CSC 2025
CORONARY AND STRUCTURAL CONGRESS
CONGRESO CORONARIO Y ESTRUCTURAL
MADRID

5, 6 y 7 NOVIEMBRE
HOTEL RIU PLAZA DE ESPAÑA

APRENDE DE UN CASO: BIFURCACIÓN

Dr. Jose A. Linares Vicente
Unidad Cardiología Intervencionista. HCU Lozano Blesa
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Instituto de Investigación Sanitaria Aragón
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Hospital Clínico Universitario Lozano Blesa
Universidad Zaragoza 1542

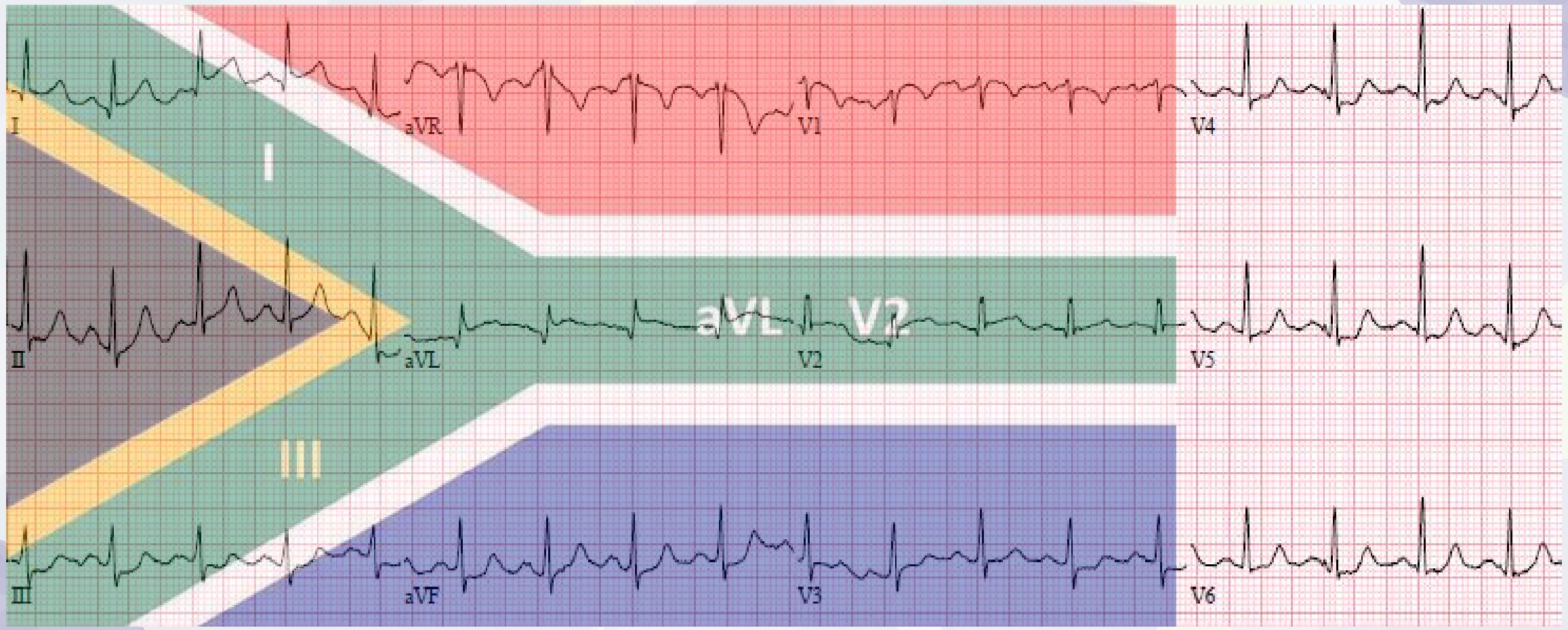
Caso clínico

Mujer 70 años

FRCV: HTA

Historia actual

Angina prolongada tras estrés emocional


I
aVR
V1
V4
II
aVL
V2
V5
III
aVF
V3
V6

Caso clínico

Mujer 70 años

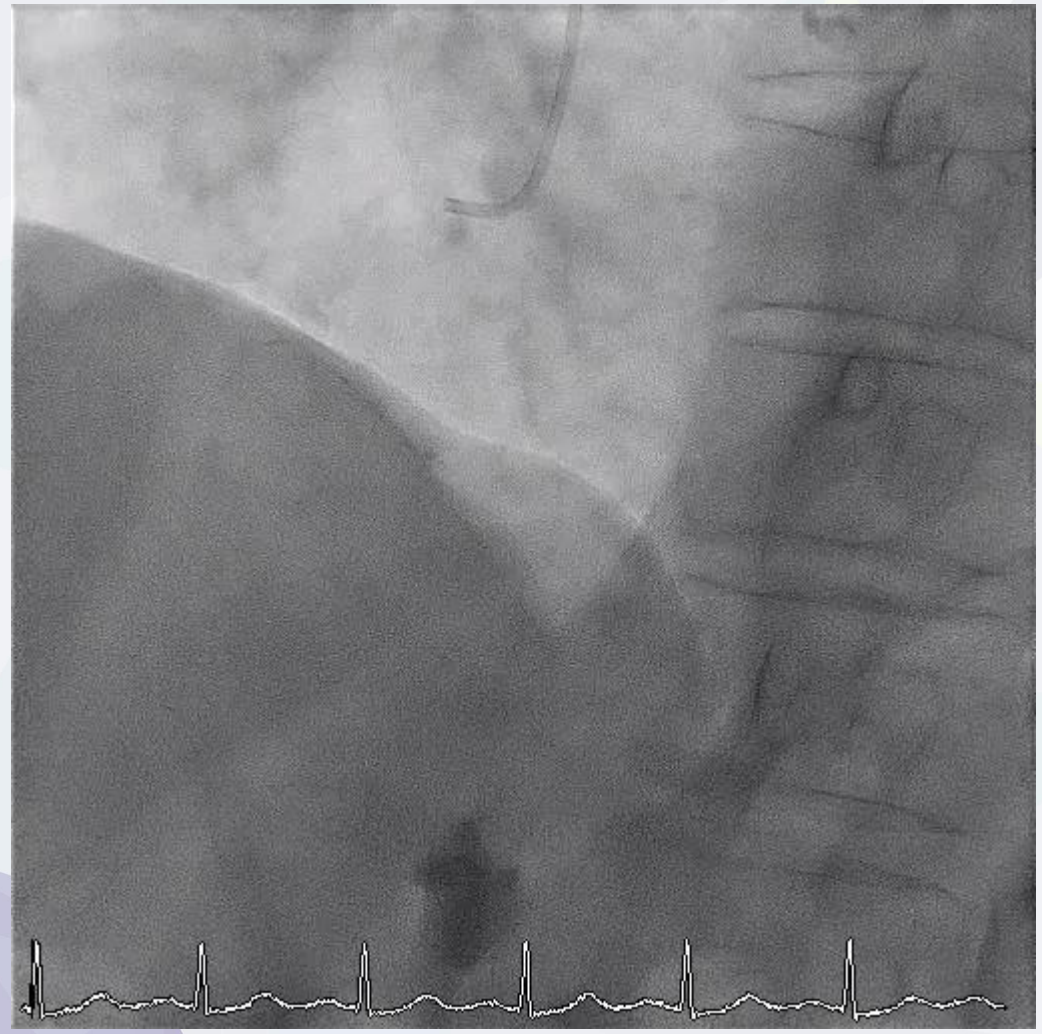
FRCV: HTA

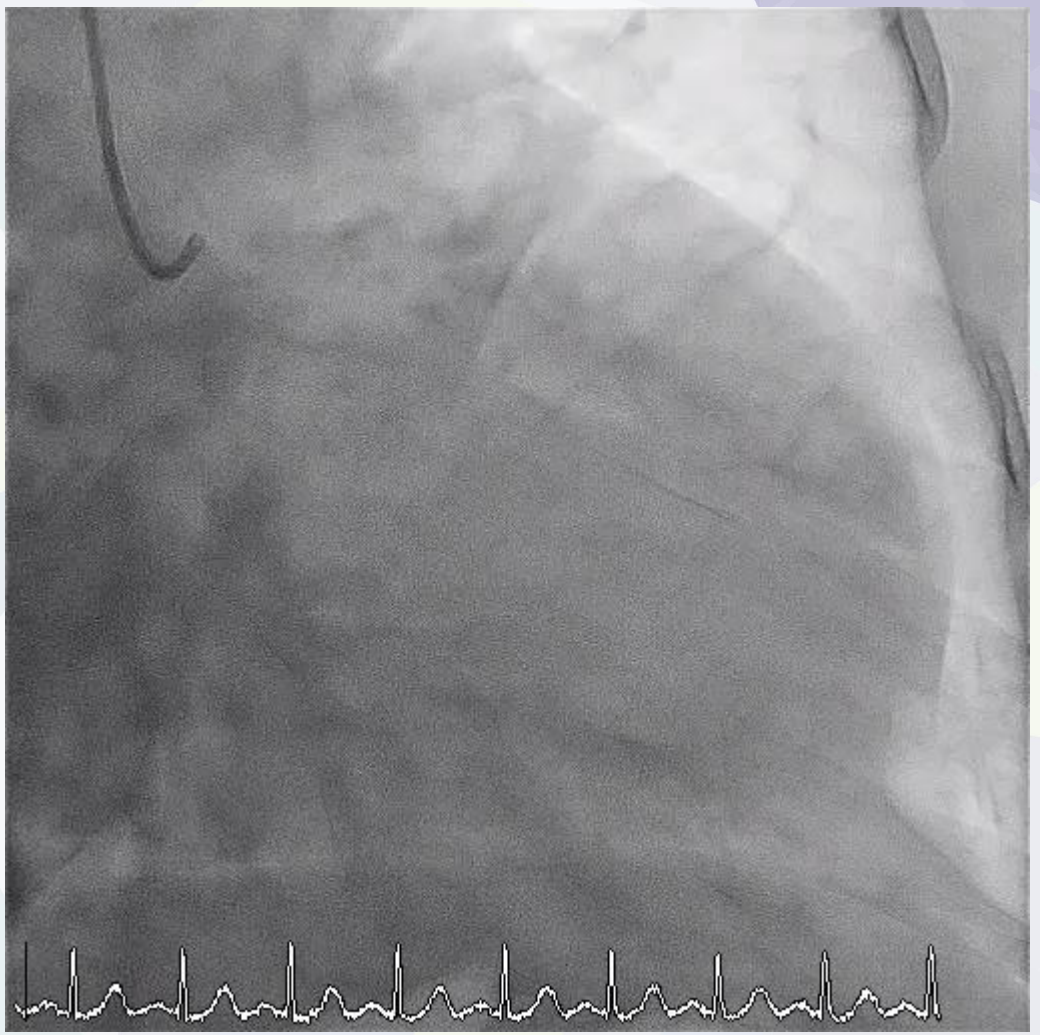
Historia actual

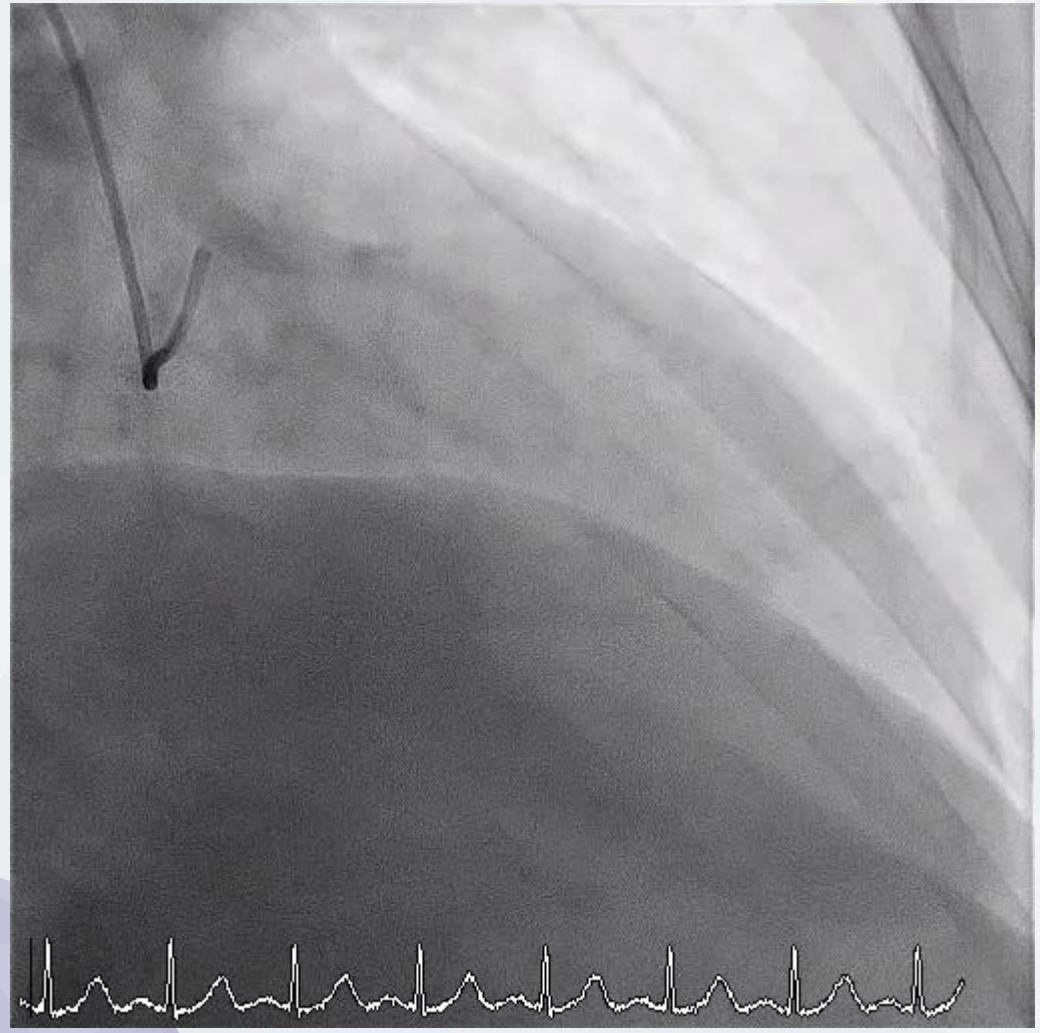
Angina prolongada tras estrés emocional

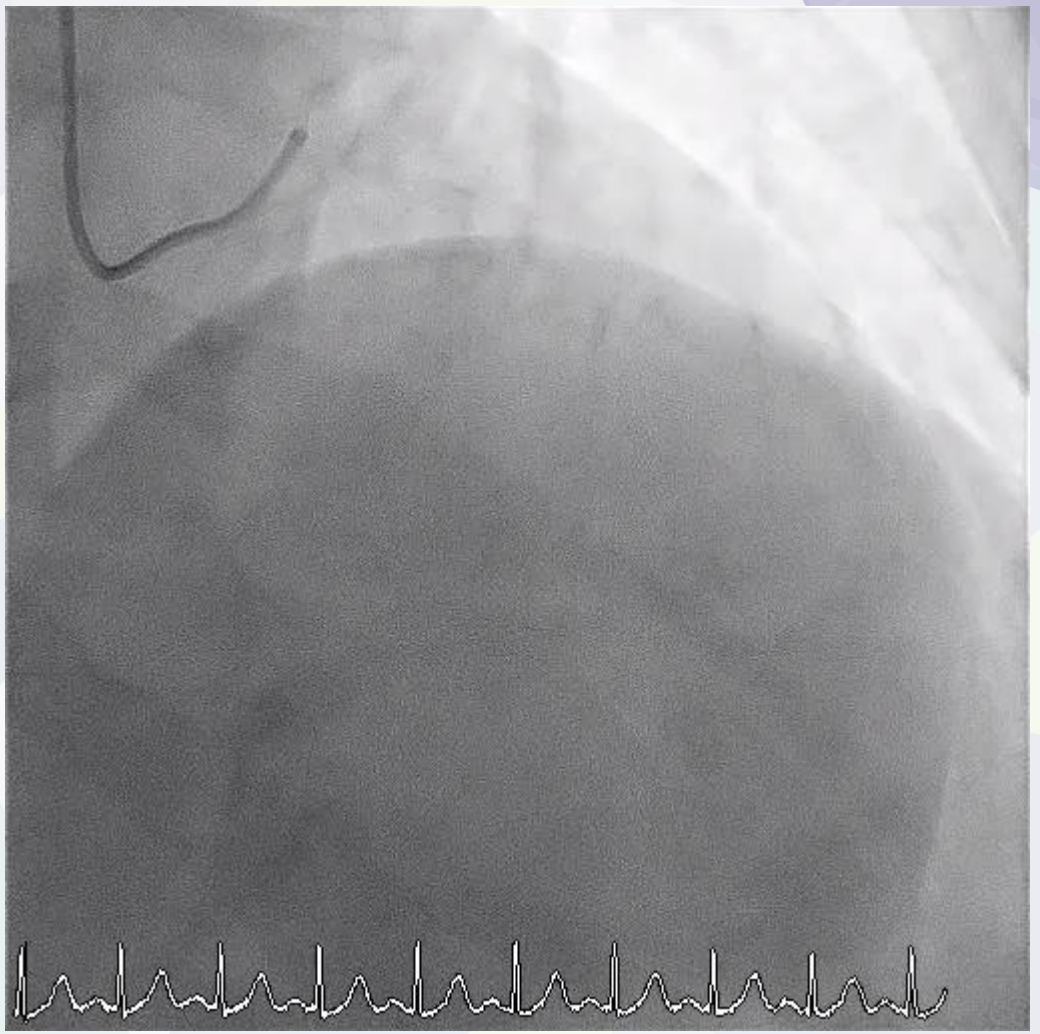
ETT: disfunción VI y segmentarismos anterior e inferior

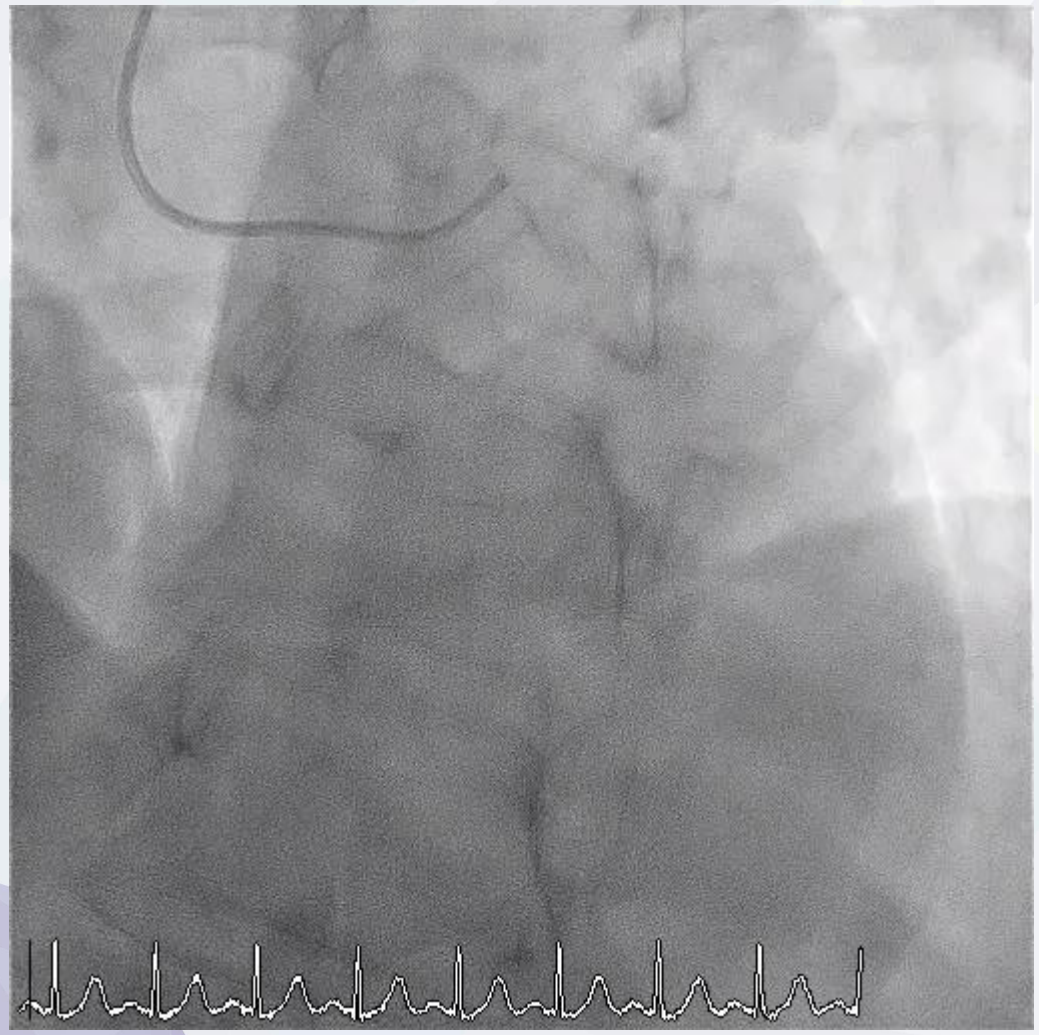
AAS + ticagrelor y traslado a CNG urgente

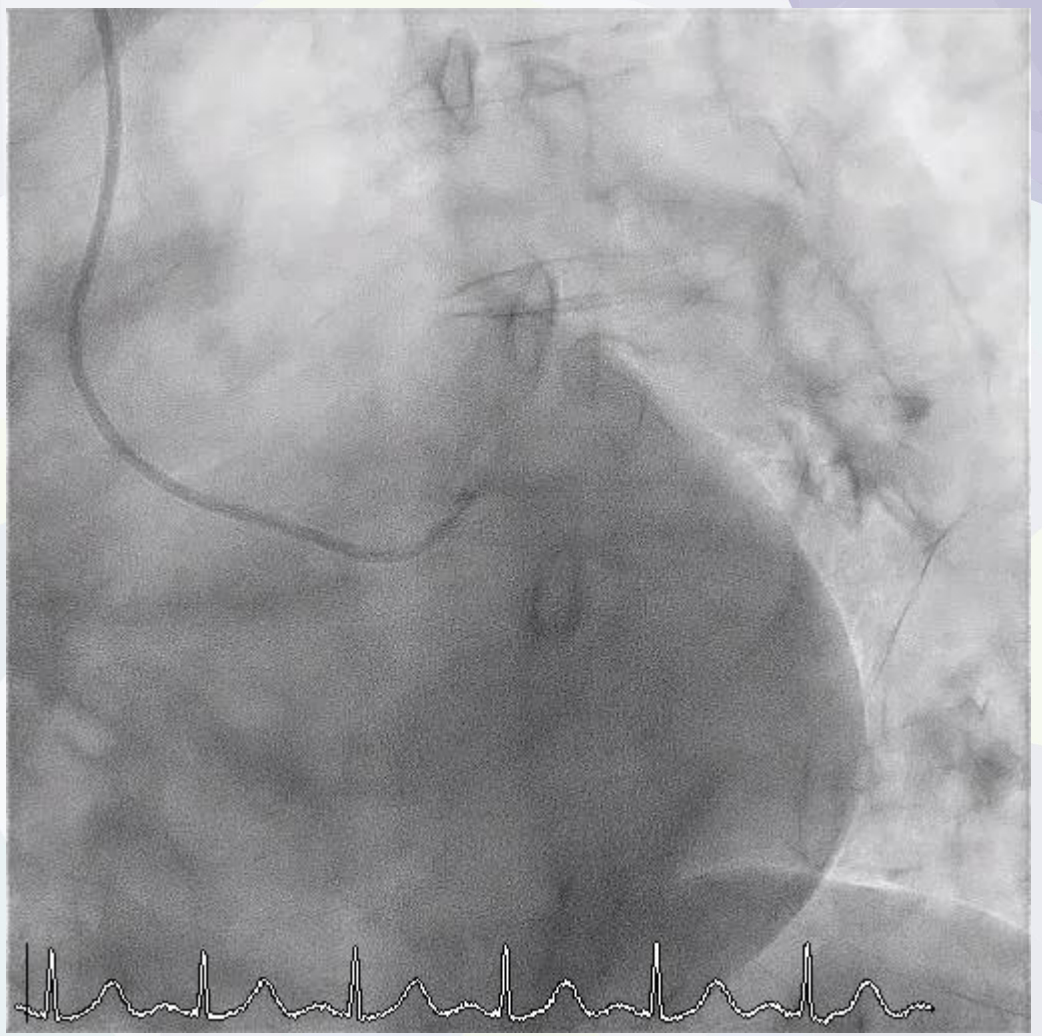


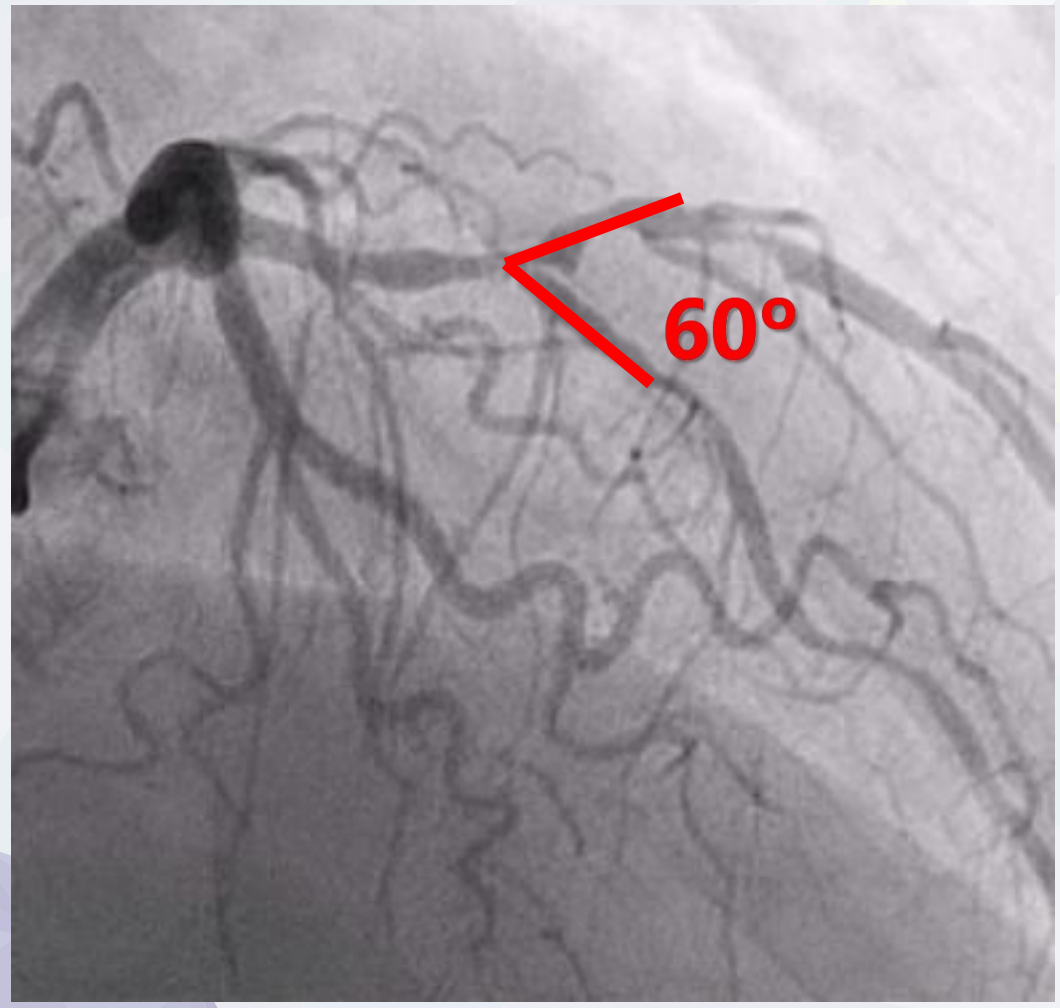








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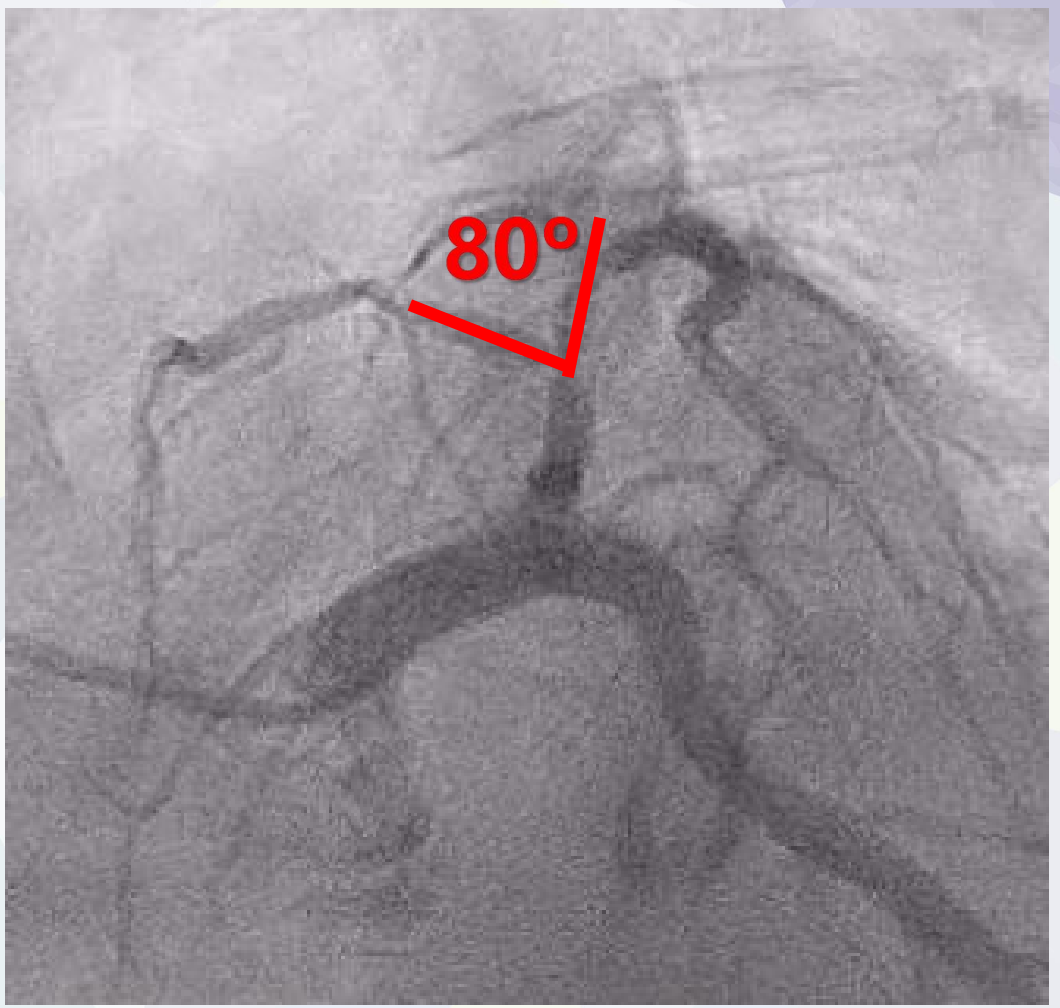
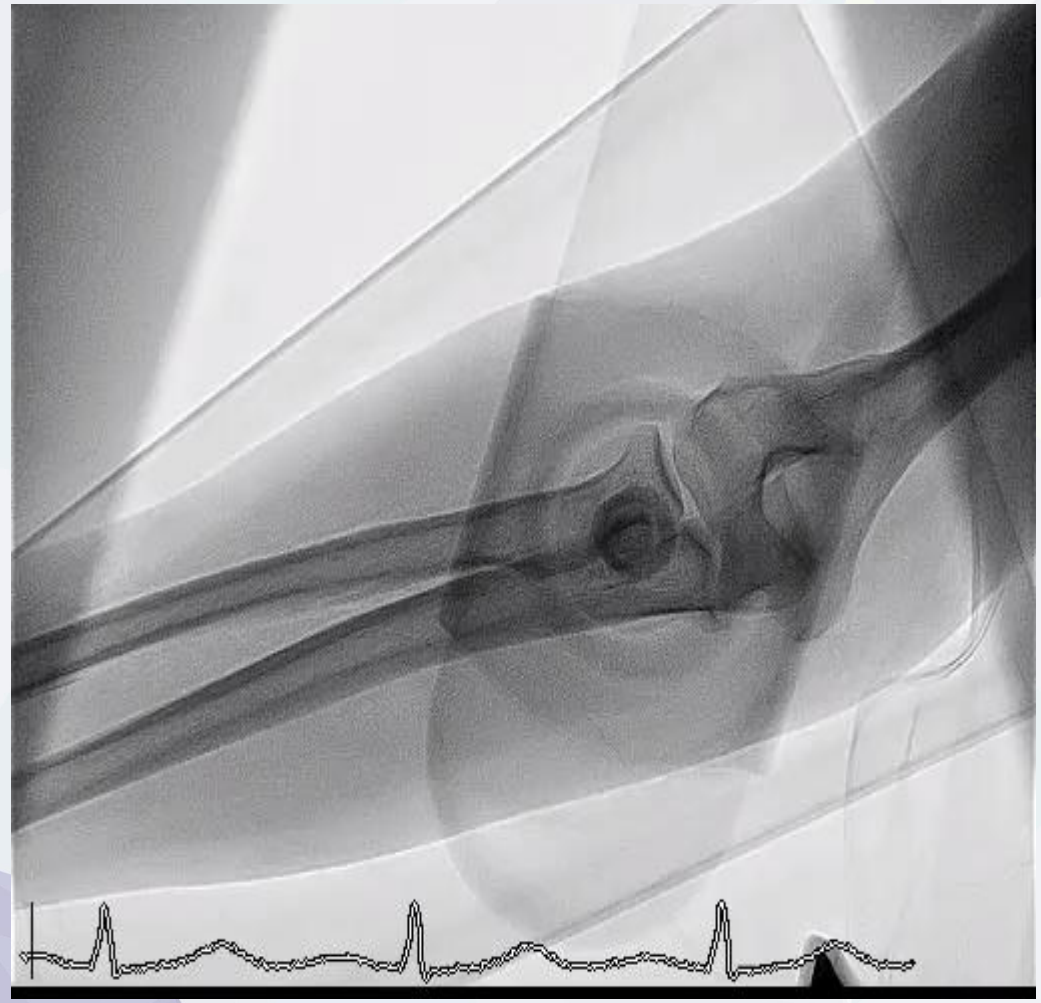
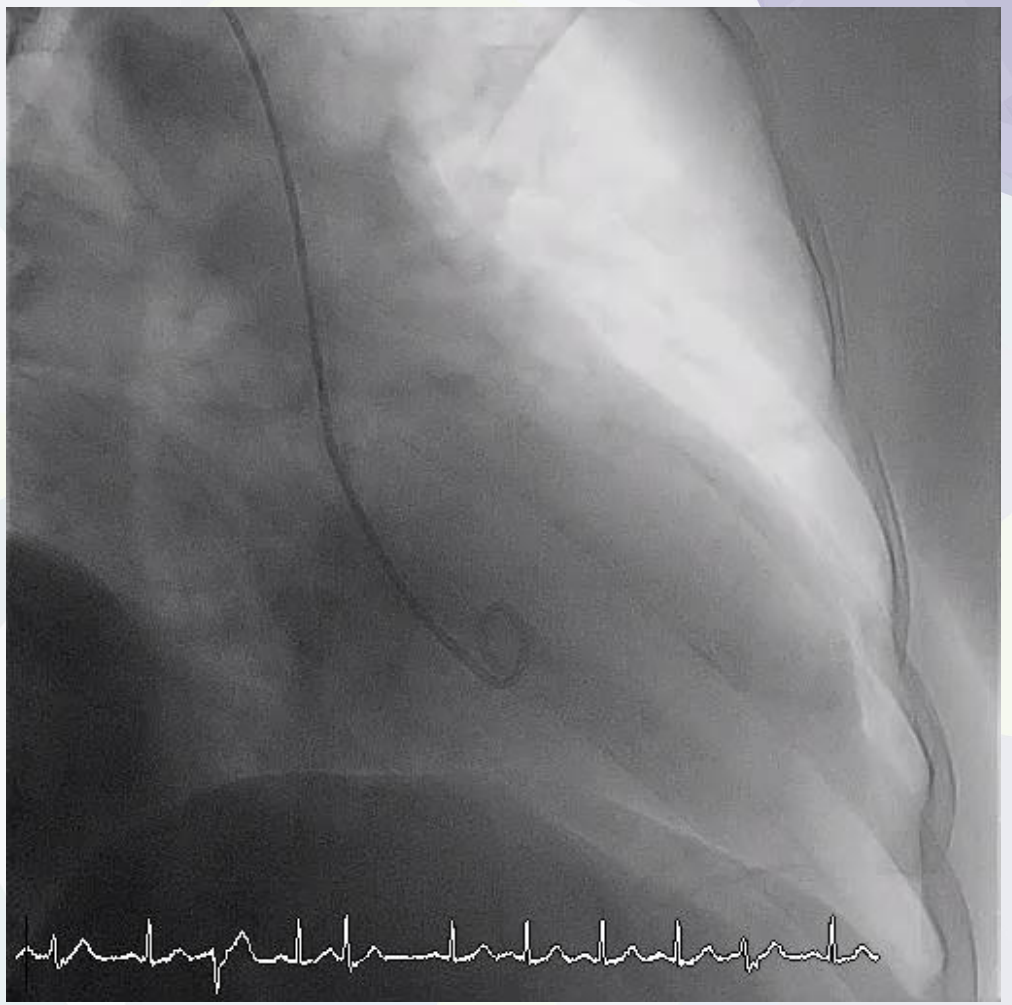

80º





RESUMEN

- Enfermedad coronaria 1 vaso
- Estenosis severa bifurcación DA proximal- 1ª diagonal Medina 1,1,1
- Disfunción VI sugestiva de MCP estrés (PTDVI elevada)
- TnT HS 350ngr/L
- Arteria radial 2mm

PLANTEAMIENTO DEL CASO

- Parar o "ad-hoc"?
- ICI?
- **1 vs 2 stents? Si 2 stents, técnica?**
- **1 vs 2 DEB?**
- 6 o 7F? Radial o femoral?

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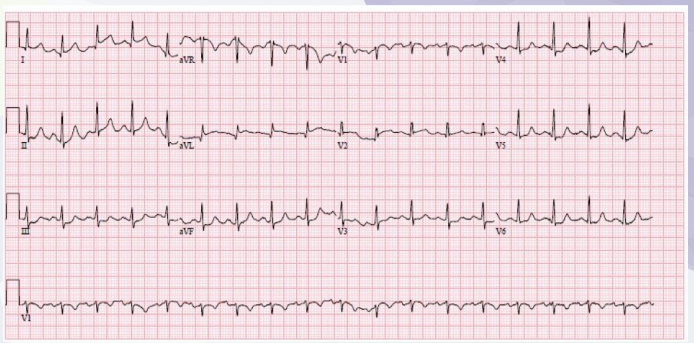
HOSPITAL UNIVERSITARIO Virgen del Rocío

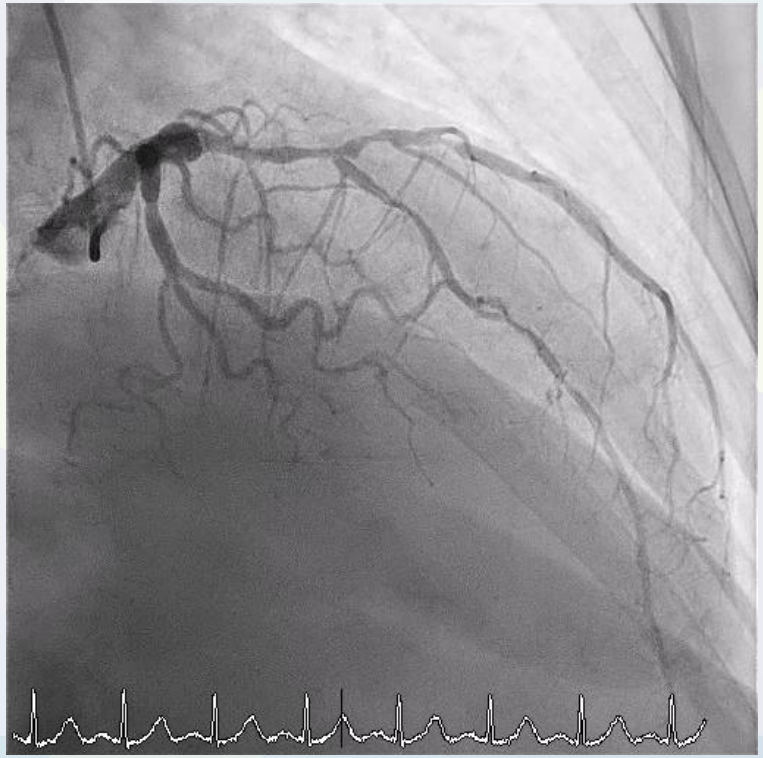
Corazón #somos HUV

Rosa M. Cardenal
Unidad de Hemodinamica
Servicio de Cardiologia
Hospital Universitario Virgen del Rocío

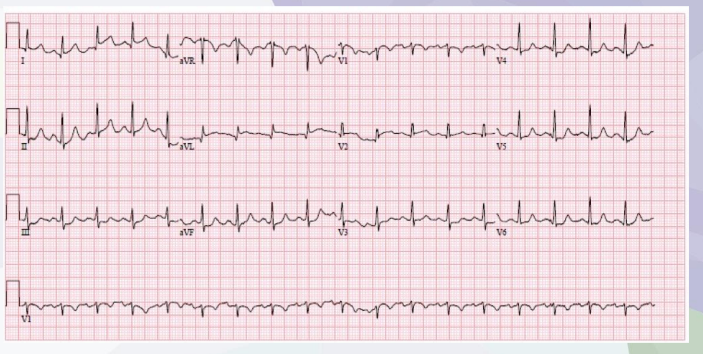
¿Qué tenemos?



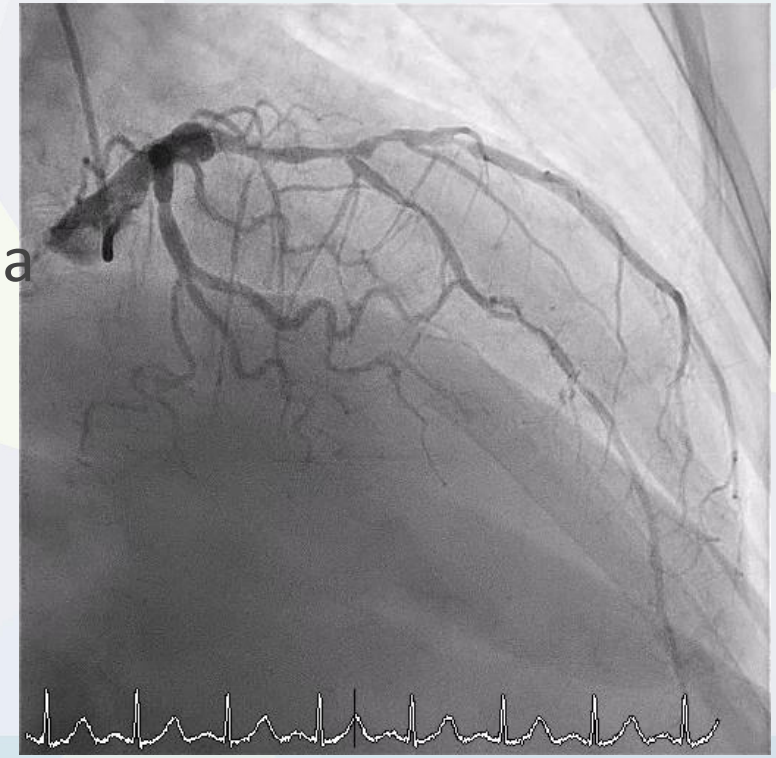
- IAM lateral
- Lesión culpable: Ramo diagonal
- Bifurcación DA-Diagonal: Medina 1-1-1
- DA enferma y de menor calibre que Diagonal



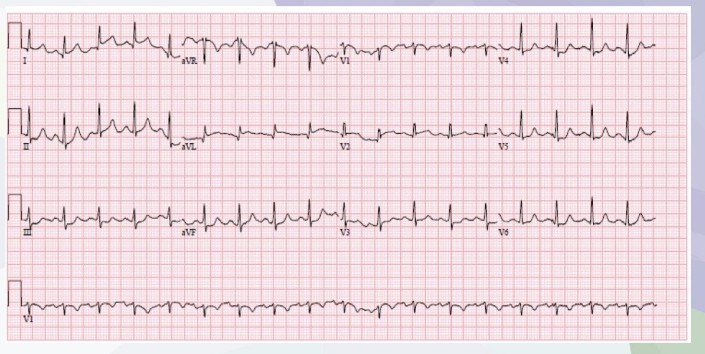
DUDAS-PREGUNTAS



- ¿Diámetro de la rama secundaria?
- ¿Longitud de la lesión?
- ¿Ángulo de la rama secundaria?
- ¿Facilidad de paso de guía tras implante de stent en rama principal?
- ¿Cuántos stents vamos a implantar?



DUDAS-PREGUNTAS



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- ¿Longitud de la lesión?
- ¿Án
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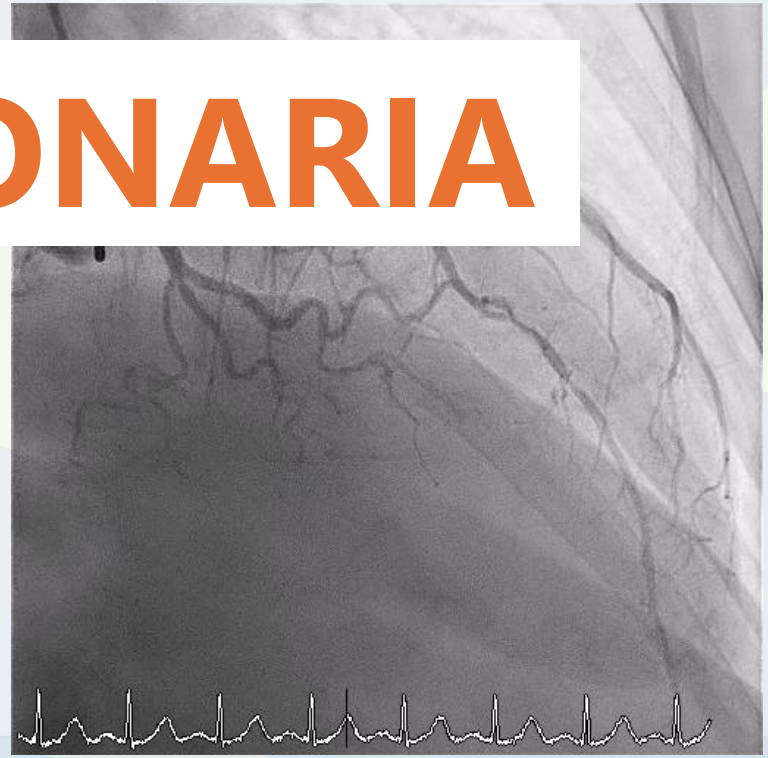
IMAGEN INTRACORONARIA



DUDAS-PREGUNTAS

- **Técnica**:
  - *Stent Provisional*:
    - Más simple, menos metal, más facil de tratar la re-estenosis, menos trombosis?
    - Contras: Dificultad de recruce de guía y estenosis residual del ostium de la rama

- Gran desarrollo (>2.5mm)
- Difusa (>10mm)
- Paso de guía complejo
- Angulación desfavorable

HOSPITAL UNIVERSITARIO Virgen del Rocío

DUDAS-PREGUNTAS

- **Técnica**:

  - *Stent Provisional*:
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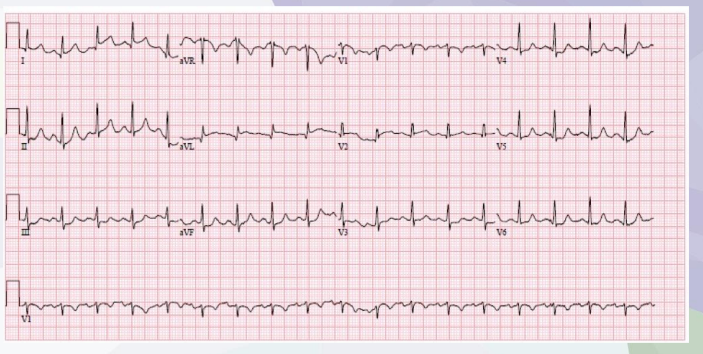
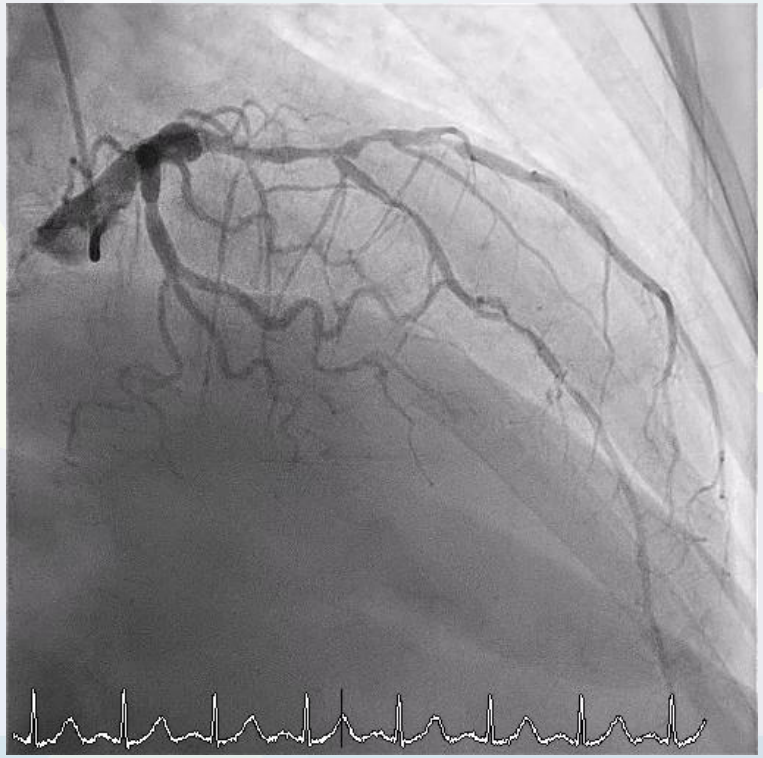
- Gran desarrollo (>2.5mm)
- Difusa (>10mm)
- Paso de guía complejo
- Angulación desfavorable

- ***¿ Dos stent?*** **No me convence**

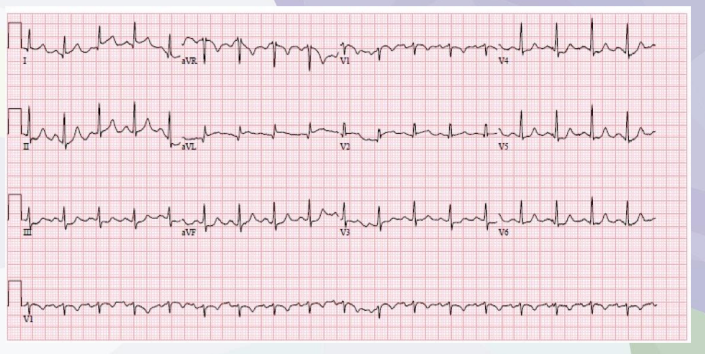
¿Qué tengo claro?



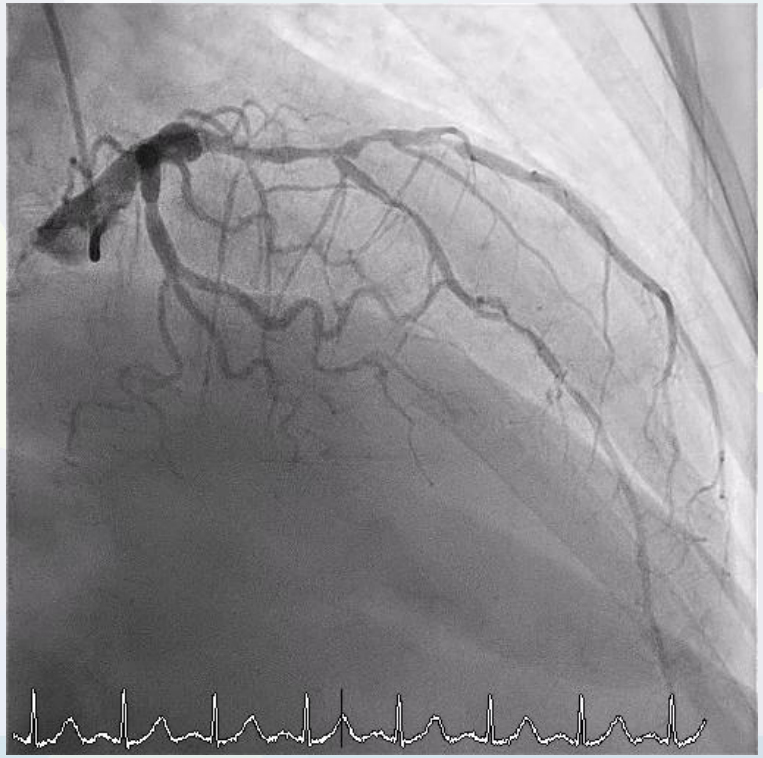
- No quiero “stentar” toda la DA
- DA media: Tratamiento con balón farmacoactivo
- Bifurcación: Stent provisional



¿Qué no tengo claro?



- ¿ Es la rama diagonal la rama secundaria?
- ¿Quiero “enjaular” la DA?
- ¿Hay “landing zone” sin placa en DA?
- ¿Qué me ha dicho la imagen intracoronaria?
- ¿Trato la lesión culpable con balón farmacoactivo?



¿Qué hacemos?

- **¿HAY ALTERNATIVAS? ¿BALÓN FARMACOACTIVO?**

JACC
VOL. 86, NO. 15, 2025

PUBLISHED BY ELSEVIER

JACC STATE-OF-THE-ART REVIEW

Indications for Use of Drug-Coated Balloons in Coronary Intervention

Academic Research Consortium Position Statement

Simone Fezzi, MD, Msc,[a,b] Patrick W. Serruys, MD, PhD,[a] Bernardo Cortese, MD, PhD,[c,d,e] Bruno Scheller, MD,[f] Fernando Alfonso, MD, PhD,[g] Raban Jeger, MD,[h,i] Antonio Colombo, MD,[j] Michael Joner, MD, PhD,[k] Eun-Seok Shin, MD, PhD,[l] Franz Kleber, MD, PhD,[m] Azeem Latib, MD,[n] Tuomas T. Rissanen, MD, PhD,[o,p] Simon Eccleshall, MD,[q] Flavio Ribichini, MD,[b] Ling Tao, MD, PhD,[r] Bon-Kwon Koo, MD, PhD,[s] Alaide Chieffo, MD, PhD,[t,u] Junbo Ge, MD,[v] Juan F. Granada, MD,[w] Hans-Peter Stoll, MD, PhD,[x] Christian Spaulding, MD, PhD,[y] Rafael Cavalcante, MD,[z] Alexandre Abizaid, MD, PhD,[aa] Takashi Muramatsu, MD, PhD,[bb] Konstantinos Dean Boudoulas, MD,[cc] Ron Waksman, MD,[dd] Roxana Mehran, MD,[ee] Donald Cutlip, MD,[ff] Mitchell Krucoff, MD,[gg] Gregg W. Stone, MD,[ee] Scot Garg, MD, PhD,[hh,ii] Yoshinobu Onuma, MD, PhD[a]

IAM

DCB ARC

Exp **DCB only or blended approach (DES/DCB)** may emerge as an alternative to DES-only to minimize total stent burden (length/n° of stents) [9,84]

DUDAS-PREGUNTAS

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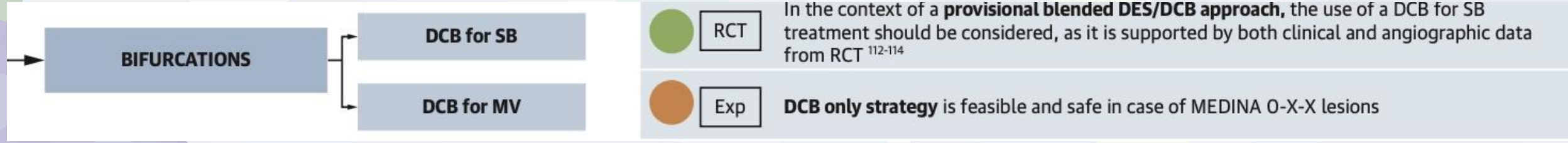
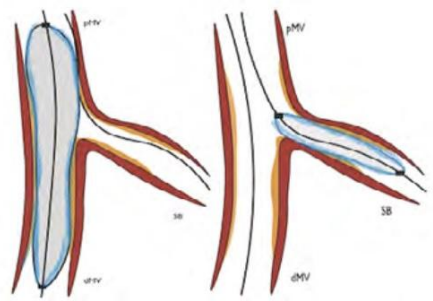


DUDAS-PREGUNTAS

- **¿HAY ALTERNATIVAS? ¿BALÓN FARMACOACTIVO?**

Drug-coated balloons for coronary bifurcation lesions: techniques, advantages, pitfalls, and state-of-the-art.

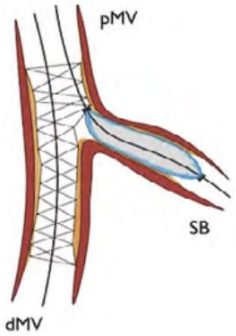
LEAVE NOTHING BEHIND



Advantages
- Efficient and sustained drug delivery
- No polymers or permanent implants
- Preserves vessel geometry and SB access
- DAPT de-escalation

Avoid DCB KBI
- Suboptimal delivery of the drug
- Proximal interaction of the two balloons
- Higher risk of dissection

BLENDED in the PROVISIONAL pathway



Advantages
- ↑ use of provisional vs 2-stent strategy
- ↓ stent burden
- Avoids issues related to polymer and strut crushing
- Allows SB late lumen enlargement

DCB to the SB after DES implantation
- Suboptimal drug delivery due to strut interference
- Limited deliverability in jailed SB

WHAT DO WE KNOW?
- DCB for SB treatment seems to be reasonable and supported by clinical and angiographic data and RCTs
- The use of PCB + BMS is inferior to new-generation DES
- The use of PCB + DES showed promising results in real-world registries
- "DCB-only strategy" is feasible and safe in case of Medina 0,X,X lesions

MORE DATA NEEDED
- RCTs used different study protocols, methods, and devices
- RCTs were relatively small, with no routine POT and a low KBI rate

Simone Fezzi *et al.* • *EuroIntervention* 2025;21:e1179-e1199 • DOI: 10.4244/EIJ-D-25-00201

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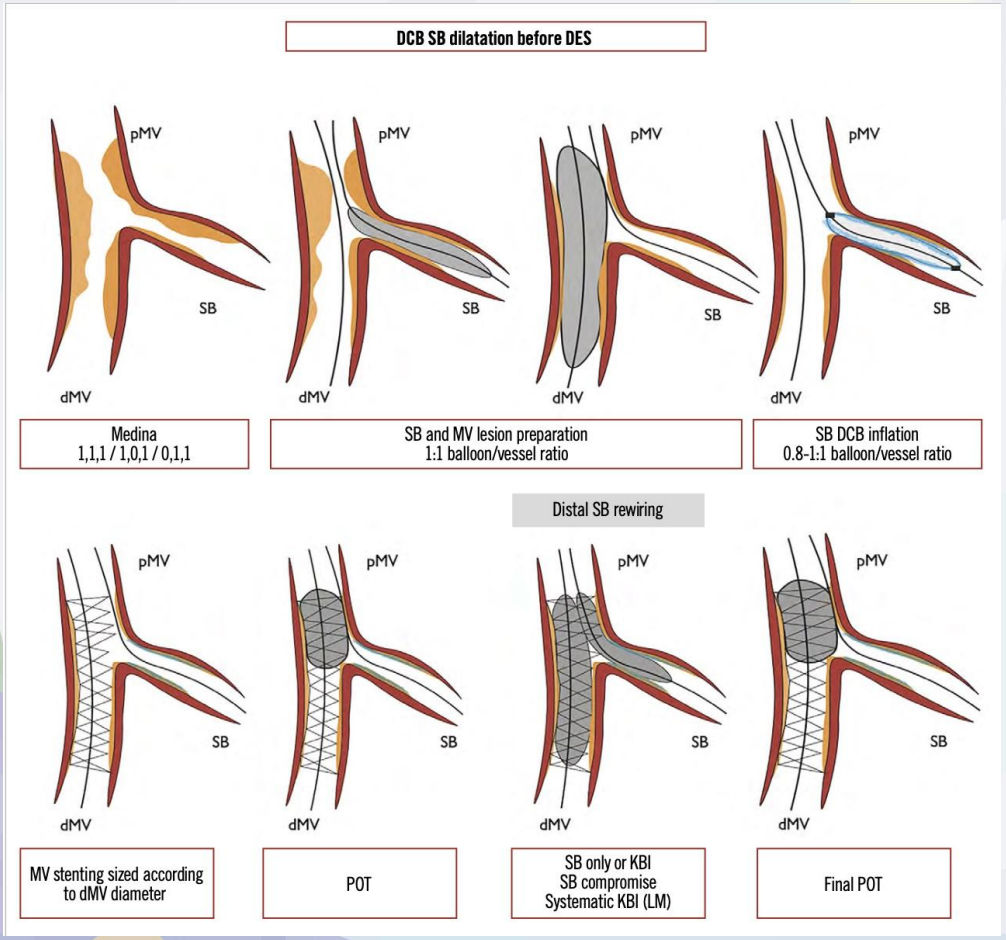

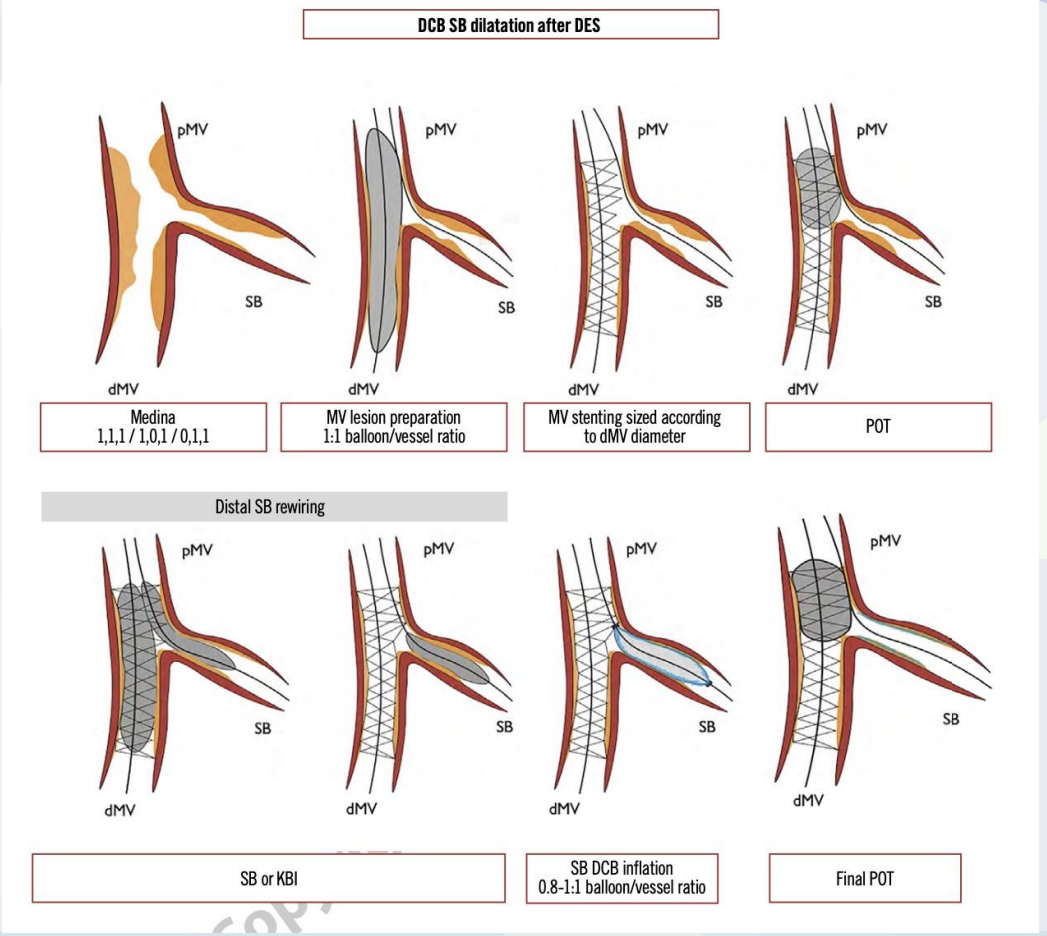

EuroIntervention 2025;21:e1179-e1199 • Simone Fezzi et al.

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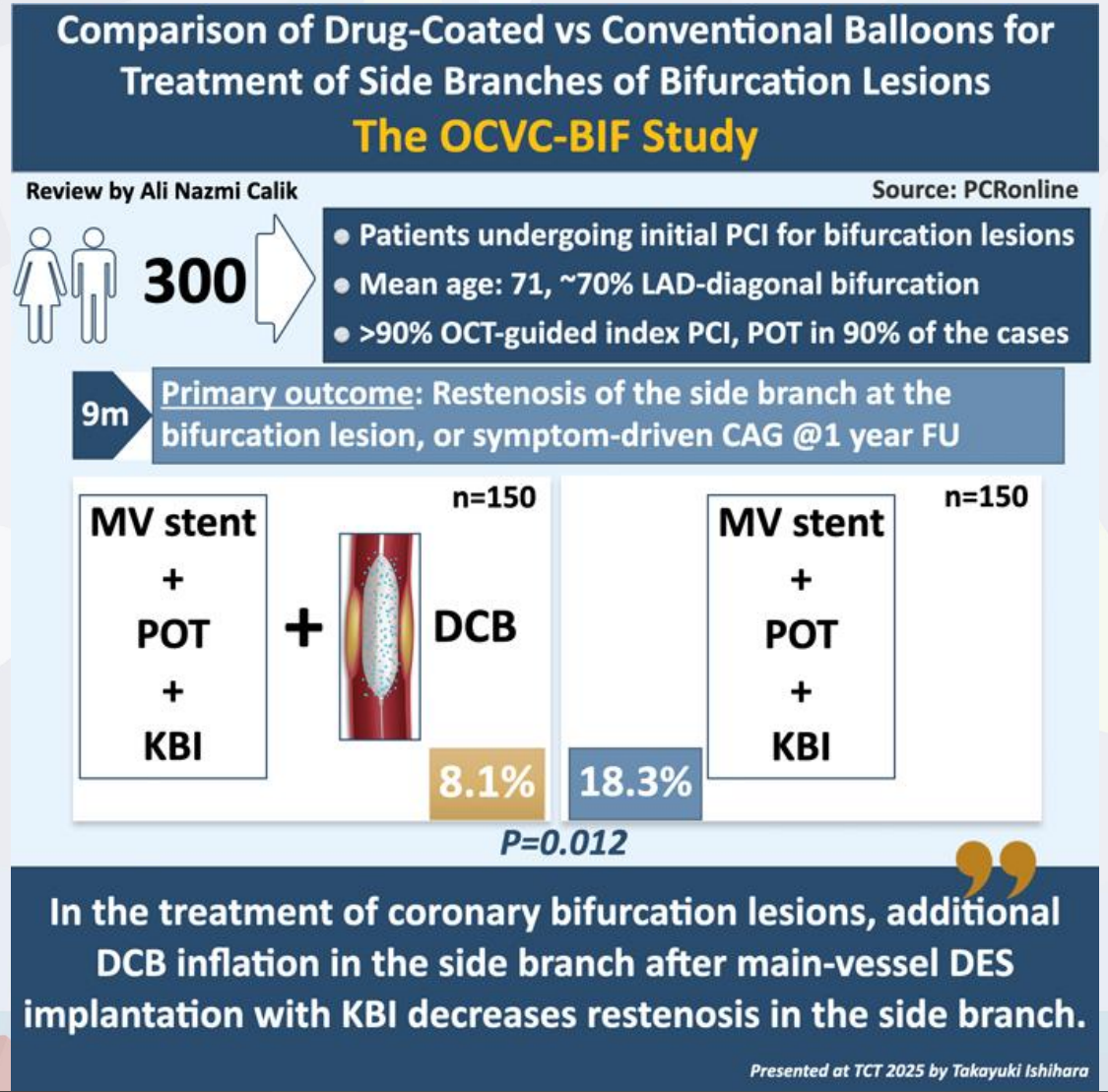

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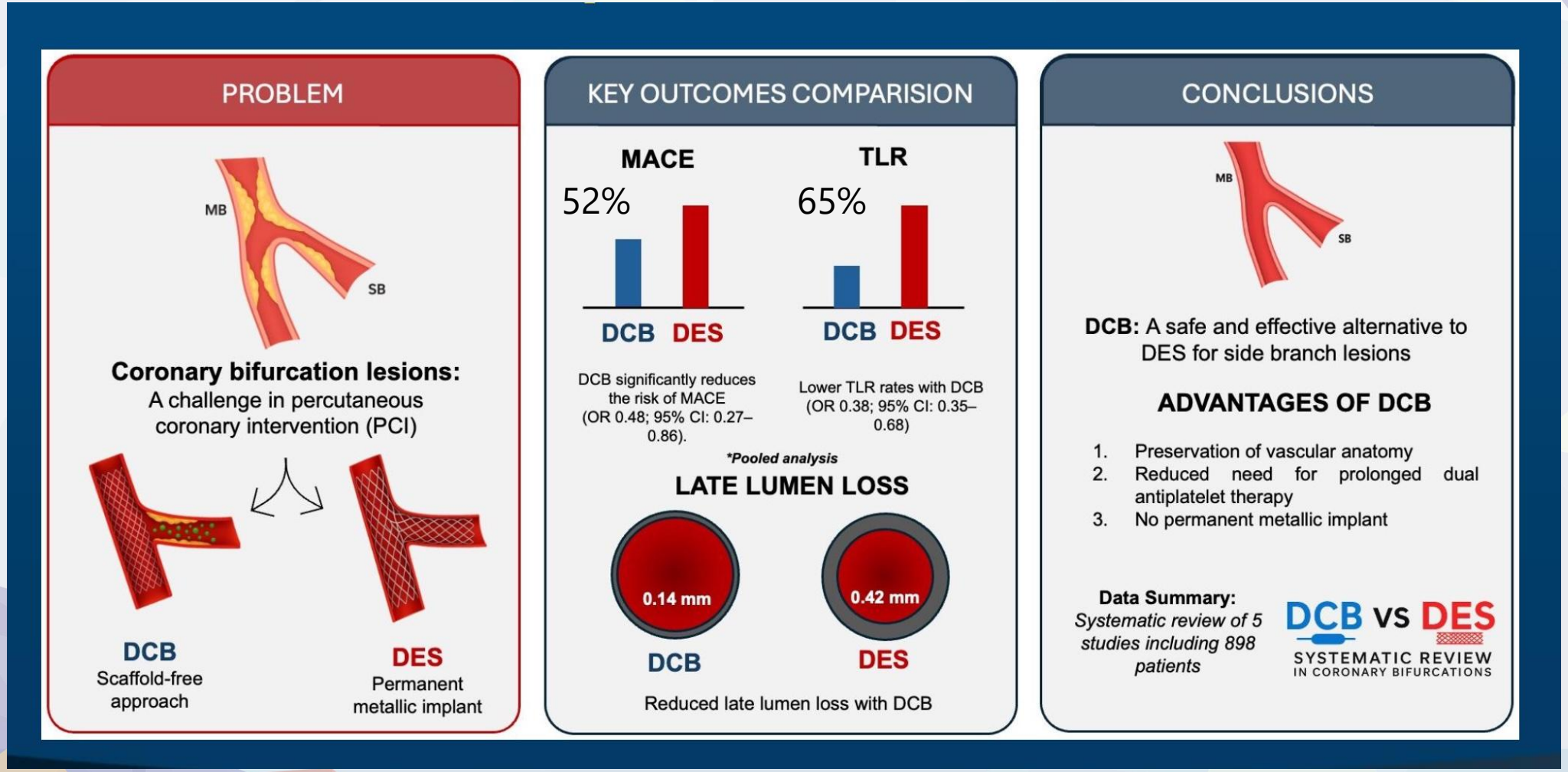


¿Qué hago?

CENTRAL ILLUSTRATION DCB Academic Research Consortium Indications for Use of DCBs in Coronary Intervention: A Step-by-Step Approach for the DCB-Only Strategy

OPTIMAL LESION PREPARATION BEFORE DCB

Standard balloon (SC, NC) 1:1 sized on distal RVD [9]	Exp
Long inflations (>30 sec) are recommended [134,135]	Exp
Specialty balloons (scoring, cutting) are recommended to improve lesion preparation and decrease the risk of flow-limiting dissections [133,136]	RCT
Intravascular imaging is encouraged for more precise assessment of vessel size and calibrated DCB selection, plaque composition and morphology [25,85] • IVI may lead to superior angiographic outcomes after DCB-only PCI [85]	RCT
Calcium debulking (IVL, RA, OA) is recommended in case of moderate-to-severe calcification [98,99]	Exp

ACCEPTABLE RESULT FOLLOWING LESION PREPARATION

ANGIOGRAPHY

RESIDUAL STENOSIS

Visual estimation [9]		≤30%	Exp
QCA *, [12,13]	*Optimal*	≤25%	Exp
	Suboptimal	25-40%	Exp

INTRAVASCULAR IMAGING

Media dissections may facilitate drug transfer to the vessel wall [75]	Exp
No evidence-based IVI criteria is currently established for DCB optimization	

NON FLOW-LIMITING DISSECTIONS Exp

- TIMI 3 flow
- No ECG changes
- No chest pain

CORONARY PHYSIOLOGY (FFR/QFR/NHPR)

No evidence-based threshold is currently available
- Pd/Pa >0.90 [137]
- QFR/FFR >0.80 [9]

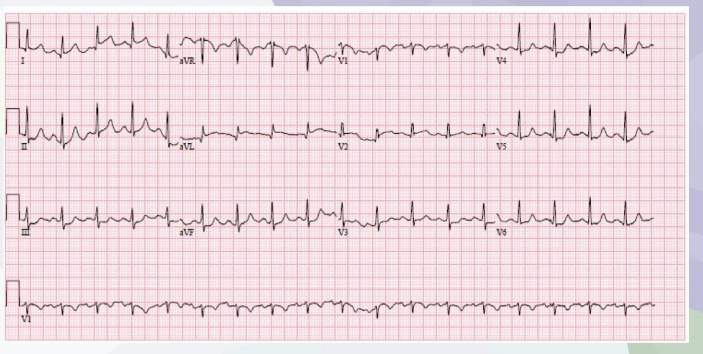
Exp

YES / NO

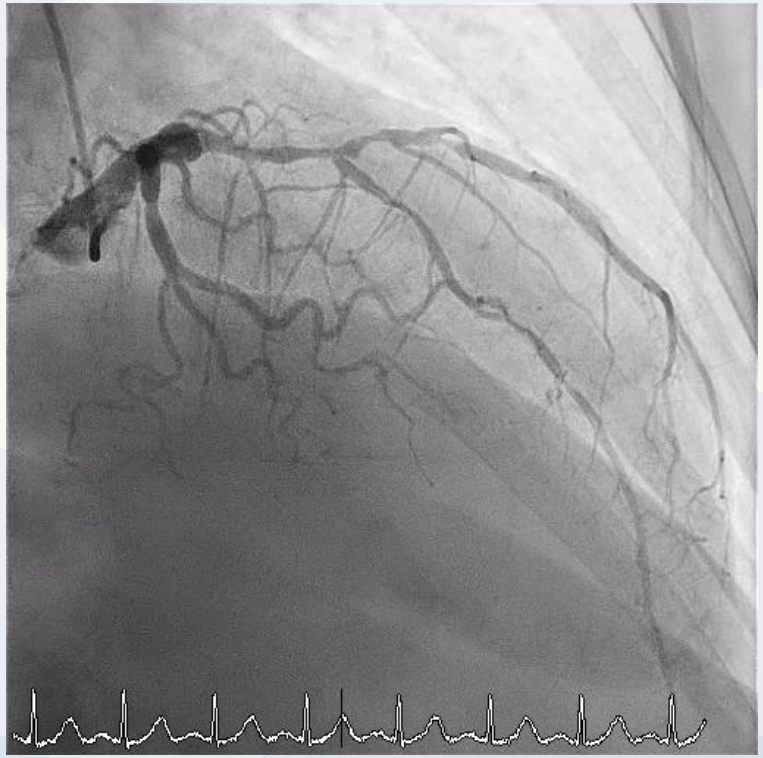
DCB	BAIL-OUT DES
SHORT DELIVERY TIME <2 minutes [9]	**FURTHER LESION PREPARATION**
LONG INFLATION TIME ≥60 seconds [134,135] Exp	

Fezzi S, et al. JACC. 2025;86(15):1170-1202.

¿Qué hago?



- Predilatar 1:1 con balón NC/scoring/cutting ambas ramas
- Imagen intracoronaria
- Balón farmacoactivo a diagonal (previo a stent)
- Stent farmacoactivo a DA
- POT
- Si compromiso ostium rama diagonal
  - “Kissing-balloon”
  - Re-POT
- Imagen intracoronaria



¡Gracias!

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Universidad Zaragoza 1542

CÓMO LO HICIMOS

- **2 STENTS**

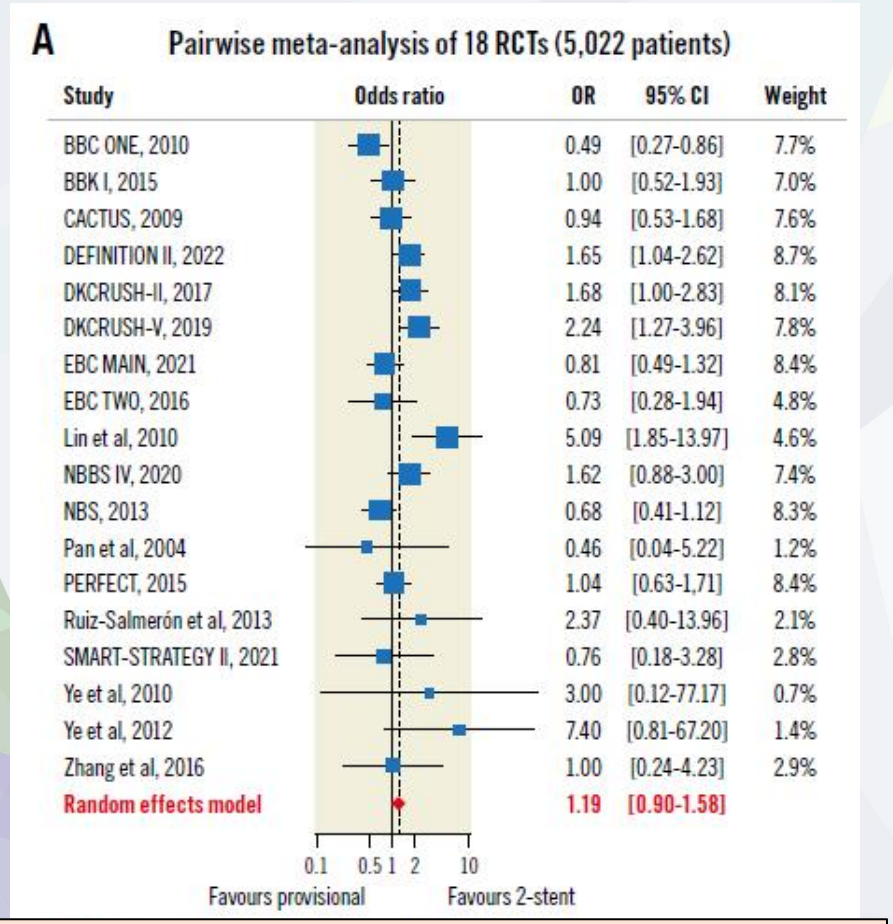
Provisional vs 2 stents

EBC: "STEPWISE" PROVISIONAL STENTING

- keep the procedure as simple as possible
- minimise the number of stents needed in a bifurcation lesion
  - only 1 Branch stenotic (Medina X,X,0)
  - low difficulty SB bail-out management

Recommendations	Class[a]	Level[b]
Stent implantation in the main vessel only, followed by provisional balloon angioplasty with or without stenting of the side branch, is recommended for PCI of bifurcation lesions.[654–658]	I	A

Provisional vs 2 stents



2 stents vs provisional: NO ↓ TLF/MACE

BIFURCACIONES "TRUE"
(Medina X,X,1)
&
BIFURCACIONES COMPLEJAS
CRITERIOS DEFINITION

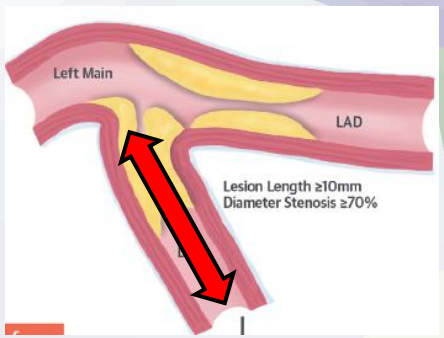


TABLE 3 Independent Factors of Major Adverse Cardiac Events at 1 Year After Stenting by Regression Analysis of 1,500

	p Value	HR (95% CI)
Major 1: Distal LM bifurcation: SB-DS ≥70% and SB lesion length ≥10 mm	<0.001	55.2 (1.005-79.437)
Major 2: Non-LM bifurcation: SB-DS ≥90% and SB lesion length ≥10 mm	<0.001	66.3 (2.708-98.184)
Minor 1: Moderate to severe calcification	0.002	38.7 (24.516-72.695)
Minor 2: Multiple lesions	0.007	26.8 (4.322-57.004)
Minor 3: Bifurcation angle <45°	0.004	14.1 (9.245-18.018)
Minor 4: Main vessel RVD <2.5 mm	0.010	9.4 (7.556-14.814)
Minor 5: Thrombus-containing lesions	0.002	27.2 (4.662-78.301)
Minor 6: MV lesion length ≥25 mm	0.010	6.9 (3.879-12.398)

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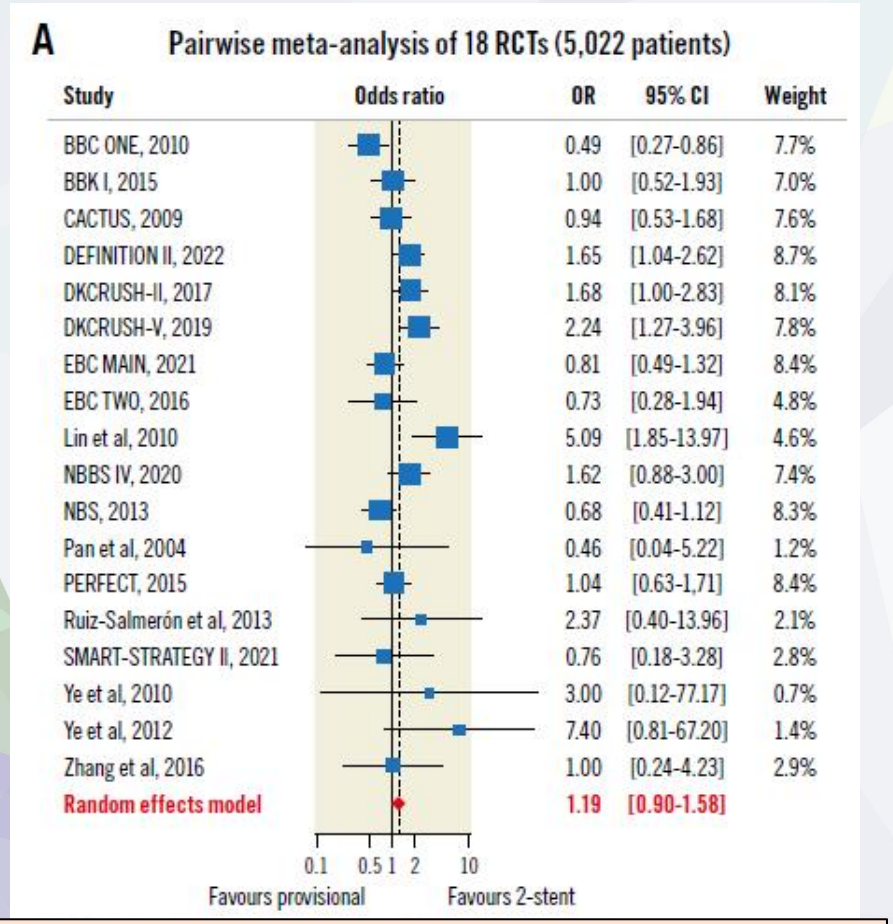
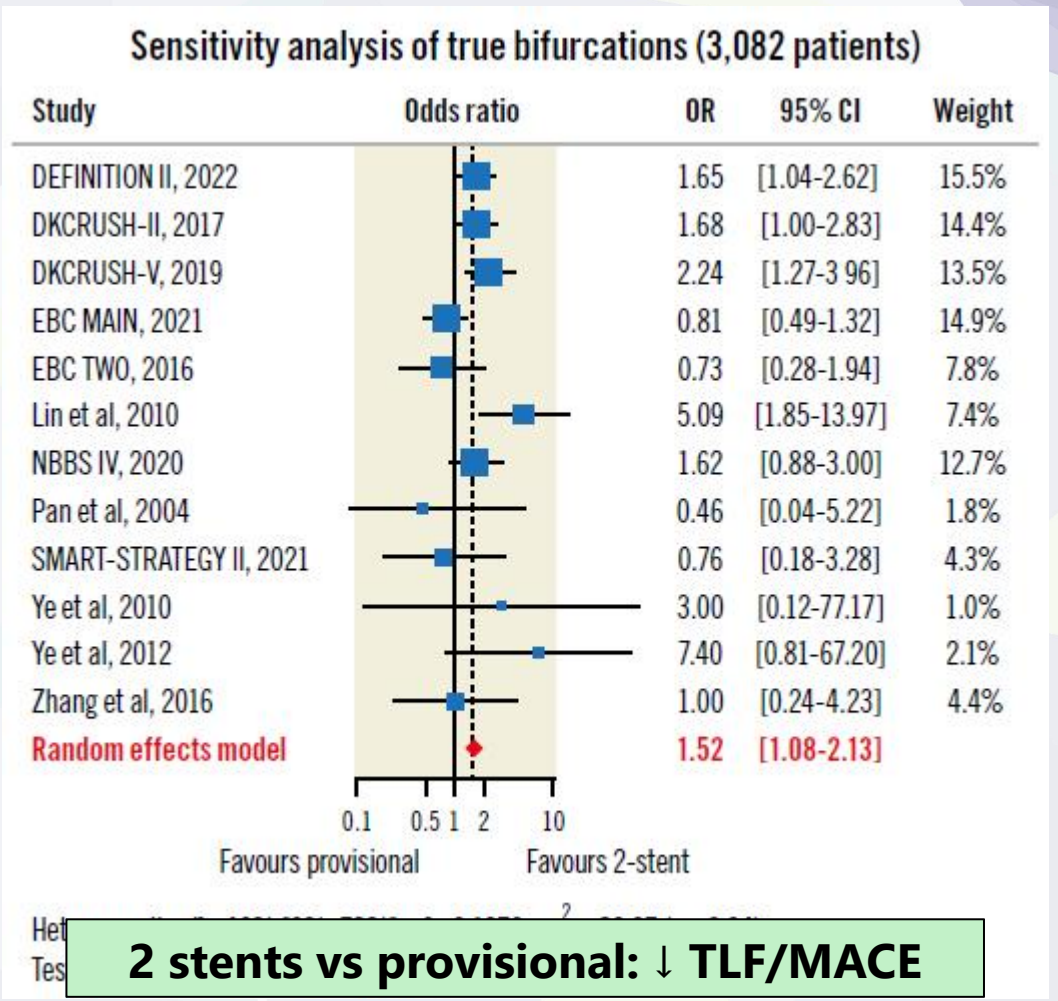
Provisional vs 2 stents



2 stents vs provisional: NO ↓ TLF/MACE



2 stents vs provisional: ↓ TLF/MACE

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CÓMO LO HICIMOS

- 2 STENTS
- **ICP COMPLEJA: esperemos a mejorar FEVI**

CÓMO LO HICIMOS

- 2 STENTS
- ICP COMPLEJA: esperemos a mejorar FEVI
- **FEMORAL 7F**

CÓMO LO HICIMOS

- 2 STENTS
- ICP COMPLEJA: esperemos a mejorar FEVI
- FEMORAL 7F
- **IMAGEN INTRACORONARIA: mandatoria**

Imagen intracoronaria

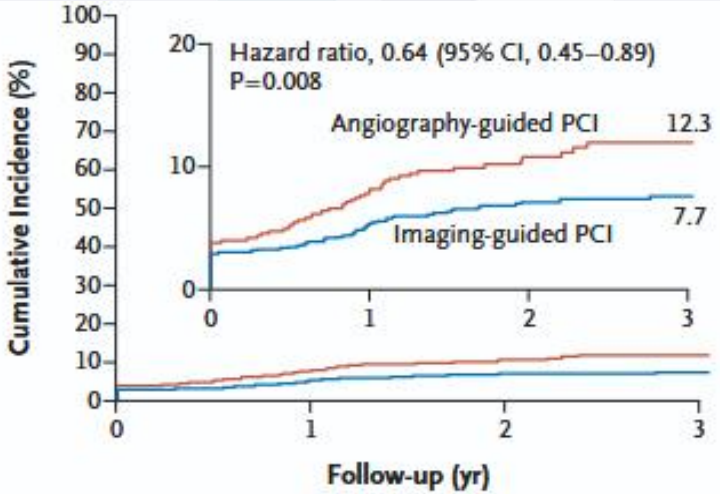
Intracoronary imaging guidance by IVUS or OCT is recommended when performing PCI on anatomically complex lesions, in particular left main stem, true bifurcations, and long lesions.[866,337,810,840,841]

I | A

The NEW ENGLAND JOURNAL of MEDICINE

ORIGINAL ARTICLE

Intravascular Imaging–Guided or Angiography-Guided Complex PCI



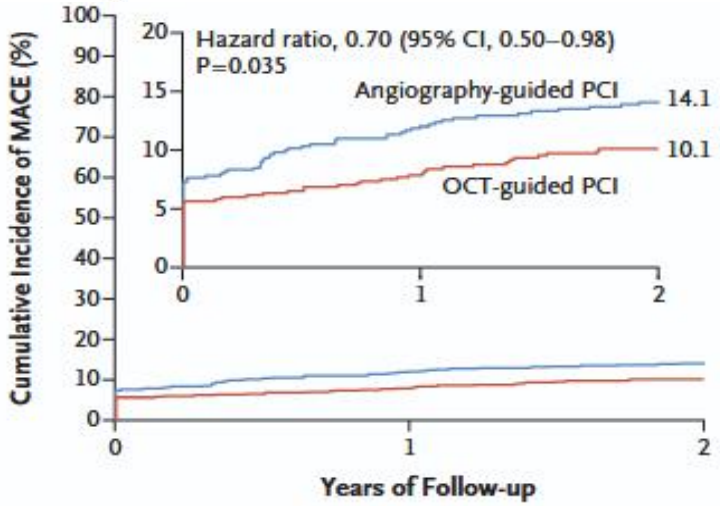
No. at Risk				
Angiography-guided PCI	547	496	280	120
Imaging-guided PCI	1092	1023	591	255

Lee JM. NEJM 2023

The NEW ENGLAND JOURNAL of MEDICINE

ORIGINAL ARTICLE

OCT or Angiography Guidance for PCI in Complex Bifurcation Lesions



No. at Risk			
Angiography-guided PCI	601	509	408
OCT-guided PCI	600	537	439

Holm NR. NEJM 2023

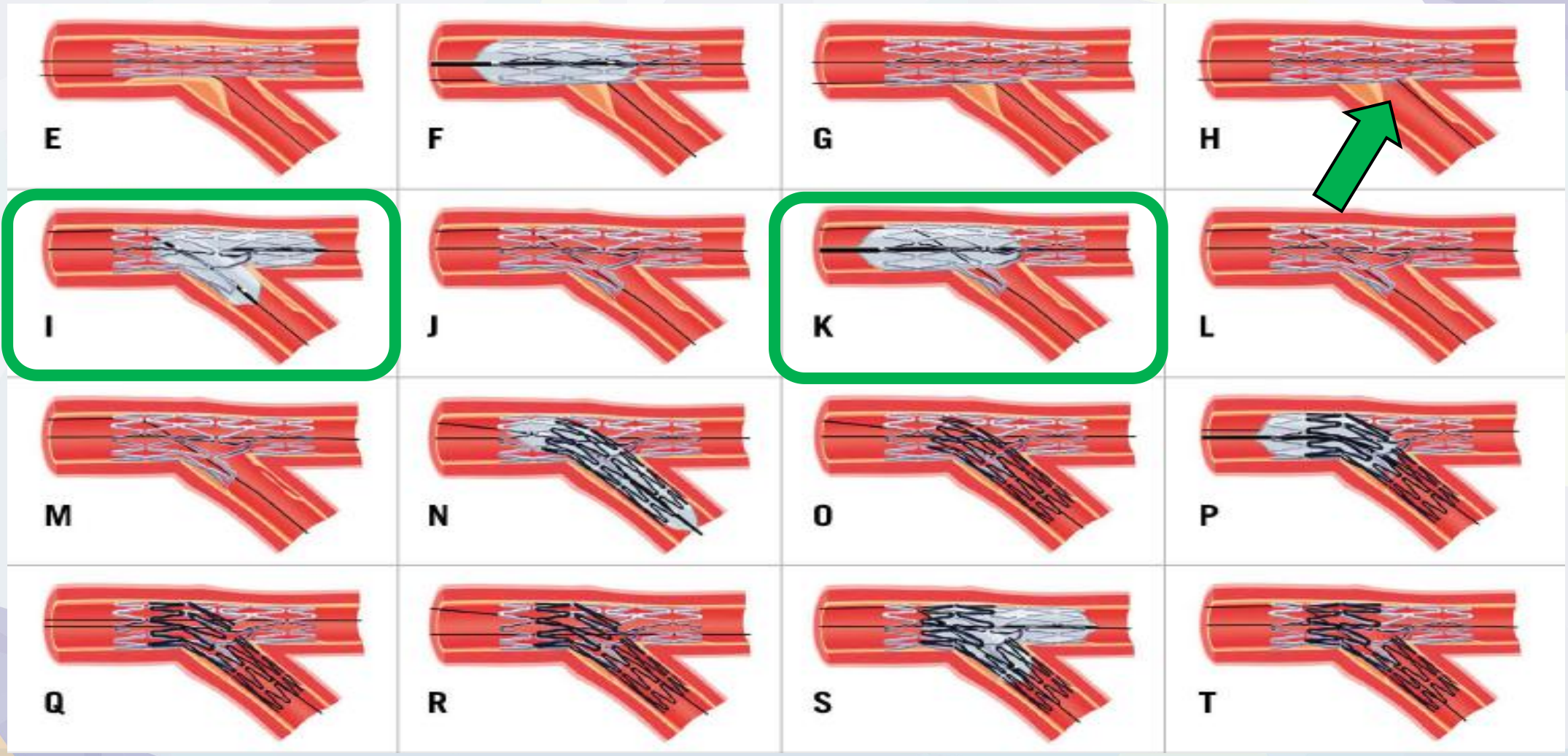
CÓMO LO HICIMOS

- 2 STENTS
- ICP COMPLEJA: esperemos a mejorar FEVI
- FEMORAL 7F
- IMAGEN INTRACORONARIA: mandatoria
- **DK-CULOTTE reverso**

CÓMO LO HICIMOS

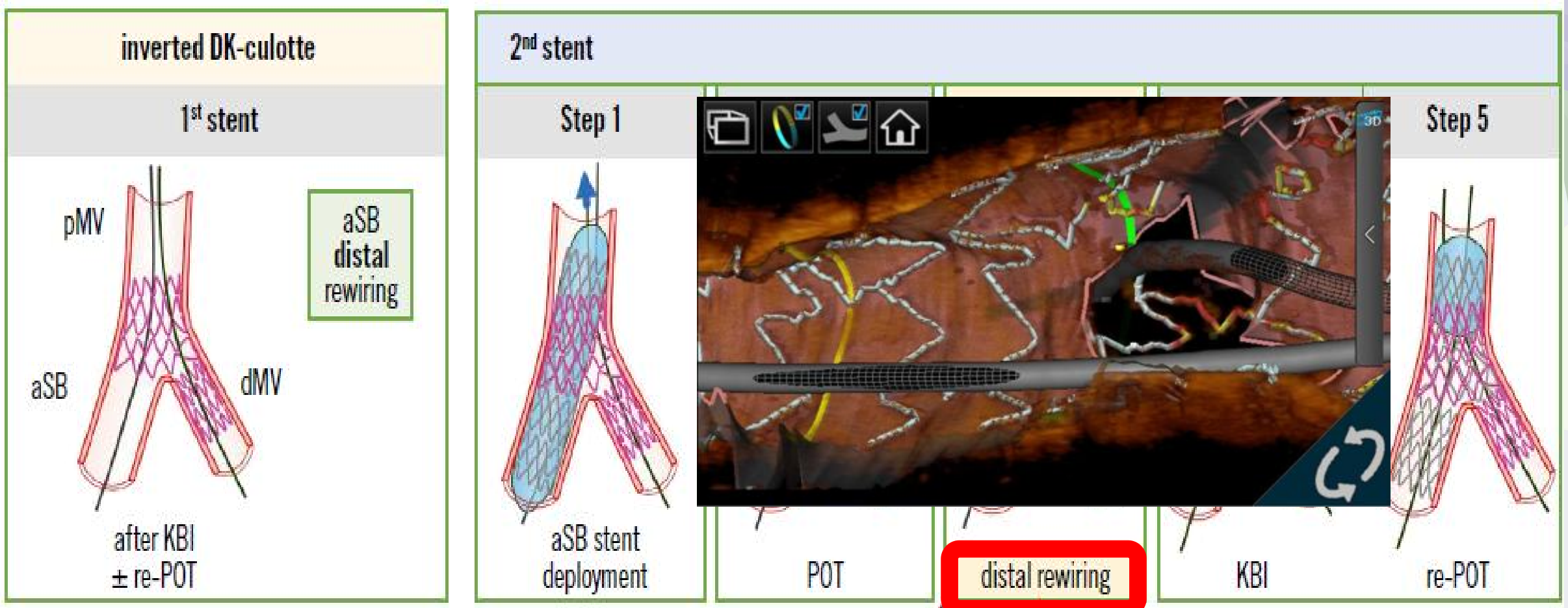
- 2 STENTS
- ICP COMPLEJA: esperemos a mejorar FEVI
- FEMORAL 7F
- IMAGEN INTRACORONARIA: mandatoria
- **DK-CULOTTE reverso**
  - Adecuada cobertura bifurcación: neo-carina metálica mínima
  - Evita 3 capas de metal en bifurcación
  - De elección
    - SB difícil visualización / acceso (reverse)
    - Angulaciones extremas
  - Menor exigencia técnica DK-crush

DK-CULOTTE: en qué consiste



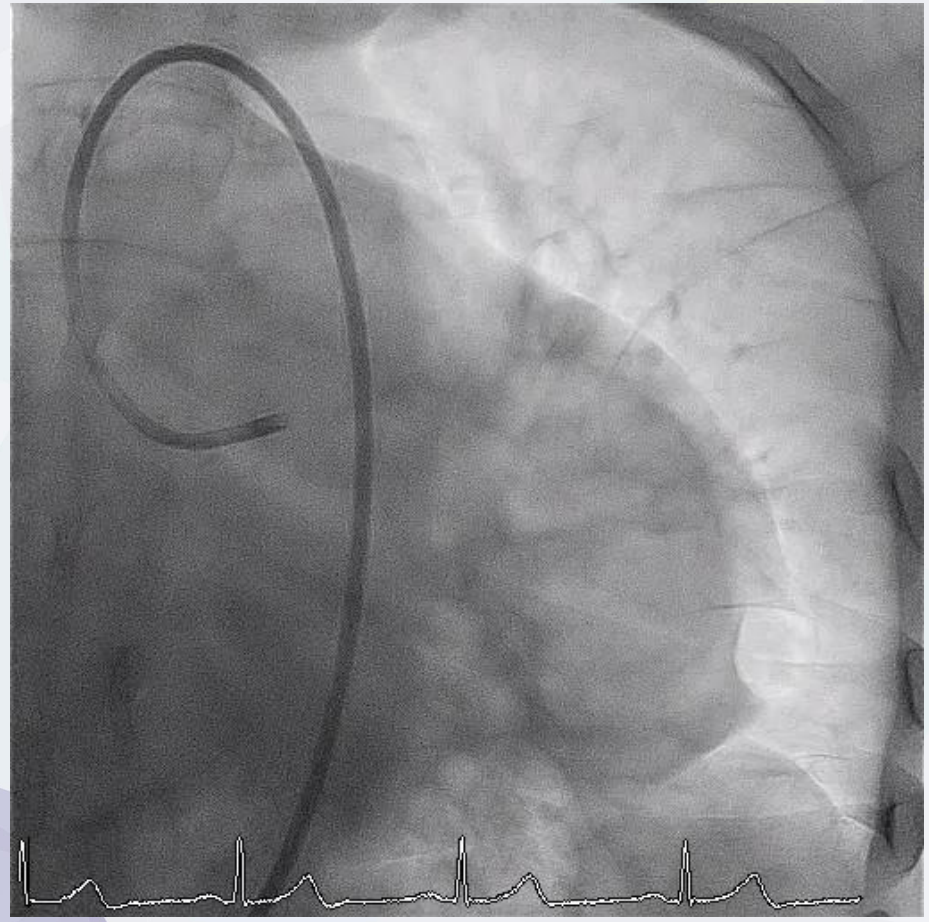
Hildick-Smith D. Eurointervention 2022

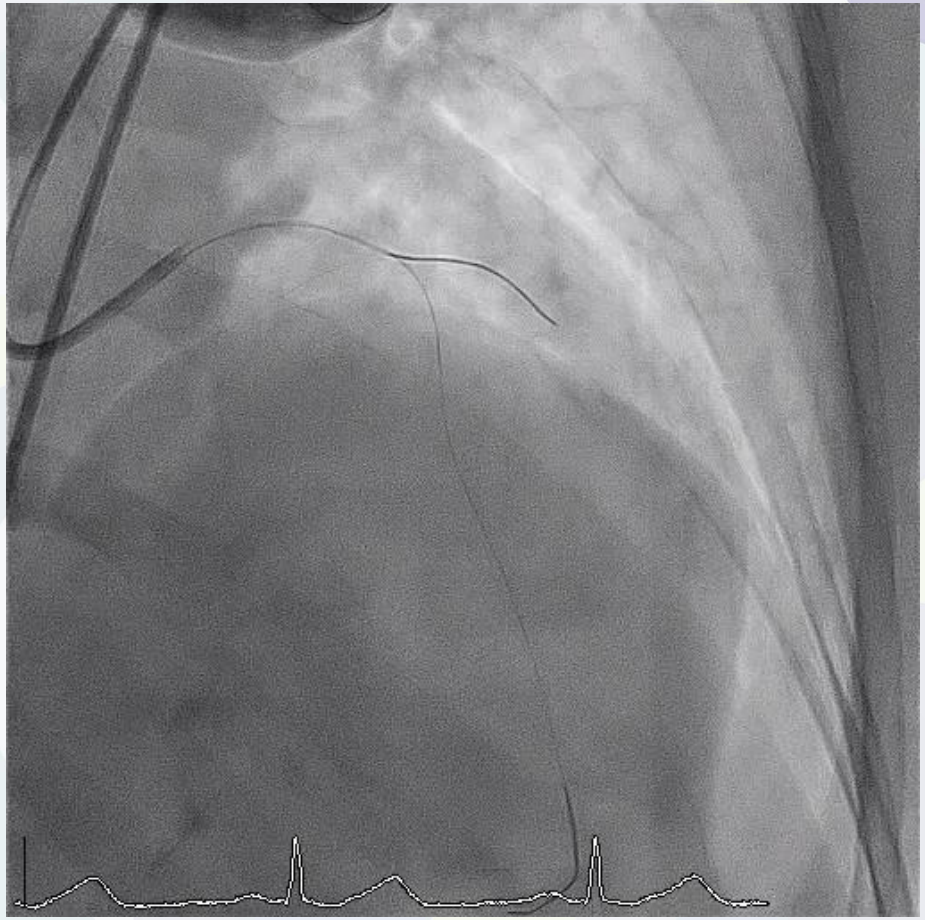
DK-CULOTTE upfront 2 stents (reverse)



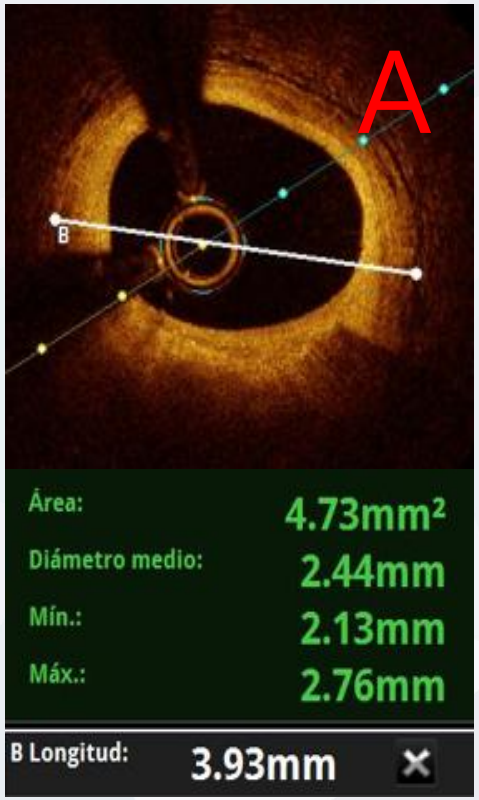
Lassen FJ. Eurointervention 2022

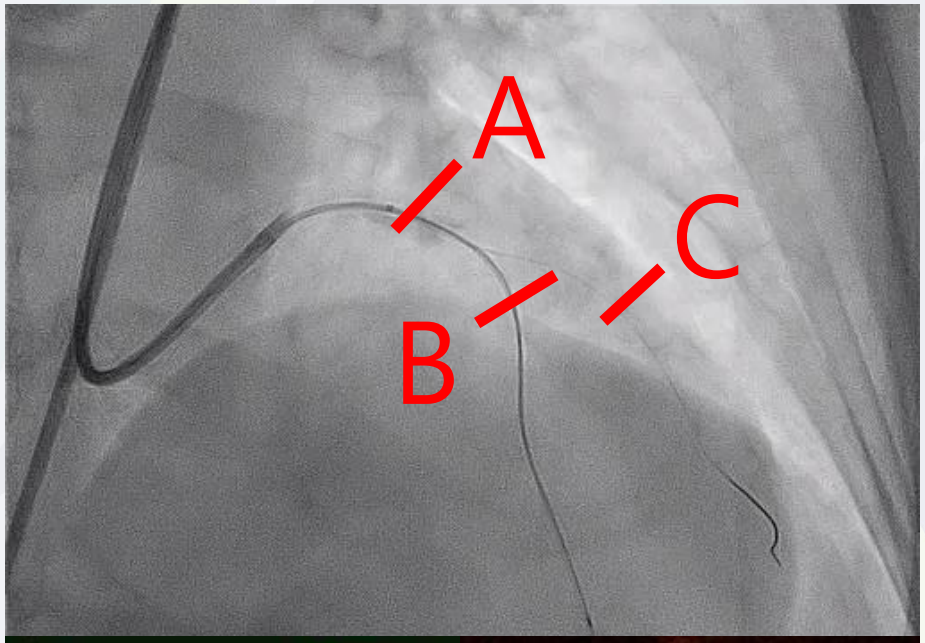
Wiring: lesión DA suboclusiva

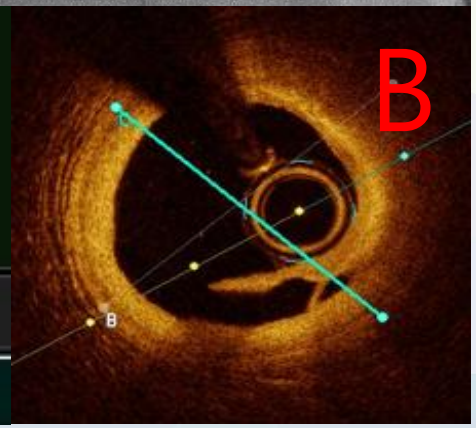


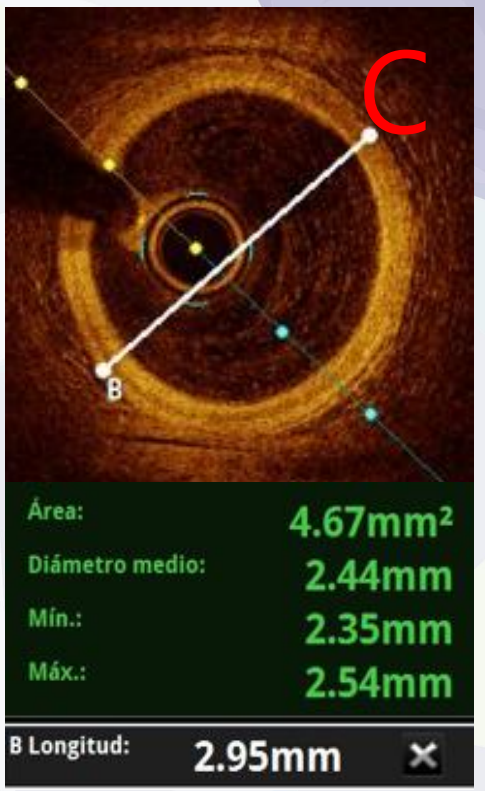


OCT DA y diagonal

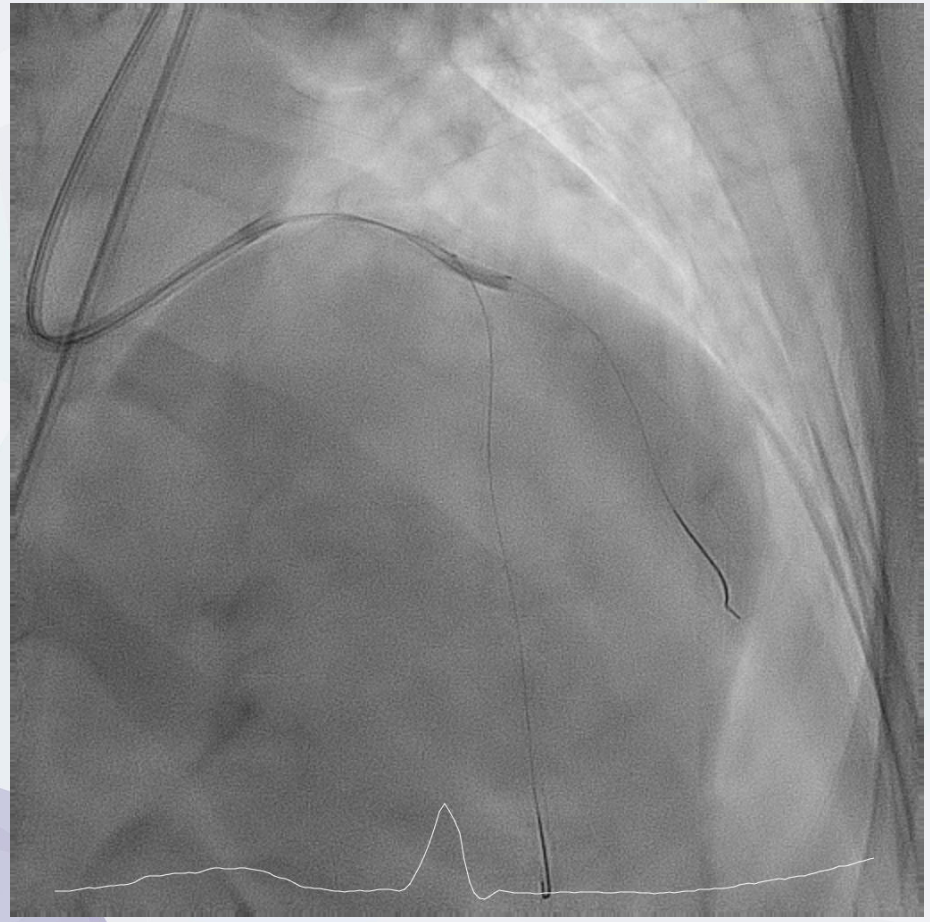


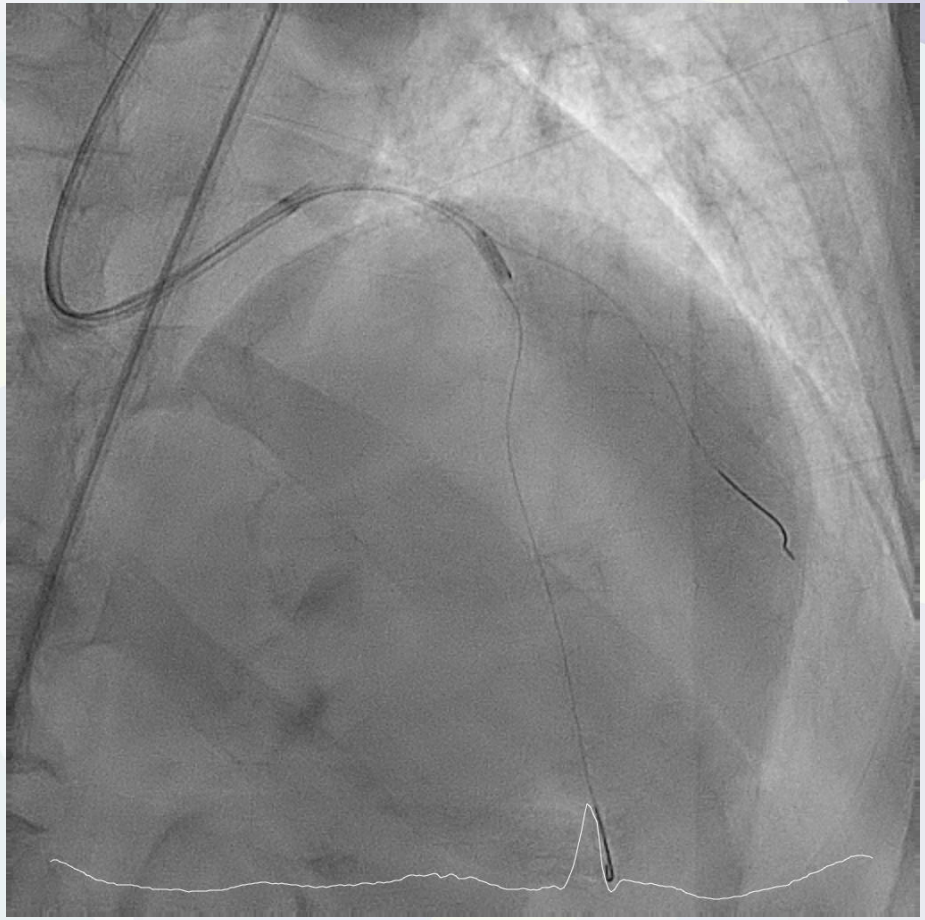




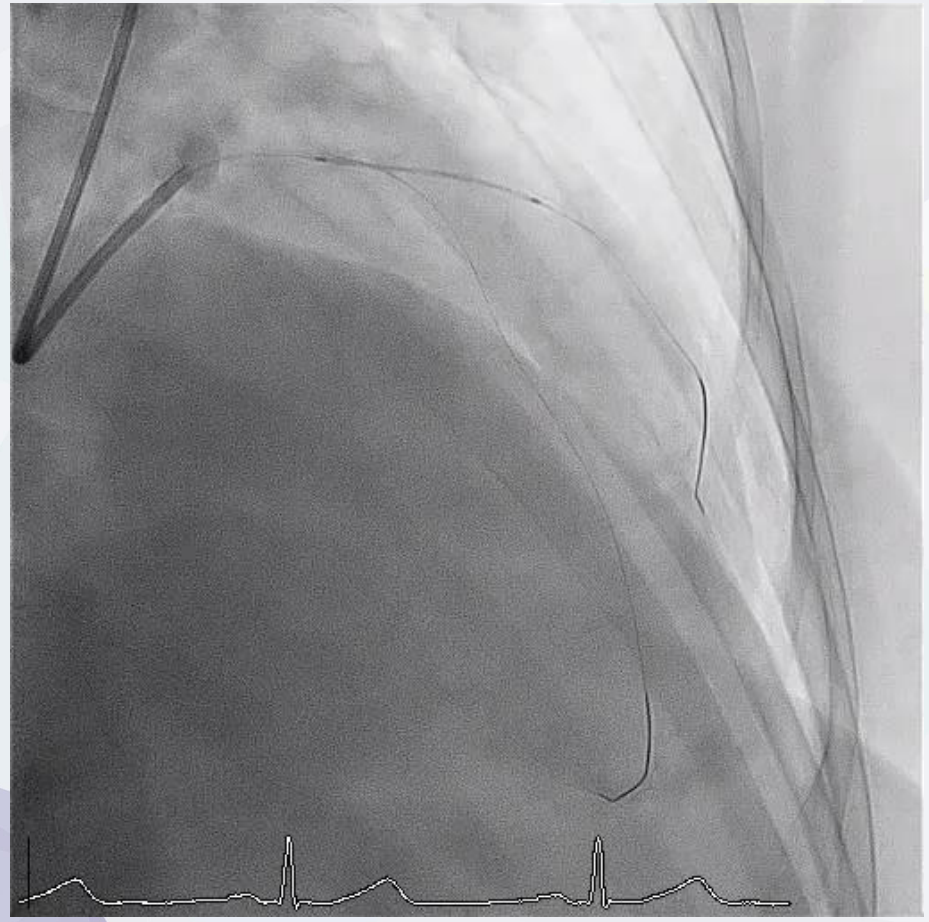


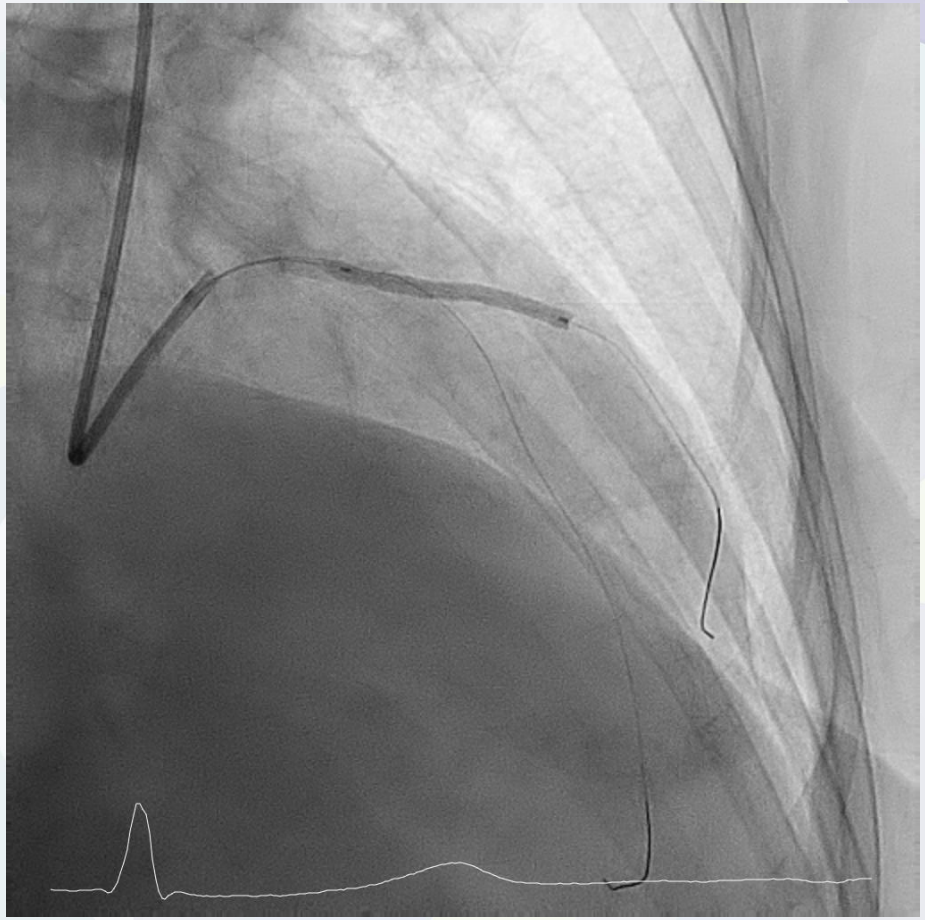
Scoring NC 2.5x12mm ambos ostium



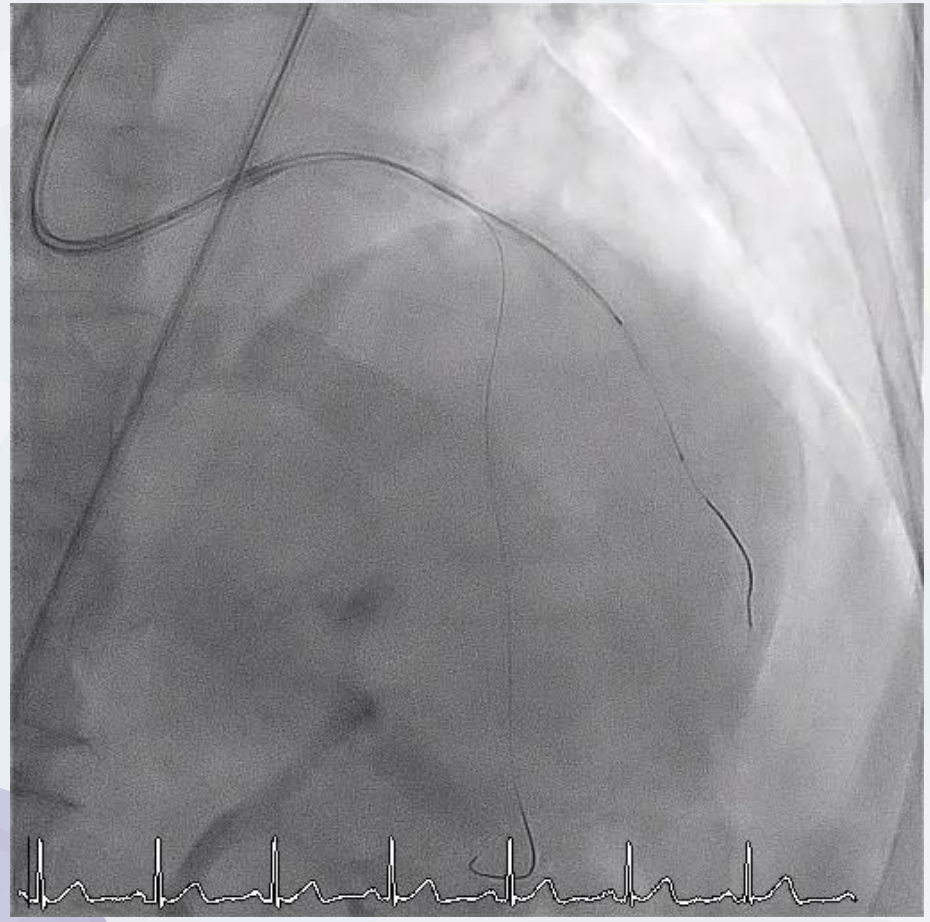


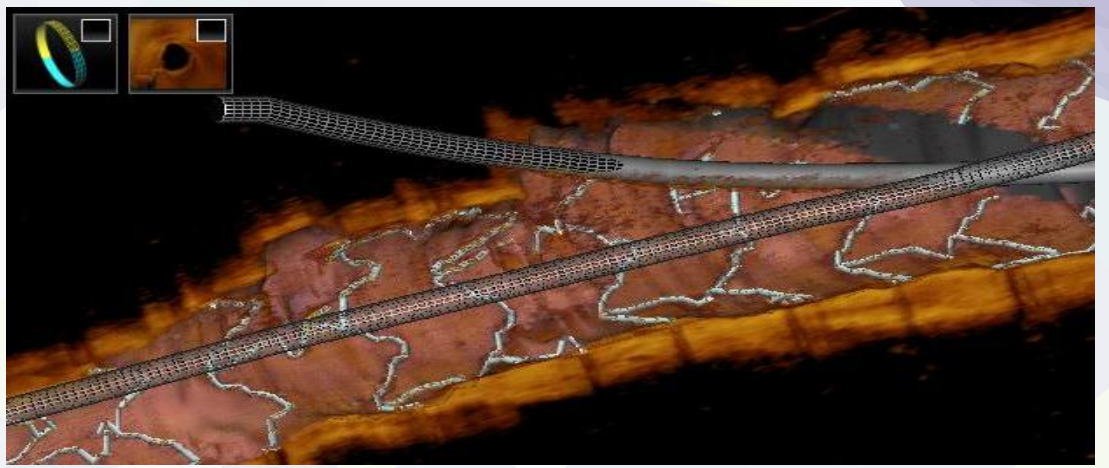
DES 3x33mm DA-diagonal

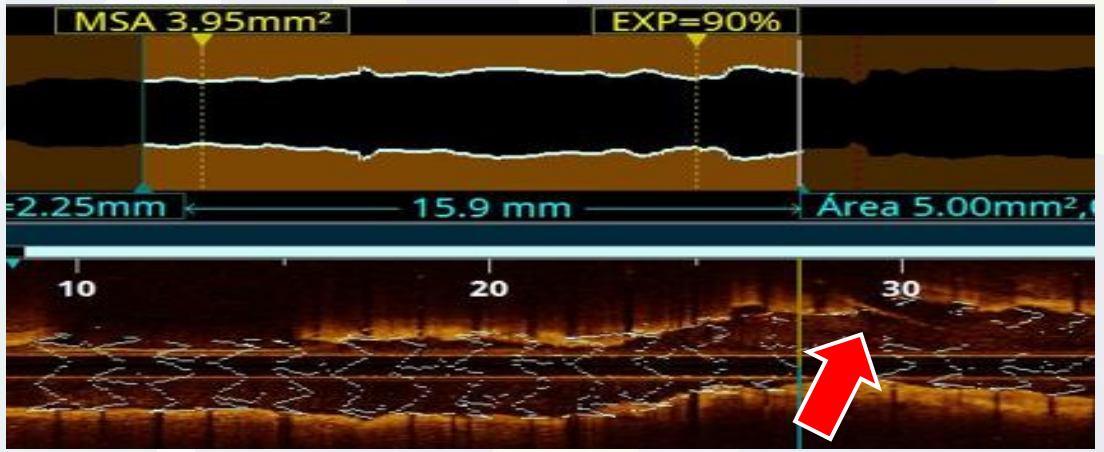




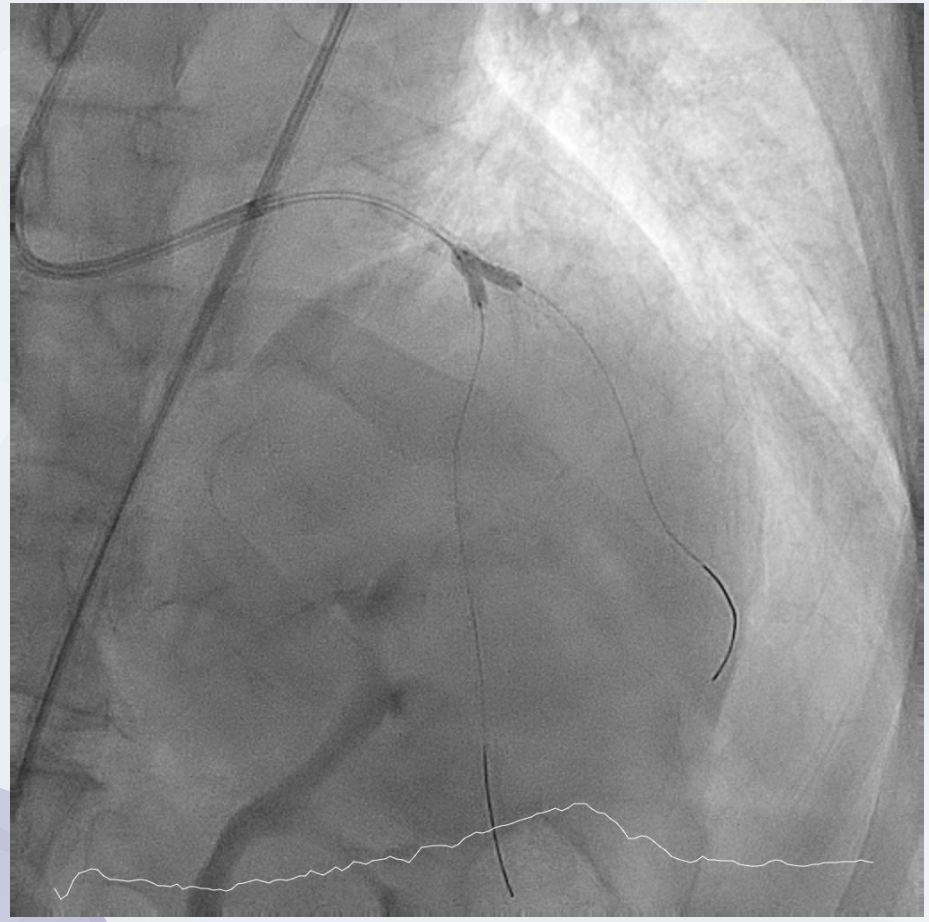
OCT: resultado Diag + recruce distal

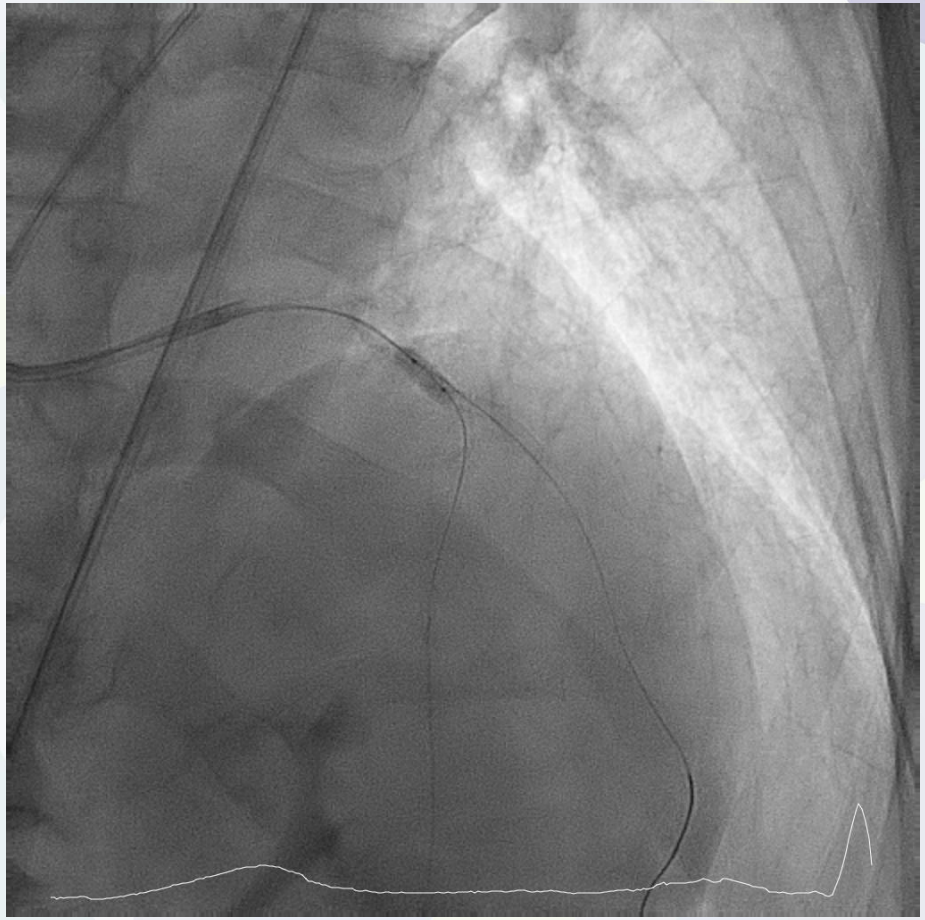




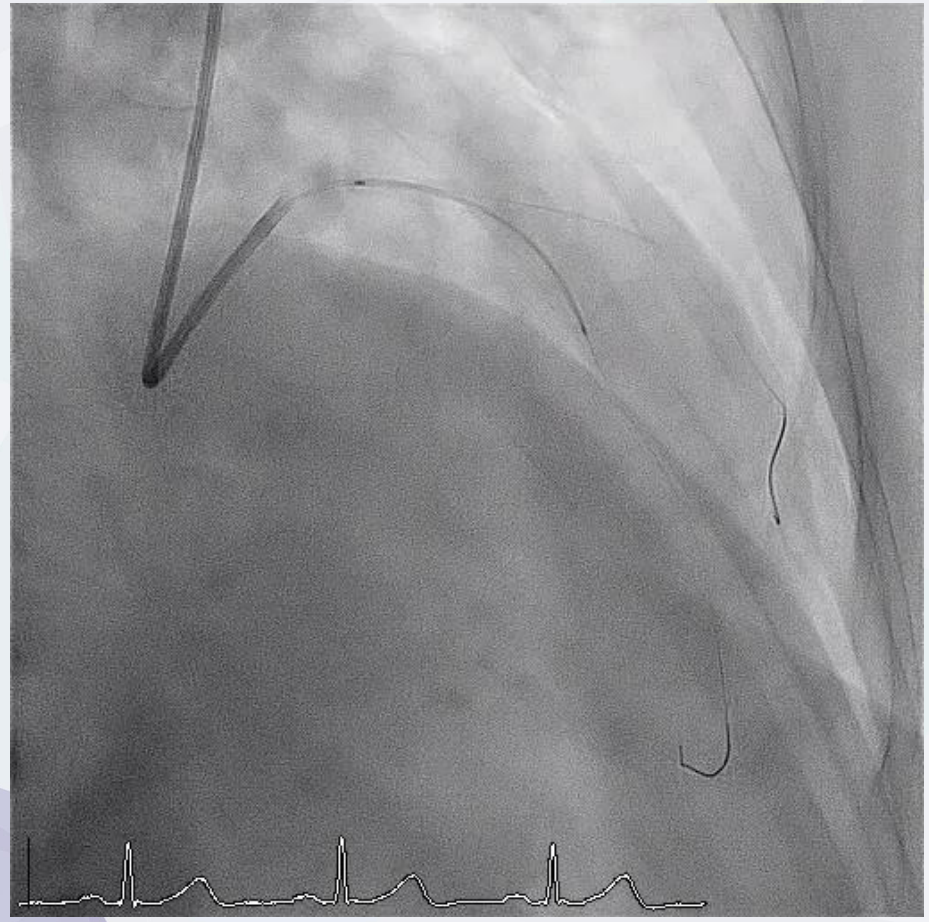


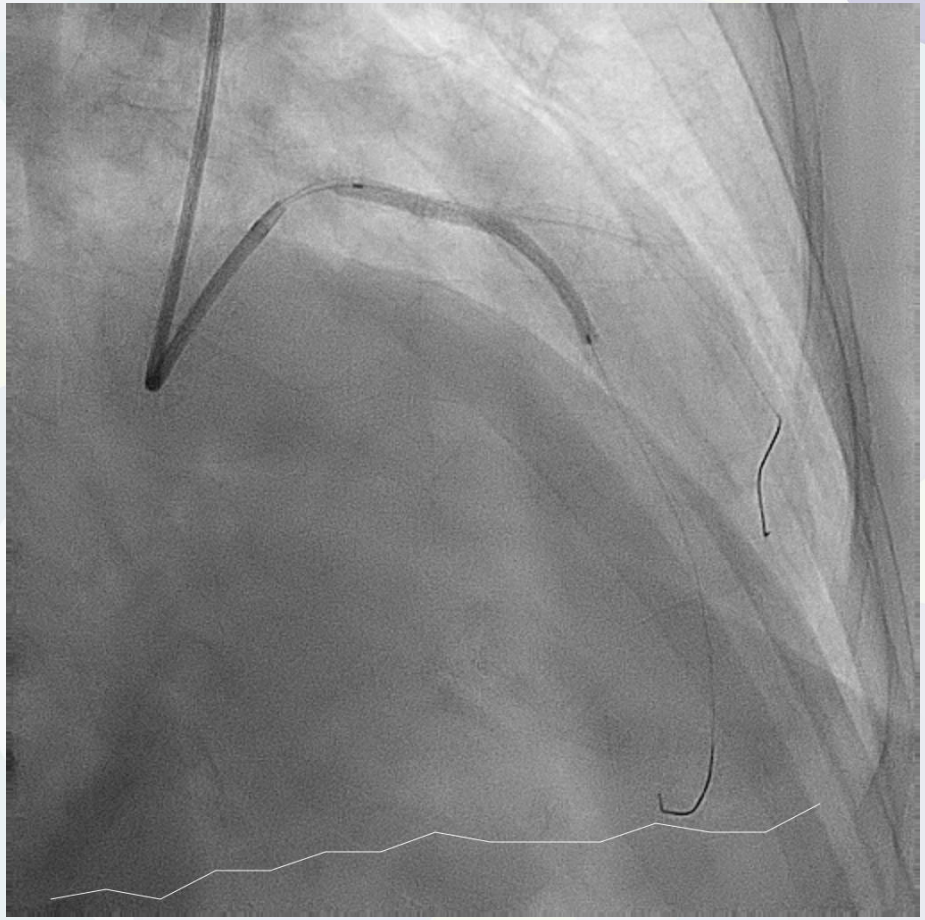
1er Kissing NC 2.75x12 mm+ POT 3.5mm



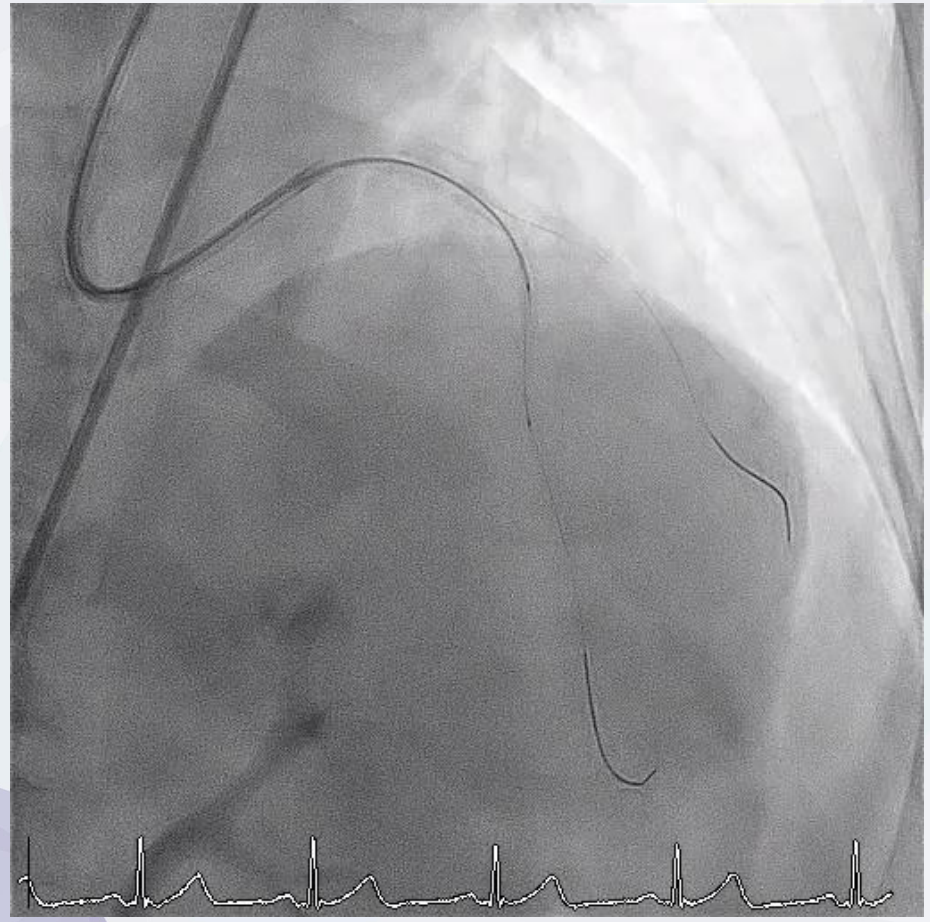


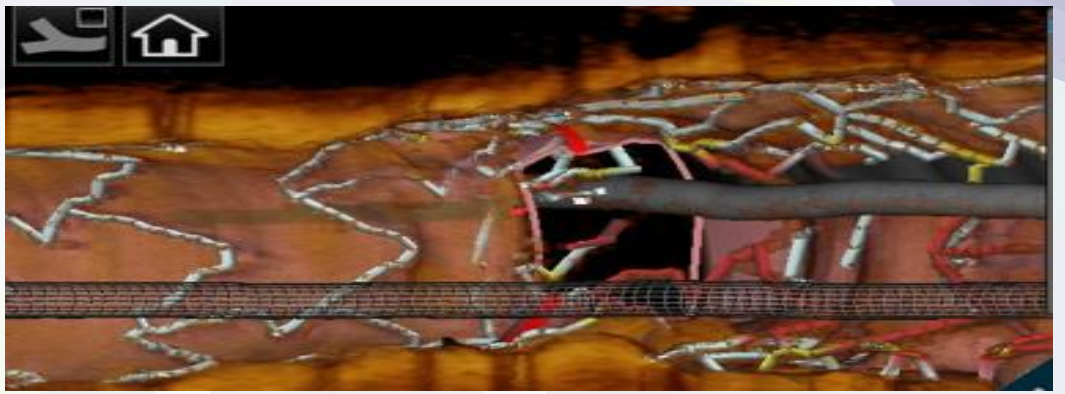
DES 3x48mm DA prox-media

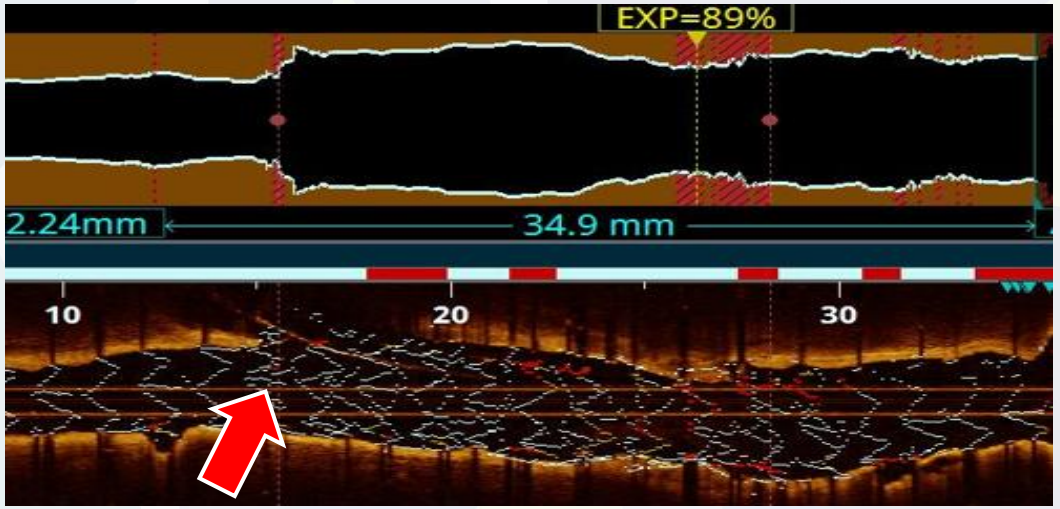




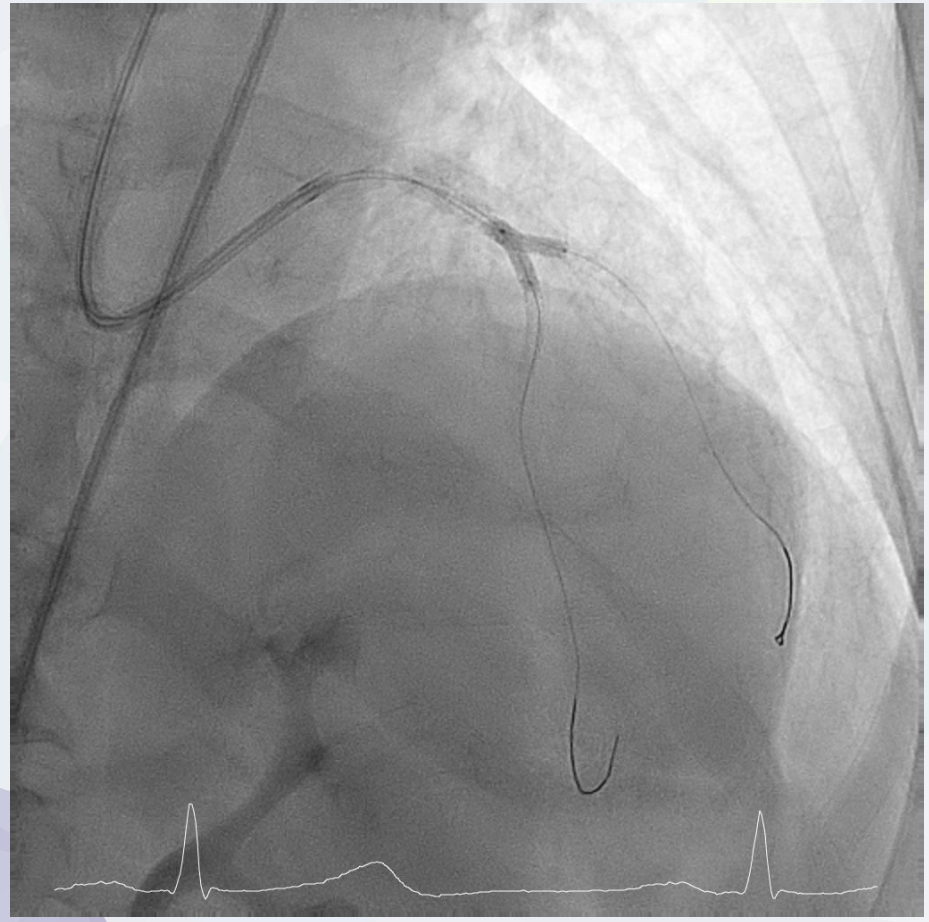
OCT: resultado DA + recruce distal



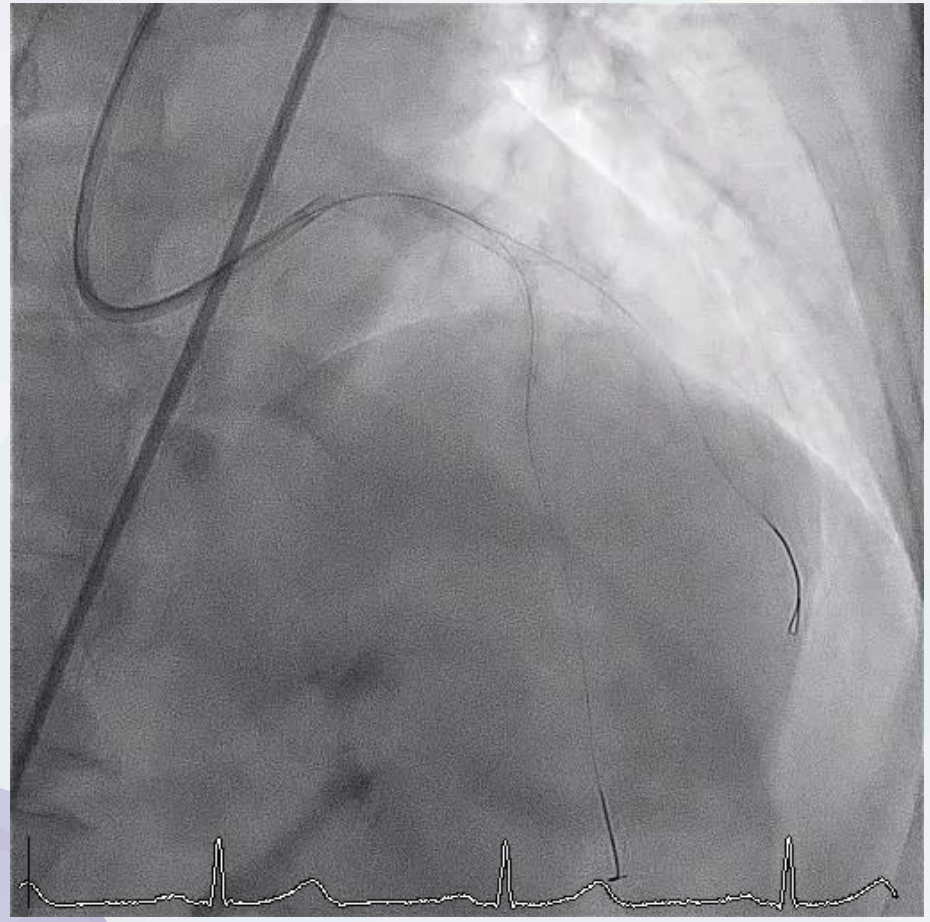


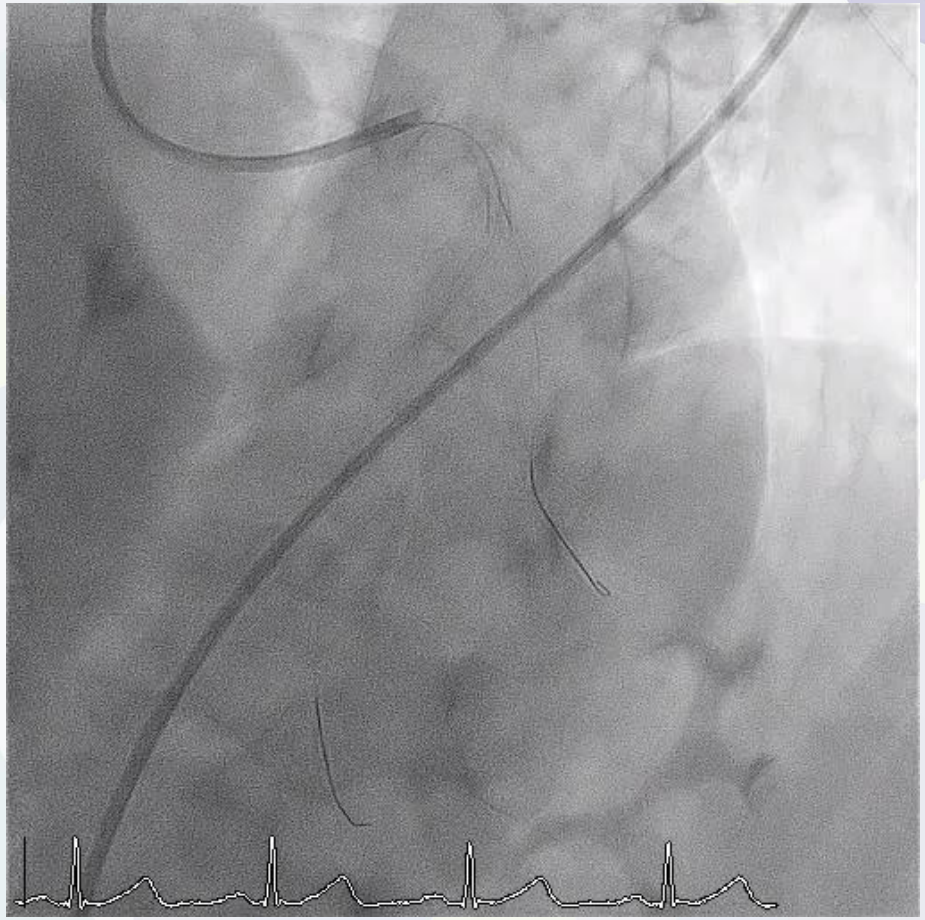


2º Kissing 2.75x12 + POT NC 4x15mm

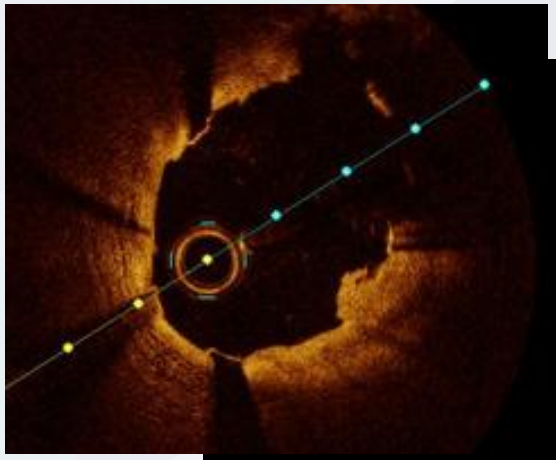


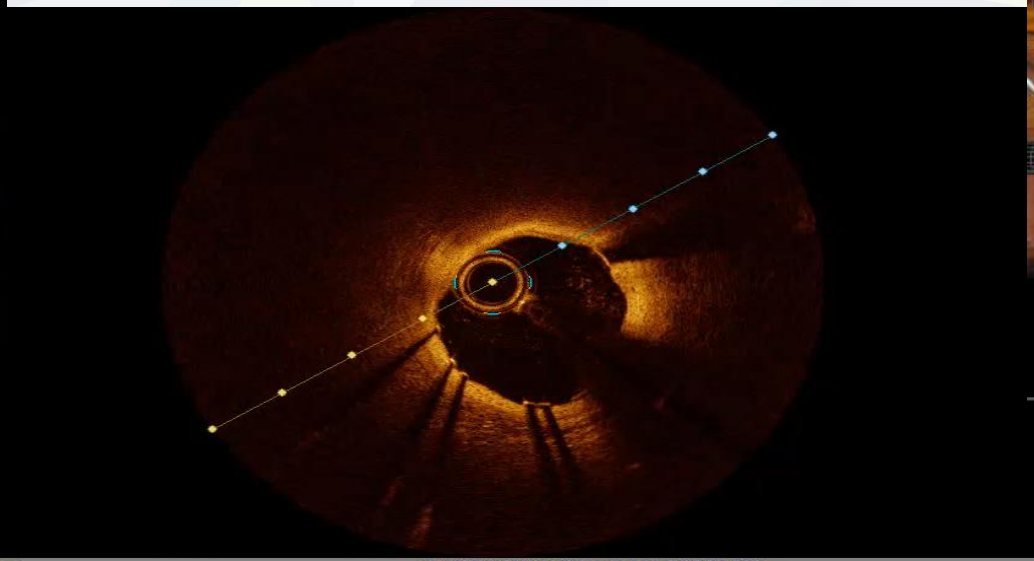
Angiografía final

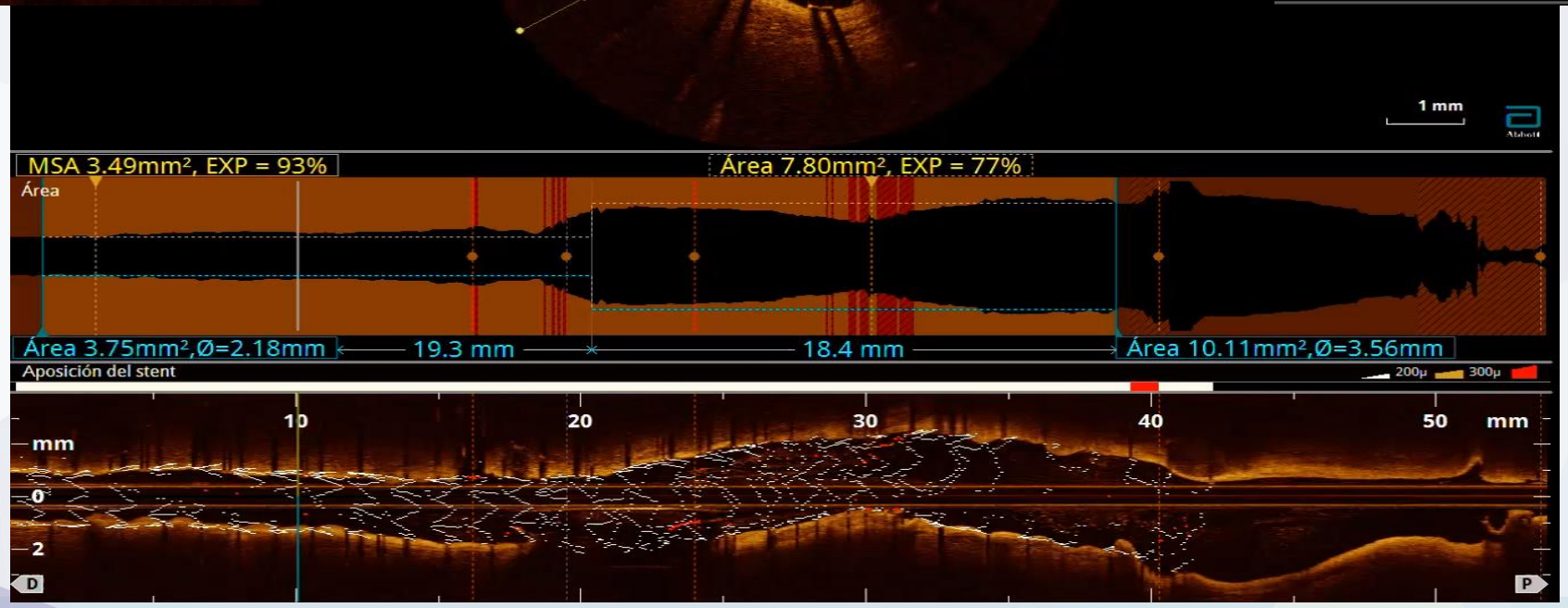




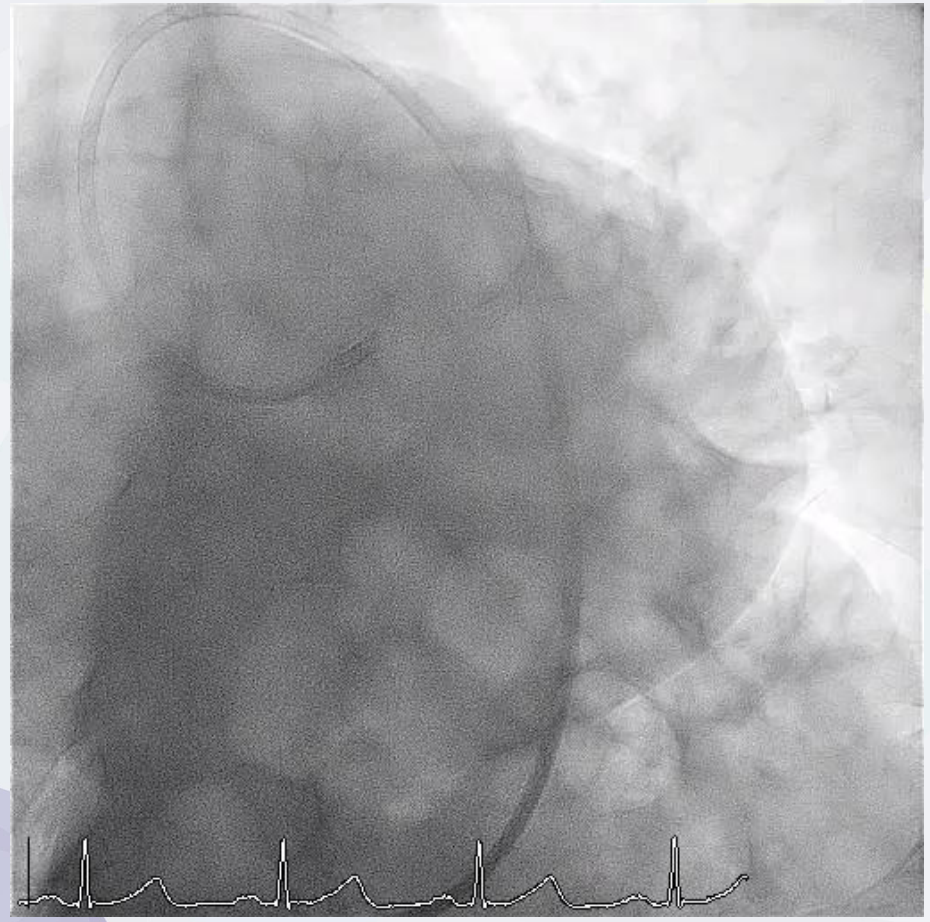
OCT final

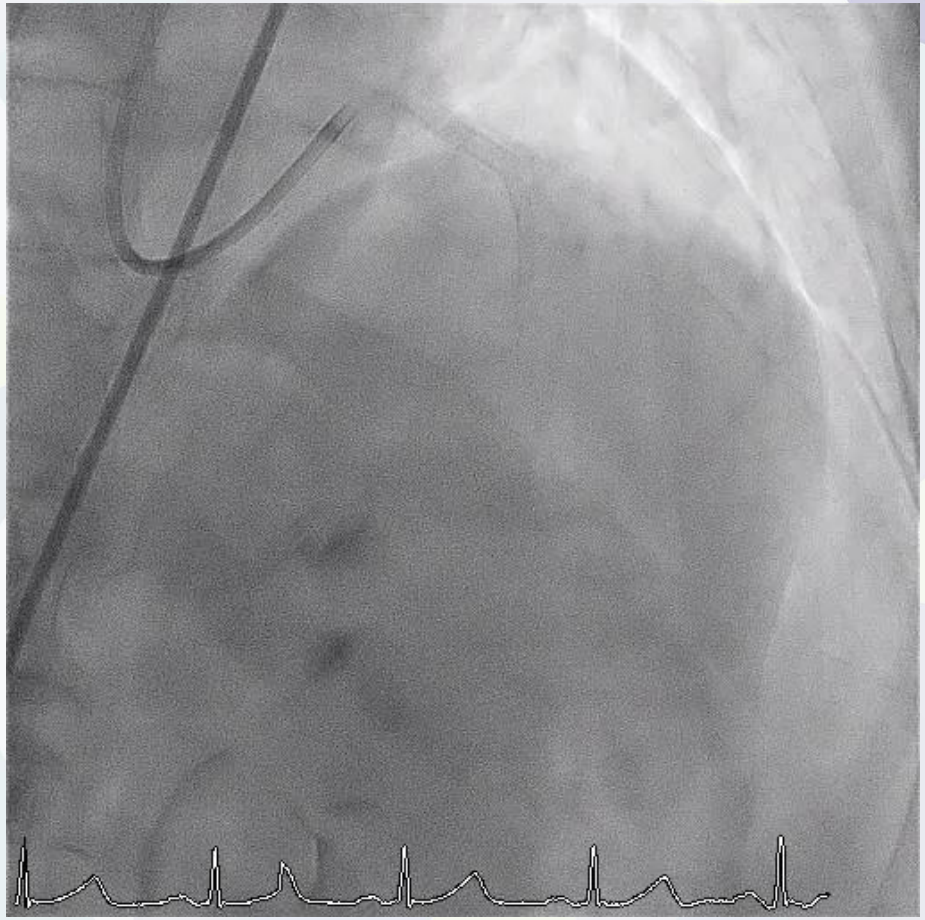





1 mm
MSA 3.49mm², EXP = 93%
Área 7.80mm², EXP = 77%
Área
Área 3.75mm²,Ø=2.18mm
19.3 mm
18.4 mm
Área 10.11mm²,Ø=3.56mm
Aposición del stent
200µ
300µ
10
20
30
40
50
mm
mm
0
2
D
P

Angiografía final

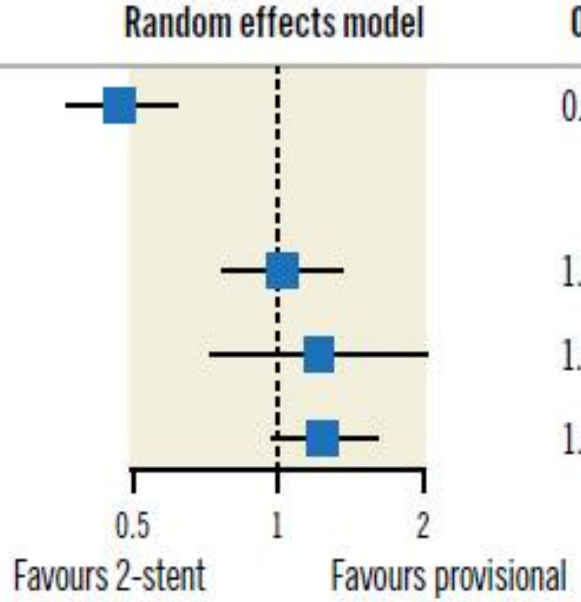


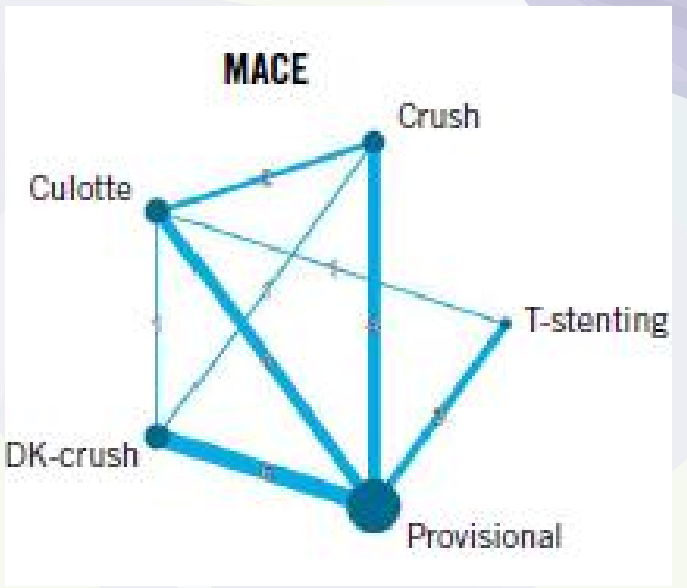


Discusión DK culotte vs DK crush

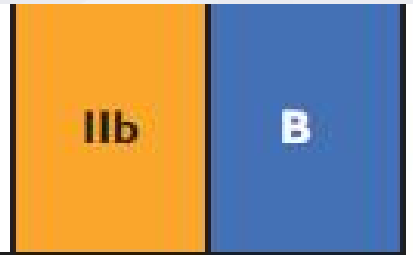
D Network meta-analysis of 22 RCTs (6,726 patients)

Technique	Random effects model	OR	95% CI	*p*-value	*p*-score
DK-crush		0.47	[0.36-0.62]	<0.01	1.00
Provisional		Reference		NA	0.57
Culotte		1.03	[0.77-1.36]	0.86	0.51
T-stenting		1.22	[0.73-2.03]	0.45	0.26
Crush		1.24	[0.97-1.60]	0.09	0.16





In true bifurcation lesions of the left main, the double-kissing crush technique may be preferred over provisional T-stenting.[620]



Bujak K. Eurointervention 2023

Discusión DK culotte vs DK crush

Table 1. DK-crush – pitfalls and troubleshooting.

	Procedural steps	Pitfalls	Troubleshooting	Prevention
1	1st SB/aSB stent implantation	– Difficult passage of the stent into the SB/aSB	– Additional balloon dilation using NC balloons inflated at high pressure – Atherectomy in very calcified vessels	– Adequate lesion preparation in stage B (see part I[5])
2	SB/aSB ostium optimisation	– Not reported so far		
3	Balloon crush	– Difficult passage of the MV balloon that was erroneously positioned proximal to the bifurcation	– Use an ultra-low profile balloon (diameter ≤1.5 mm) to cross and start crushing then retry the passage of the appropriately sized MV balloon to complete stent crush	– MV balloon positioned distal to the bifurcation prior to SB/aSB stent deployment
		– Discover a dissection in the SB/aSB after balloon crush		– Angiographic control of the SB/aSB before crushing
4	1st POT	– Incomplete crush (Figure 5, Step 3)	– Repeat POT with optimal balloon positioning and sizing according to pMV reference diameter	– Adequate POT (1st and 2nd POT when required) with a balloon sized according to pMV reference diameter
5	1st SB/aSB rewiring	– Distal abluminal rewiring, at the level of the carina (Figure 5, Panel A) that may lead to proximal SB/aSB stent crush after KBI (Figure 5, Panel B), leaving an uncorrectable significant gap at the distal margin of the SB/aSB ostium (Figure 5, Panel C, arrowhead)	– Rewiring the SB/aSB through a proximal or "non-distal" stent cell (Figure 5, Step 5) before the 1st KBI (Figure 5, Step 6)	– SB/aSB ostial optimisation (Step 2) with high pressure balloon inflation before the SB/aSB stent is crushed may facilitate subsequent (intraluminal, proximal/non distal) rewiring
		– Difficult SB/aSB rewiring	– Wire tip reshaped with a secondary curve – Exchange for polymer-coated wires or speciality wires with increased torqueability and/or stiffness – Use of dual lumen, angulated or steerable microcatheters (for angulated SB/aSB) – The "hairpin" or reverse wiring technique	
6	1st KBI	– Difficult SB/aSB balloon crossing	– Change SB/aSB wire position	– Imaging guidance may confirm adequate wire position
7	2nd MV stenting	– Difficult passage of the MV stent	– Repeat POT with optimal balloon positioning and sizing according to the proximal MV reference	– Adequate POT (1st and 2nd POT when required) with a balloon sized according to pMV reference diameter
8	2nd re-POT	– Incomplete 2nd re-POT		
9	2nd SB/aSB rewiring	– Abluminal pMV stent rewiring (Figure 6, Panel A)	– Refer to the main text for a detailed description of this troubleshooting	– Intravascular imaging can identify this pitfall (see part I)
10	2nd KBI	– Difficult SB/aSB balloon passage	– Use an ultra-low profile balloon to cross (diameter ≤1.5 mm) – Dilating the stent struts at the SB/aSB ostium with a microcatheter – Increase the support of the guide catheter (coaxial alignment, deep engagement, use of guide catheter extensions) – Exchanging the SB/aSB wire for an extra-support guidewire using a microcatheter – Exclude the "wire wrap" – Rewiring the SB/aSB through a different cell at the SB ostium level	
	Final re-POT	– SB/aSB stent crushed by non-simultaneous KB deflation during 2nd KBI or too distal final re-POT (Figure 6, Panel B)	– Repeat KBI with simultaneous deflation – Repeat final re-POT with the balloon positioned far from the carina	– KBI performed with simultaneous balloon deflation – Final re-POT with the balloon positioned far from the carina

DK-crush: double kissing crush; KBI: kissing balloon inflation; MV: main vessel; NC: non-compliant; pMV: proximal main vessel. POT: proximal optimisation technique; SB/aSB: side branch/assigned side branch; TAP: T and small protrusion

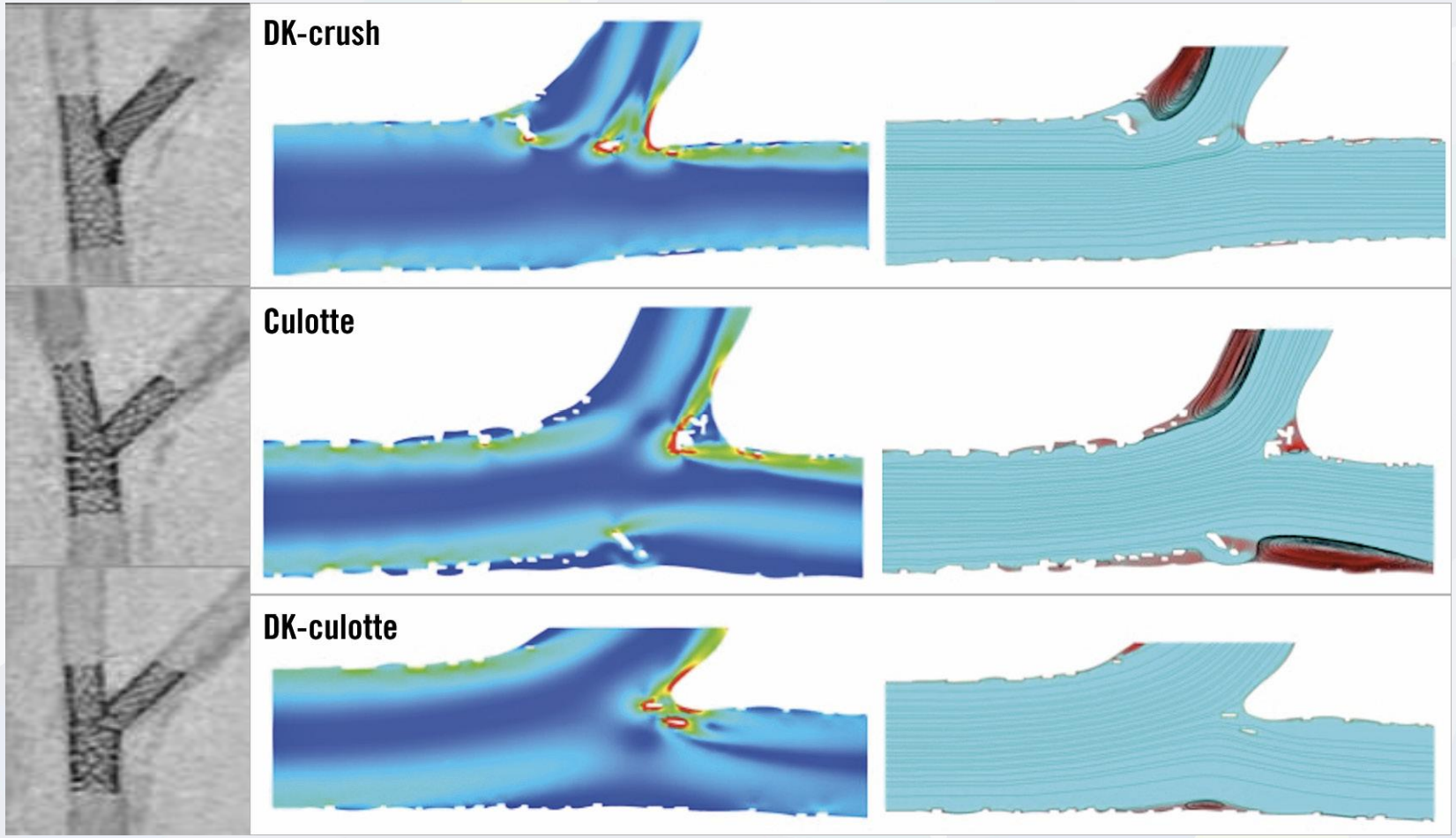
DK-CRUSH: many pitfalls..

Learning the DK crush technique, although not overly complicated, requires training, experience, and attention to procedural detail, including carefully rewiring the SB, sequential post-dilation with non-compliant balloons at high pressure before each kissing inflation, and final POT after KBI. The operators participating in the DKCRUSH-V trial were relatively high-volume proceduralists, were familiar with the DK crush technique, and had to submit roll-in cases demonstrating their technical competence with this approach. The results of the present trial may not be replicated by less experienced operators.

Lassen FJ. Eurointervention 2022

Chen SL JACC 2017

Discusión DK culotte vs DK crush



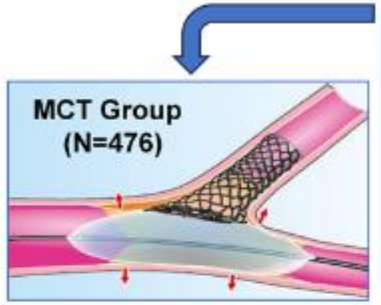
Toht G. Eurointervention 2020

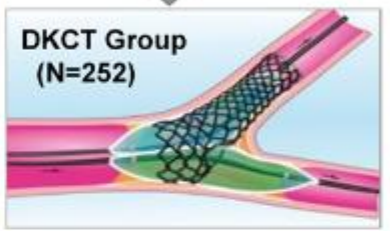
Discusión DK culotte vs DK crush

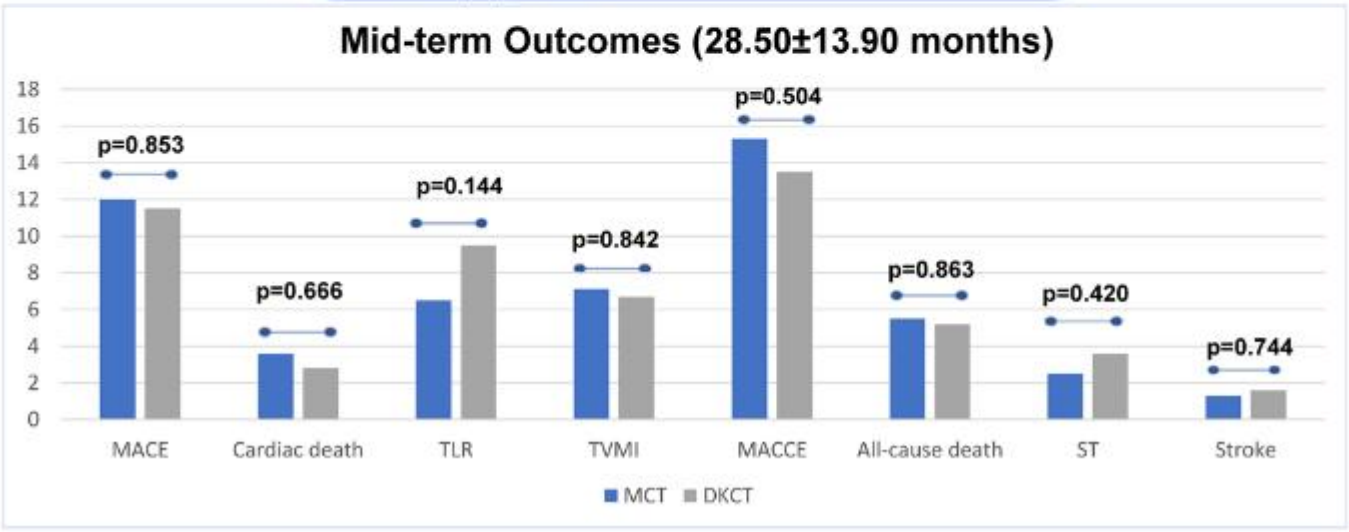
Double Kissing Culotte or Mini-crush Stenting for True Coronary Bifurcation Lesions: The Multicenter COLLECT-BIF Registry

Study Design and Cohort

- Seven hundred and twenty-eight patients with true coronary bifurcation lesions.
- Multicenter (n=8) in Türkiye.
- Mini-crush (MCT) and double kissing culotte (DKCT) techniques as 2-stent strategies.
- Primary endpoint: major adverse cardiac events (MACE) as the combination of cardiac death, target lesion revascularization (TLR) and target vessel myocardial infarction (TVMI).
- Secondary endpoint: major adverse cardiac and cerebral events (MACCE) as the combination of all-cause death, TLR, TVMI, stent thrombosis (ST), or stroke.

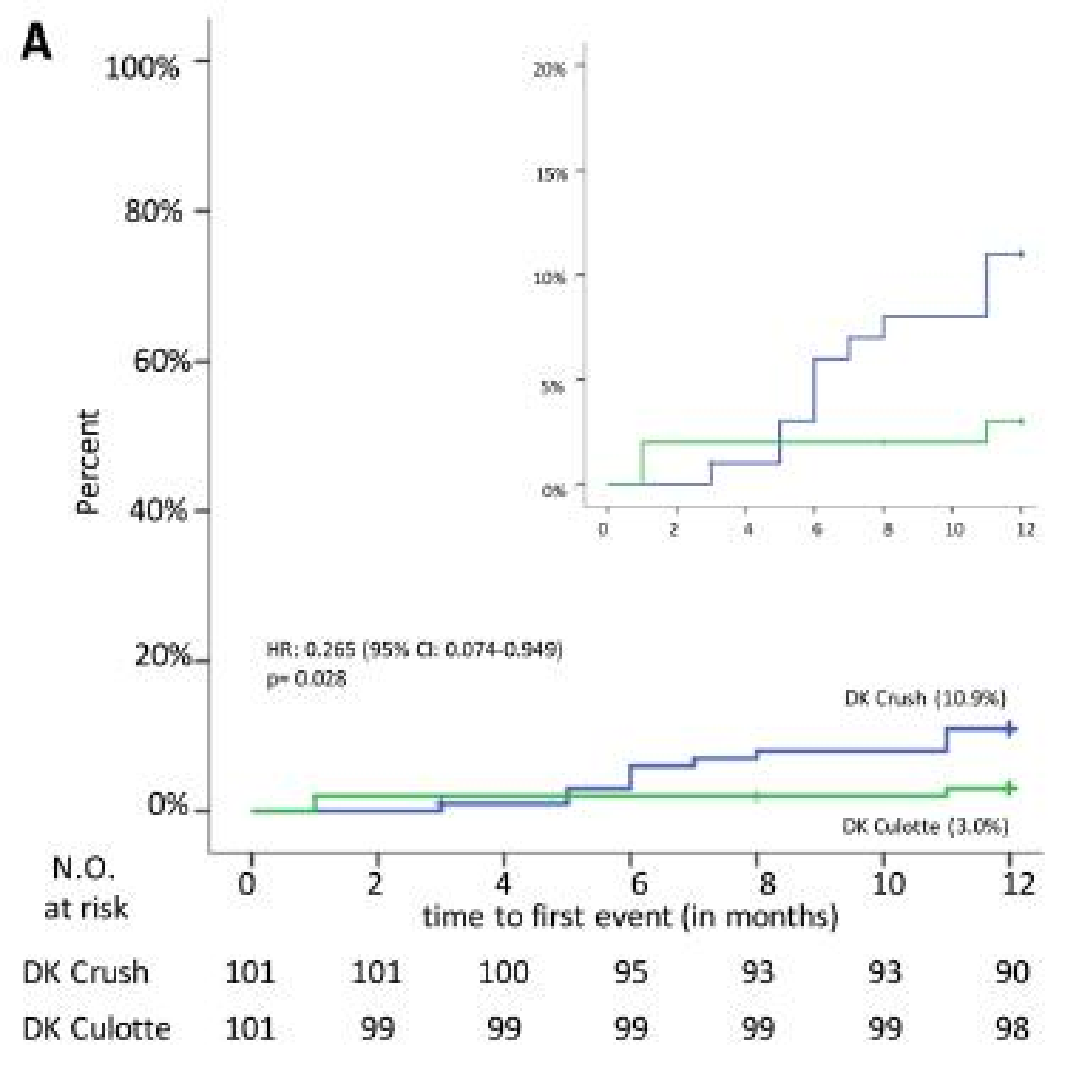




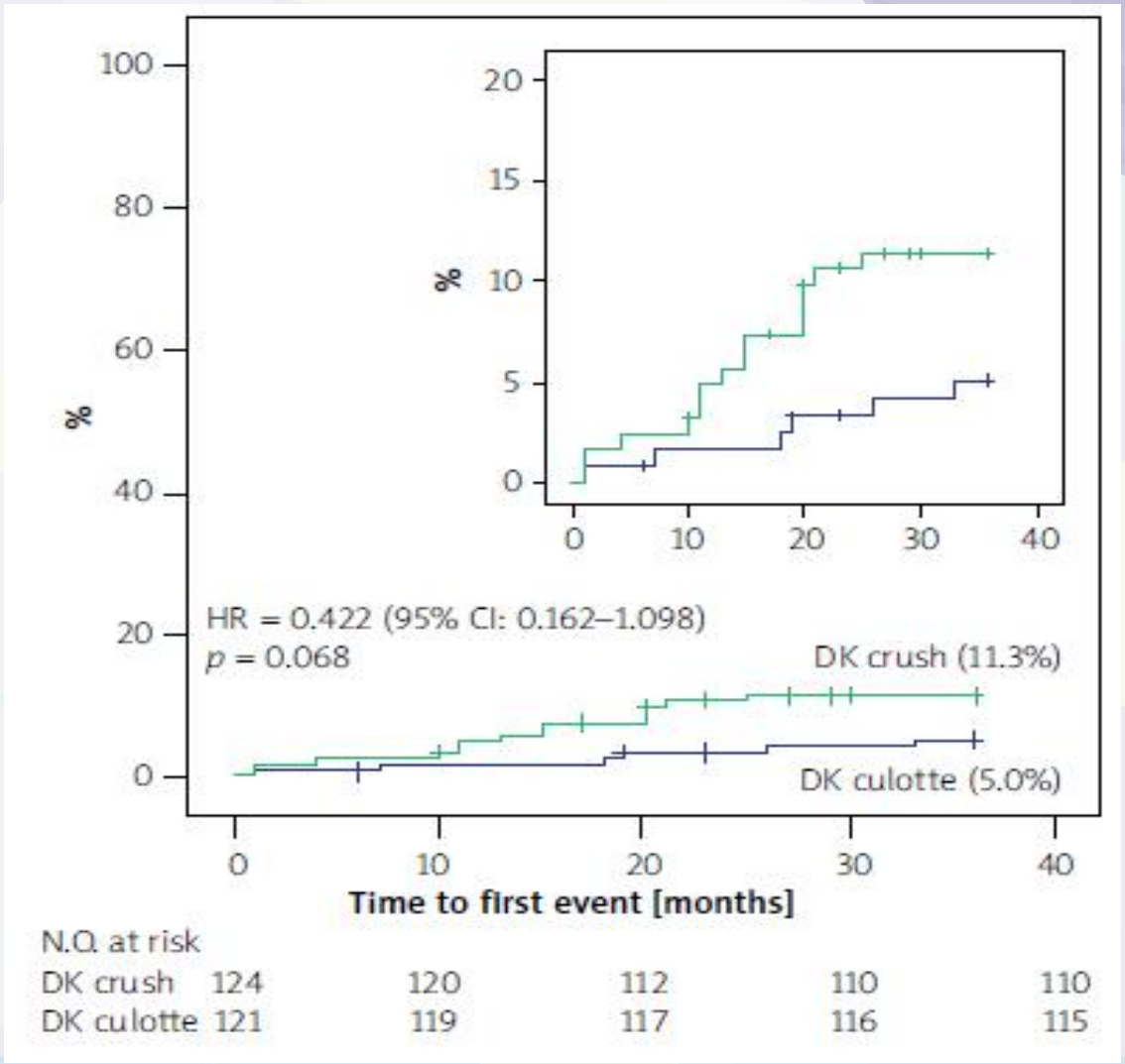


Çizgici A. Coronary Artery Disease 2025 Ahead of Print

Discusión DK culotte vs DK crush

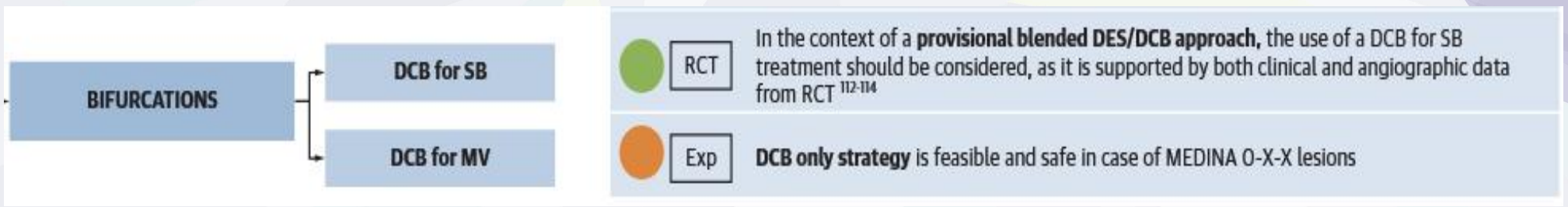


Kahraman S. Circulation Cardiovasc Int 2020



Erturk M Adv Interv Cardiol 2025

Discusión 2 stent vs 1 stent+DEB



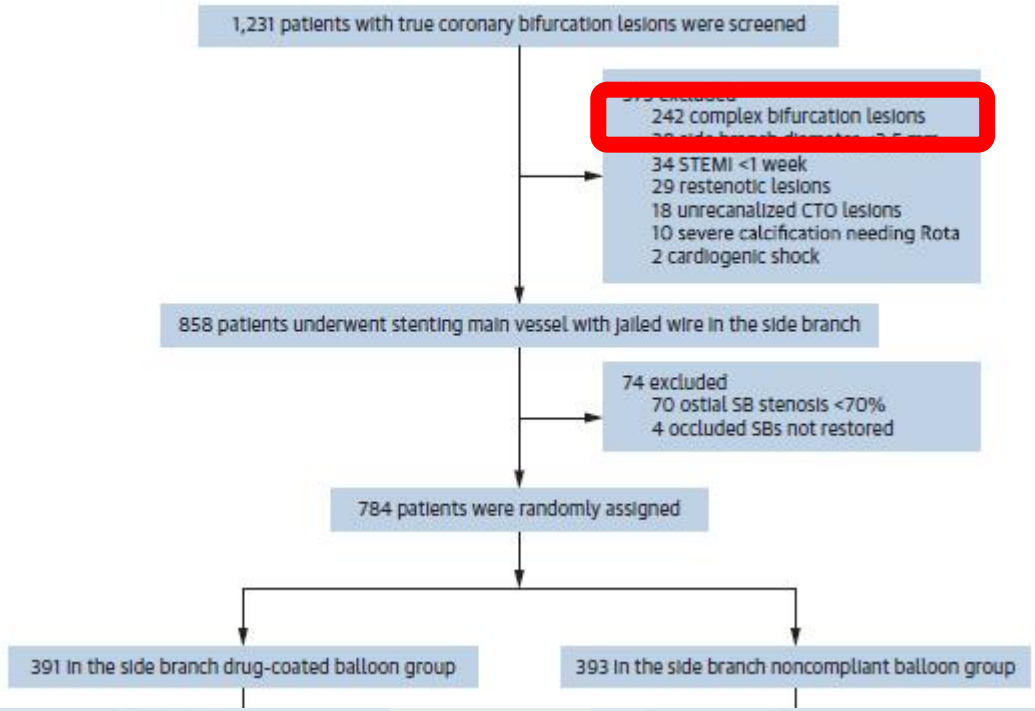
ORIGINAL RESEARCH

Drug-Coated Balloon Angioplasty of the Side Branch During Provisional Stenting

The Multicenter Randomized DCB-BIF Trial

Fezzi S. JACC 2025

FIGURE 1 Study Flowchart of the DCB-BIF Trial



Gao X. JACC 2025

Más vale conocido.. (por el momento..)

CONCLUSIONES

- Bifurcación **verdadera** y **compleja**: up-front 2 stents
  - Mayor evidencia disponible en actualidad
  - Estudios DEB: criterios de exclusión
- DK-Culotte
  - Estrategia versátil (+/- reverse) con DES actuales
  - Técnicamente menos compleja DK-Crush
  - Uso imagen esencial re-wiring
  - Datos al menos resultado similares DK-Crush

FUP 1y: ASINTOMÁTICA y SIN EVENTOS

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Gracias por su atención