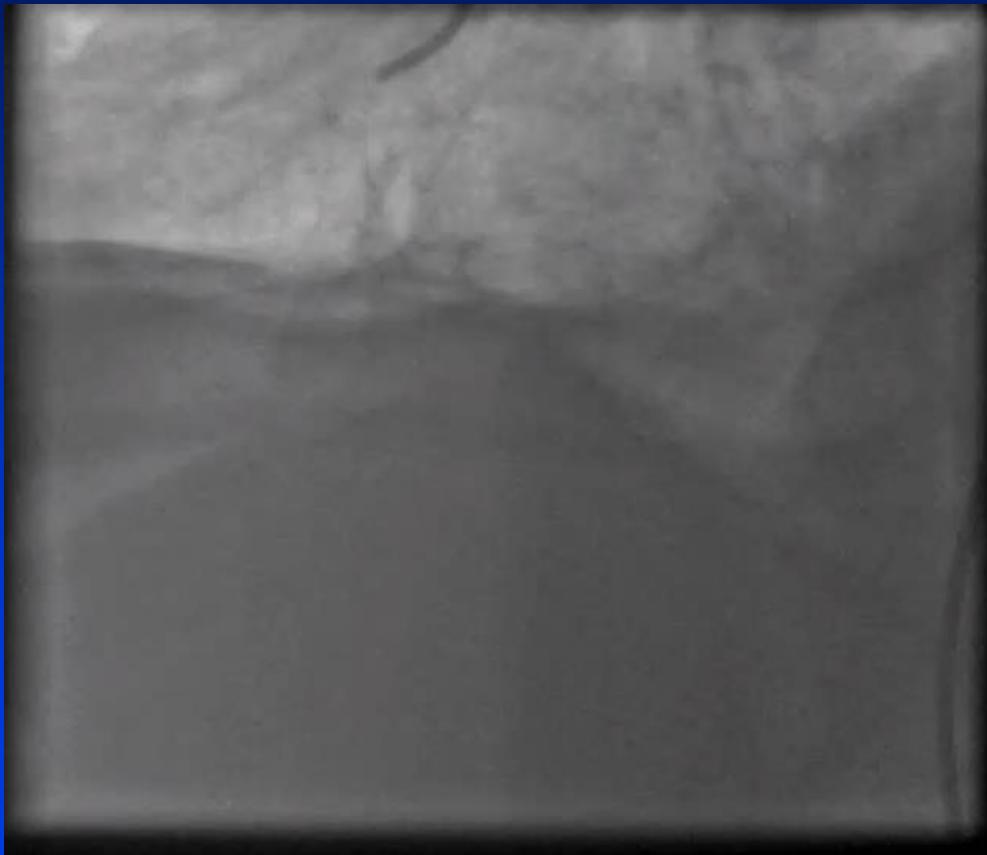
Full view of the system



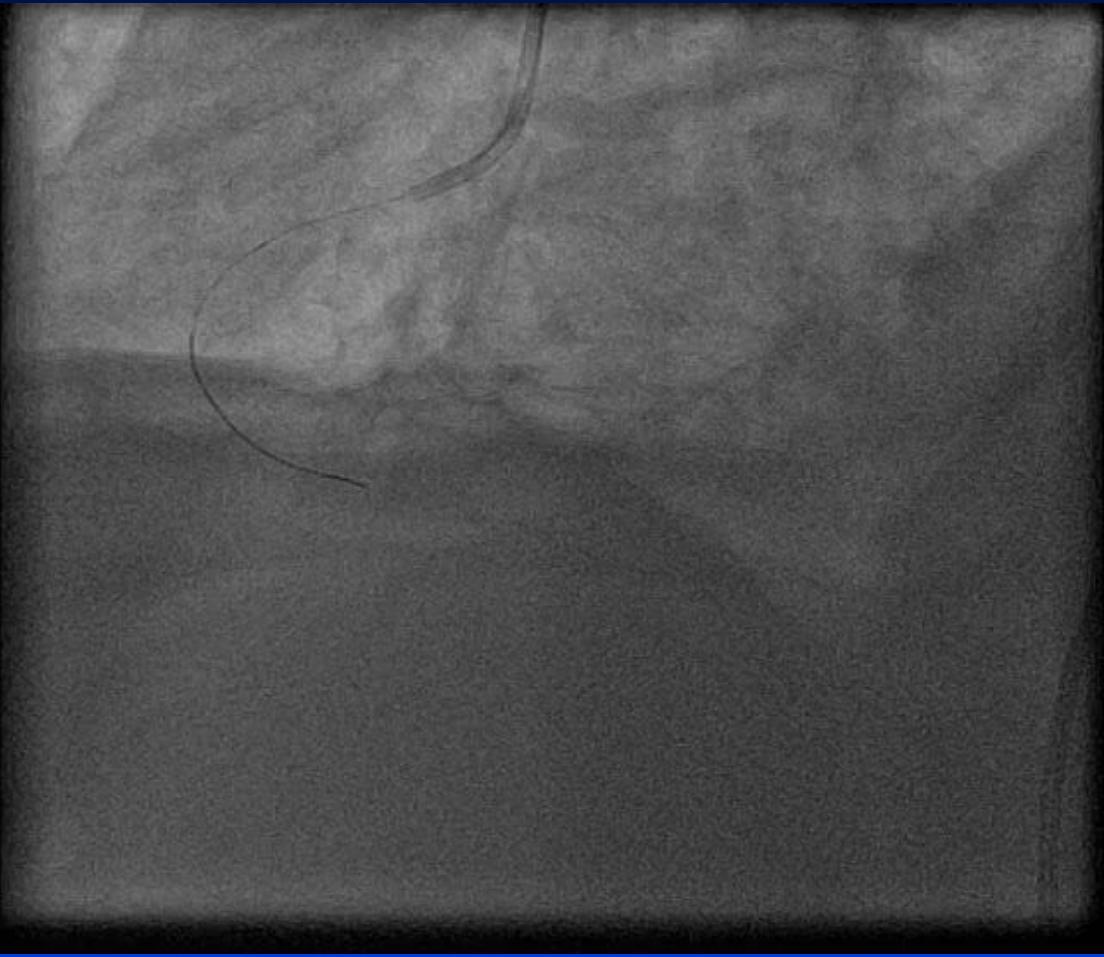
Vaka: 78 yaş erkek

- CRF: Hipertansiyon, Hipercolesterolemİ, Sigara
 - Sol Femoro-popliteal bypass (1988)
- Inferior AMI (1999), Kresendo angina (2004),
- KAG: Distal LAD de diffüz lezyon: 60-70%,
- Superdominant RCA: Oklüde
- LVG: İnfero posterior lokal akinezi

Koroneler Angiyografi



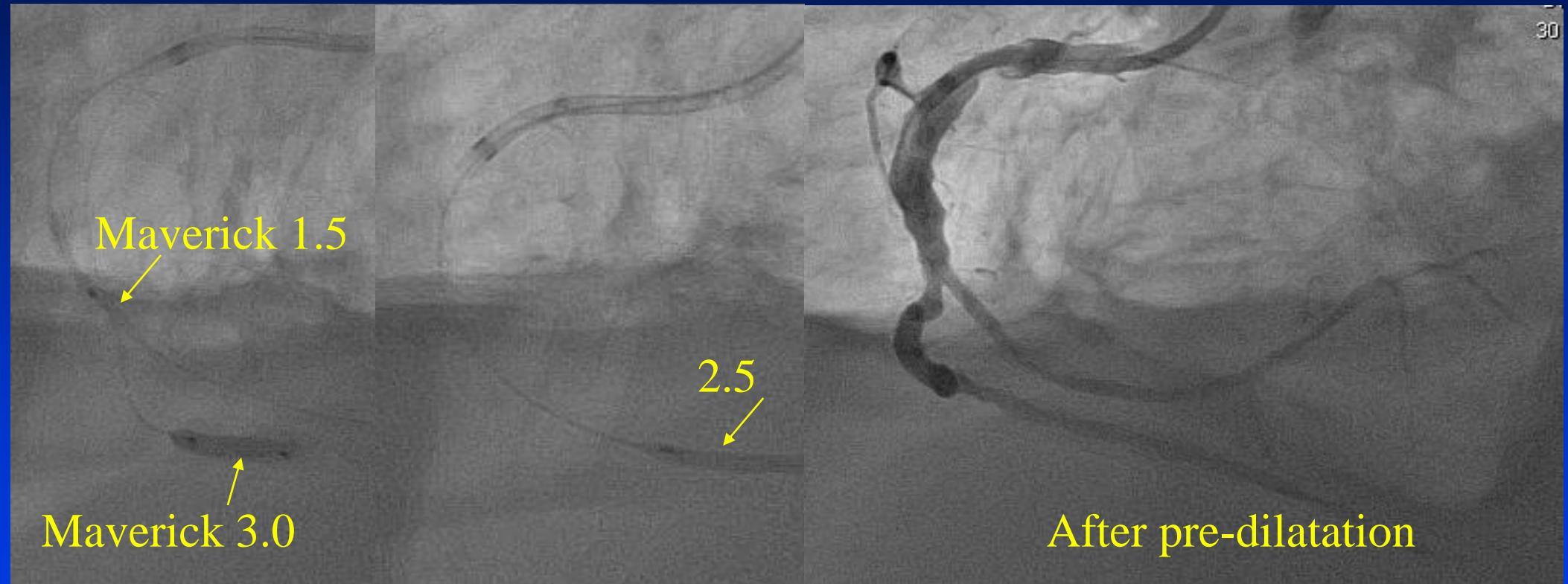
Angiyoplasti; Tel Manuplasyonu



GC: 6Fr Launcher JR5.0 (Medtronic),

GW: Miracle 3g (ASAHI INTECC) with 1.5*15 Maverick OTW balloon (Boston Scientific)

Anchor Balloon

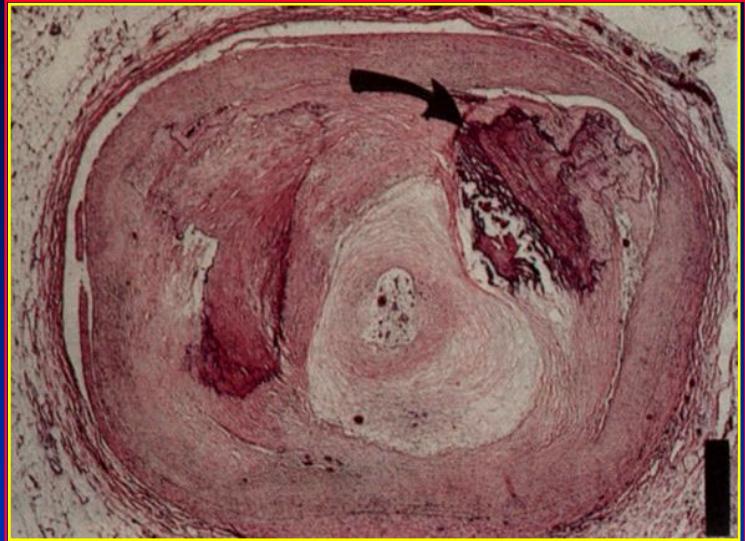


GC: 6Fr AR2.0 (Medtronic)

Yönlendirilebilirlik and Esneklik

- OTW: İstisnasız kural; daima 1.5 mm; teli yönlendirmede sıkıntılar ve giriş bölgesinde irreversible zarar yapmamak için telin uç kısmına yakın yere balonu ilerletmekten sakının
- Tel seçimi: Çok amaçlı teller ile CTO vakalarında çalışmayın
- Tel ile oklude segment geçildiğinde telin yönlendirilebilmesi önemlidir.
- Polymer kaplı teller CTO dan geçerken kullanılabilir fakat beraberinde yalancı lümene düşme daha riski taşır.

CTO Histolojisi

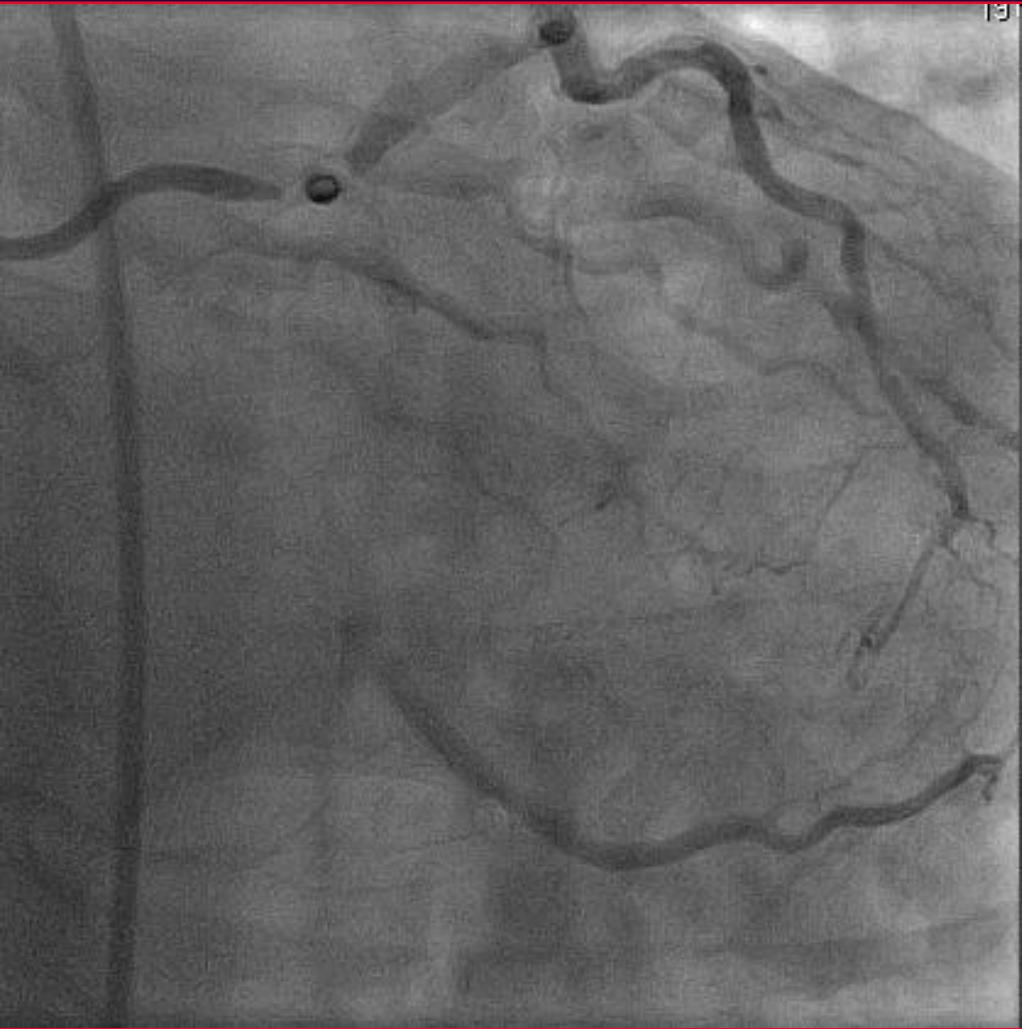


Anjiyografik olarak görüntülenmiş 96 CTO in 61 pts
 < 1 yıl > 1 yıl

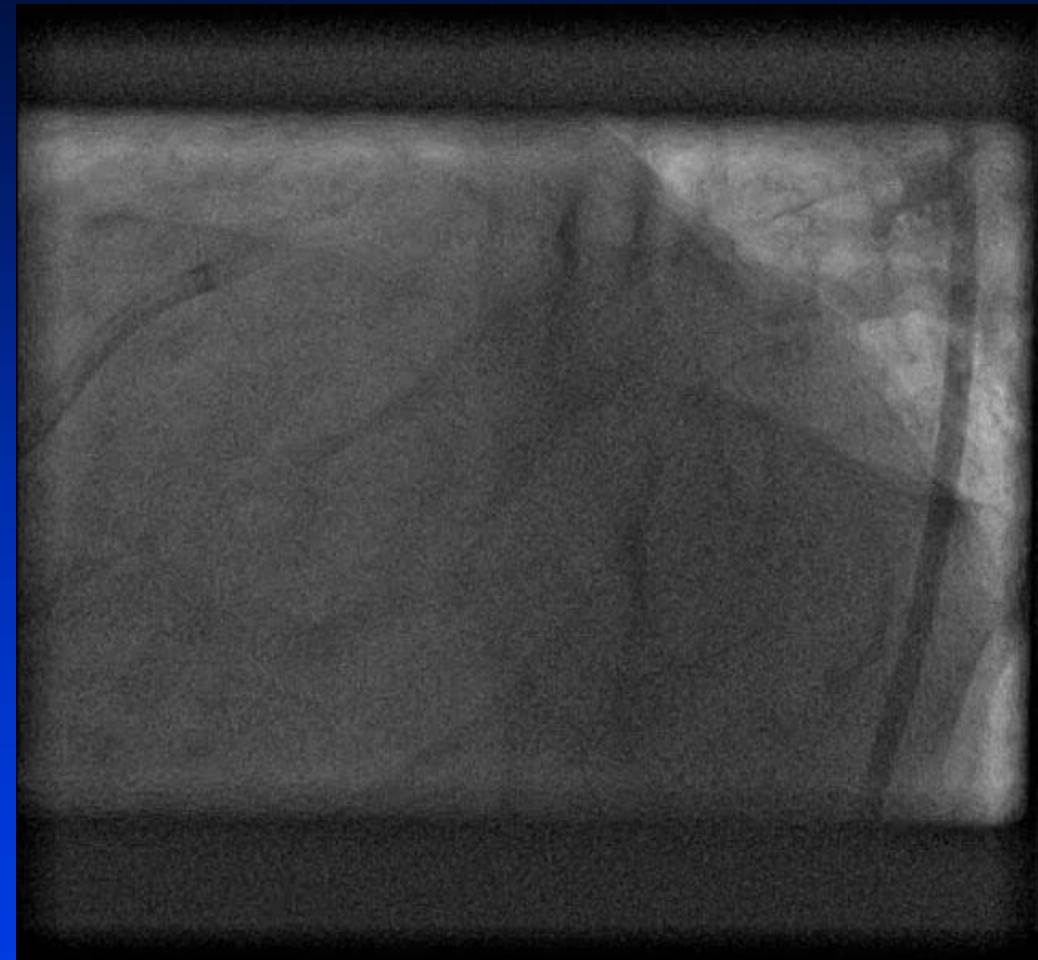
- Lipid -laden ($>50\%$ PA)
- Inflamatuar hücreler
- Adventisyal yeni damar kanalları
- Fibrocalcific
- İnflamasyon yok
- Intimal yeni damar kanalları

Unfavourable angle to have catheter support

66 Yaş Erkek – 4 yıl önce Inferolateral AMI



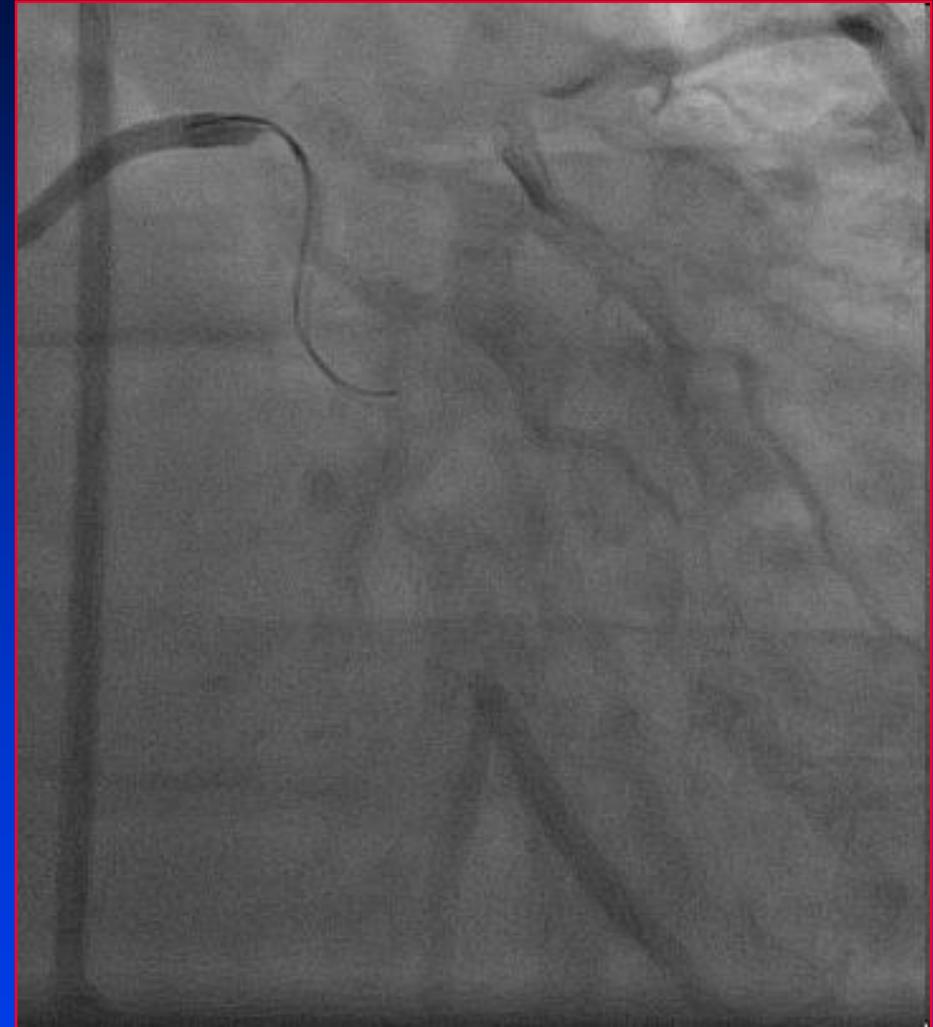
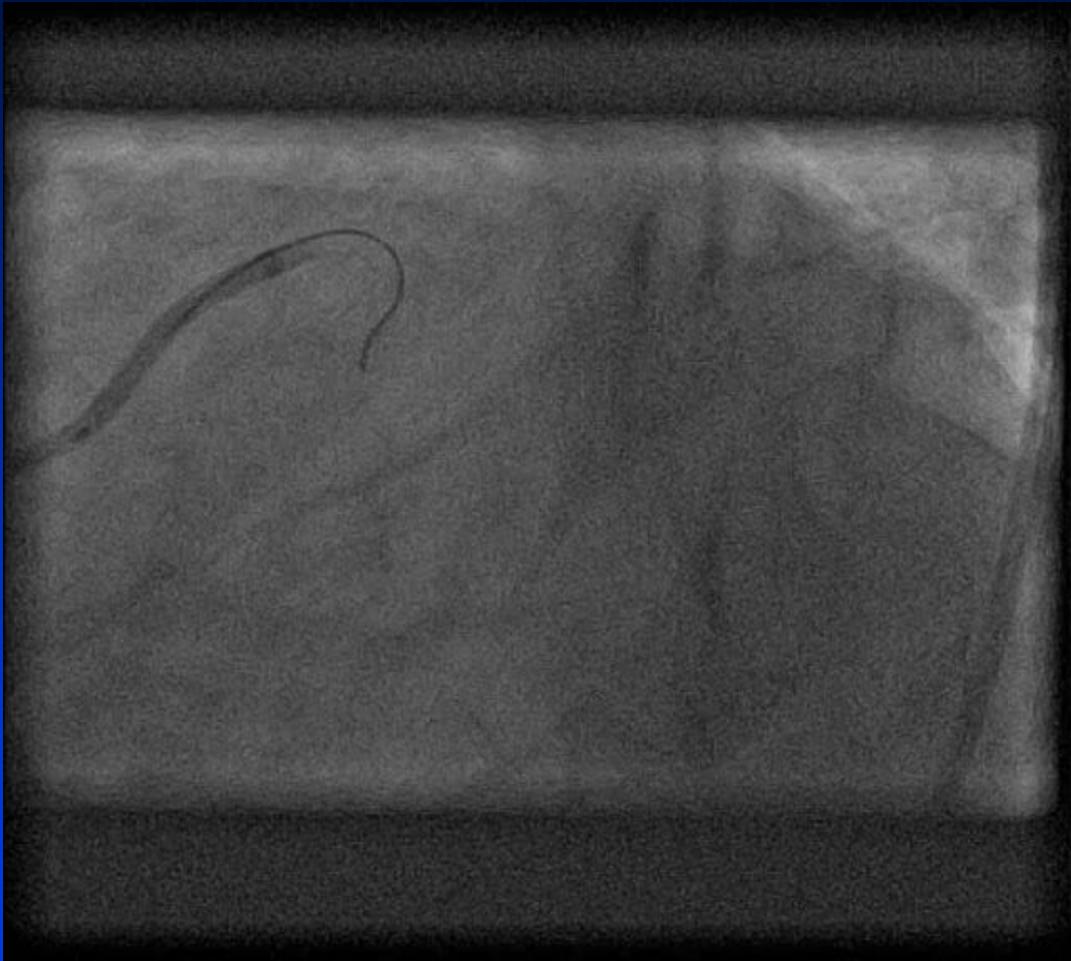
PreTreatment Amplatz 2 L



Amplatz 2 Left

Unfavourable angle to have catheter support

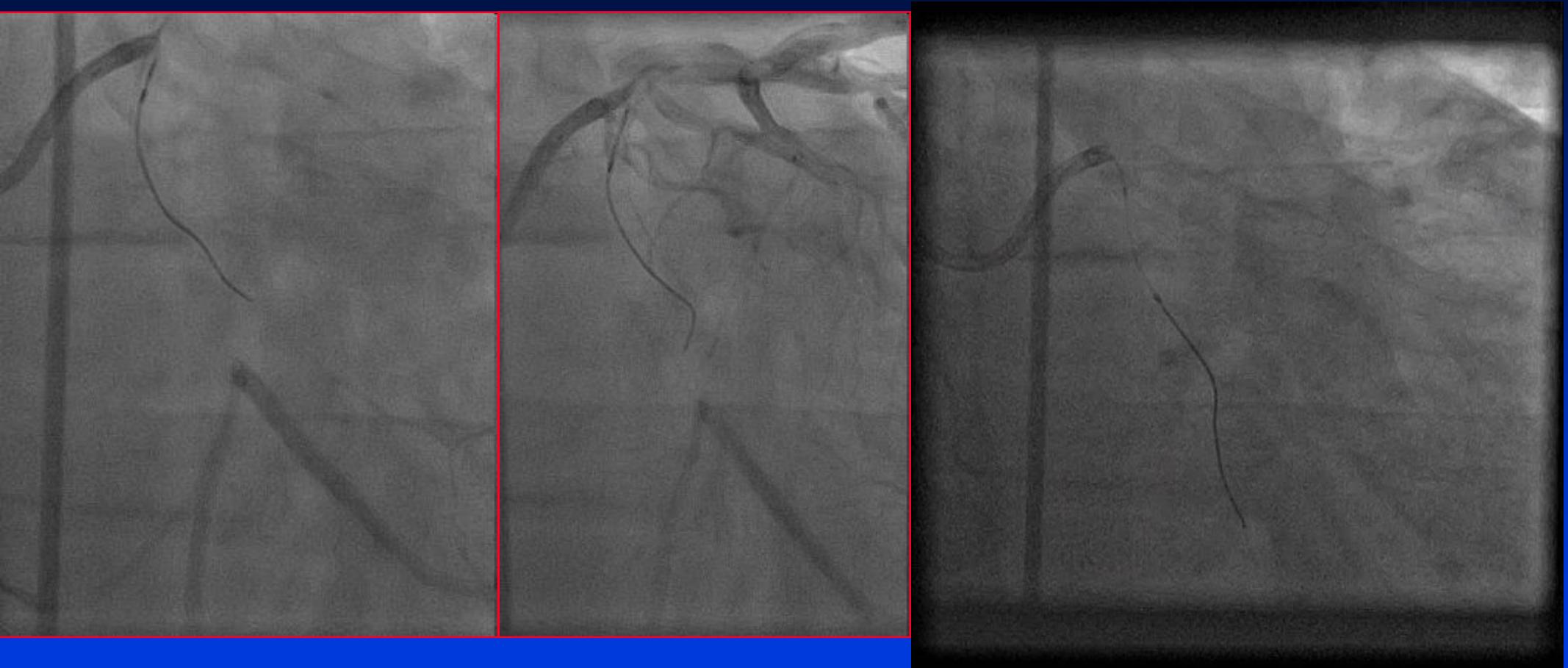
66 Yaş Erkek – 4 yıl önce Inferolateral AMI



Maverick 1.5 mm + Pilot 50 RIO, Slight Balloon Support

Unfavourable angle to have catheter support

66 Yaş Erkek – 4 yıl önce Inferolateral AMI



Progression of Pilot Wire

Unfavourable angle to have catheter support

66 Yaş Erkek – 4 yıl önce Inferolateral AMI



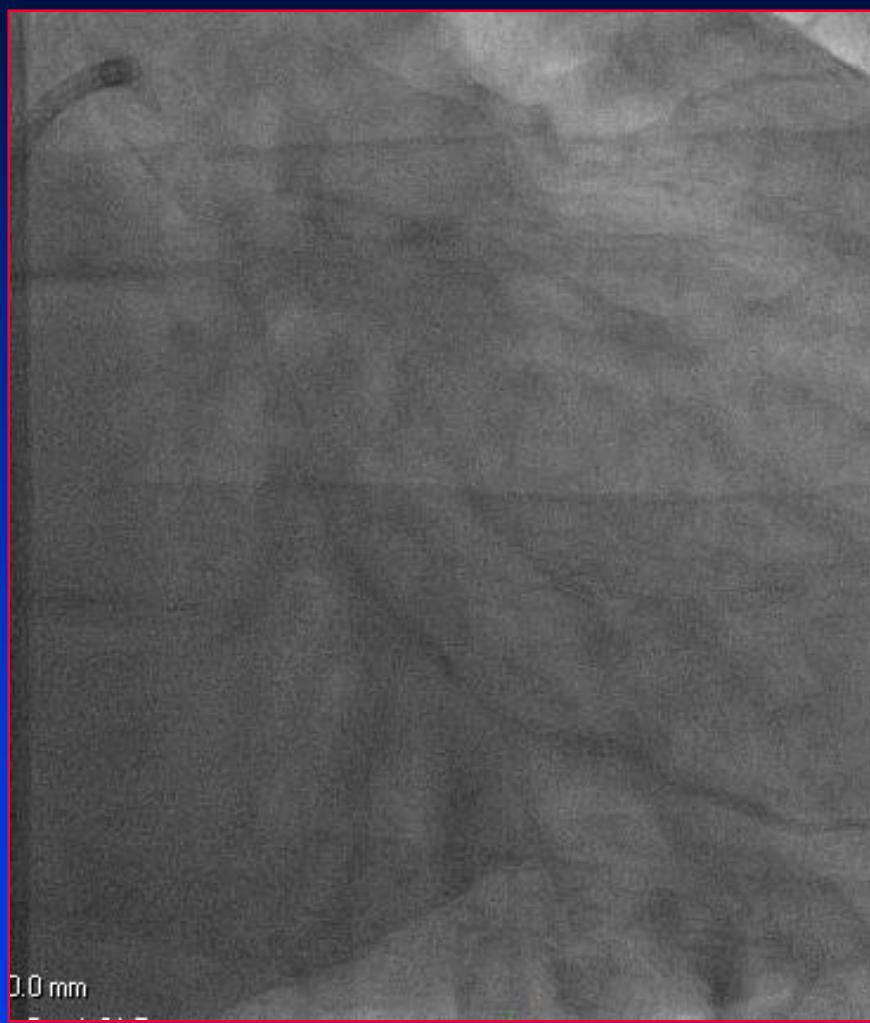
Maverick 1.5 mm + Miracle 3



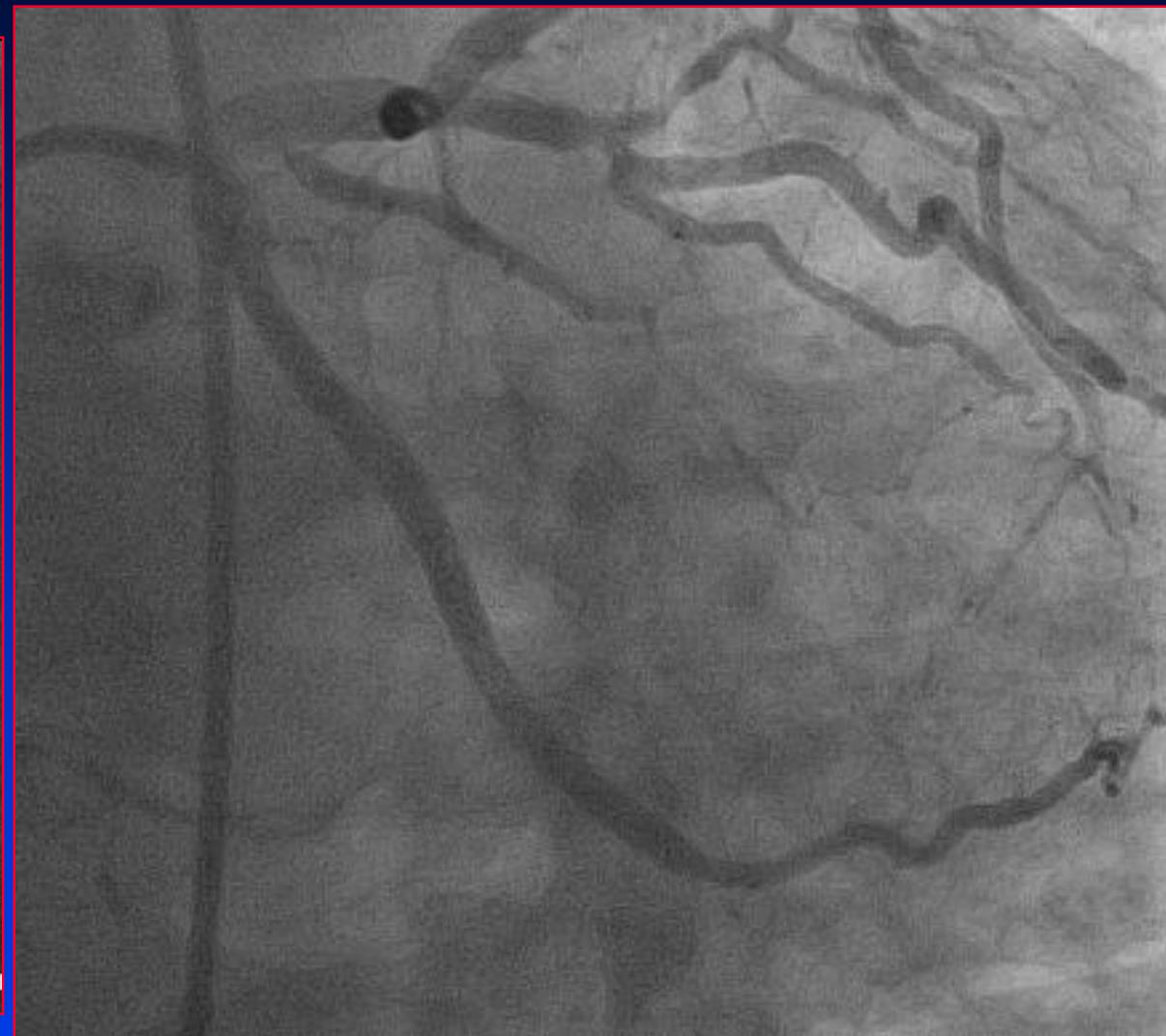
Time for Confianza

Unfavourable angle to have catheter support

66 Yaş Erkek – 4 yıl önce Inferolateral AMI



OWT Balon içerisinde
dilue kontrast

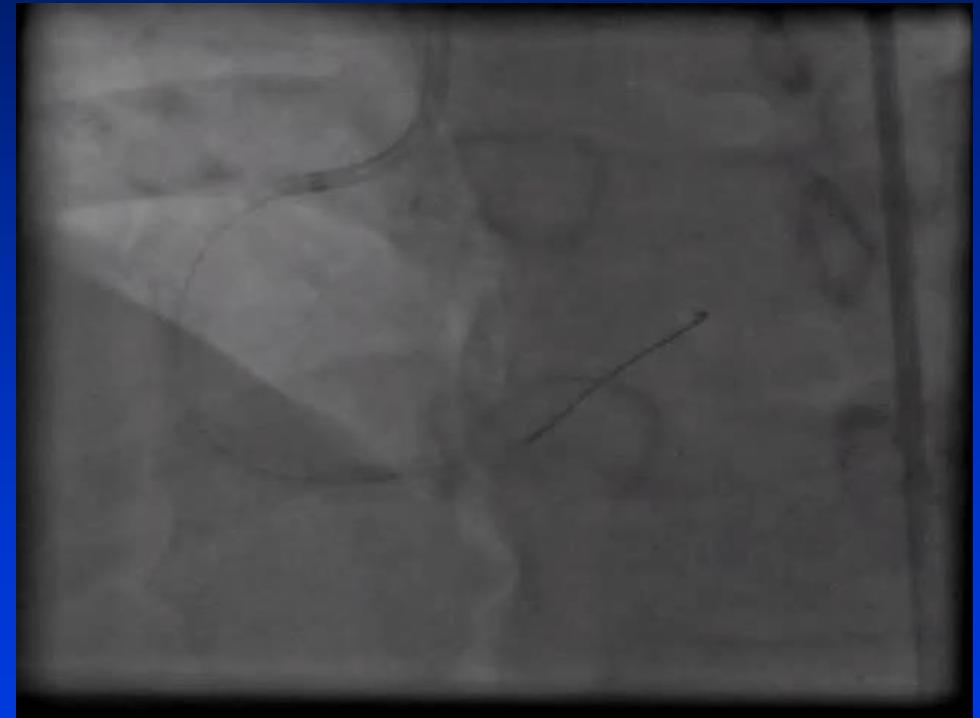
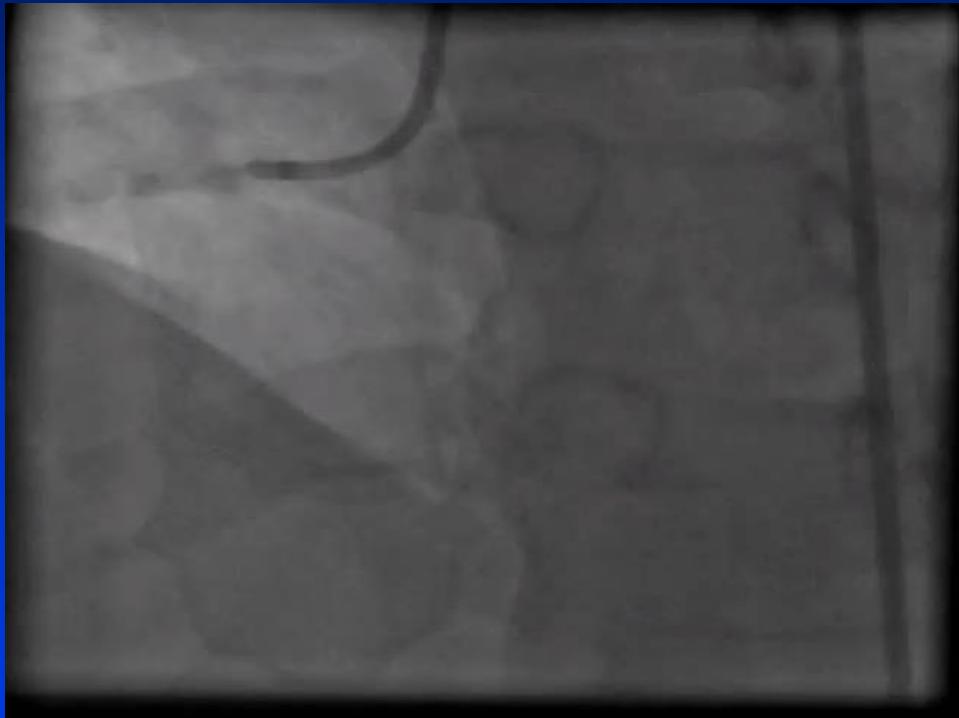


After 28 + 32 mm Taxus, 3.0 18 Atm

Vaka S.M: 45 Yaş Erkek

- CRF: Hipertansiyon, Hipercolesterolemİ, Sigara, DM
- Inferior AMI (2000); RCA ya stent (2002),
Kreşendo angina (2004),
- KAG: Distal RCA da instent daralma
- LVG: İnfero posterior duvarda lokalize akinezi

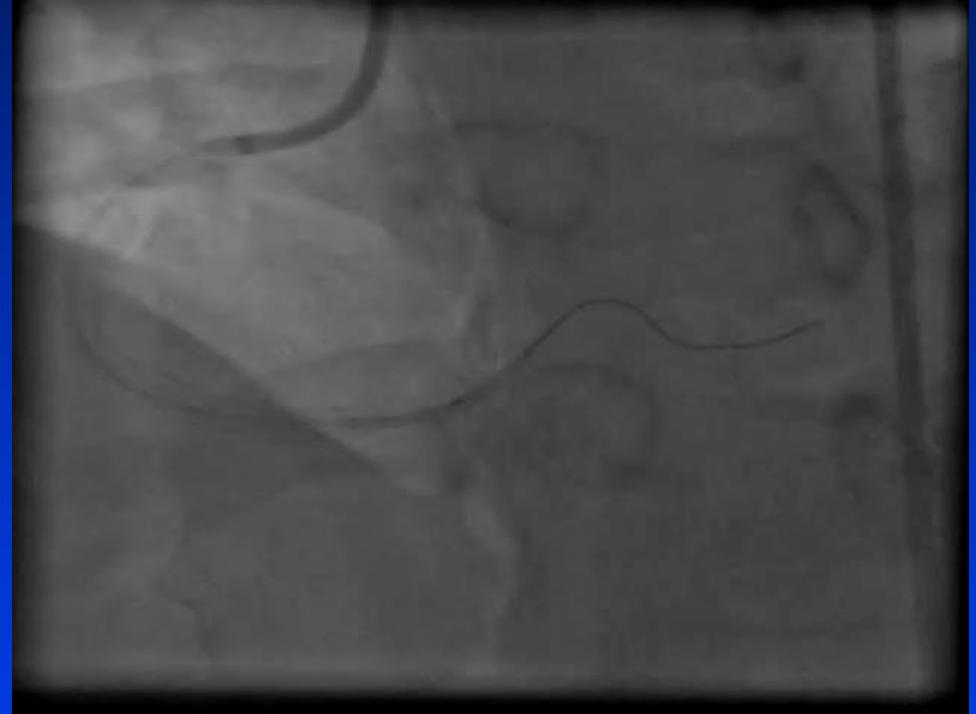
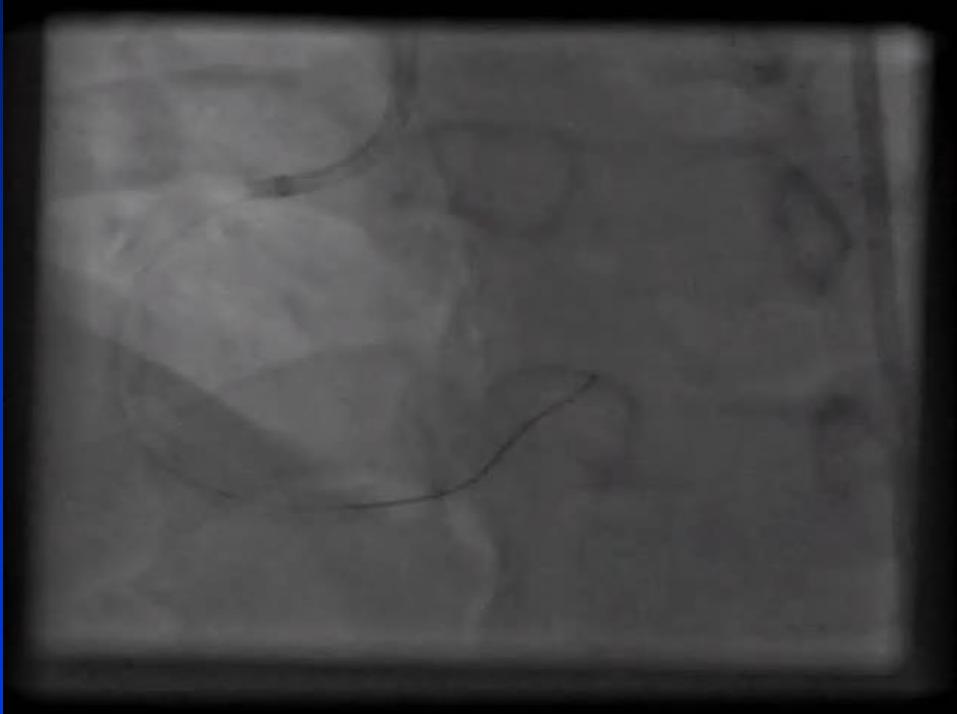
Koroneler Angiyografi



GC: 6Fr Launcher JR4.0 (Medtronic),

GW: Pilot 50 (Guidant) with 1.5x20 Maverick OTW balloon (Boston Scientific)

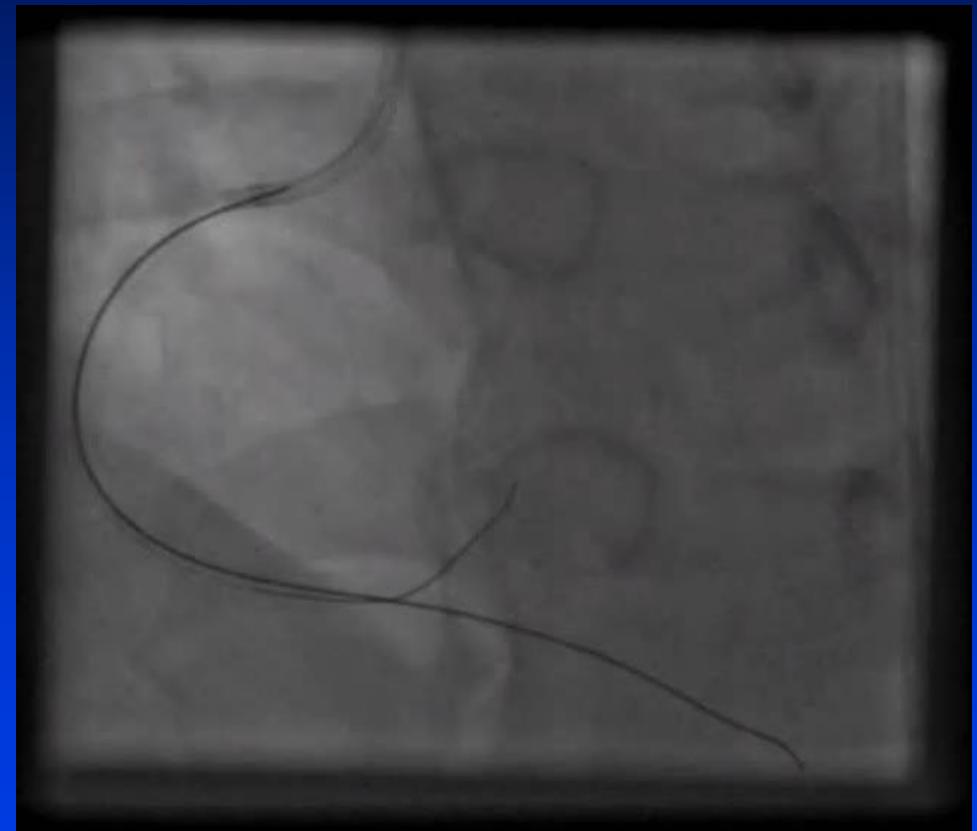
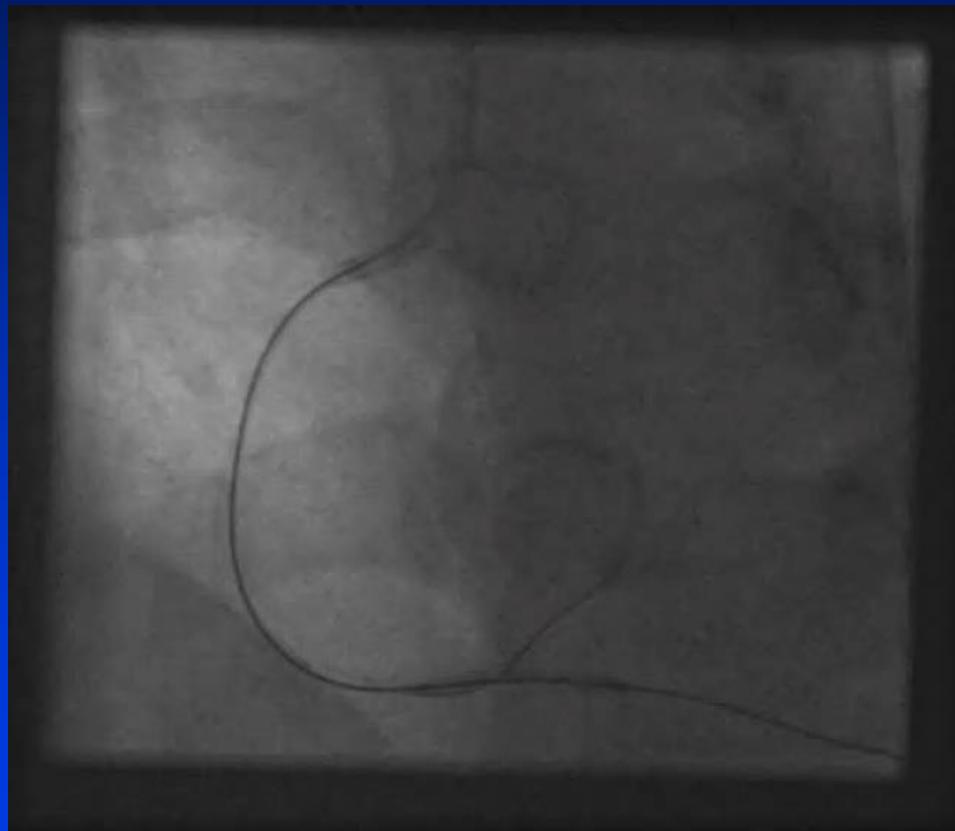
Angiyoplasti; Tel Manuplasyonu



Switched to OTW and Miracle 3;
Tel değişimi esnasında tel çok distalde

Prolonged Balon Inflation

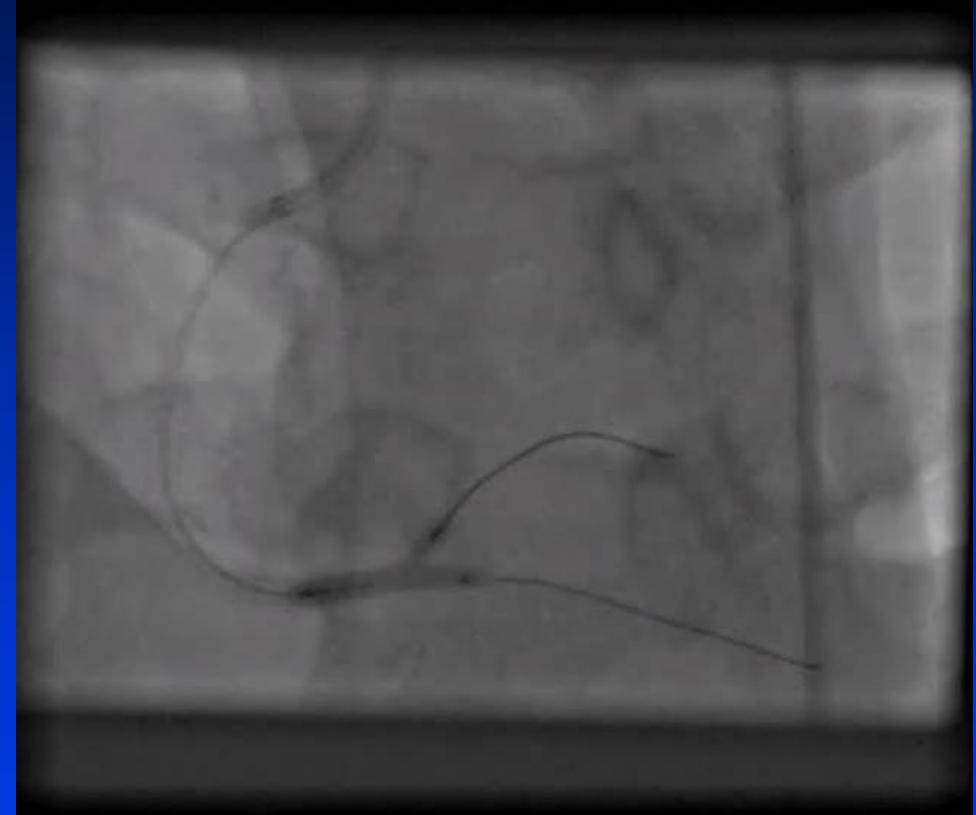
Balon Angiyoplasti



Angioplasty; Stentleme

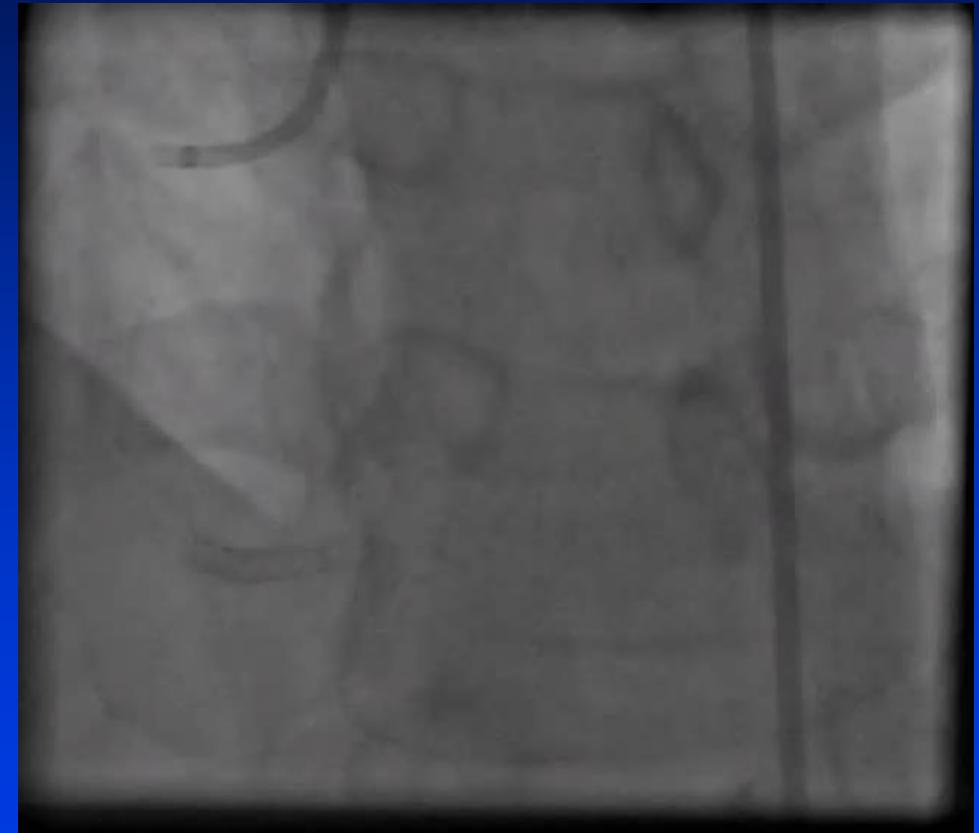
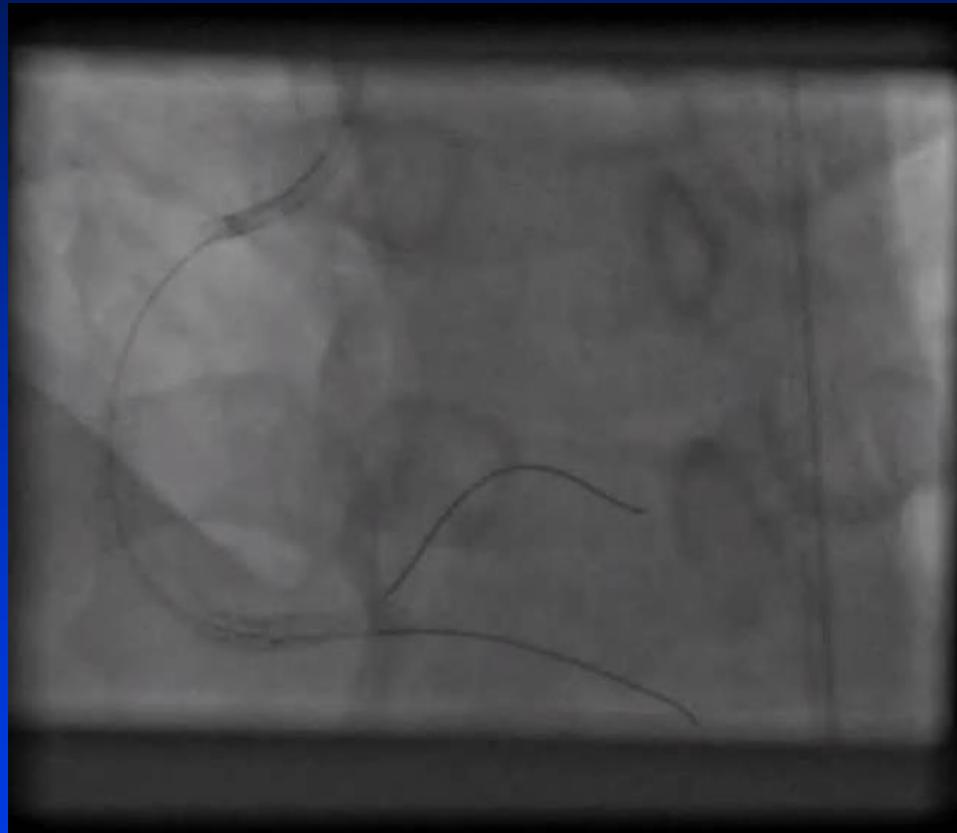


Cypher 2.5 × 28 (Cordis) at 16atm



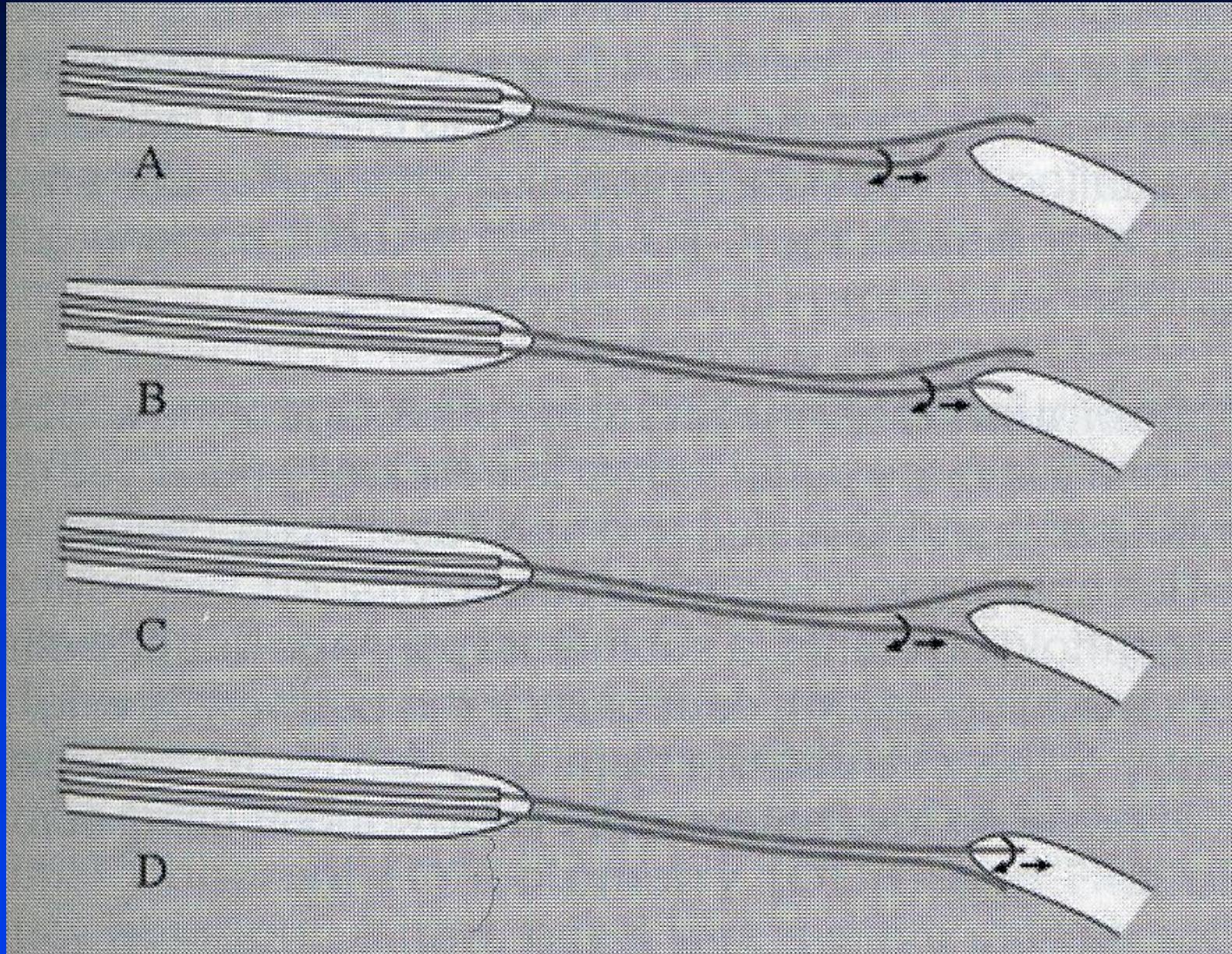
2.0*20 Maverick for 4PL (Boston Scientific)
2.5*20 Maverick for 4PD (Boston Scientific)

Final Angiyografi

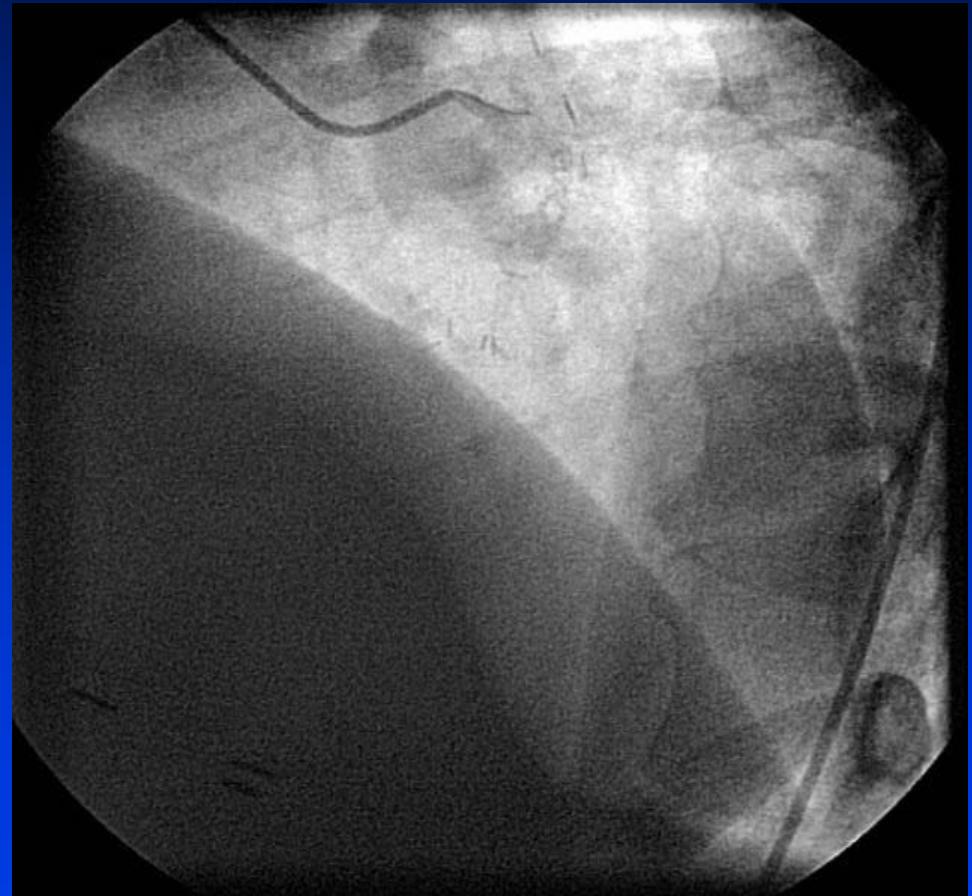
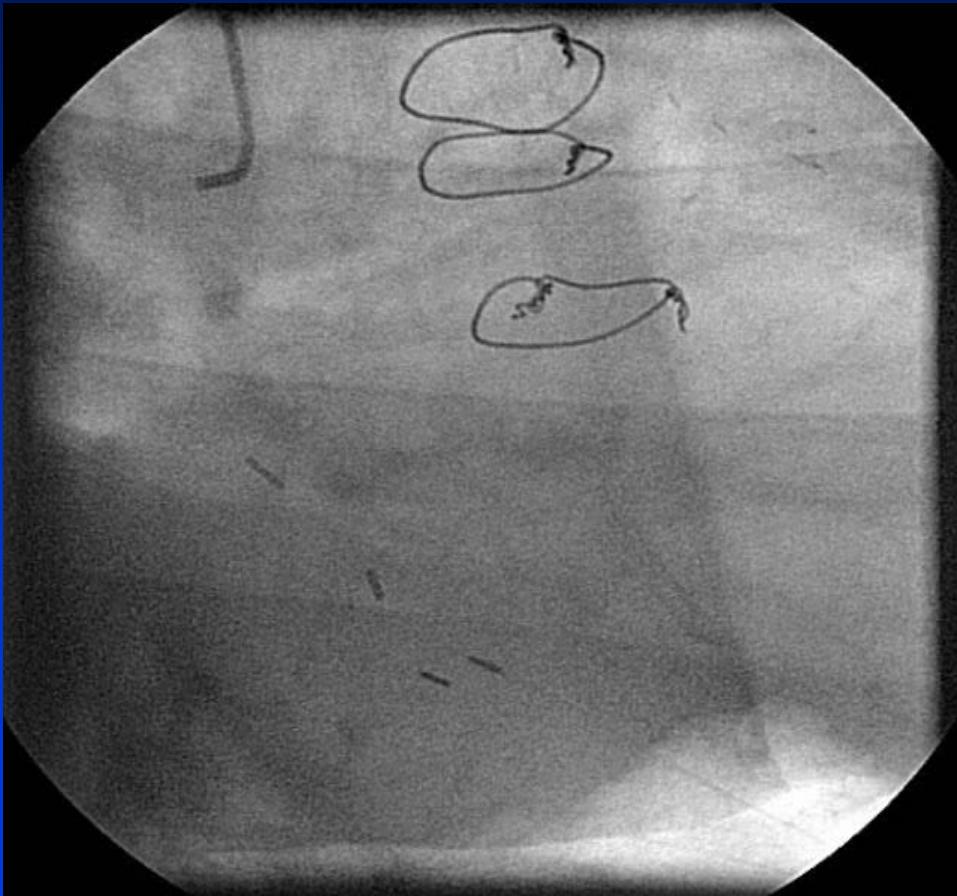


He parin etkisini çevirmek için Protamine verildi.

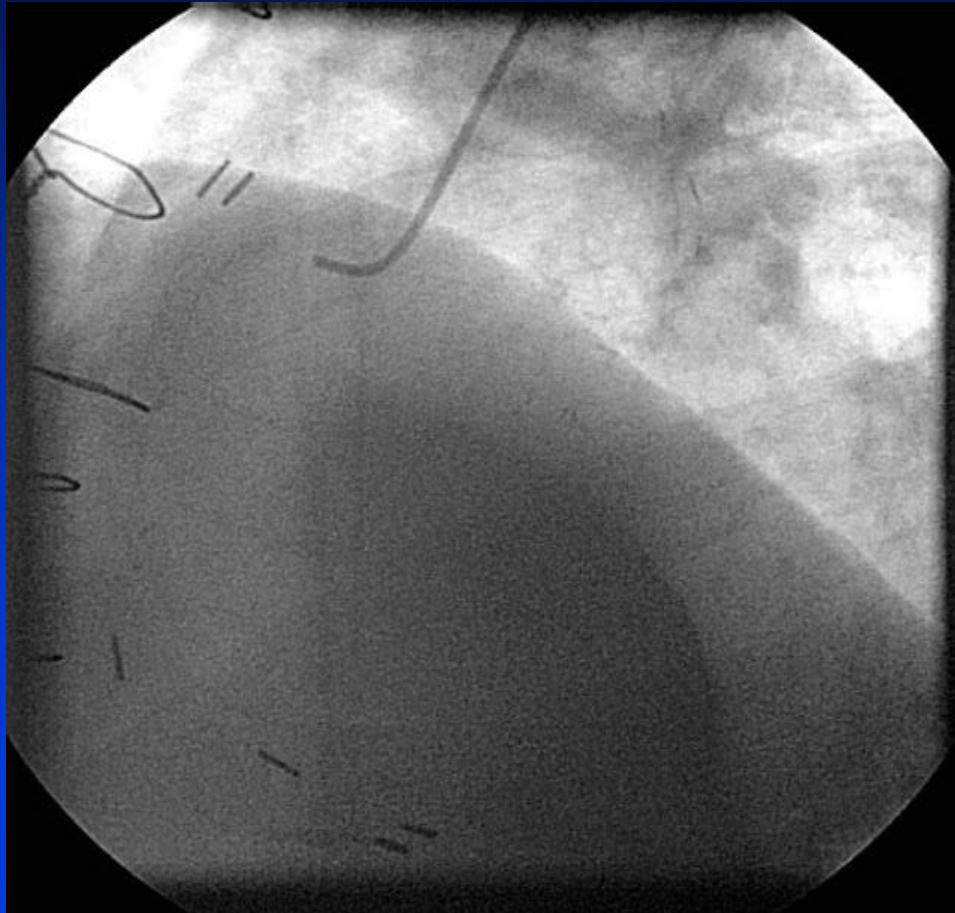
Parallel Tel Tekniği



Vaka R.D: 56 Yas Erkek
Evre III AP, inferior MI sonrası CABG 1998 (LITA-LAD, SVG-
Intermediate, OM, RCA occluded); 40% LVEF

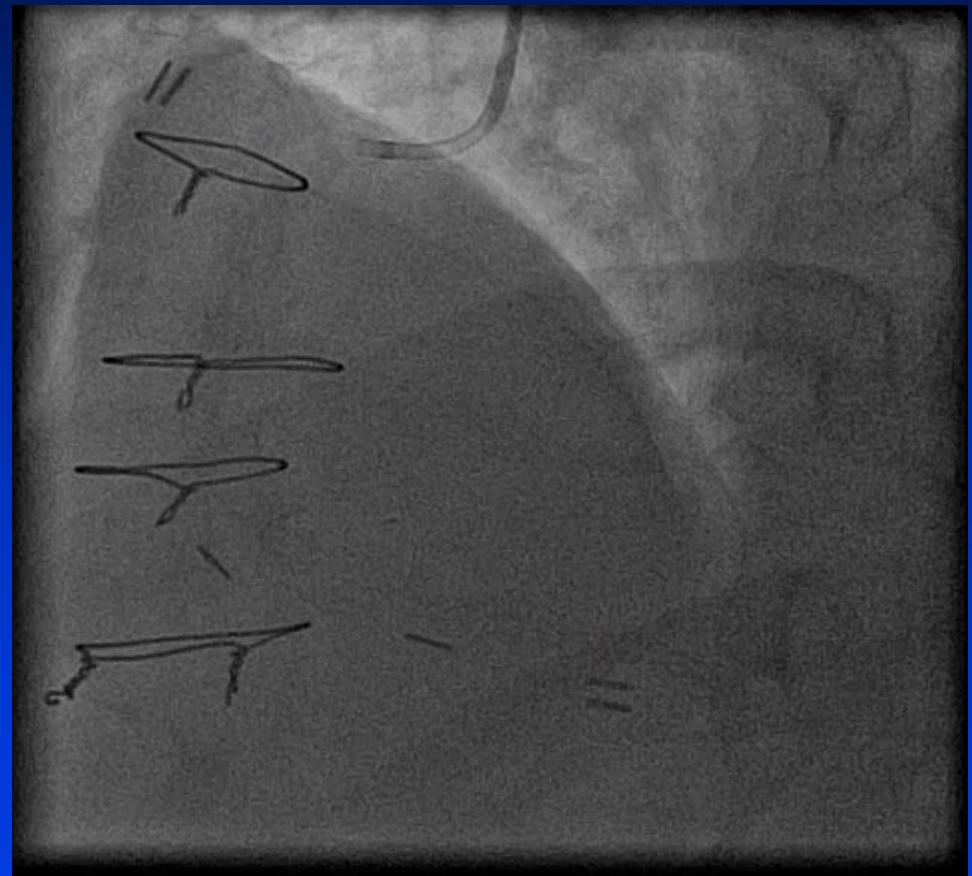
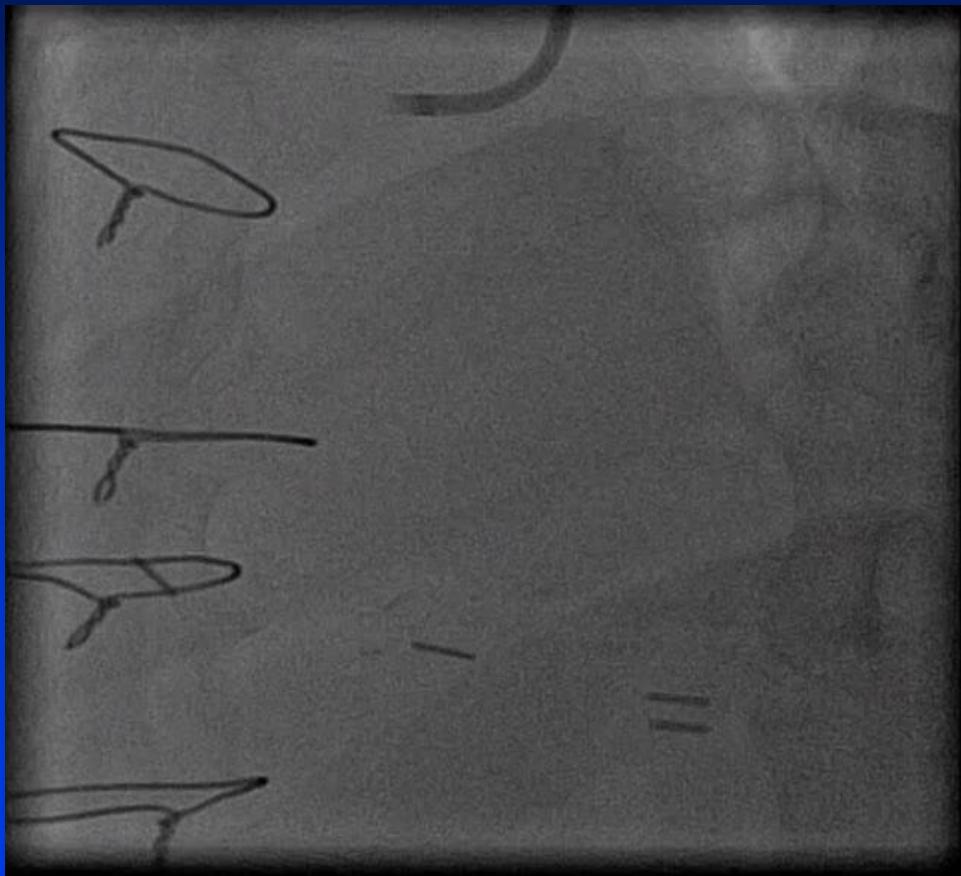


Vaka R.D: 56 Yaş Erkek



Vaka R.D: 56 Yaş Erkek

RCA için İlk Girişim 26/Kasım/2004



2 Taxus PDA + 1 8 mm Taxus posterolateral

Vaka R.D: 56 Yaş Erkek

Persistan AP (CCS 2) talyumda lateral iskemi



22/Sep/2005

Rezidüel Lateral İskemi İçin Girişim

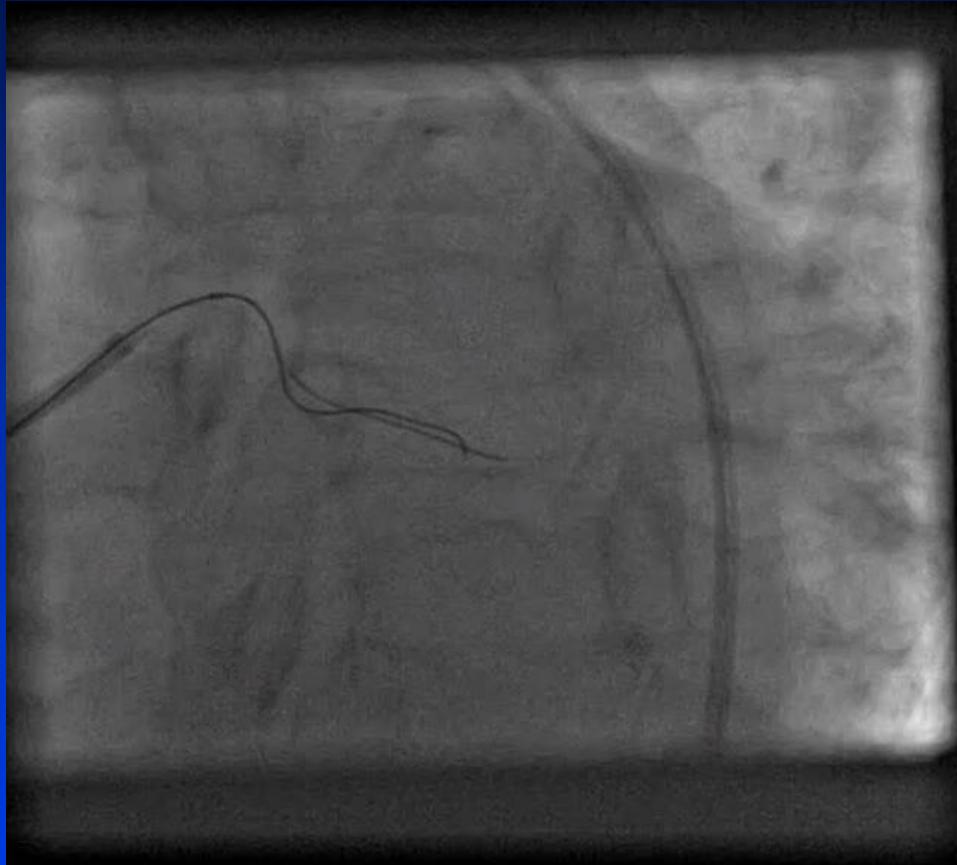


Taxus Liberte 2.25 × 24 Intermediate



Maverick OTW + Pilot 50

Rezidüel Lateral İskemi İçin Girişim

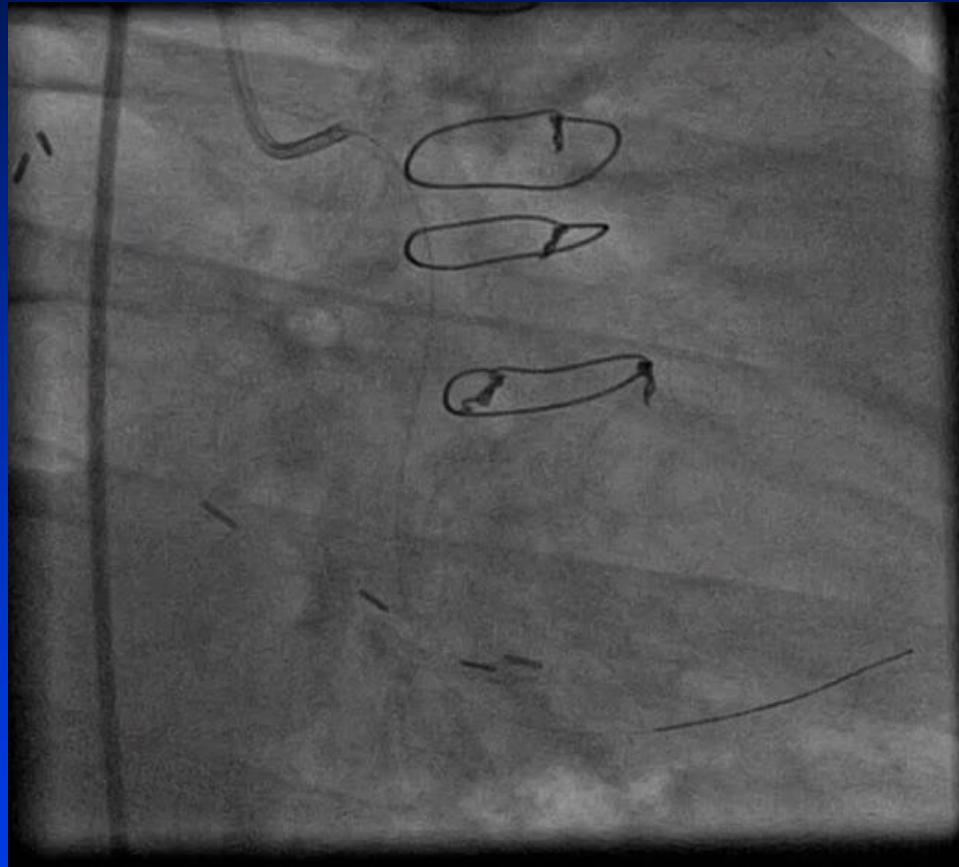


Parallel wire technique using
Maverick OTW + Miracle 3g and 12

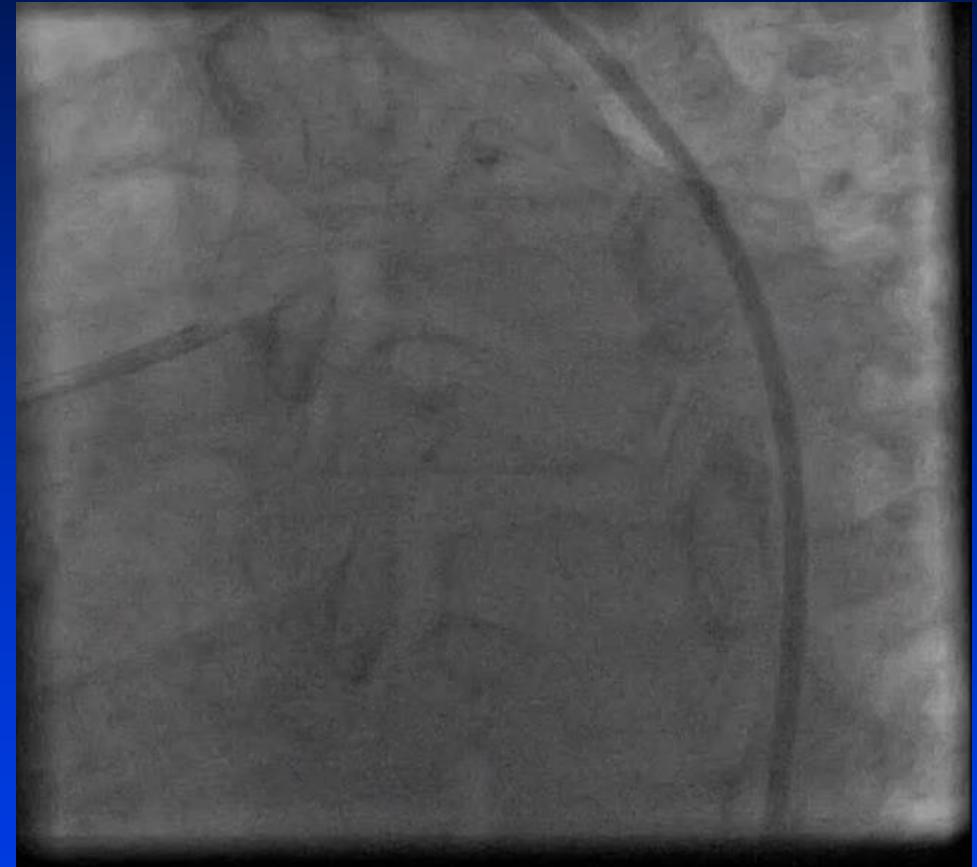


Parallel wire technique using
Maverick OTW + Miracle 3g and **Miracle12g**

Lateral İskemi İçin Girişim



After tandem inflation and
exchange into conventional wire



Taxus 2.5/24+2.25/24

CTO ya Yaklaşımım

- DES alanında , CABG e öncülük eden esas sebep CTO dur.
- Basamak basamak artan sertlikte guidewire kullanılmalı, kontralateral enjeksiyon, çift tel tekniği ve guiding kateter desteğinin sağlanması başarı oranının arttırılması, az sayıda usta operatörün elinde >80% üzerinde kronik oklüzyonlarda başarı sağlanır.
- Diğer değişkenler: 1) Oklude segmentin tahmin edilemeyen tortuözitesi; 2) Yoğun kalsifikasyon; 3) Rekanalizasyon işleminin süresi, kompleksliği and maliyeti (çok sayıda DES kullanımı)

Focus on: New Approaches to CTO

- New mechanical systems for recanalisation CTO
- Guidance and improved catheter manipulation
- Catheter advancement after wire crossing

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

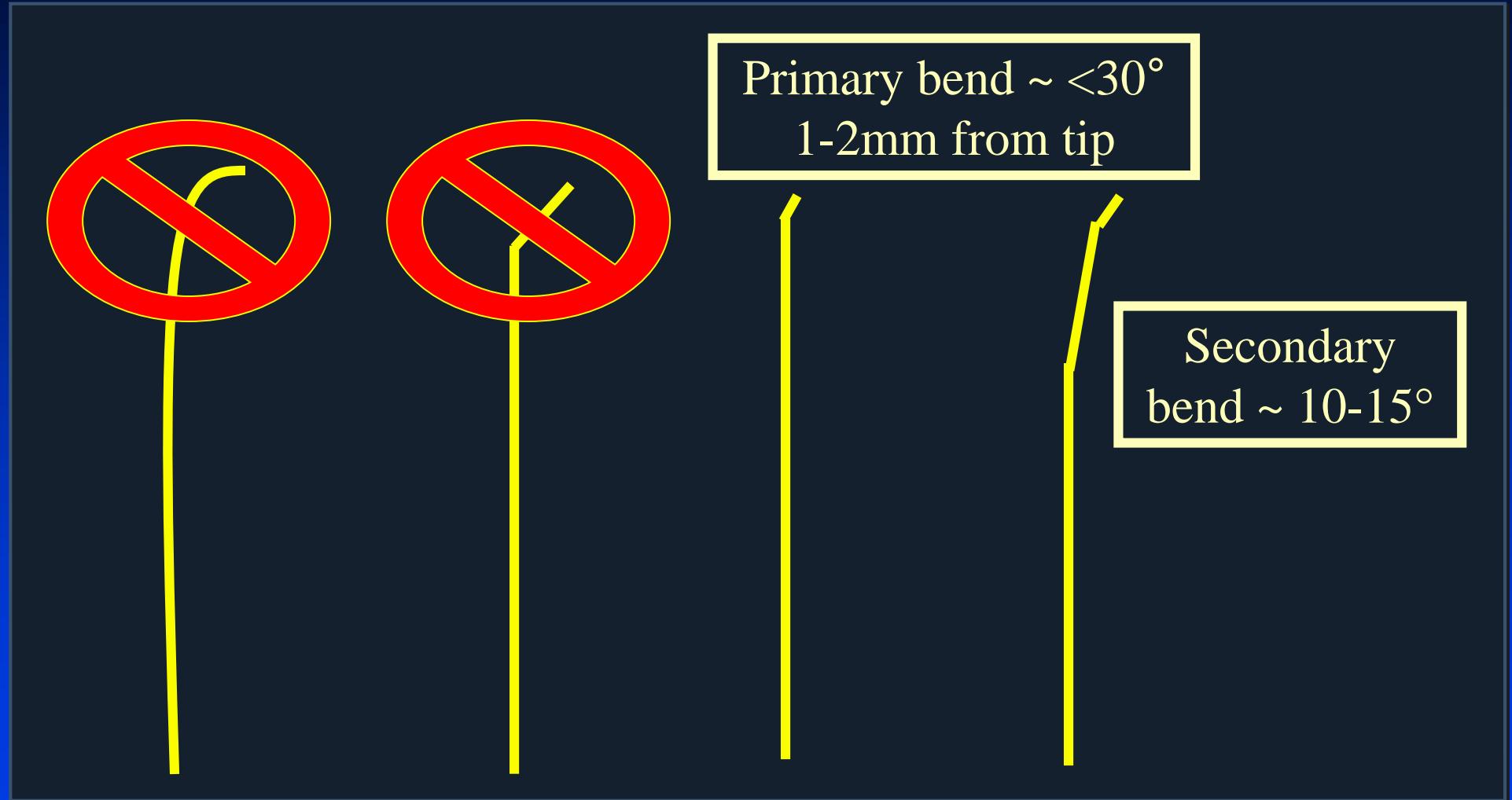
- Heparin anticoagulation
 - No bivalirudin and keep ACTs 200-250 secs
- Patient comfort
 - Adequate sedation and foley catheter
- Other factors
 - Access issues (consider long sheaths)
 - Status of pericardium (post-CABG issues)
- ZEN philosophy
 - Spiritual adventure – you cannot be “beaten” by the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

Is There a Time NOT to Try ?

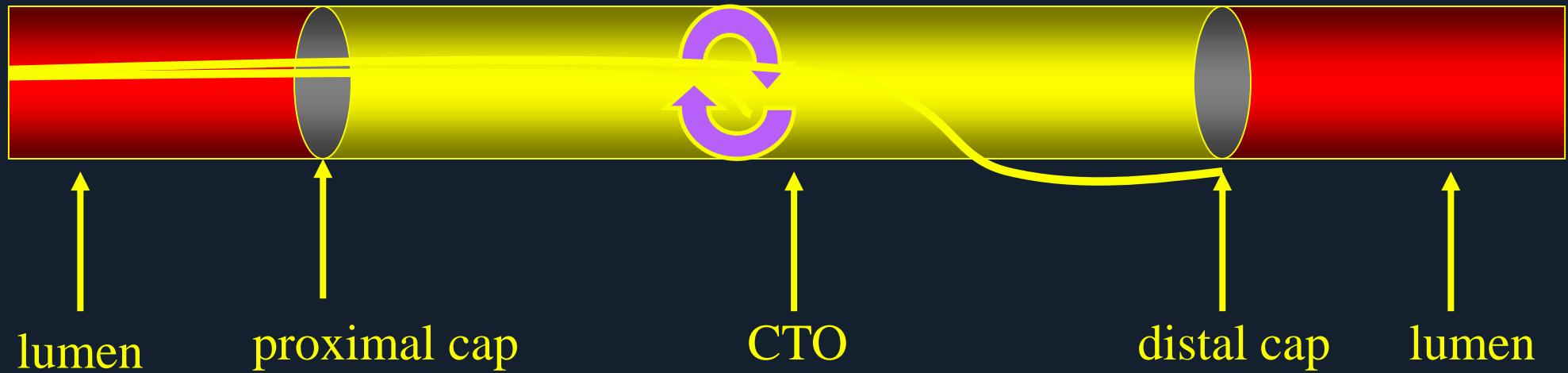
Maybe...

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

CTO Guidewires – Tip Shaping



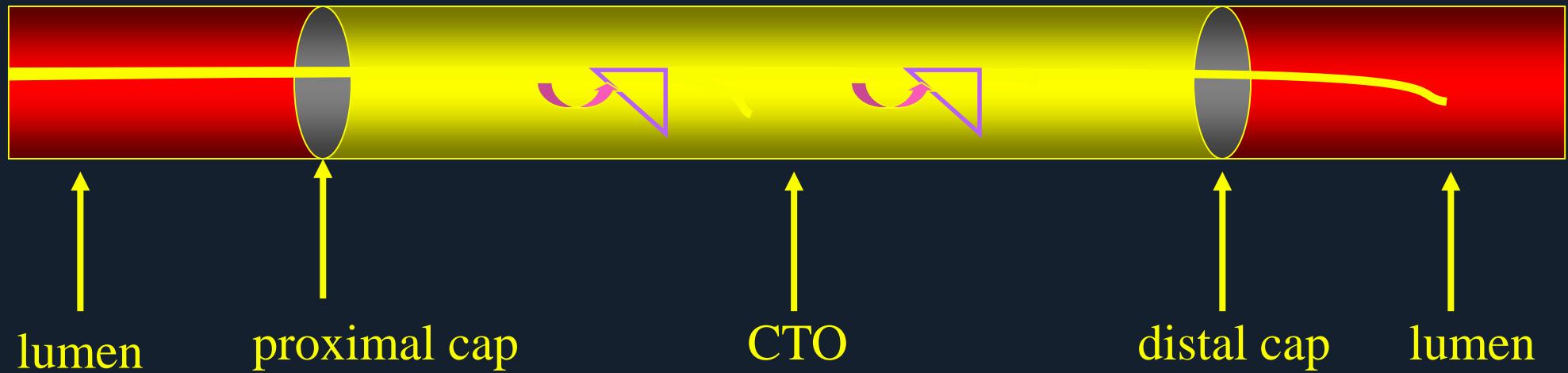
Antegrade CTO Wiring Techniques



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)

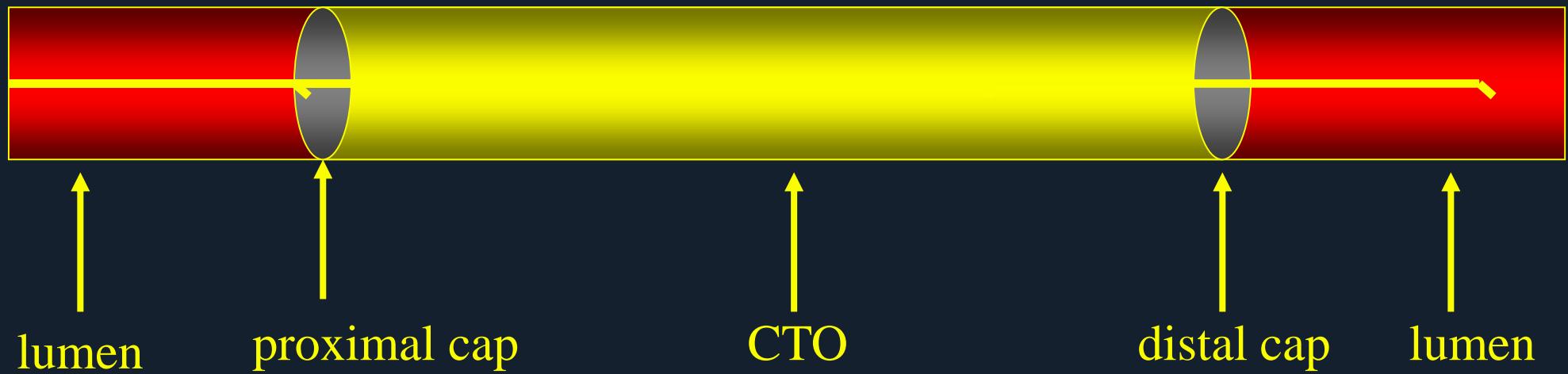
- Abbott CROSS-IT wires (100, 200, **X**
and 300**X**)
- Asahi MIRACLE Bros wires (3-12 gm)
- Medtronic PERSUADER wires
(3 and 6 gm)

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



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 CRUX SS XT 4X X
- Asahi-Abbott CONFIENZA wires (regular and PRO)
- 9 and 12 gm
- Medtronic PERSUADER wire - 9 gm

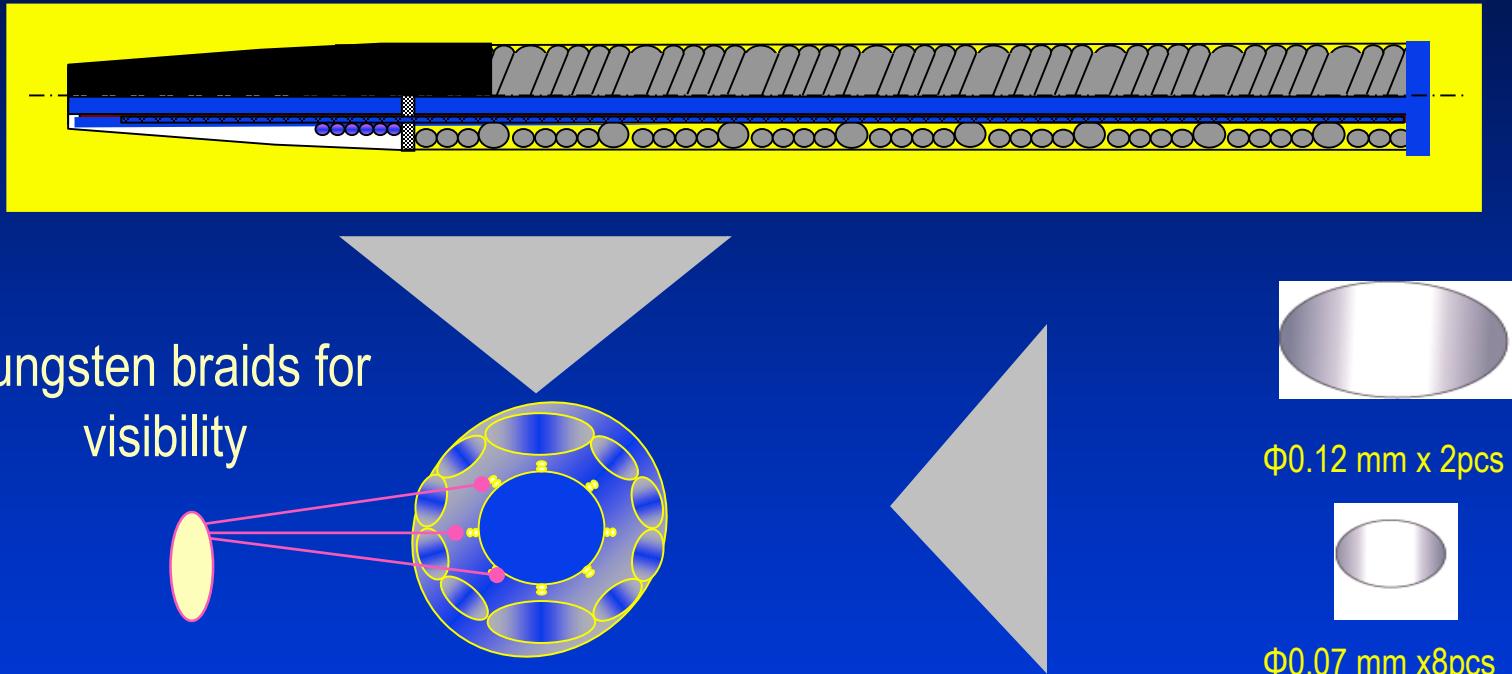
Lesion-Specific CTO Approaches

PENETRATION

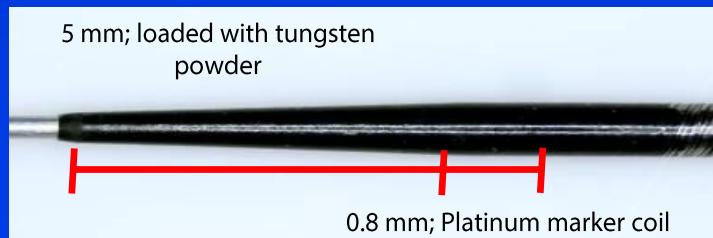
- Blunt entry point, short straight CTO segments
- Heavily calcified or resistant lesions
- Alternative to “drilling” after initial soft wire failure or after “drilling” wire failure
- Parallel wiring technique

Corsair Micro-catheter

For crossing & dilating small vessels: SHINKA Shaft



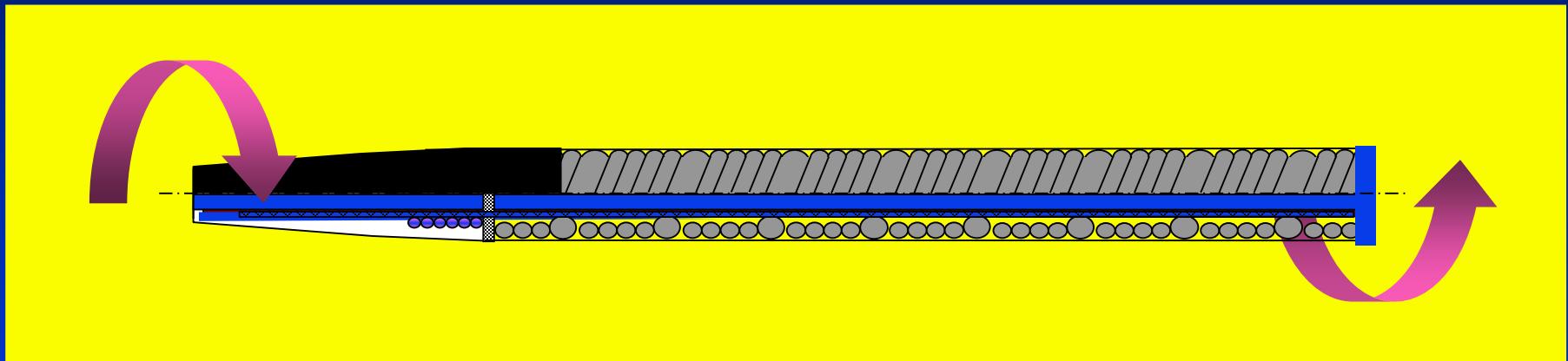
8 thin wires wound with 2 larger ones = pushability, trackability and support.



Corsair Micro-catheter

Also for antegrade crossing as support catheter

Rotation Resistance Reduction

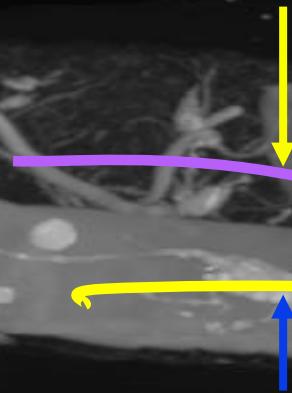


SHINKA-Shaft's spiral structure transmits rotation to the distal tip. This rotation gives CORSAIR its crossing performance through tortuous channels.

Antegrade CTO Wiring

Parallel wire technique

Wire 1 –subadventitial space

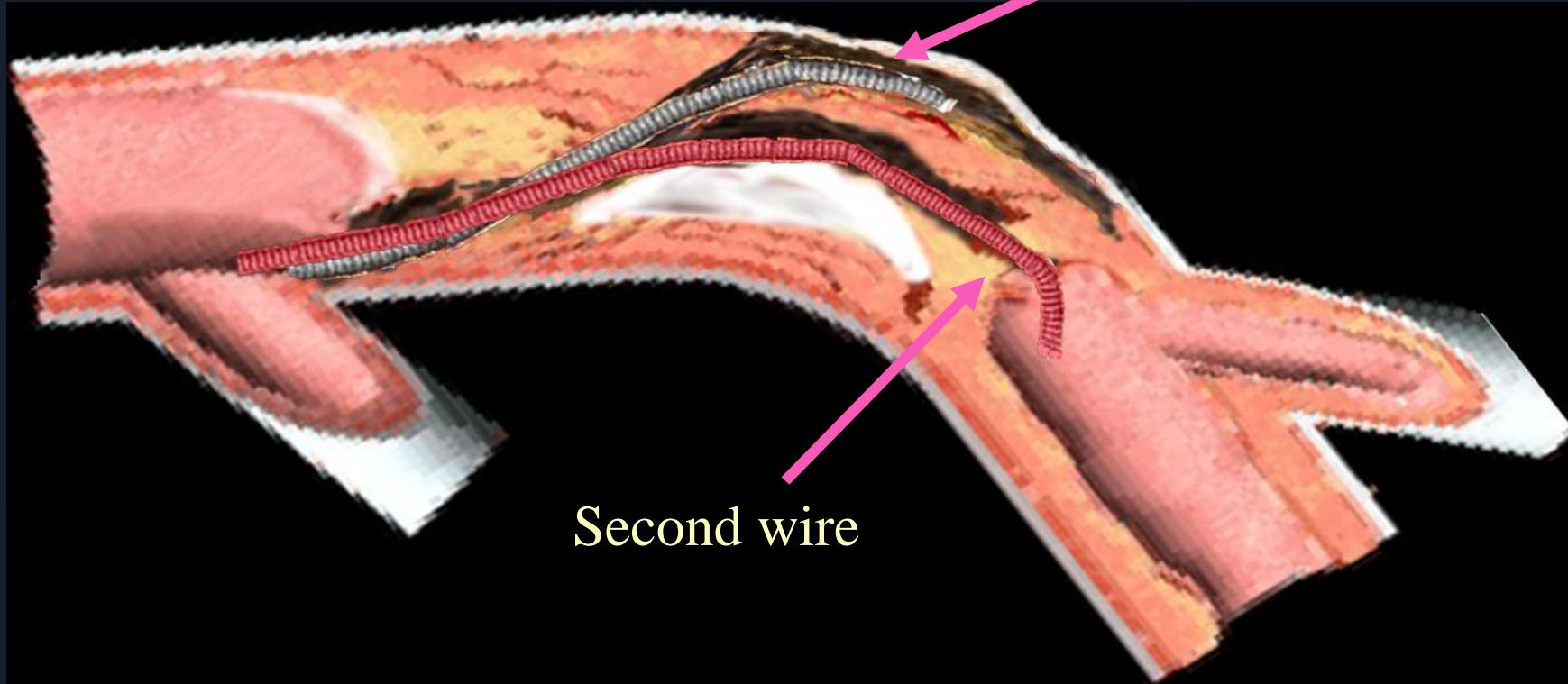


Wire 2 – redirected to true lumen path

- First wire serves as marker, obstructs entry to false channel
- 2nd (parallel) wire (with greater tip stiffness) redirected to true lumen
 - based on subtle inflection from where wire 1 went offline
 - based on visual/tactile feedback

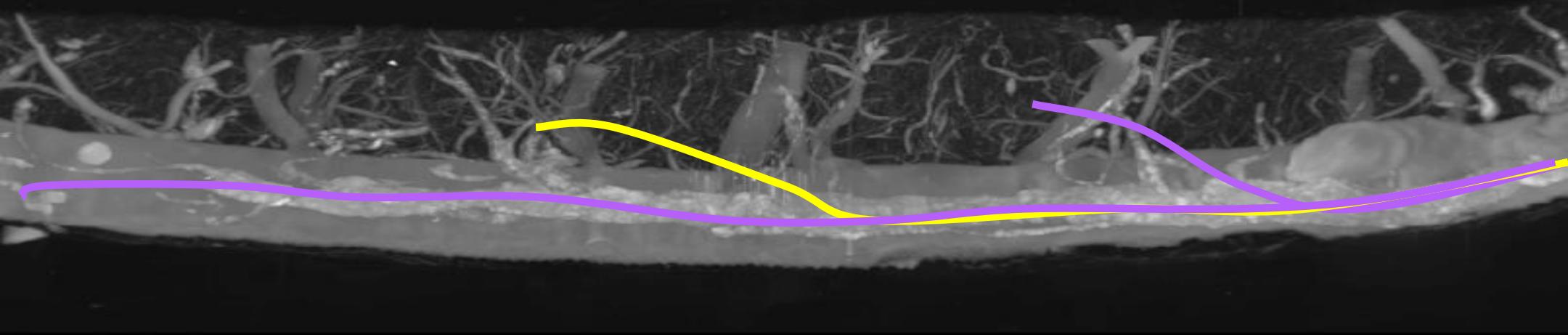
Antegrade CTO Wiring

Parallel wire technique



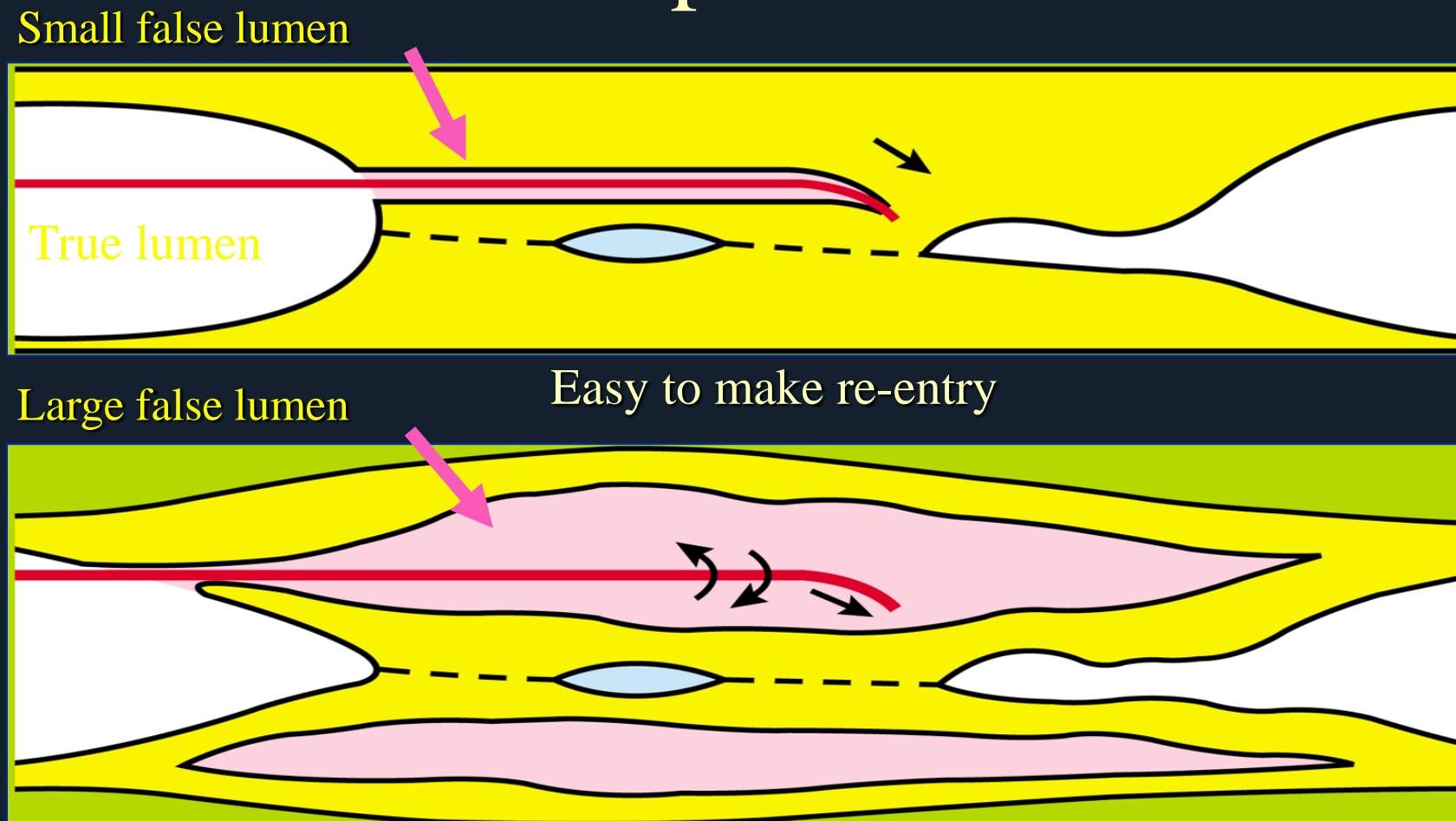
Antegrade CTO Wiring

See-Saw wire technique



- Requires two micro-catheters; may use similar stiffness wires
- Alternating wires repetitively redirecting into true lumen
 - most often used in tortuous long segment CTOs
 - based on visual/tactile feedback

Guidewire Re-entry from Subintimal Space



CTO Guidewires – Tip Shaping

For penetrating the entry point

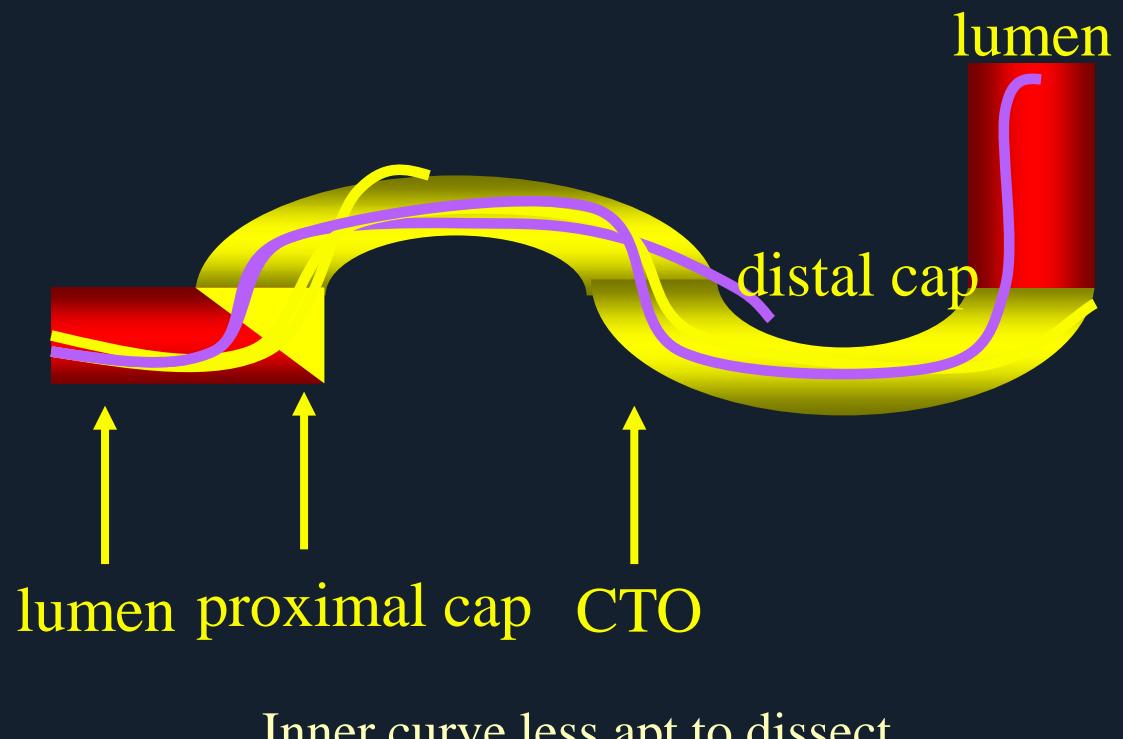
For reentering to the true lumen from the subintima



Antegrade CTO Wiring Techniques

Severe Tortuosity

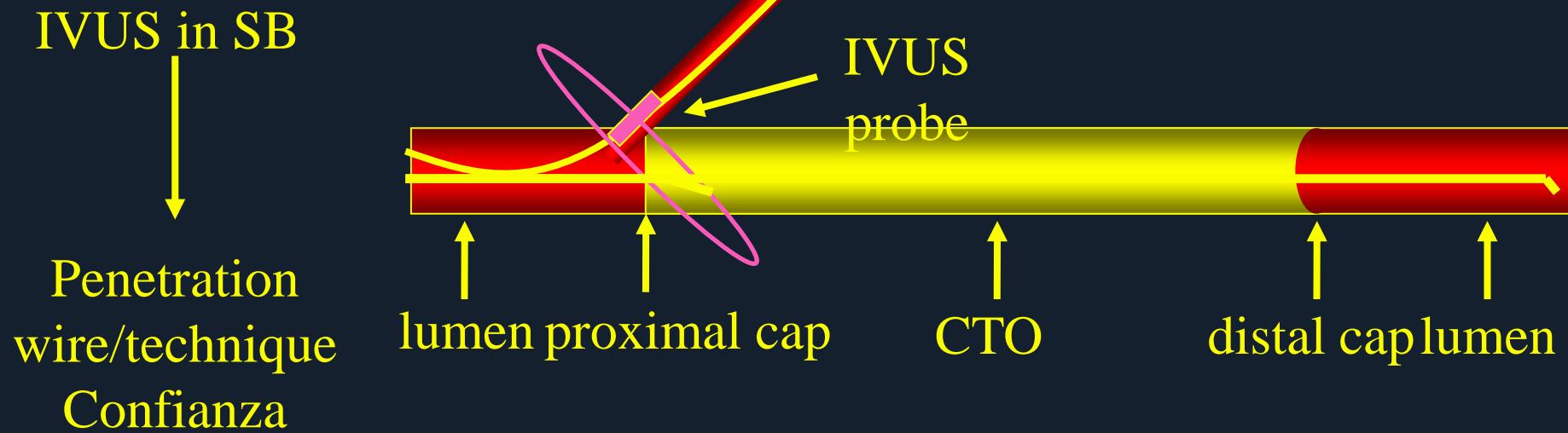
Miracle 3
↓
Miracle 6, 12
↓
Parallel/See-saw wiring
with support catheters



Antegrade CTO Wiring Techniques

IVUS guidance

Blunt occlusion at sidebranch takeoff

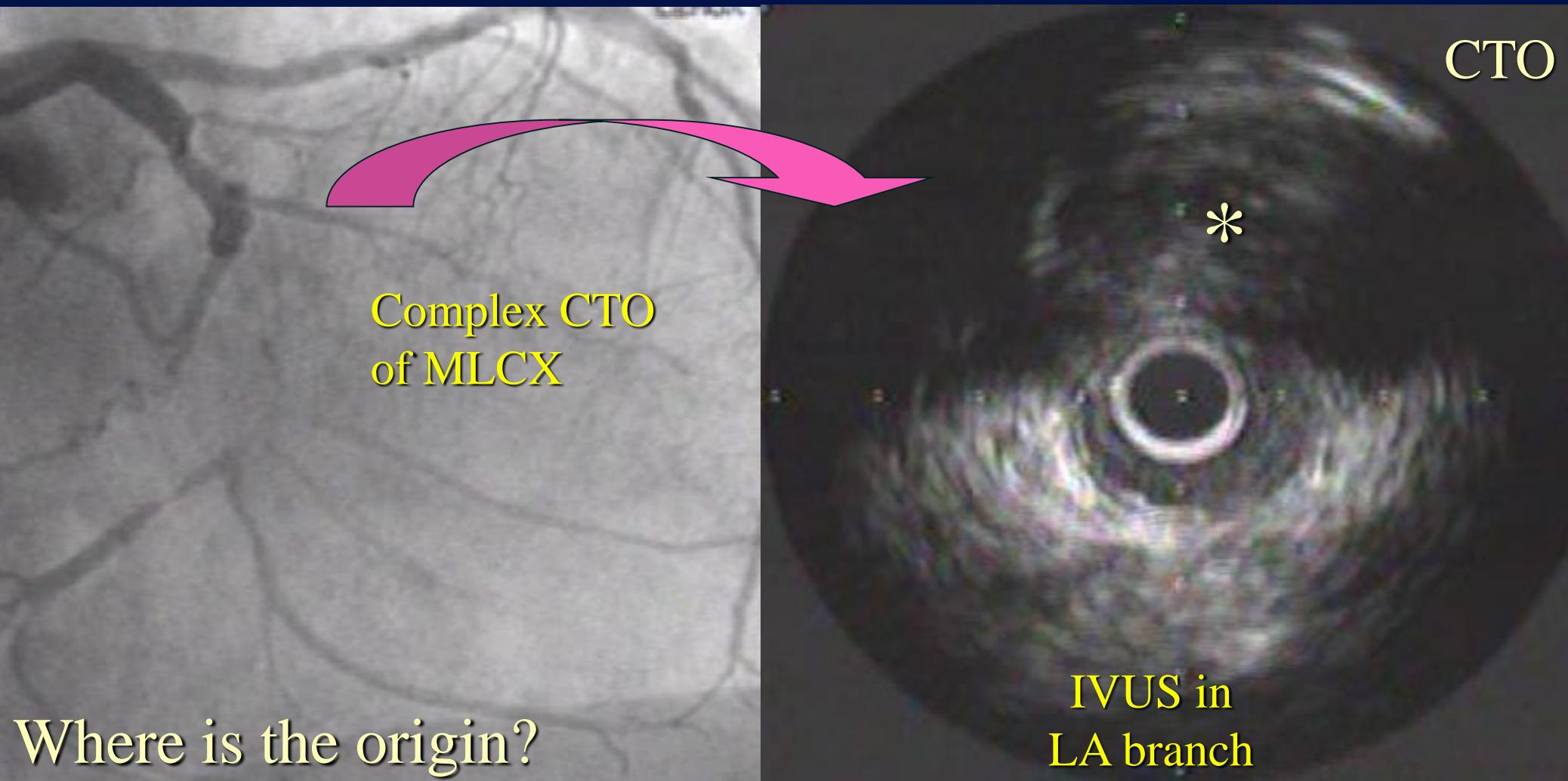


Penetration
wire/technique

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
(Confienza 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)

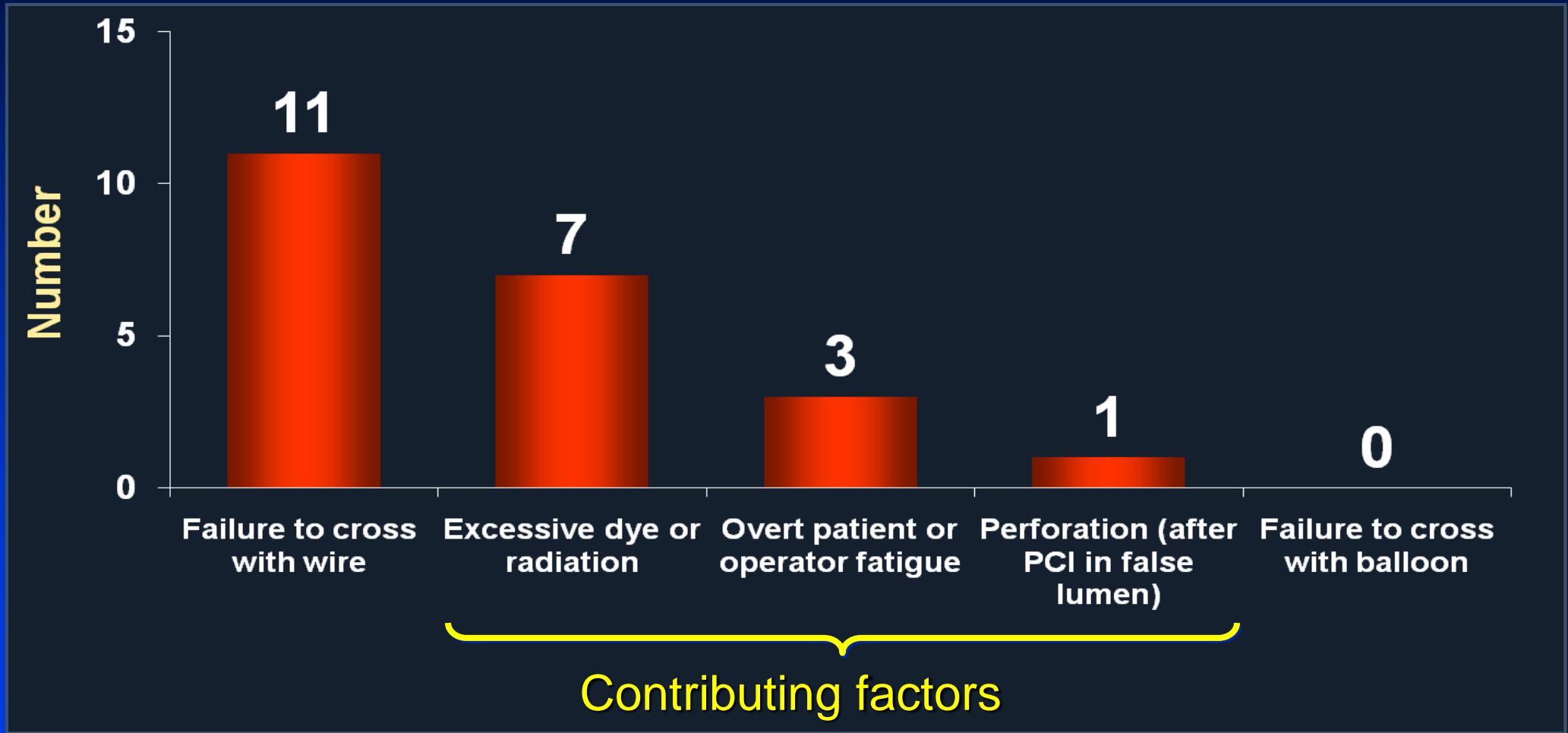


Not cross

Stiff tapered + hydrophilic coating
(Confienza 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

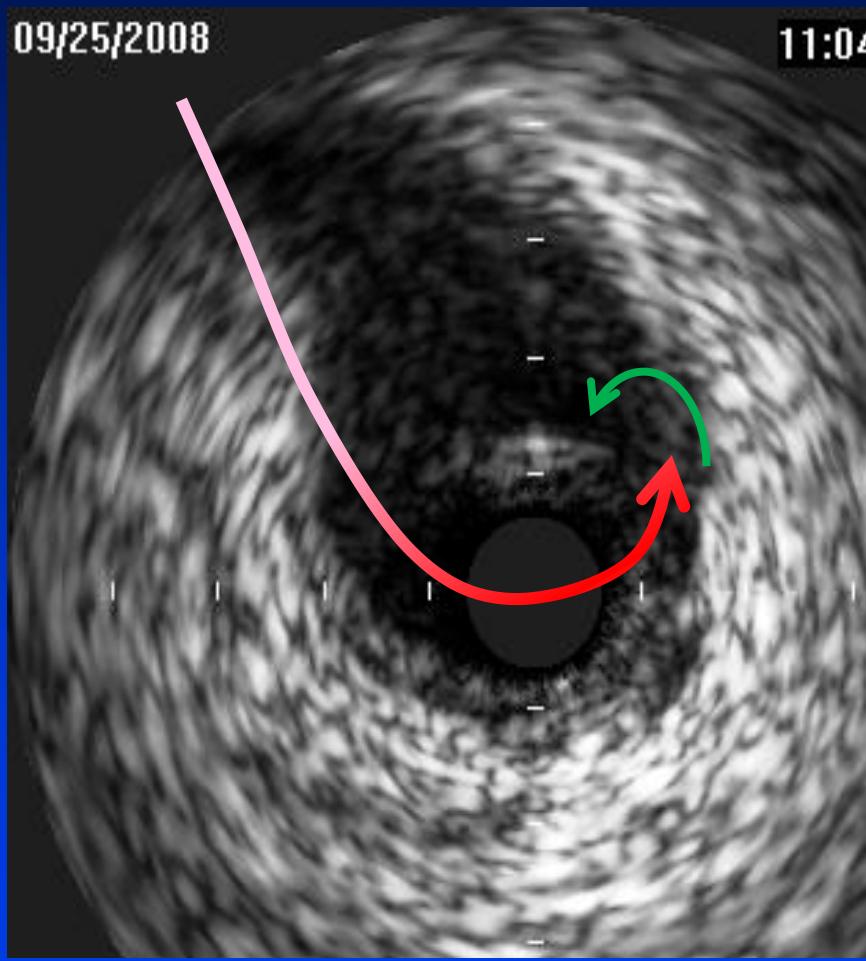
When to STOP!

- 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

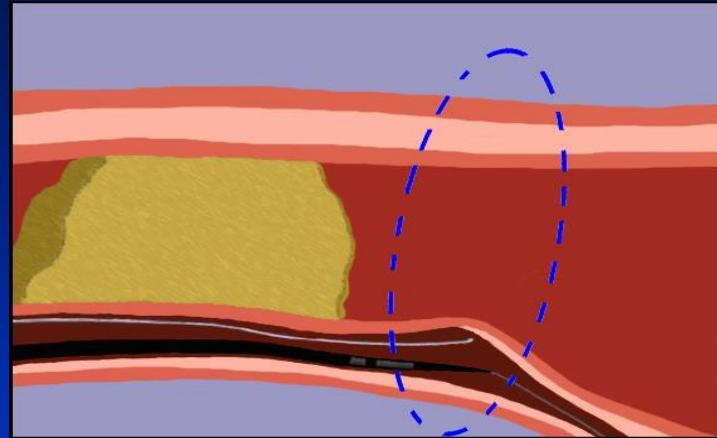
Recent TRENDS

- 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

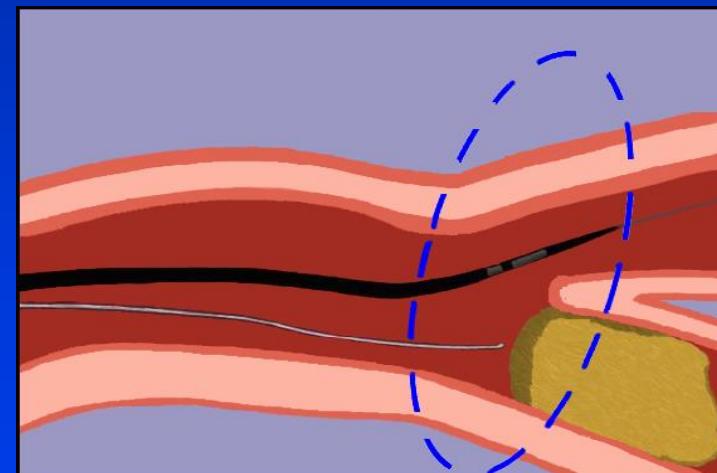


IVUS Guided Technique

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”