Coronary Artery Disease - Reporting and Data System (CAD-RADS)

Sandeep S. Hedgire, MD; Udo Hoffmann, MD, MPH, Ik-Kyung Jang MD PhD, Brian Ghoshhajra, MD, MBA

Clinical History
A 55 year old male presented for urgent care with left sided chest pain; he had previously been well, with past medical history of hypertension and hyperlipidemia. Upon evaluation, he was noted to have recent onset of intermittent chest pain (3-4 weeks). His blood pressure and physical exam was otherwise unremarkable (including normal heart sounds and peripheral pulses). An ECG was unremarkable, with normal rate and rhythm, and no evidence of prior infarction. His serum troponin was within normal limits. Given his low- to intermediate risk for coronary artery disease, he was referred for coronary computed tomography angiography (CTA).

Findings
CTA demonstrated calcified and noncalcified plaque causing a severe stenosis in the dominant proximal right coronary artery (RCA) (Fig.1A) additional plaques were noted in the left anterior descending and circumflex arteries, but none were deemed greater than 50% diameter narrowing. Overall, the CTA result was classified as CAD-RADS 4-V. The patient was referred to Cardiology, and was promptly taken to the lab for invasive coronary angiography (ICA), where a severe right coronary artery stenosis was confirmed (Fig.1B), and revascularization was successfully performed via drug-eluting stent.

Discussion
Coronary CTA is known to have a very high negative predictive value, and positive cases should correlate with the gold standard (ICA) as closely as possible. Reporting of CTA can be complex on a segment-by-segment basis, but standardized stenosis thresholds and reporting templates facilitate improved communication. The new multi-societal CAD-RADS (Coronary Artery Disease – Reporting and Data System) is designed to facilitate uniform standardization of reporting (Fig.2, 3). Patients can then be matched to suggested management pathways, which vary depending on clinical settings and patient factors (ie. acute chest pain versus stable outpatients).
Figure 1. Coronary CTA in a 55 year old male showing severe stenosis in the proximal RCA (A) which was confirmed on invasive coronary angiography (B)
Figure 2. Illustration showing the categories for standardized reporting in the Coronary Artery Disease - Reporting and Data System (CAD-RADS). The guidelines offer recommendations for patients with A) Stable chest pain.

CAD-RADS 0 - Reassurance. Consider non-atherosclerotic causes of chest pain.

CAD-RADS 1 - Consider non-atherosclerotic causes of chest pain. Consider preventive therapy and risk factor modification.


CAD-RADS 3 - Consider functional assessment. Consider symptom-guided anti-ischemic and preventive pharmacotherapy as well as risk factor modification per guideline-directed care. Other treatments should be considered per guideline-directed care.

CAD-RADS 4A : Consider ICA or functional assessment. Consider symptom-guided anti-ischemic and preventive pharmacotherapy as well as risk factor modification per guideline-directed care.
CAD-RADS 4B: ICA is recommended. Other treatments (including options of revascularization) should be considered per guideline-directed care.

CAD-RADS 5 - Consider ICA and/or viability assessment. Consider symptom-guided anti-ischemic and preventive pharmacotherapy as well as risk factor modification per guideline-directed care.

CAD-RADS N - Additional or alternative evaluation may be needed.

**B) Patients presenting with acute chest pain, negative first troponin, negative or non-diagnostic electrocardiogram and low to intermediate risk (TIMI risk score <4) (emergency department or hospital setting):**

CAD-RADS 0 - ACS highly unlikely. No further evaluation of ACS is required. Consider other etiologies.

CAD-RADS 1 - ACS highly unlikely. Consider evaluation of non-ACS etiology, if normal troponin and no ECG changes. Consider referral for outpatient follow-up for preventive therapy and risk factor modification.

CAD-RADS 2 - ACS unlikely. Consider evaluation of non-ACS etiology, if normal troponin and no ECG changes. Consider referral for outpatient follow-up for preventive therapy and risk factor modification.

CAD-RADS 3 - ACS possible. Consider hospital admission with cardiology consultation, functional testing and/or ICA for evaluation and management. Anti-ischemic and preventive management should be considered as well as risk factor modification. Other treatments should be considered if presence of hemodynamically significant lesion.

CAD-RADS 4A or 4B: ACS likely. Consider hospital admission with cardiology consultation. Further evaluation with ICA and revascularization as appropriate. Anti-ischemic and preventive management should be considered as well as risk factor modifications.

CAD-RADS 5 - ACS very likely. Consider expedited ICA on a timely basis and revascularization if appropriate if acute occlusion. Anti-ischemic and preventive management should be considered as well as risk factor modifications.

CAD-RADS N - ACS cannot be excluded. Additional or alternative evaluation for ACS is needed.
Figure 3: Illustration showing CAD-RADS modifiers.
Fig. A shows ‘V’ for Vulnerable plaque in the mid portion of LAD.
Fig. B shows an example of modifier ‘G’ for bypass graft (left internal mammary to LAD graft in this case).
Fig. C shows a patent stent in the mid LCX denoted as ‘S’ for coronary stent in the CAD-RADS modifiers.
Fig. D shows an example of ‘N’ for nondiagnostic study due to extensive motion and slab artifacts rendering the image quality non diagnostic for evaluation of RCA. (LAD= Left anterior descending coronary artery, LCX=Left circumflex coronary artery, RCA= Right coronary artery)
References


Brian Ghoshhajra, MD, Editor
Doreen DeFaria Yeh, MD, Editor

© Mass General Department of Radiology, 55 Fruit Street, Boston, MA 02114

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