12th AP VALVES & STRUCTURAL HEART
AUGUST 10-11 2023
GRAND WALKERHILL SEOUL, KOREA

Repeated Recurrent Restenosis in a Patient with Delayed Coronary Obstruction after TAVR

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Professor of Medicine, Cheng-Hsin General Hospital
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I am proctors of Medtronic, Edwards, and Abbott TAVR devices and Boston Scientific cerebral protection device.

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Case Presentation (1)

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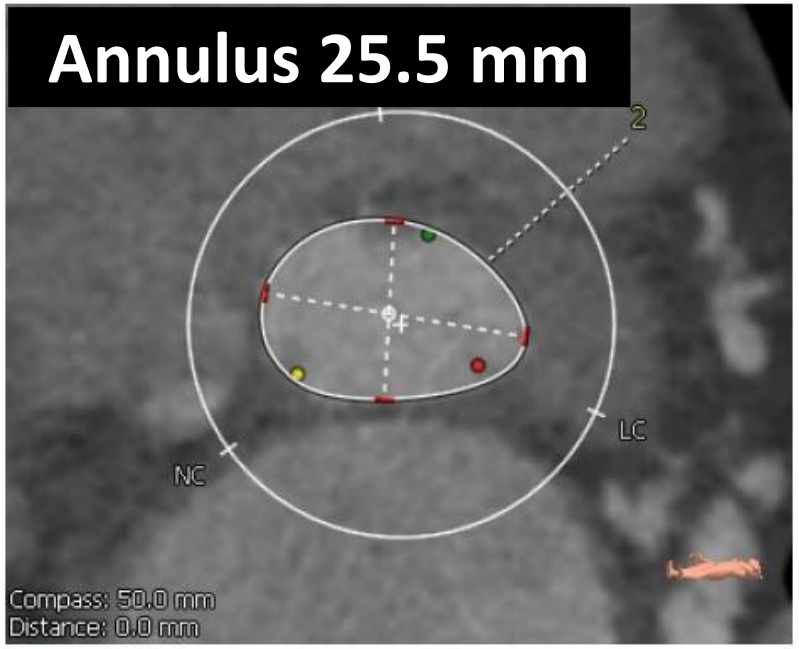
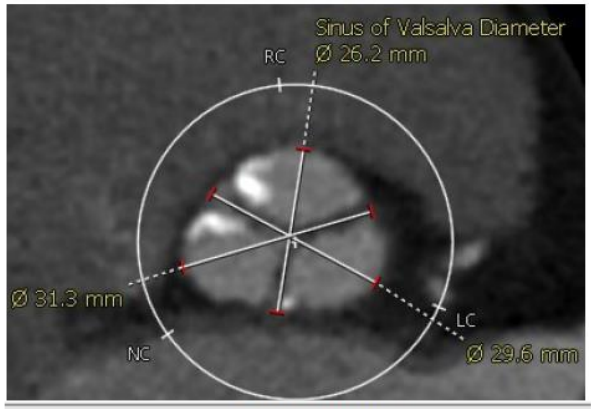
04/2016: LCSJ, a 90 years old female presented with critical AS and progressive HF

Aortic annulus area

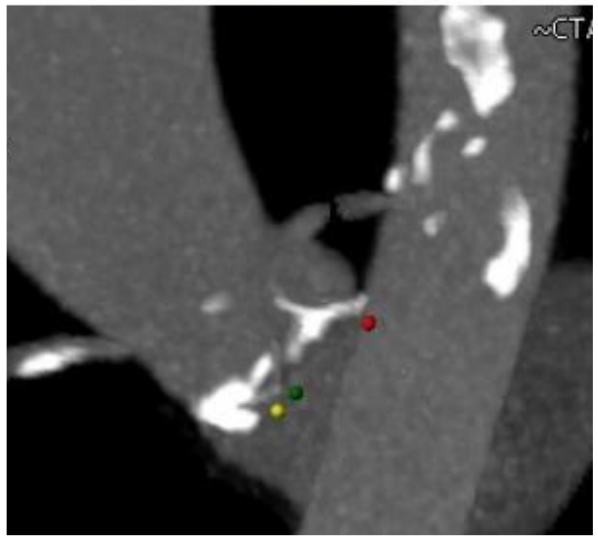


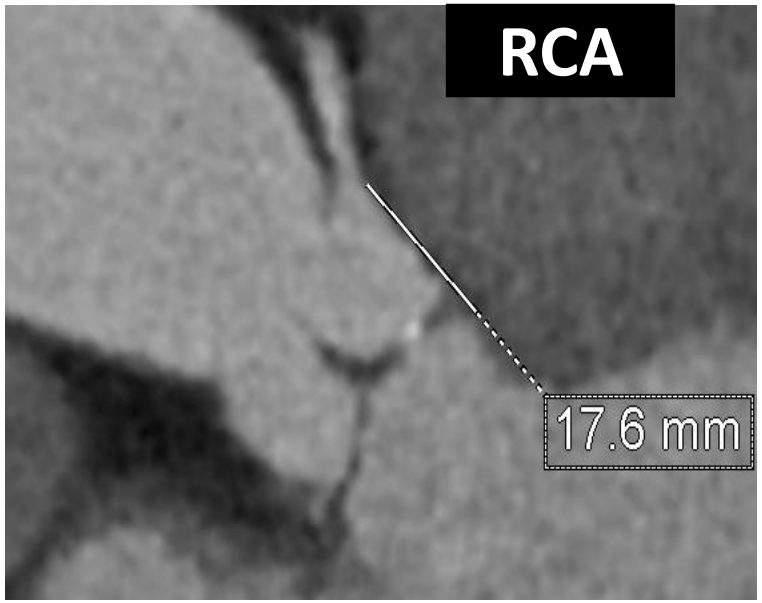
ID	Type	Label	Value
2	Polygon	Min. Ø	20.9 mm
		Max. Ø	30.9 mm
		Avg. Ø	25.9 mm
		Area derived Ø	25.5 mm
		Perimeter derived Ø	26.4 mm
		Area	510.0 mm²
		Perimeter	82.8 mm

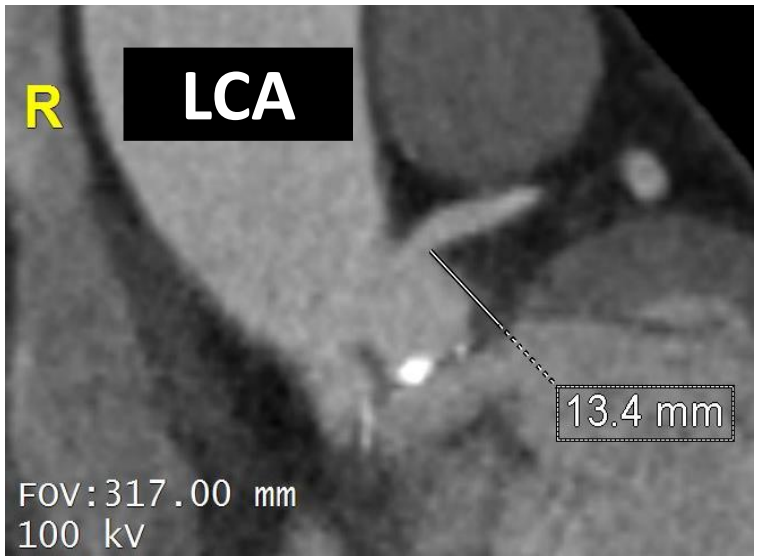
Sinus of Valsalva



Calcifications





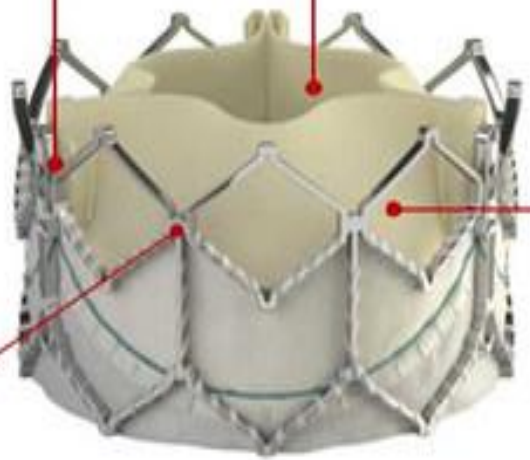


In the era of *Sapien XT*, more complications can happen, especially for the beginners……..

Edwards SAPIEN XT THV Builds upon Edwards Proven Balloon Expandable Platform

More oversizing and post-dilatation needed!

Anchoring by radial force!



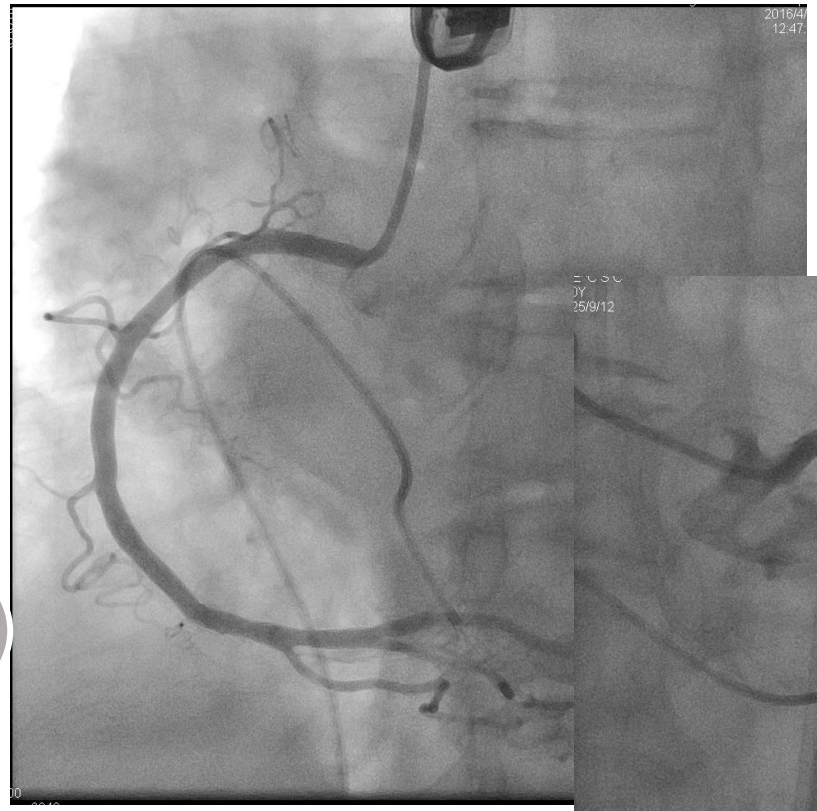
No sealing skirt!

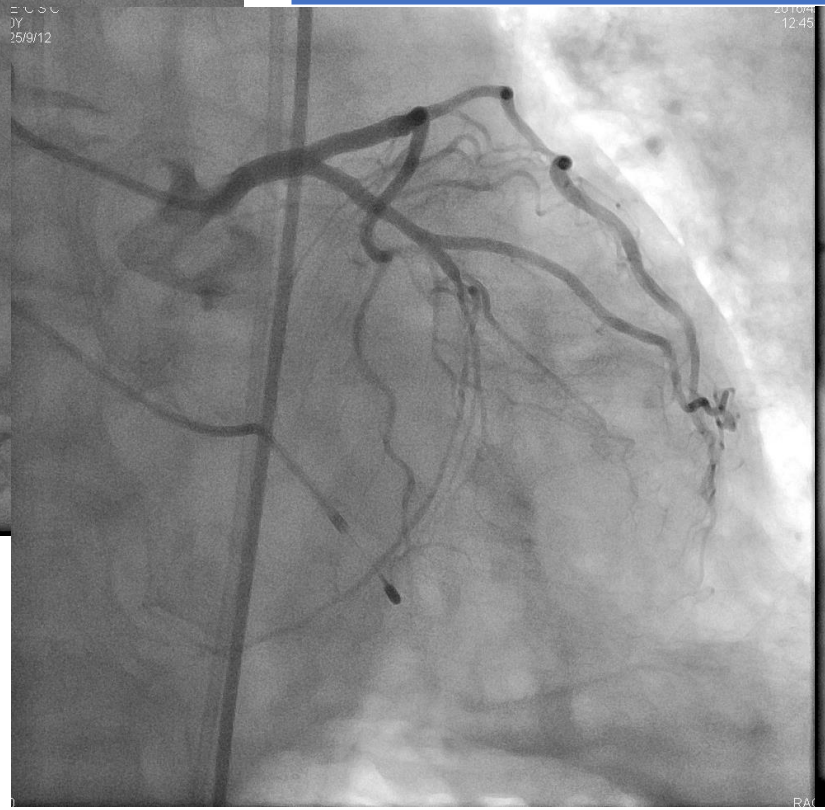
High radial strength cobalt-chromium frame designed to achieve full expansion for apposition at the annulus to minimize paravalvular leak

Leaflets matched for thickness and elasticity to enhance coaptation and maximize durability

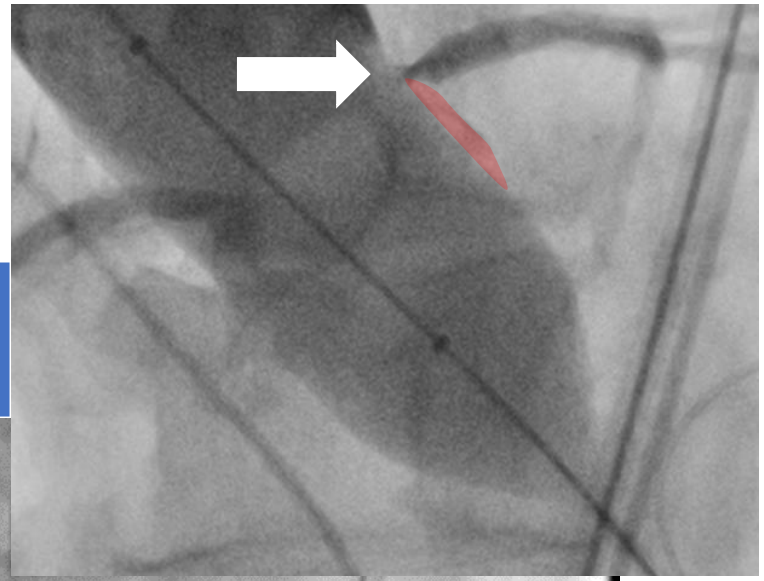
Case Presentation (2)

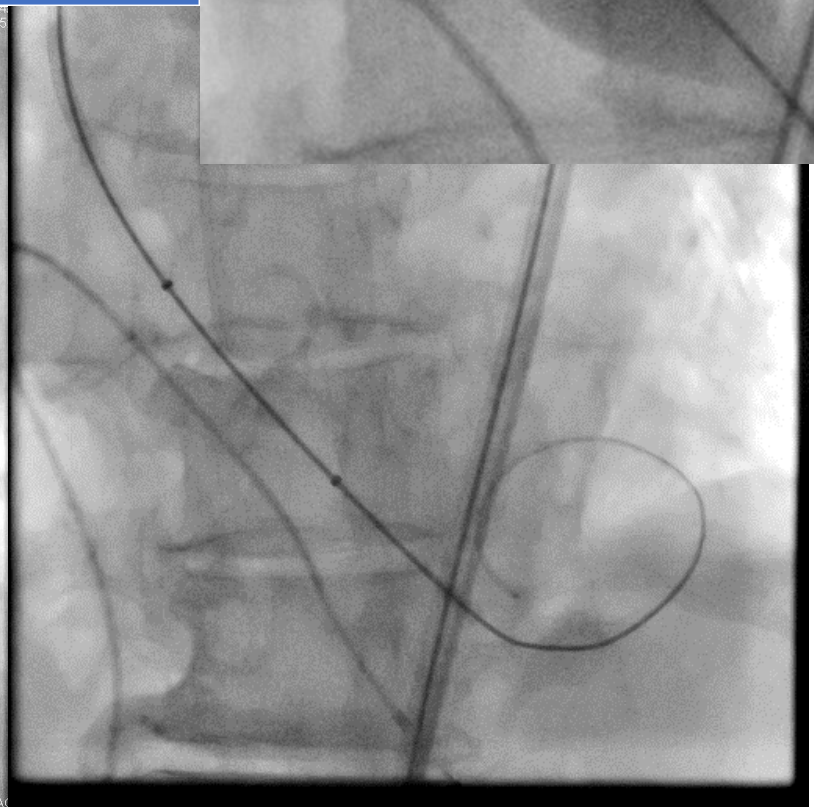
04/19/2016: CAG





25mm BAV showed impingement of leaflet into Lt coronary orifice





12th AP VALVES & STRUCTURAL HEART 2023

AUGUST 10-11, 2023
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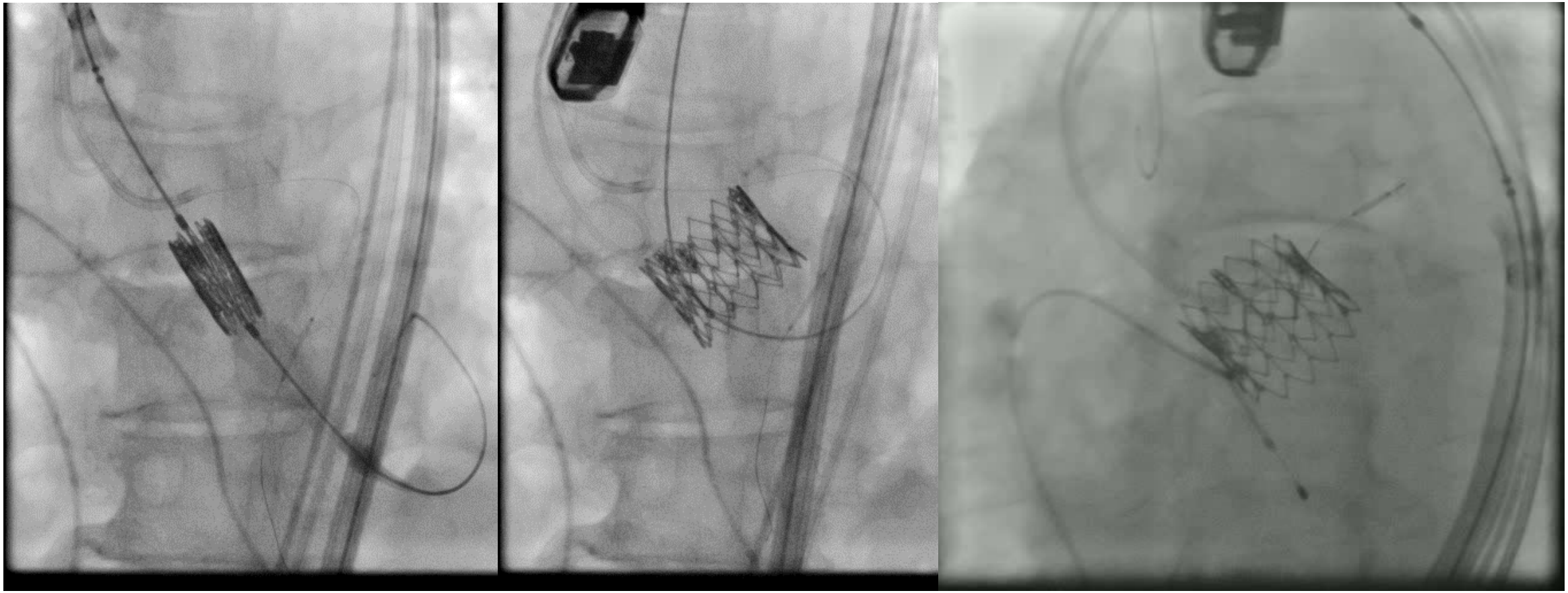
Case Presentation (3)

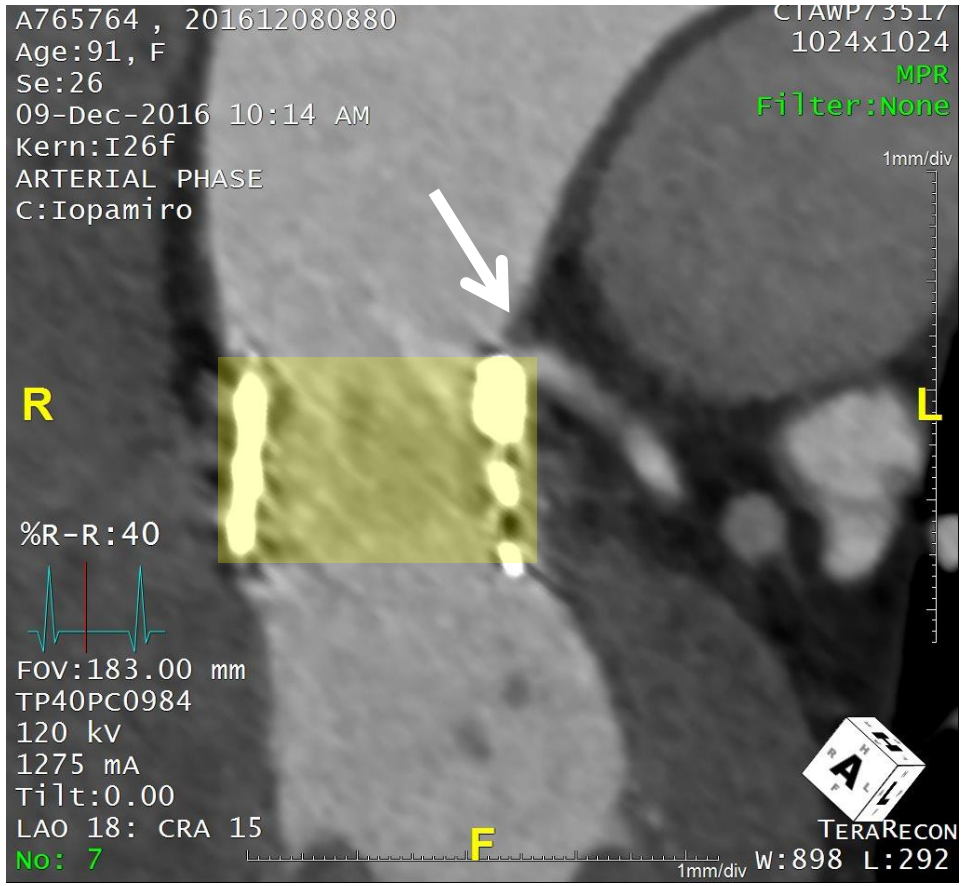
TAVR with a 29mm Sapien XT (underfill 2cc) with coronary protection → mild AR and patent coronary artery after TAVR

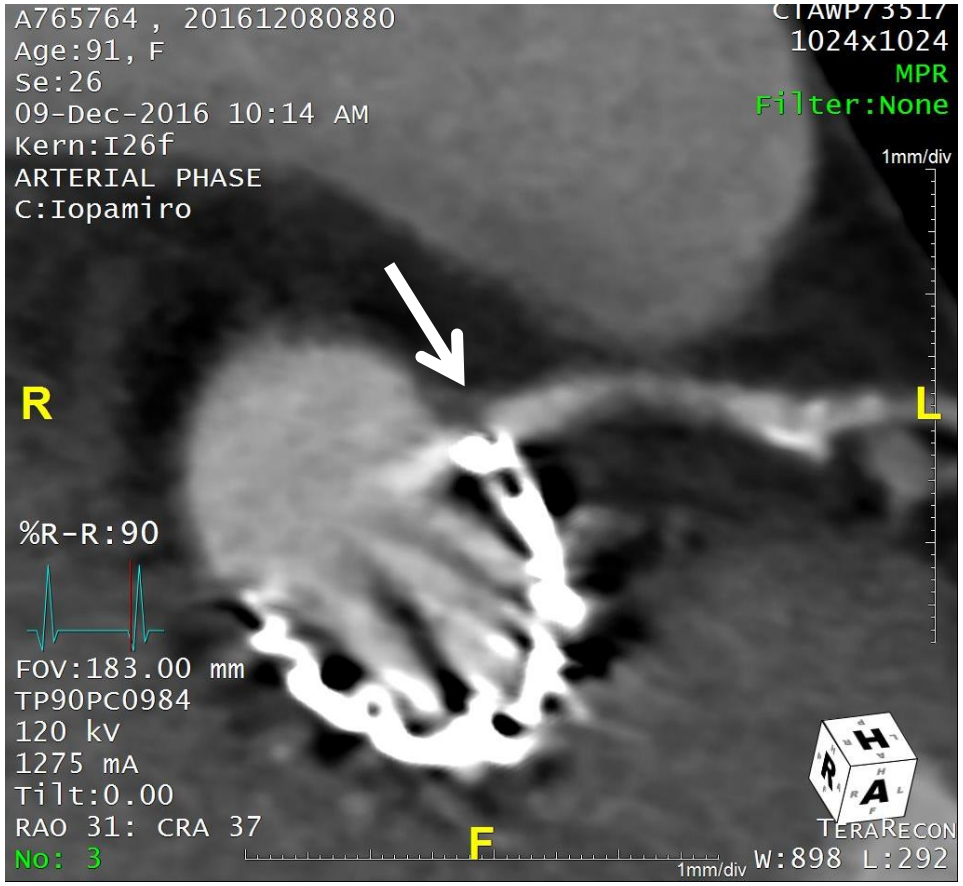


2016 12
2018 05
2019 12
2020
2021 08
2022 11
2023 05

Case Presentation (4)

2016/12, the patient was asymptomatic, but a follow-up CT showed impingement of valve frame into the coronary artery and new tissue growth at the ostium of LM





2016 12
2018 05
2019 12
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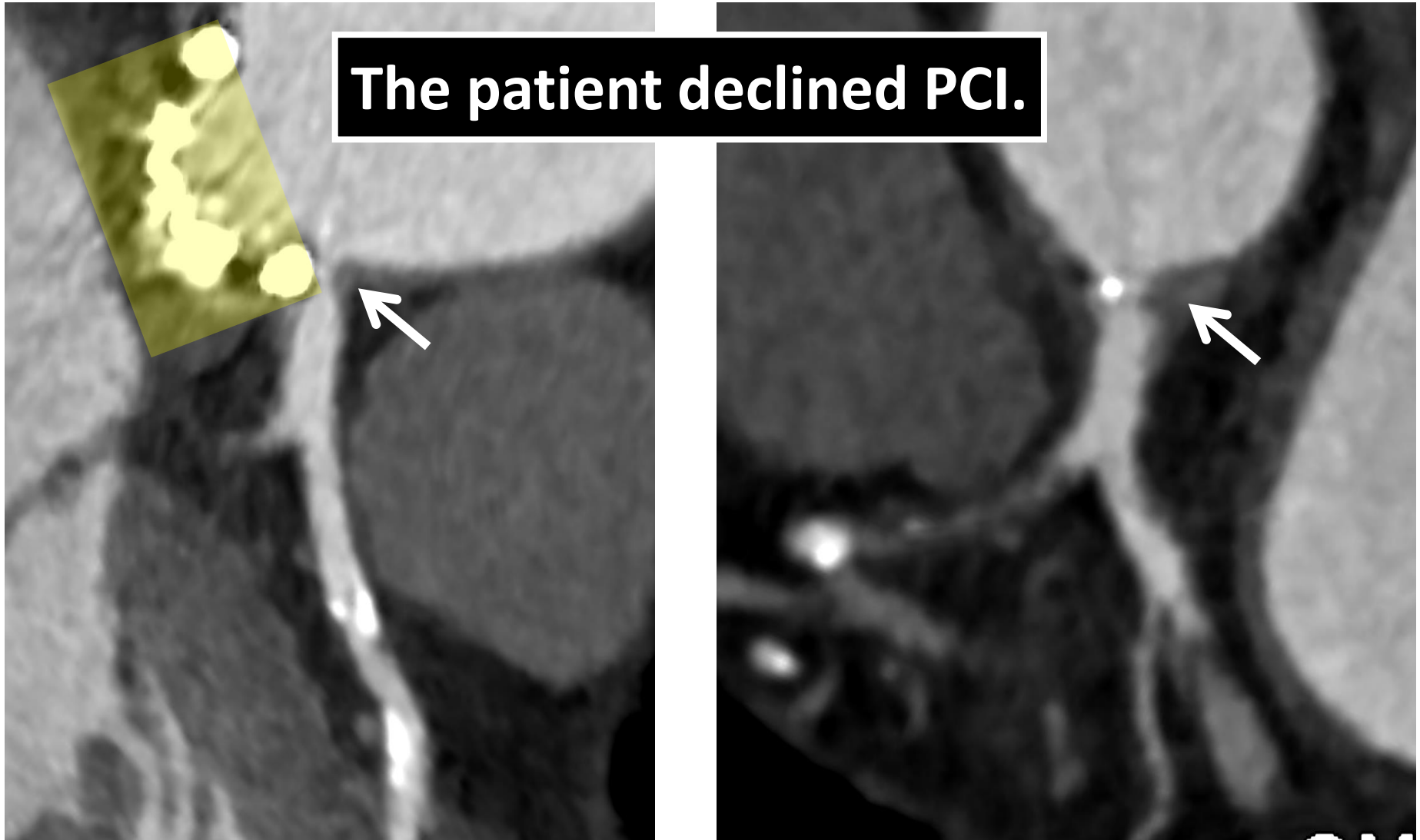
2021 08
2022 11
2023 05

Case Presentation (5)

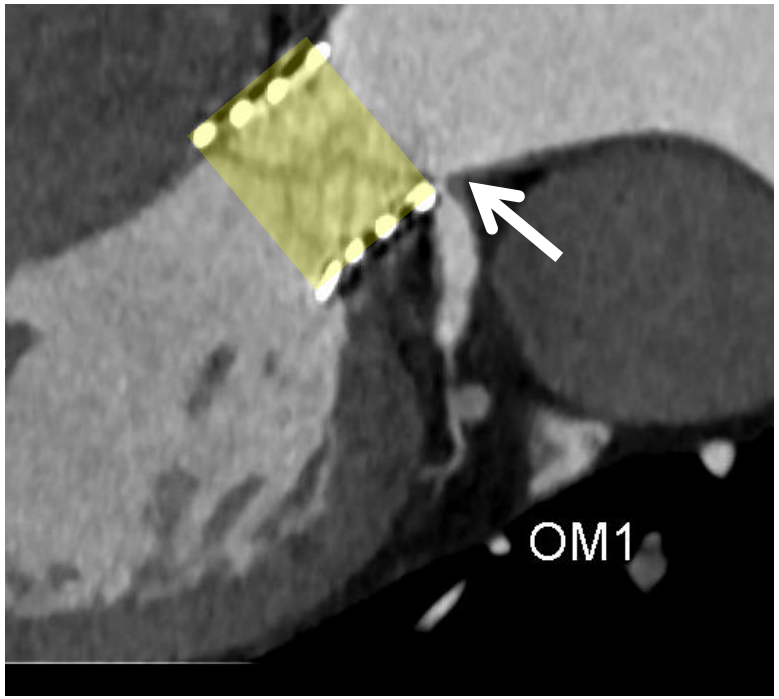


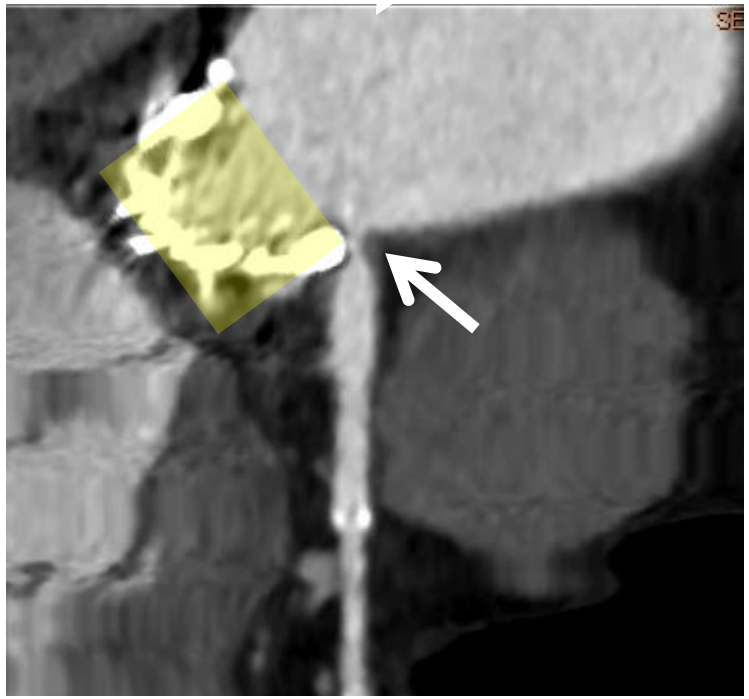
2016 04 6
2018 05
2019 12
2020
2021 08 1
2022 11
2023 05

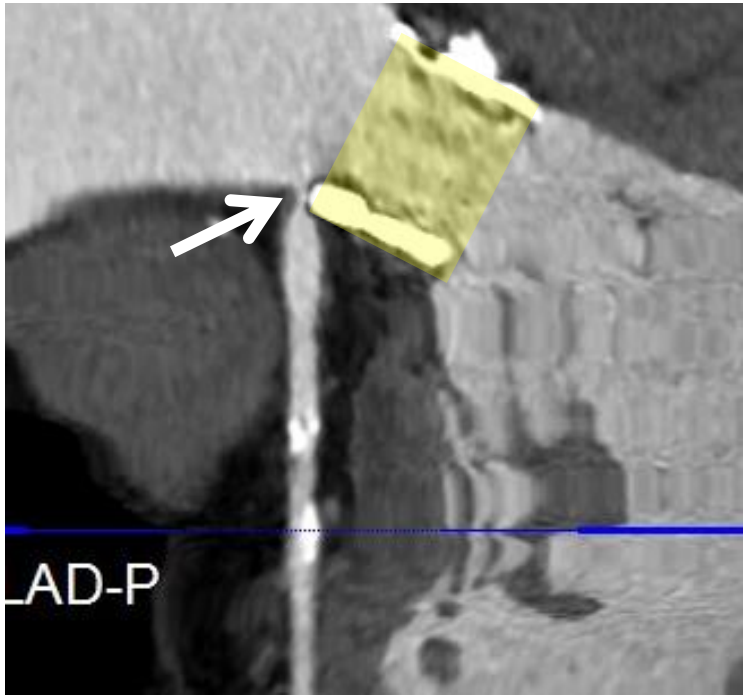
Age 92

Case Presentation (6)

2018/05/17 (17 months later), the patient was admitted because of crescendo angina for one month and repeated CT showed severe stenosis of LM ostium.



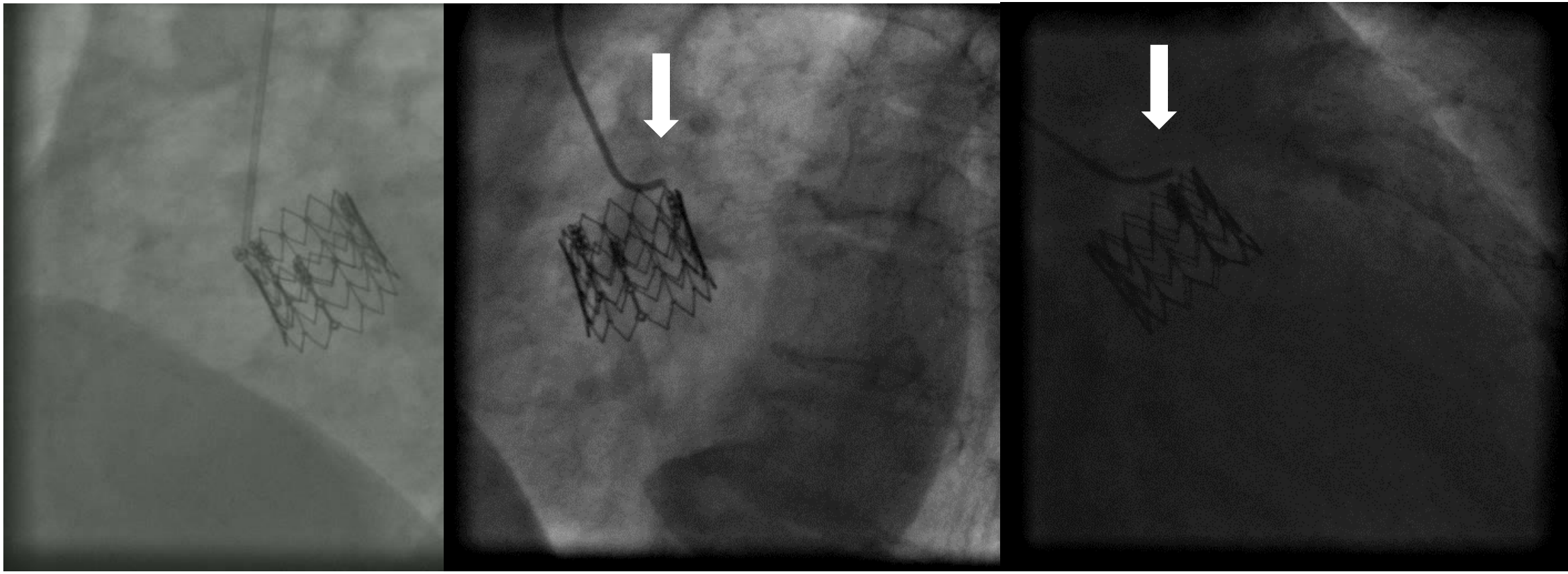




2016 04 6
2018 05
2019 12
2020
2021 08 1
2022 11
2023 05

Case Presentation (7)

2018/05/17, CAG confirmed critical stenosis of LM ostium.



2016 04

2018 05

2019 12

2020

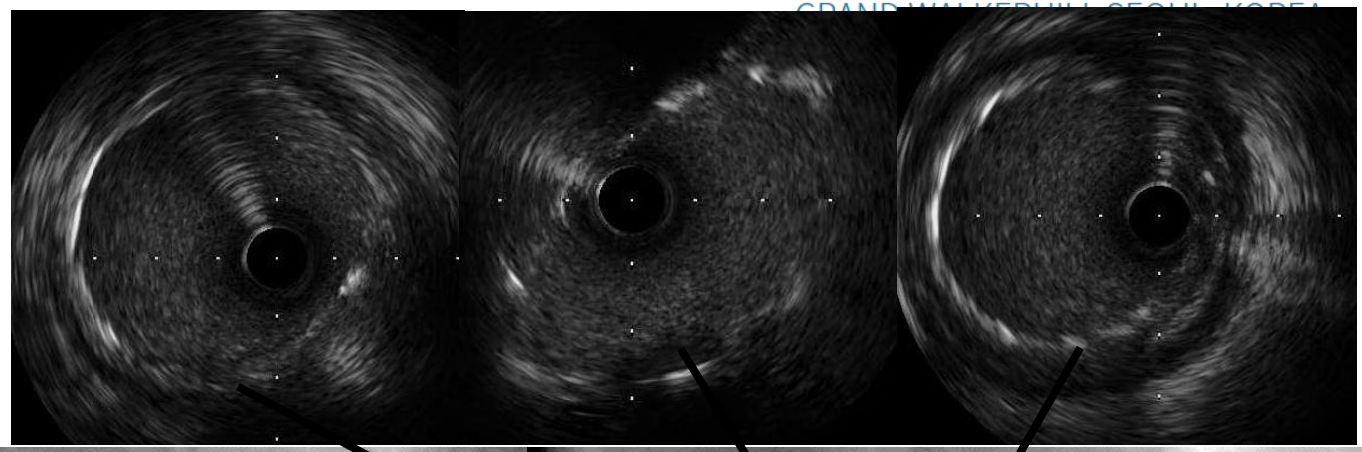
2021 08

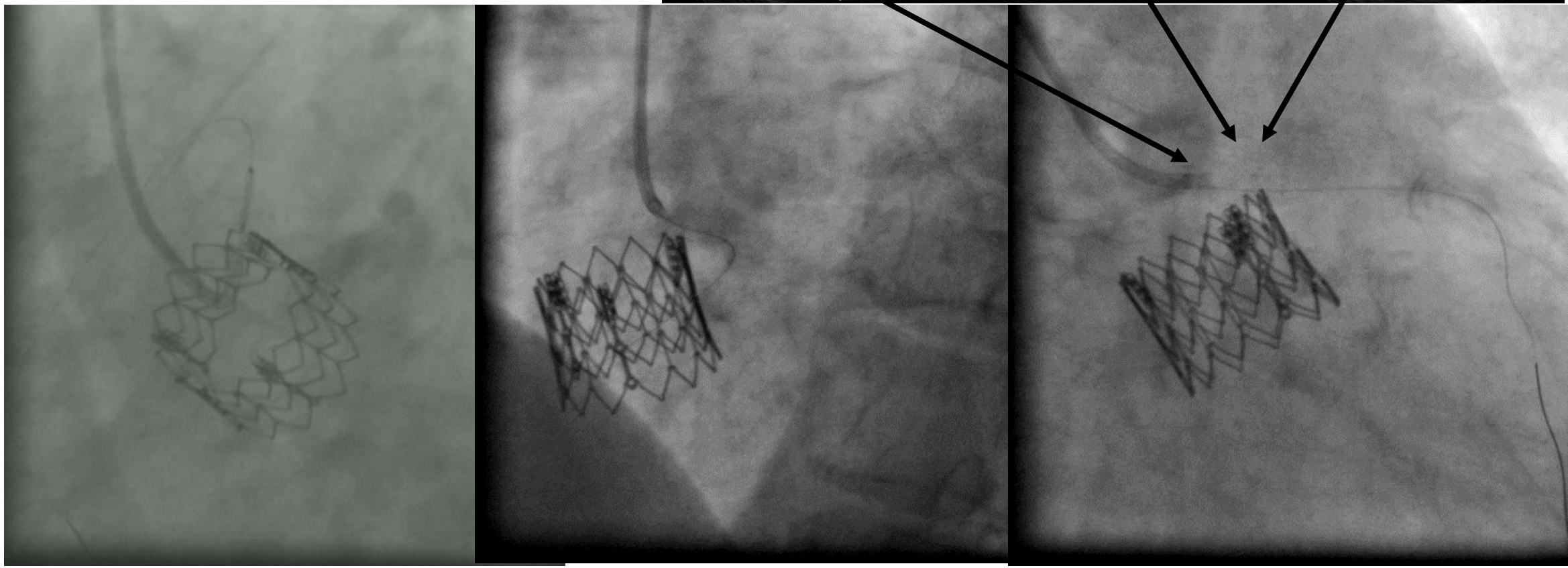
2022 11

2023 05

Case Presentation (8)

Direct stenting for LM ostium with a 4.0x12mm DES and post-dil. with a 4.5mm NC balloon under IVUs guidance.



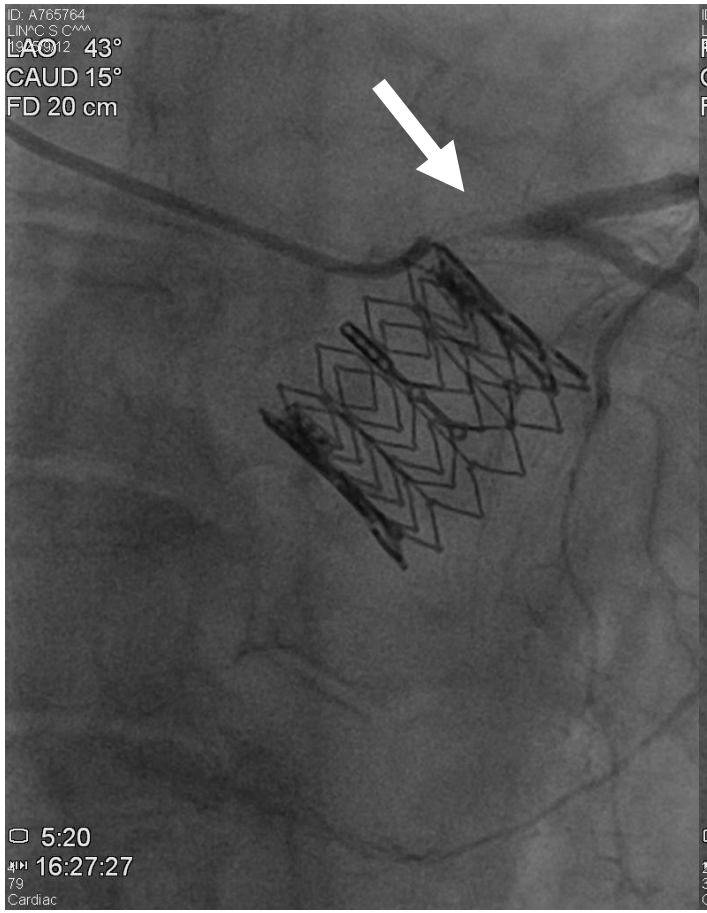


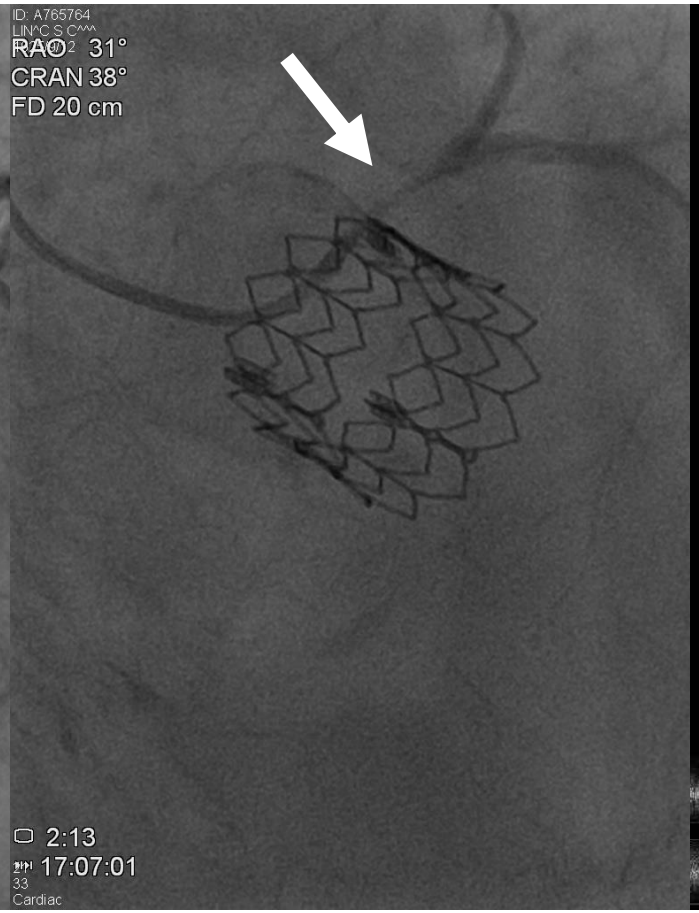
Age 93

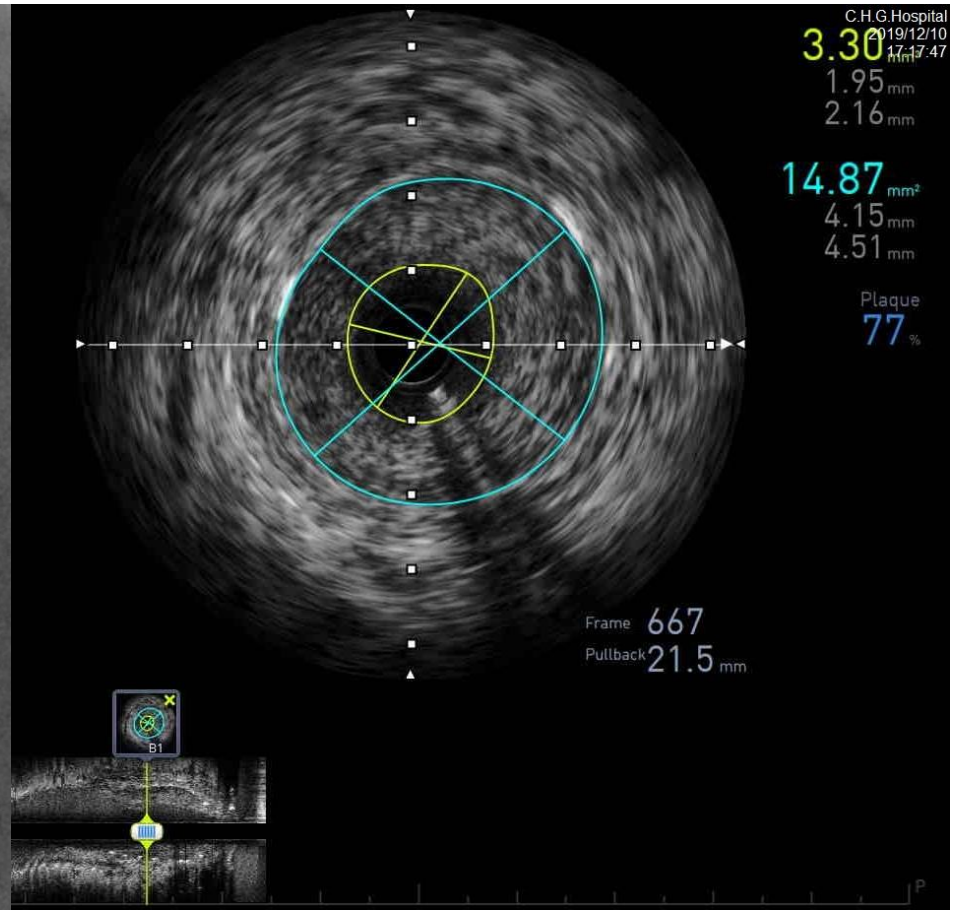
Case Presentation (9)

2019/12 (19 months later, First ISR of LM-ostium, presented with unstable angina

Neo-intimal hyperplasia was noted by IVUS







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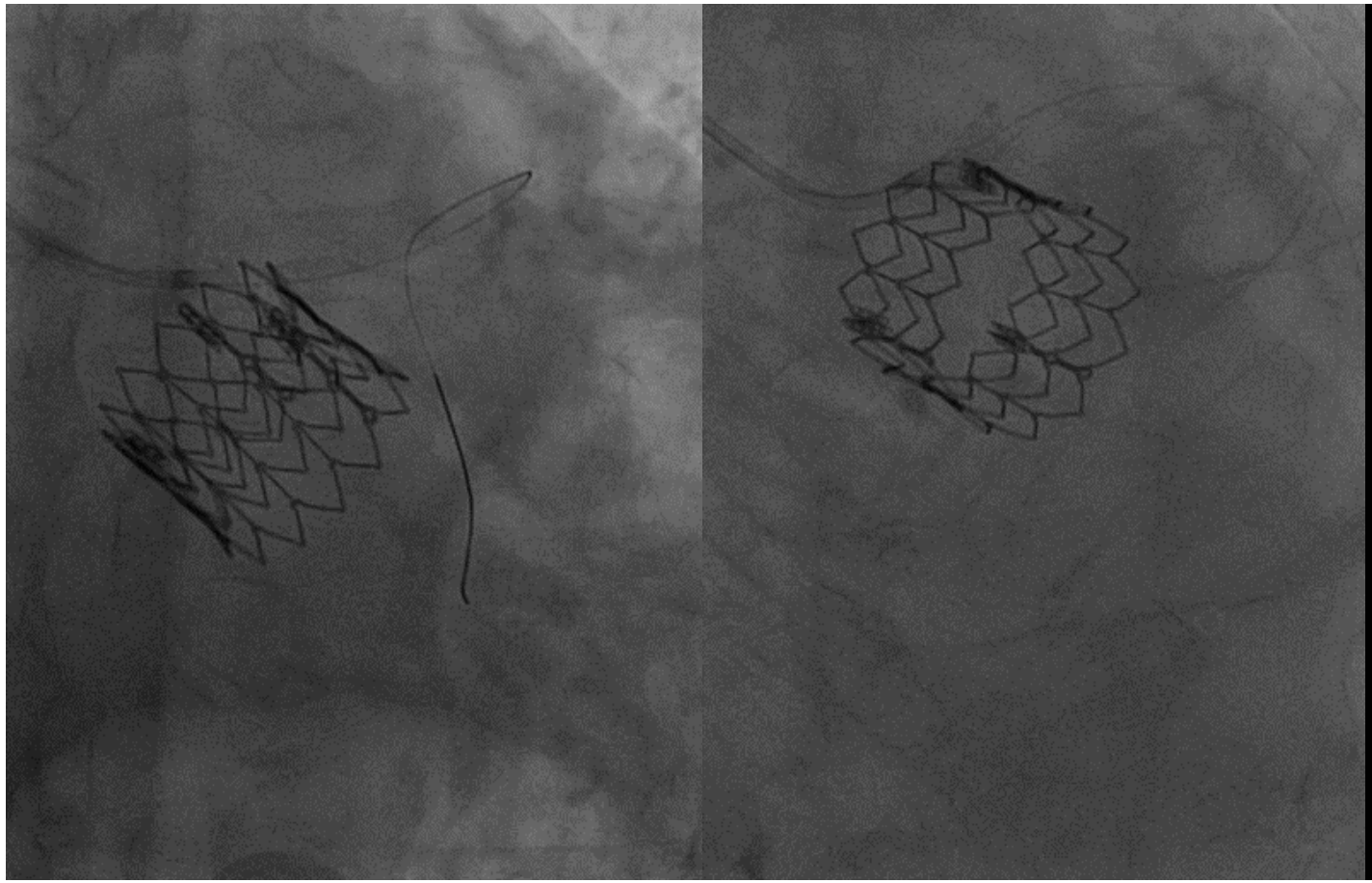
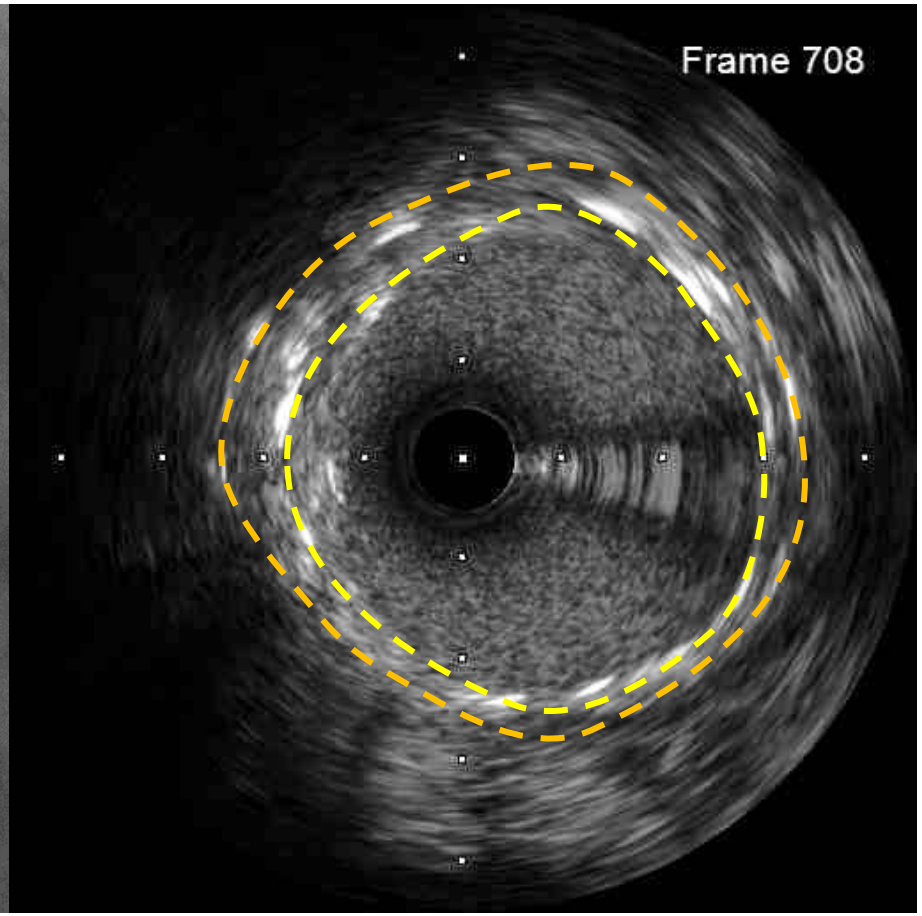
Case Presentation (10)

The ISR was treated with stent-in-stent with another DES, 2 layers of DES noted by IVUS.





2016 04 6
2018 05
2019 12
2020
2021 08 1
2022 11
2023 05

Case Presentation (11)

Age 94

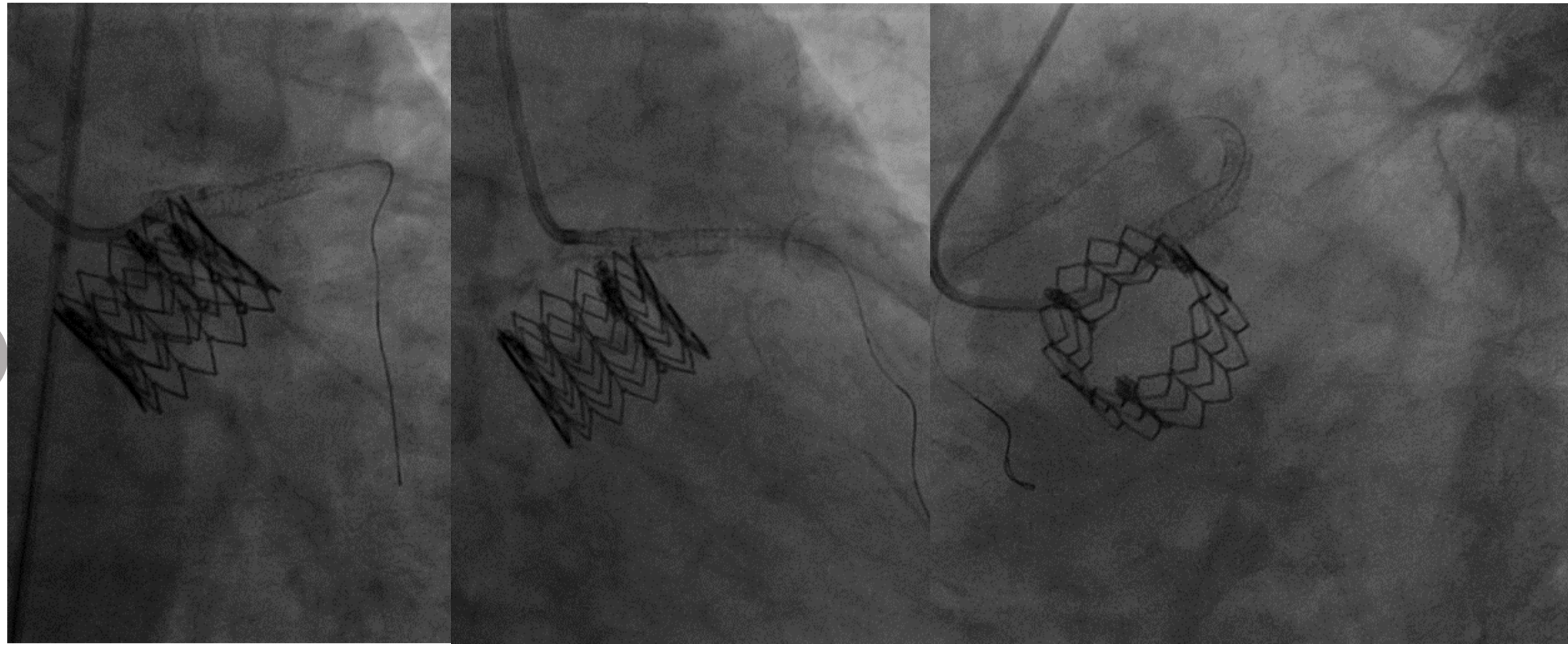
2020: PTCA for LAD and LCX bifurcation stenting (Culotte) at other Hospital for recurrent angina, but LM-ostium untouched!

2016 04
2018 05
2019 12
2020
2021 08
2022 11
2023 05

Age 95

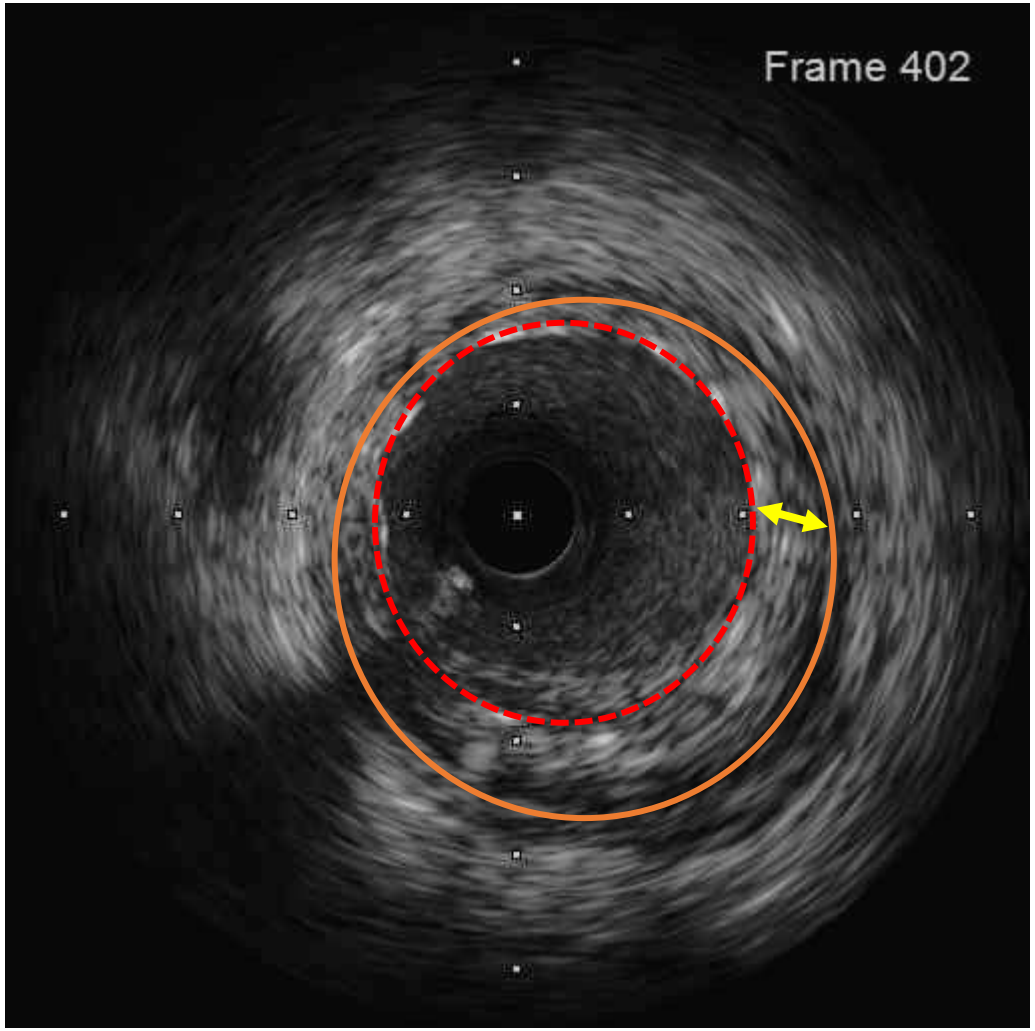
Case Presentation (12)

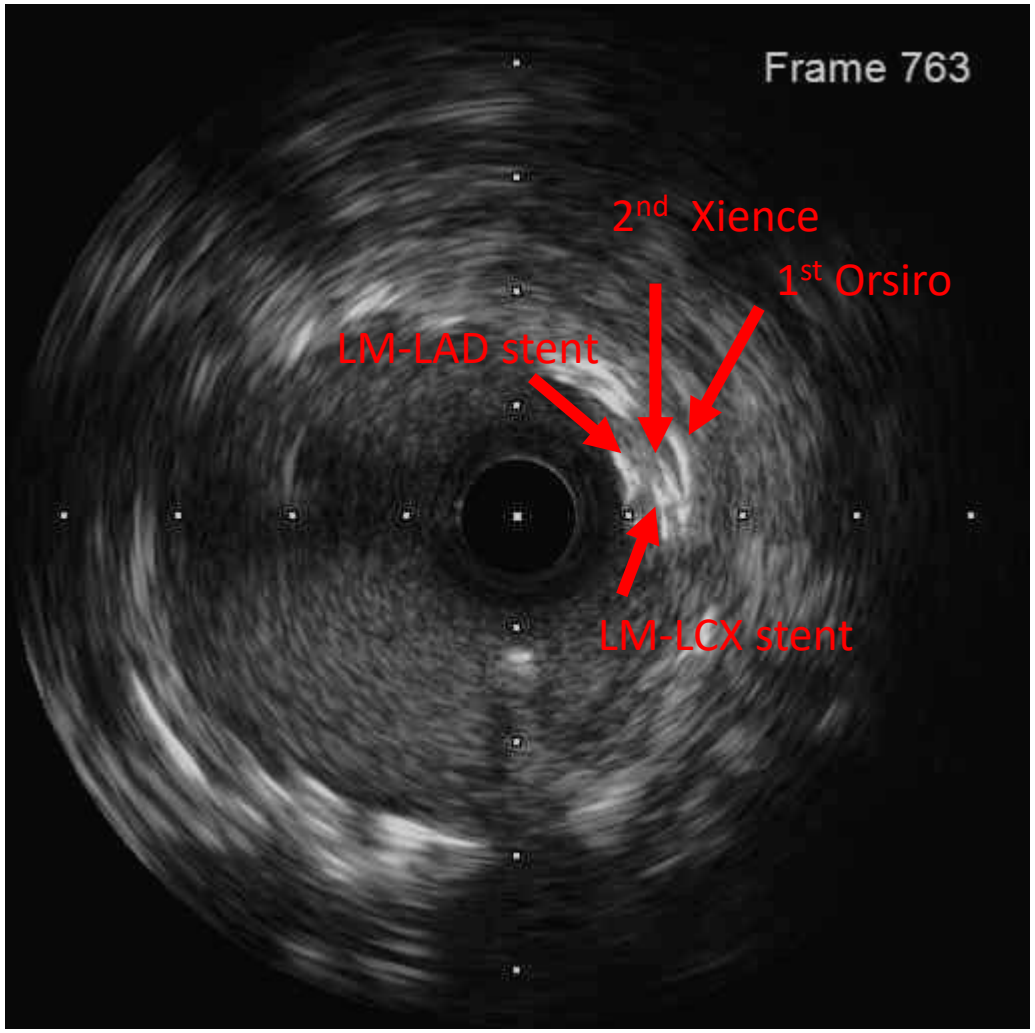
2021/08 (about 1 year later): ISR of LAD-P, treated with cutting balloon and DCB



Case Presentation (13)

IVUS showed under-expansion of LAD-P stent and 4 layers of DES at LM-D.



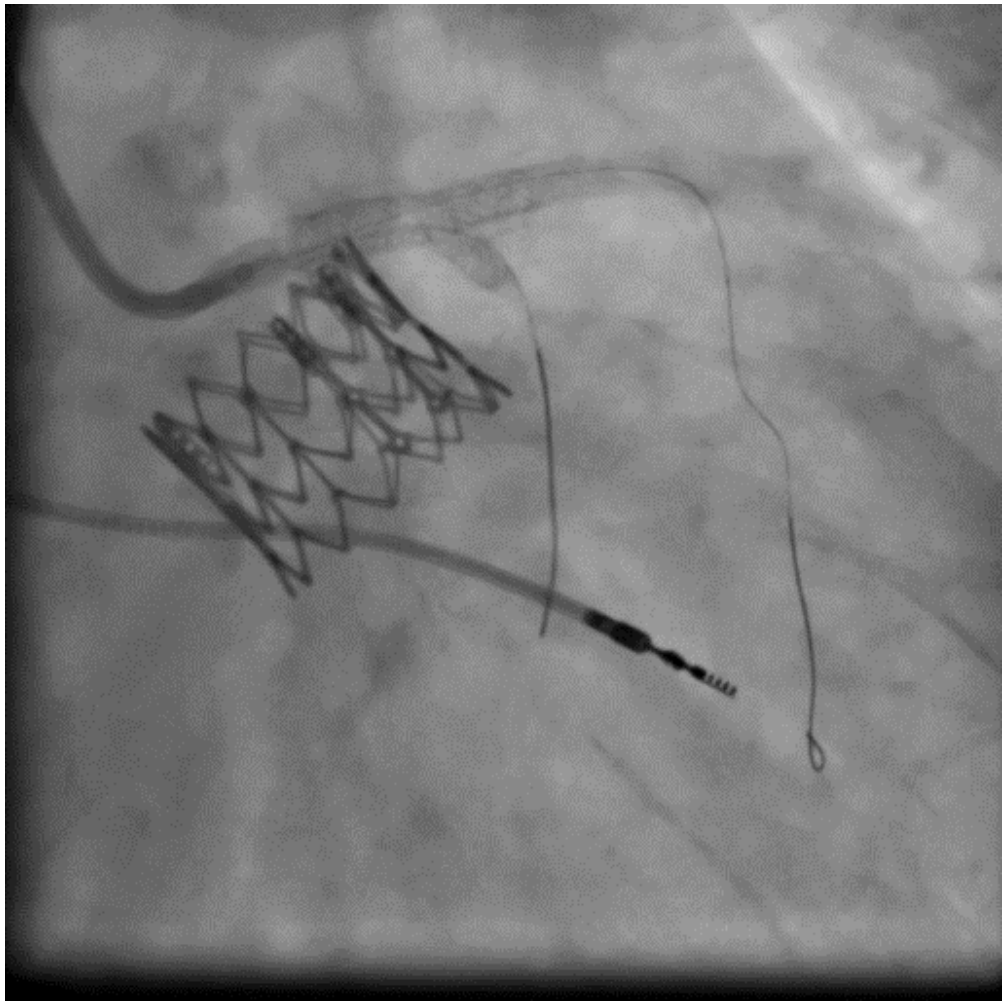


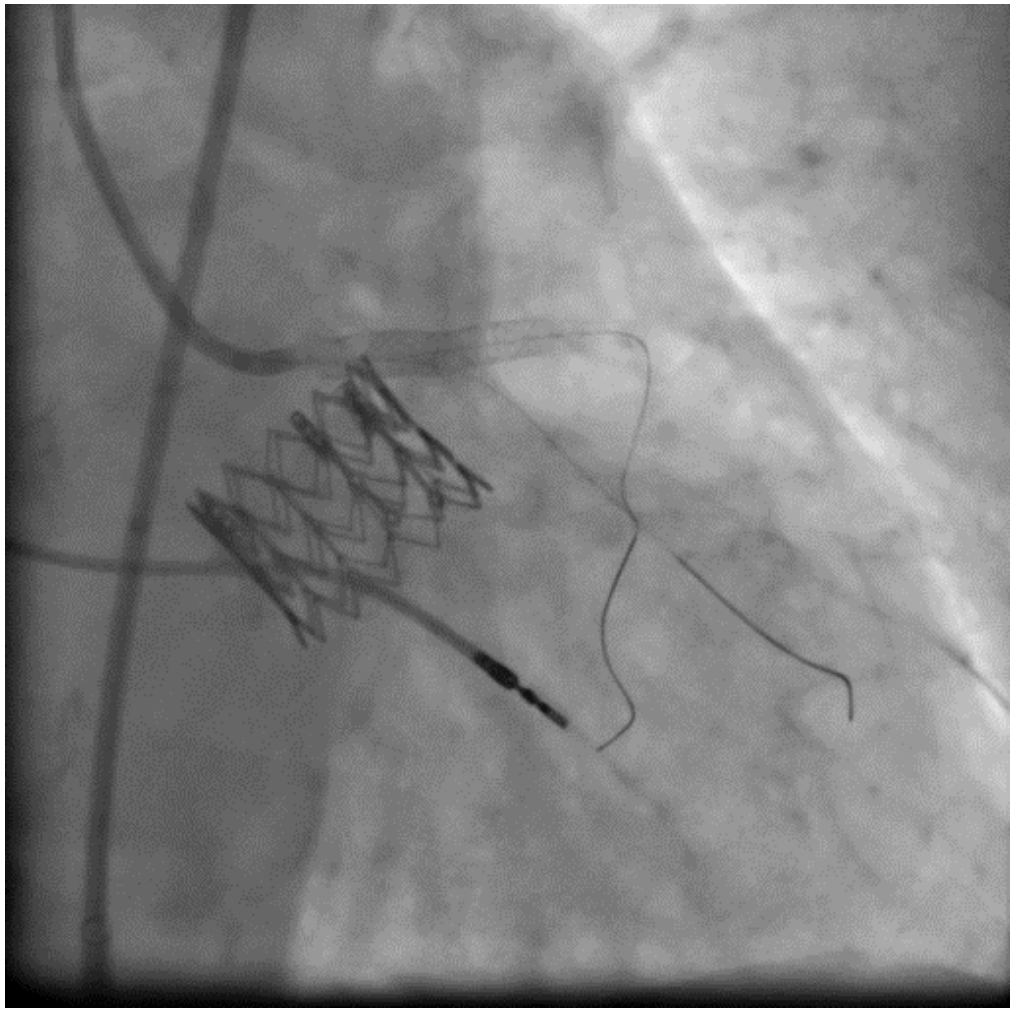
2016 04 6
2018 05
2019 12
2020
2021 08 1
2022 11
2023 05

Case Presentation (14)

Age 96

2022/11 (15 months later): ISR of LM-D bifurcation, treated with cutting balloon and DCB.



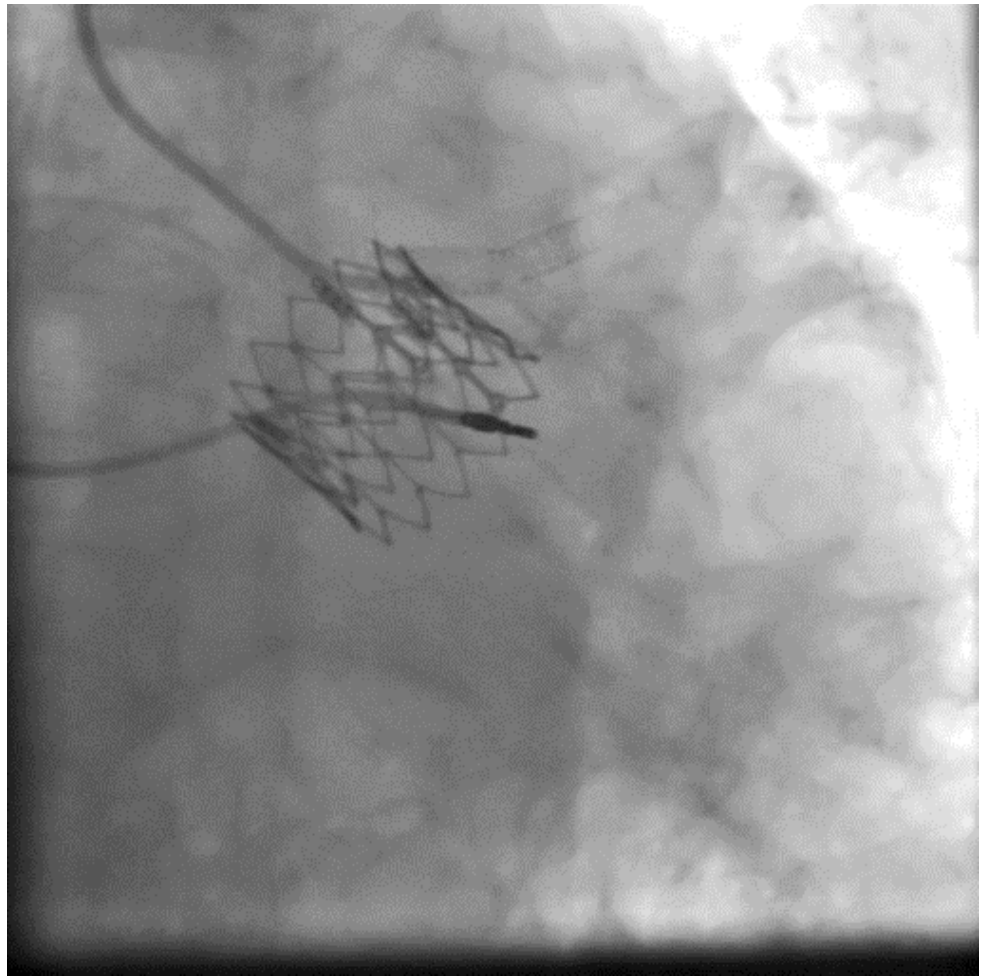


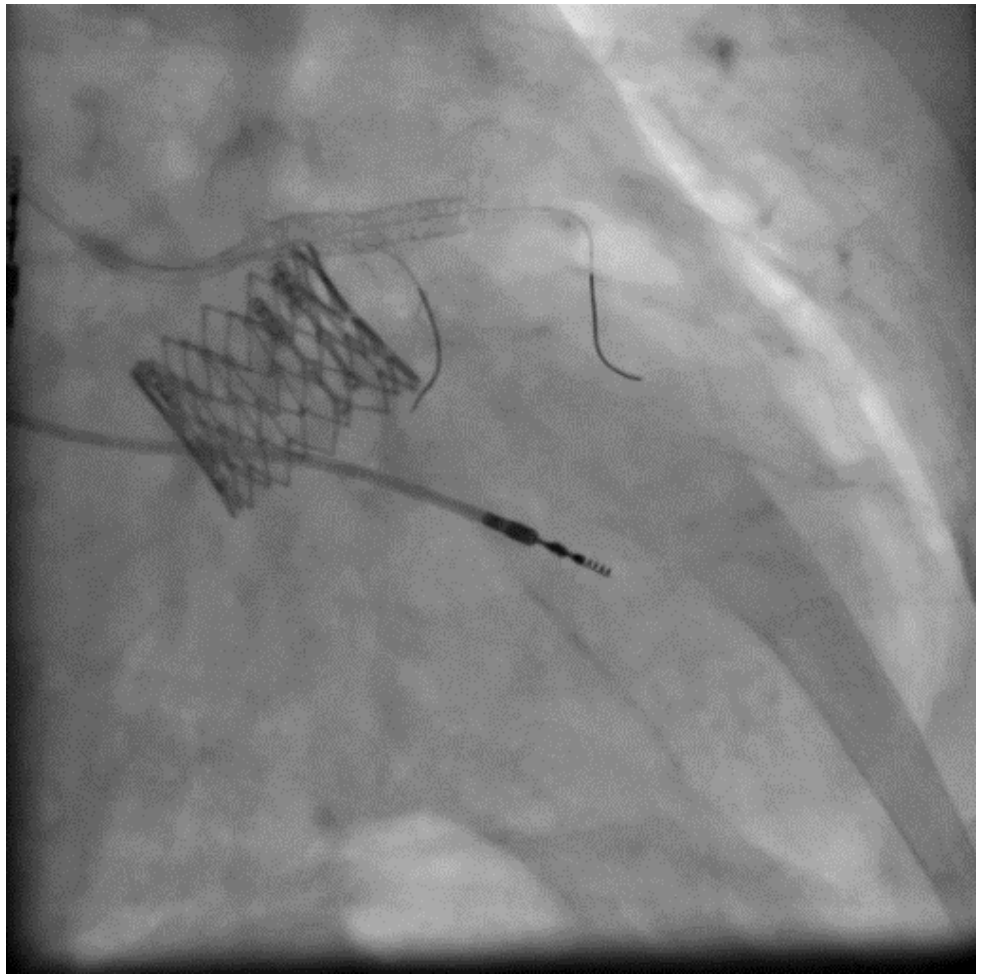
2016 04 6
2018 05
2019 12
2020
2021 08 1
2022 11
2023 05

Age 97

Case Presentation (15)

2023/05 (6 months later): ISR of LM-D, treated with DCB

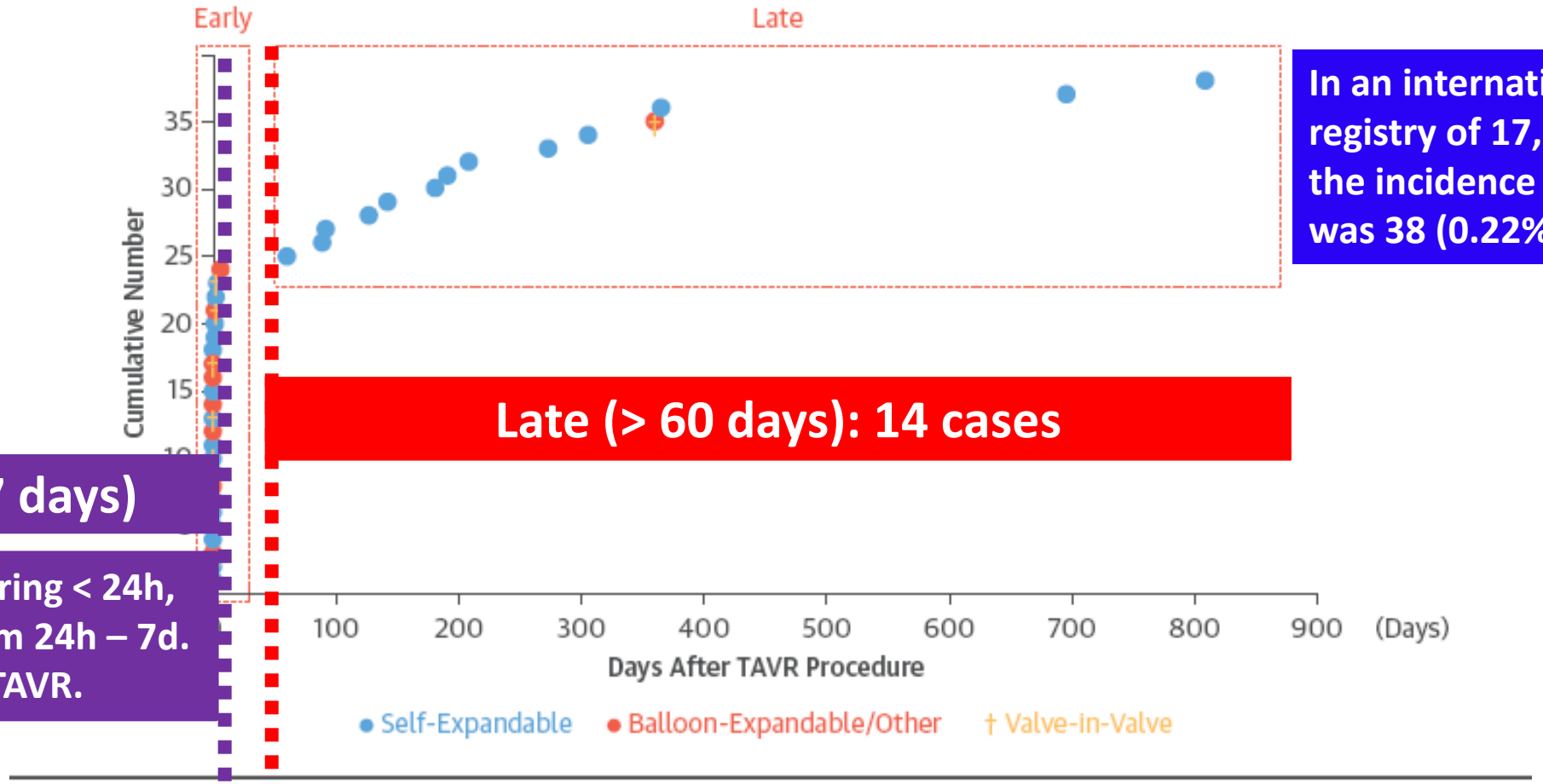




Delayed Coronary Obstruction After Transcatheter Aortic Valve Replacement

(J Am Coll Cardiol 2018;71:1513-24)

FIGURE 2 Timing of Delayed Coronary Obstruction Events Following TAVR Procedure



In an international registry of 17,092 TAVRs, the incidence of DCO was 38 (0.22%).

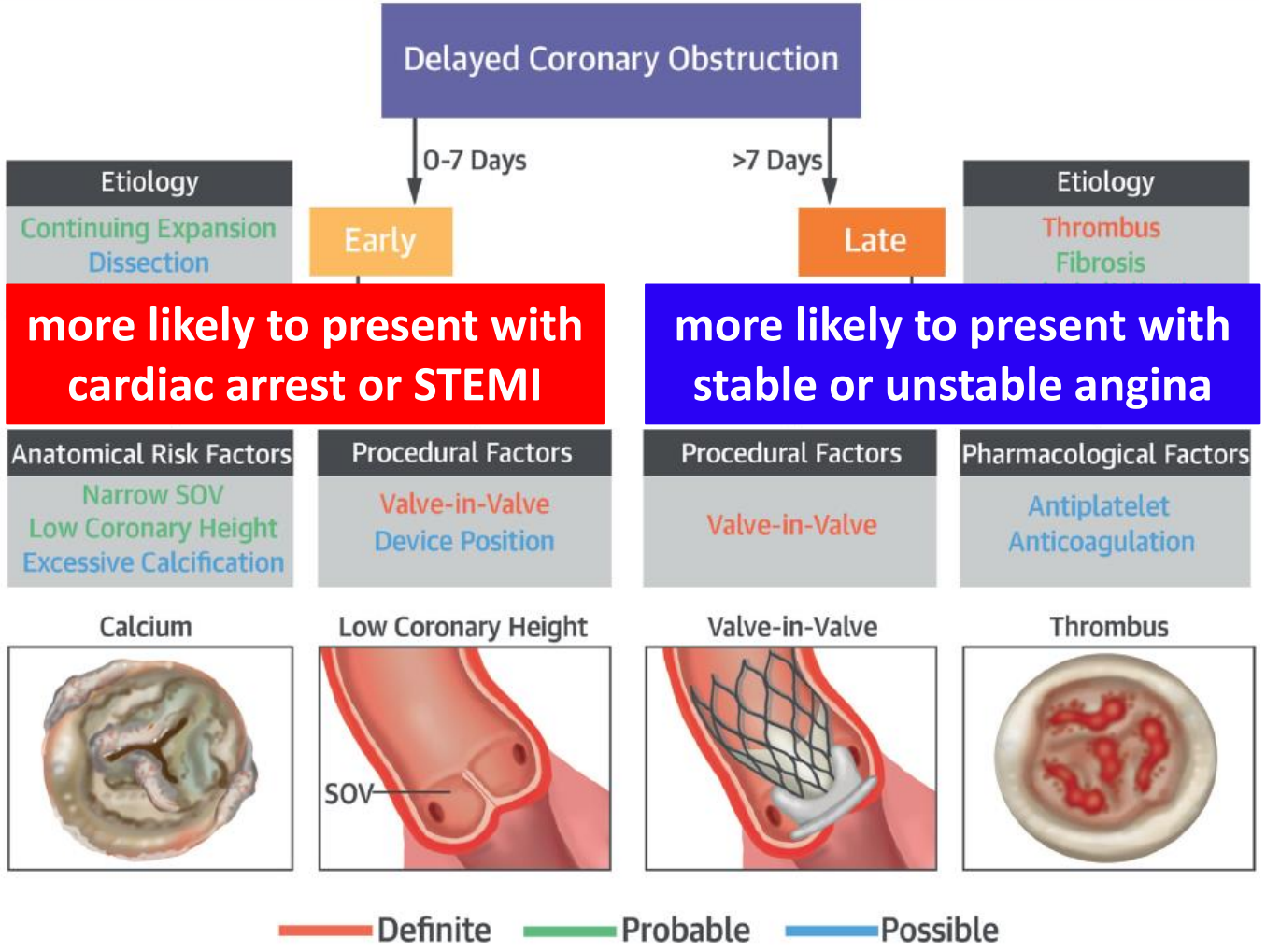
Late (> 60 days): 14 cases

Early (< 7 days)

18 cases occurring < 24h, and 6 cases from 24h – 7d. 9 in VIV TAVR.

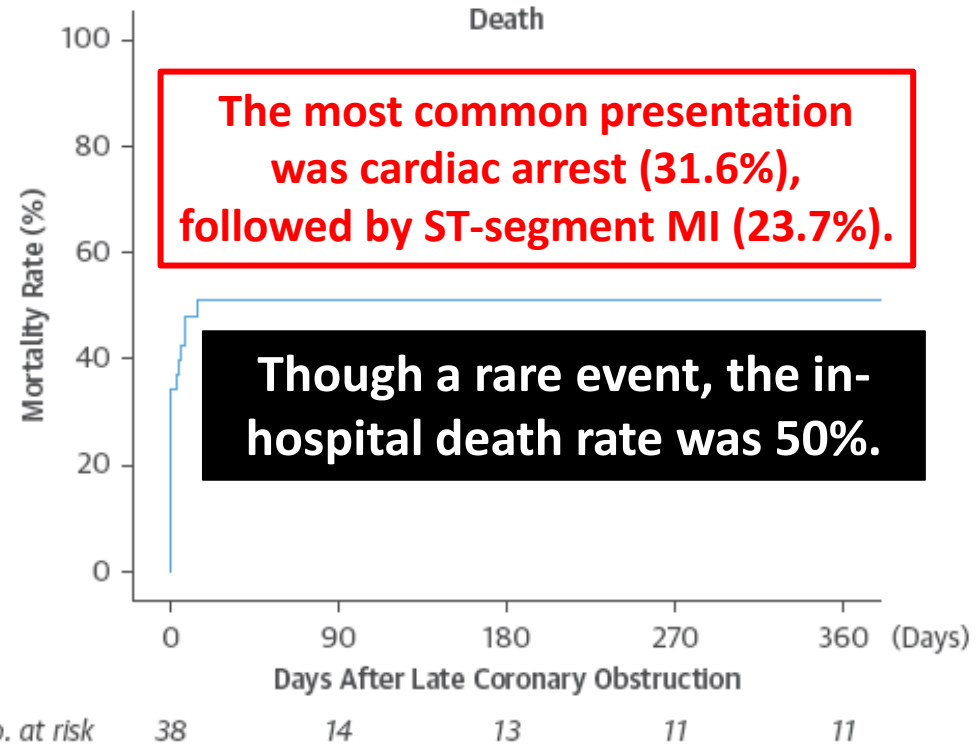
A rare but deadly complication of TAVR

CENTRAL ILLUSTRATION Etiology and Risk Factors for Delayed Coronary Obstruction



Jabbour, R.J. et al. J Am Coll Cardiol. 2018;71(14):1513-24.

FIGURE 3 Kaplan-Meier Curve of All-Cause Death After DCO



The most common presentation was cardiac arrest (31.6%), followed by ST-segment MI (23.7%).

Though a rare event, the in-hospital death rate was 50%.

The in-hospital death rate was 50% (n = 19). The median follow-up of the survivors following delayed coronary obstruction (DCO) was 375 days (interquartile range: 35 to 1,026 days), and no case of stent thrombosis or death occurred in any patient who survived to hospital discharge. One patient underwent target-vessel revascularization during the follow-up period.

Why is it important?

- ***It is less rare than we recognize!***
- The incidence of DCO may be higher than reported because **sudden cardiac death outside the hospital** may be the first manifestation and thus DCO may go undiagnosed **if no autopsy** is performed.
- As we move to lower-risk patients, there could be **a greater incidence** of delayed coronary obstruction occurring due to patients having **a longer life expectancy post-TAVR**.
- Patients may **be relatively protected** from the symptoms of coronary obstruction if they've had a **prior coronary artery bypass graft**.

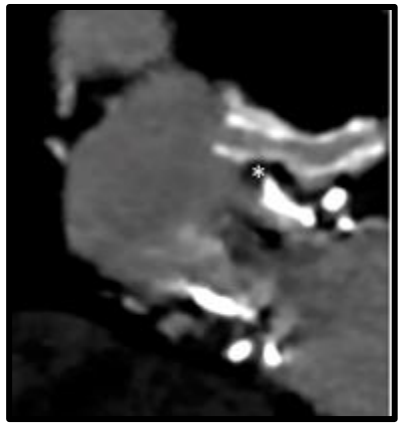
How to manage it?

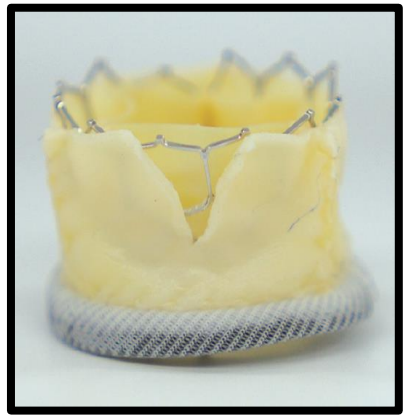
- **PCI with the use of 2 stents** with greater radial strength **overlapped at ostium** are possible solutions.

TABLE 5 Delayed Coronary Obstruction Details

	Overall (N = 38)	Early (0-7 Days) (n = 24)	Late (>7 Days) (n = 14)
LM revascularization	35	21	14
PCI	26 (74.3)	17 (81.0)	9 (64.3)
Successful	21 (80.8)	14 (82.4)	7 (77.8)
Unsuccessful	5 (19.2)	3 (17.6)	2 (22.2)
CABG	6 (17.1)†	2 (9.5)	4 (28.6)
Not attempted	4 (11.4)	2 (9.5)	2 (14.3)
RCA revascularization	10	7	3
PCI	6 (60.0)	4 (57.1)	2 (66.7)
Successful	1 (16.7)	1 (25.0)	0 (0.0)
Unsuccessful	5 (83.3)	3 (75.0)	2 (100.0)
CABG	3 (30.0)‡	1 (14.3)	2 (66.7)
Not attempted	3 (30.0)	3 (42.9)	0 (0.0)
Outcome			
In-hospital death	19 (50.0)	15 (62.5)§	4 (28.6)§

How to prevent it?



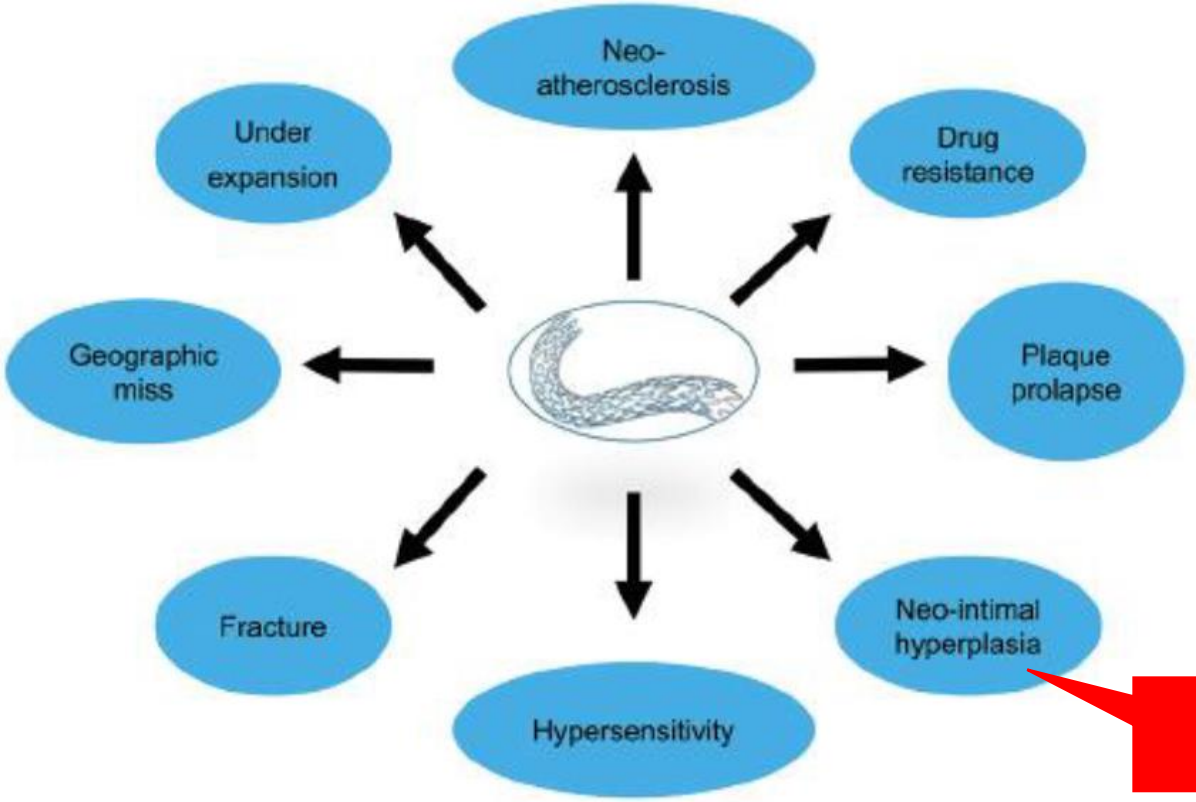


- ***There is no easy preventive strategy.***
- **Anticoagulants** to prevent valve thrombosis, and at the same time those anticoagulants could conceivably protect against the sinus filling up with clot…, **speculative**.
- **Preventive placing a chimney stent** or using stents with greater radial strength are possible solutions.
- For **valve-in-valve procedures**, the novel **BASILICA technique**, which involves intentionally lacerating the aortic leaflet before TAVR, may be considered.

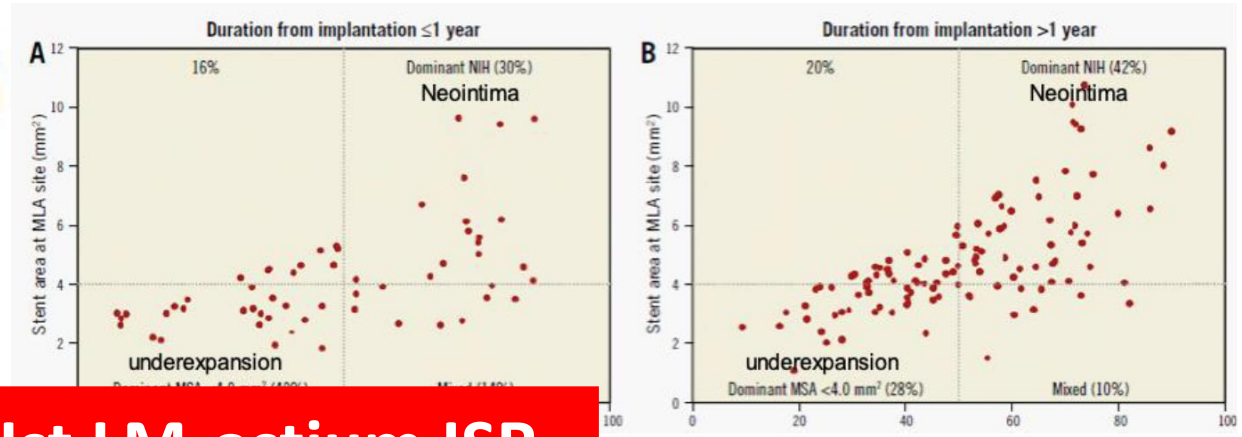
Another 3 LM-bifurcation ISR

Stent under-expansion is present in 75% of multilayer stent failures.

Technical & Biological Mechanisms of ISR



Stent under-expansion was found to be the cause of ISR in up to 40% of patients.



Ist LM-ostium ISR

rvention 2017;13:294-302.

- Avoid too aggressive oversizing → When you finish a case and ***left with not much sinus of Valsalva***, you need to give some thought to this possibility.
- When someone TAVR patient gets sick or when you're told someone has died suddenly, this is something you need to think about.
  → *We need to* ***have a lower threshold for imaging the coronary system post-TAVR!***

- **If PCI is feasible, use of 2 stents** with greater radial strength **overlapped at ostium** are possible solutions. (?preventive stenting)
- **Avoid unnecessary LM-bifurcation multi-layer stenting if possible!**
- Optimize PCI results by **image guidance** is of paramount importance.


Thank you!