Coronary Bifurcation Classification: An Illusion or a Valuable Guide to Decision Making?

Andrejs Erglis, Indulis Kumsars

Latvian Centre of Cardiology

Pauls Stradins Clinical University Hospital

Riga, LATVIA

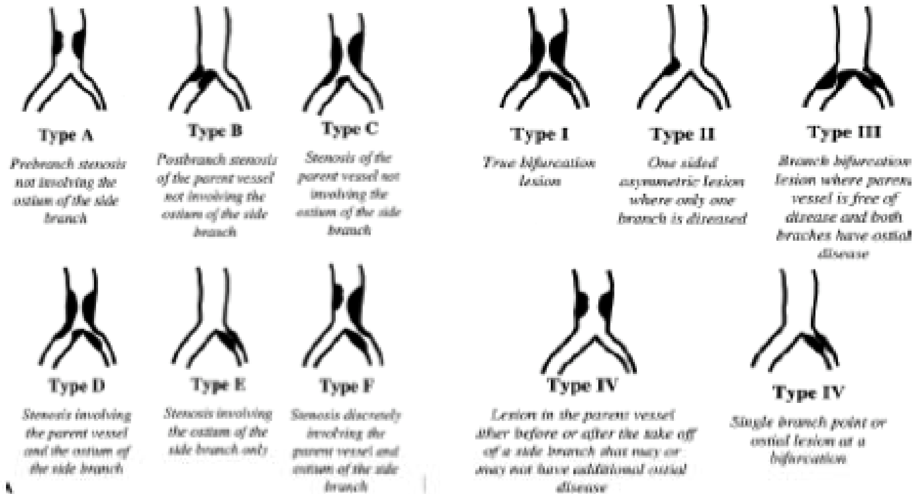
Disclosure Statement of Financial Interest

I, Indulis Kumsars DO NOT have a financial interest/arrangement or affiliation with one or more organizations that could be perceived as a real or apparent conflict of interest in the context of the subject of this presentation.

Introduction

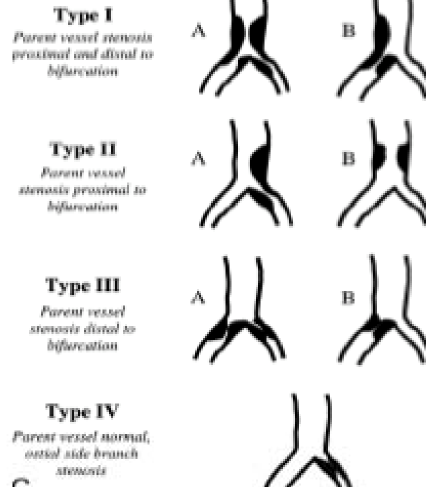
- There is marked variability in the morphology of coronary bifurcation lesions.
- The variability includes vessel size (MB and SB), lesion location, eccentricity, length, morphology, and SB takeoff angle.
- In medicine, classifications are often used to describe pathologies, anatomies and techniques in order to simplify complex issues

Classifications of bifurcation lesions

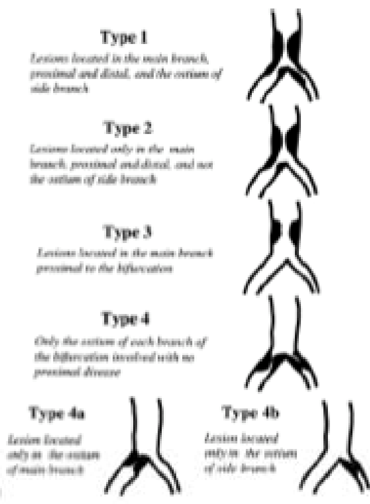


Duke

Sanborn

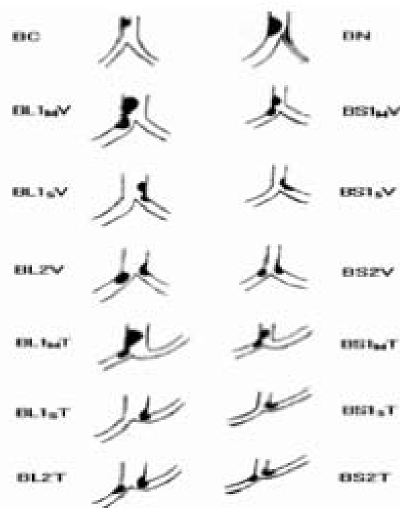


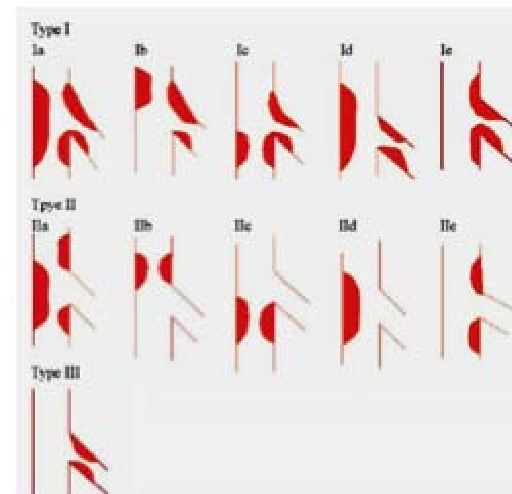
Safian



Icps-Lefevre

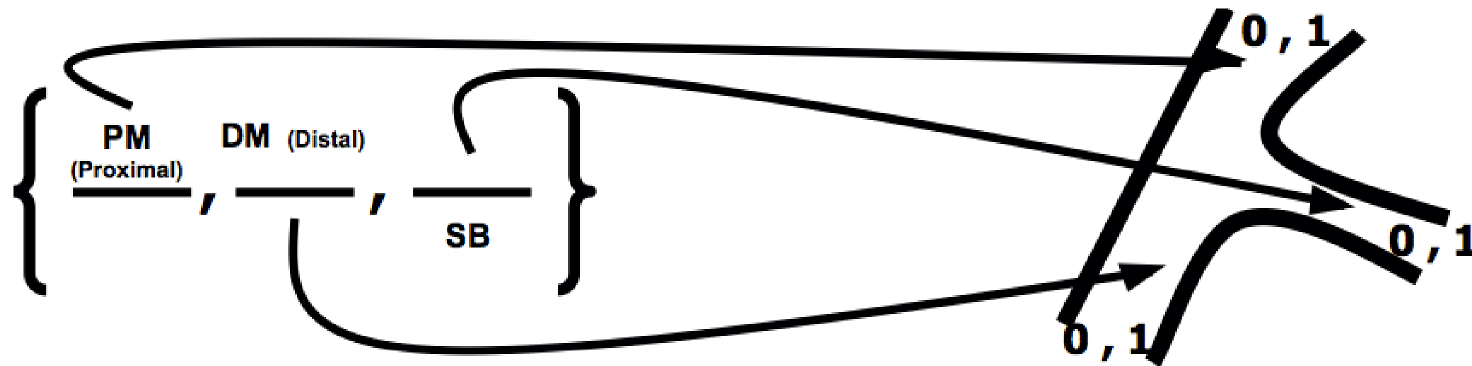
Movahed

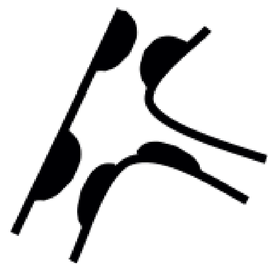




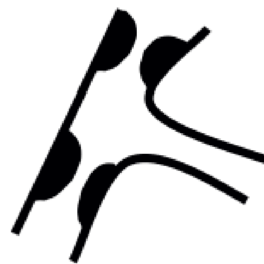
Chen - Gao

Medina classification



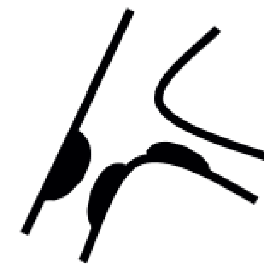


1,1,1



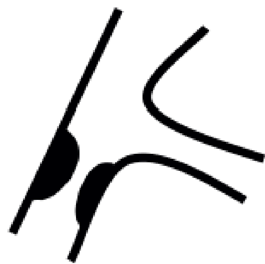
1,1,0

1,0,1



0,1,1

1,0,0

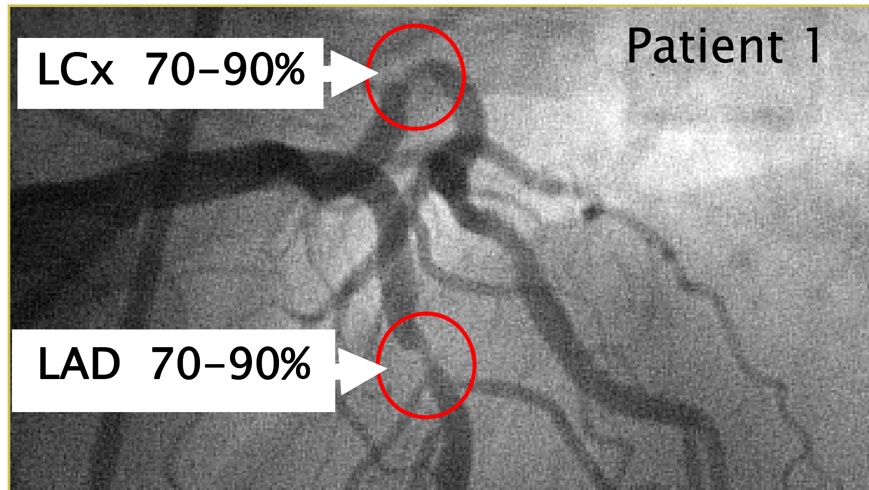


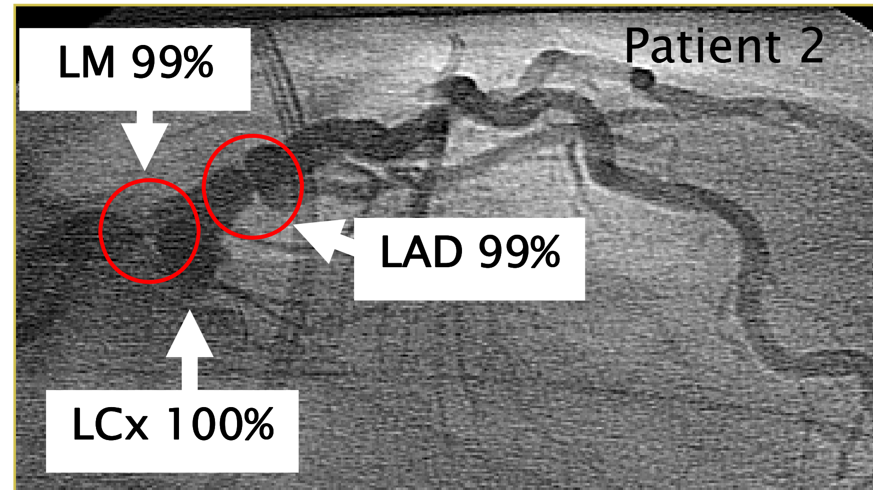
0,1,0

0,0,1

Louvard Y et al. *EuroIntervention.* 2010;6 Suppl J: J31-J35

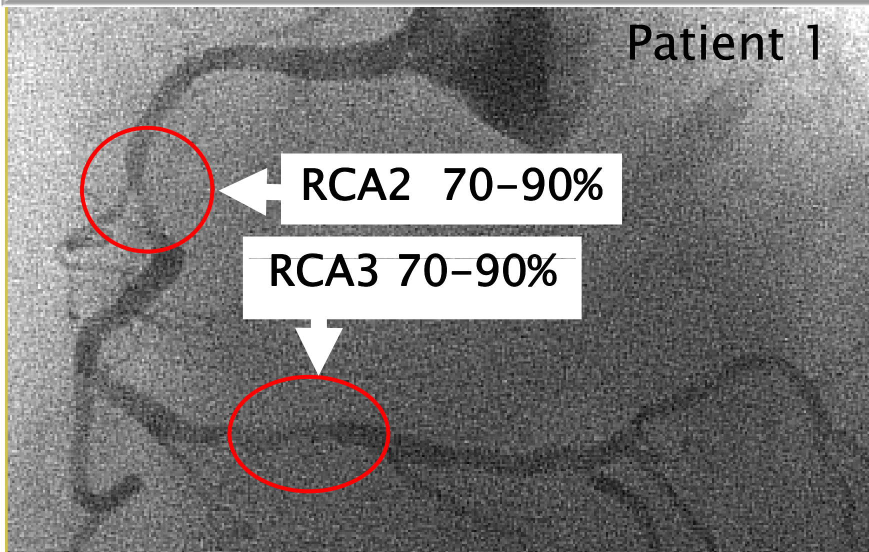
3 vessel disease and 3 vessel disease

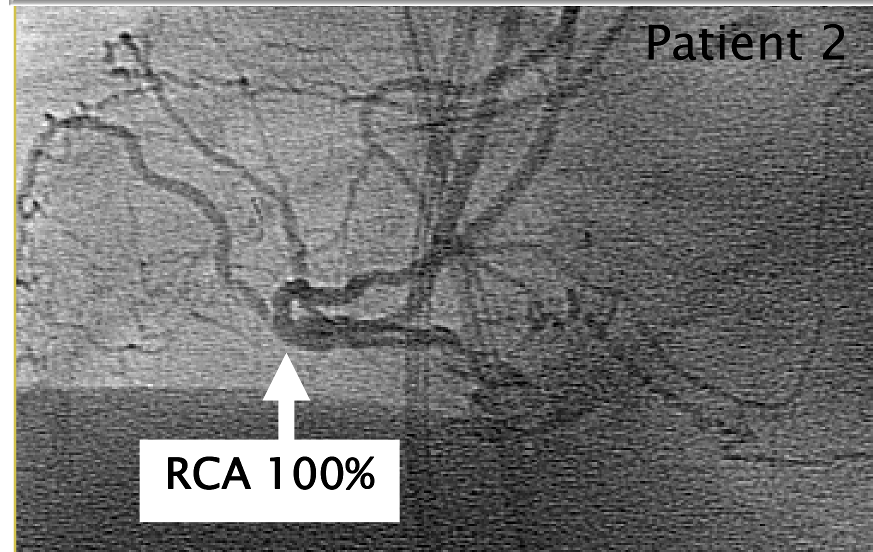




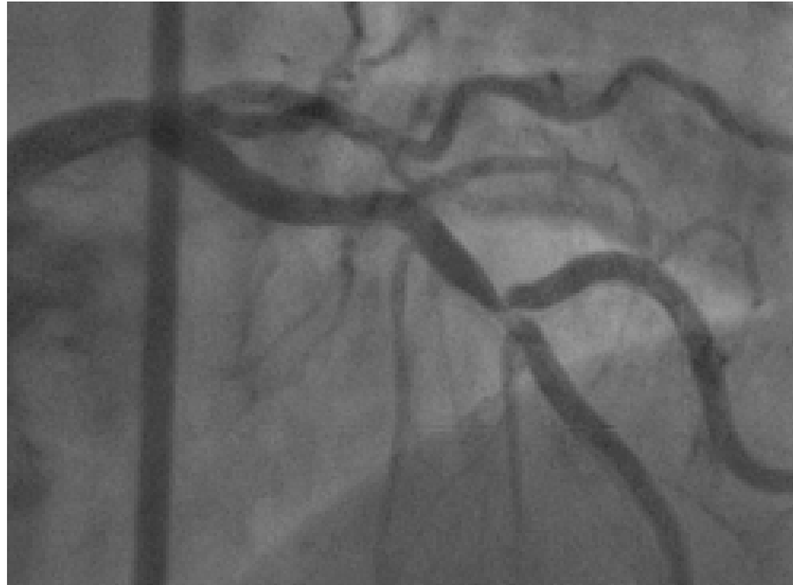
SYNTAX SCORE 21

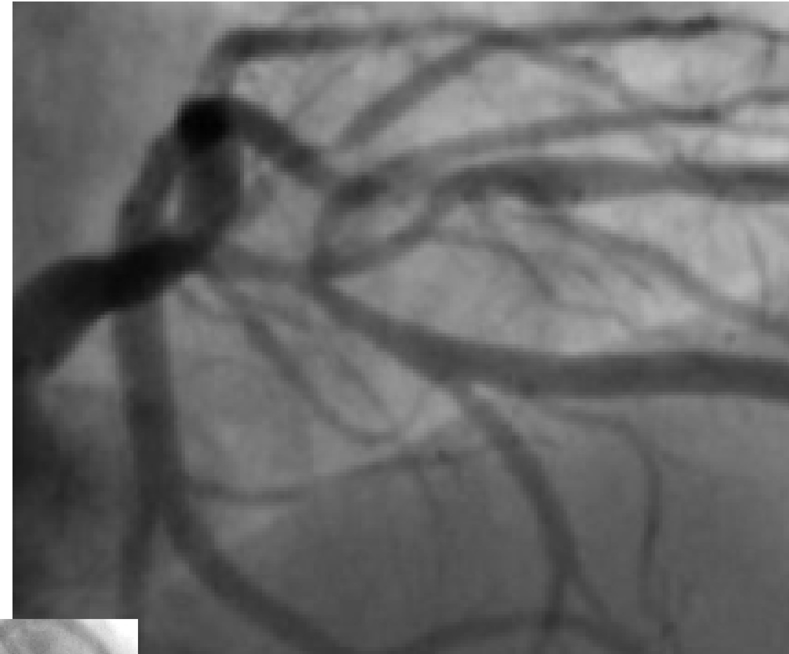
SYNTAX SCORE 52

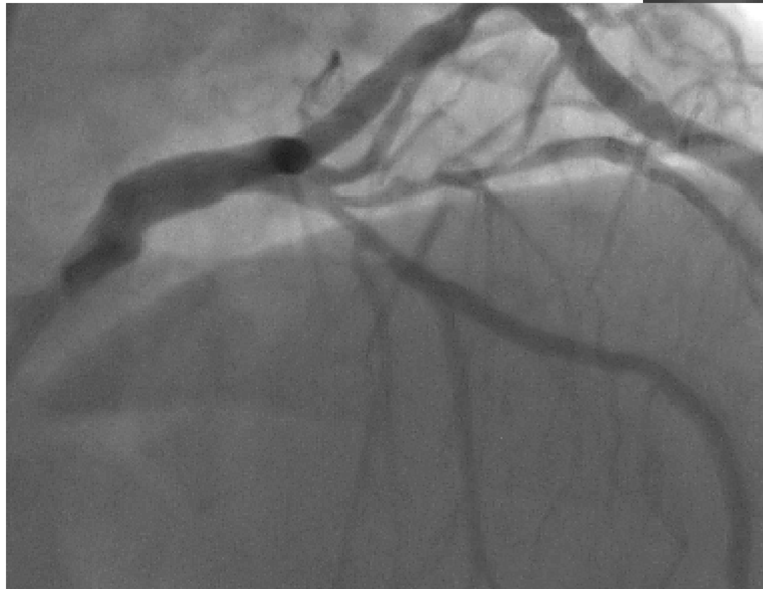




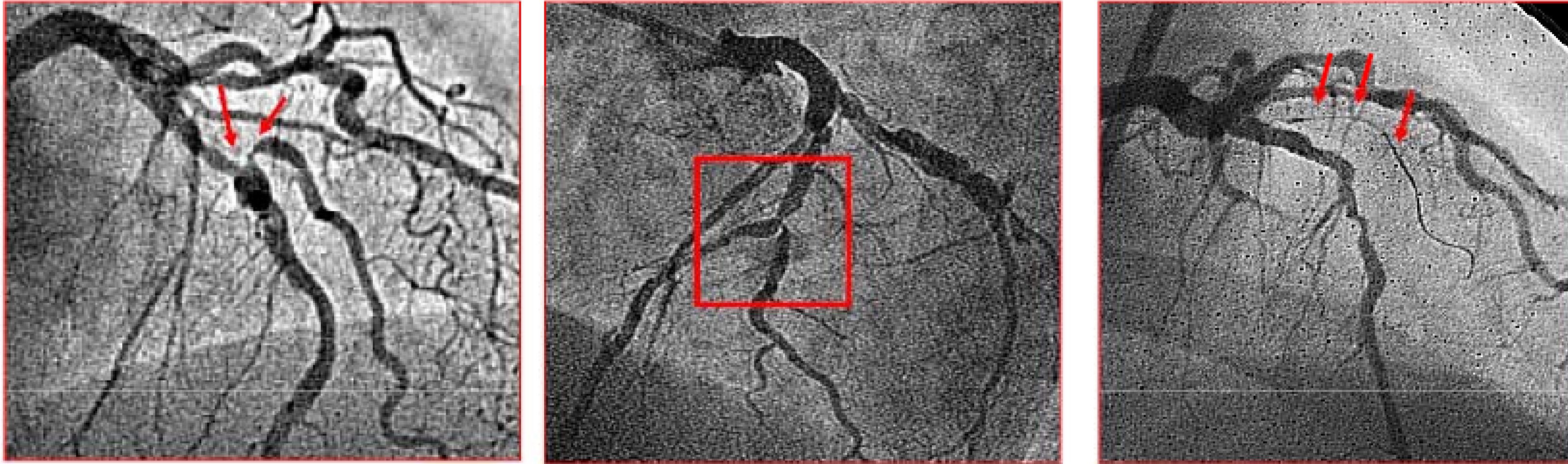
Medina 1,1,1 and Medina 1,1,1





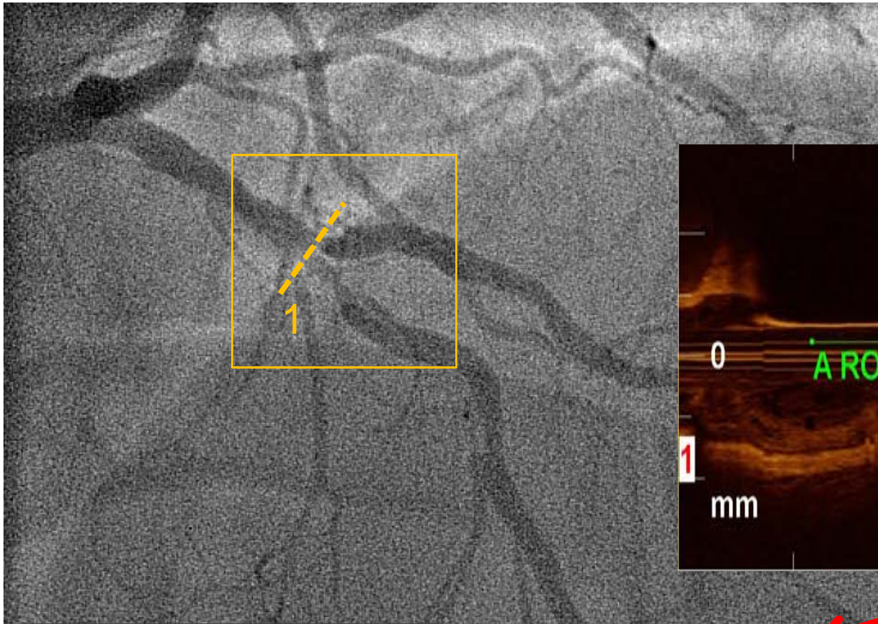


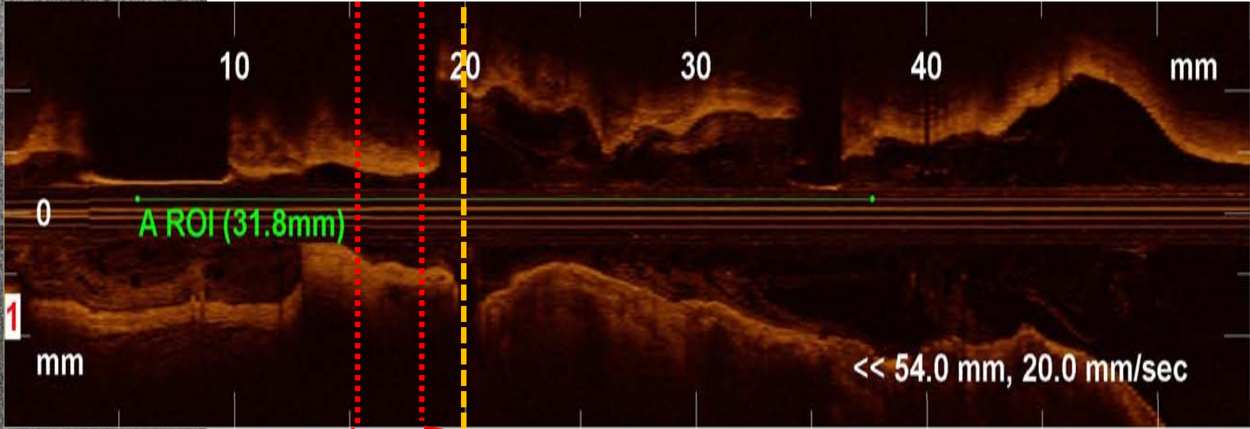
DIFFICULTY ACCESSING THE SB

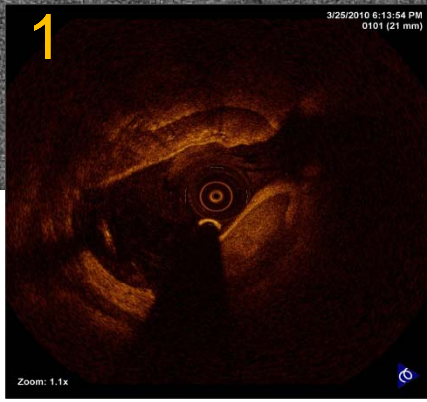


- Extreme angulation of the SB take off
- Very severe lesions in both vessels
- Stent-jailed SB
- We reported 3% failure rate

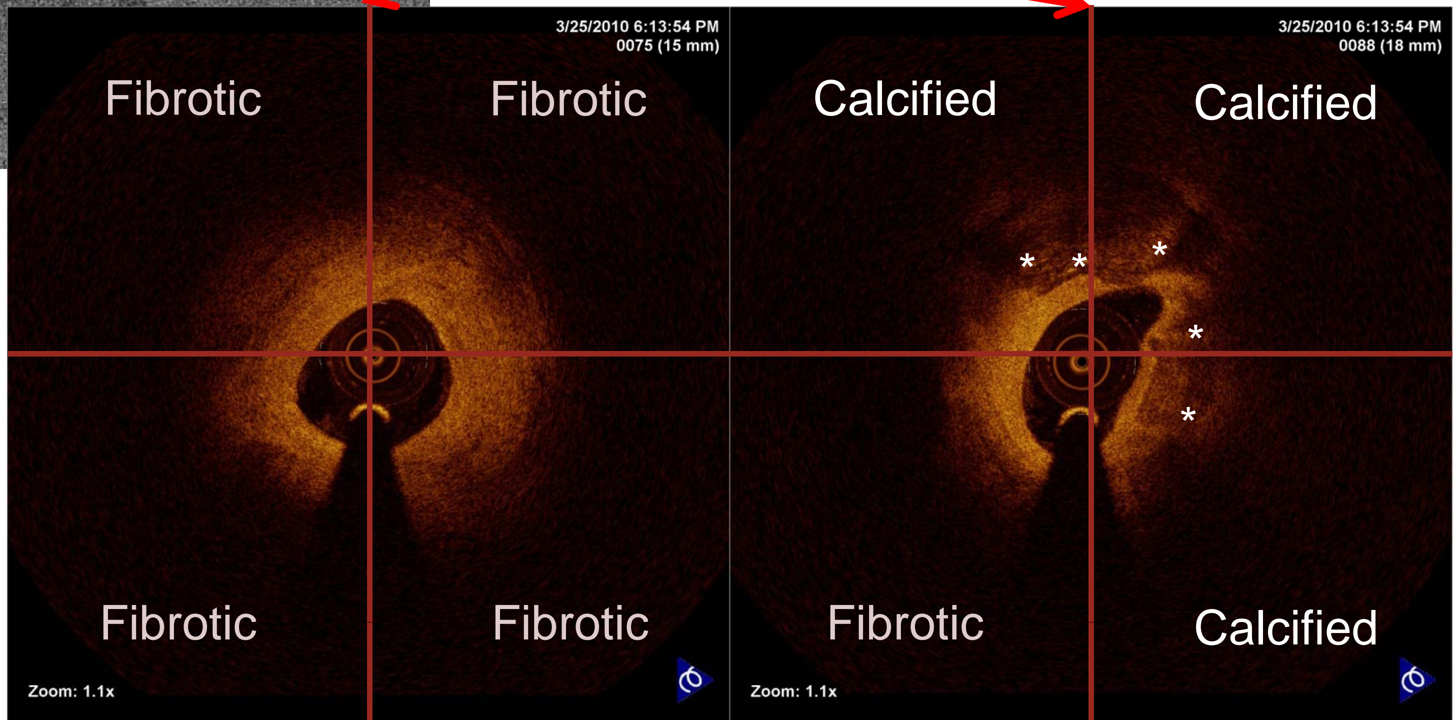
S.Ojeda, presentation at EBC,Lisabon 2011







Tri-furcation as landmark



Courtesy by M.Costa

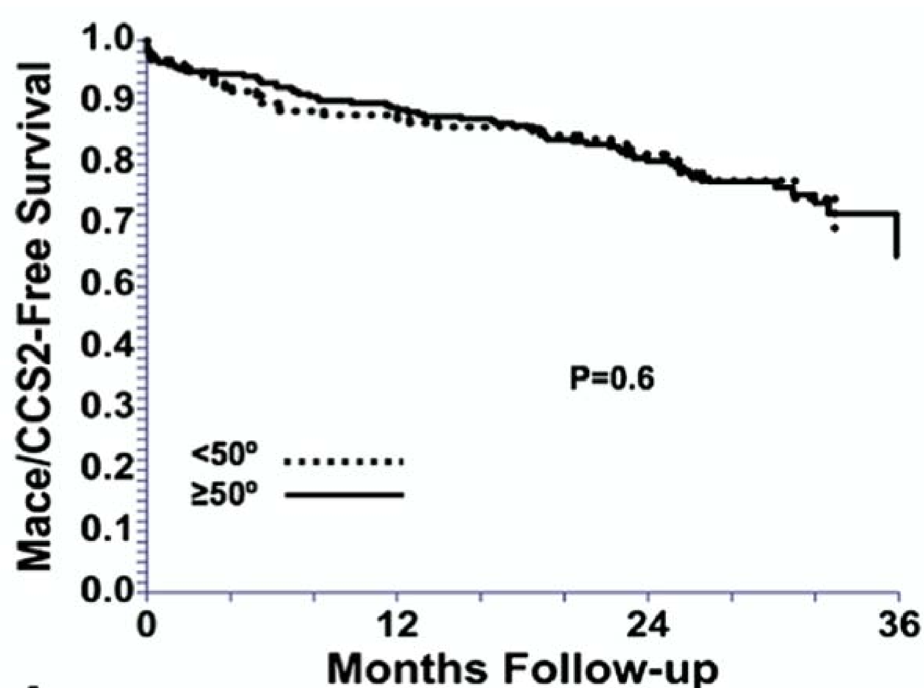
Bifurcation angle calculation in 3D QCA

Louvard Y et al. *EuroIntervention.* 2010;6 Suppl J: J36-J43

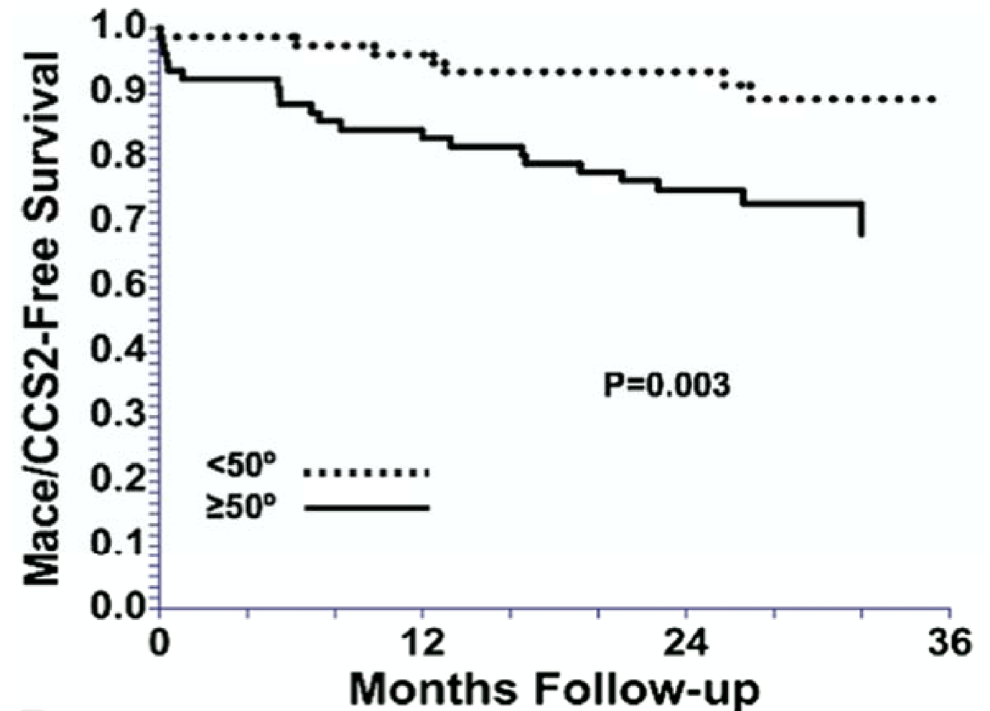
The role of bifurcation angle

Kaplan-Meier curves for MACEs or CCS class ≥2 angina-free survival

MV stenting only

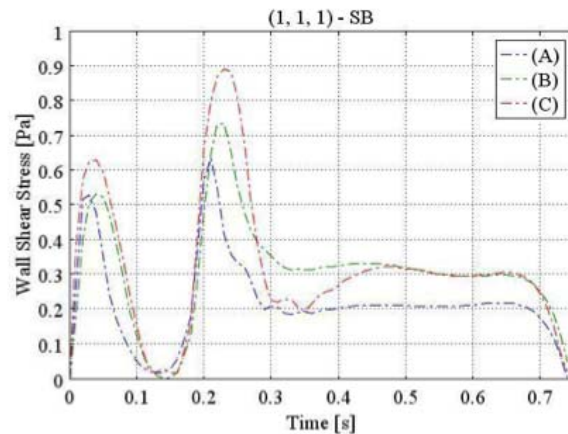


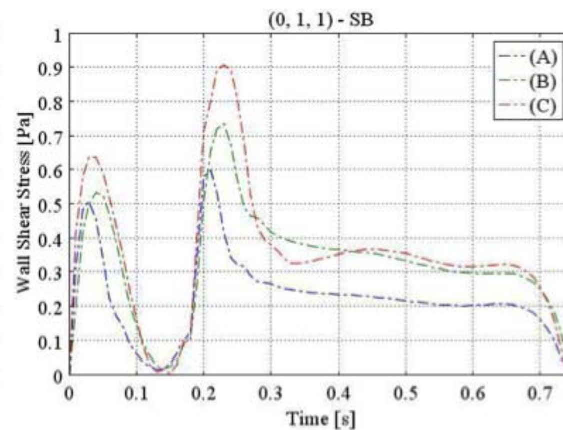
Crush/Culotte stenting

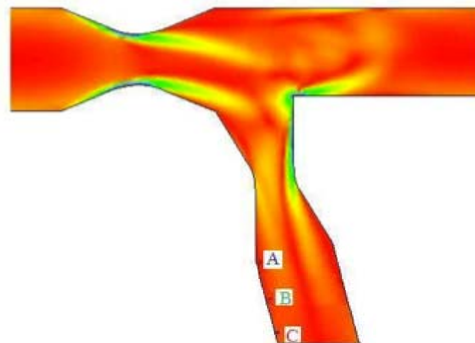


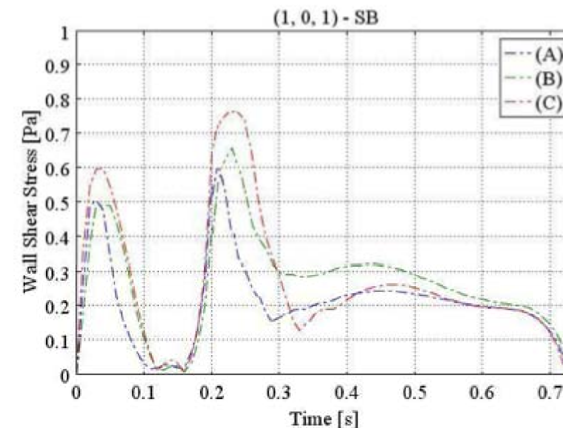
Collins N et al. *Am J Cardiol* 2008;102:404–410

Wall shear stress in SB of true bifurcation









Examinations of the WSS distribution in true bifurcation lesions showed that on the SB, in terms of athero-prone regions, the lesion type (1, 1, 1) is not likely the worst case because the results support that lesion type (1, 0, 1) resulted in lower values of WSS on both inner and outer walls specially in the deceleration phase of the cardiac cycle.

Zarandi MM et al. Modelling and Simulation in Engineering, in press

Disadvantages of Medina's classification

- Medina's classification does not provide a complete description of lesions that may influence the choice of the treatment strategy and the outcome:
  - Lesion length, especially in the SB
  - SB diameter
  - Presence of calcification
  - Angles between the vessel segments
  - Flow conditions

J Am Coll Cardiol Intv, 2008; 1:218-226, doi:10.1016/j.jcin.2007.12.008
© 2008 by the American College of Cardiology Foundation

State-of-the-Art Paper

Bifurcation Disease

What Do We Know, What Should We Do?

Azeem Latib, MB BCh*,‡, Antonio Colombo, MD*,†,*

Practically, the most important distinction is to divide bifurcation lesions into: "true" bifurcations (i.e., Medina 1.1.1, 1.0.1, 0.1.1) where MB and SB are both significantly narrowed (>50% diameter stenosis) and "non-true bifurcations," which include all the other lesions involving a bifurcation.

Latib A, Colombo A. *JACC Intv* 2008;1:218-226

Algorithm for Treating Bifurcations

True Bifurcation
(significant stenosis on the main and side branches)

- **No** → **Provisional SB stenting**
- **Yes** → **Is SB suitable for stenting?**
  - **No** → **Stent on MB "Keep It Open" for SB**
  - **Yes** → **SB disease extends from the ostium?**
    - **No** → **Provisional SB stenting**
    - **Yes** → **Elective implantation of two stents (MB and SB)**

Latib A, Colombo A. *JACC Intv* 2008;1:218-226

Prognostic value of lesion characteristics *NORDIC I + BBC I*

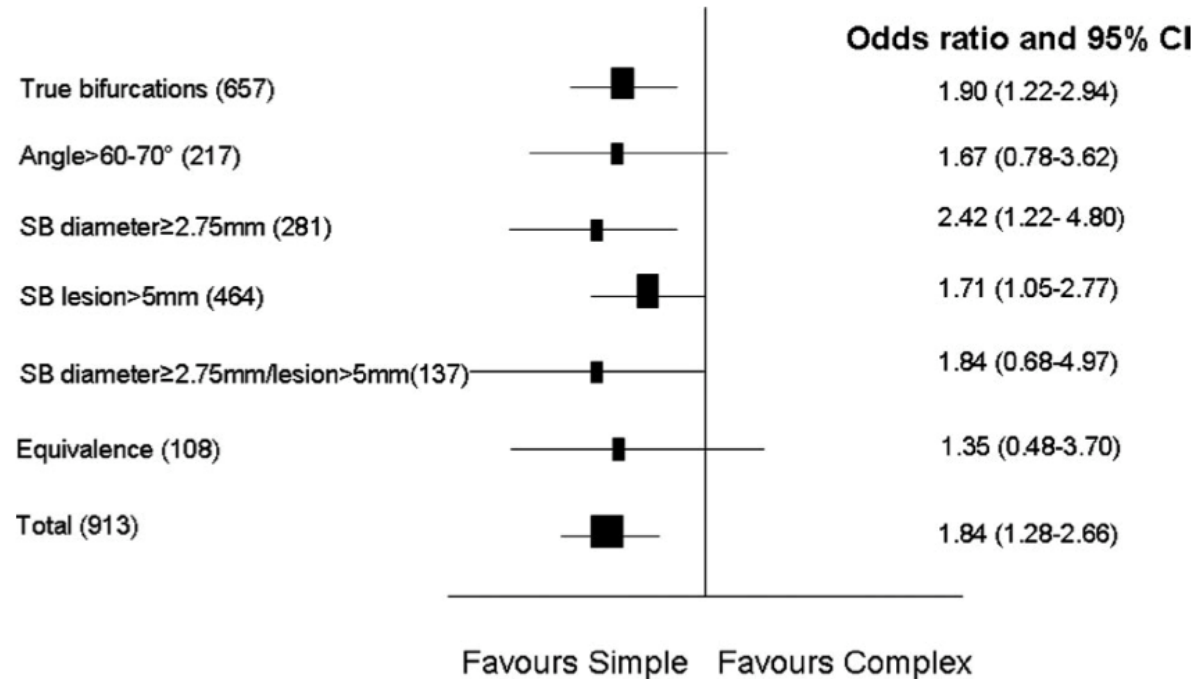


Figure 2. Odds ratio plot of the primary outcome for individual subgroups. Equivalence indicates that the SB is <0.25 mm smaller than the MV. Size of data markers indicates the number of patients in that subgroup. SB indicates side branch; MV, main vessle; CI, confidence interval.

Behan MW et al. *Circ Cardiovasc Interv*. 2011;4:57-64

Consensus from European Bifurcation Club, 2010

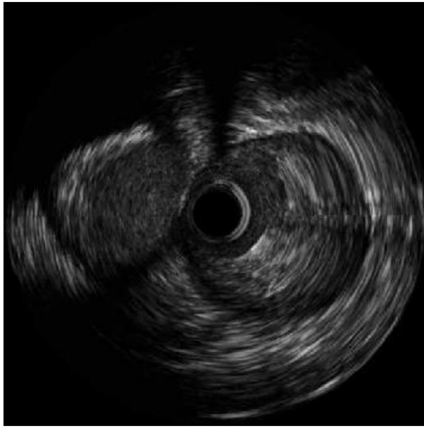
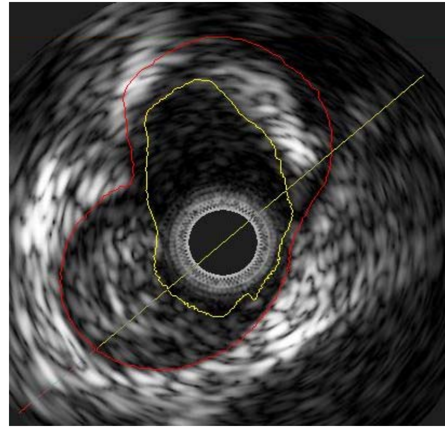
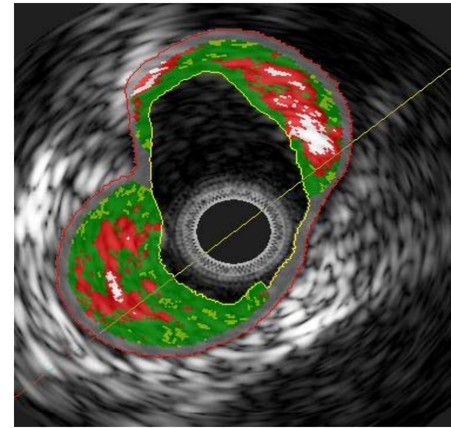
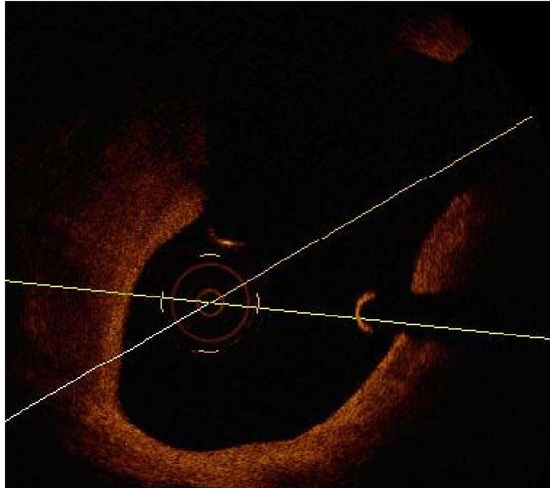
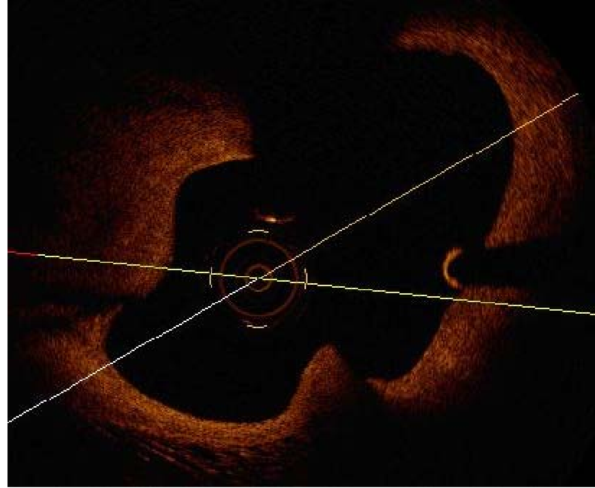
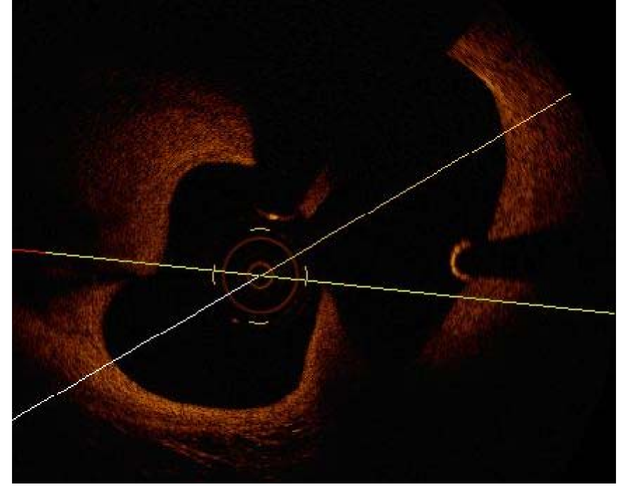
- Provisional T stenting remains the gold standard technique for most bifurcations
- Large side branched with ostial disease extending >5 mm from the carina are likely to require a two-stent strategy
- Side branches whose access is particularly challenging should be secured by stenting once accessed
- Bifurcations with angulation > 60 degree between the daughter vessels should be approached with single stent strategies where possible

Eurointervention 2010;6:34-38

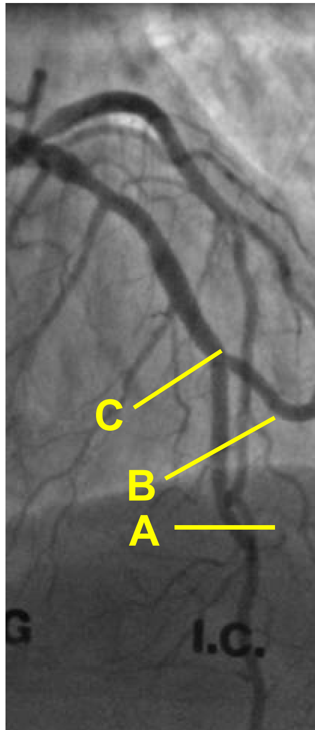
XIENCE – Optimal Study

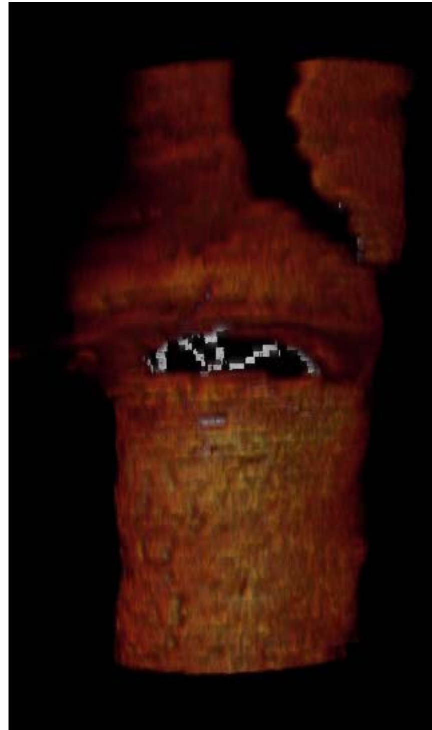
Optimizing Percutaneous Coronary Bifurcation Intervention by OCT – Guided XIENCE – PRIME Implantation (n = 70)

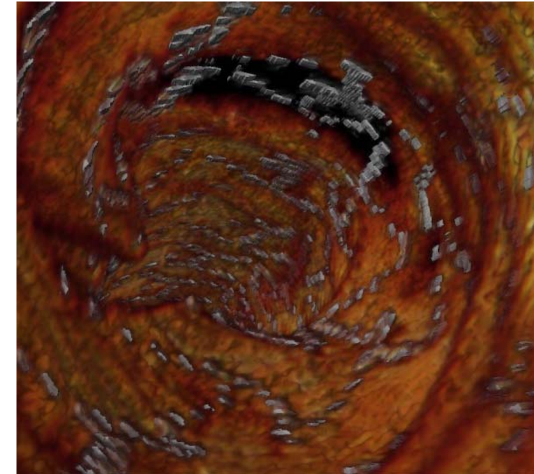
Step	Imaging
Pre – procedural Lesions evaluation	•Angio •OCT •IVUS (iMap) •Virtual Histology IVUS
Lesion pre-treatment	•Angio •OCT •IVUS (iMap)
Stenting (intended provisional T stenting)	•Angio •OCT •IVUS (iMap)
9 months follow-up	•Angio •OCT •IVUS (iMap)

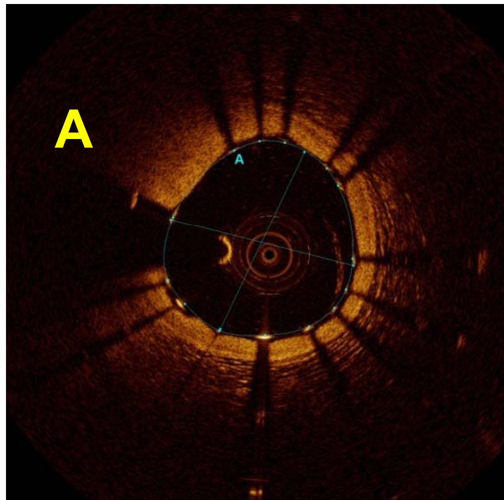







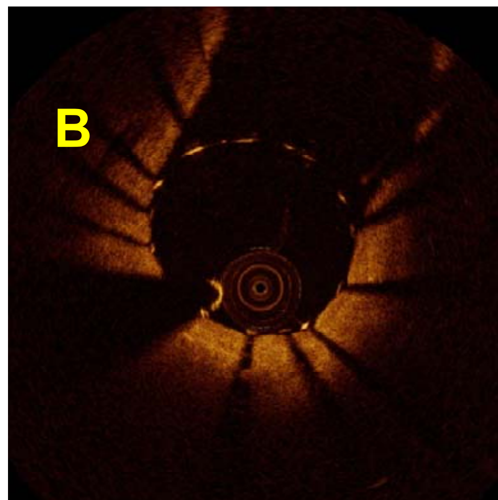
3D Reconstruction

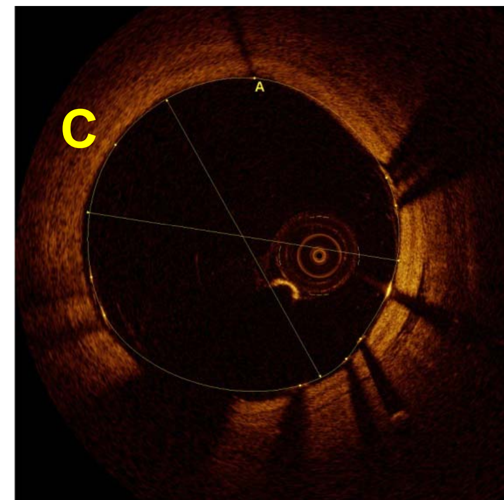












Courtesy by M.Costa

Conclusion

- **Medina's is the simplest and the most reliable bifurcation classification**
- **However there is currently no available description of prognostic values associated with the various Medina lesion types identified**
- **Advances in the current intravascular imaging modalities will enable the development of more accurate models for the study of geometry and flow conditions in coronary bifurcations.**