

Analysis of post-stent coronary dissections, when we should treat it

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Background

- **Edge dissections are defined as disruptions of the arterial lumen surface in the stent edge segments (either 5 mm proximal or distal to the stent borders).**
- **Incidence of post-stent (DES) coronary dissection: 1,5-2%, up to 8% with IVUS... and more with OCT.**
- **Residual final dissections left untreated after PCI are significantly associated with increased short-term risk of major adverse cardiovascular events (MACE).**
- **Incidence of in-hospital MACE or 1-month MACE: up to 13%**

Rogers JH, Lasala JM. Coronary artery dissection and perforation complicating percutaneous coronary intervention. *J Invas Cardiol* 2004; 16:493– 499.

Giuseppe G.L. Biondi-Zoccai et al, on behalf of the RECIPE (Real-world Eluting-stent Comparative Italian retrosPective Evaluation) Study Investigators, Incidence, predictors, and outcomes of coronary dissections left untreated after drug-eluting stent implantation, *European Heart Journal*, Volume 27, Issue 5, March 2006, Pages 540–546, <https://doi.org/10.1093/eurheartj/ehi618>

Background II

- **IVUS data showed that the prevalence of coronary artery dissection in lesions treated with**
 - **Balloon angioplasty > 60%**
 - **BMS 11% to 20%**
 - **DES 8%**

In addition, the detection rates for coronary dissection varied among imaging modalities.

Sens → OCT > IVUS > Angio

Pathophysiology

- Balloon inflation and stent implantation are associated with mechanical dilation of the artery as well as plaque fracture, intimal splitting, and localized medial dissection that is a function of the biomechanical properties of the plaque
- Stiffer atherosclerotic plaques resist circumferential expansion more than normal sites to generate high shear stresses at interfaces between stiff plaques and normal vessel segments to cause dissections
- The dissection occurs at the transition point between the rigid stent and the unstented reference segment

NHLBI Classification For Coronary Dissection

Types A and B are generally clinically benign, whereas types C through F have clinically significant morbidity and mortality if untreated.

A



B



C



D



E



F



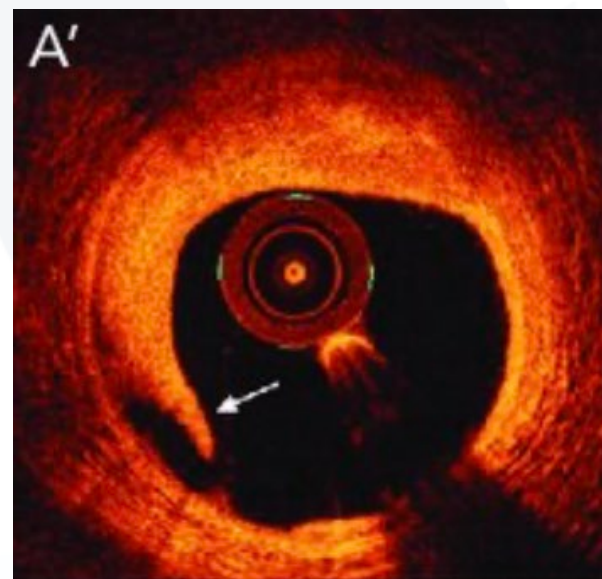
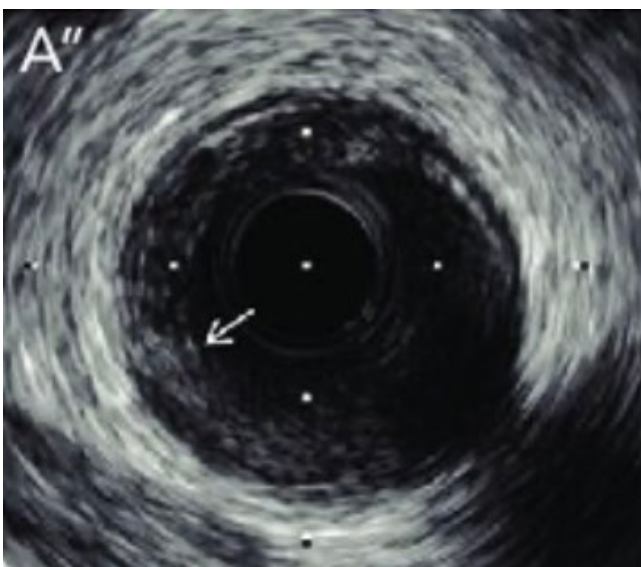
In Which Scenario are More Frequent?

- **Longer and complex lesions:**
 - **Proximal dissection:** Calcified plaque at the proximal stent edge and proximal stent edge expansion.
 - **Distal dissection:** Distal reference plaque burden, attenuated plaque at the distal stent edge and distal edge stent expansion (lumen-to-stent-edge-area ratio).
- **Especially in the left anterior descending (LAD)**

The Role of Intra-vascular Imaging

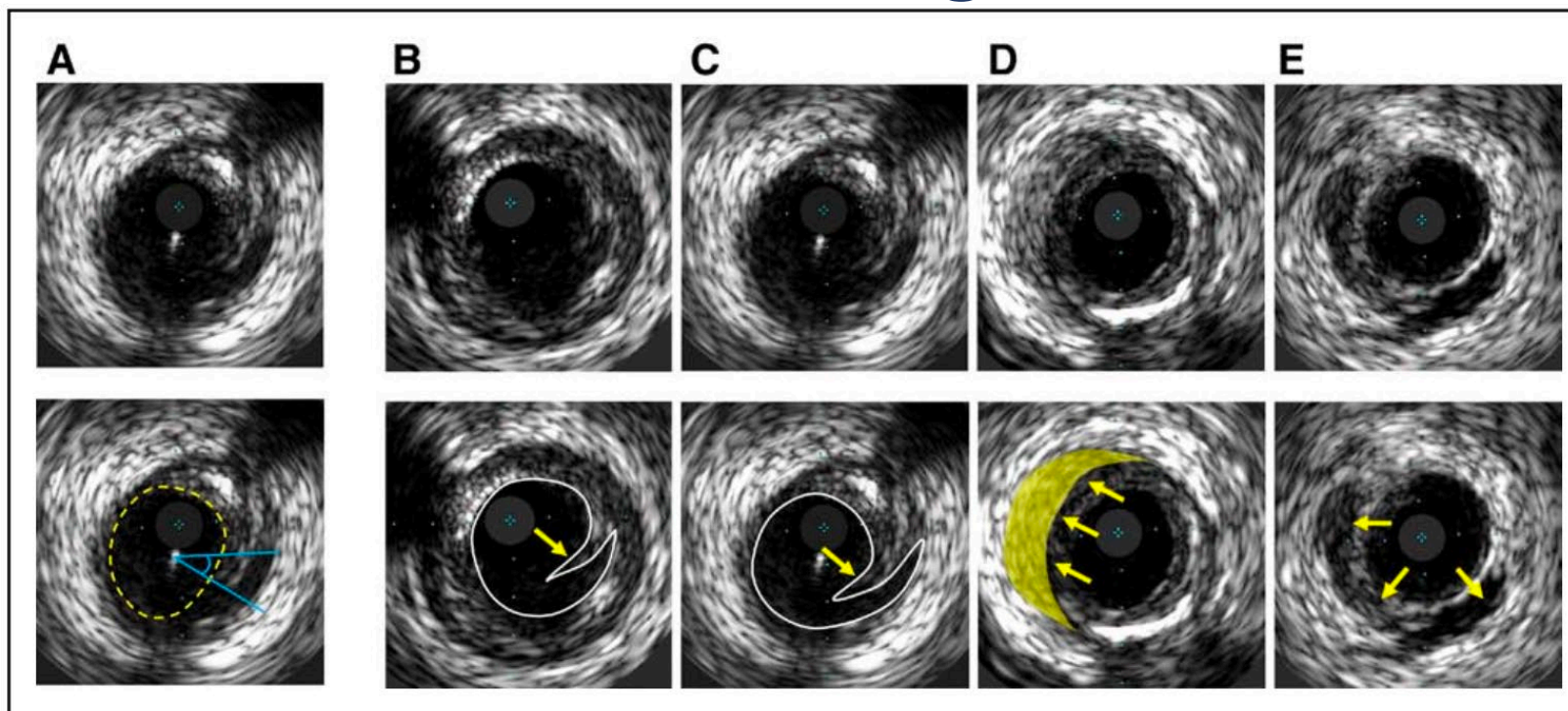
The role of IVUS/OCT:

- Detect the post-stent dissection
- Characterize the lesion
- If needed, guide the treatment



Malaiapan Y, Leung M, White AJ. The role of intravascular ultrasound in percutaneous coronary intervention of complex coronary lesions. *Cardiovasc Diagn Ther.* 2020 Oct;10(5):1371-1388. doi: 10.21037/cdt-20-189. PMID: 33224763; PMCID: PMC7666921.

Qualitative And Quantitative Analyses for Stent Edge Dissection



A: Measurements of the angle of dissection (blue line) and effective lumen cross-sectional area (yellow dotted line)

B: Intimal dissection

C: Medial dissection

D: Intramural hematoma

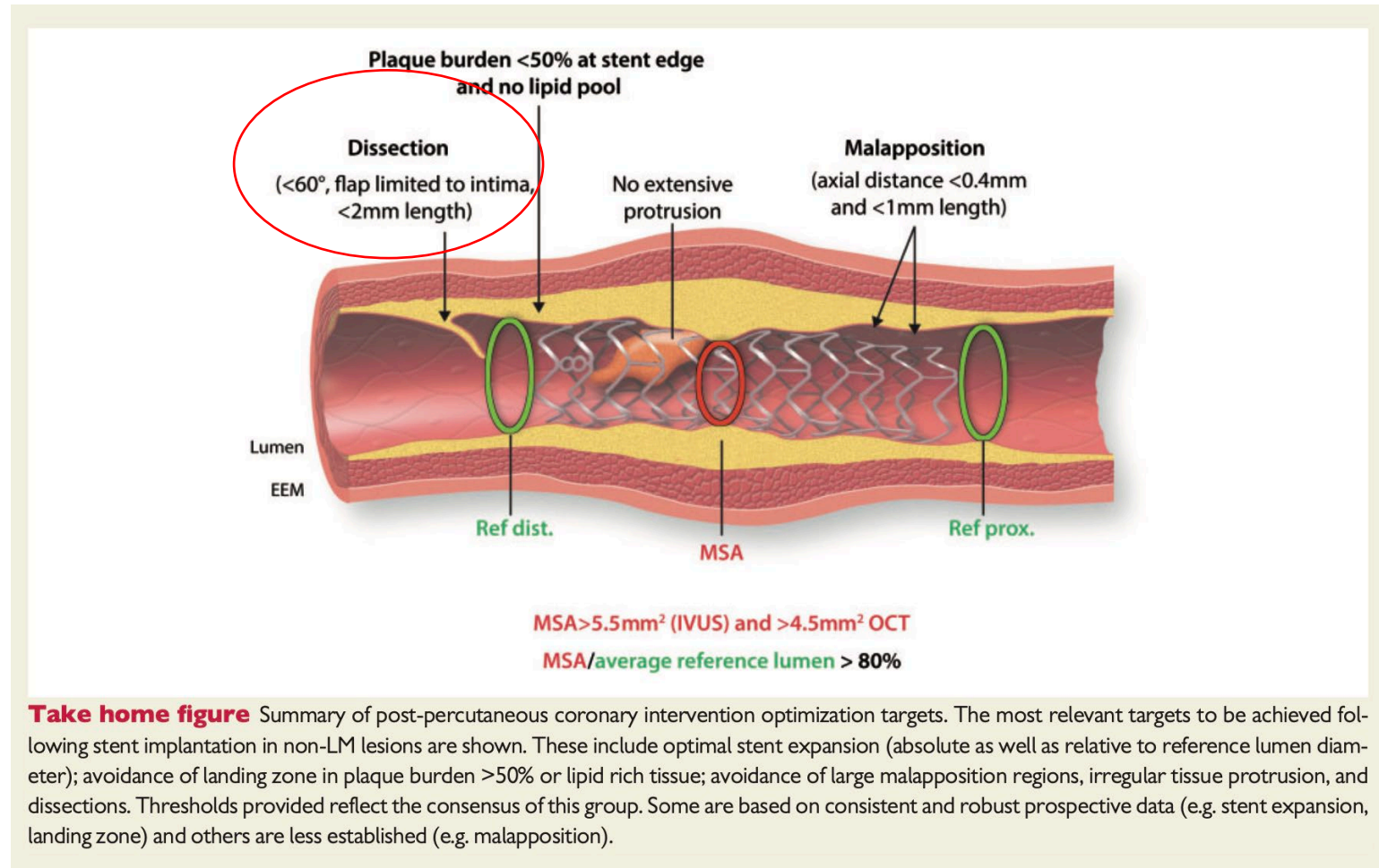
E: Extramedial injury

Kobayashi, N., et al. (2016). Prevalence, Features, and Prognostic Importance of Edge Dissection After Drug-Eluting Stent Implantation: An ADAPT-DES Intravascular Ultrasound Substudy. *Circulation. Cardiovascular interventions*, 9(7), e003553. <https://doi.org/10.1161/CIRCINTERVENTIONS.115.003553>

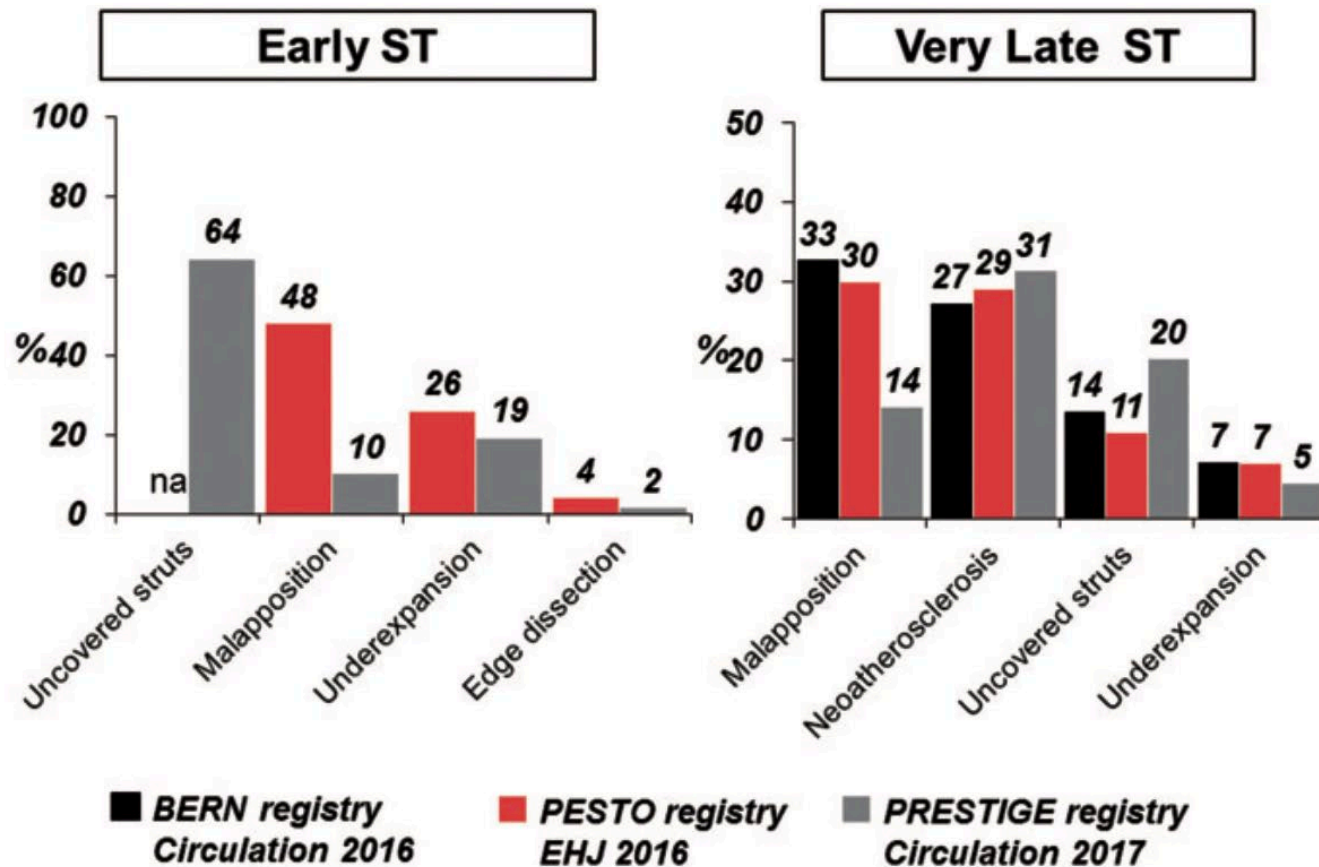


The adverse role of post-procedural dissections have been questioned for both in-hospital and mid-to-long term events

EAPCI 2018 Expert Consensus Document

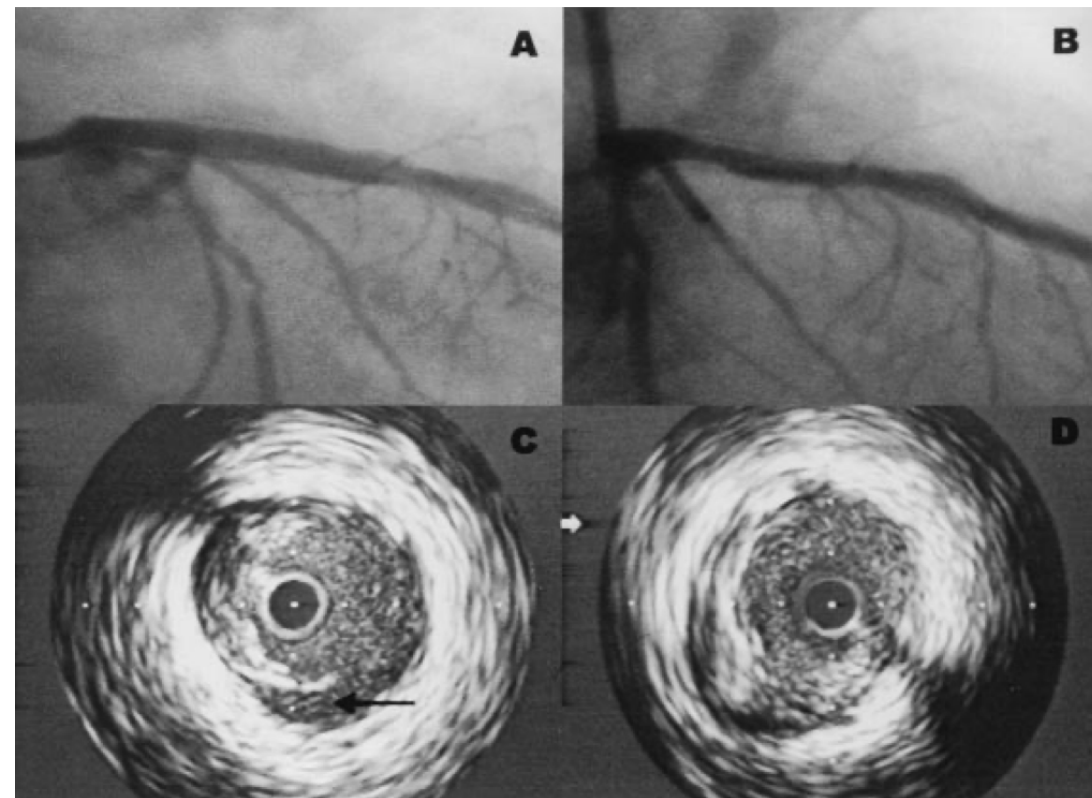


EAPCI 2018 Expert Consensus Document



Dissection at the Edge of Stents Detected with IVUS

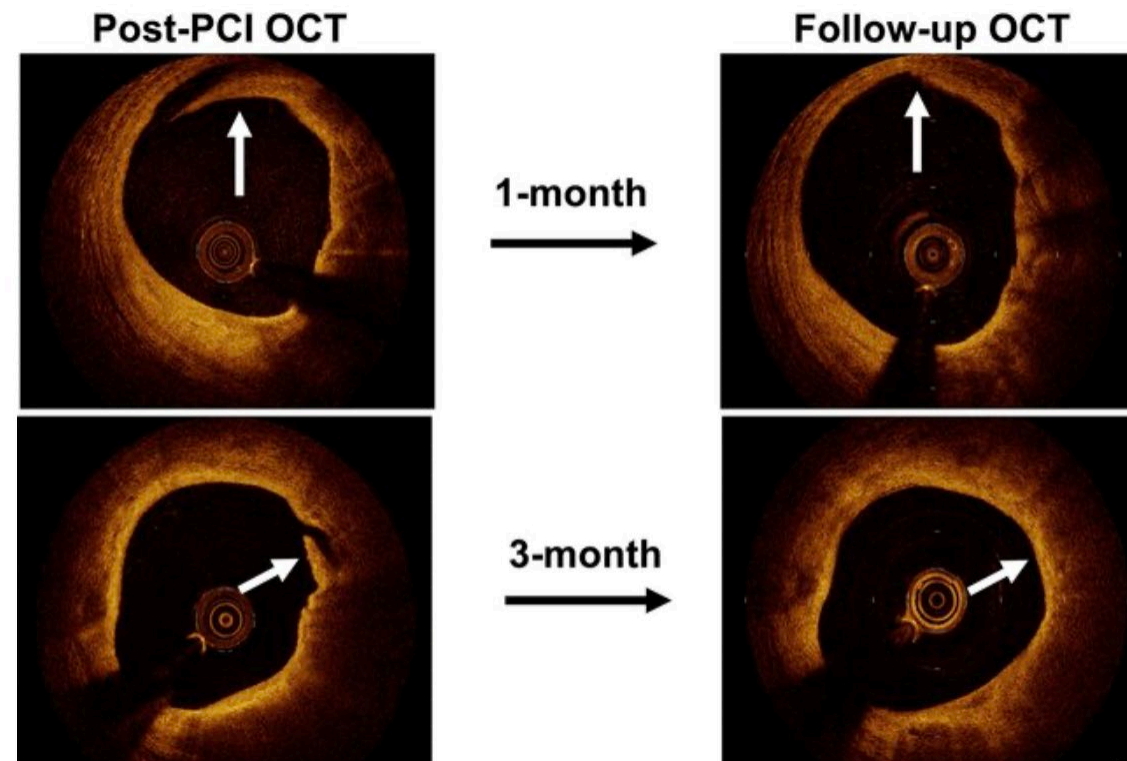
- **Significant edge dissection, defined as lumen narrowing less than 4 mm^2 or dissection angle $\geq 60^\circ$ are associated with increased incidence of early stent thrombosis;**
- **However, a minor dissection, non-flow-limiting dissections at the edge of stents may not be associated with an increased incidence of stent thrombosis.**



Dissection at the Edge of Stents Detected With OCT

Based on OCT findings, criteria for PCI

- $\geq 200 \mu\text{m}$ wide edge dissection
- Extending beyond intima
- Dissection flap involving circumferential arc of $\geq 60^\circ$
- Flow-limiting dissection or dissection noted in more than three frames



OCT-detected edge dissections which are angiographically silent in the majority of cases are not associated with acute stent thrombosis or restenosis up to one-year follow-up

Noguchi M, et al. Comparison of 6-month vascular healing response after bioresorbable polymer versus durable polymer drug-eluting stent implantation in patients with acute coronary syndromes: A randomized serial optical coherence tomography study. *Catheter Cardiovasc Interv.* 2021 Nov 1;98(5):E677-E686. doi: 10.1002/ccd.29892. Epub 2021 Aug 6. PMID: 34357673; PMCID: PMC9292175.

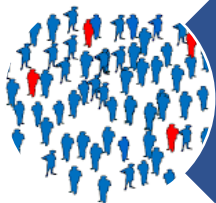
Radu, M. D., Räber, L., Heo, J., Gogas, B. D., Jørgensen, E., Kelbæk, H., Muramatsu, T., Farooq, V., Helqvist, S., Garcia-Garcia, H. M., Windecker, S., Saunamäki, K., & Serruys, P. W. (2014). Natural history of optical coherence tomography-detected non-flow-limiting edge dissections following drug-eluting stent implantation. *EuroIntervention* : journal of EuroPCR in collaboration with the Working Group on Interventional Cardiology of the European Society of Cardiology, 9(9), 1085–1094. <https://doi.org/10.4244/EIJV9I9A183>

Minor post-stent coronary dissection

- NHLBI type A or B
- Non flow-limiting dissection (TIMI 3)
- On IVUS: lumen vessel > 4 mm and dissection angle $< 60^\circ$
- On OCT: $< 200 \mu\text{m}$ wide edge dissection, dissection angle $< 60^\circ$ and limiting in intima

Leave them alone

Conclusions



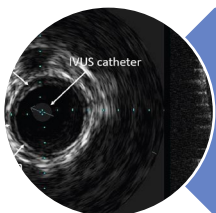
Post-stent coronary dissections are frequent...
more than expected



In some cases they are associated with major
cardiovascular events







But in a lot of cases, minor, non flow-limiting
dissections healed on their own



Intra-vascular imaging is crucial to evaluate and
to optimize the management



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Thanks for your attention