

Quantitative Flow Ratio (QFR[®]) for Non-Invasive Analysis of Coronary Angiography

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Functional testing for lesion assessment prior to percutaneous coronary interventions (PCI)

- Use of Fractional Flow Reserve (FFR) to assess lesions is a Class IA recommendation*
- However, FFR has various limitations:
 - Invasive with a pressure wire to be inserted into coronary artery
 - Need for adenosine (FFR)
 - Discomfort to patient
 - Chance on Arrhythmia
 - Time consuming
 - Suboptimal FFR measurements occur in approximately one-third of tracings**
 - FFR is not reproducible

* European Heart Journal 2019; 40: 87-165 Doi.org/eurheartj/ehy394

** JACC Interv 2017; 10:1392



To address these limitations, Quantitative Flow Ratio (QFR[®]) was developed

- QFR[®] is an image-based physiologic parameter (simulating FFR) based on 3D anatomy and flow velocity
- Non-invasive
 - Does not require a pressure wire
- Accurate
 - Very high correlation with QFR[®] and FFR score (both 0.8 threshold)
 - QFR has been shown to be highly reproducible in several studies
- Efficient
 - The QFR[®] can be obtained in less time (avg 5 min) than the FFR (avg 7 mins)*
- Associated with significantly reduced exposure to ionizing radiation compared to both FFR and iFR

* J Am Heart Assoc 2018; 7: e009603; doi:10.1161/JAHA.118.009603

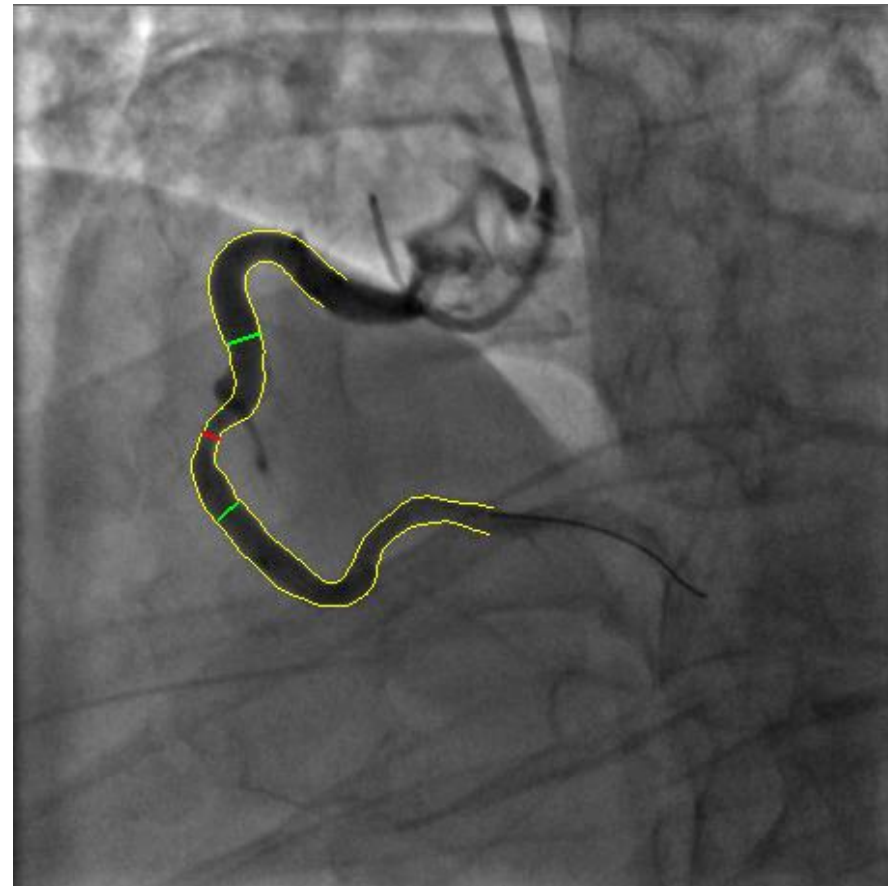


Further advantages of using QFR[®]

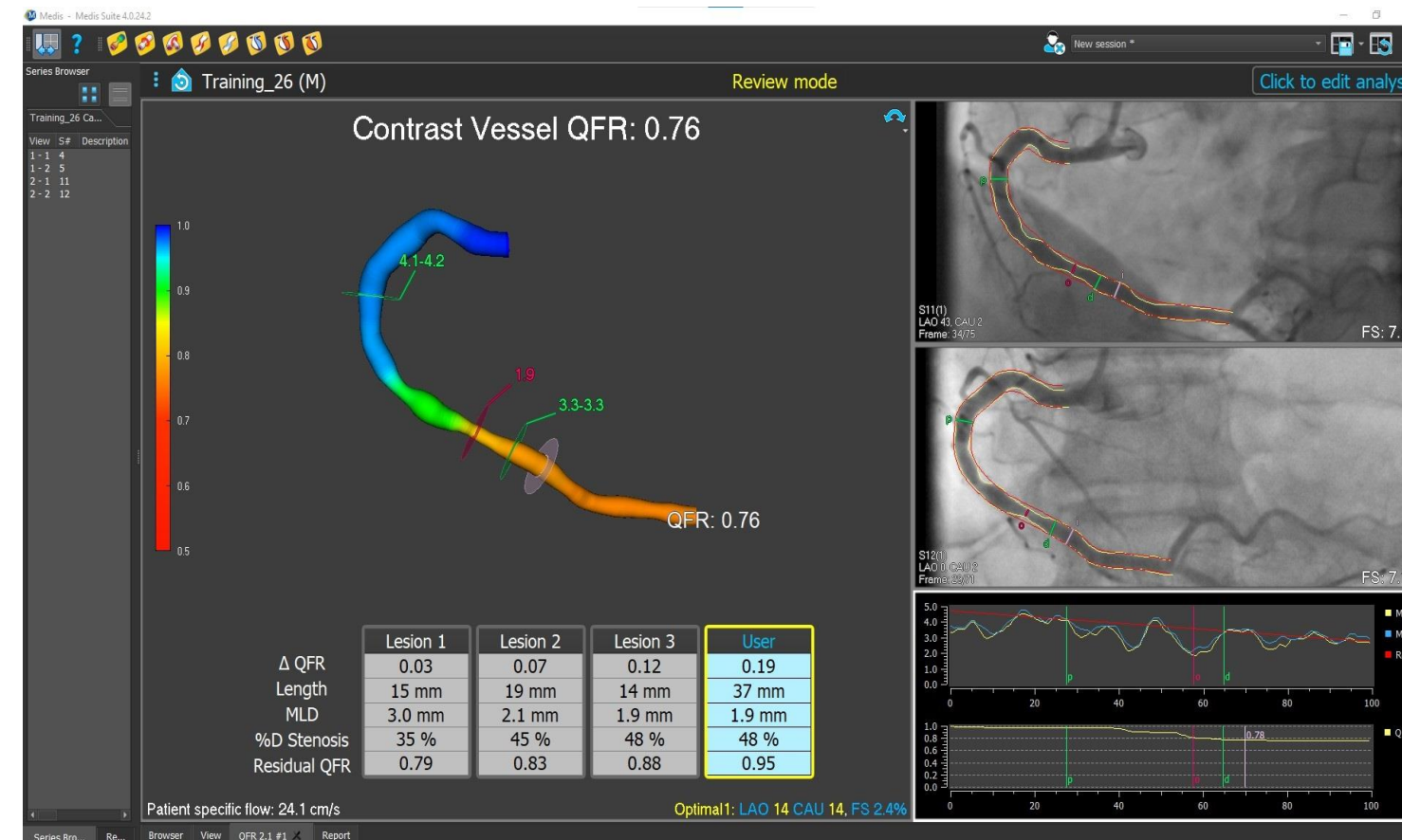
- Pre-service usage
 - Functional assessment of coronary obstructions from standard coronary X-ray angiograms
 - Produces a 3D model to inform treatment options
- Intra-service usage
 - The QFR[®] score is provided for each location along the analysed vessel which enables the selection of the most prominent lesion for intervention
 - In addition to the QFR[®] score, three-dimensional anatomic information is provided which can be used for stent sizing
 - The QFR[®] score may also be utilized to predict results of the intervention
- Post-service usage
 - The QFR[®] score may also be utilized post-service to assess the results of the intervention which has prognostic information on MACE
- Patient comfort
 - QFR[®] does not require adenosine administration



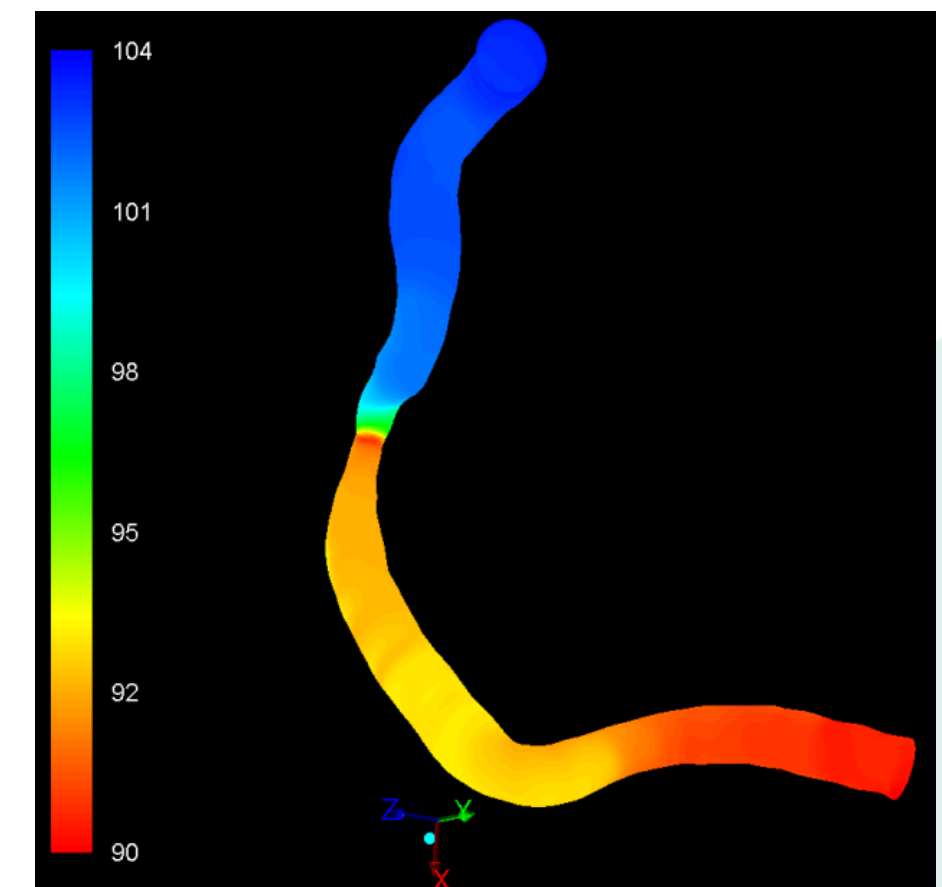
QFR[®]: pre-, intra- and post-service



Pre-Service Diagnostics
FFR not applicable



Intra-Service Images to Guide Stent Selection and Lesion Selection (main FFR usage)



Post-Service Procedure Assessment
FFR typically not used

- Procedure documentation to identify QFR may include the following terminology:
 - Quantitative flow ratio
 - QFR
 - Image-based FFR
 - Angio FFR



No Systematic Differences Between QFR[®] vs FFR

Study	Author	Number patients	Difference	Area-under-curve
Meta-analysis FAVOR Studies: WIFI I, FAVOR Pilot, FAVOR I, FAVOR II Eu/Jp	Westra et al CCI 2019	819 ptns / 969 vessels All patients with stable angina	0.01 ± 0.07	0.92
Meta-analysis and systematic review	Cortés et al CCI 2020	16 studies (7 prosp); 2933 ptns / 3335 vessels	0.01	Pooled AuC = 0.94
NICE UK Report	Diagnostic Guidance, March 17, 2021	39 studies; 5440 ptns	- 0.01	Sensitivity 85% Specificity 91%
Multi-center QFR Registry	Choi et al Int J Cardiol 2020	455 ptns / 599 vessels ACS in 153 ptns	0.002	0.95

3. NICE Diagnostic Guidance, published March 17, 2021

4: K.H. Choi et al., *Clinical relevance and prognostic implications of contrast quantitative flow ratio in patients with coronary artery disease*, Int J Cardiol 2020



Summary

- QFR[®] is obtained from coronary angiography to assess lesions and guide PCI procedures
 - No wire or adenosine needed
 - Associated with significantly reduced exposure to ionizing radiation compared to both FFR and iFR
- Pre-service use:
 - Diagnostic tool to assess physiology of lesions
- Intra-service use:
 - Guides stent pre-selection to avoid over or under stenting
 - Allows for selection of lesion(s) which cause significant pressure drops
 - Predicts the effect of an intervention
- Post-service use:
 - Assess the final results after a percutaneous coronary intervention




Example of QFR[®] report that is saved in patient file and PACS

Medis Suite 4.0 Report

Organization: Your organization name (in configuration)
Report created by: Rolf Koolstra
Report date/time: 24/01/2022 13:37
Session name: Session 24/01/2022 13:37 Case26_RCA_RK

Training_26: Case26



Patient Study Info

Name: Training_26

ID: Case26

Birthdate:

Age/Gender: -/M

Modality: XA

Manufacturer: Siemens

Manufacturer model: AXIOM-Artis

Study date: 14/06/2017

Description:

Accession number:

Referring physician's name:

Institution name:

Performing physician's name:

Operator's name:

Acquisition number: 4, 5, 11, 12

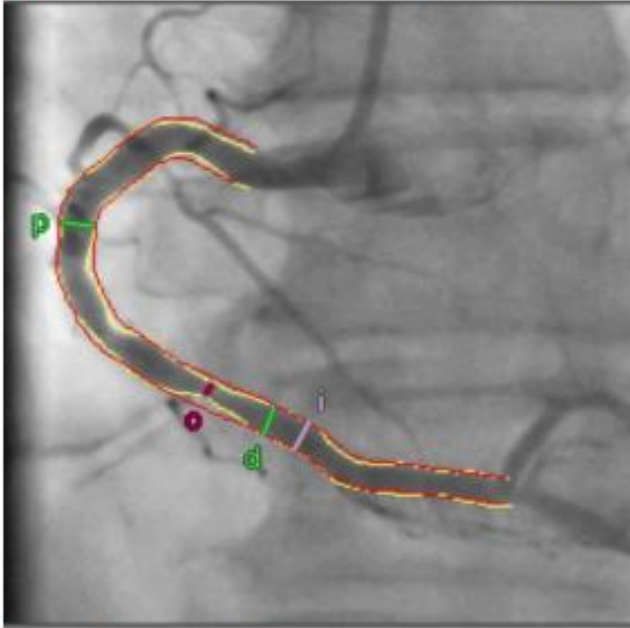
Reason for Referral


QFR (QFR 2.1 #1)

Analysis performed in QAngio XA 3D 2.1.12.4
Segment: Other coronary than left main or LAD
3D space calibrated based on acquisition parameters

QFR Summary (last selected lesion in bold)

	Vessel	Lesion 1	Lesion 2	Lesion 3	User	
Contrast QFR	0.79	0.98	0.96	0.87	0.82	
QFR-PPG Index	0.70					
Contrast Δ QFR		0.02	0.04	0.13	0.18	
Residual Vessel QFR		0.81	0.83	0.92	0.96	
Length	93.9	11.3	18.9	13.7	37.3	mm
Proximal diameter		3.9 - 4.2	4.0 - 4.1	3.6 - 3.7	4.0 - 4.1	mm
Distal diameter		4.2 - 4.6	3.7 - 4.1	3.3 - 3.4	3.3 - 3.4	mm
Reference diameter		4.6	3.9	3.6	3.6	mm
MLD		3.1	2.4	1.8	1.8	mm





S12 I1, frame 29 (lesion: User)

S11 I1, frame 34 (lesion: User)

1/3

Medis Suite 4.0.24.4



Thank you

