Assessment of stent edge dissection by FFR

2015. 4. 30

Eun-Seok Shin, MD,PhD

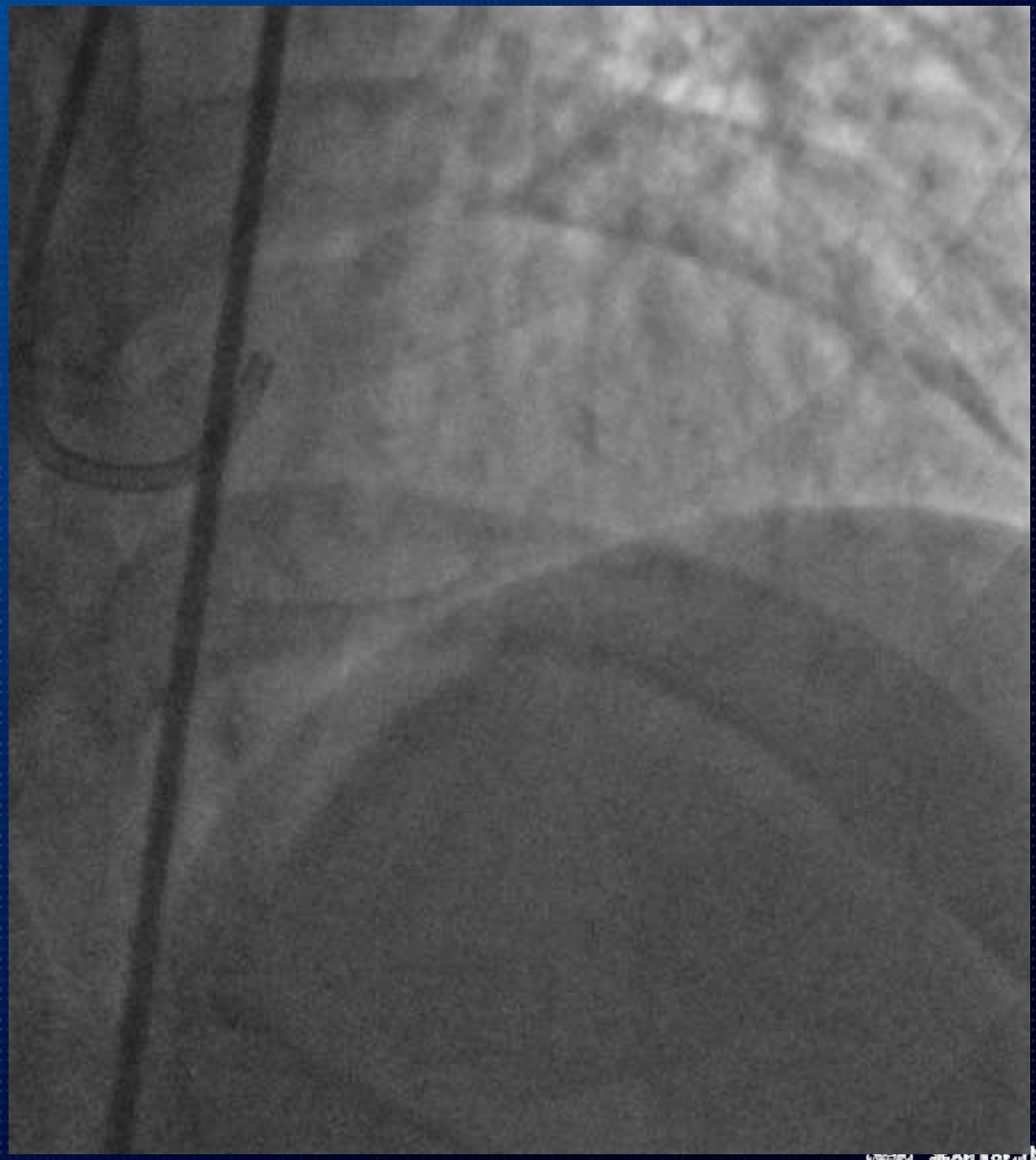
Division of Cardiology
Ulsan University Hospital
University of Ulsan College of Medicine

울산대학교병원
ULSAN UNIVERSITY HOSPITAL

Case 1: M / 61 years

Chest pain on exertion a week ago

Risk Factors:
Hypertension (+)
Dyslipidemia (+)



Stenting at pLAD

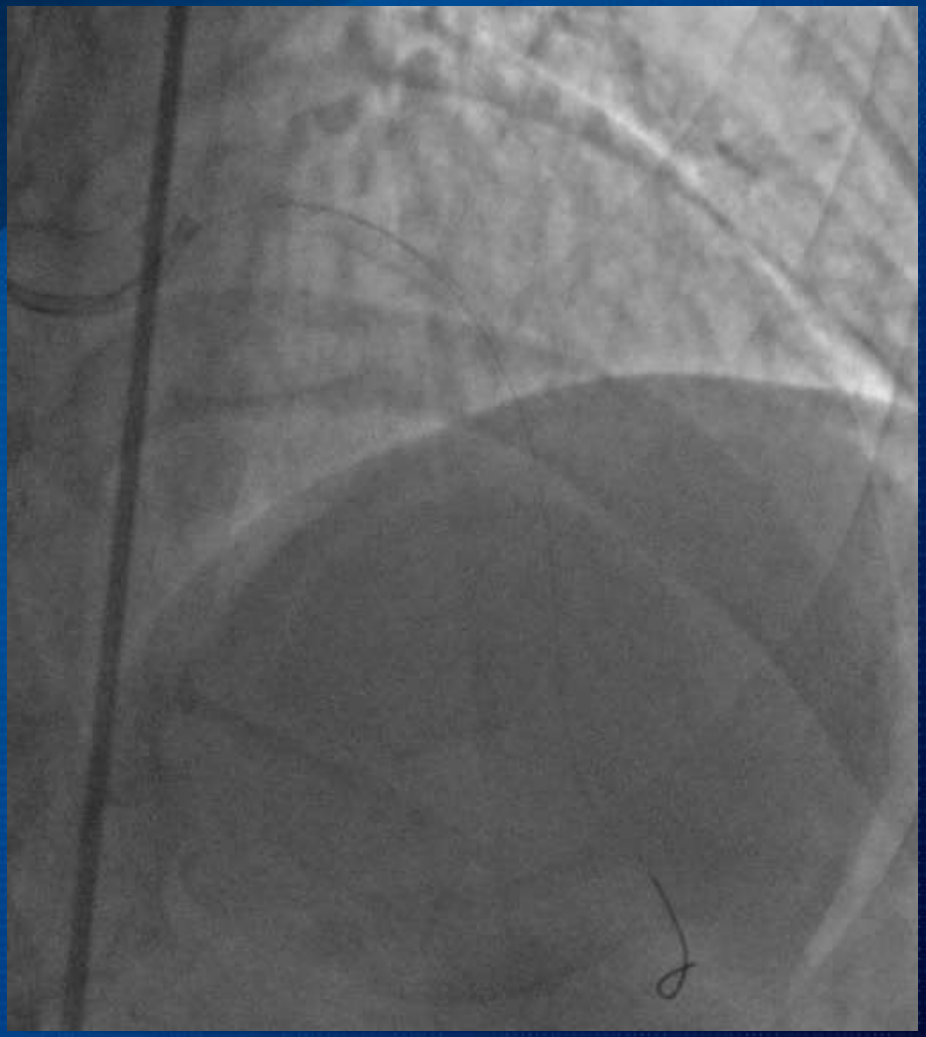
FFR: 0.70→ 0.42

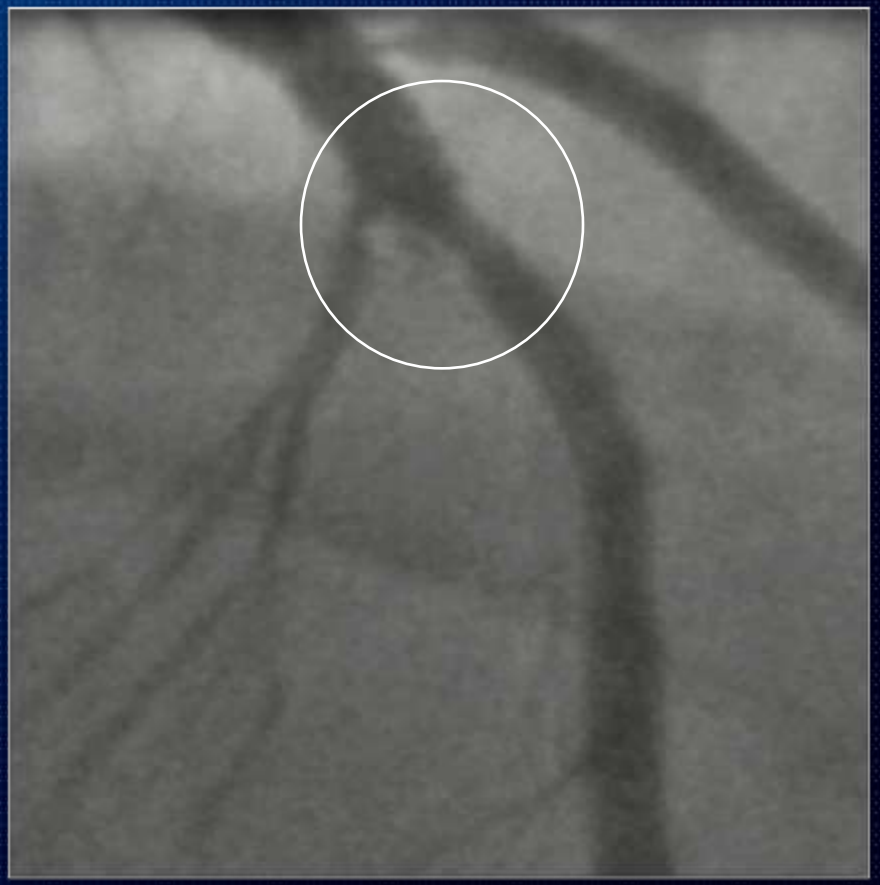
Balloon angioplasty

Stenting

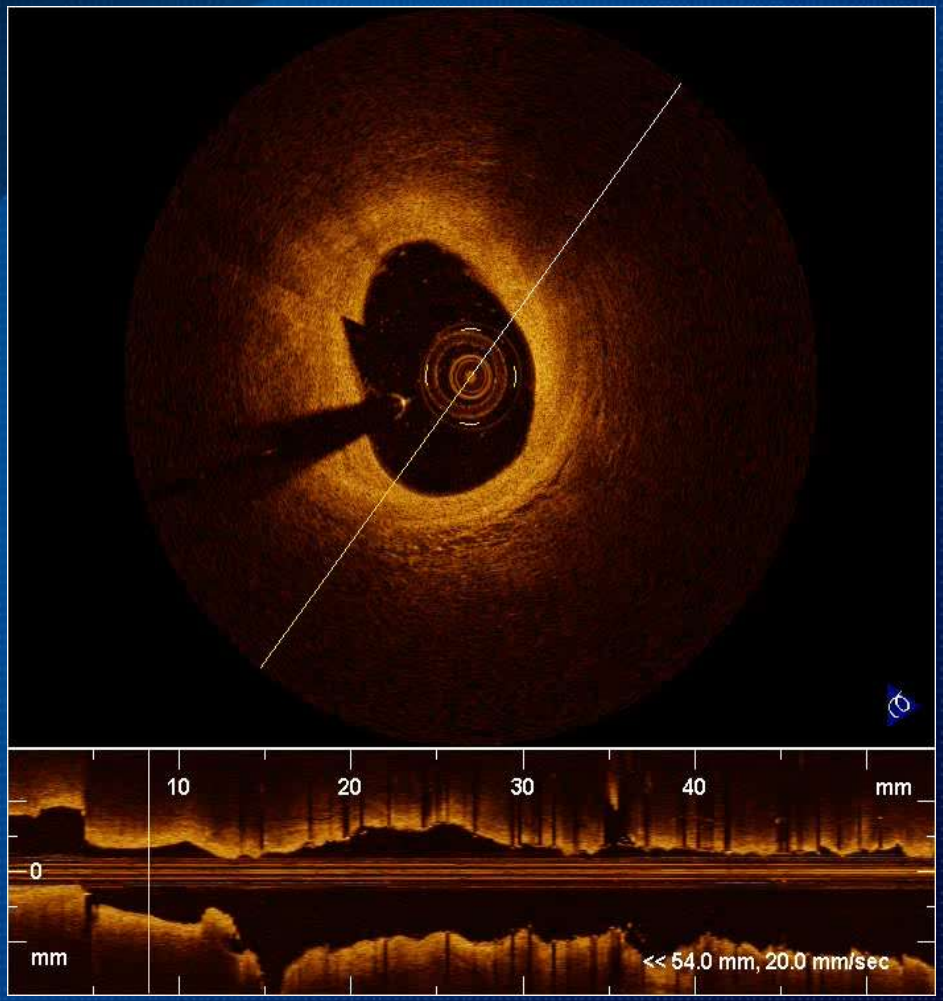
DES 3.5/38mm

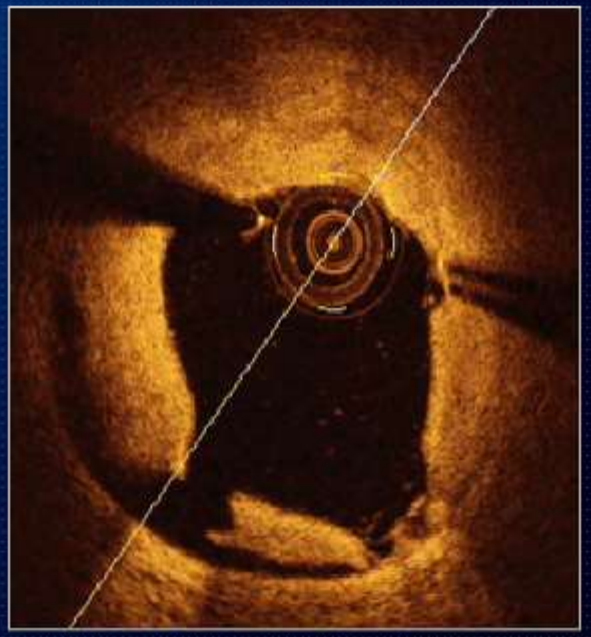
Coronary angiography after stenting

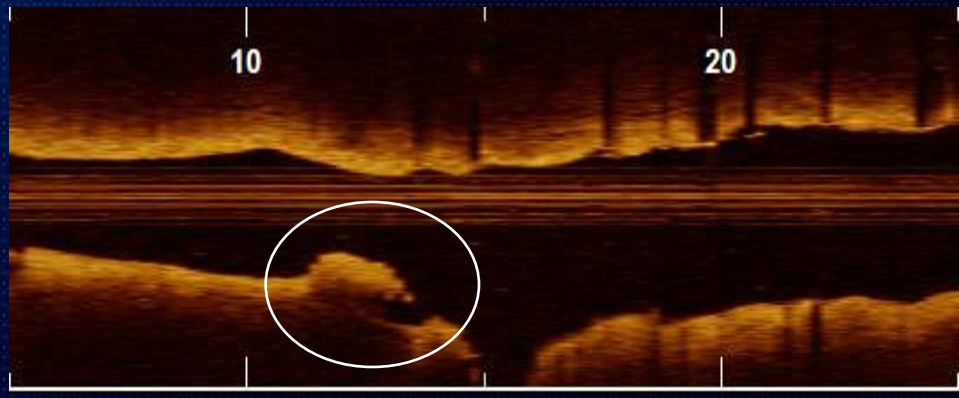




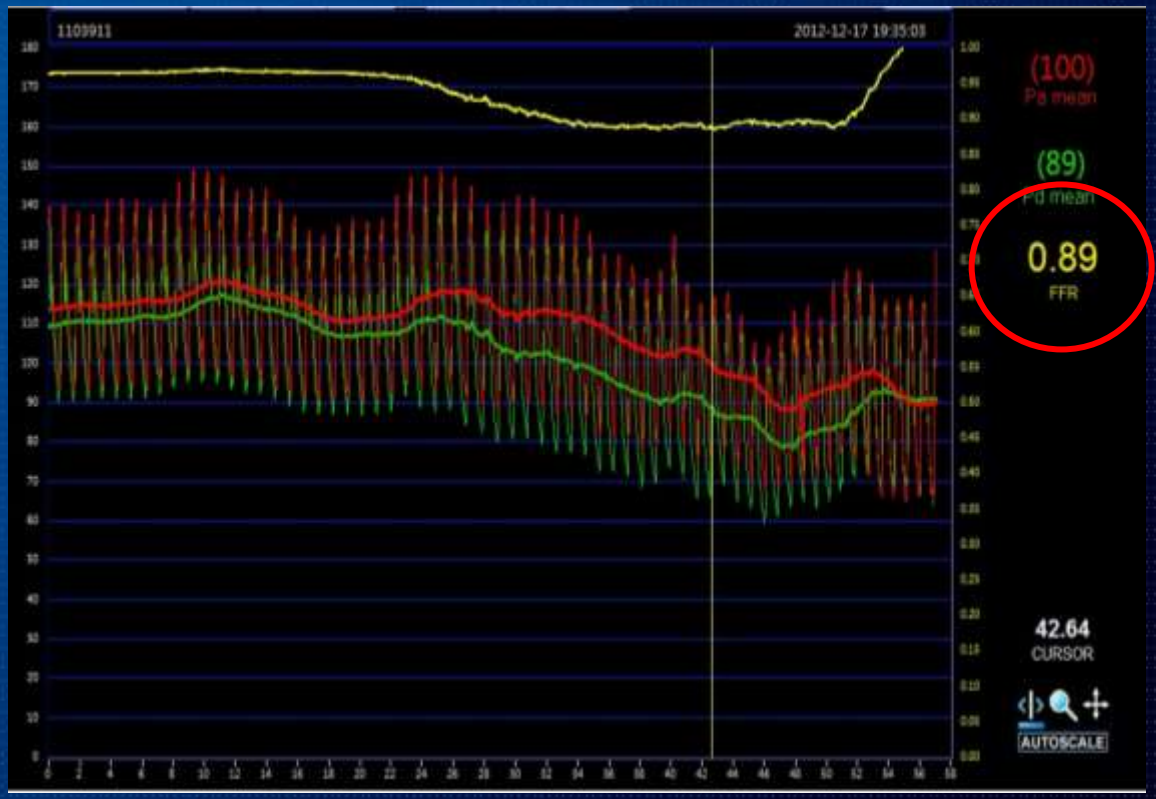
Final OCT





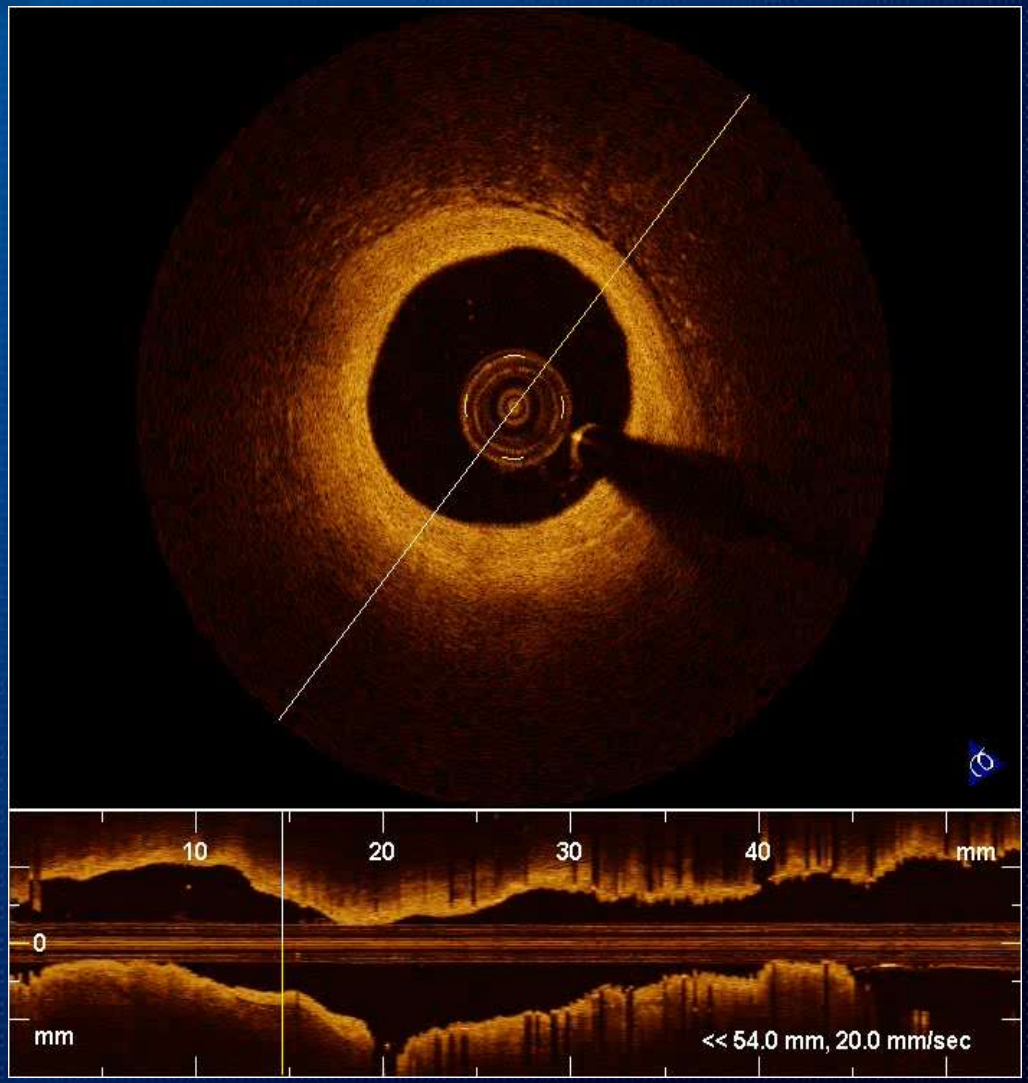


FFR after stenting



FFR:0.97 → 0.89

9 months follow-up

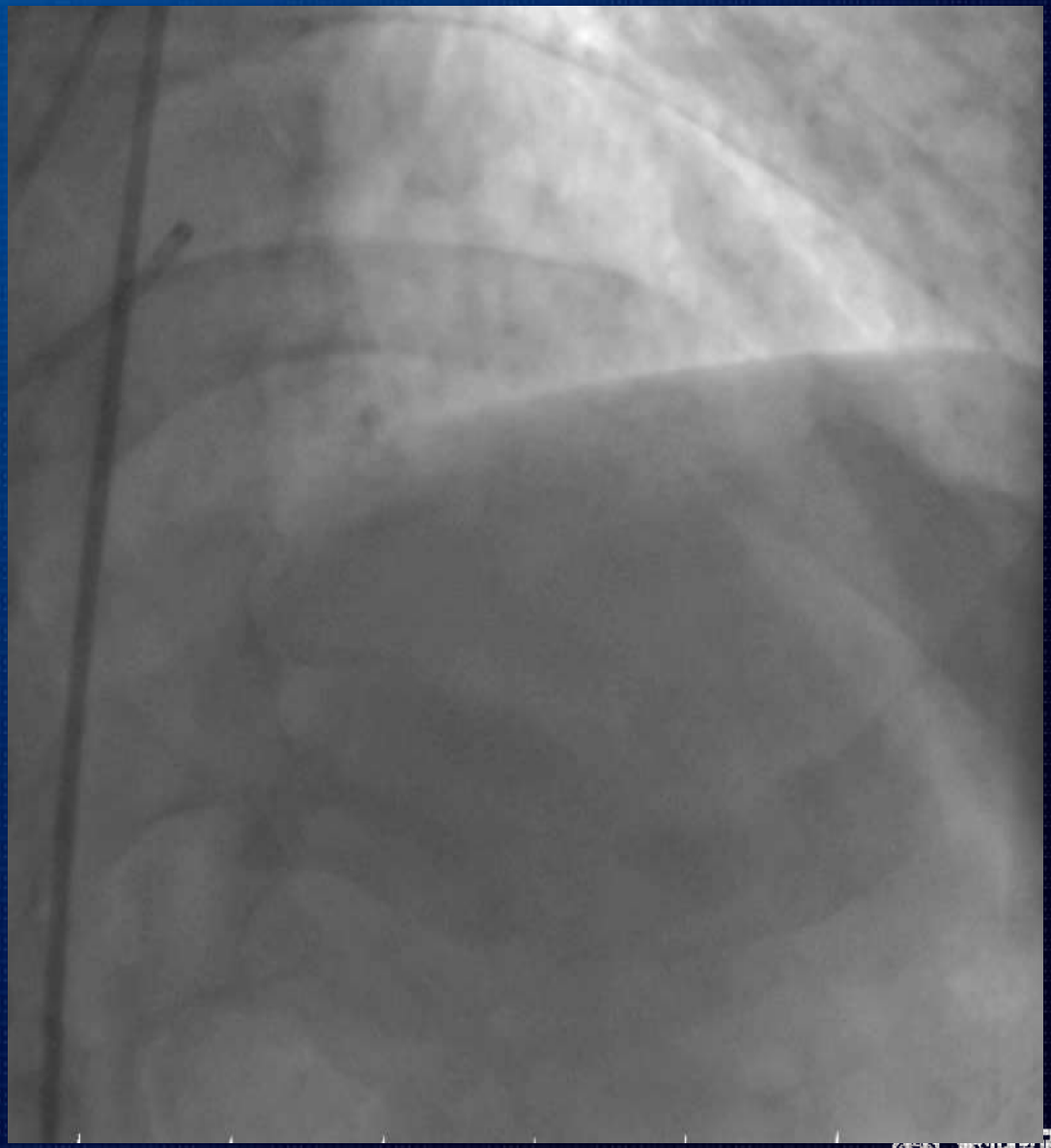


Case 2: M / 78 years

Chest pain on exertion a week ago

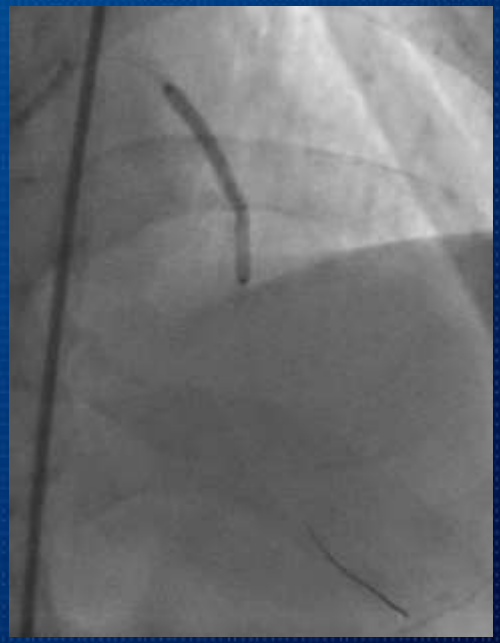
Risk Factors:
Hypertension (+)
Dyslipidemia (+)

Treadmill test (+)

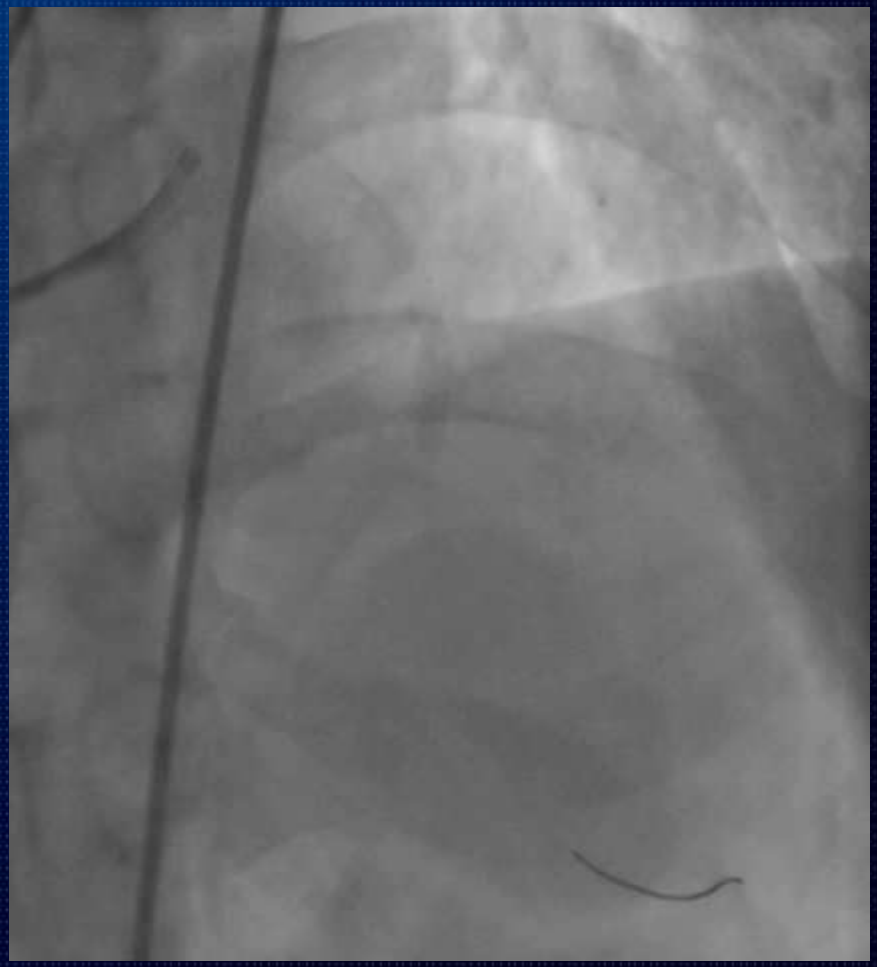


Stenting at LAD

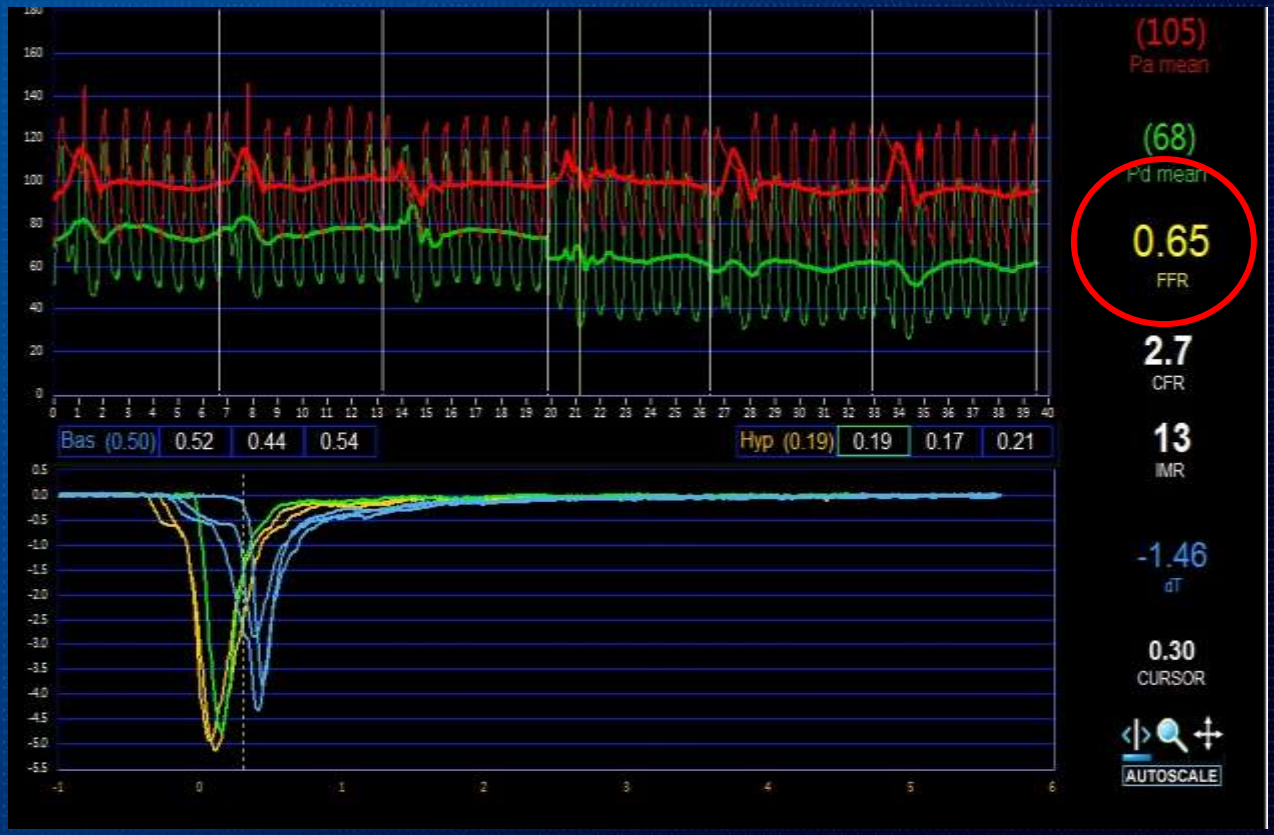
Balloon angioplasty



Stenting
DES 3.0 x 38 mm

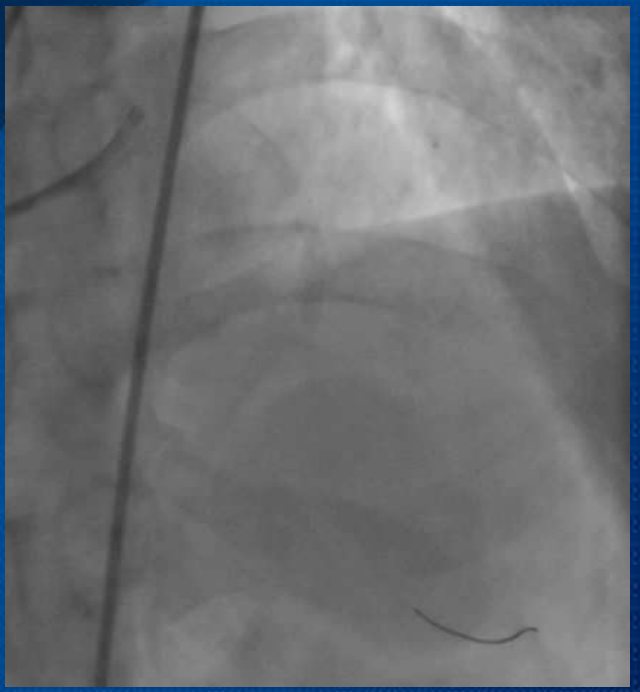


FFR after stenting

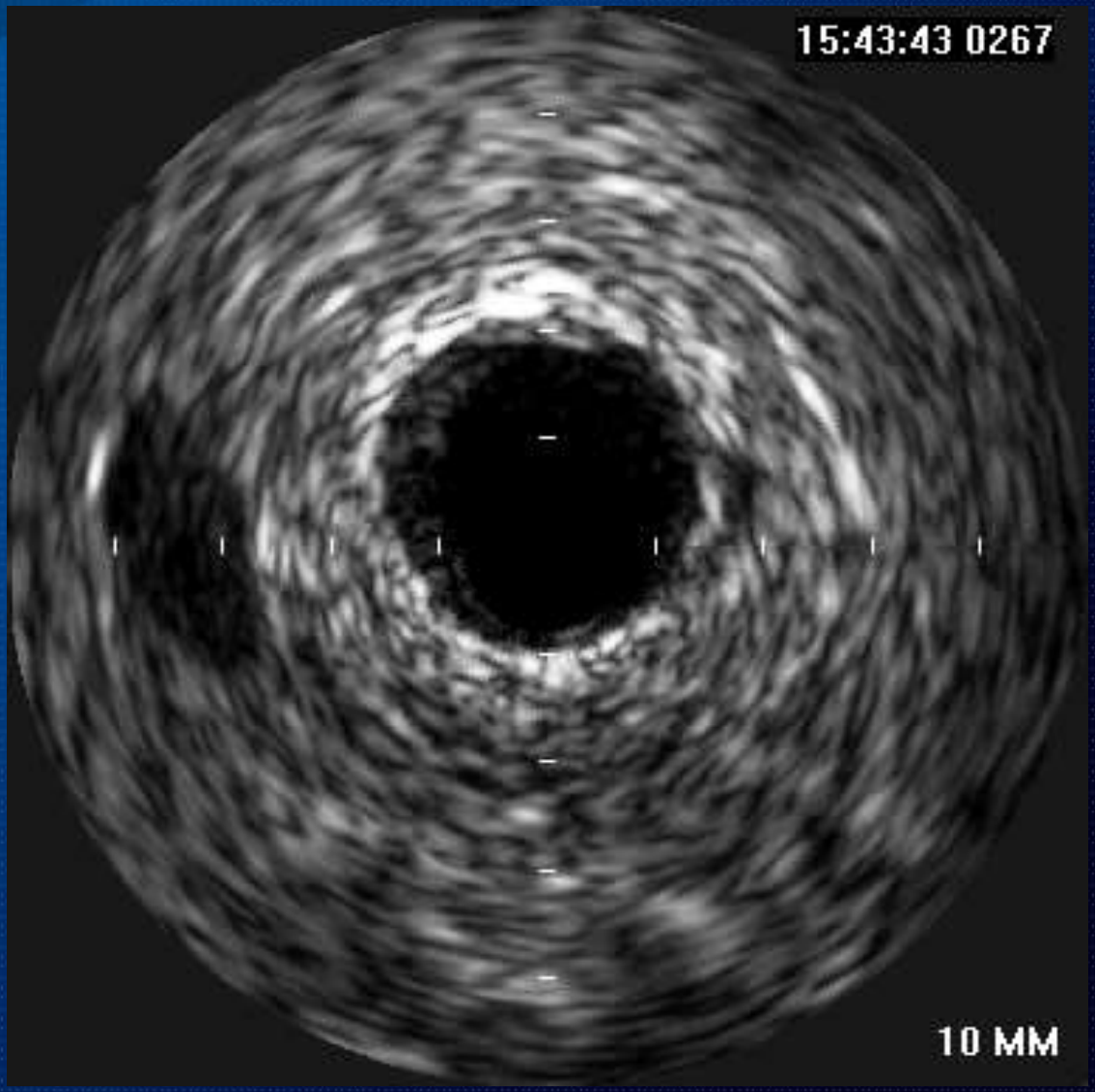


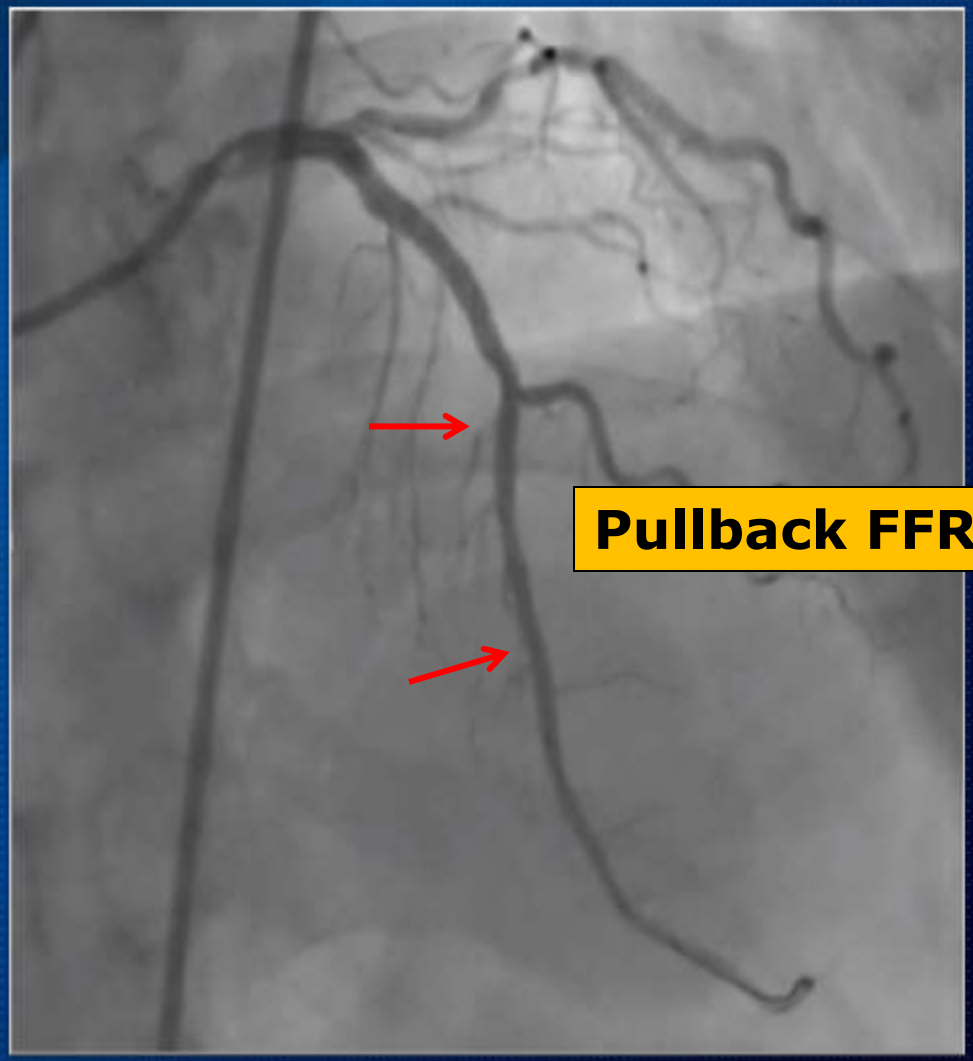
FFR: 0.80 → 0.65

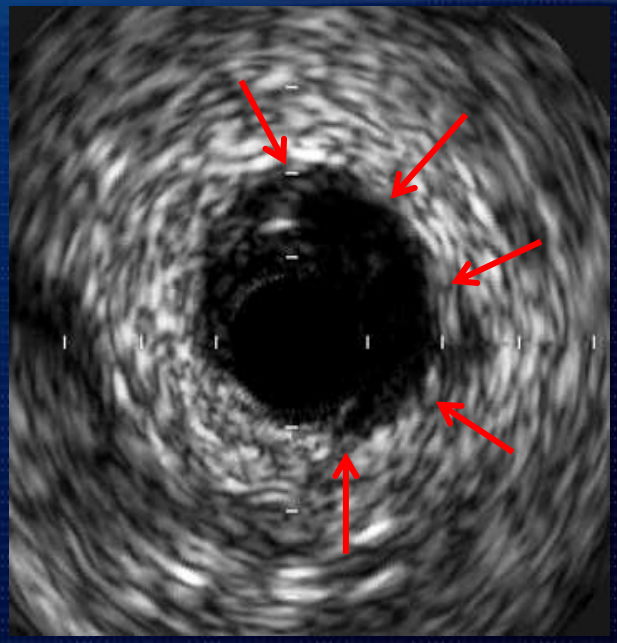
Angiography Review



Post-stent IVUS



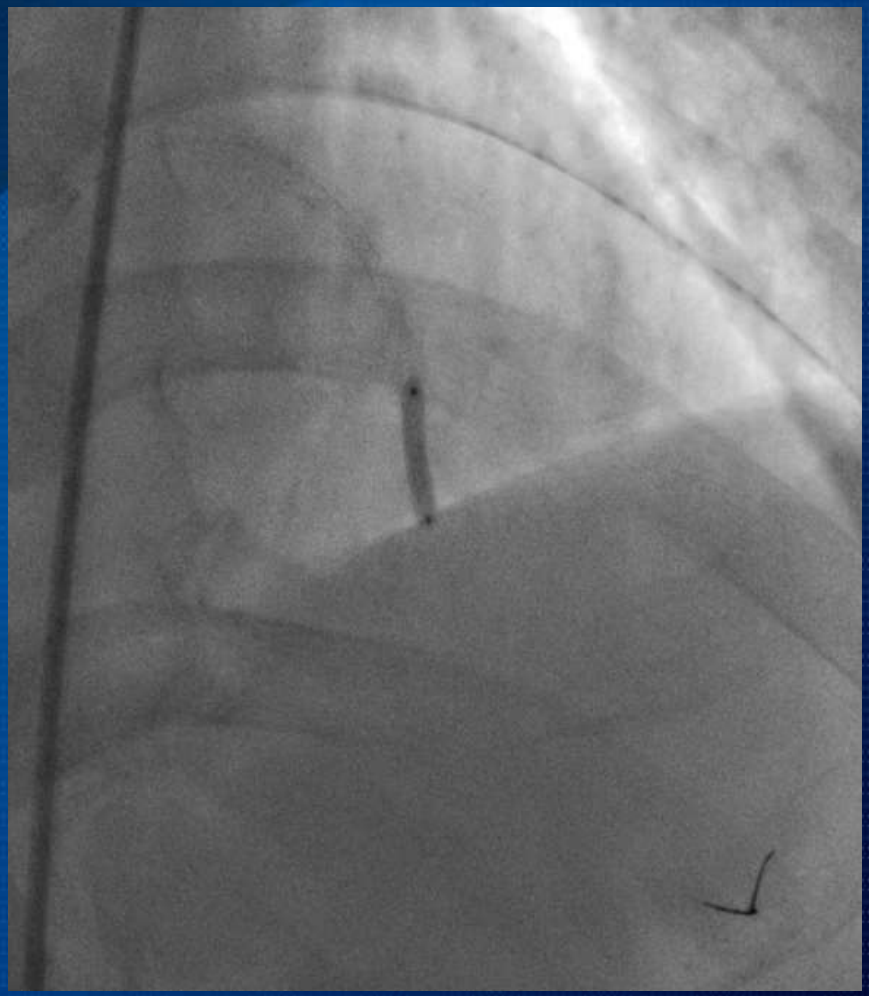


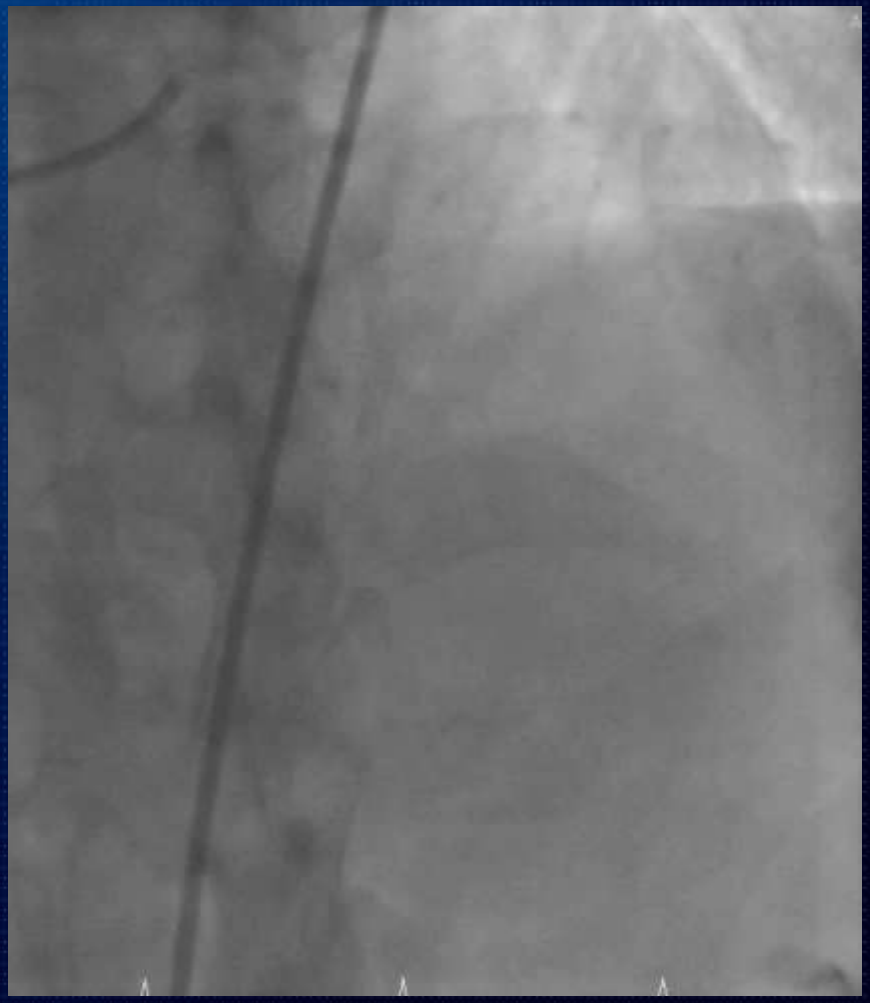


Pullback FFR: 0.65 → 0.89

Δ FFR 0.24

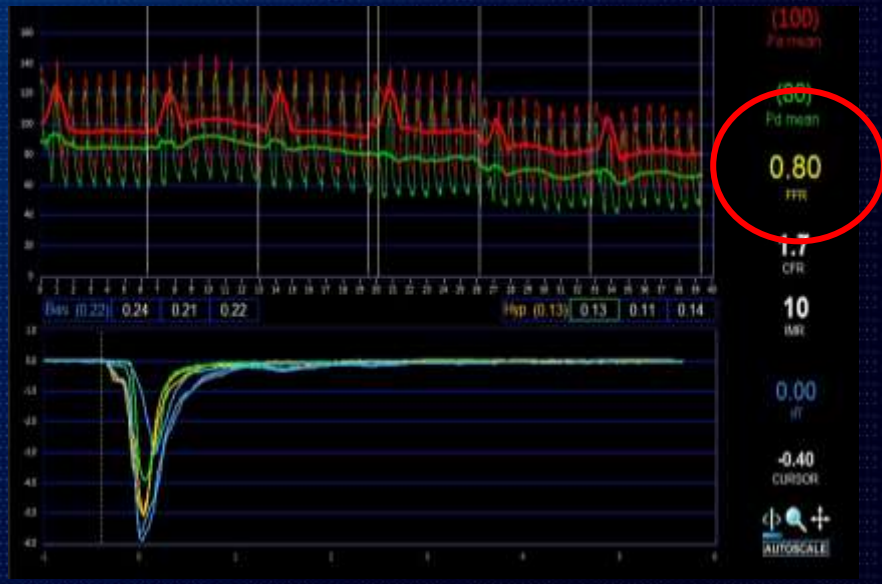
Additional Stenting at ED





DES 2.75 x 14 mm

FFR after additional stenting



FFR: 0.80→ 0.65

FFR: 0.90→ 0.80

울산대학교병원
ULSAN UNIVERSITY HOSPITAL

Background

- Incidence of ED after PCI
  - Angiography: ~6%
  - IVUS and OCT: ~24%

- Stent ED detected angiographically have been associated with increased MACE and stent thrombosis

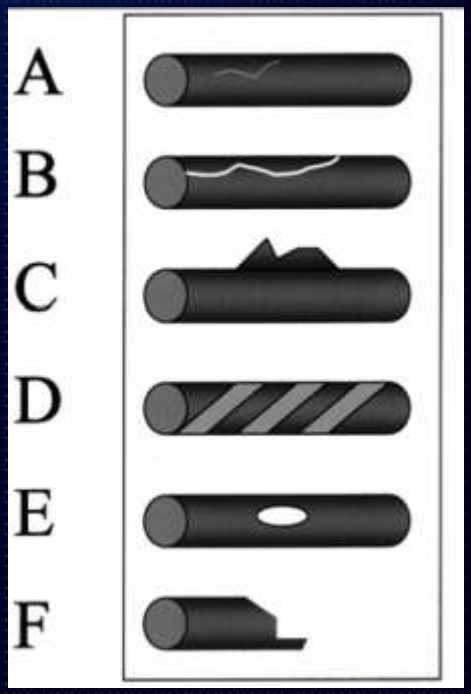
- Functional assessment has not been studied yet.
  → Is FFR-guided management effective?

Objective

- To investigated the relationship between FFR and the angiographic type of stent edge dissections
- To assess the use of FFR-guided management for edge dissection

Study population

- Patients enrolled from 3-vessel FFR trial (NCT01621438)
- 50 patients (51 dissections) out of 989 cases
- Inclusion: lesions with ED seen after stent implantation and corresponding FFR measurement
- ED was classified as types A to F
- Additional stent implantation for ED was operator dependent and based on the angiographic severity and FFR value



Coronary Artery angiographic changes after PTCA: Manual of Operations NHBLI PTCA Registry 985-6:9

Study results

Patient Demographics , n (%)

Age, years	61.3 ± 9.5
Male	37 (74)
Hypertension	31 (62)
Diabetes	19 (38)
Hypercholesterolemia	24 (48)
Current smoking	10 (20)
Family history of coronary disease	8 (16)
Prior myocardial infarction	2 (4)
Prior PCI	9 (18)

Clinical presentation, %

Stable angina	26 (52)
Unstable angina	18 (36)
Acute myocardial infarction	6 (12)

Lesion characteristics

Lesion type	B2 or C	38 (74.6)
Stent	Diameter, mm	3.1 ± 0.4
	Length, mm	31.4 ± 12.8
	Pressure, atm	11.4 ± 3.2

Edge dissections

Vessel	LAD	31 (60.8)
	LCX	8 (15.7)
	RCA	12 (23.5)
Location	Proximal stent	13 (25.5)
	Distal stent	38 (74.5)

Angiographic & QCA findings

- Type A: 47.1% (n=24)
- Type B: 41.2% (n=21)
- Type C: 2.0% (n= 1)
- Type D: 9.8% (n= 5)

	Edge Dissection type				
	A (n = 24)	B (n = 21)	C (n = 1)	D (n = 5)	p value
Proximal RD, mm	2.97 ± 0.40	2.94 ± 0.53	2.34	2.67 ± 0.42	0.290
Distal RD, mm	2.49 ± 0.56	2.50 ± 0.50	1.75	1.81 ± 0.30	0.022
MLD, mm	2.19 ± 0.43	2.10 ± 0.61	1.42	0.77 ± 0.44	0.002
DS, %	17.2 ± 8.4	22.7 ± 13.8	26.0	64.8 ± 17.4	0.002
LL, mm	7.1 ± 2.2	7.8 ± 3.8	15.0	17.0 ± 5.2	0.005
FFR	0.87 ± 0.09	0.86 ± 0.07	0.72	0.57 ± 0.08	0.002

Treatment and clinical outcomes

- No Tx: 78.4% (n=40)
- Additional stents: 21.6% (n=11)
- Type A & B:17.8% had FFR ≤ 0.8 and 50% of them received additional stents
- Type C & D: All had FFR ≤ 0.8 and received additional stents

	FFR ≤ 0.8		FFR > 0.8	
	No treatment	Additional stenting	No treatment	Additional stenting
	(n = 4)	(n = 10)	(n = 36)	(n = 1)
Dissection type				
A	2	1	21	0
B	2	3	15	1
C	0	1	0	0
D	0	5	0	0

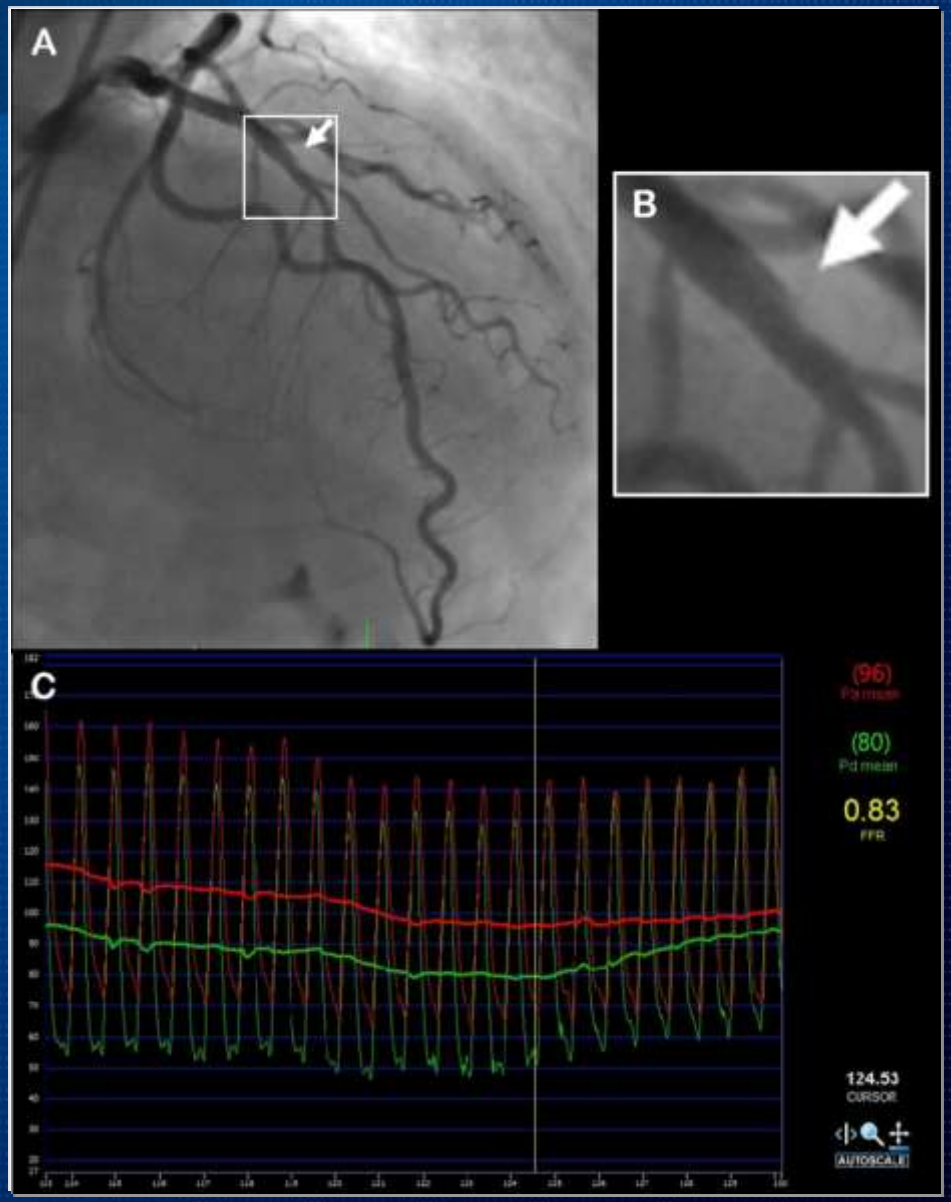
ED characteristics

- ED at distal stent edge: 74.5%
  vs. proximal edge: 25.5%

- Lesions with additional stents had:
  - FFR ≤0.8, DS >50%, and/or LL >15mm

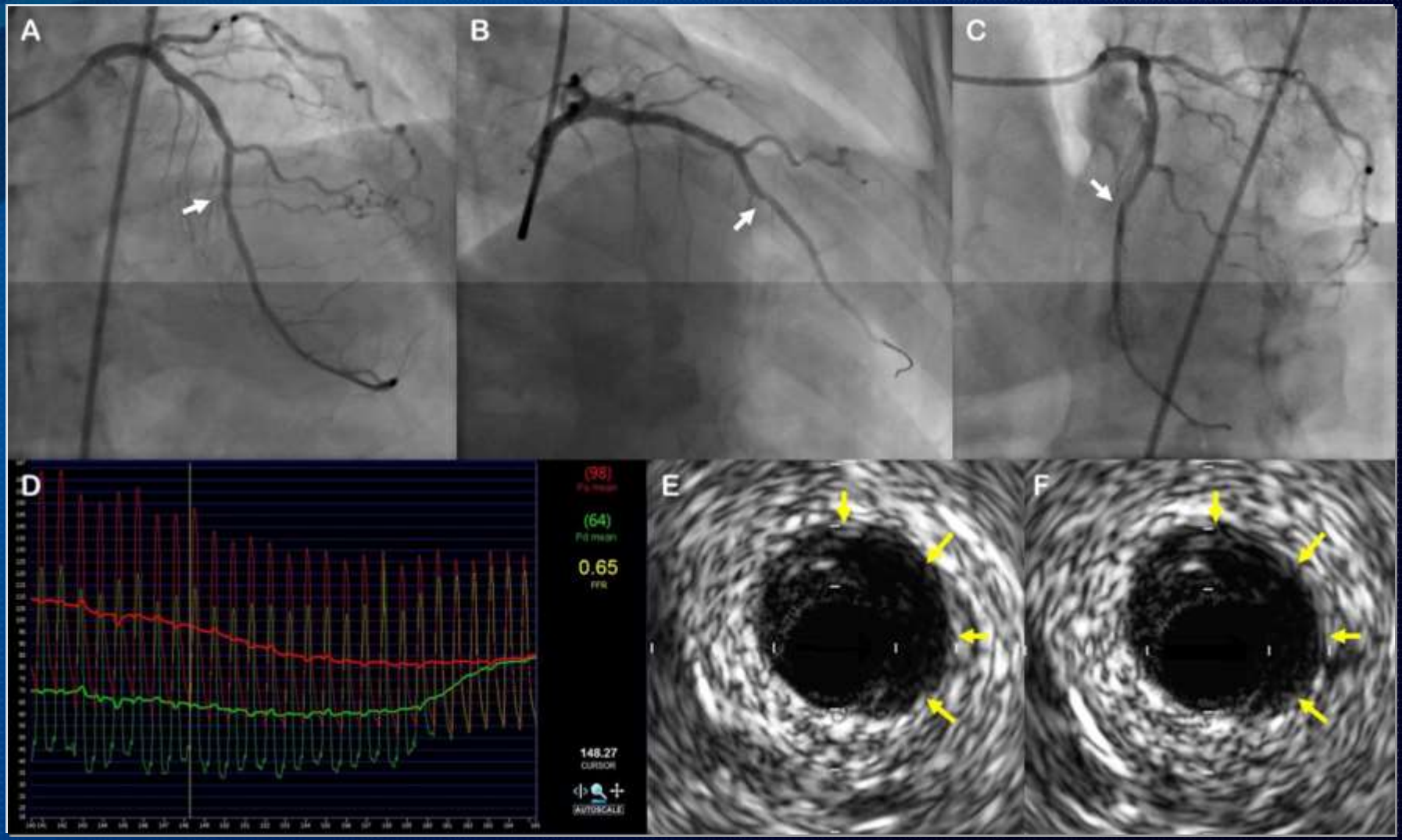
- Main concern lies with
  - Types A and B with FFR ≤0.8

Type B stent ED with high FFR



- Type B ED with FFR >0.8
  → No Tx

Type A stent ED with low FFR



Type A, but FFR ≤0.8 & pressure step-up, additional stent
→ FFR 0.84

Conclusions

- FFR correlates well with the angiographic type of ED.
- Severe ED (types C & D)
  - ✓ Angiographic findings are sufficient for treatment
- Mild ED (types A & B)
  - ✓ FFR-guided management may help the decision on further treatment

International Journal of Cardiology 185 (2015) 29–33

Contents lists available at ScienceDirect

International Journal of Cardiology

journal homepage: www.elsevier.com/locate/ijcard

Assessment of stent edge dissections by fractional flow reserve

Ju-Hyun Chung [a,1], Soe Hee Ann [a,1], Bon-Kwon Koo [b], Chang-Wook Nam [c], Joon-Hyung Doh [d], Gillian Balbir Singh [a], Hyung Il Kim [e], Eun-Seok Shin [a,*]

[a] Division of Cardiology, Department of Internal Medicine, Ulsan University Hospital, University of Ulsan College of Medicine, Ulsan, South Korea
[b] Department of Internal Medicine and Cardiovascular Center, Seoul National University Hospital, Seoul, South Korea
[c] Department of Internal Medicine, Keimyung University College of Medicine, Dongsan Medical Center, Daegu, South Korea
[d] Division of Cardiology, Inje University Ilsan Paik Hospital, South Korea
[e] Suntech Research Center, Seoul, South Korea

ARTICLE INFO

Article history:
Received 22 September 2014
Received in revised form 23 February 2015
Accepted 3 March 2015
Available online 4 March 2015

Keywords:
Stent edge dissection
Fractional flow reserve
Drug eluting stent

ABSTRACT

Backgrounds: Edge dissections after intervention have been studied with imaging techniques, however, functional assessment has not been studied yet. We investigated the relationship between fractional flow reserve (FFR) and the angiographic type of stent edge dissections and tried to assess the use of FFR-guided management for edge dissection.

Methods: 51 edge dissections assessed by FFR were included in this prospective observational study. FFR was measured for each type of edge dissection and compared with quantitative coronary angiographic findings. Clinical outcomes were evaluated based on FFR measurements.

Results: Edge dissections were classified as type A (47.1%; 24/51), type B (41.2%; 21/51), type C (2.0%; 1/51) and type D (9.8%; 5/51). Mean FFR in type A dissection was 0.87 ± 0.09, in type B 0.86 ± 0.07, in type C 0.72 and in type D 0.57 ± 0.08. All type C and D dissections (6/51) had FFR ≤0.8 and were treated with additional stents. Among the 45 type A and B dissections, 8 had a FFR ≤0.8 (17.8%), and 50% received additional stenting. All dissections with FFR >0.8 were left untreated except one long dissection case. There was no death, myocardial infarction or target lesion revascularization during hospitalization or the follow-up period (median 152 days; IQR 42–352 days).

Conclusions: FFR correlates well with an angiographic type of edge dissection. Angiographic findings are sufficient for deciding the treatment of severe dissections such as types C and D, while FFR-guided management may be safe and effective for mild edge dissections such as types A and B.