

On-site CT-FFR of an anomalous right coronary artery to influence revascularization strategy

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INTRODUCTION

CT fractional flow reserve (FFR_{CT}) is a relatively new adjunct to CT Coronary angiography (CTCA) to determine if a stenosis is functionally significant. We describe FFR_{CT} as an alternative to myocardial perfusion imaging (MPI) to assess a narrowing in an anomalous right coronary artery (RCA) in the setting of a left anterior descending artery (LAD) territory myocardial infarct (MI).

CASE REPORT

A 63-year-old man was transferred with an anterior ST-elevation MI to our center after receiving thrombolysis. Invasive coronary angiogram revealed a severe proximal LAD stenosis (Figure 1A) and an anomalous origin of the RCA from the left coronary cusp

(Figure 1B). The anomalous RCA origin was confirmed on CTCA (Figure 2A). CTCA also showed luminal narrowing as the proximal RCA coursed inter-arterially between the aorta and the right ventricular outflow tract (Figure 2B) and a severe proximal LAD stenosis (Figure 2C).

The revascularization strategy (surgery v. stent) depended on whether or not the anomalous RCA narrowing was functionally significant. Although MPI was a considered option, in this case, assessing for possible RCA territory ischemia would likely be confounded by almost certain ischemia in the LAD territory. FFR was considered most appropriate. FFR_{CT} was calculated on-site, using prototype software (cFFR version 3.1, Siemens GmbH, Forchheim, Germany), but at our center is approved for research purposes only. Hence, invasive FFR was required. FFR_{CT} suggested that the narrowing of the anomalous RCA was not

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Figure 1. Coronary angiogram revealed a severe proximal left anterior descending artery stenosis (dashed arrow) as well as an anomalous origin of the right coronary artery (RCA) from the left coronary cusp (solid arrow = RCA origin, open arrow = Left main coronary artery origin).

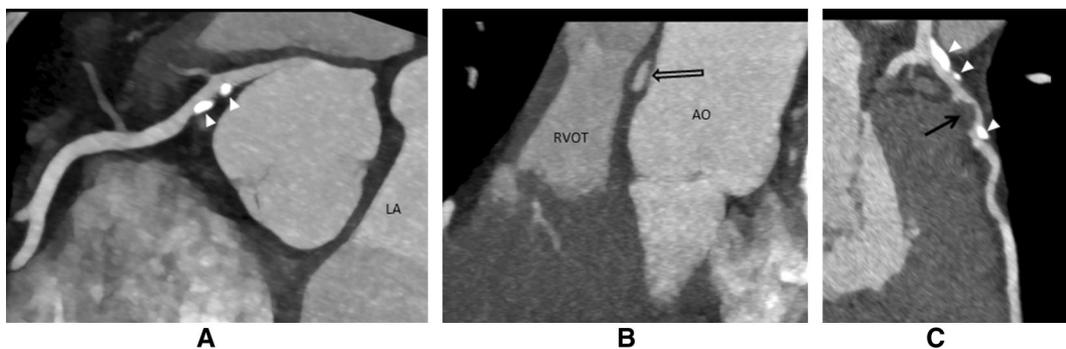


Figure 2. Oblique maximum intensity projection CT Coronary angiogram (CTCA) images demonstrating the anomalous origin of the right coronary artery (RCA) from the left coronary cusp (A), showing an inter-arterial course of the proximal portion (B) with luminal narrowing (open arrow). CTCA also confirmed severe proximal left anterior descending artery (LAD) stenosis from non-calcified plaque (solid arrow (C)). Non-obstructive calcific plaque was seen elsewhere within the LAD and RCA on CTCA (solid arrowheads), not appreciated on coronary angiography. LA, left atrium; RVOT, right ventricular outflow tract; AO, Aorta.

functionally significant ($FFR_{CT} = 0.95$; functionally significant ≤ 0.8) (Figure 3). Invasive FFR confirmed this ($FFR = 0.89$). Conversely, FFR_{CT} demonstrated the proximal LAD stenosis to be functionally significant ($FFR_{CT} = 0.75$) (Figure 3) concordant with invasive FFR (0.73). The proximal LAD was stented. No

intervention was performed on the anomalous RCA. Two months later, the patient remained symptom free.

This is the first FFR_{CT} case report of an anomalous coronary artery narrowing that is not functionally significant^{1–3} and is also the first report utilizing on-site software to calculate the FFR_{CT} .

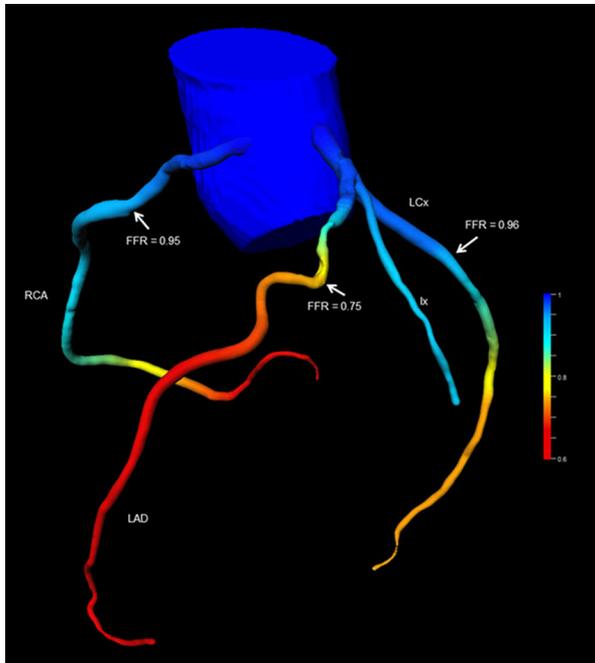


Figure 3. Non-invasive CT fractional flow reserve (FFR_{CT}) revealed a FFR_{CT} of 0.89 in the proximal anomalous right coronary artery which was not functionally significant (functionally significant ≤ 0.8). FFR_{CT} of the proximal left anterior descending artery stenosis was found to be functionally significant with a FFR_{CT} of 0.75. FFR_{CT} is calculated for all vessels as a routine and was found to be normal in the circumflex artery ($FFR_{CT} = 0.96$). Note that, the FFR_{CT} values drop off in the distal parts of the vessel even in the absence of a stenosis due to blood flow distribution. *RCA*, right coronary artery; *LAD*, left anterior descending artery; *LCx*, circumflex artery; *Ix*, Ramus intermedia.

Disclosures

None.

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