9th European Bifurcation Club
18th & 19th October 2013 – London, UK
News
19/10/13 08:00-10:00

Advanced 3D QCA assessment of bifurcation lesions

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Disclosures

Dr Girasis does not have

any potential conflict of interest

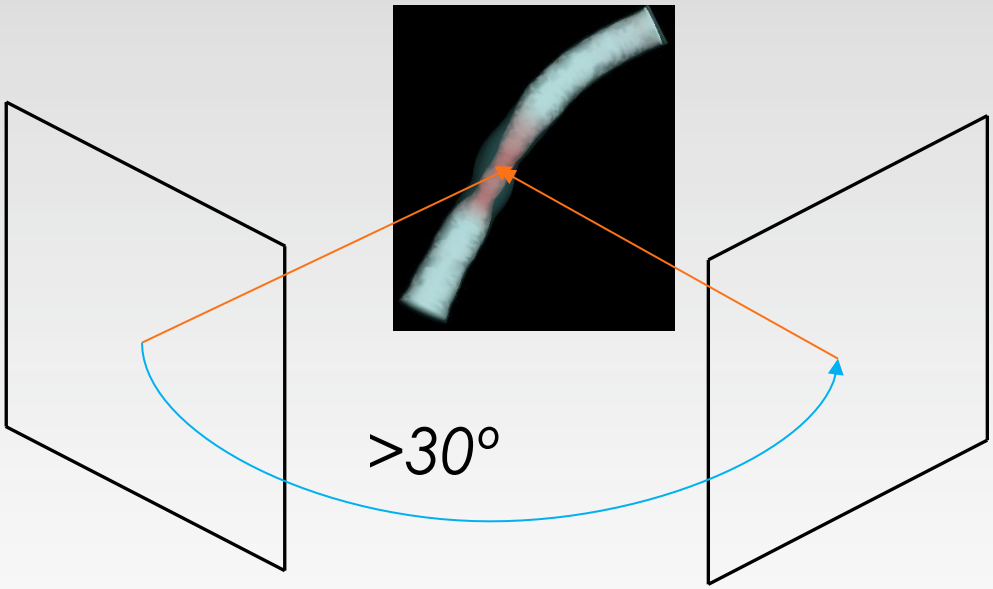
Benefits of 3D QCA vs. 2D QCA

- Elimination of foreshortening-overlap
- Elimination of out-of-plane magnification
- Highly accurate length, cross-sectional area and bifurcation angle measurements
- Identification of optimal viewing angle

3D bifurcation QCA solutions

- Cardi-Op, Paieon Inc., Israel
- QAngio XA 3D, Medis, The Netherlands
- CAAS, Pie medical Imaging, The Netherlands

Basic requirements

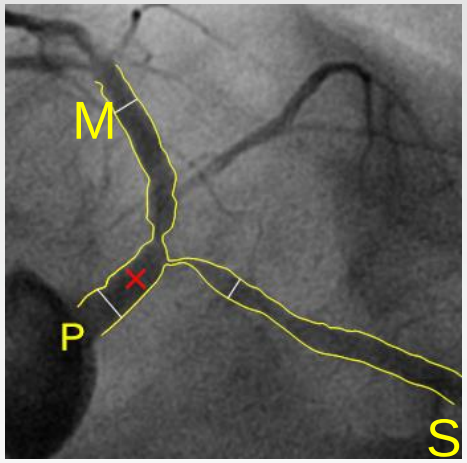


- 2 angiography images (up to 4)

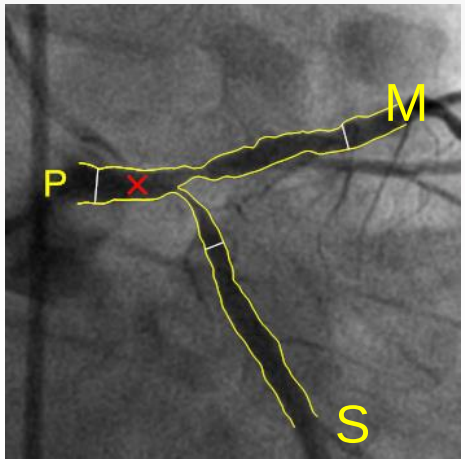
  Biplane, monoplane, rotational (flat-panel)
- At least 30º apart in viewing angle
- Same phase of the heart cycle

  (Optimal – End Diastole)

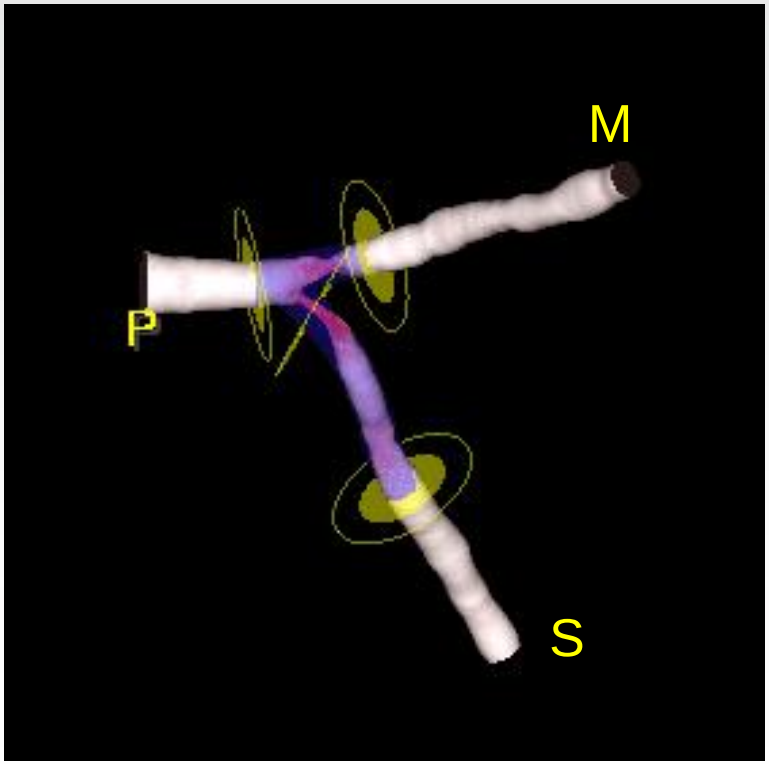
Creation of 3D model



LAO 44
CAU 37



RAO 20
CAU 20



EuroIntervention

A novel dedicated 3-dimensional quantitative coronary analysis methodology for bifurcation lesions

Yoshinobu Onuma[1], Chrysafios Girasis[1], Jean-Paul Aben[2], Giovanna Sarno[1], Nicolo Piazza[1], Coen Lokkerbol[2], Marie-Angel Morel[3], Patrick W. Serruys[1]*

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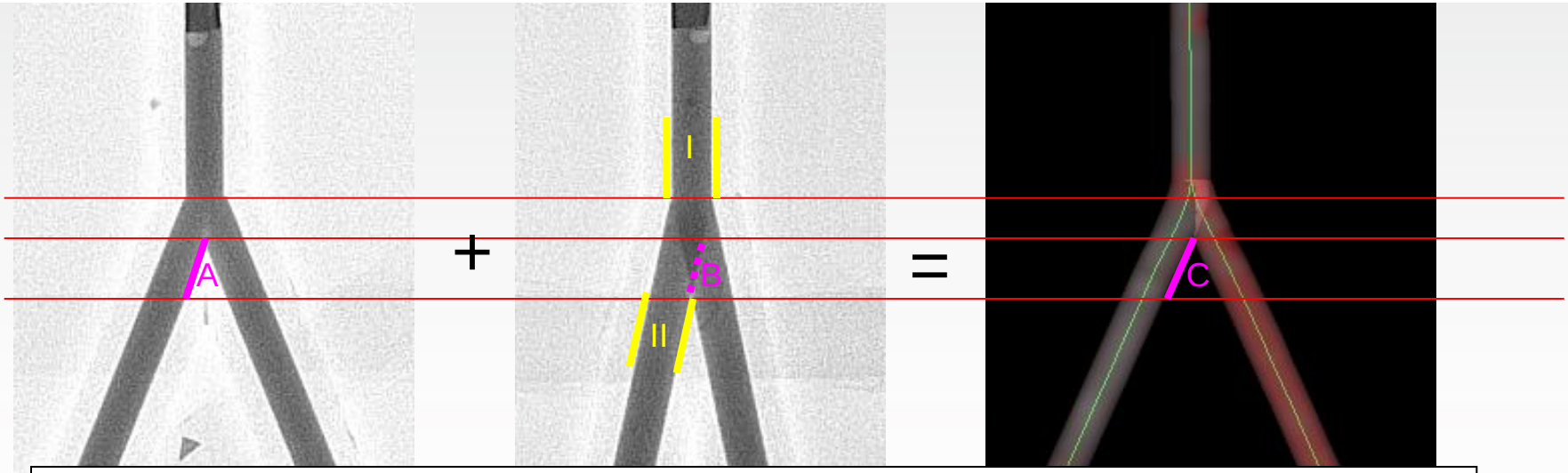

Edge A is visible but edge B is hidden in other 2D image by overlap

Missing edge B is determined from region I and II using spline method (mathematical method for polynominal interpolation)

Edge C then calculated from edge A and B.

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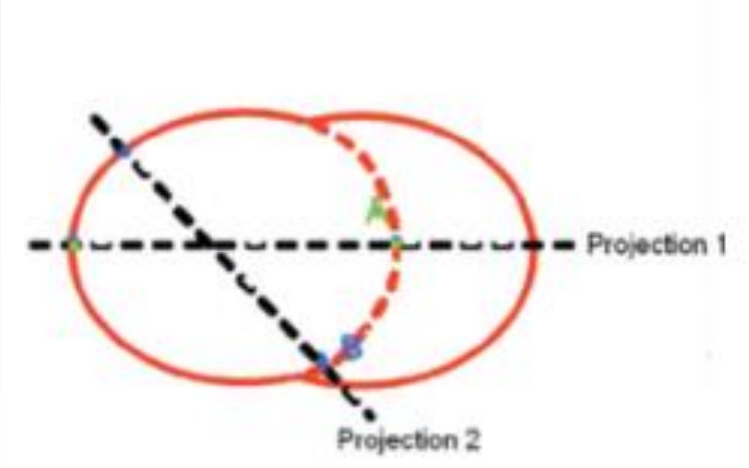
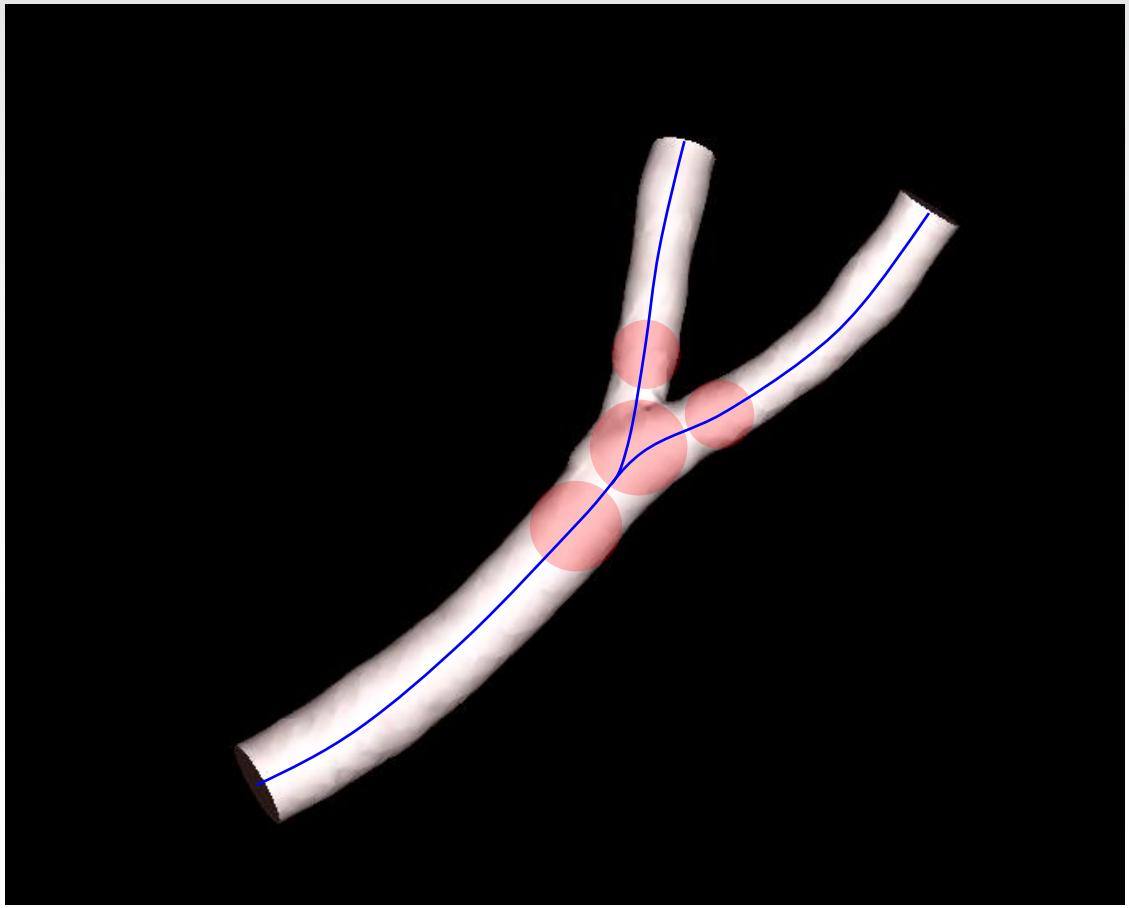
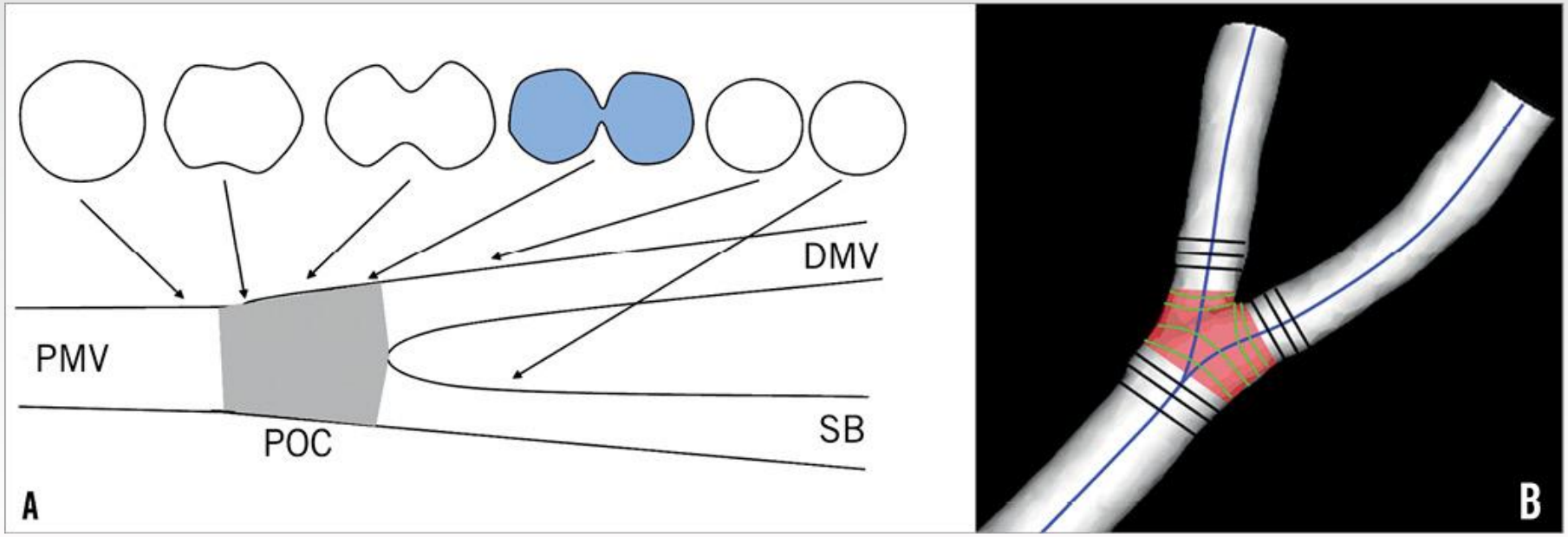


3D model centerline derivation



New 3D definition of the POC



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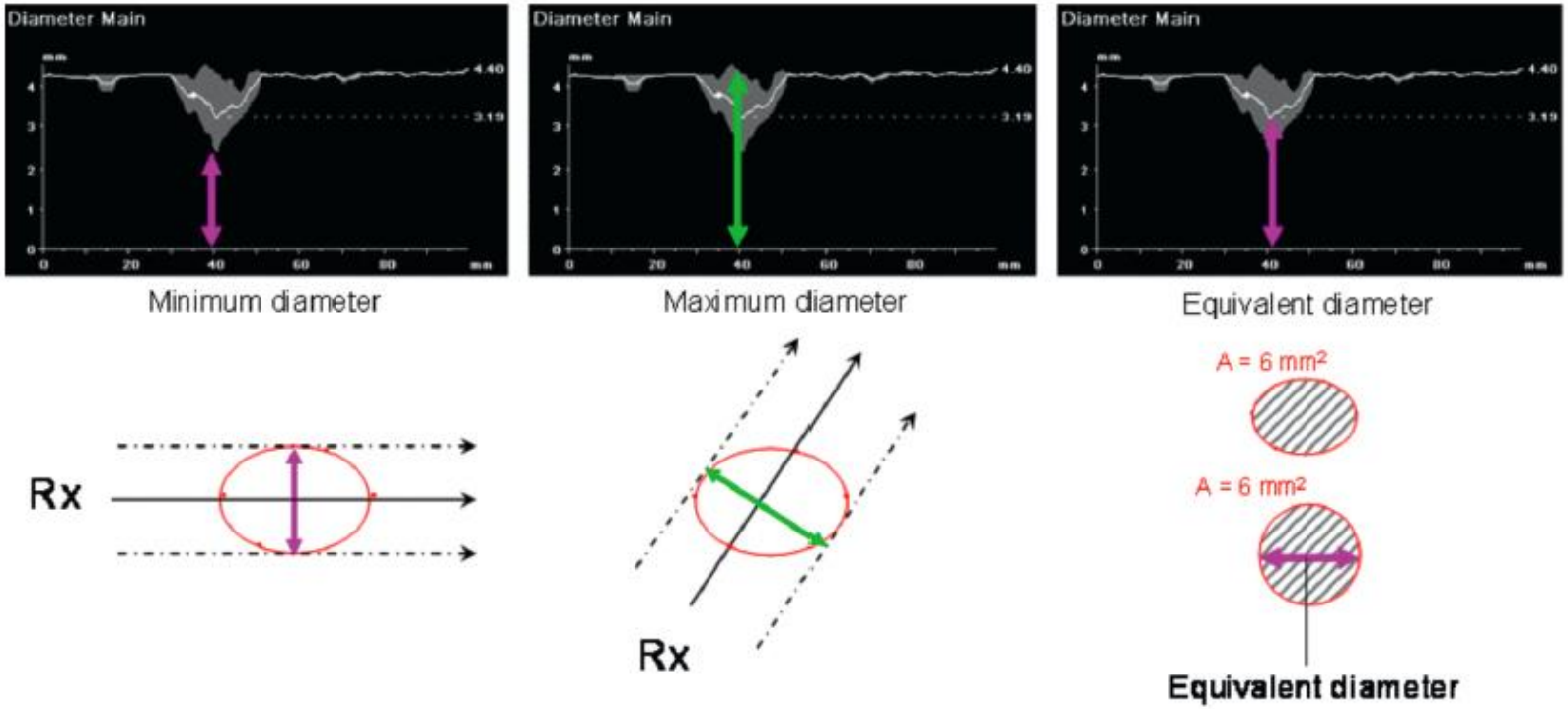
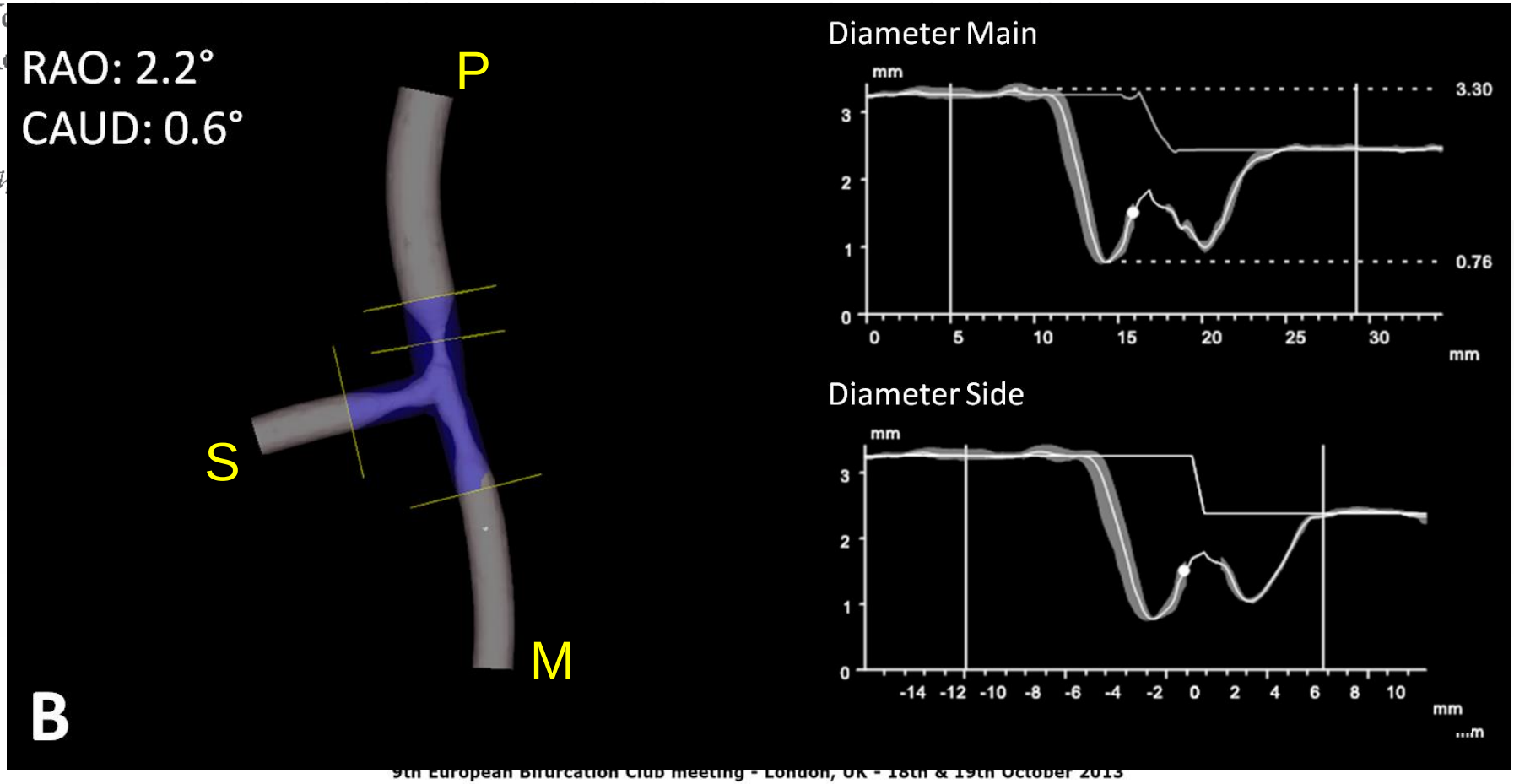


Figure 5. Measurement of diameters: The measured cross-sectional area is converted to a circle with similar cross-sectional area. The diameter of such circle is called an "equivalent diameter".

EuroIntervention

Advanced three-dimensional quantitative coronary angiographic assessment of bifurcation lesions: methodology and phantom validation

Chrysafios Girasis[1], MD; Johan C.H. Schuurbiers[2], BSc; Takashi Muramatsu[1], MD; Jean-Paul Aben[3], BSc;



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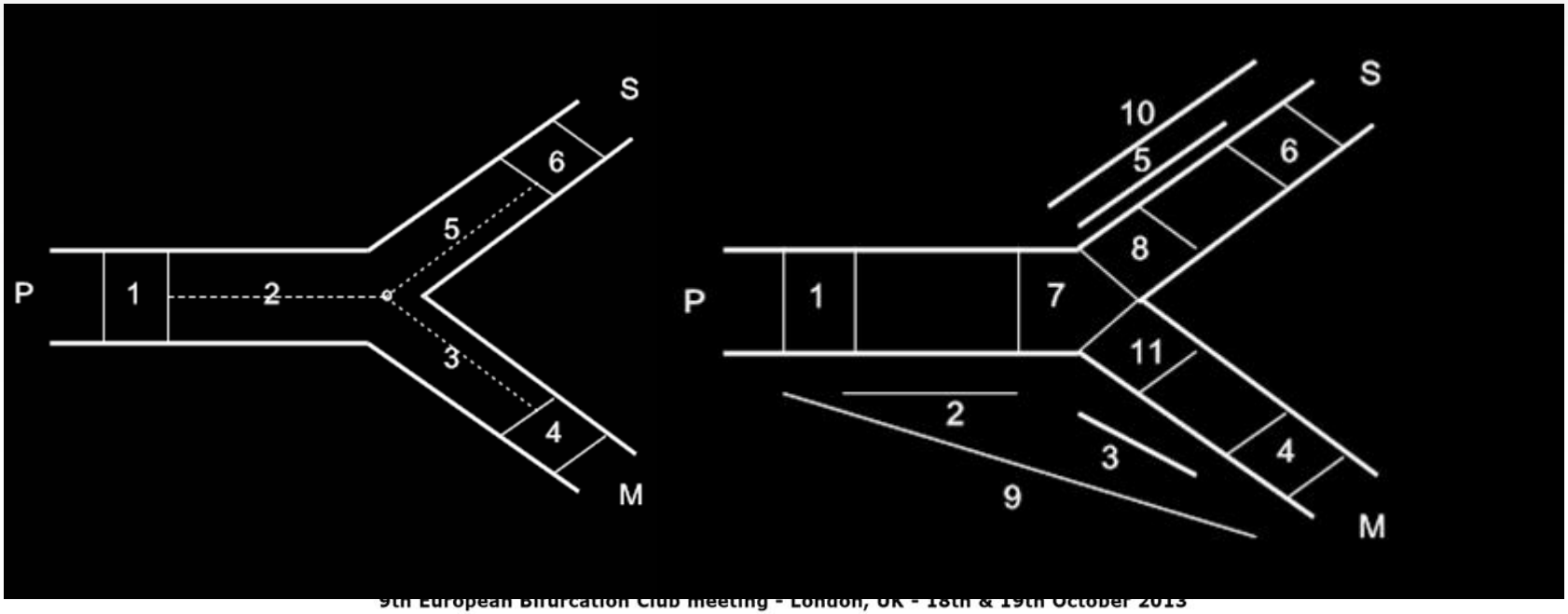
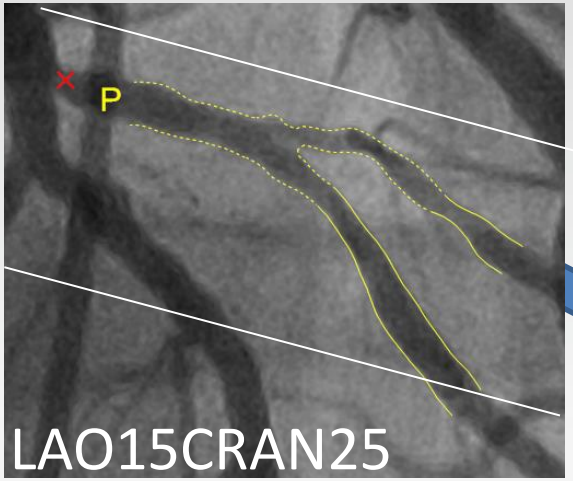
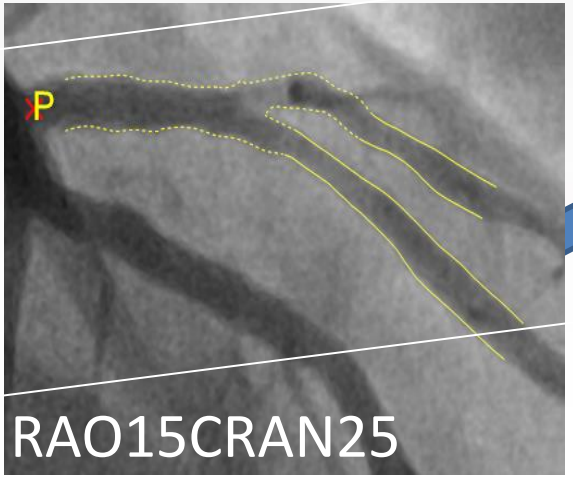
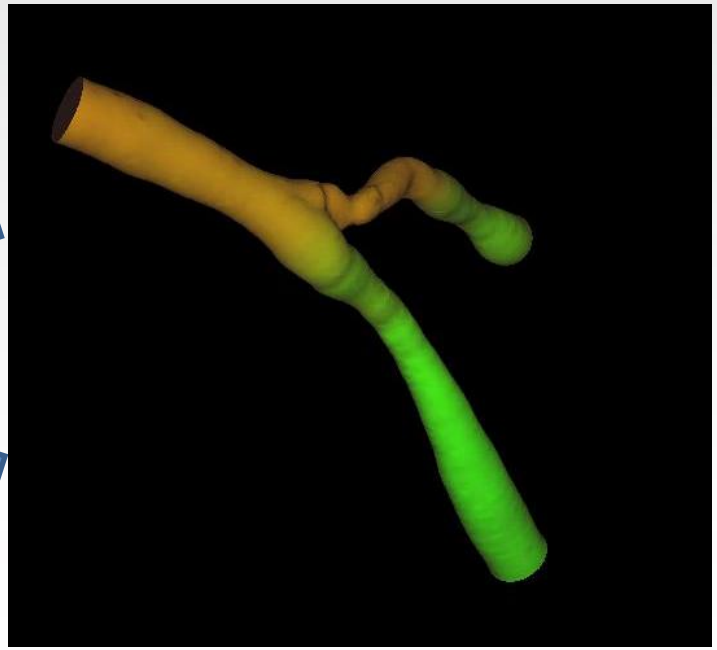
1. Thoraxcenter, Erasmus MC, Rotterdam, The Netherlands; 2. Biomedical Engineering, Erasmus MC, Rotterdam, The Netherlands; 3. Pie Medical Imaging, Maastricht, The Netherlands; 4. Cardialysis B.V., Rotterdam, The Netherlands



Reliability Indicator

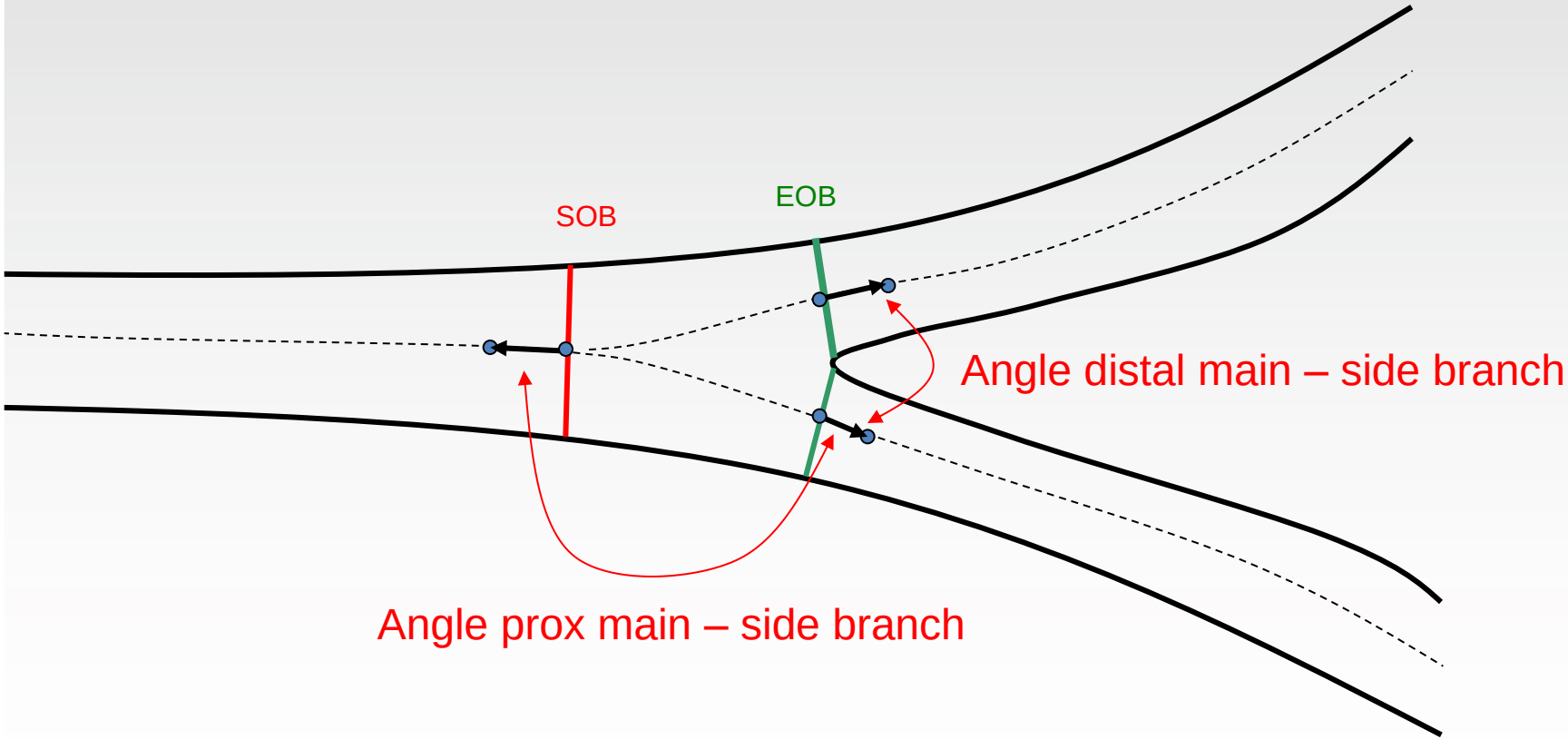






Bifurcation Angle measurement

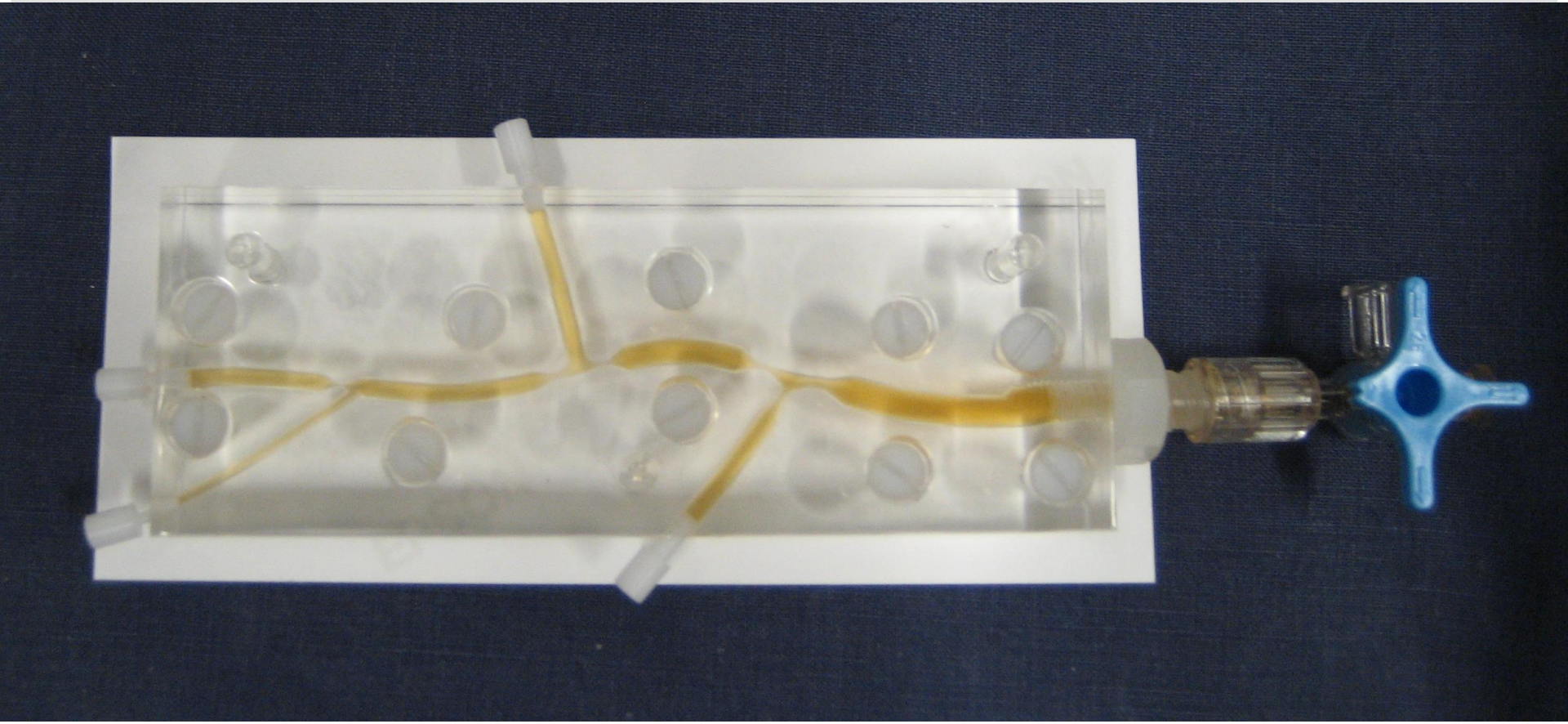
Inflow and outflow directions at the ostia of the POC



Onuma et al, EIJ 2010

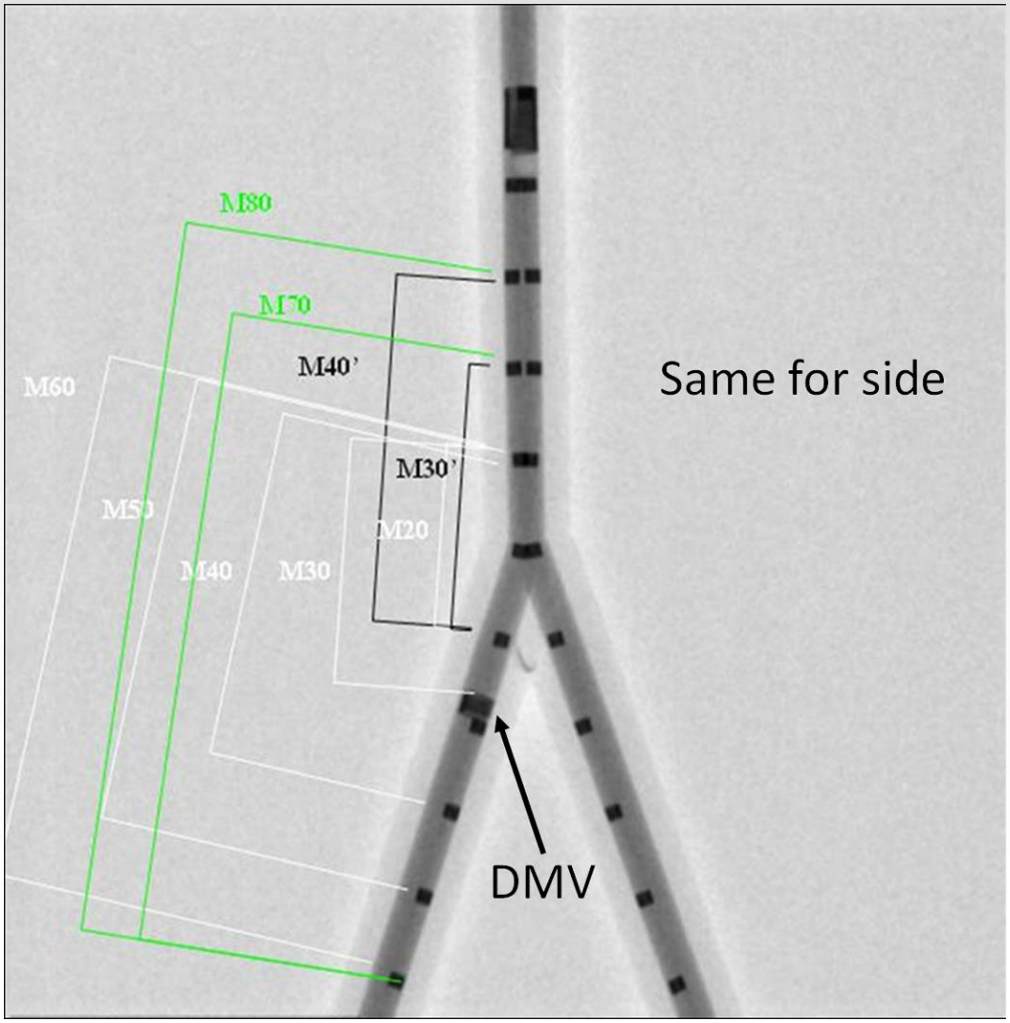
In vitro validation

Plexiglas bifurcation phantoms

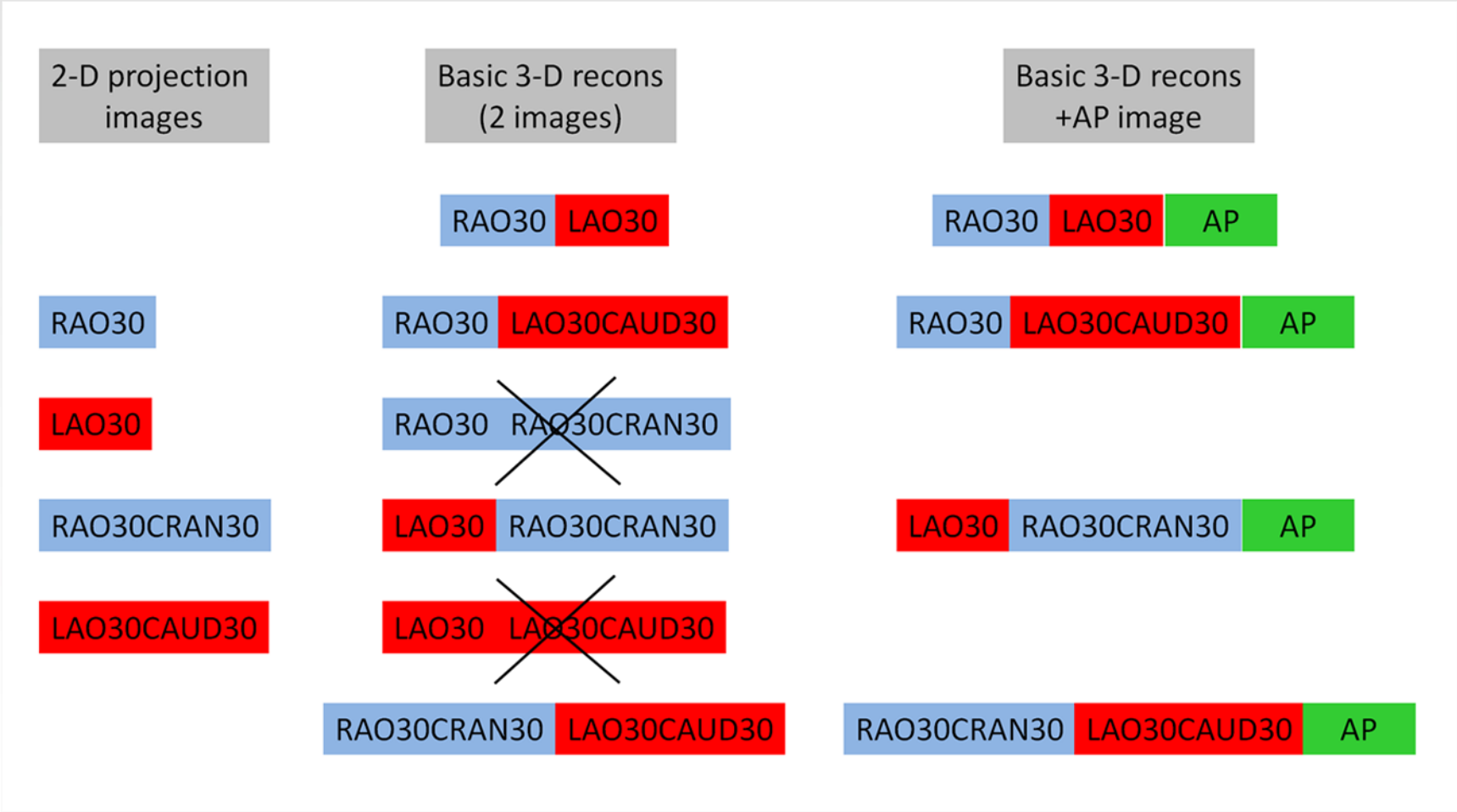


Accuracy of the milling process <10µm

Length validation

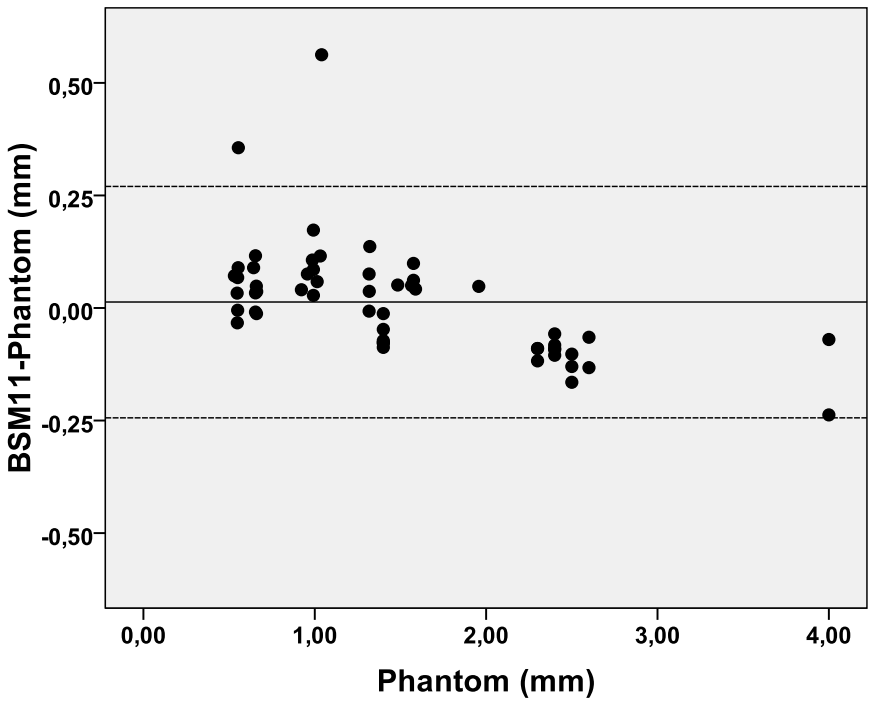


Validation protocol

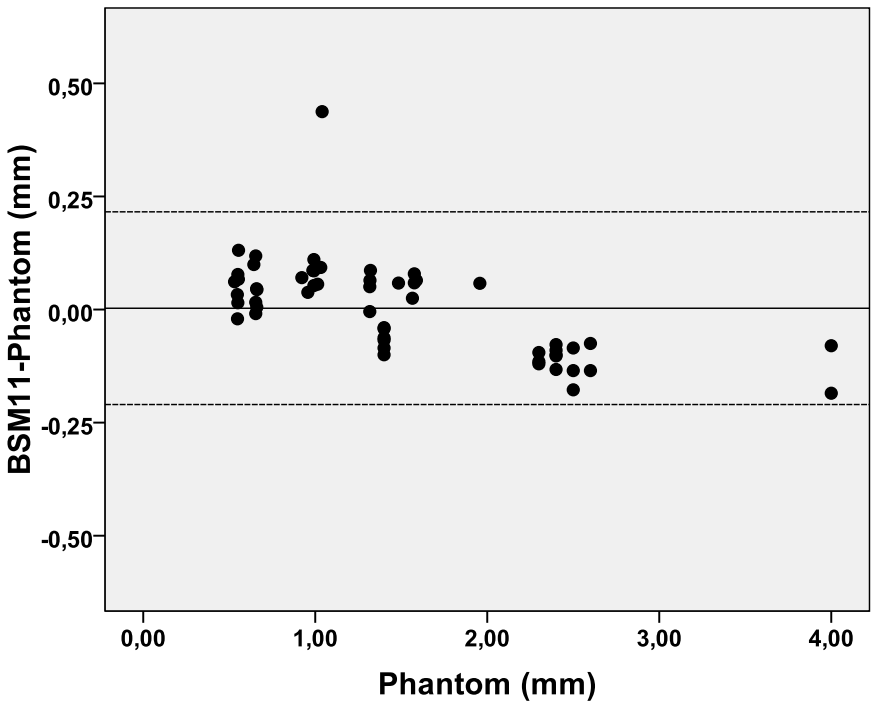


MLD

2 views recon



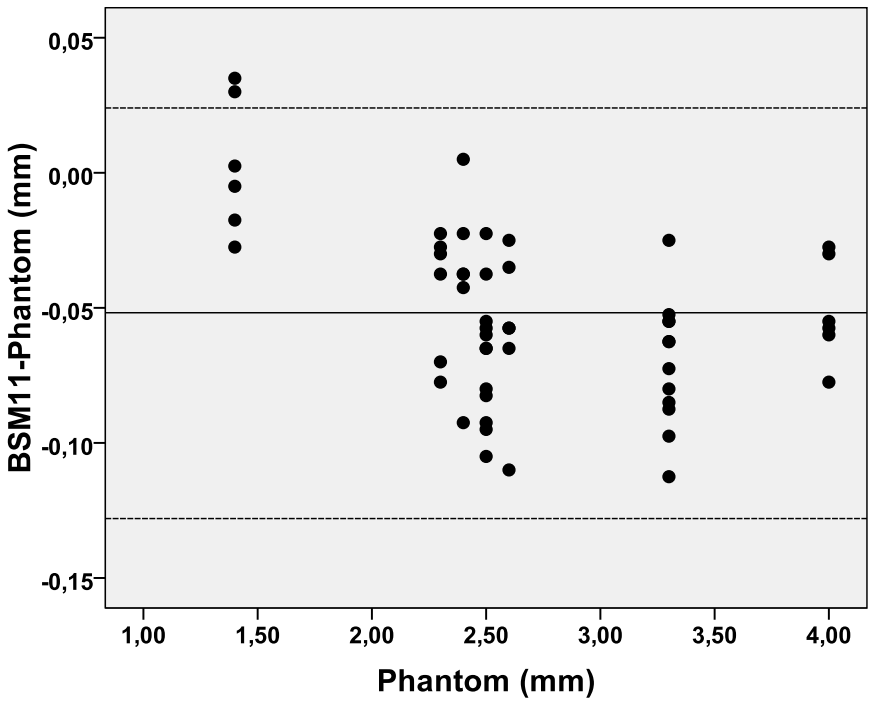
2 views recon +AP



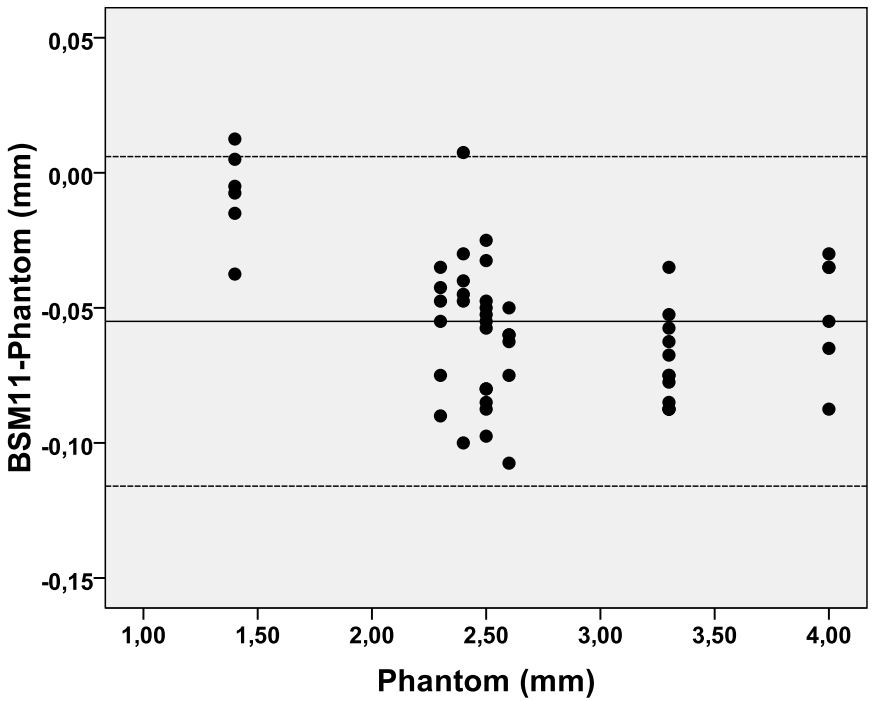
Bias= 0.013mm	p=0.07	Bias= 0.003mm
SD= 0.131mm	p=0.09	SD= 0.109mm

RVD

2 views recon



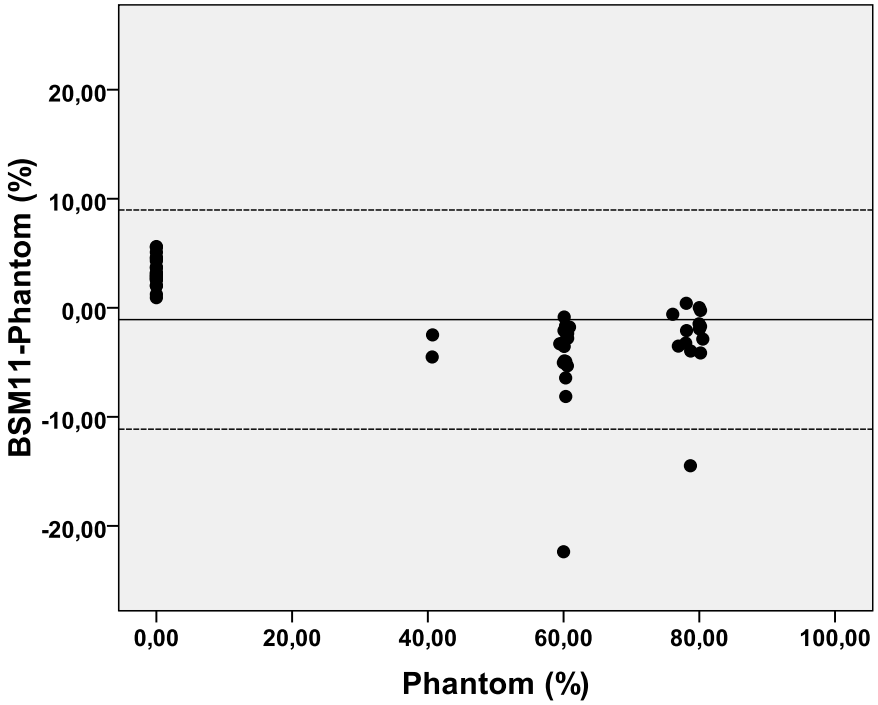
2 views recon +AP



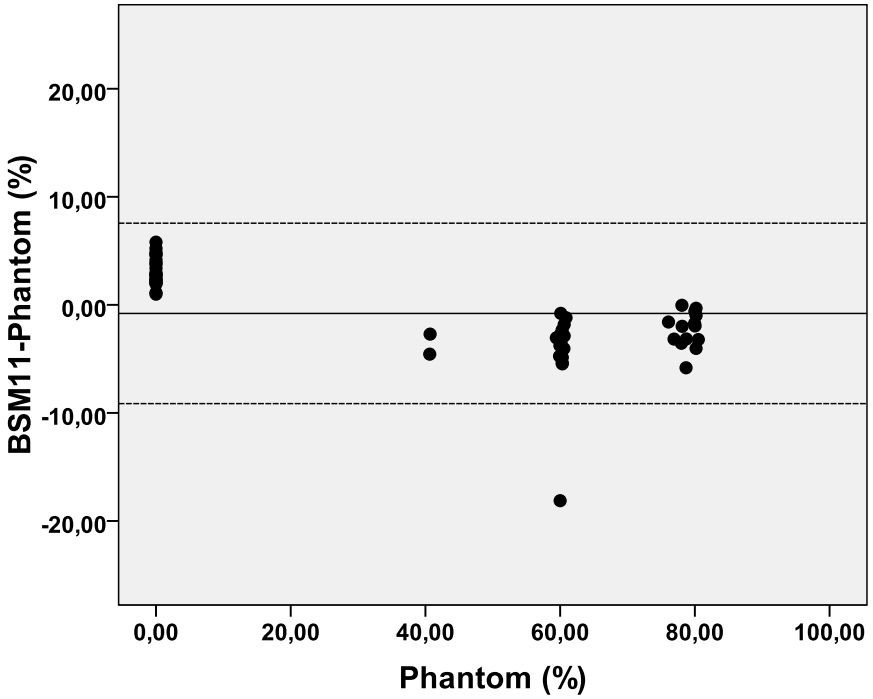
Bias= -0.052mm	p=0.07	Bias= -0.055mm
SD= 0.039mm	p=0.06	SD= 0.031mm

DS

2 views recon



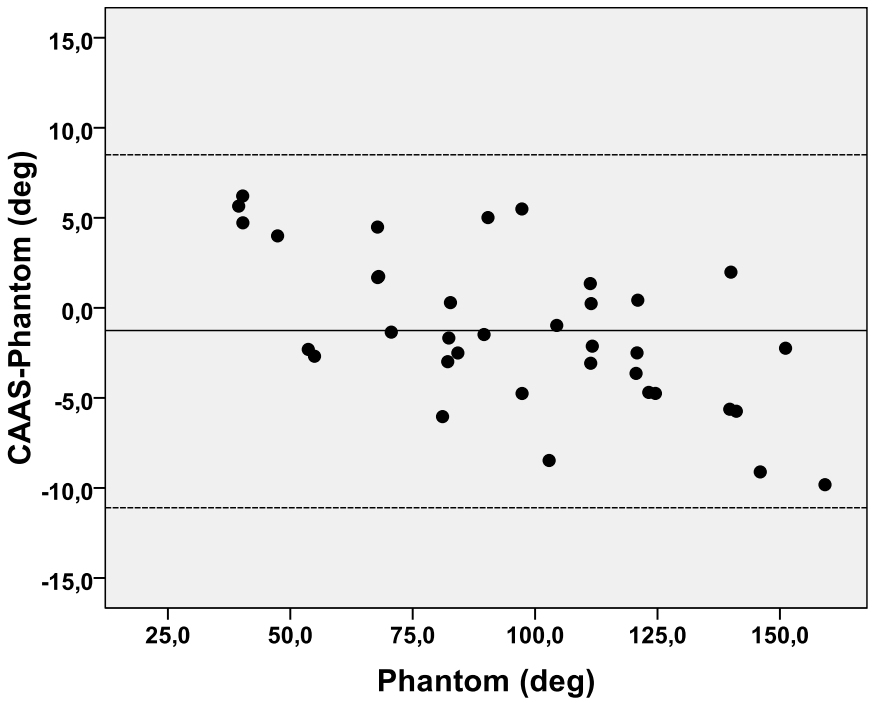
2 views recon +AP



Bias= -1.08%	p=0.18	Bias= -0.79%
SD= 5.13%	p=0.09	SD= 4.26%

BA

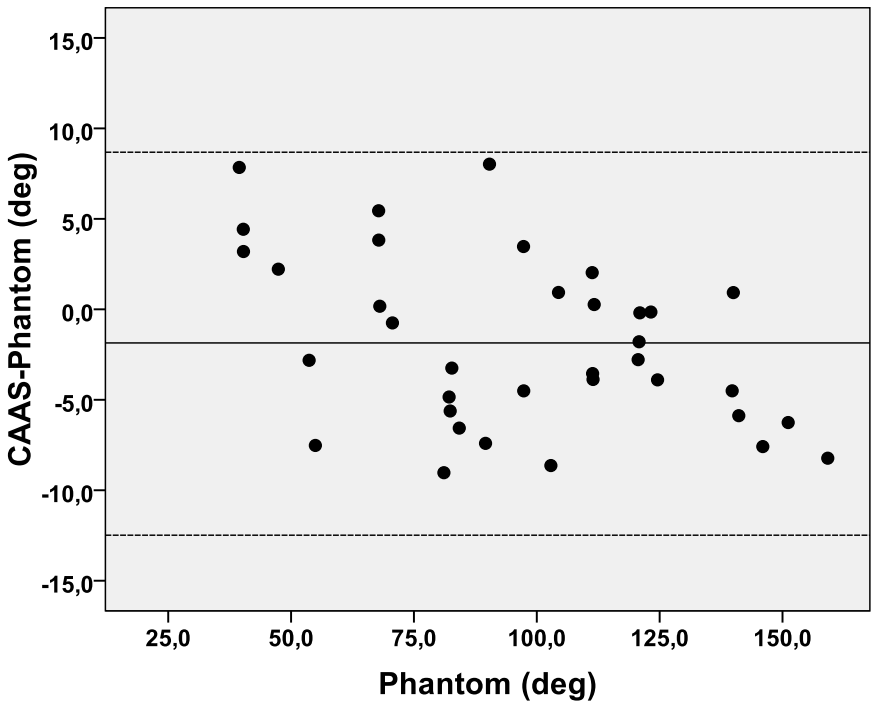
2 views recon



Bias= -1.3°
SD= 5.0°

p=0.15
p=0.33

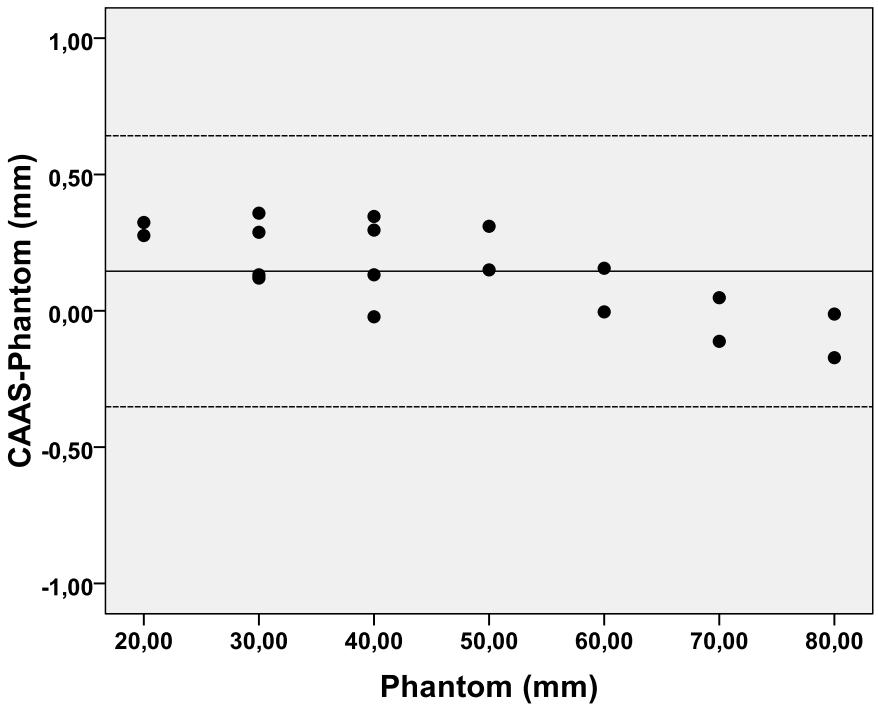
2 views recon +AP



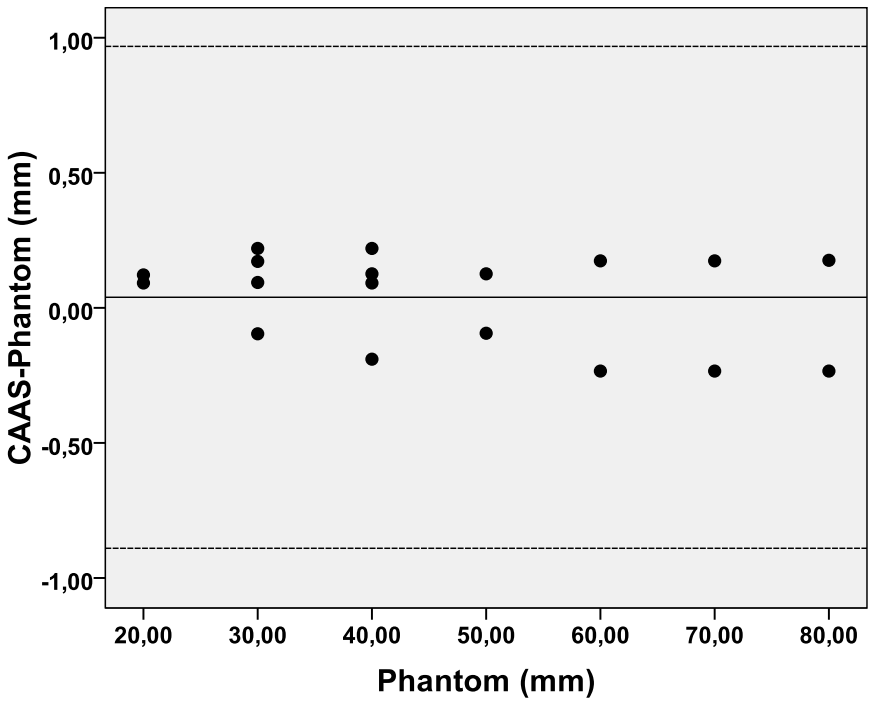
Bias= -1.9°
SD= 5.4°

LENGTH

2 views recon



2 views recon +AP



Bias= 0.15mm
SD= 0.26mm

ground truth
46.7±19.4mm

Bias= 0.04mm
SD= 0.47mm

Conclusions

- 3D bifurcation reconstruction feasible and time-efficient for ≥2 2D images
- CAAS 3D 5.11 features full automatic calibration, reliability analysis and indicates the optimal viewing projection
- It features novel, accurate and precise 3-D quantitative analysis of bifurcation lesions for diameter (multiple segment models), length and bifurcation angle measures.
- Adding the optimal projection to a basic reconstruction of two suboptimal 2-D images results in higher accuracy and precision for MLD and DS values.
- There is still work to be done regarding the *in vivo* validation of this software, in order to determine the clinical relevance of these data.

Thank you for your attention