BifurQFR
Bifurcation evaluation with Quantitative Flow Reserve and 3 Dimension Quantitative Coronary Angiography

Julien Adjedj, Shengxian Tu, Hans Reiber, William Wijns

Background

Virtual FFR

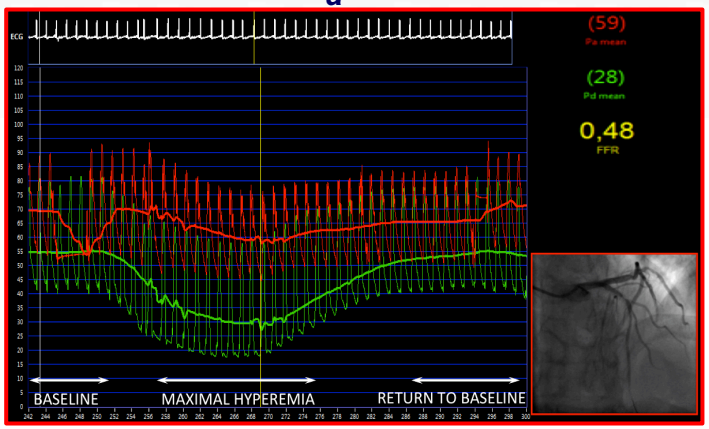
FFR

$$FFR = \frac{Q_s^{max}}{Q_N^{max}}$$

$$FFR = \frac{(P_d - P_v)^{max} / R_s}{(P_a - P_v)^{max} / R_N}$$

- Maximal hyperemia ➔ $R_s = R_N$
- P_v <<< P_a et P_d

$$FFR = \frac{P_d}{P_a}$$



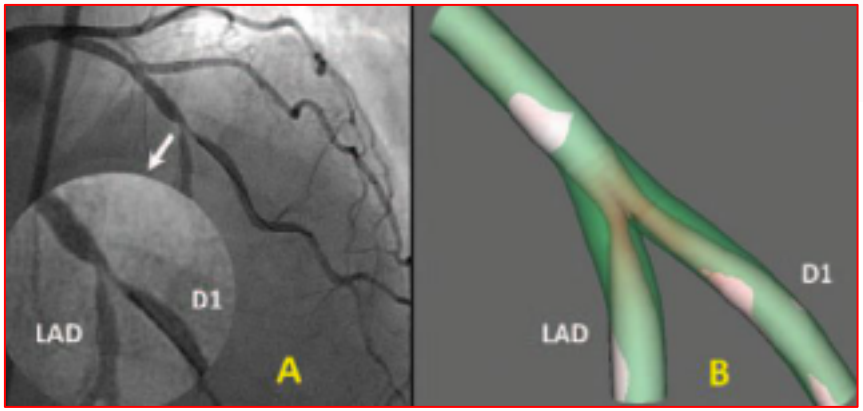
Virtual FFR/QFR

Algorithme

$$\frac{Dv}{Dt} = -\text{grad}\, V - \frac{1}{\rho}\text{grad}\, p + \frac{1}{\rho}\text{div}\, \tau$$

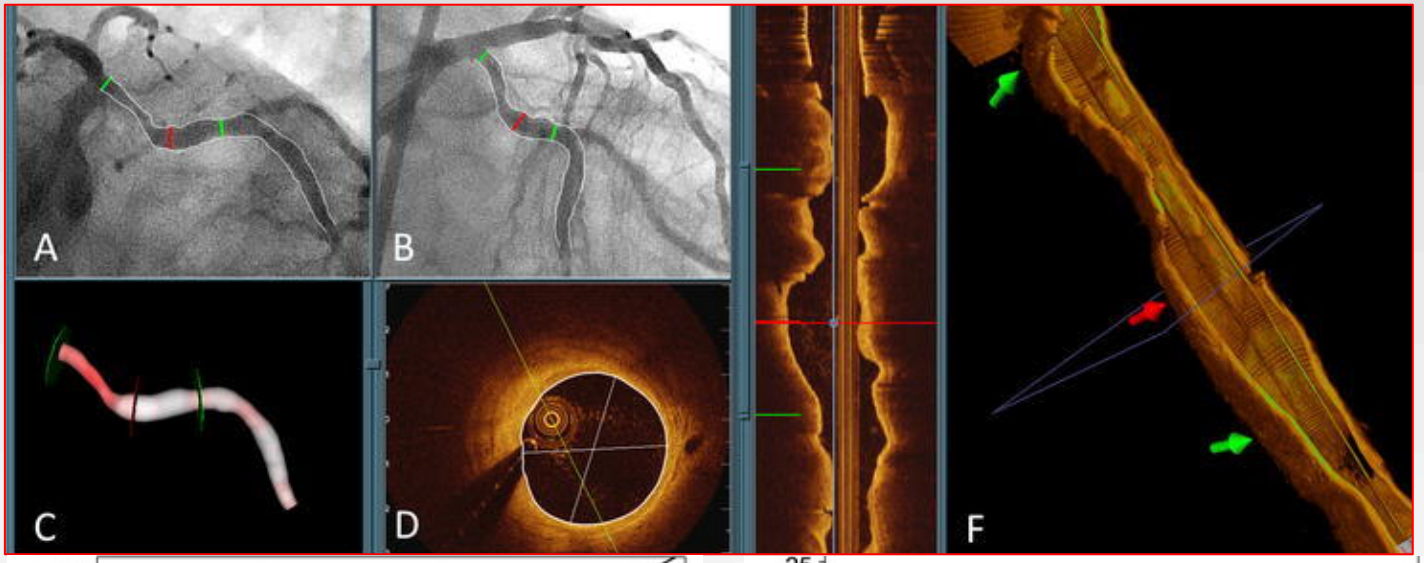
$$\tau_{ik} = \mu\left(\frac{\partial v_i}{\partial x_k} + \frac{\partial v_k}{\partial x_i} - \frac{2}{3}\delta_{ik}\frac{\partial v_s}{\partial x_s}\right) + \mu_\vartheta \delta_{ik}\frac{\partial v_s}{\partial x_s}$$

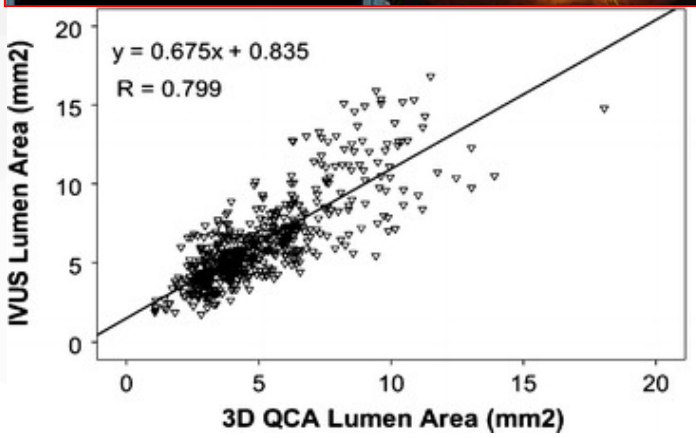
3D vessel modelling

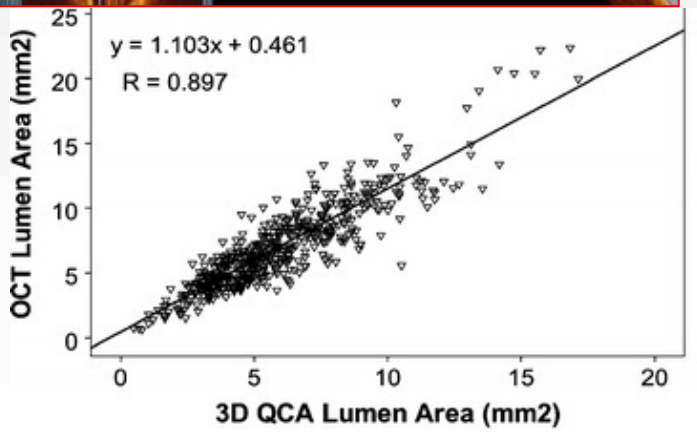


Background

3D QCA



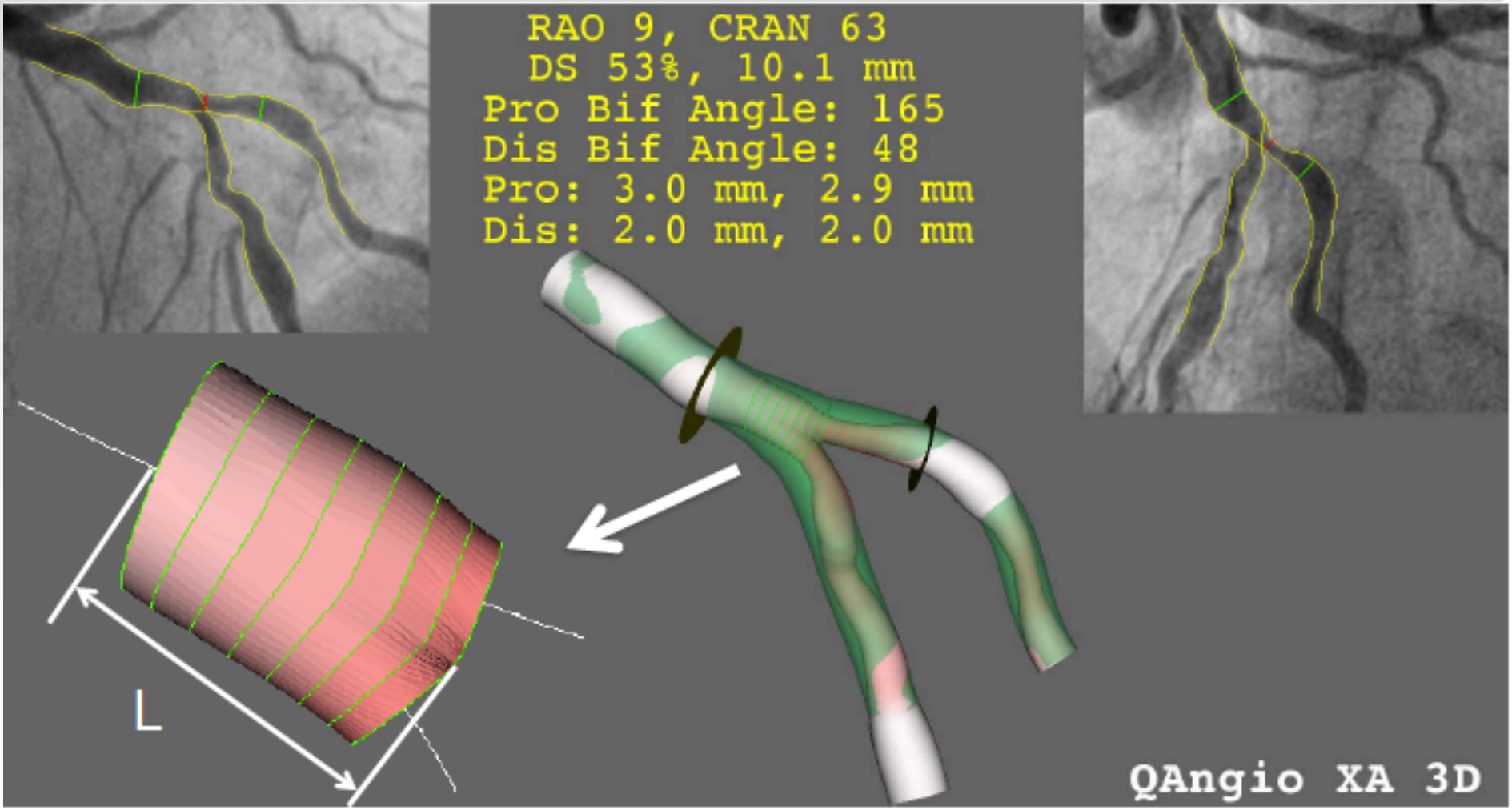




Tu et al. Int J Cardiovasc Imaging 2012.

Background

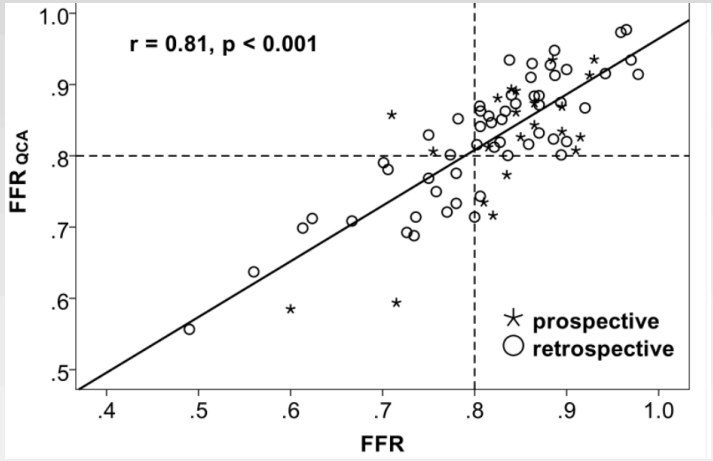
Bifurcation lesion

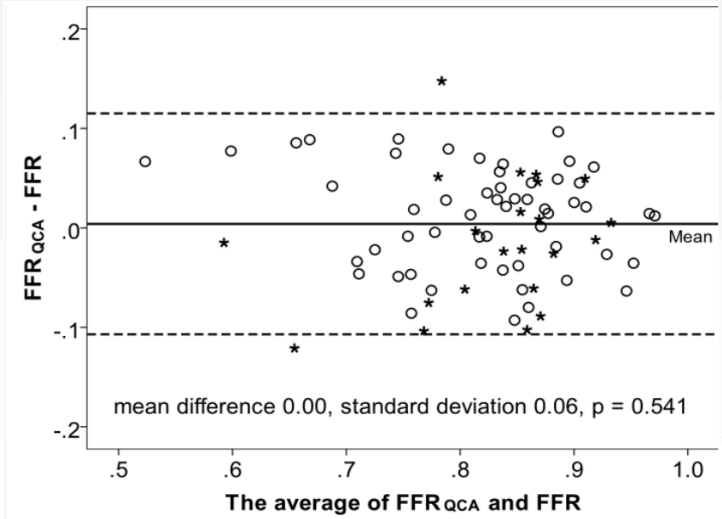


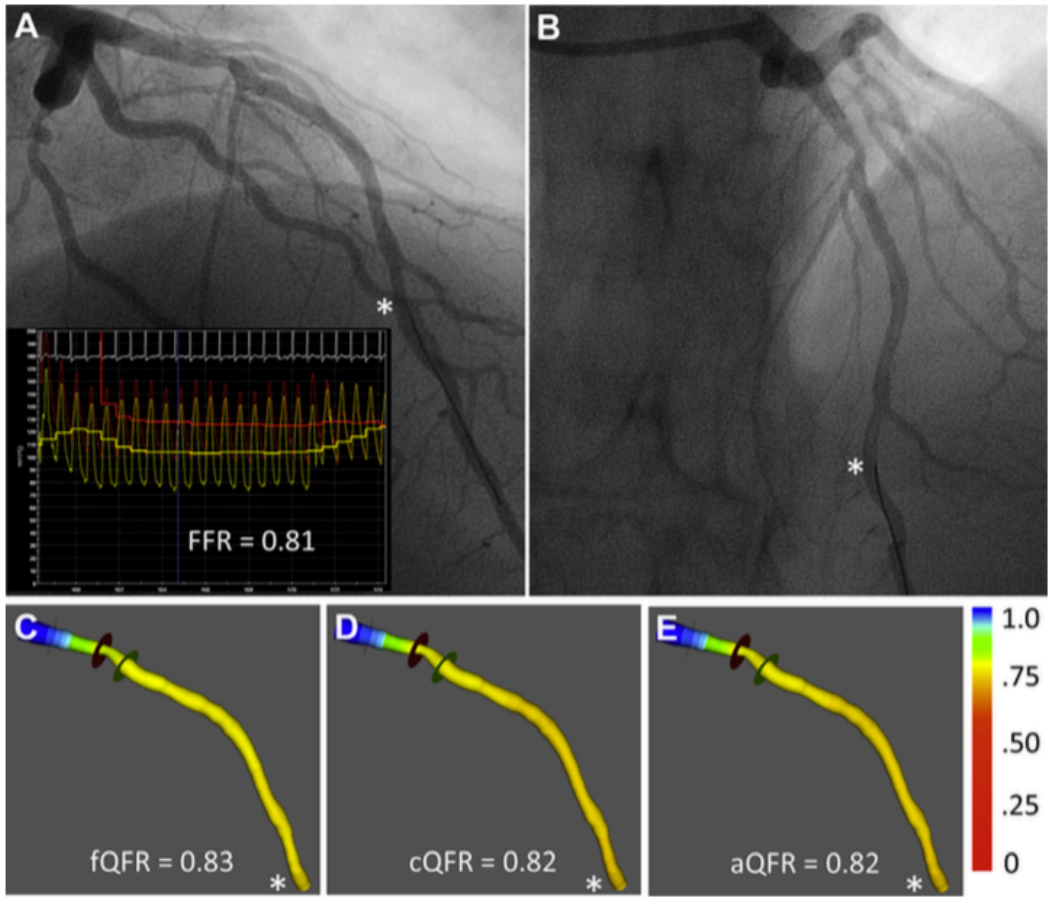
Courtesy of Shengxian *Tu*

Background

QFR







Tu et al. JACC Cardiovasc int 2014

Tu et al. JACC Cardiovasc int 2016

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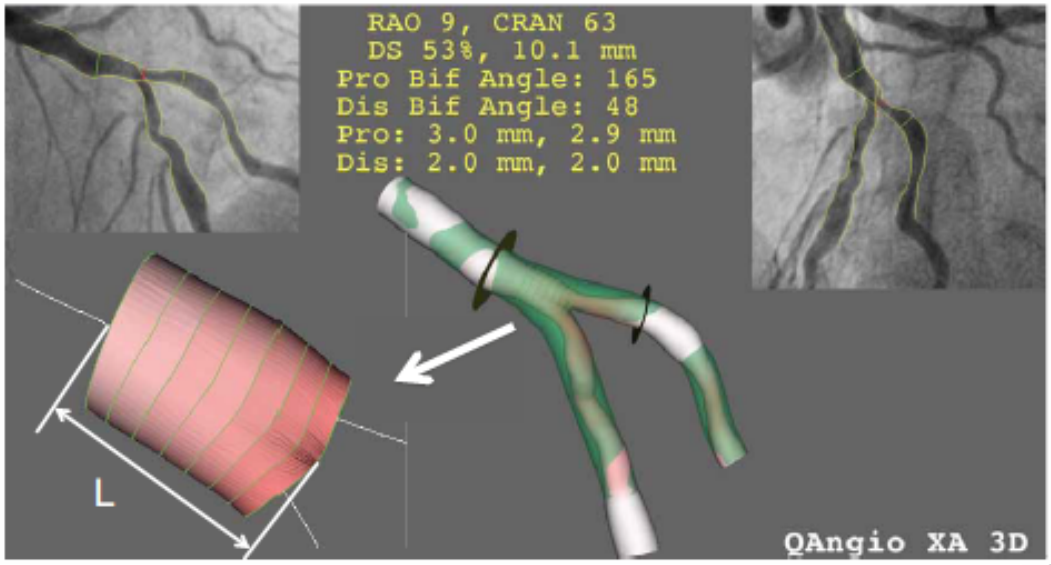
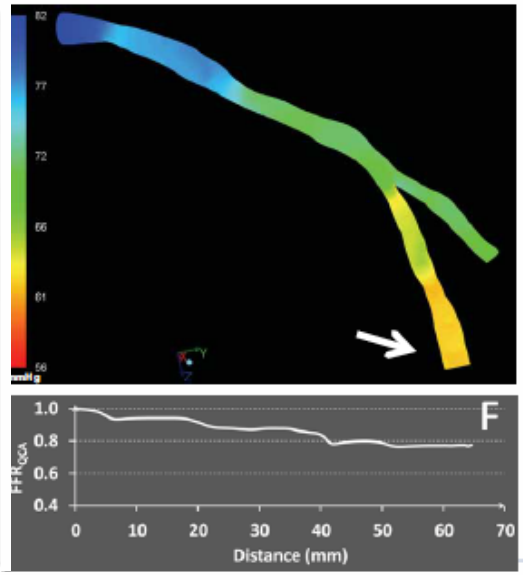
Objectives

- Use 3D QCA and FFR to evaluate predictors of SB suffering

- Evaluate QFR accuracy compared to FFR pre and post provisional T stenting





FFR_{QCA} = 0.78

vs.

FFR = 0.78

← FFR_{QCA} pullback

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Design

Observational & multicentric study

Angio
2 views (30°)

FFR
MB + SB

Orsiro DES

Angio
2 views (30°)

FFR
MB + SB

DATA ANALYSIS

Blind

QFR value
pre

FFR value
pre

Blind

QFR value
post

FFR value
post

	SB	MB
Pre	QFR vs FFR	QFR vs FFR
Post	QFR vs FFR	QFR vs FFR

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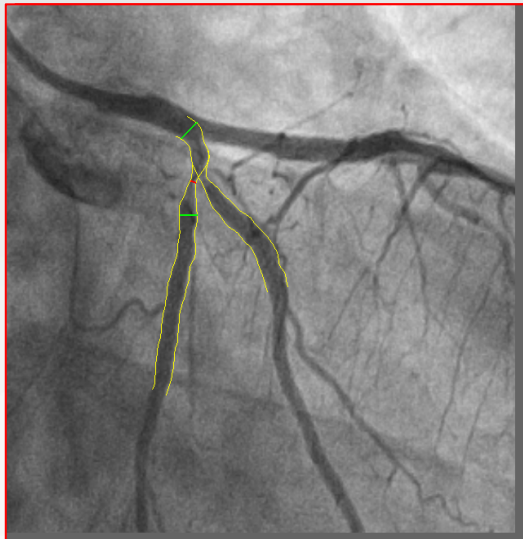
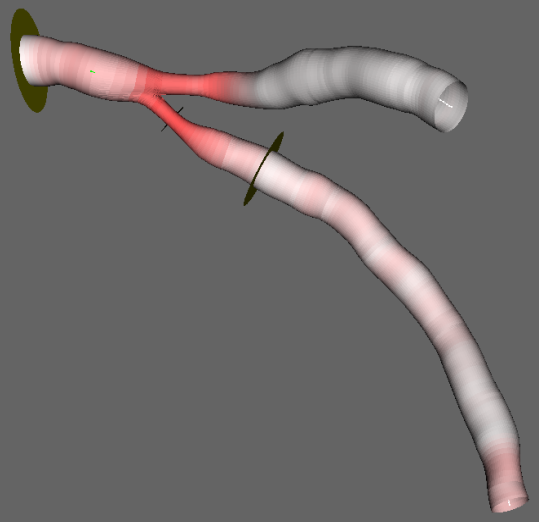
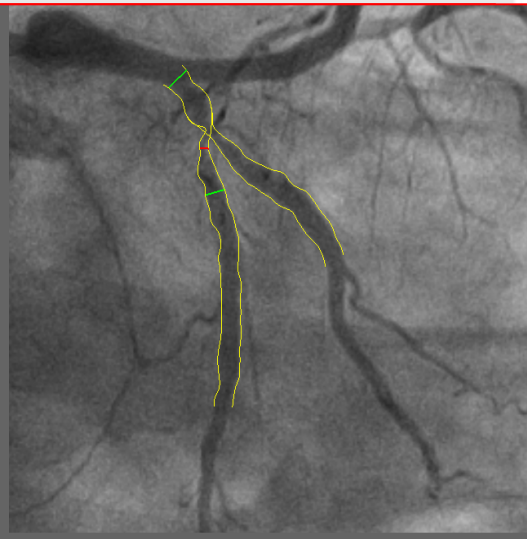
Example

68 years old male
previous anterior STEMI



LAO 45, CAUD 51
DS 66%, LL 14.6 mm
Prox Bif Angle: 163
Dist Bif Angle: 35
PD: 2.8 mm, 2.7 mm
DD: 2.3 mm, 2.2 mm





QAngio XA 3D

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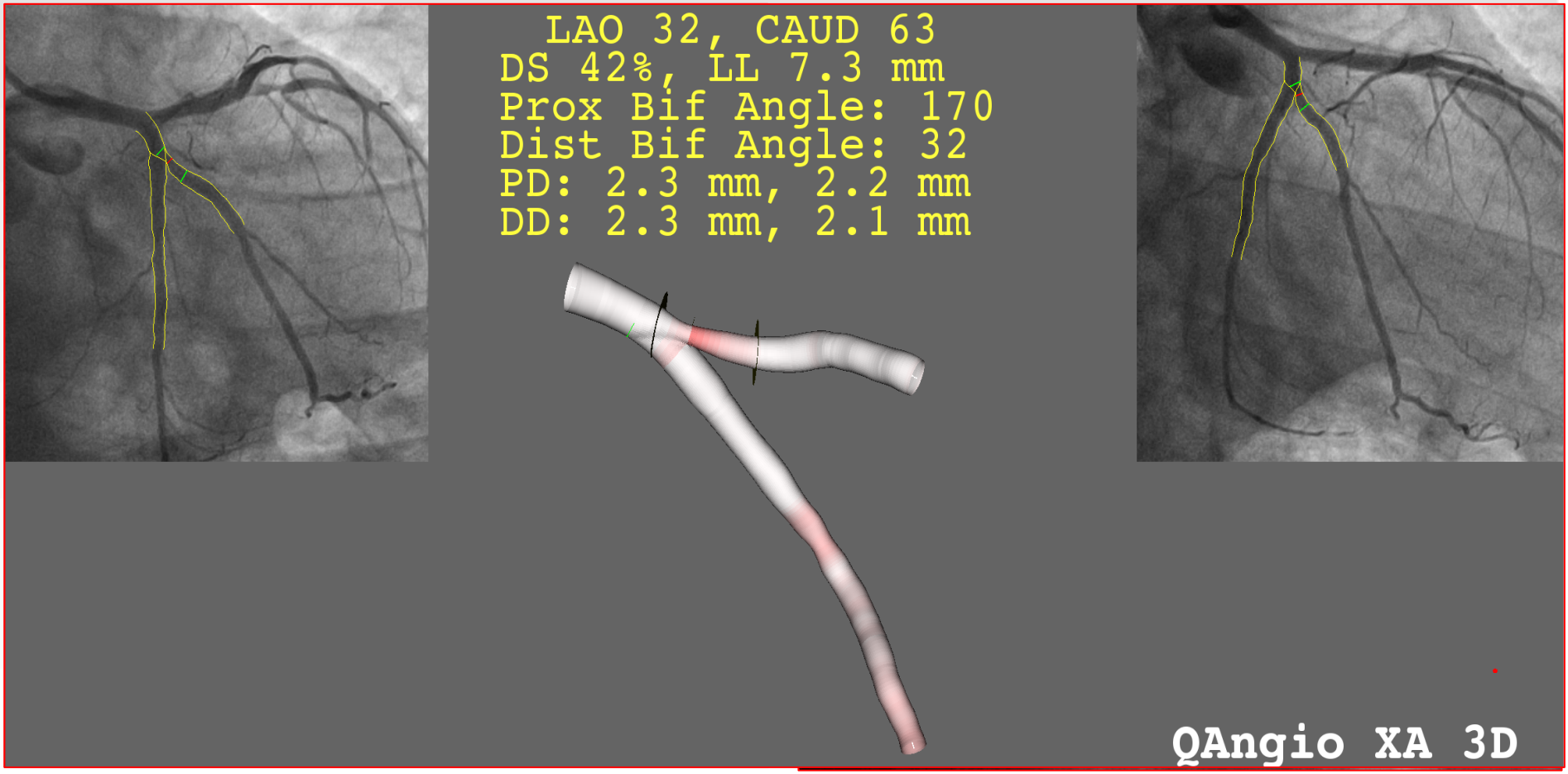

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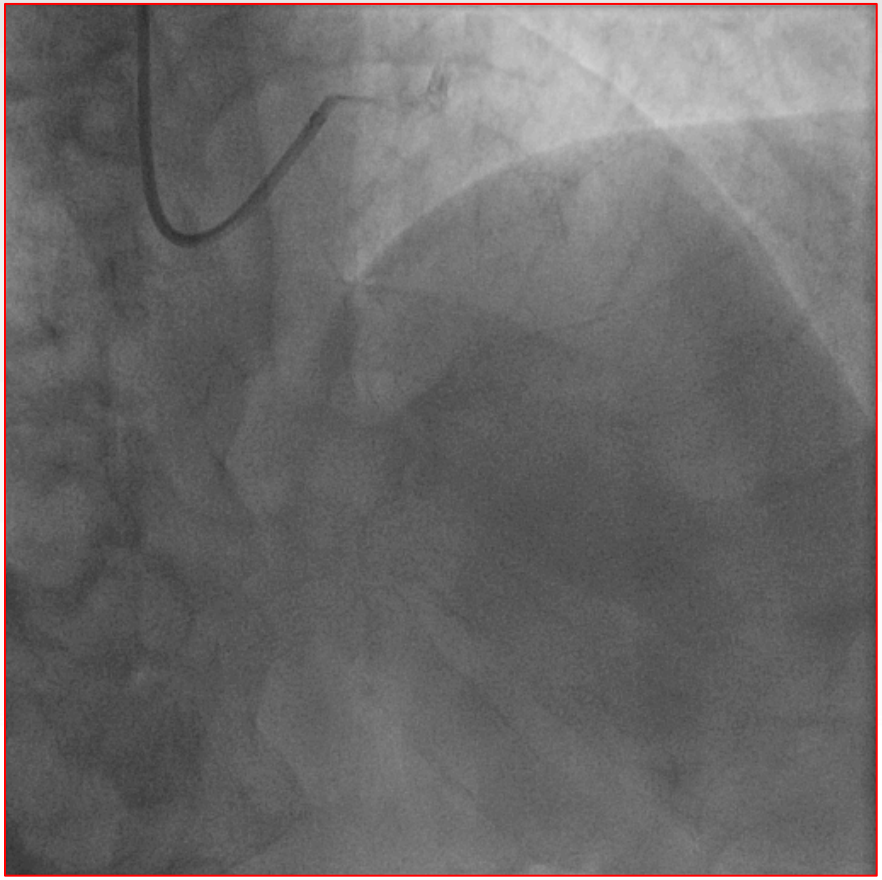

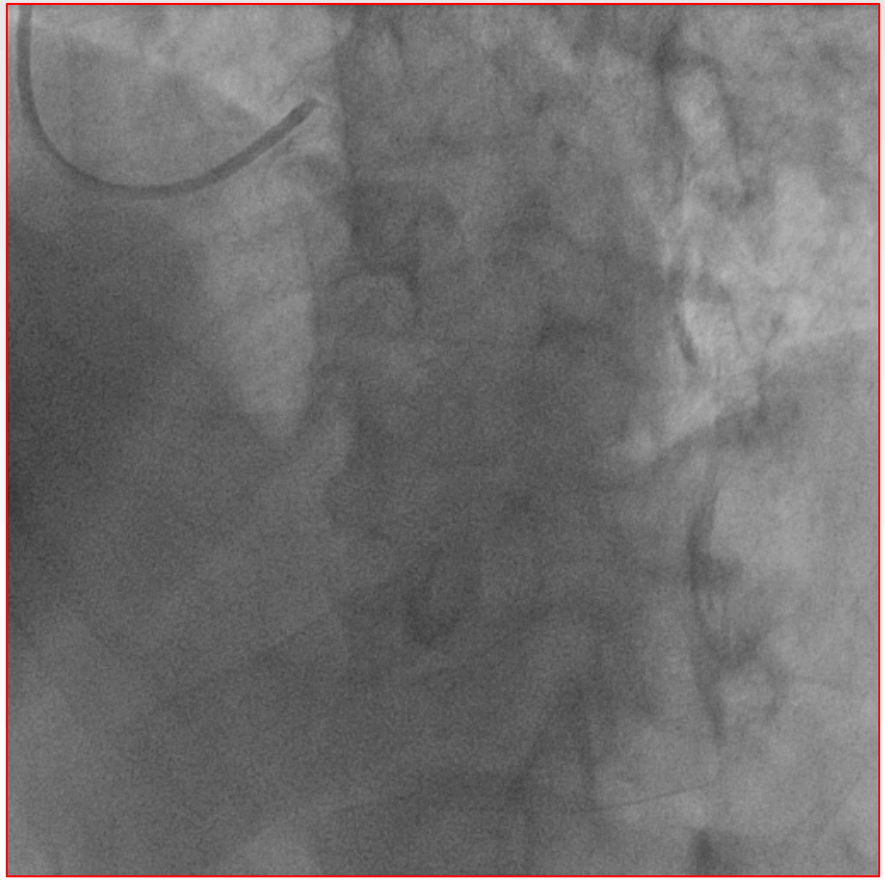

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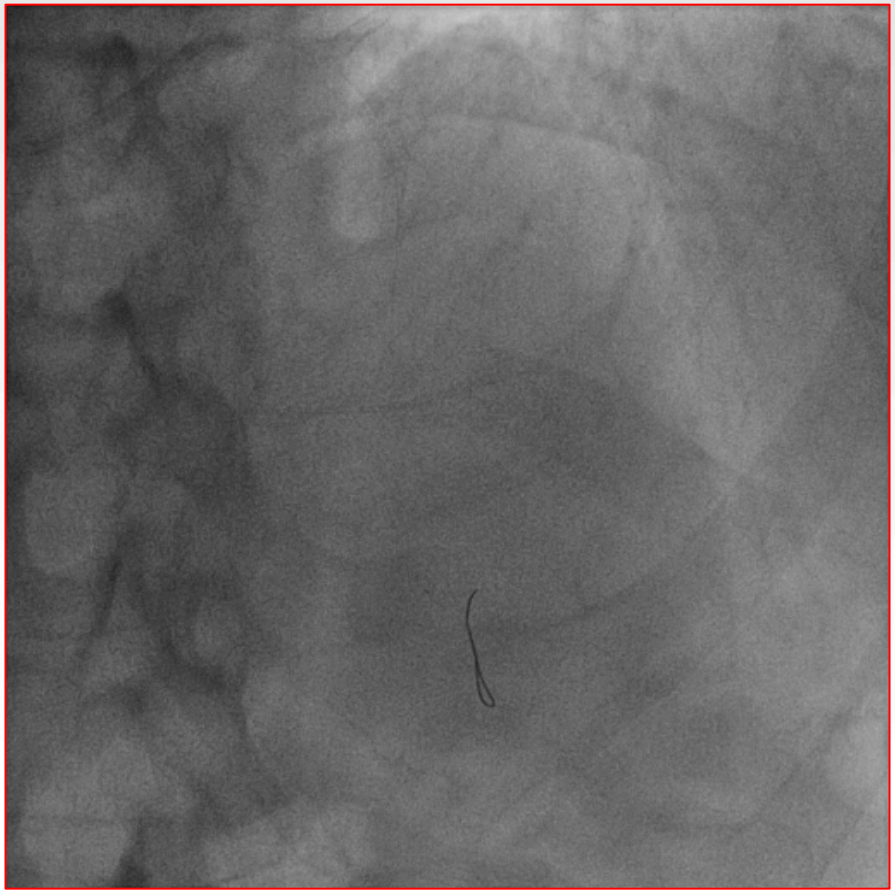

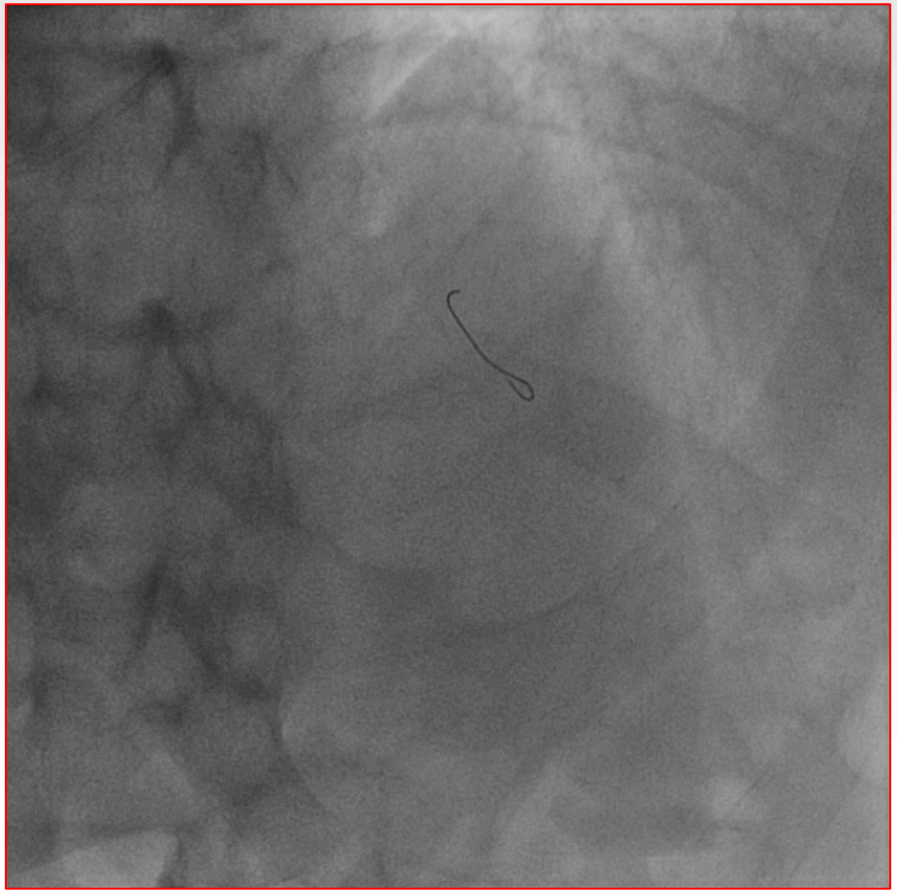

BifurQFR Example

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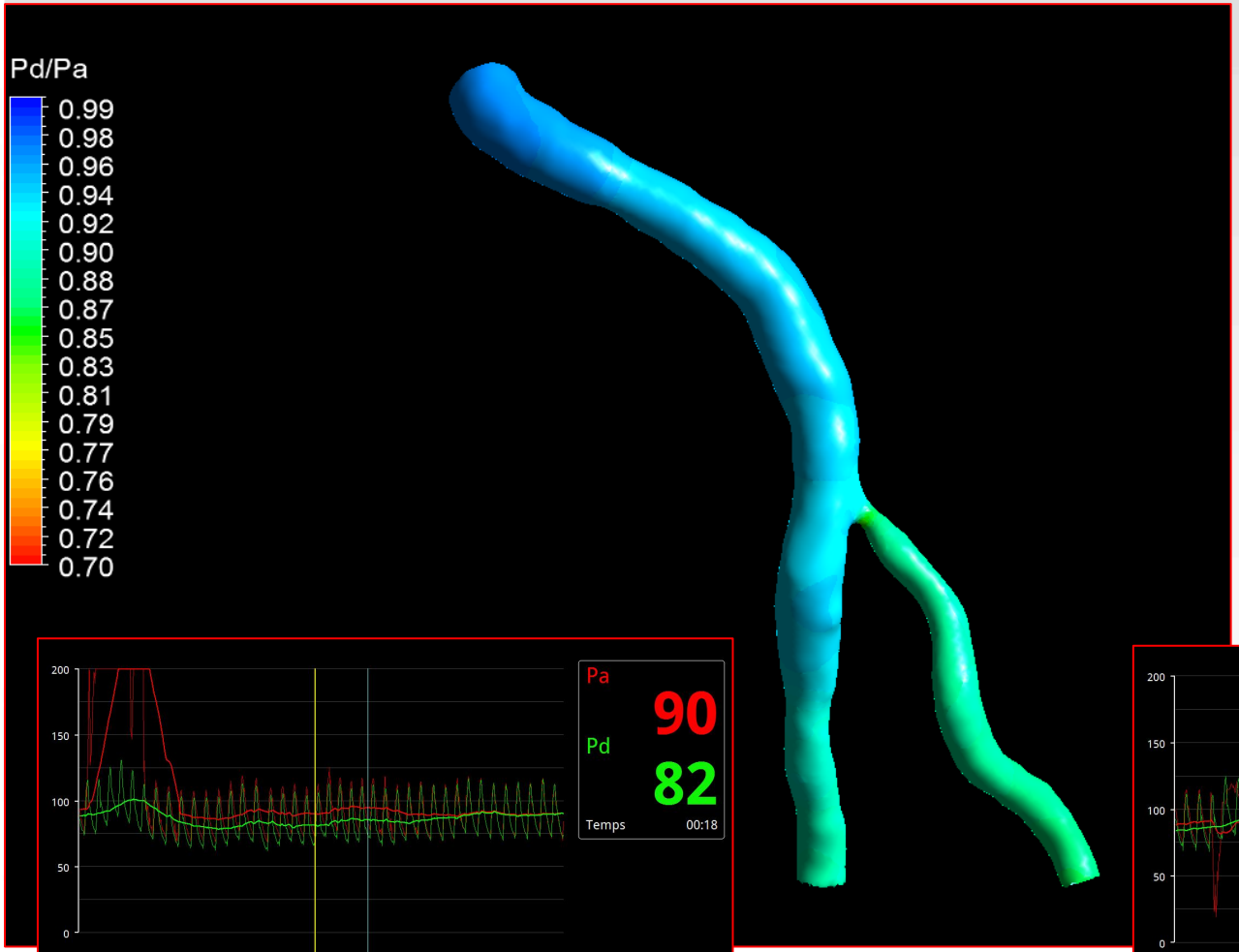

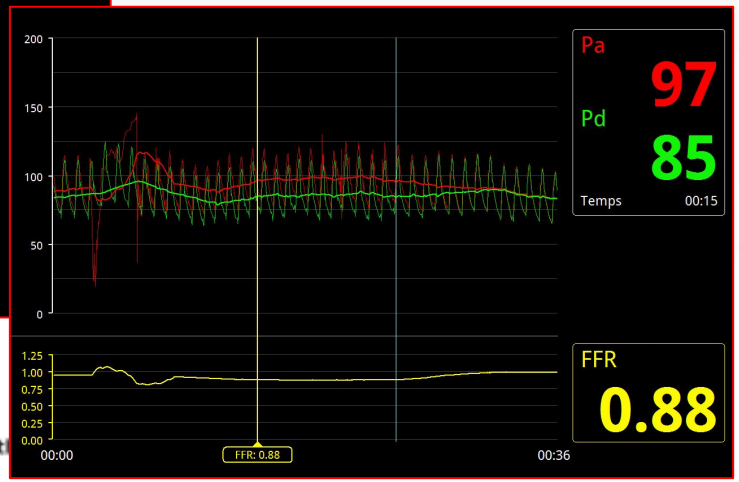

BifurQFR

Sample size and support

- Sample size calculation: based on FAVOR trial
- 90-100 patients with planned bifurcation PCI
- Distal LM are excluded
- Biotronik support using ORSIRO DES
- No FFR wire support

Perspectives

- Better evaluate SB suffering predictors after provisional T stenting with 3D QCA

- Validate QFR in bifurcation lesions pre and post PCI

Thank you

julienadjedj@hotmail.com