

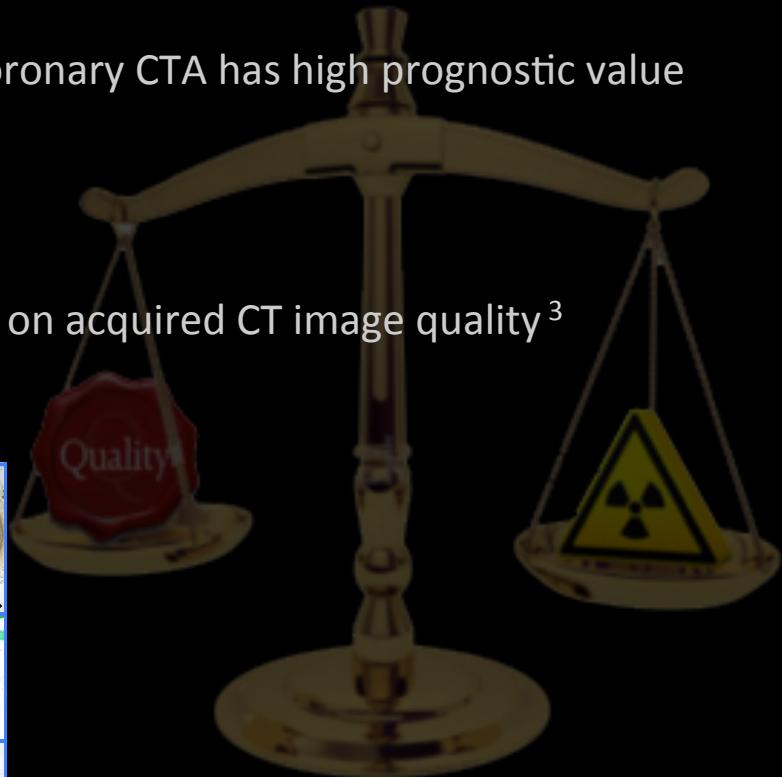
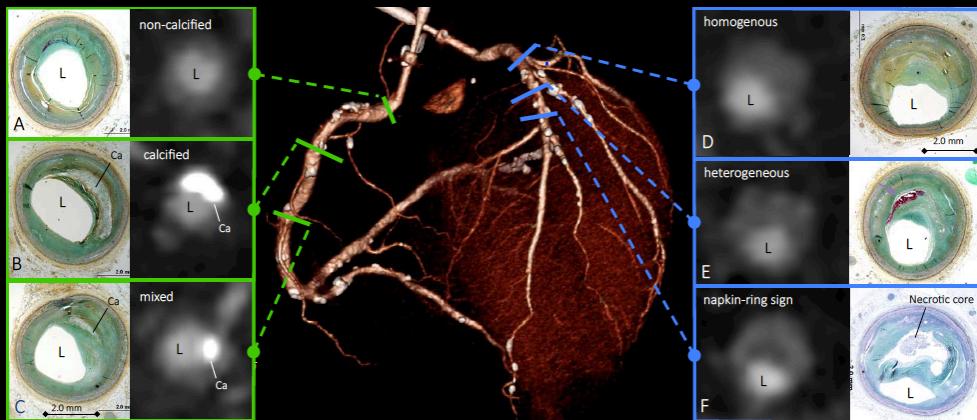
Image quality of coronary CT angiography using iterative model image reconstruction

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Coronary CT Angiography

- Coronary CTA allows for reliable non-invasive assessment of CAD ¹
- Characterization of atherosclerotic plaques with coronary CTA has high prognostic value regarding future CV events ²
- (Automated) plaque characterization is dependent on acquired CT image quality ³



1. Budoff et al. Circulation 2011

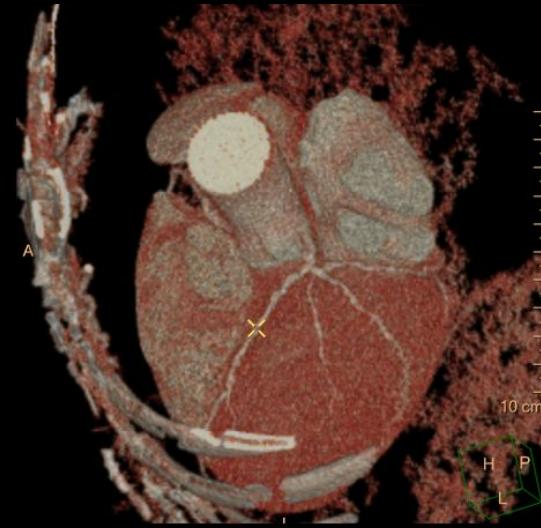
2. Maurovich-Horvat et al. Nature reviews 2014

3. Puchner...Karolyi et al. Int J CVI 2013

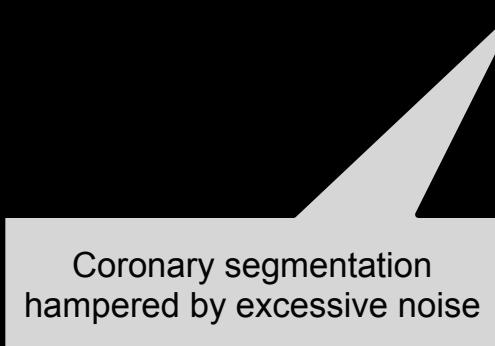
Coronary segmentation



Filtered back projection reconstruction (FBR)



Hybrid iterative reconstruction (HIR)



Iterative model reconstruction (IMR)

BMI = 38 kg/m²



Aims

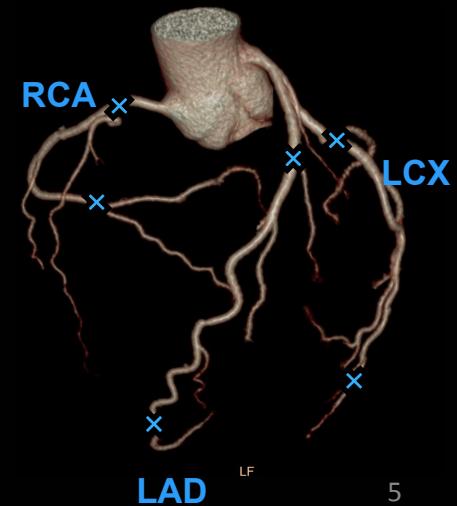
- I. To assess the qualitative and quantitative image quality parameters of coronary CTA datasets reconstructed with FBR, HIR and IMR techniques

Methods

- 52 consecutive patients referred to coronary CTA
(39 male; mean age: 64.7 ± 9.3 yrs; BMI: 28.5 ± 5.6 kg/m²)
- 256-slice CT (Philips Brilliance iCT) used for data acquisition
- Datasets reconstructed with FBR, HIR and IMR technique
- Patients excluded with a heart rate >60 bpm

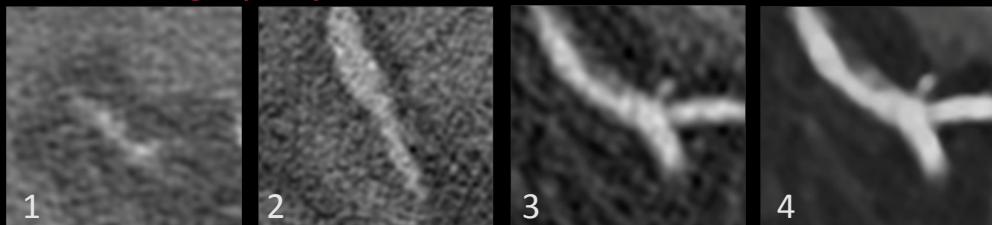
Image quality assessment

- Qualitative and quantitative image quality parameters
- Proximal and distal coronary segments



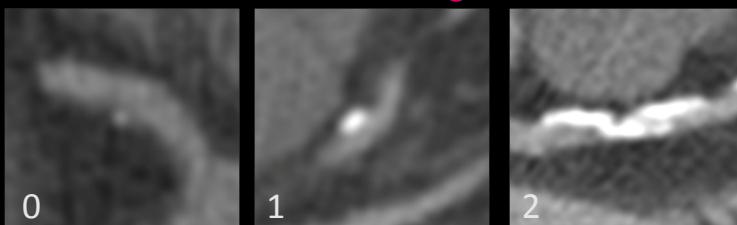
Qualitative image quality assessment

Overall image quality



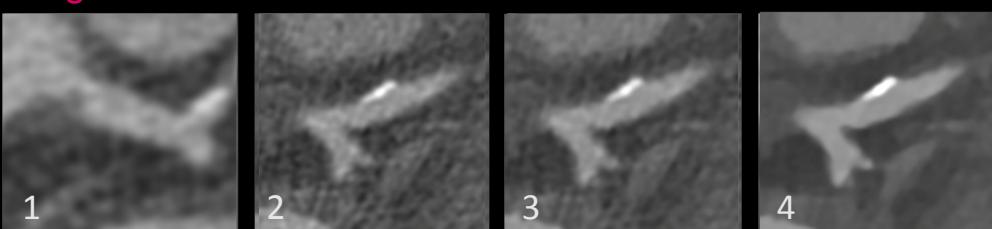
- 1 = non diagnostic
- 2 = moderate
- 3 = good
- 4 = excellent

Calcification related blooming artifacts



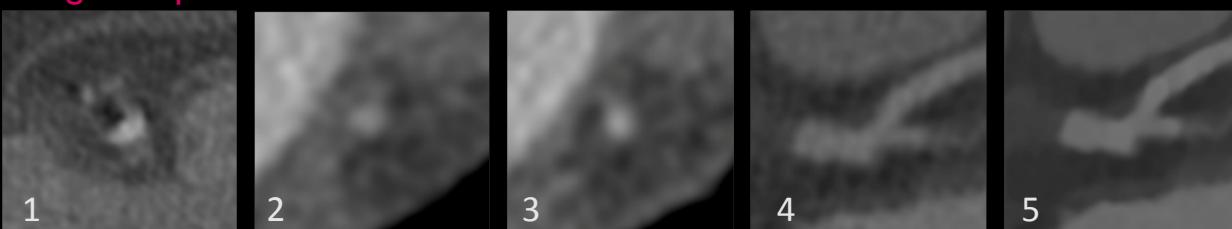
- 0 = non-significant
- 1 = minor blooming, clear lumen
- 2 = severe blooming, lumen not definable

Image noise



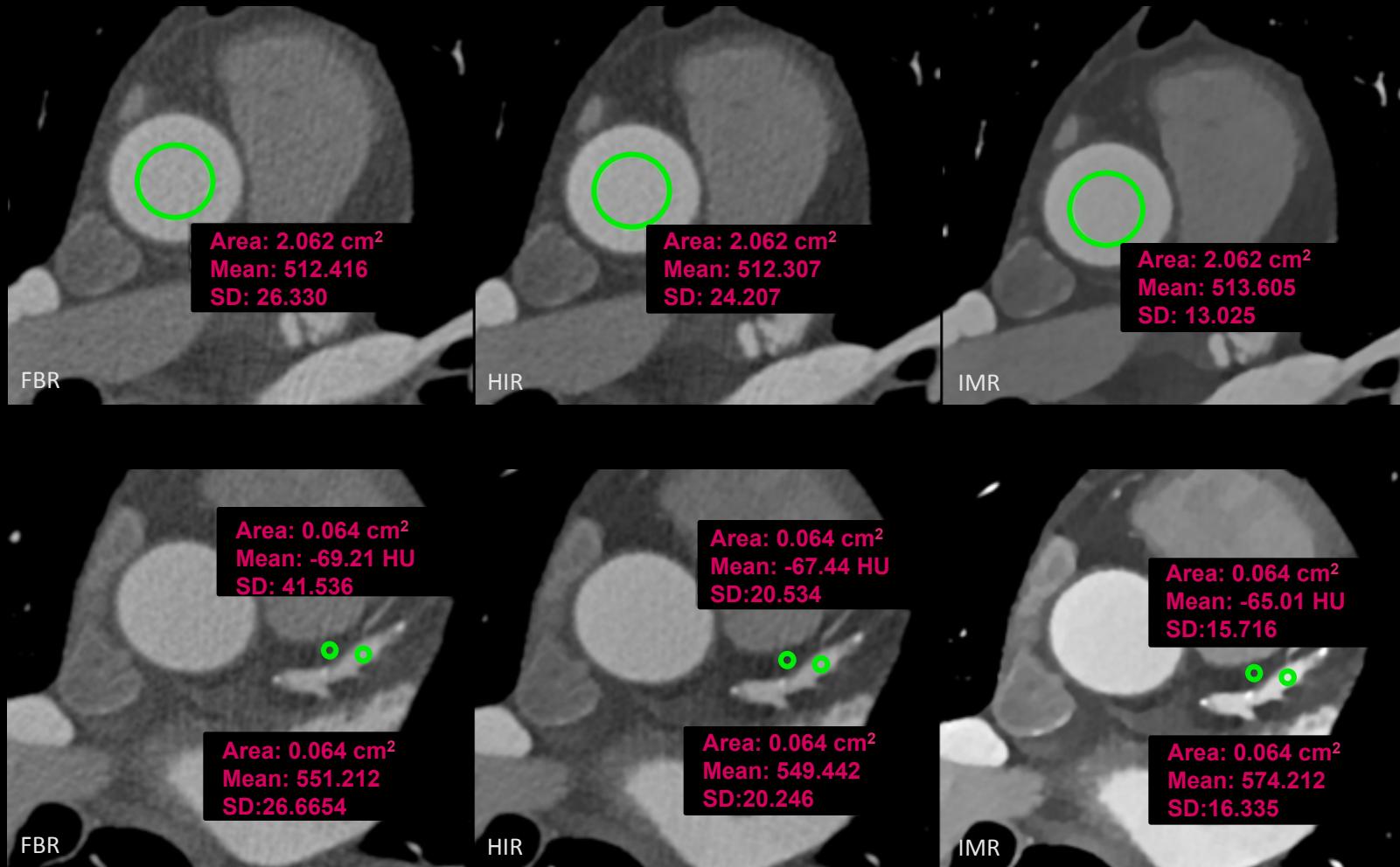
- 1 = severe noise
- 2 = above average
- 3 = average noise
- 4 = negligible noise

Image sharpness



- 0 = non-definable lumen
- 1 = 50% of the lumen obscured
- 2 = minor artifact, definable lumen
- 3 = clear lumen
- 4 = excellent

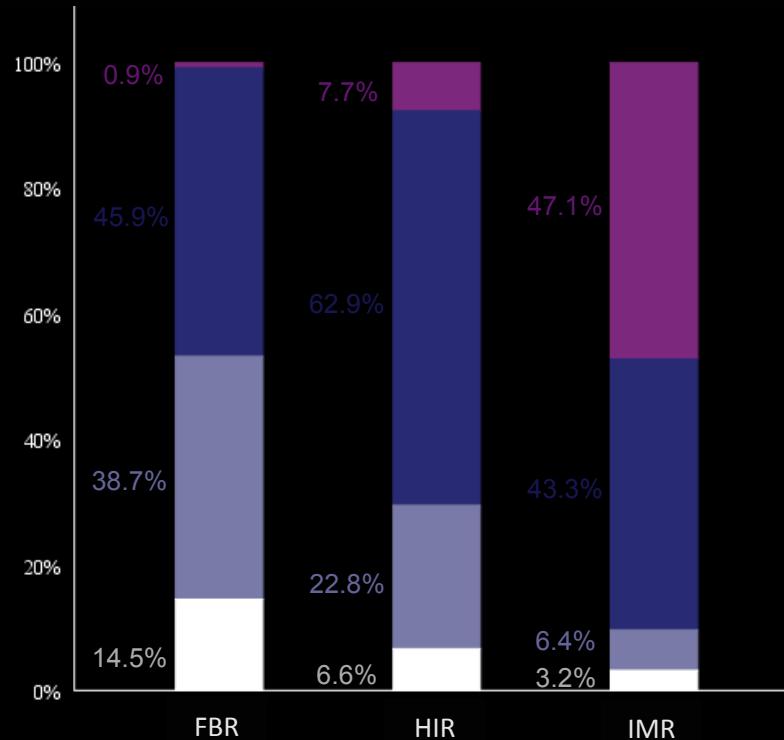
Quantitative image quality assessment



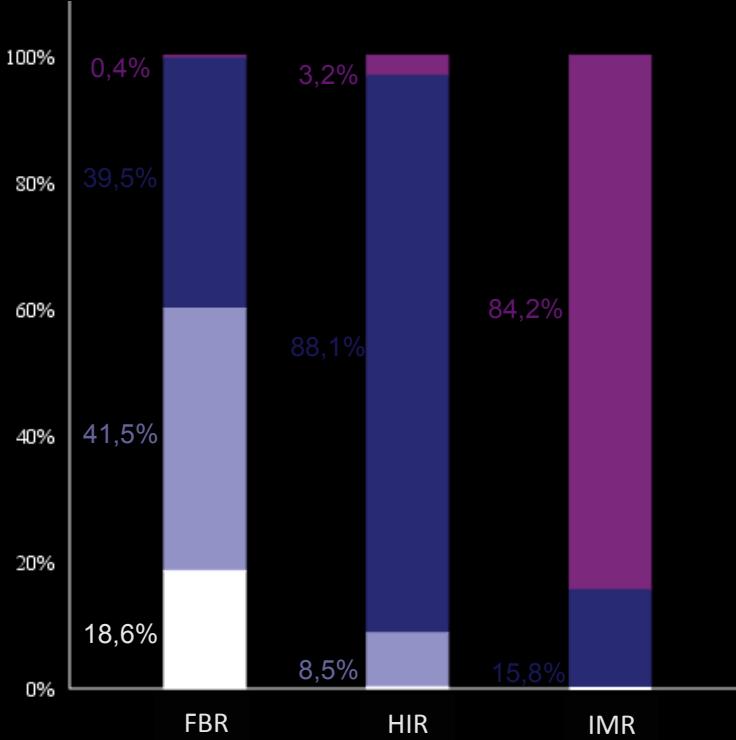
- HU coronary and pericoronal fat
- Mean noise (SD)
- Contrast to noise ratio (CNR): $(\text{HU}_{\text{coronary}} - \text{HU}_{\text{pericoronal fat}}) / \text{SD}_{\text{aorta}}$



Overall image quality and image noise



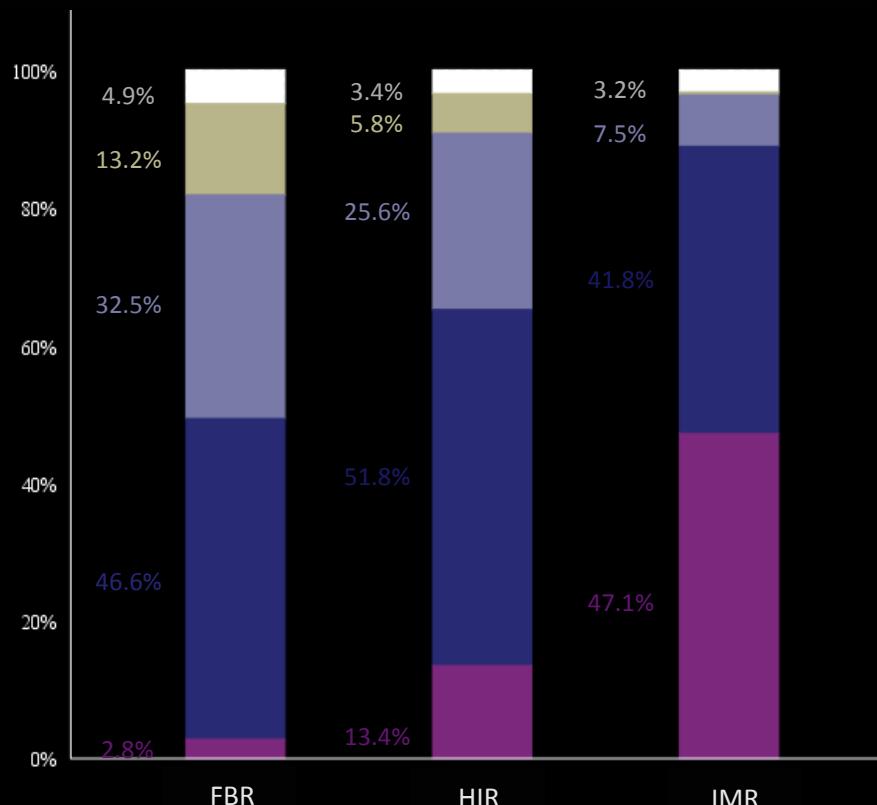
- Excellent
- Good
- Moderate
- Non-diagnostic



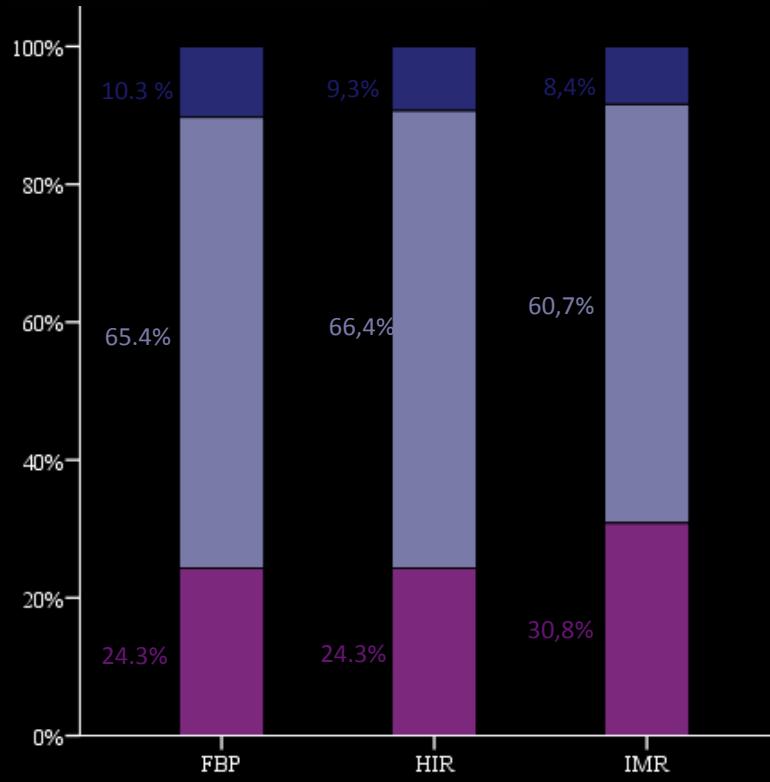
- Negligible noise
- Average noise
- Above average
- Severe noise



Image sharpness and blooming

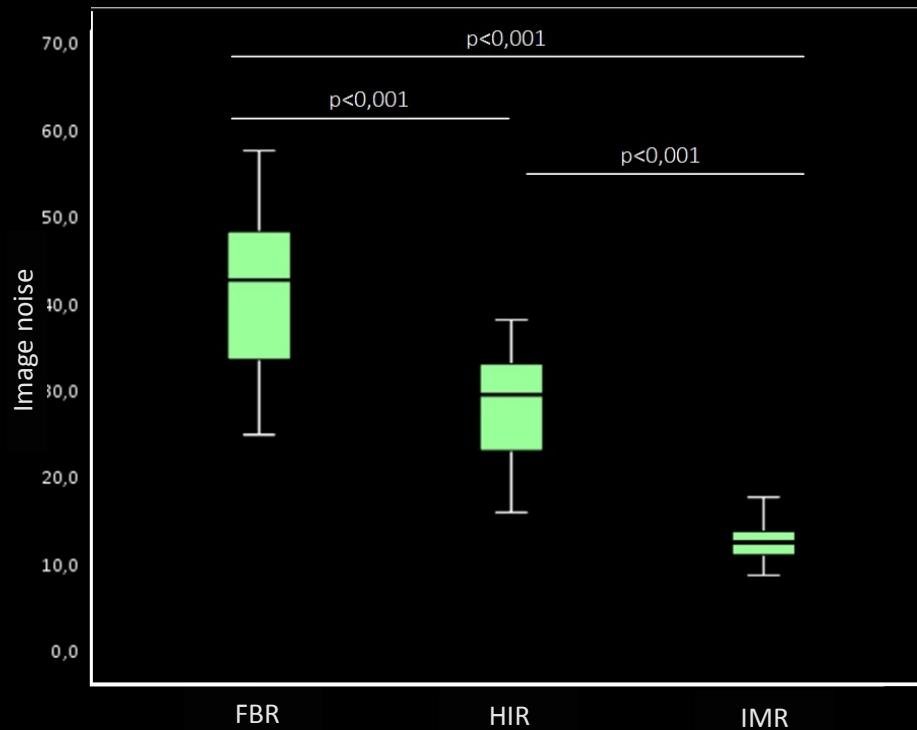


- Non-definable lumen
- 50% of the lumen obscured
- Minor artifacts, definable lumen
- Clear lumen
- Excellent



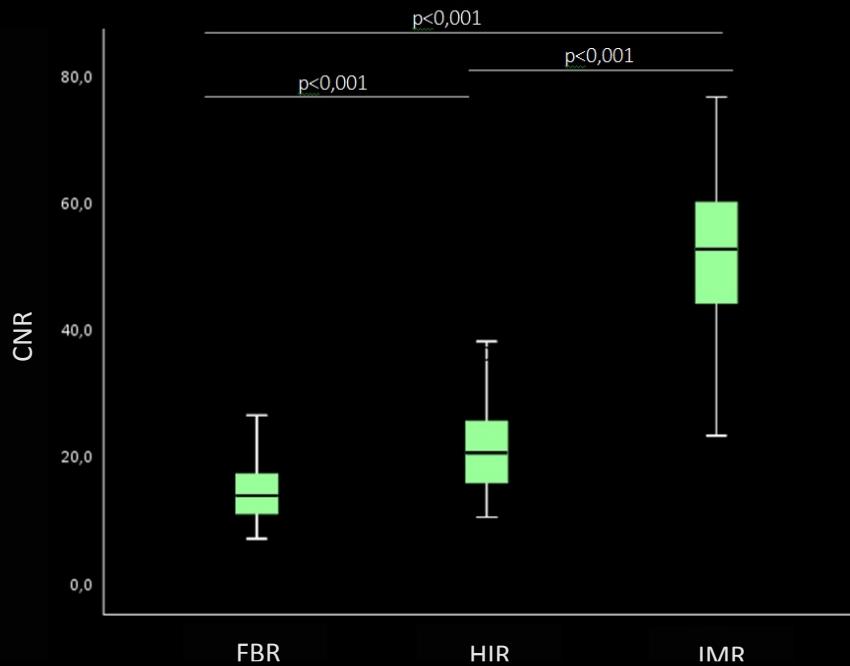
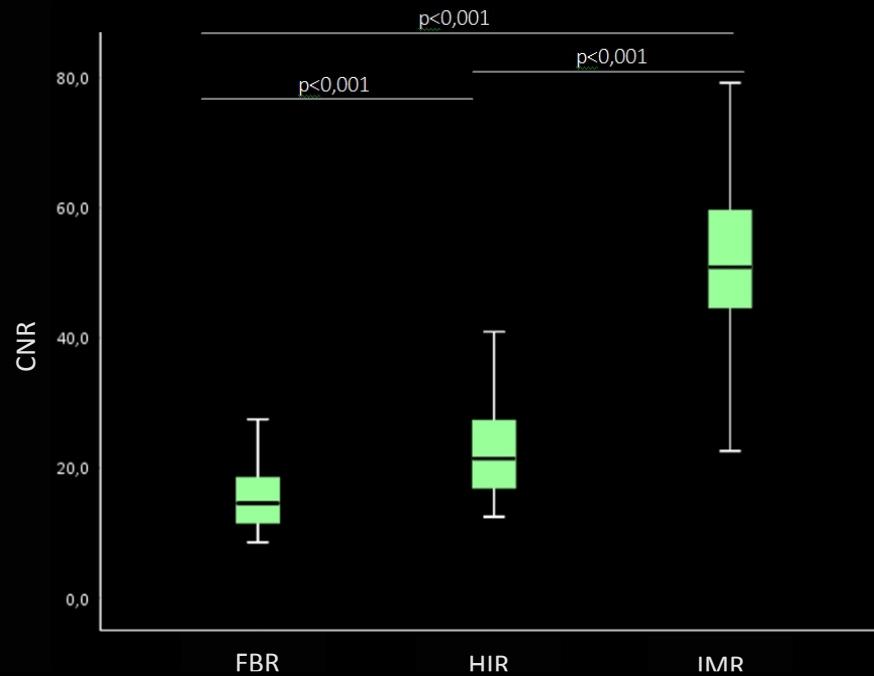
- No blooming
- Minor blooming
- Severe blooming

Quantitative image noise



Reconstructoin	Noise (SD)	p
FBR	42.1 ± 10.7	<0.001
HIR	28.7 ± 7.2	<0.001
IMR	12.9 ± 2.7	<0.001

Proximal and distal CNR



Reconstruction	Prox. segment CNR	Dist. segment CNR	p
FBR	17.4 ± 5.8	16.2 ± 5.0	<0.001
HIR	25.3 ± 8.4	23.5 ± 7.4	<0.001
IMR	54.2 ± 12.0	55.2 ± 12.4	<0.001

Conclusions

- IMR leads to significantly improved image quality and decreased image noise in coronary CTA as compared to HIR and standard FBR
- IMR increases CNR both in the proximal and distal coronary segments





CIRG

Cardiovascular Imaging
Research Group

Thank you for your attention!

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