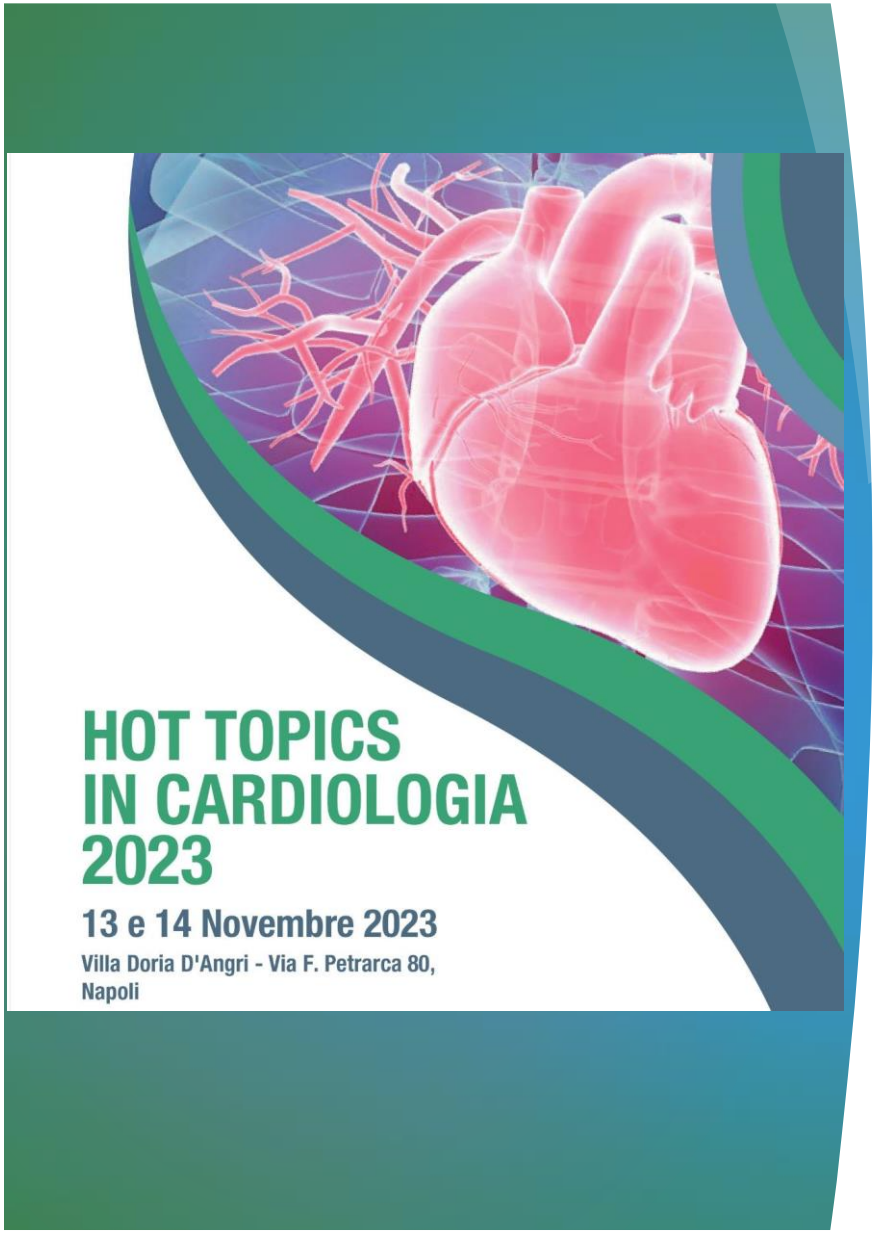


Imaging intracoronarico nelle SCA

Gennaro Galasso
Direttore Scuola di Specializzazione
Malattie dell'Apparato
Cardiovascolare
Università degli Studi di Salerno

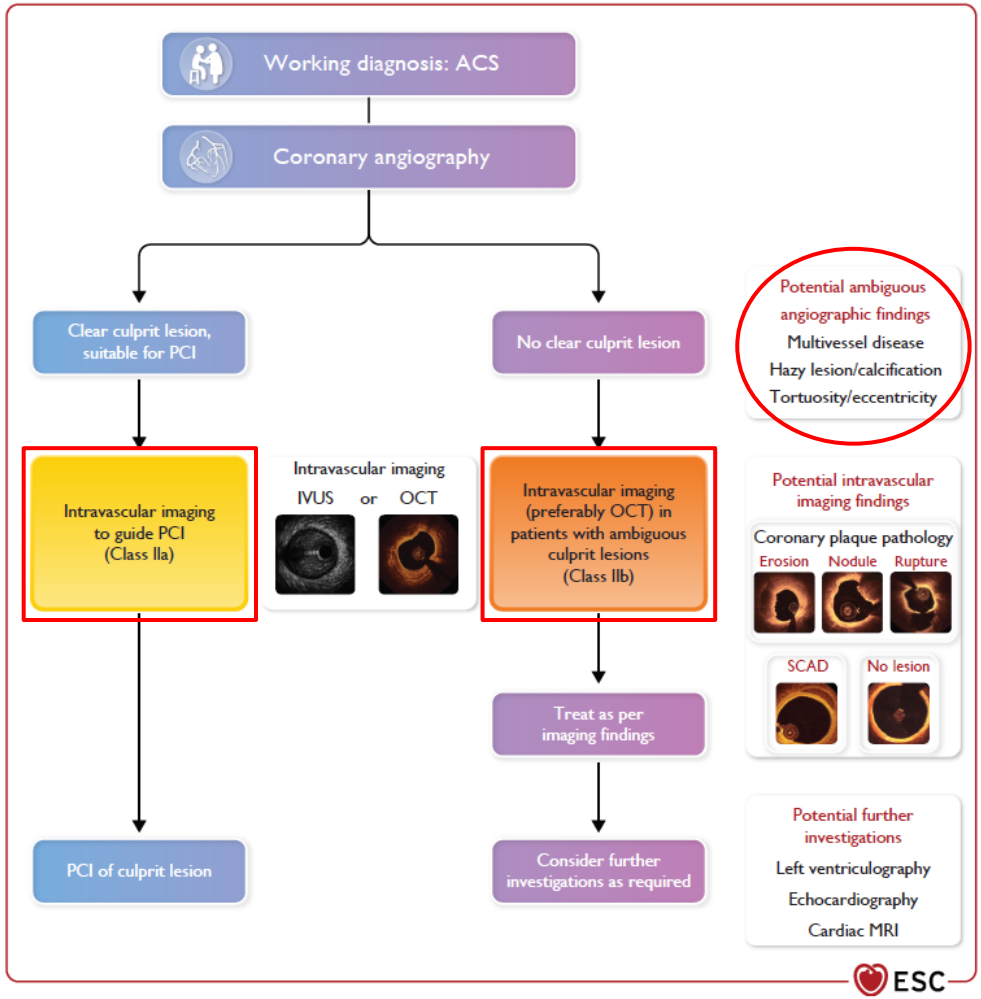
CARDIOUNISA

Why should I do intracoronary imaging in ACS?

- Optimizing PCI
- CAG is not perfect in identifying culprit lesion
- CAG may not identify non-atherosclerotic causes of ACS
- CAG will not identify lesion morphology which may help in tailoring the therapy
- CAG will not delineate the mechanism of stent failure

Intracoronary imaging in ACS

Recommendations from the guidelines



Byrne RA, 2023 ESC Guidelines for the management of acute coronary syndromes, Eur Heart J 2023

Diagnostic or anatomic uncertainties

Possible mechanisms of ACS

- Plaque Rupture
- Plaque Erosion
- Calcified Nodule
- Spontaneous Coronary Dissection
- Coronary Embolism
- Coronary Spasm
- Takotsubo Cardiomyopathy

Not every case needs a stent

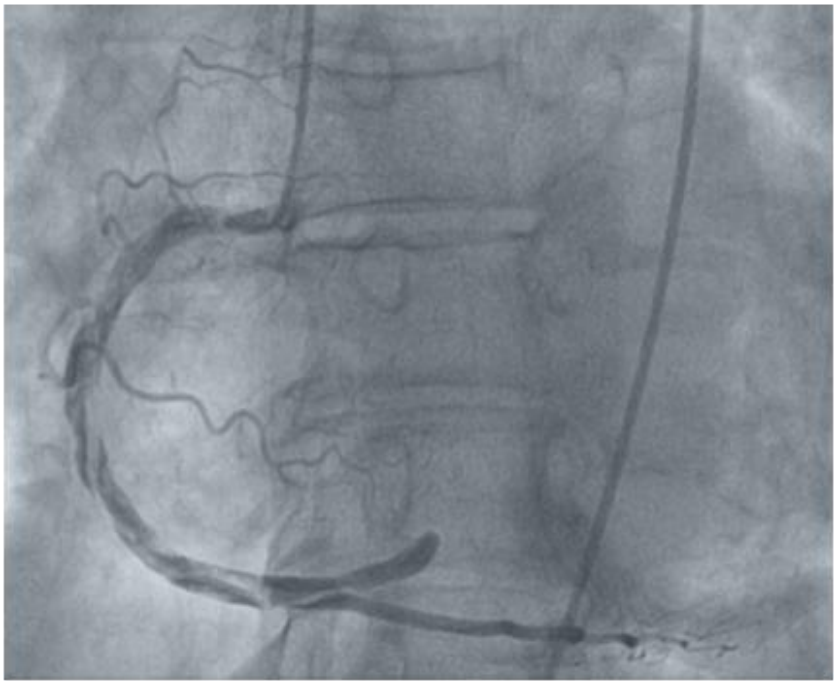
… But every patient needs a diagnosis!

Spontaneous coronary artery dissection

2-4% of angiograms undertaken for ACS
High incidence in pre-menopausal women (<50 yy) with STEMI (about 10% of cases)

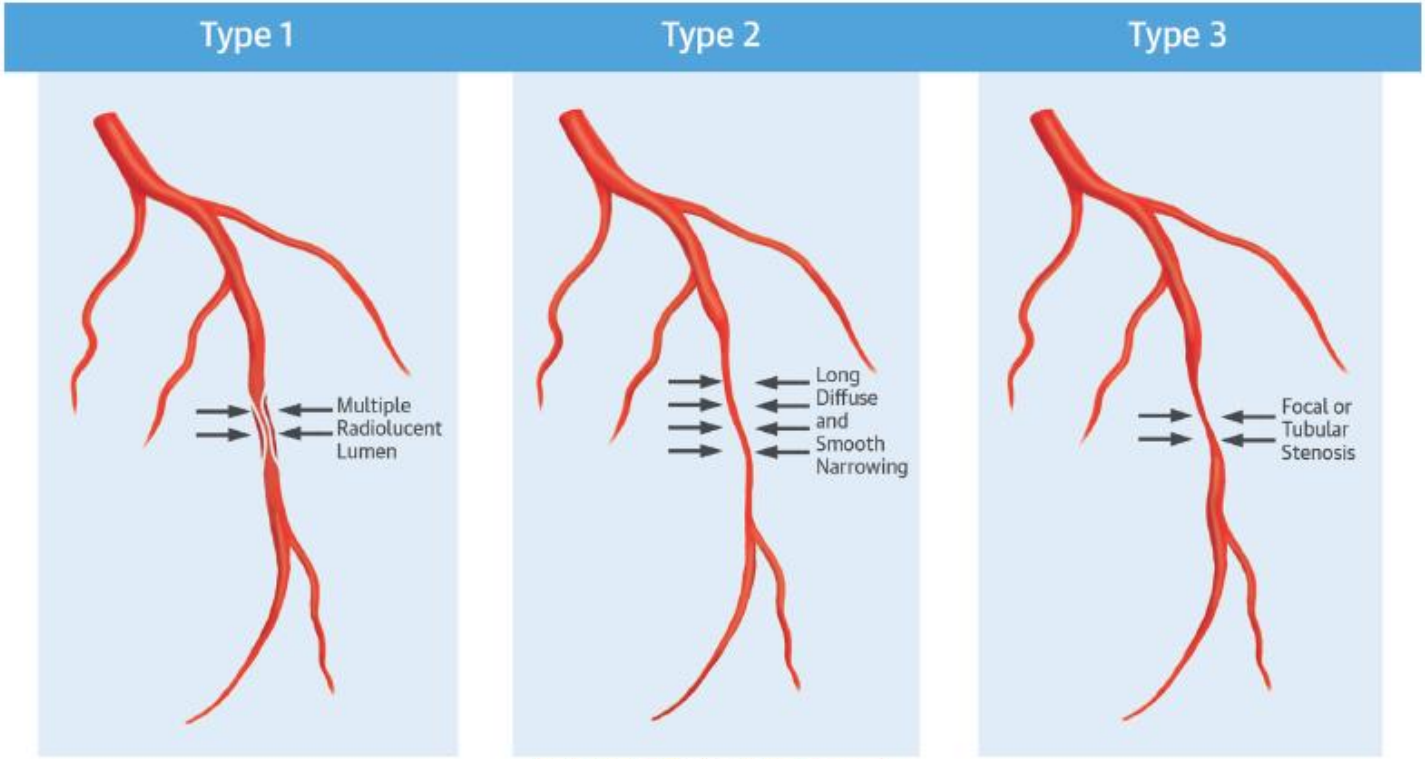
CAG of SCAD

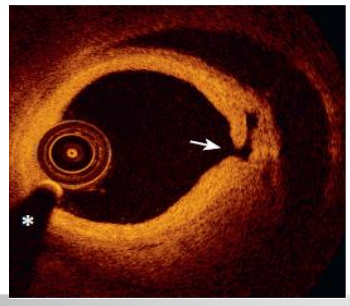
- appearance of extraluminal contrast staining multiple radiolucent lumens
- spiral dissection
- Intraluminal filling defects

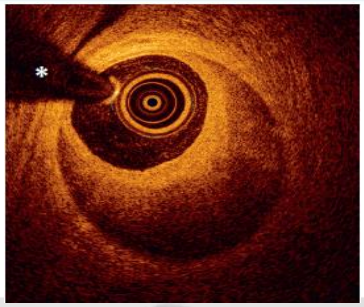


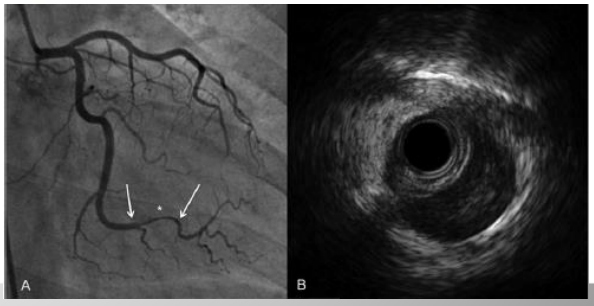
CAG is a 2-dimensional luminogram. It does not image the arterial wall!

Spontaneous Coronary Artery Dissection
Classification



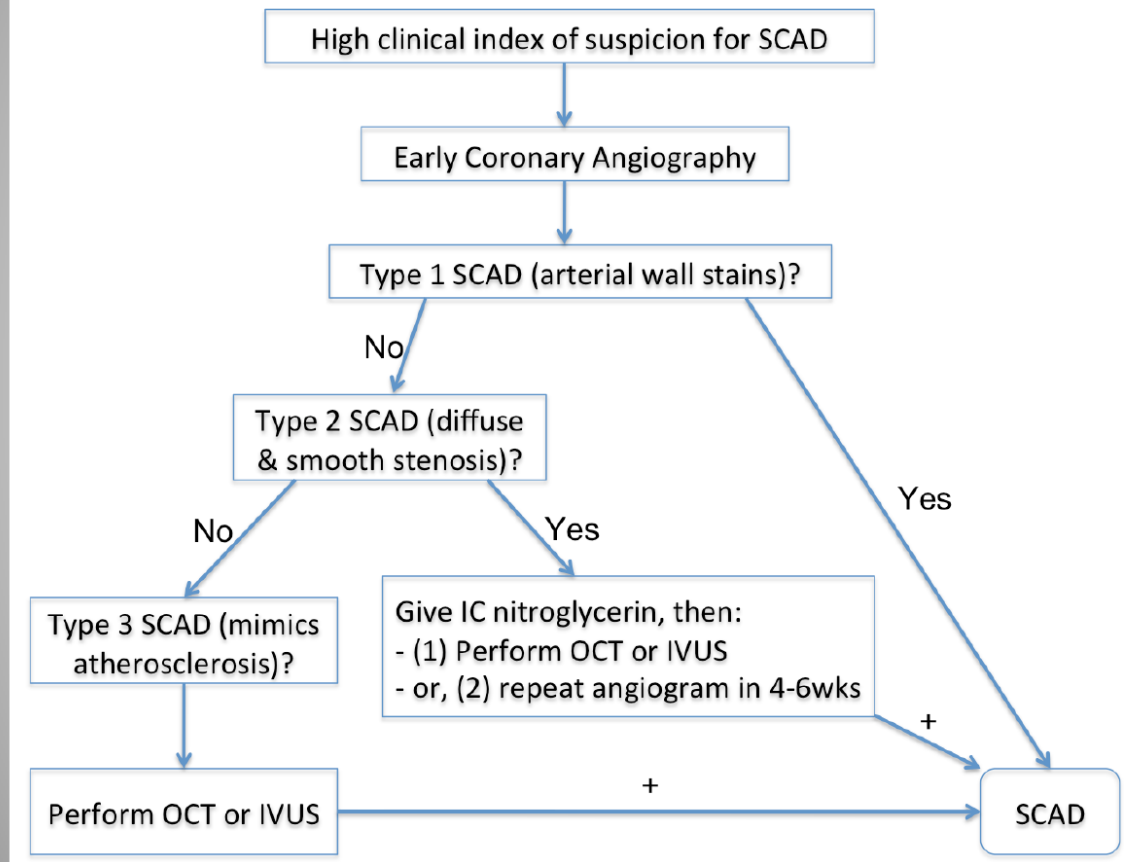


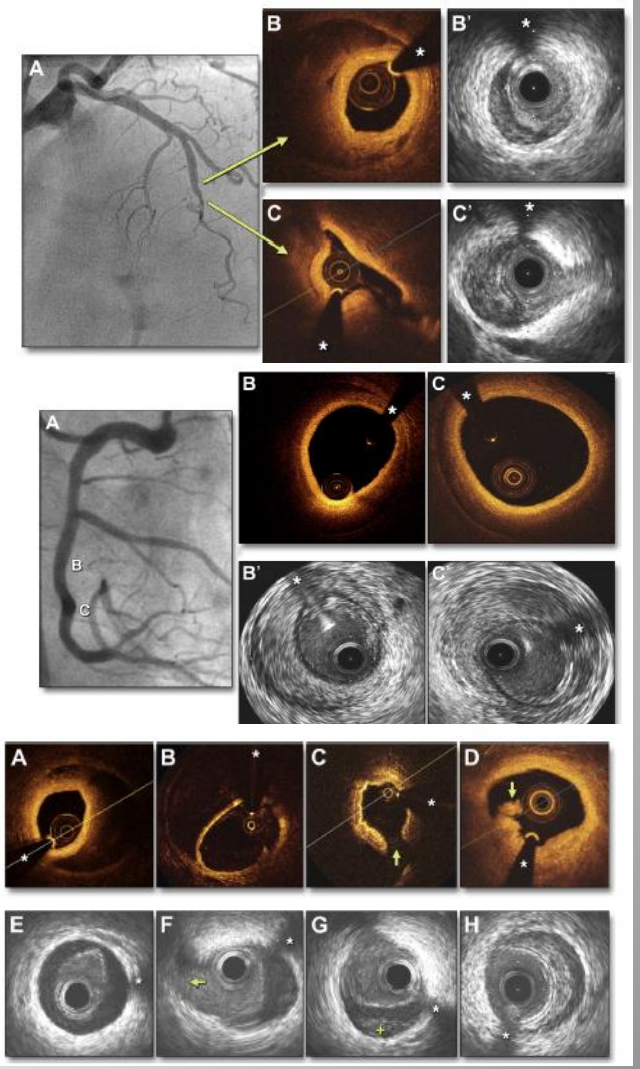




Saw J, J Am Coll Cardiol. 2017;70(9):1148-1158.

Spontaneous Coronary Artery Dissection
Diagnostic work-up



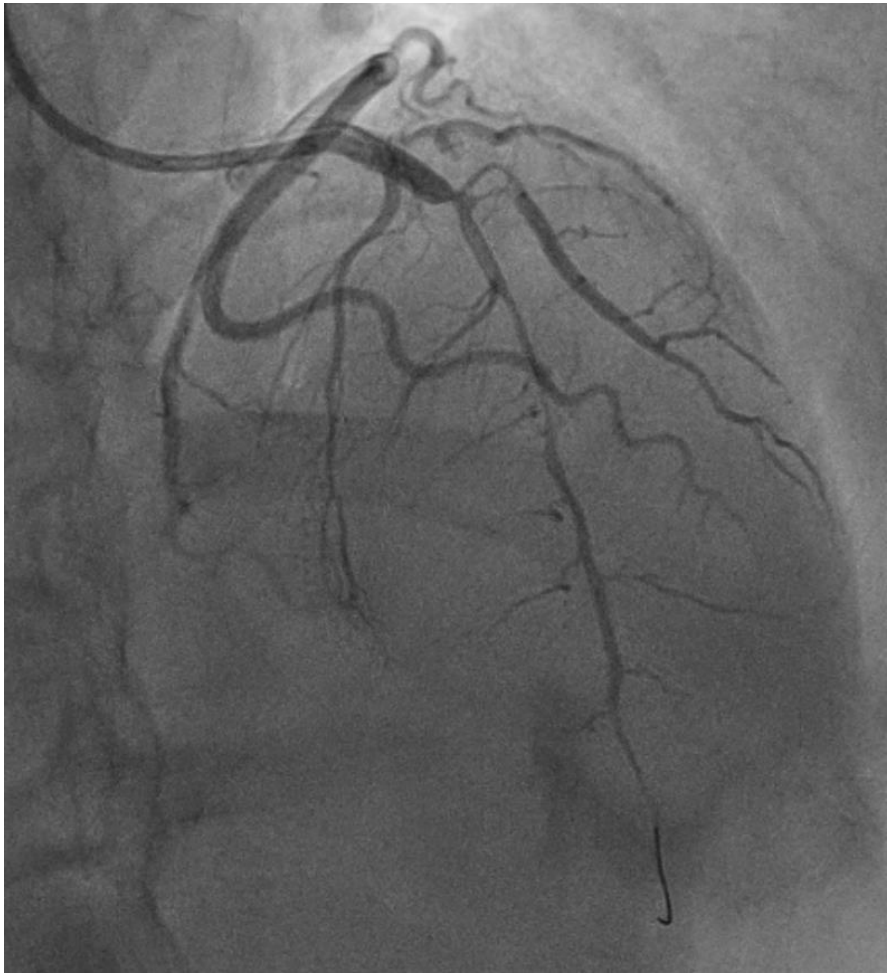


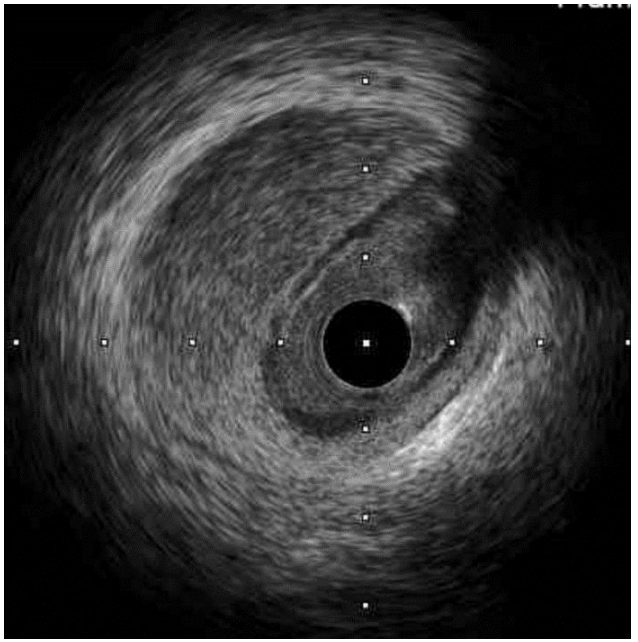
Hayes S, Circulation. 2018;137(19):e523-e557

Manuel Paulo, JACC Cardiovasc Imaging. 2013;6(7):830-2

Spontaneous Coronary Artery Dissection
Clinical case

38 y.o. female admitted with anterior STEMI

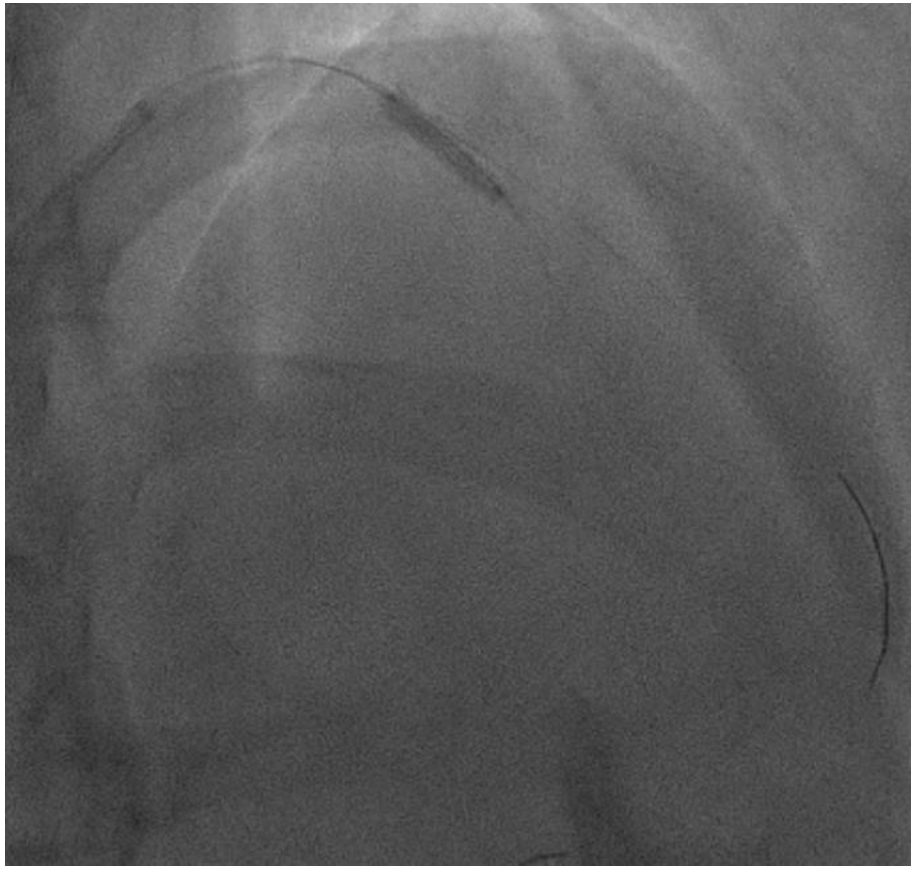


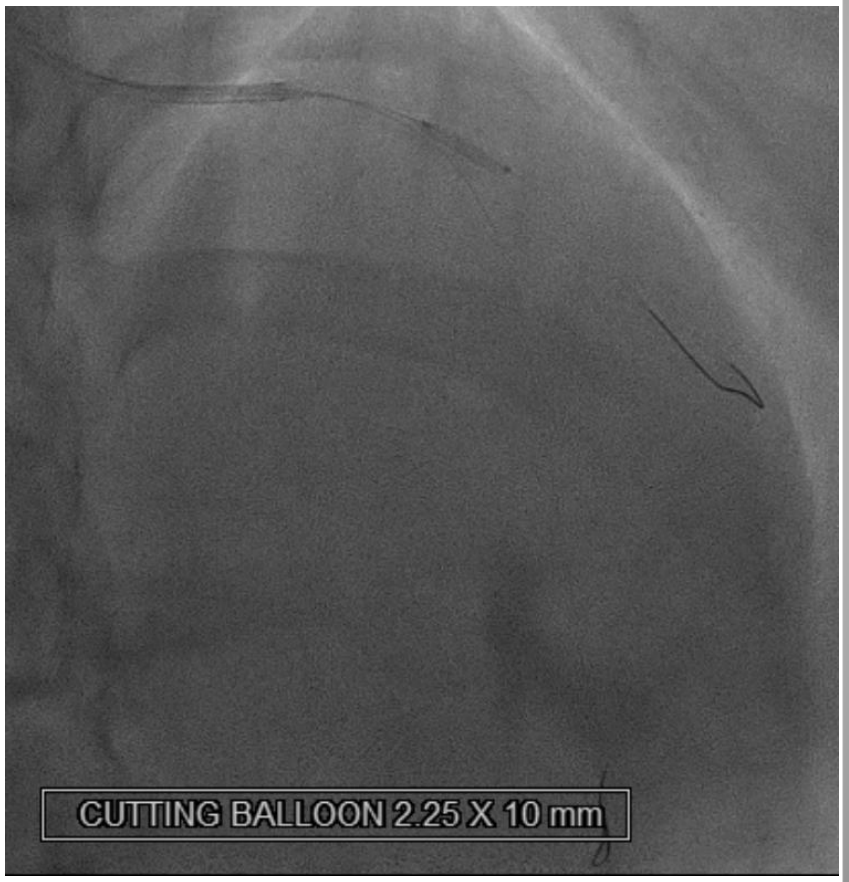


Type 2 SCAD with an extensive, non-fenestrated intramural hematoma of the LAD from the proximal to the distal segment, involving the bifurcation with the 1° Diagonal branch

Spontaneous Coronary Artery Dissection
Clinical case

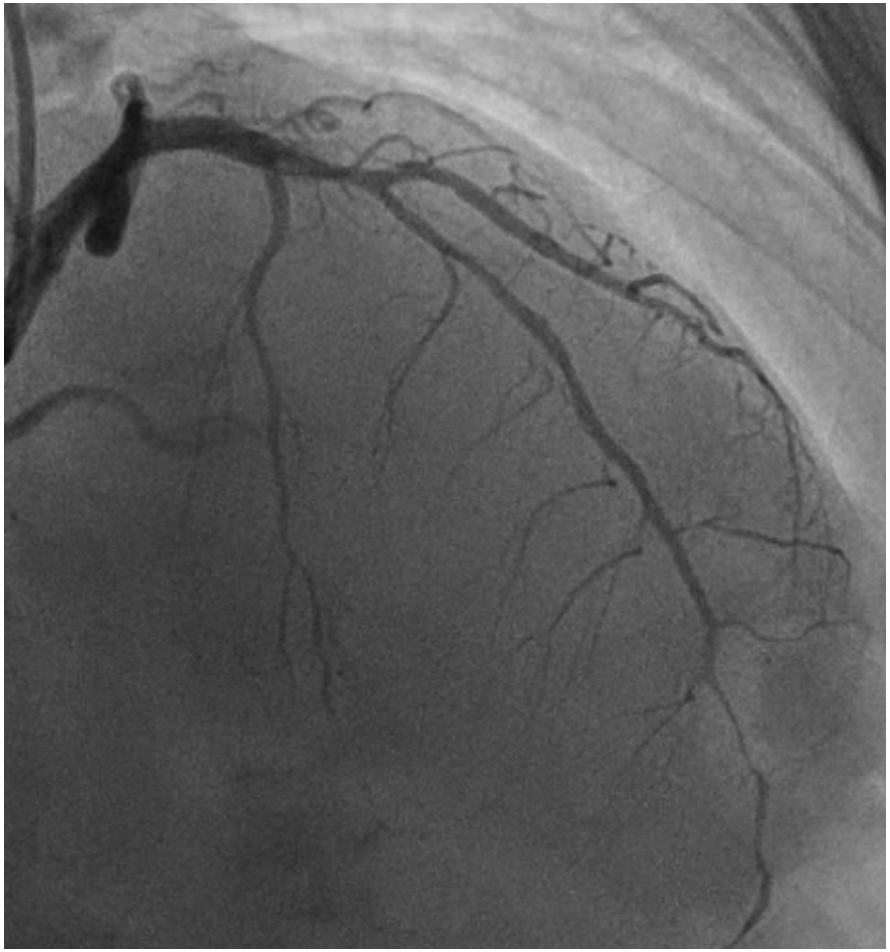
PCI with cutting balloon was performed in the LAD and Diagonal branch, aiming to decompress the true lumen

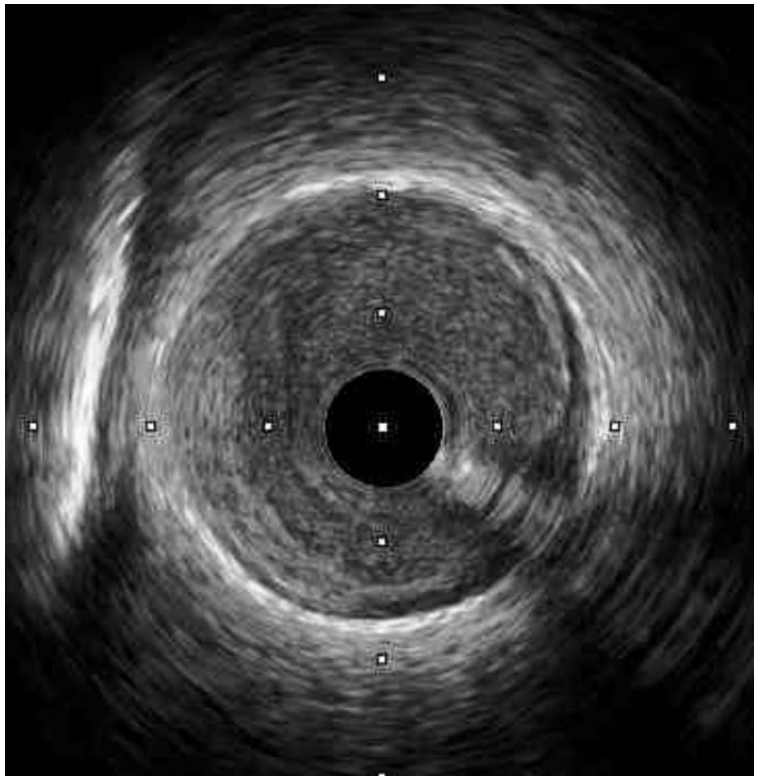




Spontaneous Coronary Artery Dissection
Clinical case

Angiographic and IVUS evidence of decompression of the true lumen



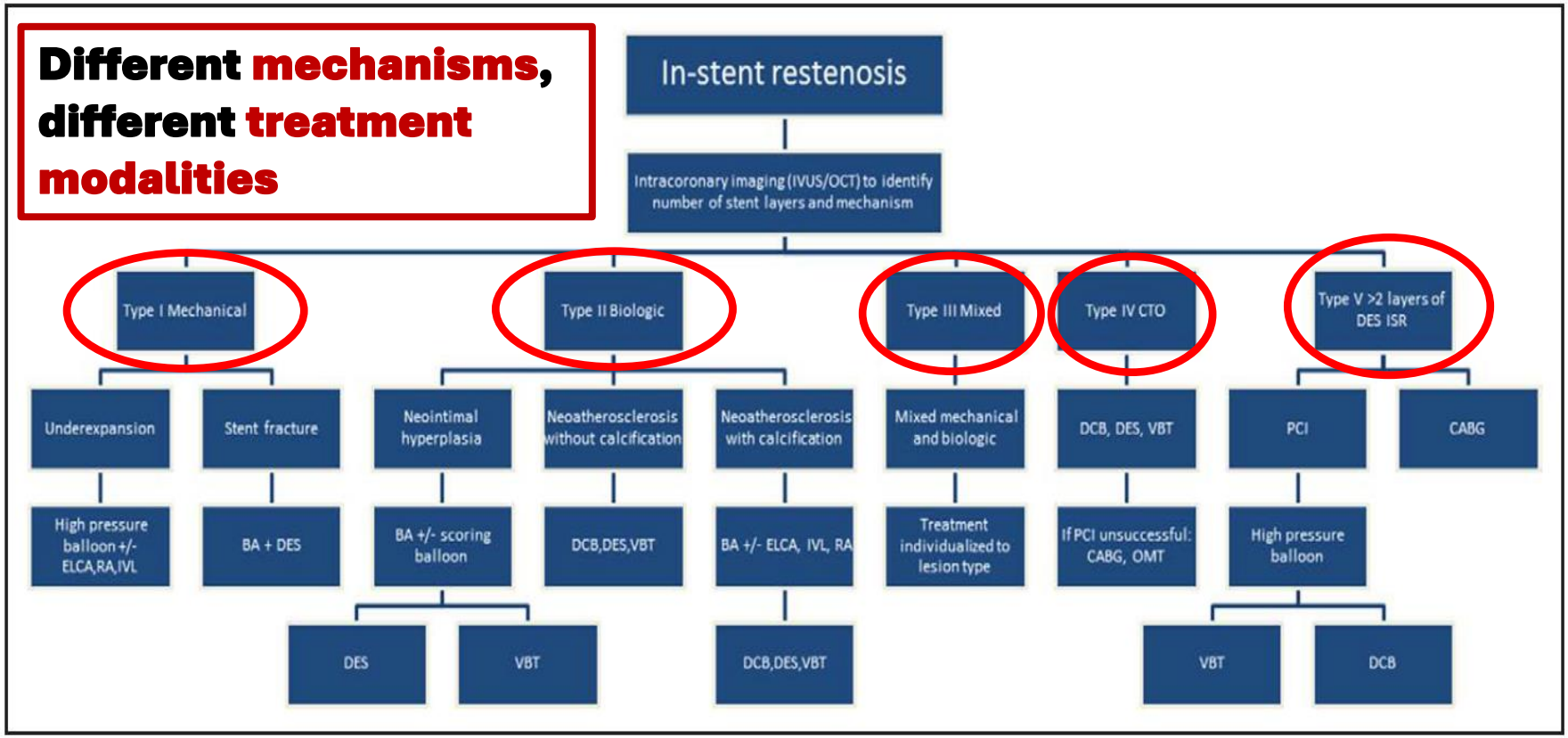


Stent failure and stent thrombosis

Understanding the mechanism

ISR: a new classification based on disease mechanism

Different mechanisms, different treatment modalities



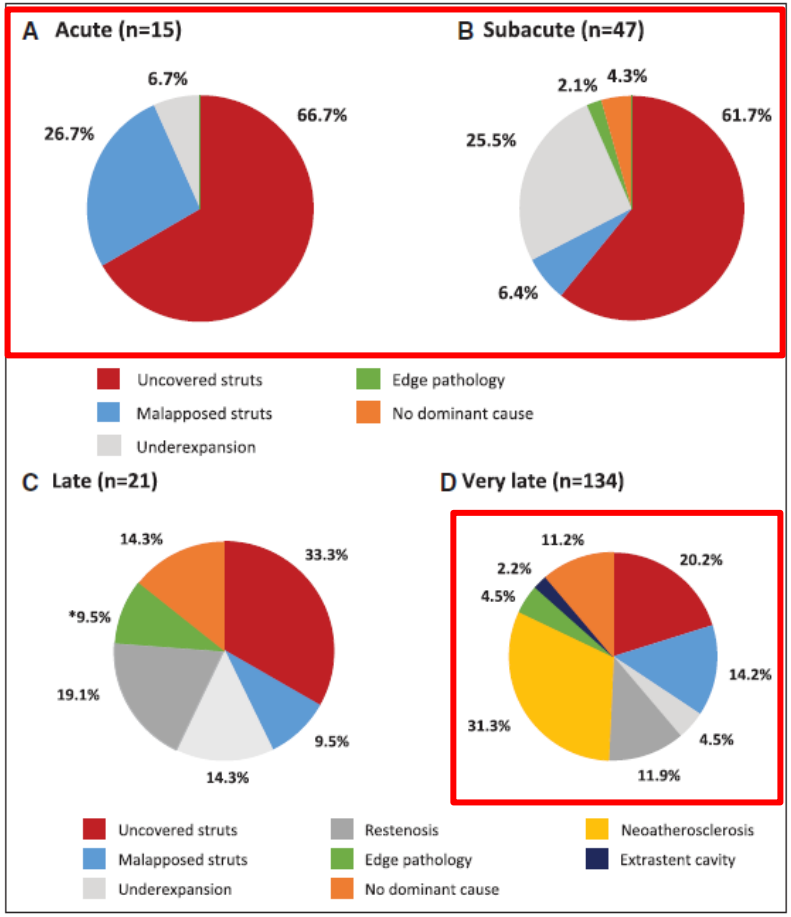
Shlofmitz E, Circ Cardiovasc Interv. 2019;12:e007023.

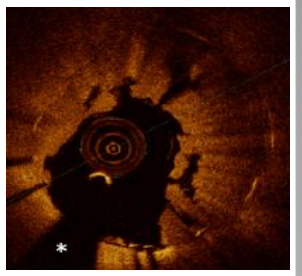
Stent failure and stent thrombosis

Understanding the mechanism

OCT findings in patients with stent thrombosis

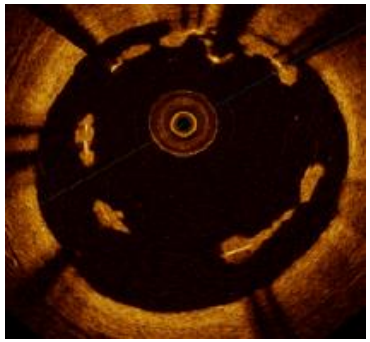
The PRESTIGE Registry



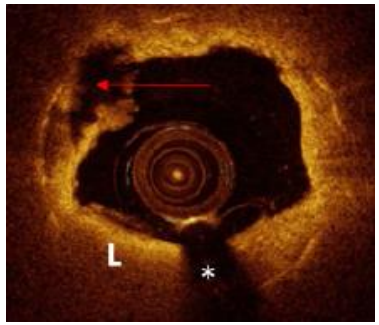


ST mechanisms varies according to the timing from the index procedure

Mechanical causes are mostly associated with acute/subacute ST



Neoatherosclerosis is the leading cause of very late ST

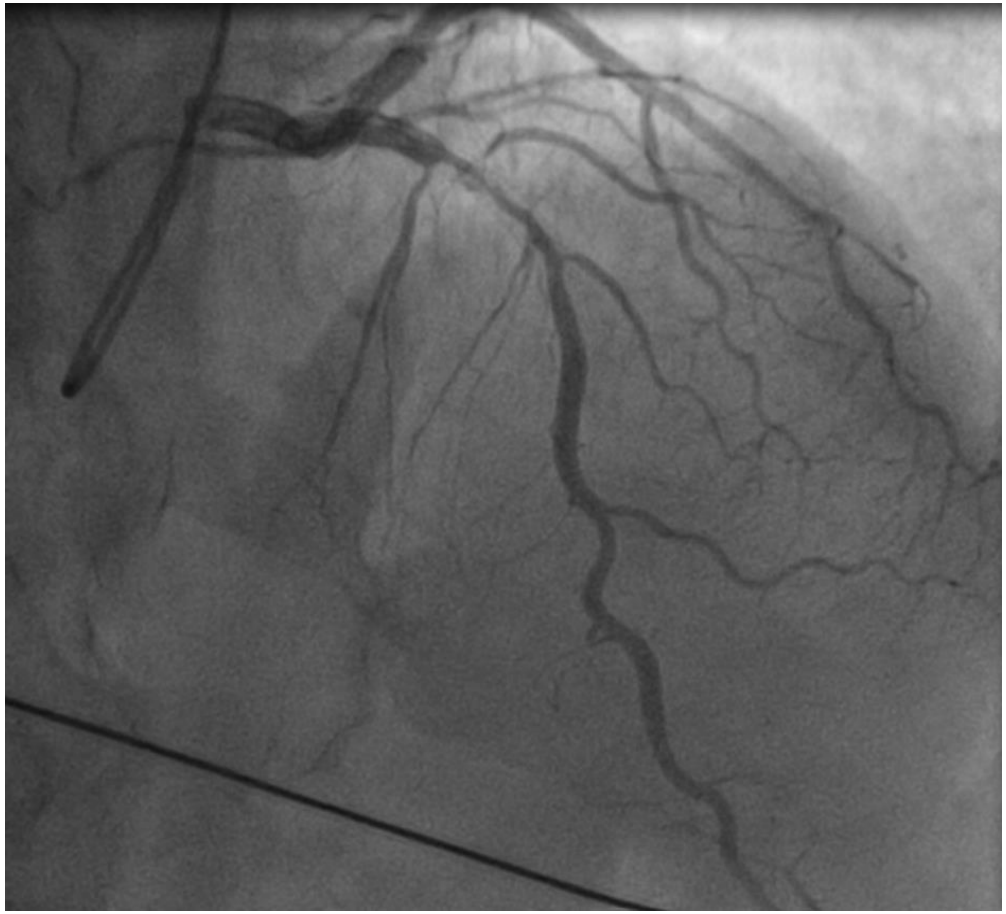


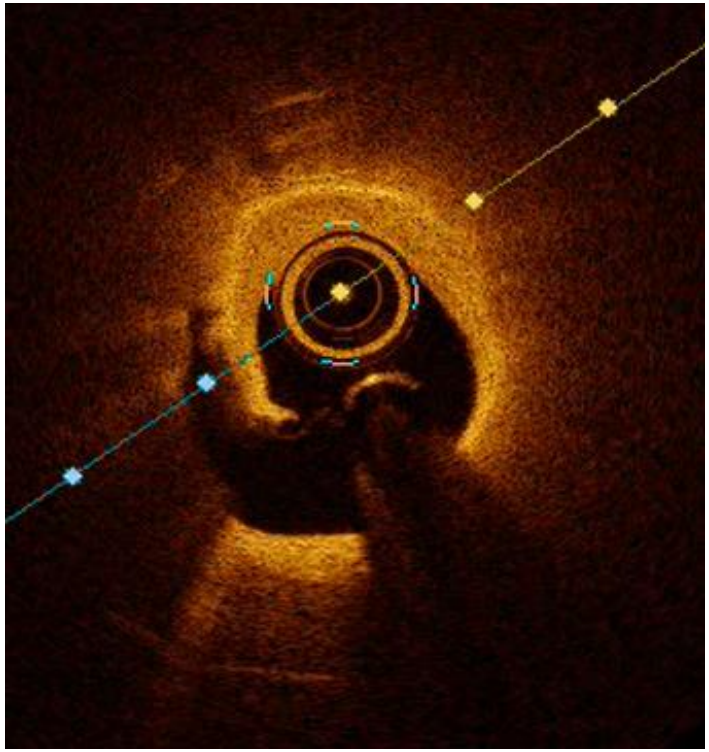
Adriaenssens T, Circulation. 2017;136(11):1007-1021.

Stent Failure and stent thrombosis

Clinical case

Male, 72 y.o., previous PCI with BMS on the LAD 20 years ago
Admitted for anterior STEMI



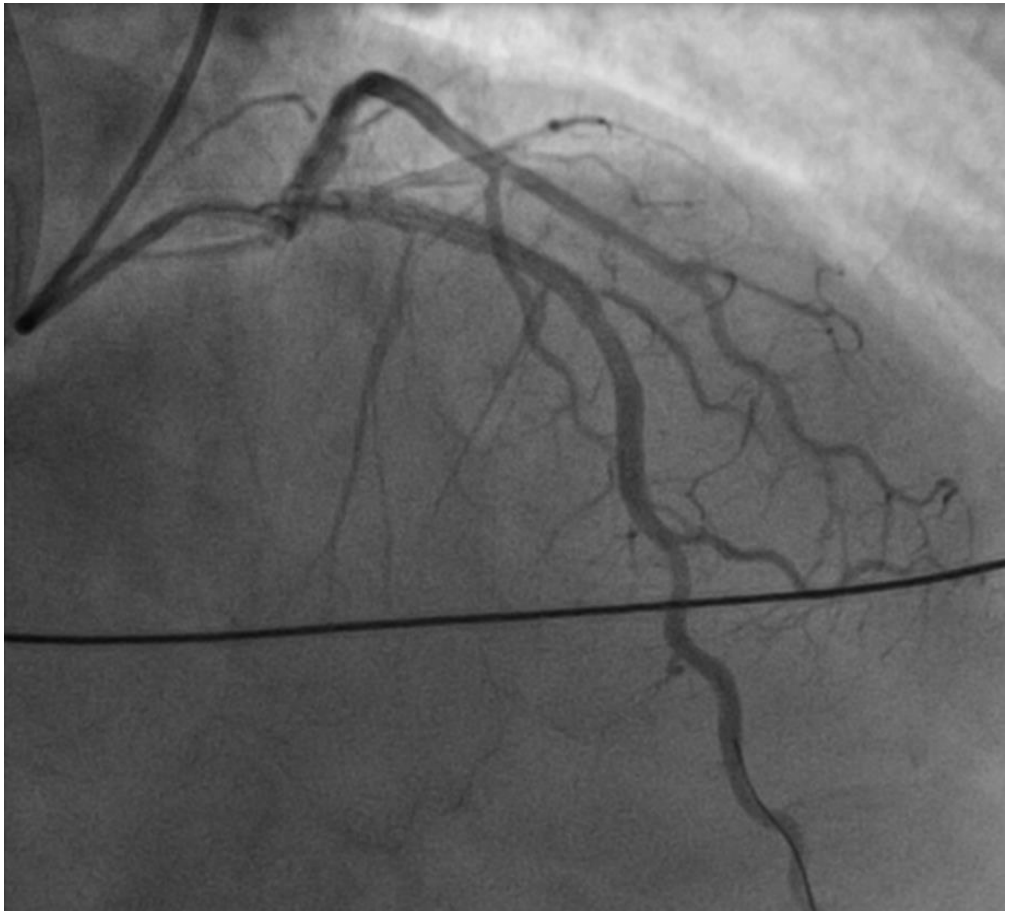


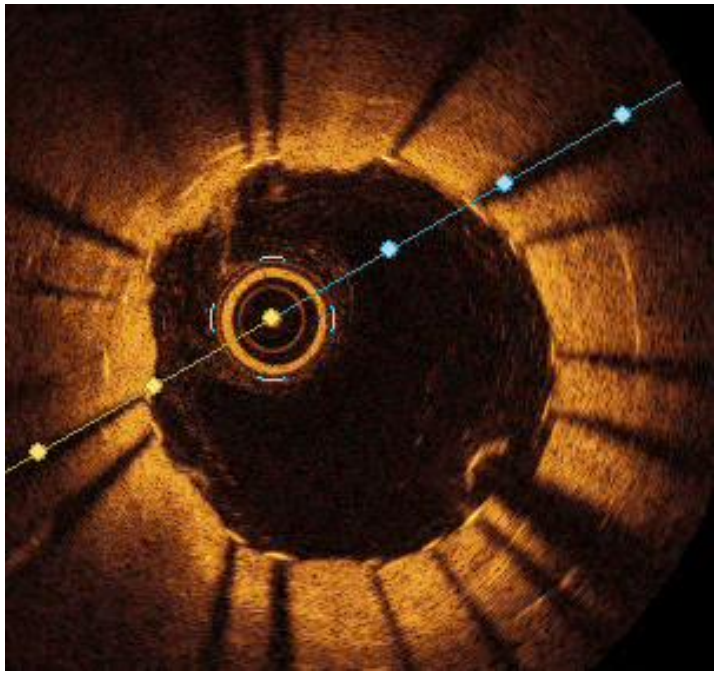
Very late stent thrombosis due to ruptured neoatherosclerosis

Stent failure and stent thrombosis

Clinical case

PCI with a 3.5 x 28 mm EES within the BMS





Final angiographic and OCT result

PCI guidance and stent optimization

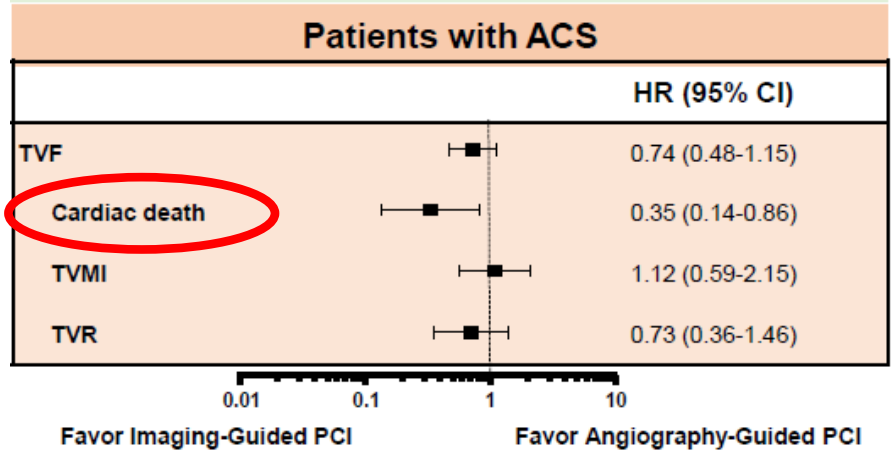
RENOVATE-COMPLEX Trial: pre-specified subanalysis on patients with ACS

1639 Patients with Complex Coronary Lesions Undergoing PCI

(Bifurcation, CTO, unprotected LM, ISR, long stent length, multivessel PCI, ≥3 Stents, severely calcified, and ostial lesion)

Stratified Randomization

- 832 Patients with Acute Coronary Syndrome
  - 560 assigned to Imaging-Guided PCI
  - 272 assigned to Angiography-Guided PCI
- 807 Patients with Chronic Coronary Syndrome
  - 532 assigned to Imaging-Guided PCI
  - 275 assigned to Angiography-Guided PCI



Hahn JY , TCT 2023

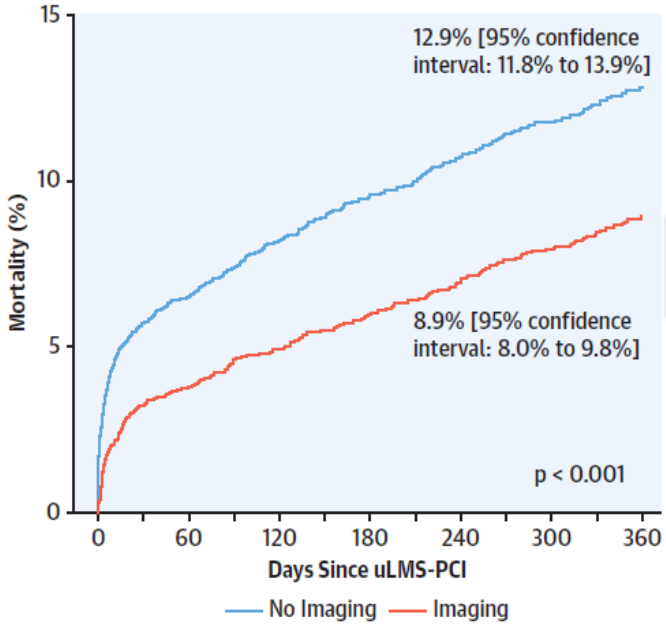
Left main and complex bifurcations

Intravascular Imaging and 12-Month Mortality After Unprotected Left Main PCI

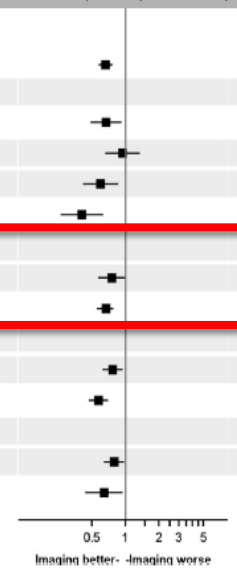
A propensity-matched analysis from the BCIS Registry

11,264 patients treated with ULM PCI (54% with ACS)

34% reduction in mortality



Subgroup	Count	Imaging N (%)	No Imaging N (%)	Odds ratio (95% CI)	Interaction p-value
Overall	7,864	335 (9.01%)	538 (12.98%)	0.663 (0.574:0.766)	
Quartiles					0.0351
Q1	1,281	75 (19.41%)	103 (16.32%)	0.669 (0.485:0.921)	
Q2	1,206	60 (10.87%)	75 (11.47%)	0.941 (0.657:1.35)	
Q3	1,121	52 (9.89%)	92 (15.46%)	0.6 (0.417:0.862)	
Q4	1,192	32 (5.07%)	65 (11.59%)	0.408 (0.263:0.633)	
ACS					0.4058
No	3,516	91 (5.21%)	120 (6.78%)	0.757 (0.572:1.002)	
Yes	4,346	244 (12.35%)	418 (17.63%)	0.669 (0.555:0.781)	
Left Main + LAD					0.048
No	3,889	157 (9.33%)	261 (11.83%)	0.768 (0.623:0.946)	
Yes	3,975	178 (4.48%)	277 (14.3%)	0.574 (0.47:0.7)	
EF < 30					0.3585
No	4,471	187 (8.25%)	225 (10.2%)	0.792 (0.646:0.97)	
Yes	583	55 (20%)	83 (27.92%)	0.645 (0.439:0.95)	



ACS subgroup

Kinnaird T, J Am Coll Cardiol Intv. 2020;13(3):346–57.

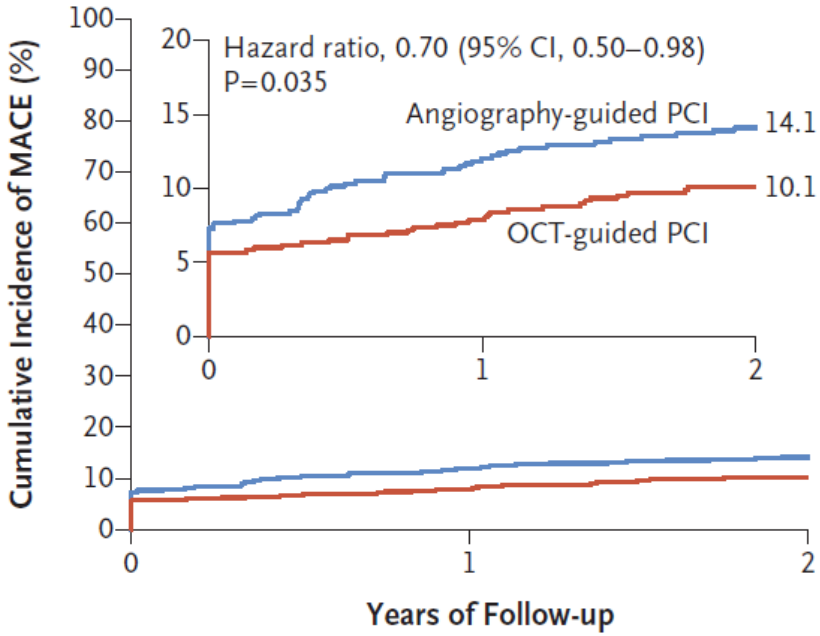
Left main and complex bifurcations

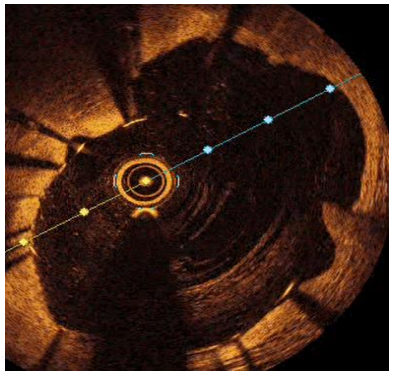
OCTOBER Trial

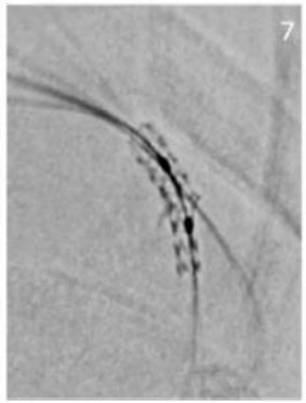
OCT or Angiography Guidance for PCI in Complex Bifurcation Lesions

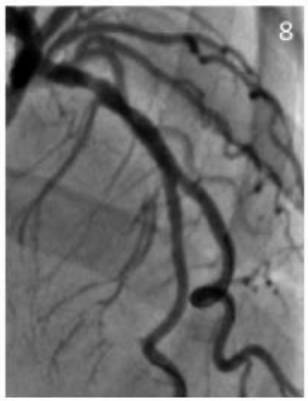
1201 patients with complex bifurcations randomized to OCT-guided or Angio-guided PCI

All-cause death, TV-MI, TLR at 2 years



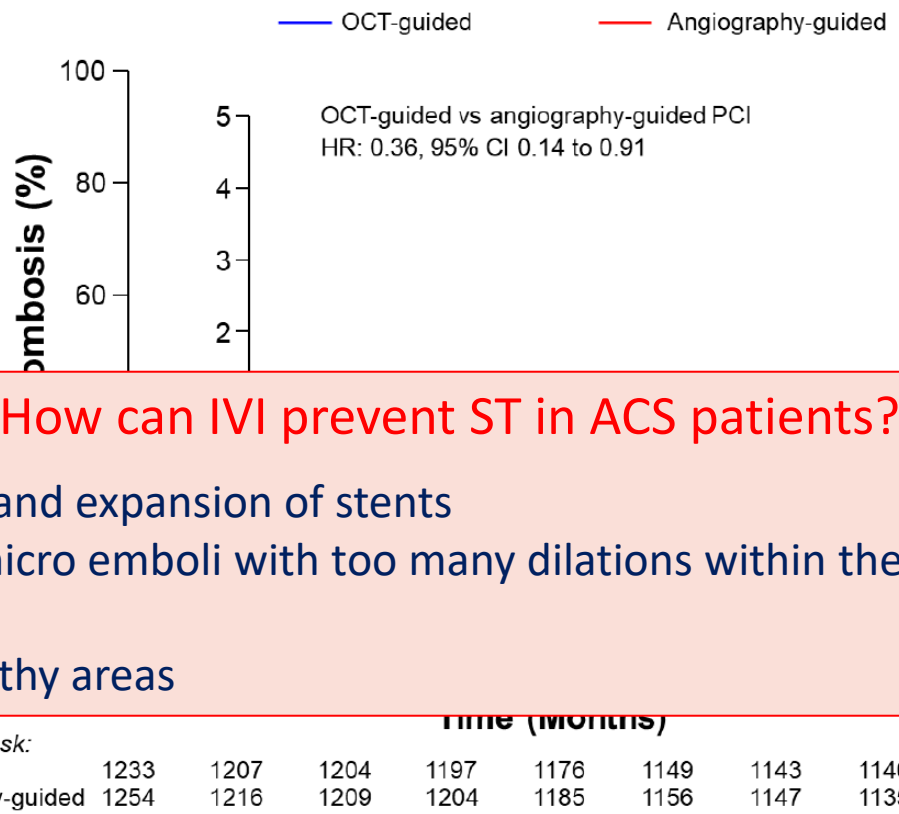






Holm NR, N Engl J Med. 2023;389(16):1477-1487..

Optimizing PCI



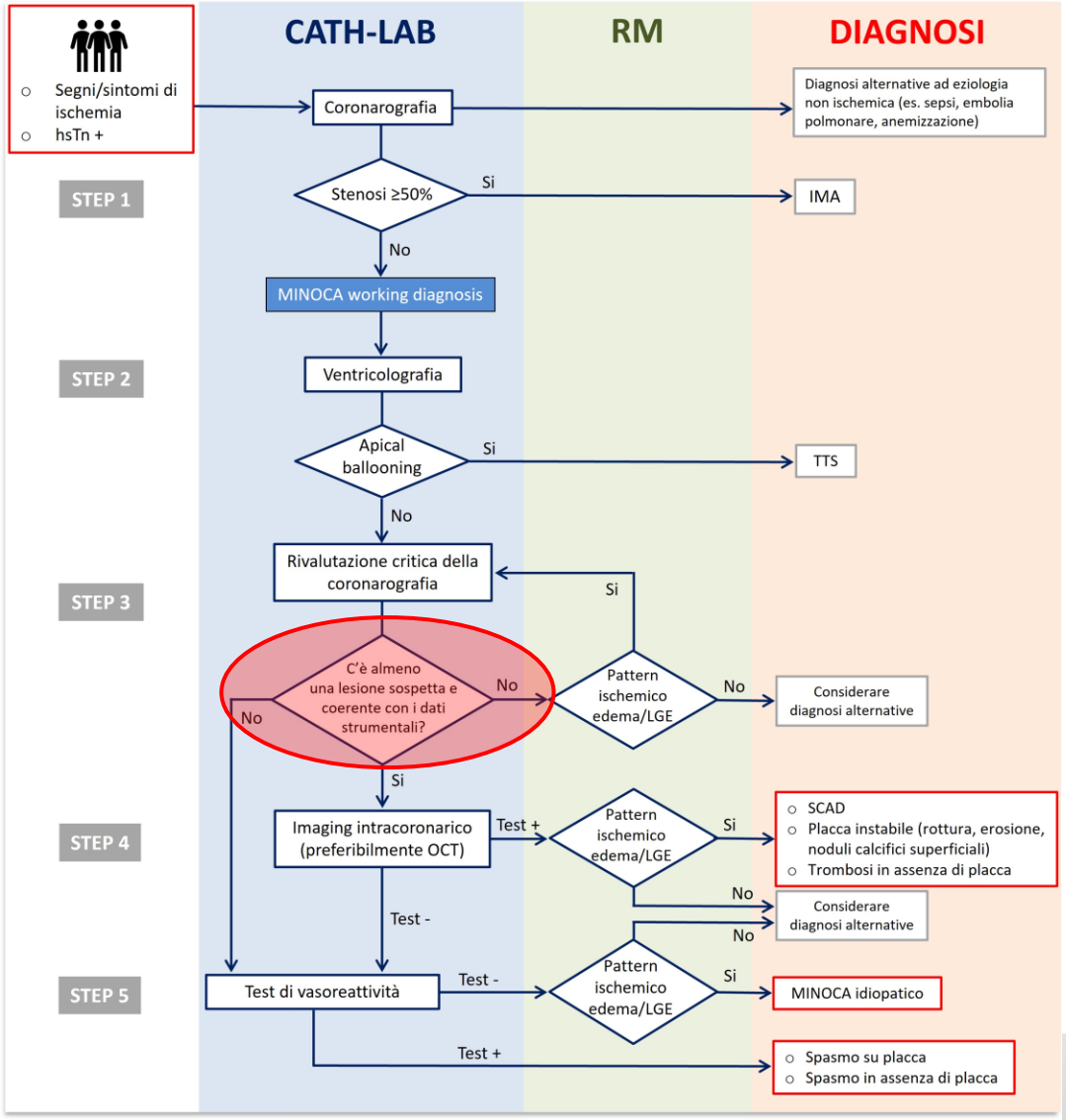
Death or MI within 2 years occurred in 22/23 pts (95.7%) with stent thrombosis

How can IVI prevent ST in ACS patients?

- Adequate apposition and expansion of stents
  - Balance with risk of micro emboli with too many dilations within the thrombotic lesion
- Land in relatively healthy areas

Ali ZA et al. NEJM 2023. **ILUMIEN IV Trial**

MINOCA
Diagnostic work-up: role of intracoronary imaging



Intracoronary imaging (preferably OCT) has a key rule in patients with working diagnosis of MINOCA

Silverio A et al. Giornale Italiano di Cardiologia 2023

MINOCA

OCT and CMR to determine the causes of MINOCA in women

301 women with clinical diagnosis of MI enrolled ⇒ 170 MINOCA ⇒ 145 OCT interpretable ⇒ 116 CMR
(23 OCT contraindications, 2 not interpretable)

OCT N=145

Culprit Lesion n=67 (46.2%)

Plaque Rupture	n=8 (5.5%)
Thrombus without plaque rupture	n=5 (3.1%)
Intra-Plaque Cavity	n=31 (21.4%)
Layered Plaque	n=19 (13.1%)
Intimal Bump (Spasm)	n=3 (2.1%)
SCAD	n=1 (0.7%)

CMR N=116

- Infarction n=38 (32.8%)
- Regional Injury n=24 (20.7%)
- Non-Ischemic n=24 (20.7%)
  - Myocarditis n=17 (14.7%)
  - Takotsubo Syndrome n=4 (3.4%)
  - Other Cardiomyopathy n=3 (2.6%)
- Normal n=30 (25.9%)

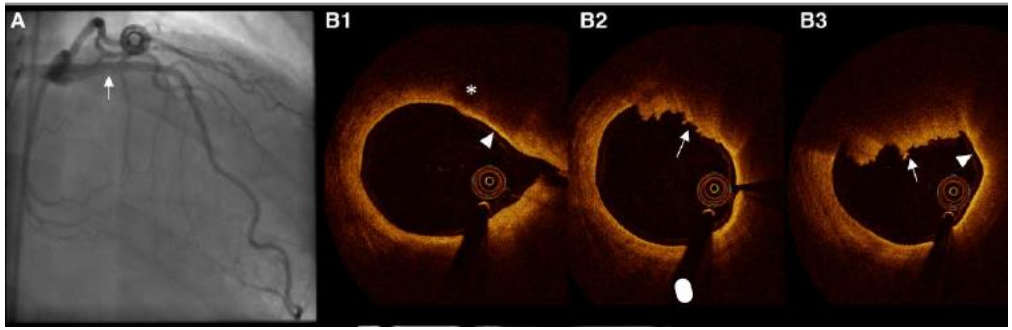
Integration of OCT and CMR N=116

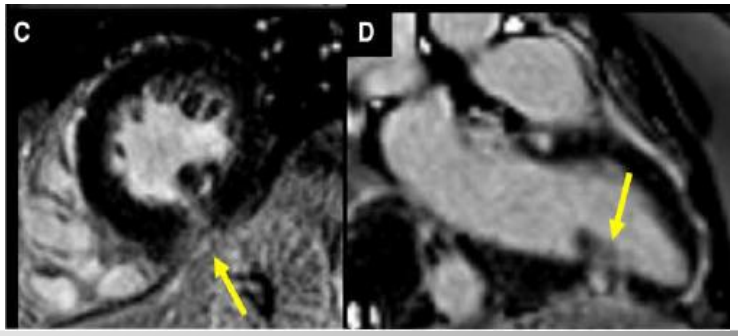
Cause Identified	**n=98 (84.5%)**
Myocardial Infarction (MI)	n=74 (63.8%)
Myocarditis	n=17 (14.7%)
Takotsubo Syndrome	n=4 (3.4%)
Non-Ischemic Cardiomyopathy	n=3 (2.6%)

No cause identified n=18 (15.5%)

170 women with MINOCA undergoing OCT and CMR

A combined use of OCT and CMR identified the cause of MINOCA in 84.5% of cases





Reynolds HR, Circulation. 2021;143:624–640.

Intracoronary imaging in ACS
When to use it?

Do we need routine intracoronary imaging in every patient with ACS?

Clearly not!

Do we need intracoronary imaging for specific scenarios in ACS?

Yes, definitely!

Based on a tailored approach, intracoronary imaging might be a precious option in patients with ACS, especially in case of diagnostic uncertainties or complex scenarios

Conclusions

Beyond guidance of stent selection and optimization of deployment, intracoronary imaging facilitates angiographic interpretation and may guide treatment in ACS

Intracoronary imaging is critical in patients with working diagnosis of MINOCA for identifying patients with atherothrombotic lesion (MI type 1) or patients with SCAD

The employment of intravascular imaging in patients with ACS should be balanced against the cost, loss of time, and the risk of complications (particularly in patients with SCAD)