Functional versus Culprit-only Revascularization in Elderly Patients with Myocardial Infarction and Multivessel Disease: the FIRE Trial

Quantitative Flow Ratio (QFR)

Angiographic Projections
Tips and Tricks

- ***Two standard projections at 15 fps with at least 25 degree angulation***
- Inject I.C. nitro-glycerine as early as possible
- Make sure that the catheter is filled with contrast before the injection (i.e. after administration of nitro-glycerine)
- Use brisk, continuous and fast contrast injections. Aim for full 3 cardiac cycles
- ***Minimize overlap of target segments***
- ***Avoid foreshortening of the vessel***
- Avoid zooming
- Avoid moving the table early after injection
- Make sure that the entire vessel is visible in both projections.

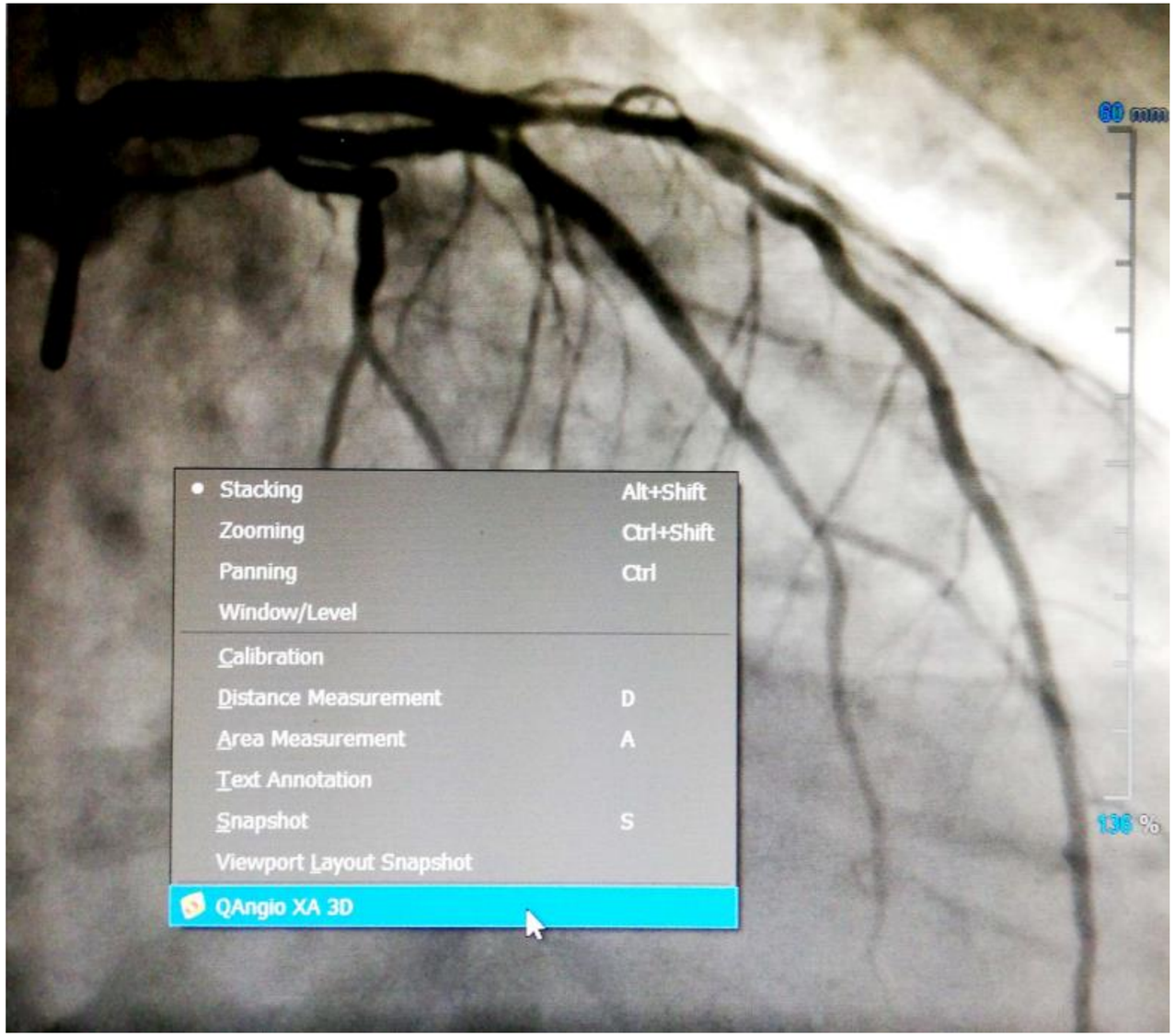
FIRE TRIAL

Angiographic Projections

Suggested projection angles for specific lesion segments

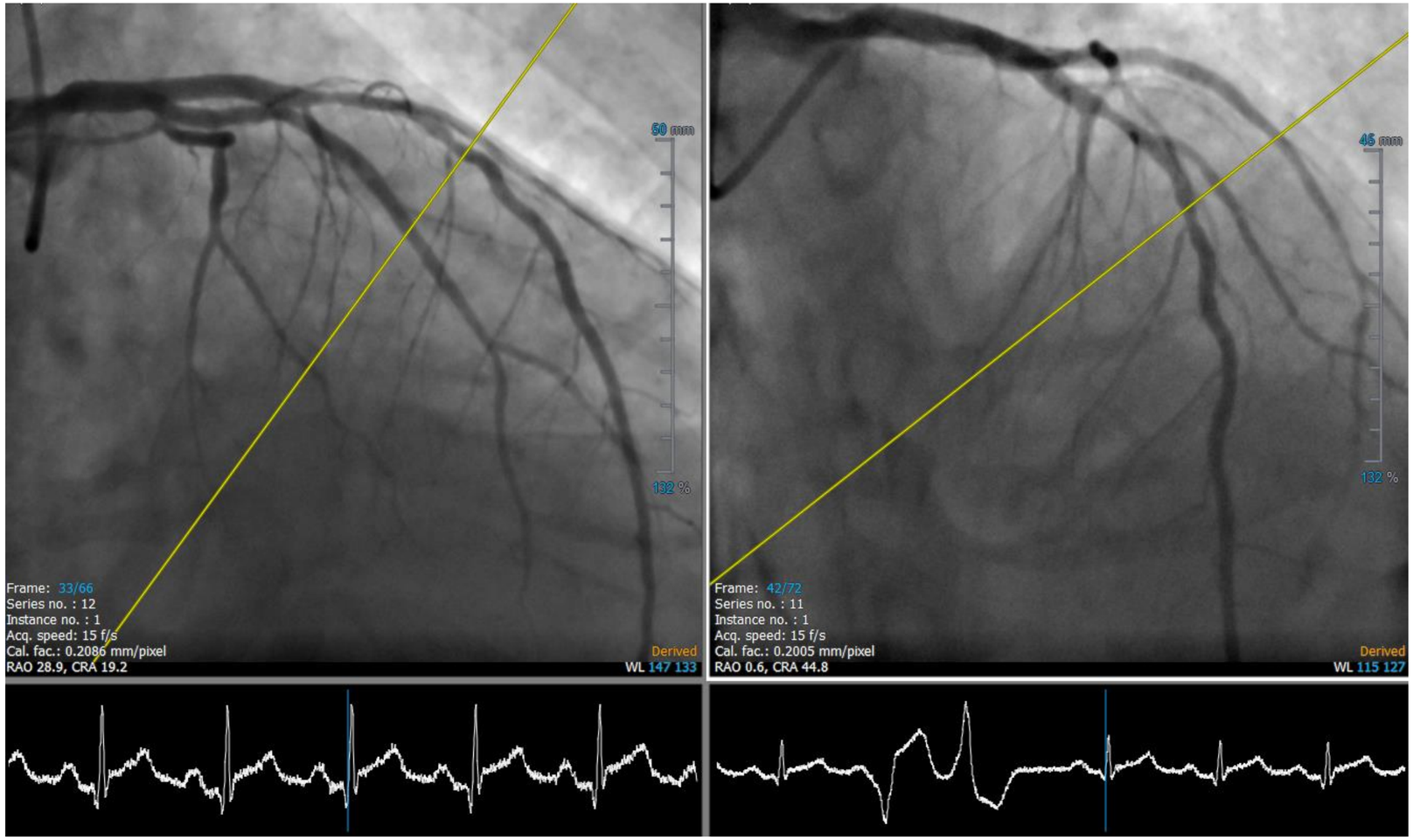
Vessel/Bifurcation	1° view	2° view
LM + LAD/LCX	RAO 20, CAU 45	AP, CAU 10
LAD/Diag	AP, CRA 45	RAO 30, CRA 20
LCX/OM	LAO 10, CAU 25	RAO 25, CAU 35
RCA	LAO 45, CAU 10	LAO 20, CRA 20

QFR Computation (1)



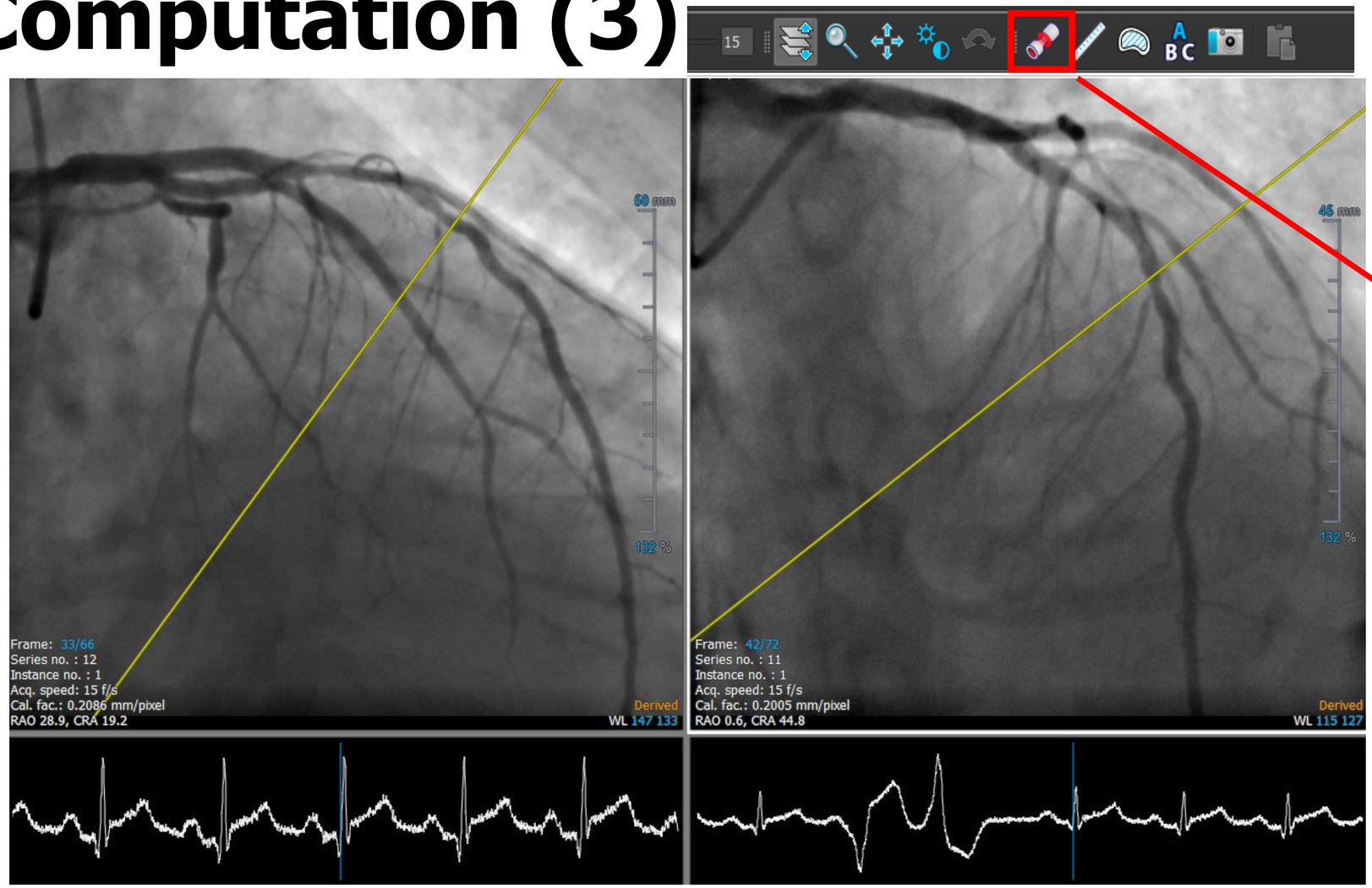
- Choose the first projection of the target vessel
- Click the right button
- Select QAngio XA 3D

QFR Computation (2)



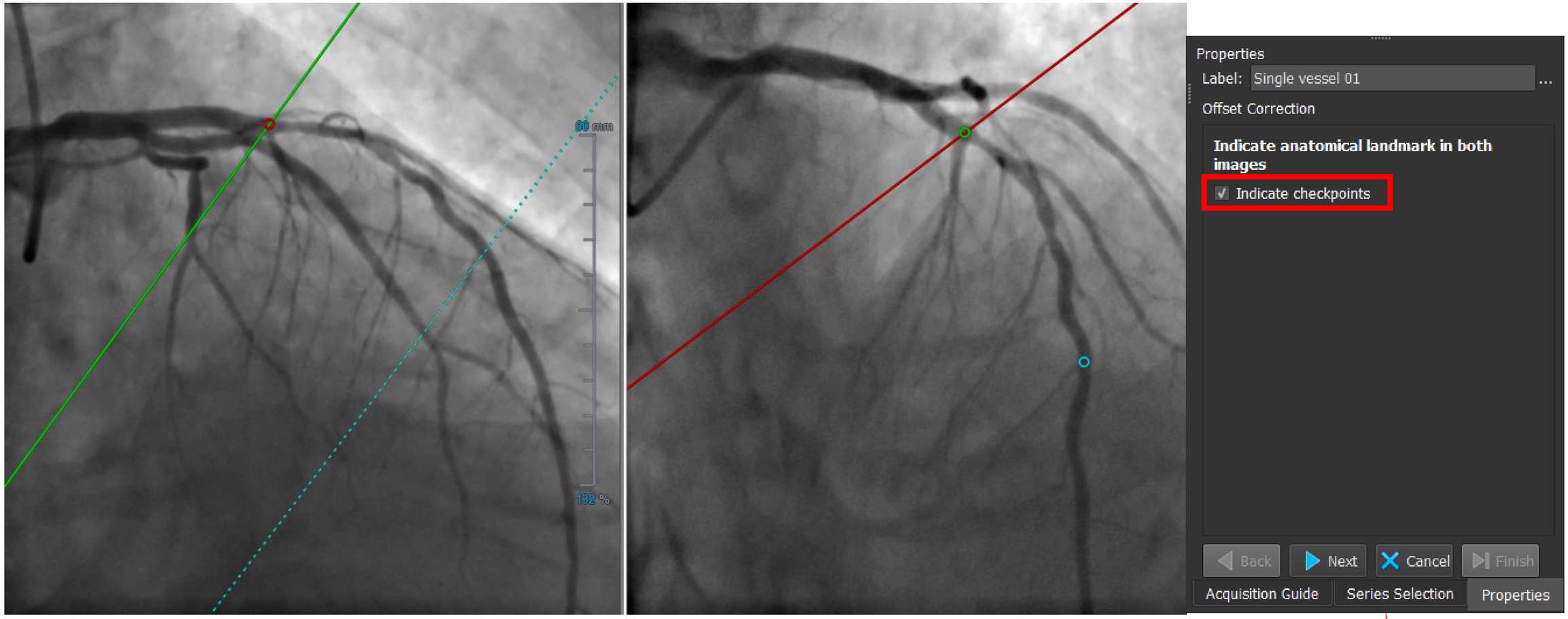
- Select the second projection of the target vessel (yellow line should be orthogonal to the lesion)
- Stop both runs at the end-diastolic frame (when the vessel is filled with contrast)

QFR Computation (3)



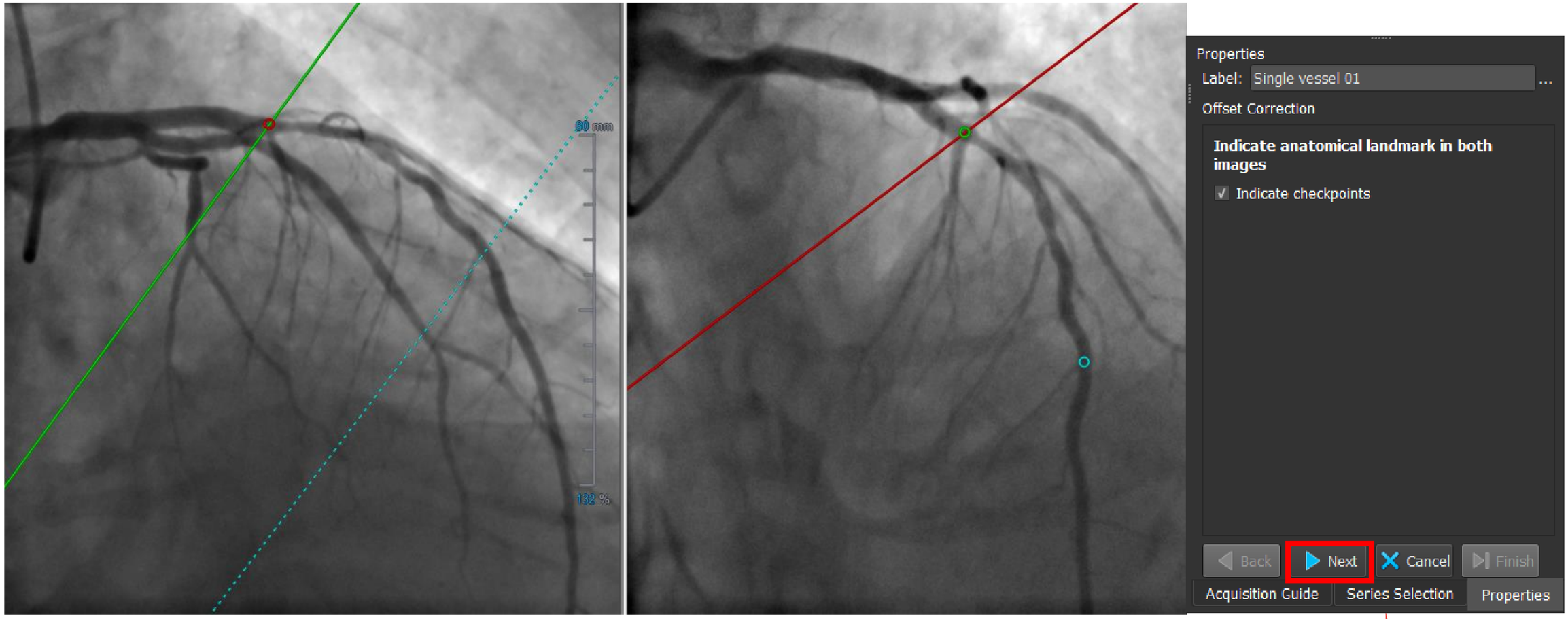
Select this item to proceed with analysis

QFR Computation (5)



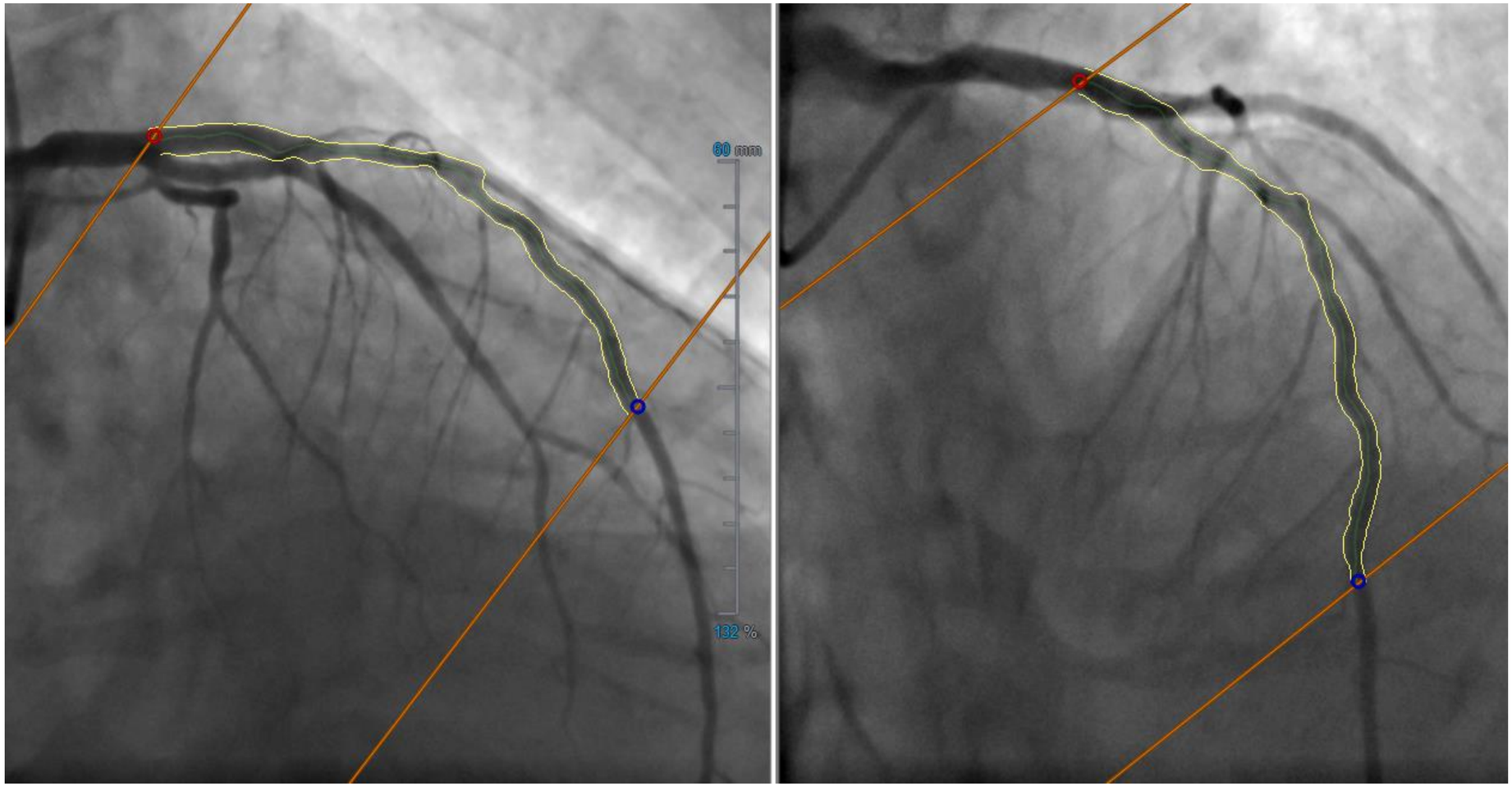
Indicate two checkpoints on target vessel (usually where a sidebranch originates) …

QFR Computation (5)



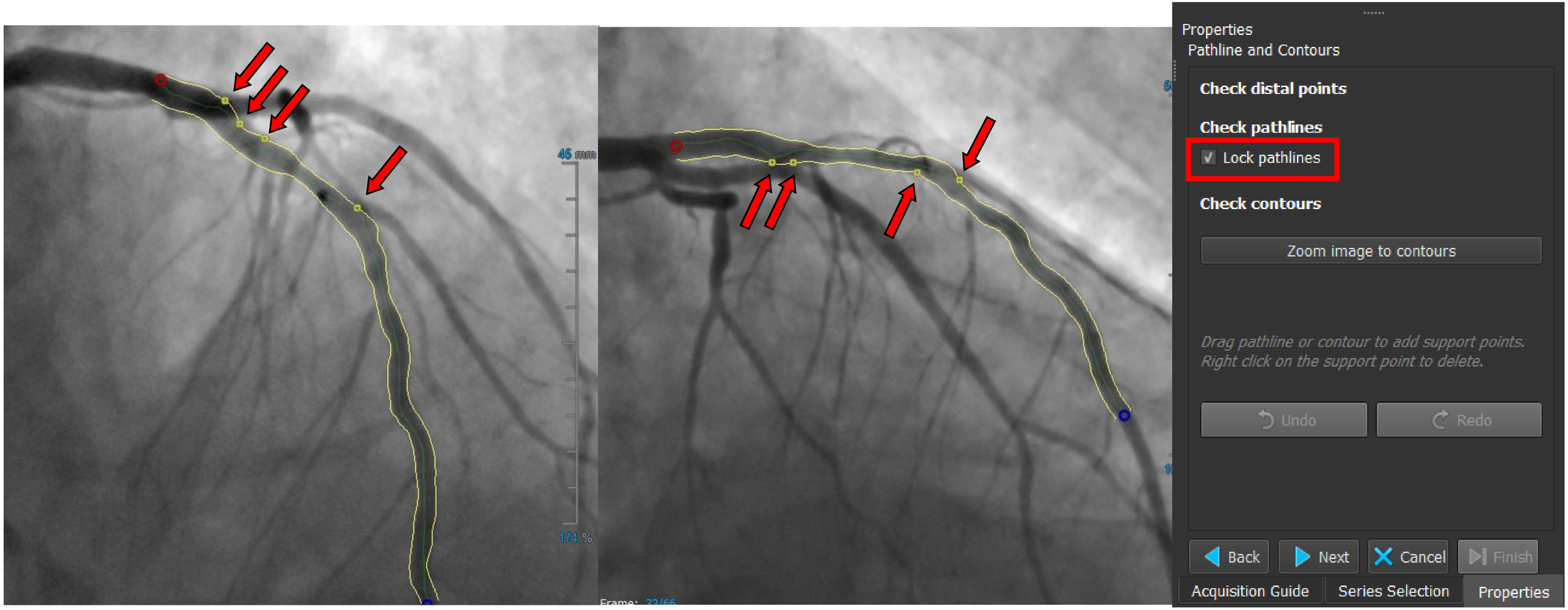
Indicate two checkpoints on target vessel (usually where a sidebranch originates) … and then click the Next button

QFR Computation (6)



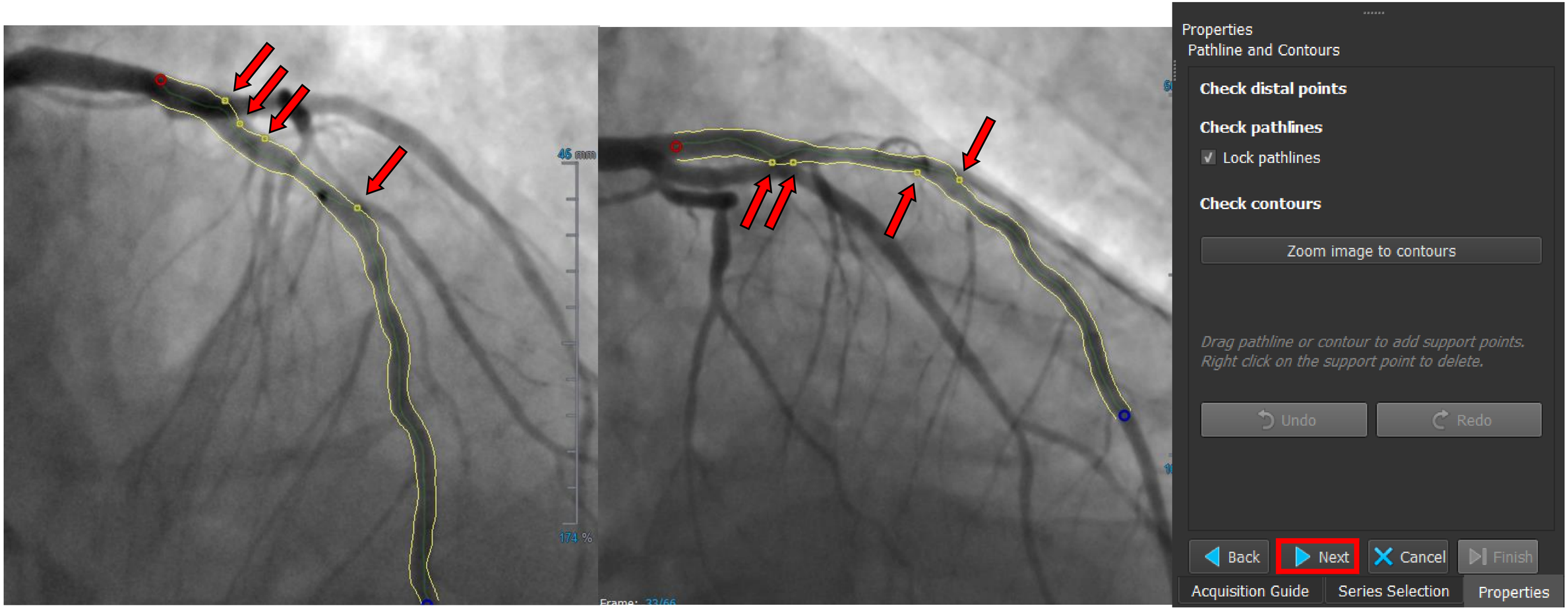
- Select a proximal and a distal landmark on target vessel …

QFR Computation (6)



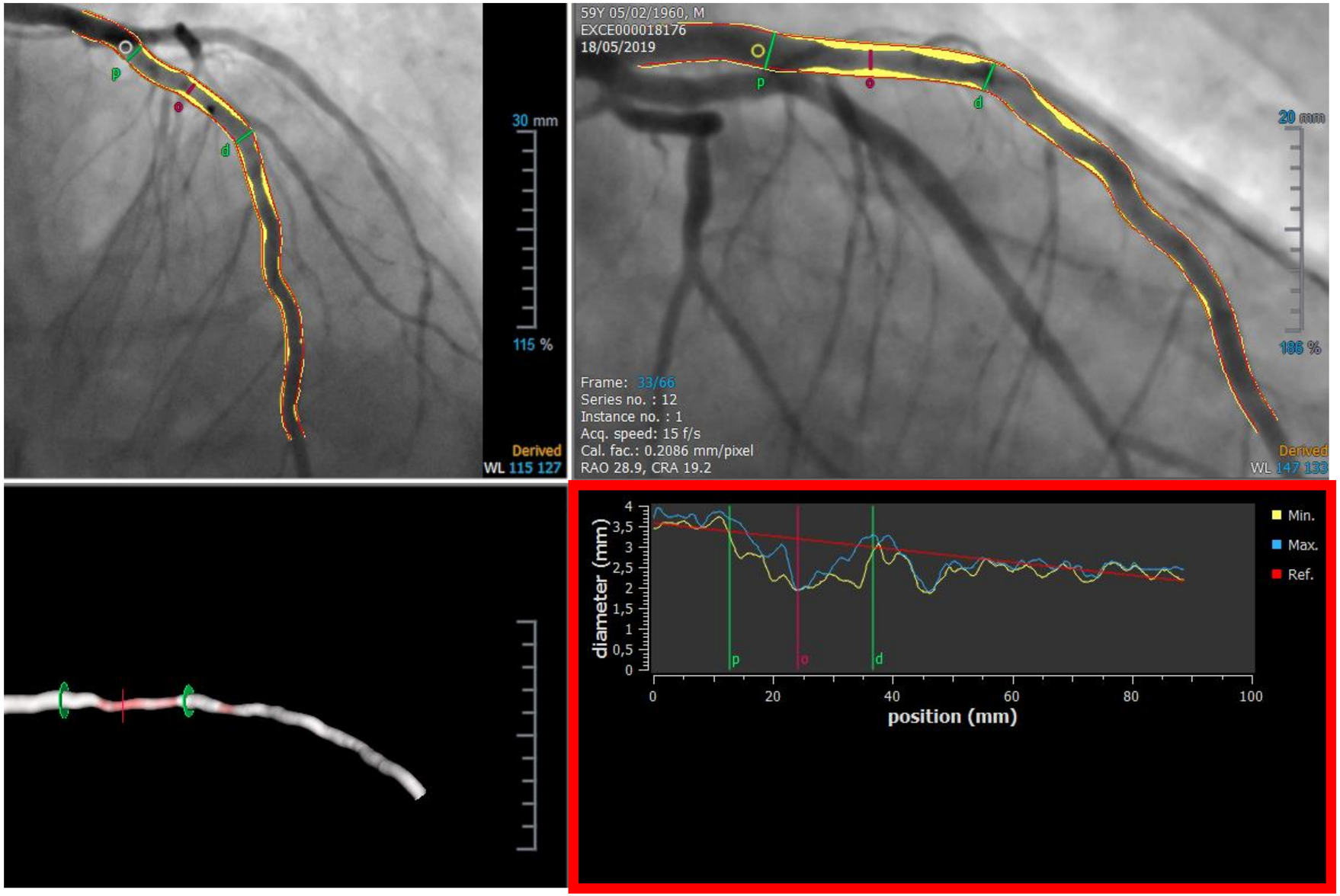
- Select a proximal and a distal landmark on target vessel …
- Click “Lock pathlines” to make any necessary corrections of the countours …

QFR Computation (6)



- Select a proximal and a distal landmark on target vessel …
- Click “Lock pathlines” to make any necessary corrections of the countours …
- Proceed with the Next button.

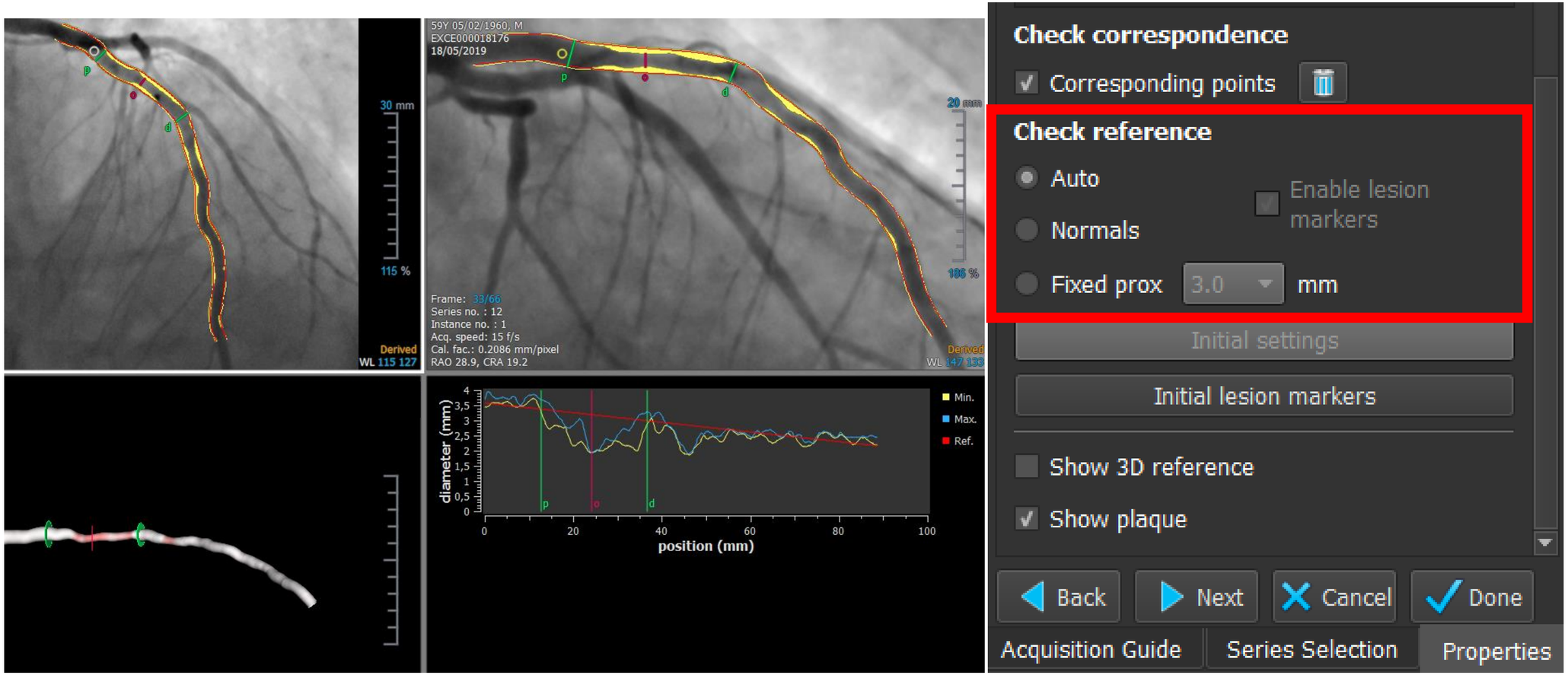
QFR Computation (7)



Check the result of the analysis based on the curves in the lower right box.

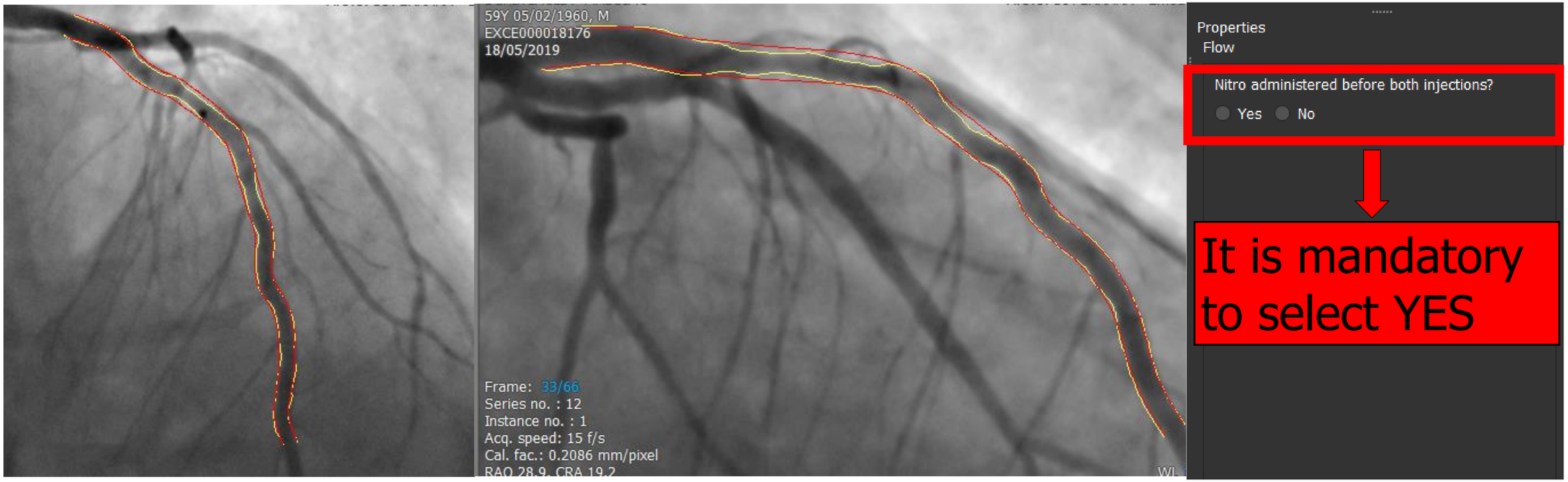
For a good result the blue and the yellow curve should be overlapped.

QFR Computation (8)

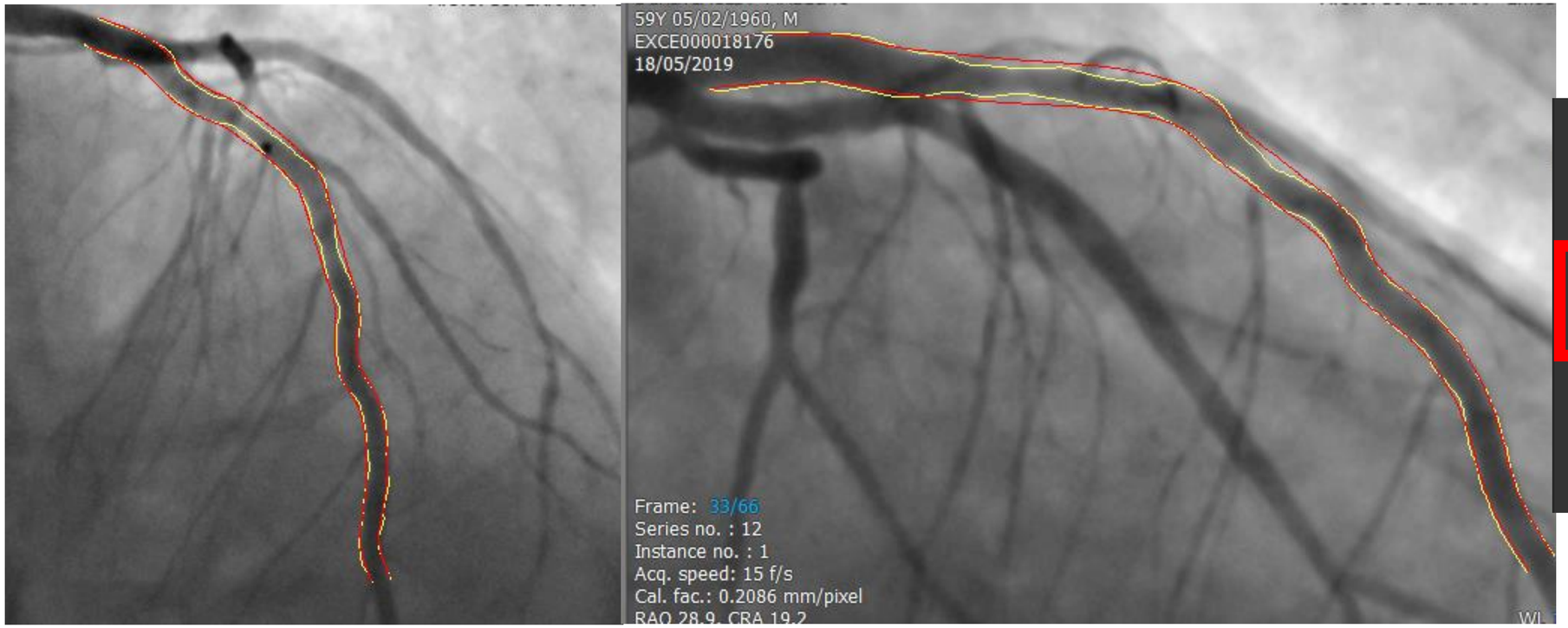


At this point you have to select the "Check Reference".
Usually it is correct to maintain what the software computes automatically ("Auto").
Sometimes it is necessary to select "Normals" to indicate the segments of the vessel which are healthy.
"Fixed prox" is necessary only when the disease involved also the ostial part of the vessel.

QFR Computation (9)

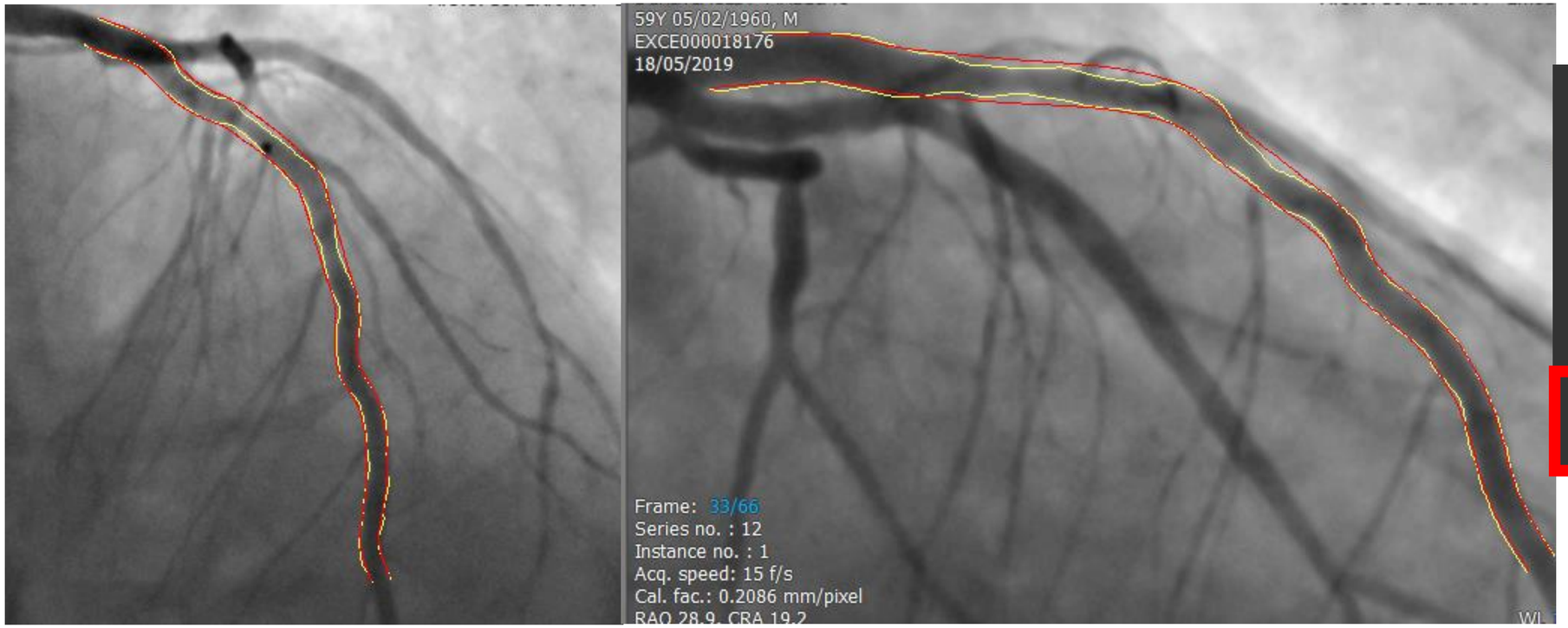


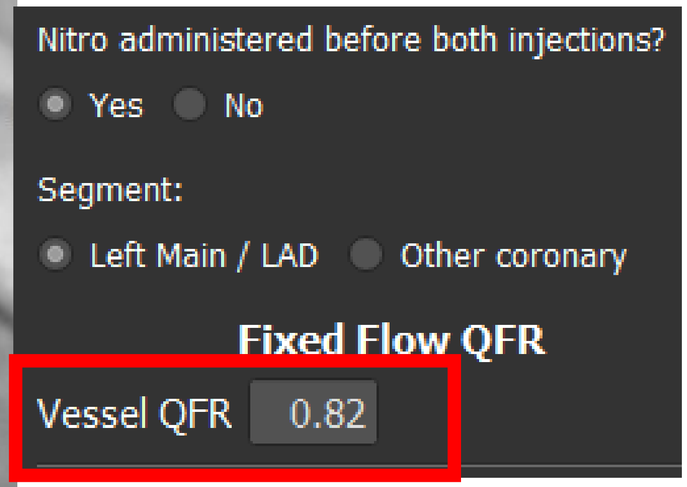
QFR Computation (9)



Select the target vessel …

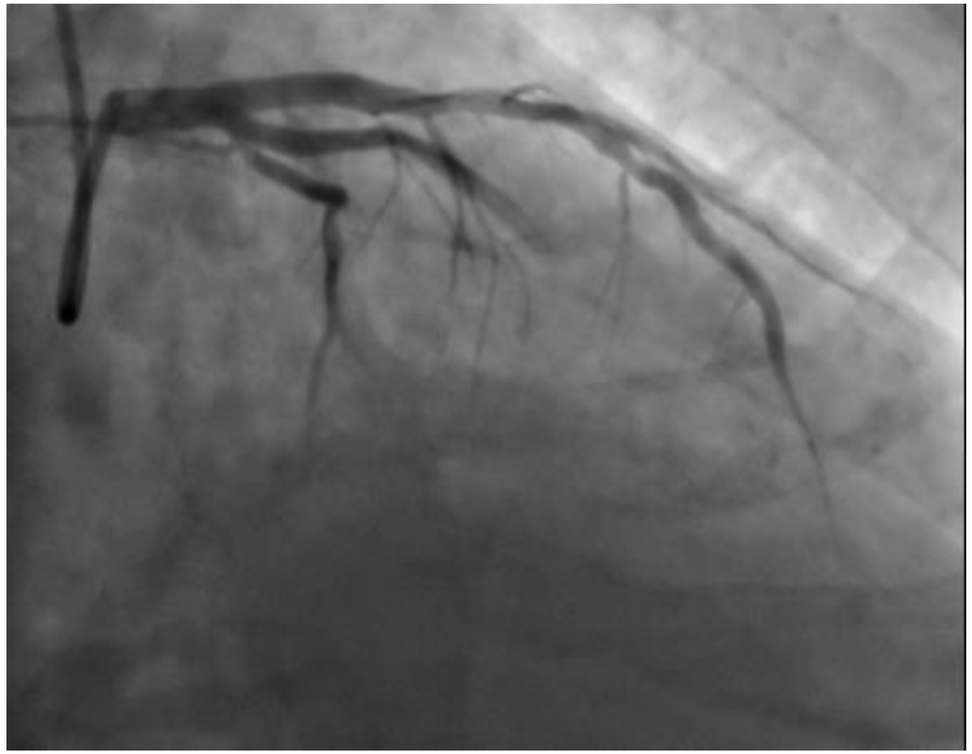
QFR Computation (9)

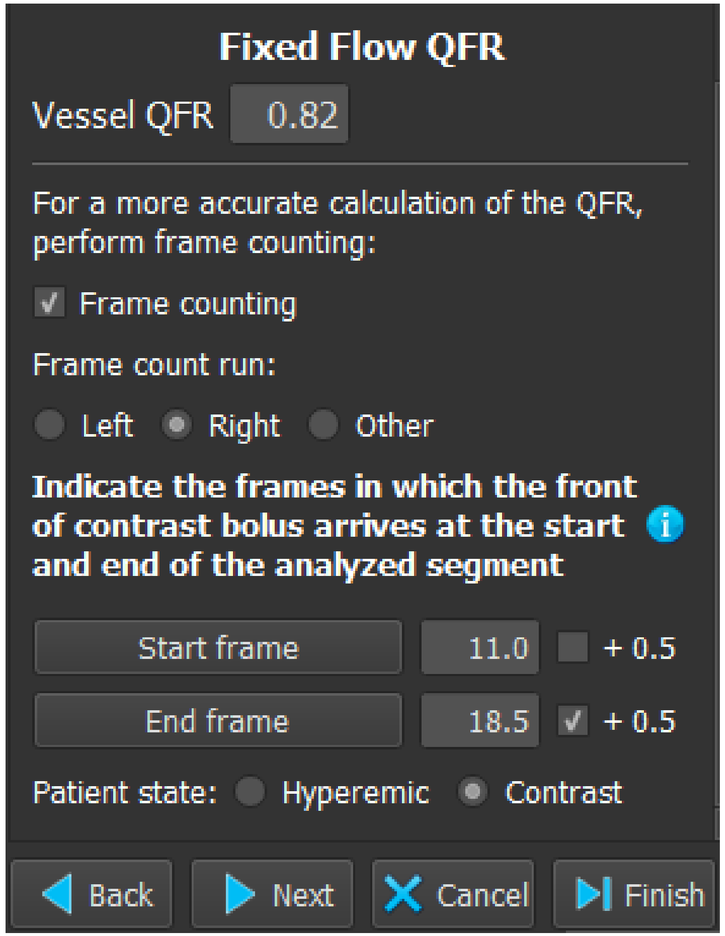




Select the target vessel …
and so you obtain the Vessel QFR “Fixed Flow”.

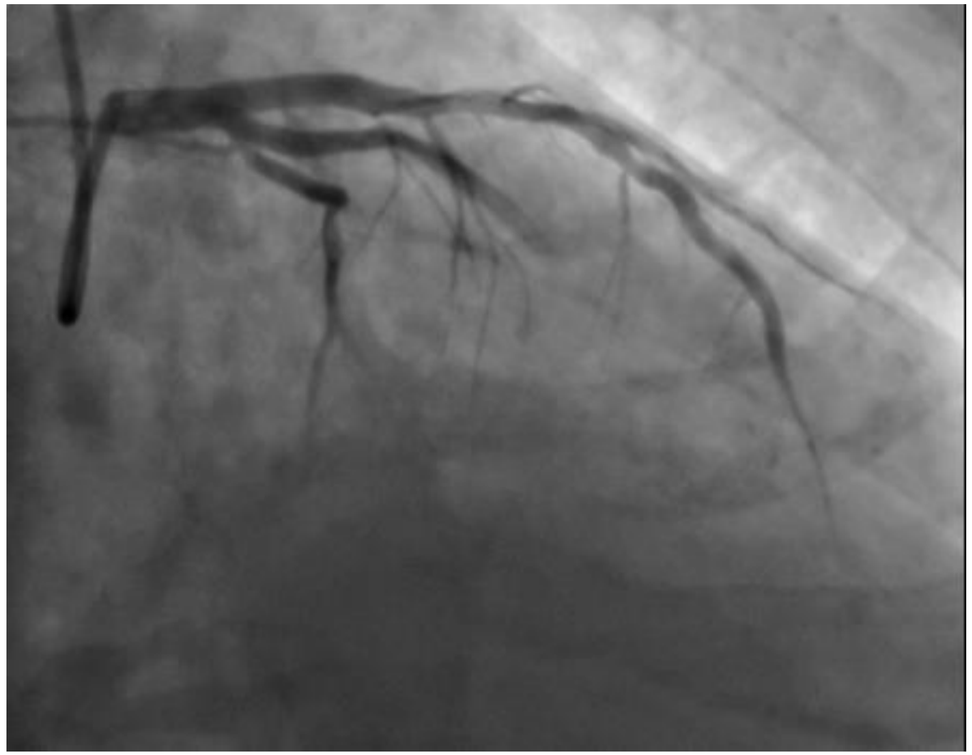
QFR Computation (10)



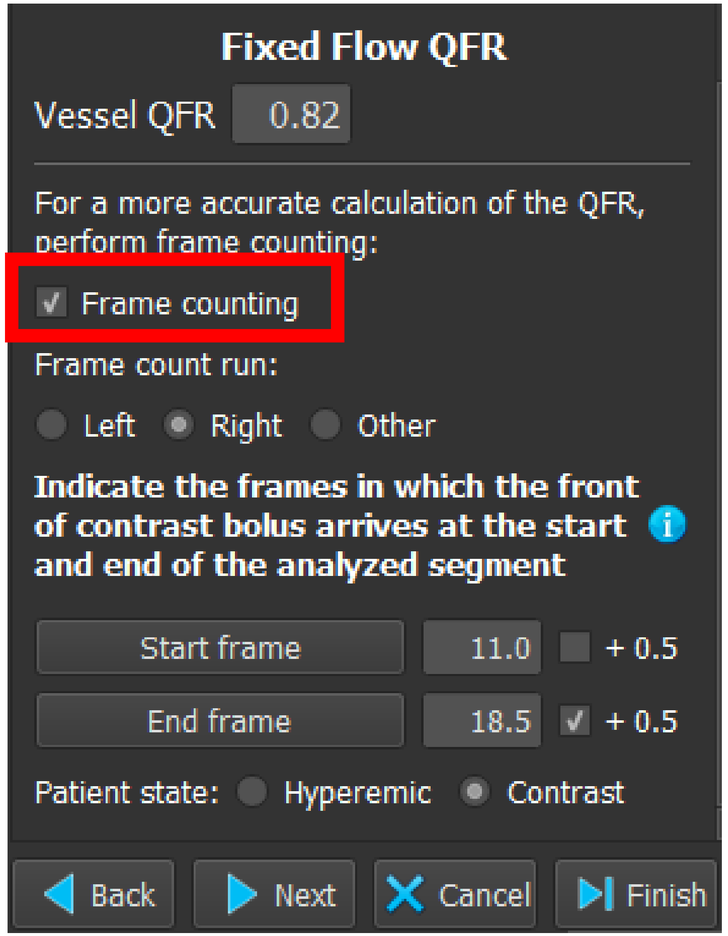


For a more accurate result, you have to perform the frame counting.

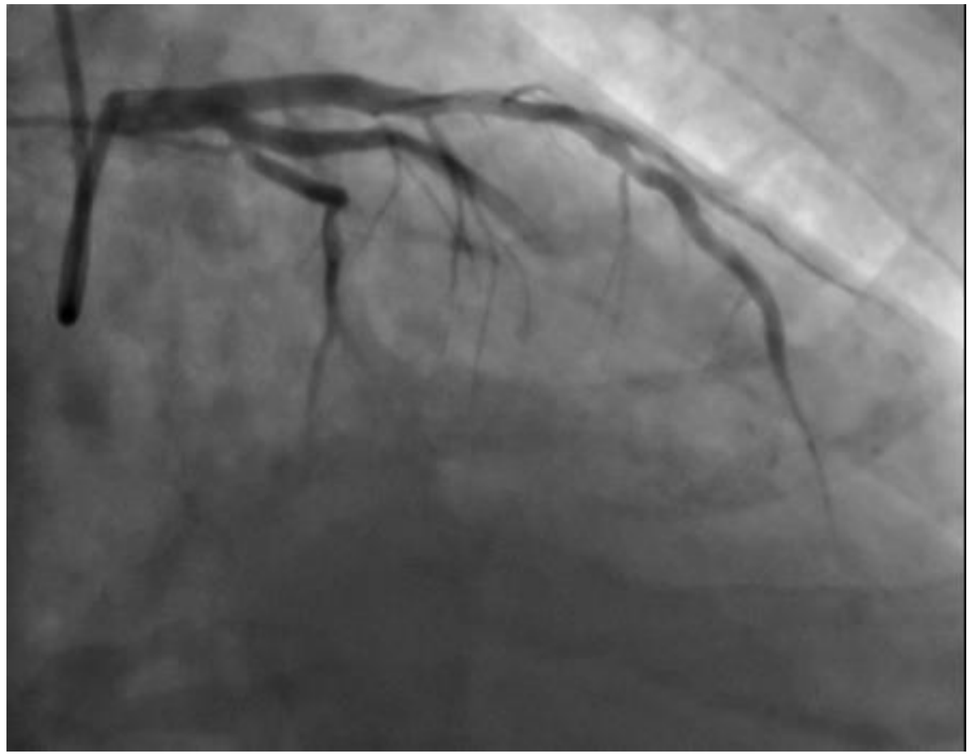
QFR Computation (10)

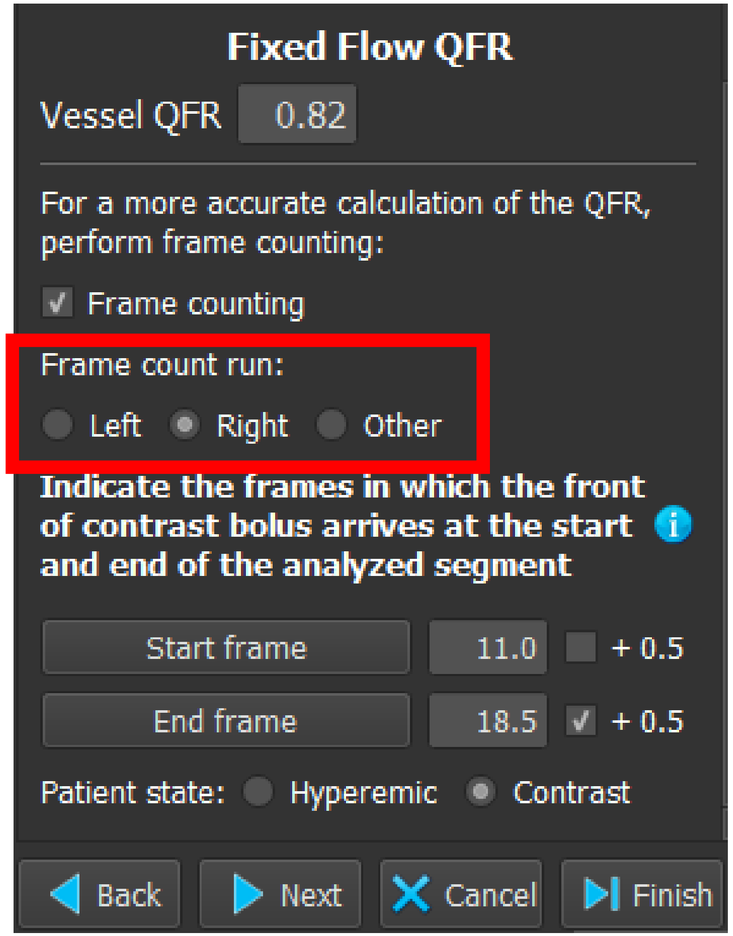


1) Select “Frame counting”



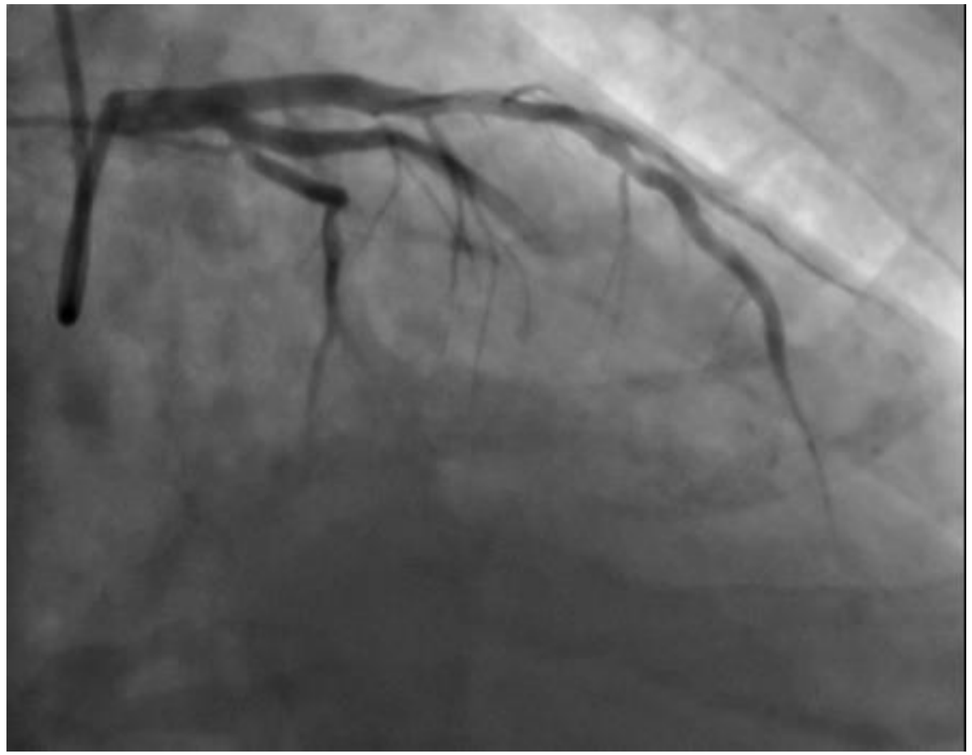
QFR Computation (10)

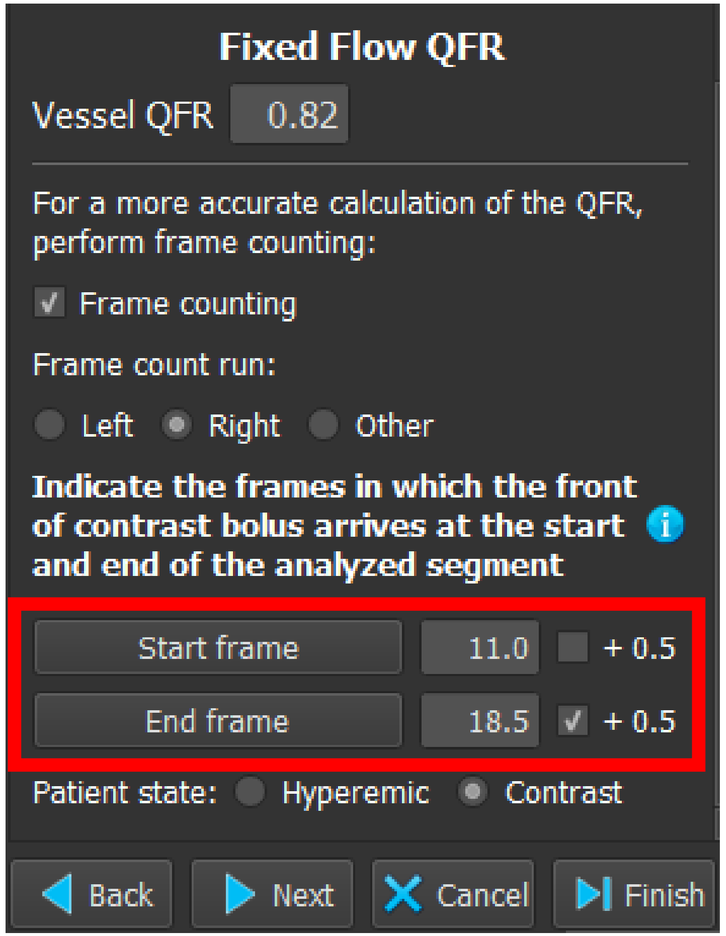




1) Select "Frame counting"
2) Choose the projection (left or right) in which you want to perform the frame counting

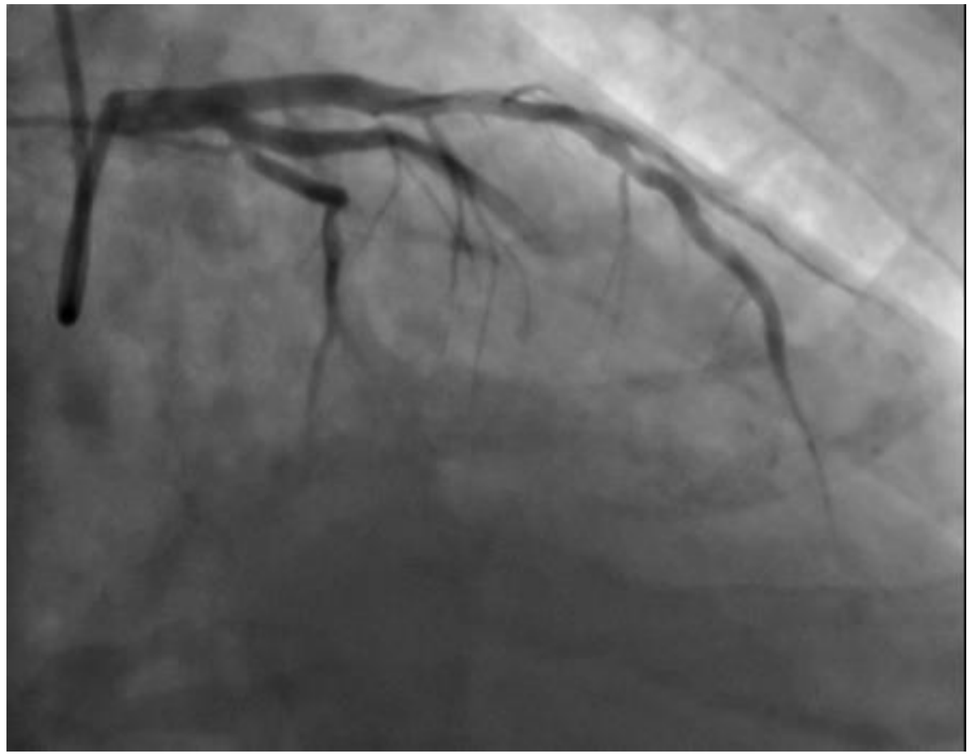
QFR Computation (10)

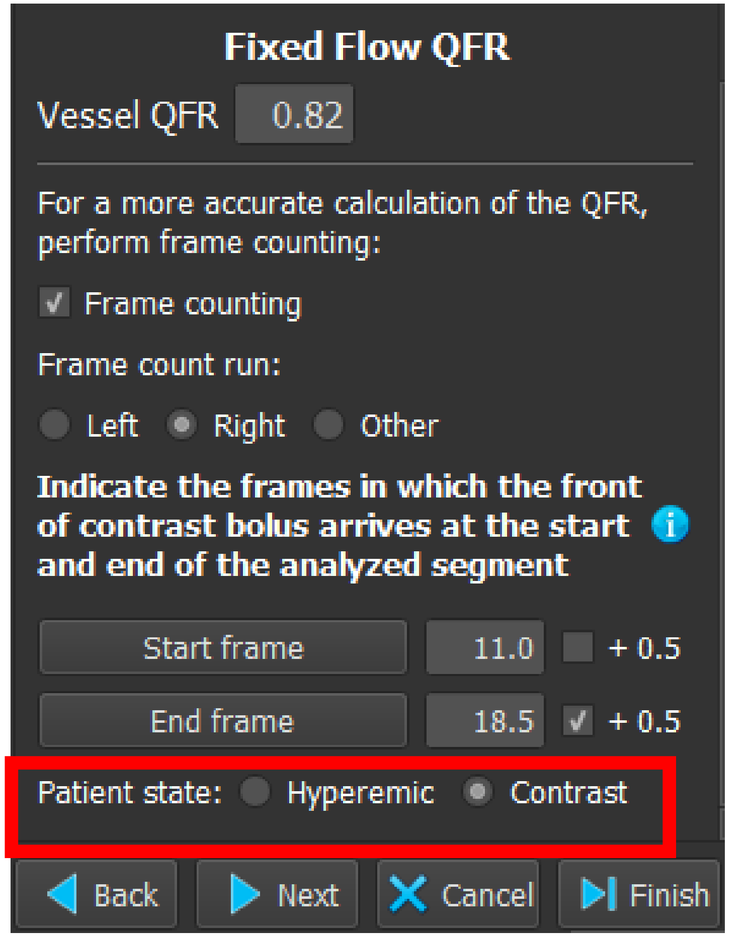




1) Select "Frame counting"
2) Choose the projection (left or right) in which you want to perform the frame counting
3) Select the frame in which contrast arrives at the proximal landmark ("Start frame") and the frame in which contrast reaches the distal landmark on target vessel ("End frame")

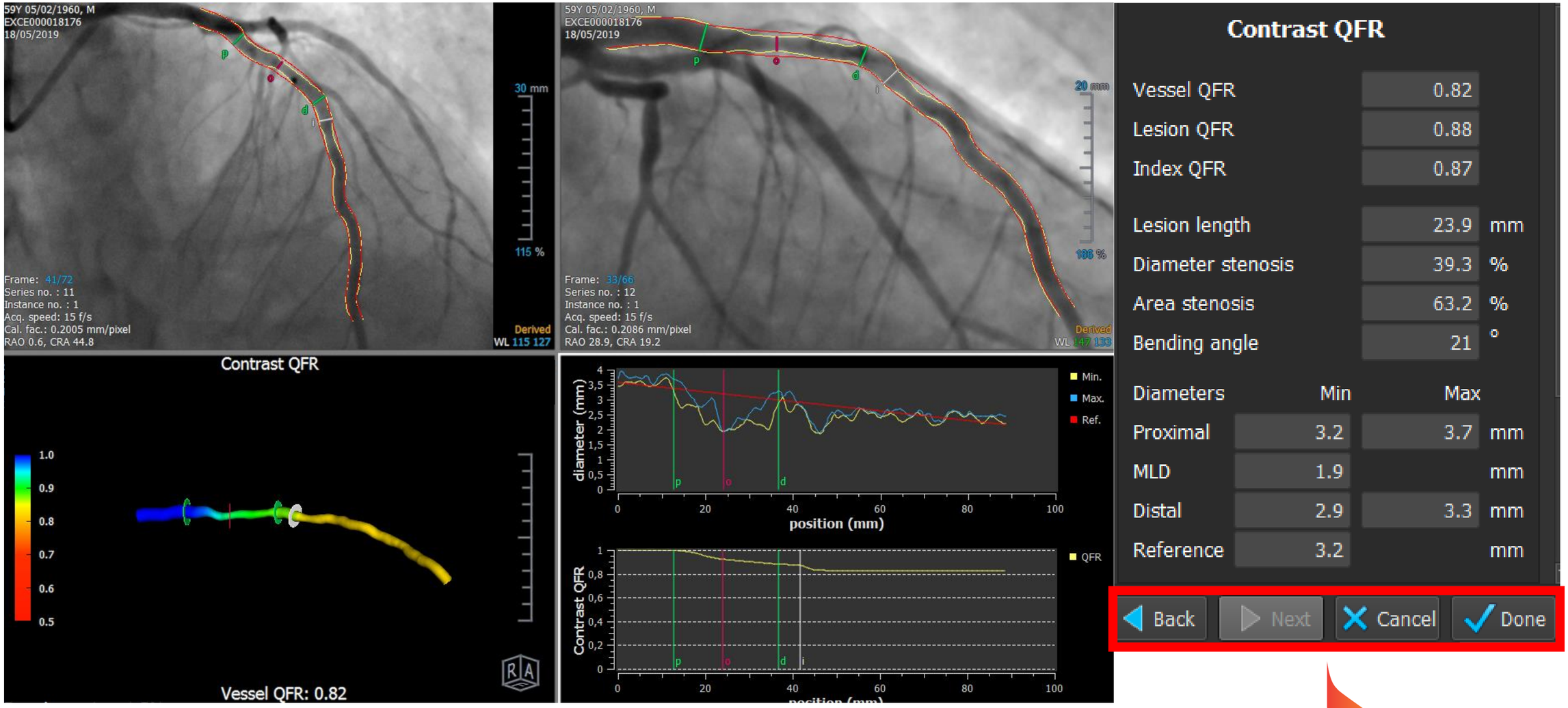
QFR Computation (10)





1) Select "Frame counting"
2) Choose the projection (left or right) in which you want to perform the frame counting
3) Select the frame in which contrast arrives at the proximal landmark ("Start frame") and the frame in which contrast reaches the distal landmark on target vessel ("End frame")
4) Select "Contrast" to proceed.

QFR Computation (11)

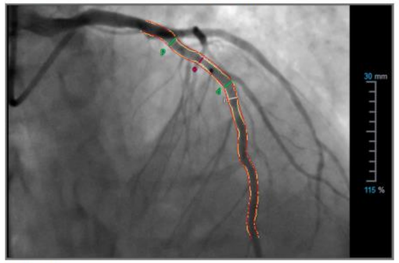


If you are satisfied with the analysis select "Done" and proceed, otherwise select "Back" to return in the previous pages to make corrections.

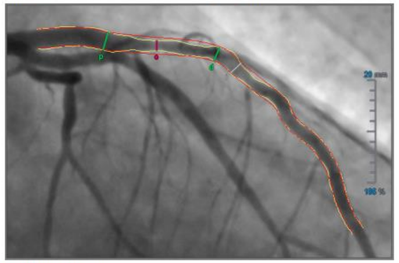
QFR Results

Single vessel 01 (QAngio XA 3D 1.1 #3)

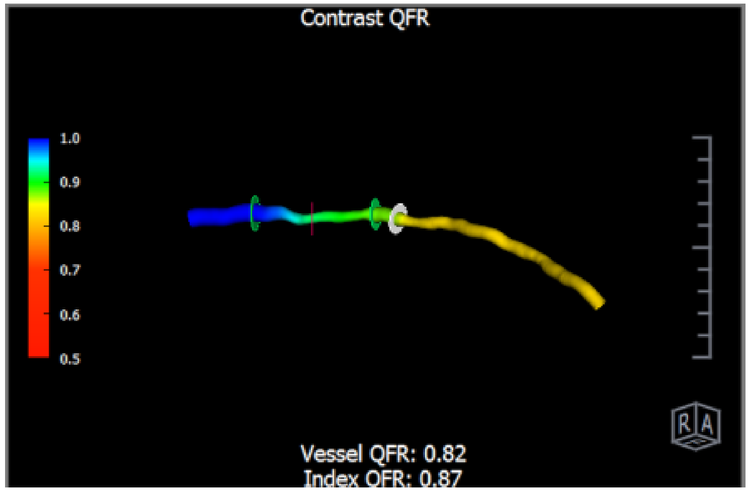
Left Calibration Factor: 0.2005 mm/pixel	Right Calibration Factor: 0.2086 mm/pixel
Left Source: Isocenter calibration	Right Source: Isocenter calibration

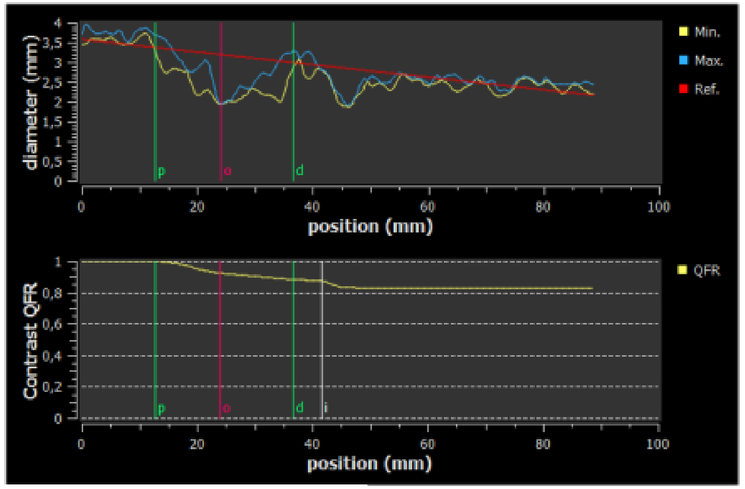


Left 2D Image

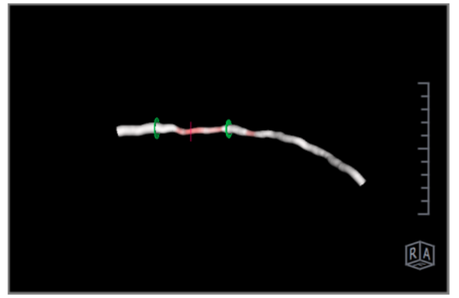


Right 2D Image

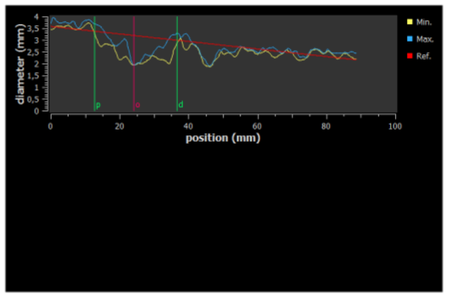




Medis Suite 3.1 Report Report



3D Reconstruction: RAO 45, CAU 19



Diameter Diagram

Lesion Results

Diameter stenosis	39.3 %
Lesion length	23.9 mm
Proximal diameter	3.2 - 3.7 mm
Distal diameter	2.9 - 3.3 mm
MLD	1.9 mm
Area at MLD	2.9 mm²
Reference diameter	3.2 mm
Reference area	8.0 mm²
Area Stenosis	63.2 %
Bending angle	21 °
Mean vessel bending angle	13 °
Maximum vessel bending angle	25 °
Mean lesion bending angle	14 °
Maximum lesion bending angle	24 °
Reference volume	190.2 mm³
Plaque volume	66.0 mm³
Lumen volume	117.4 mm³

Optimal Viewing Angles

RAO 44, CRA 31	2.5 %
RAO 45, CRA 16	2.5 %
RAO 45, CRA 1	2.2 %
RAO 45, CAU 14	1.7 %

QFR Results

	Fixed Flow	Contrast	
Vessel QFR	0.82	0.82	
Lesion QFR	0.88	0.88	
Index QFR	0.87	0.87	
Resistance		85.46	mmHg*s/m
Flow Velocity		0.18	m/s

The final value that you have to consider is "*Vessel QFR Contrast*"

FIRE TRIAL