



CAD-RADS: A Standardized Reporting System for Coronary CT Angiography

CAD-RADS: 관상동맥 CT 혈관조영술 판독을 위한 표준화된 보고 시스템

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Coronary CT angiography (CTA) has been firmly established as a reliable and accurate non-invasive diagnostic modality for the evaluation of coronary artery disease (CAD). The Coronary Artery Disease Reporting and Data System (CAD-RADS) was developed to standardize the interpretation and reporting of coronary CTA findings, including the presence, extent, and composition of coronary atherosclerotic plaques. The CAD-RADS classification is a comprehensive system that summarizes patient-level imaging results based on the most severe coronary artery lesion, ranging from CAD-RADS 0 (no CAD evidence) to CAD-RADS 5 (complete occlusion of a coronary artery). This system also provides clinical management recommendations corresponding to each classification level, including suggestions for further diagnostic testing and therapeutic strategies. CAD-RADS has the potential to enhance communication between radiologists and referring clinicians, thereby facilitating more effective and consistent clinical decision-making. It also supports a more appropriate use of invasive coronary angiography by improving diagnostic precision.

Index terms Coronary Computed Tomography Angiography; Coronary Artery Disease; Coronary Artery Disease Reporting and Data System; CAD-RADS

INTRODUCTION

Coronary CT angiography (CTA) is an essential imaging modality for diagnosing and stratifying risk of coronary artery disease (CAD). In this context, the Coronary Artery Disease–Reporting and Data System (CAD-RADS) was developed as a standardized reporting framework to ensure consistent interpretation and communication of coronary CTA results for patients with stable or acute chest pain (1). Since its introduction in 2016, the CAD-RADS has been shown to be useful in predicting major adverse cardiovascular events (MACE) such as unstable angina, myocardial in-

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farction, and cardiac death (2-5). In 2022, a new version of the system was released (CAD-RADS 2.0), which incorporated updates based on recent clinical trial evidence. These updates included additional parameters such as the extent of coronary plaque burden and the evaluation of myocardial ischemia (Table 1) (6).

The CAD-RADS classification is a consensus-based recommendation developed by a multi-disciplinary panel of experts. The proposed reporting systems are based on evidence from clinical trials and extensive expert consensus. Similar to the previous version, CAD-RADS 2.0 categorizes CAD into six grades, ranging from CAD-RADS 0 (indicating absence of coronary stenosis or plaque) to CAD-RADS 5 (indicating total occlusion of at least one coronary artery) (6). The main objective of the CAD-RADS assessment is quantifying the most severe coronary luminal stenosis observed in each patient. Additionally, the revised version introduces a new method for estimating and reporting total plaque burden.

The ultimate goal of CAD-RADS is to provide referring clinicians with clear and consistent information through standardized reporting of coronary CTA results, thereby facilitating efficient clinical decision-making for subsequent patient management. Importantly, CAD-RADS should be used as a complementary tool and should always be interpreted in conjunction with the full radiology report and the individual clinical context of the patient. This approach provides more detailed information about the location and severity of coronary plaque. In this paper, we introduce the standardized reporting system for coronary CTA interpretation known as CAD-RADS, and discuss its clinical utility and significance.

CAD-RADS CLASSIFICATION

The CAD-RADS classification adopts the stenosis severity grading criteria proposed by the Society of Cardiovascular Computed Tomography (SCCT) to assess the degree of coronary artery stenosis.

CAD-RADS is divided into six categories, ranging from CAD-RADS 0, which indicates an absence of stenosis or plaque, to CAD-RADS 5, which represents a total occlusion of at least one coronary artery (Figs. 1-3). This classification is applied to patients with stable and with

Table 1. Comparison between the First Version of CAD-RADS and CAD-RADS 2.0

Item	CAD-RADS (2016)	CAD-RADS 2.0 (2022)	Comments
Category	0, 1, 2, 3, 4A, 4B, 5	0, 1, 2, 3, 4A, 4B, 5	No change
Plaque burden	N/A	P1, P2, P3, P4	New plaque burden grading scale
Modifiers			
	N Modifier: non-diagnostic	N Modifier: non-diagnostic	No change
	S Modifier: stent	S Modifier: stent	No change
	G Modifier: graft	G Modifier: graft	No change
	V Modifier: vulnerable plaque	HRP Modifier: high-risk plaque	V Modifier replaced with HRP modifier
		I Modifier: ischemia	New modifier for ischemia
		E Modifier: exceptions	New modifier for non-atherosclerotic coronary artery disease

CAD-RADS = Coronary Artery Disease-Reporting and Data System, HRP = high-risk plaque, N/A = not applicable

Fig. 1. Coronary Artery Disease-Reporting and Data System 0.

Coronary CT angiography images from a 51-year-old woman presenting with chest pain.

A-C. Curved multiplanar reformatted images of the right coronary artery, left anterior descending artery, and left circumflex artery show no evidence of coronary artery stenosis or plaque.

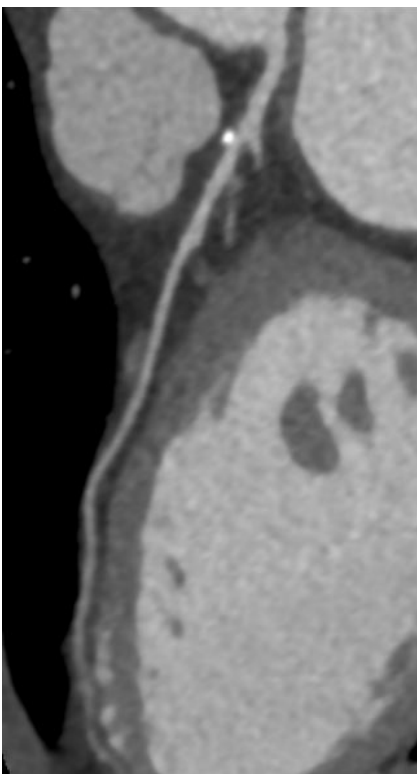
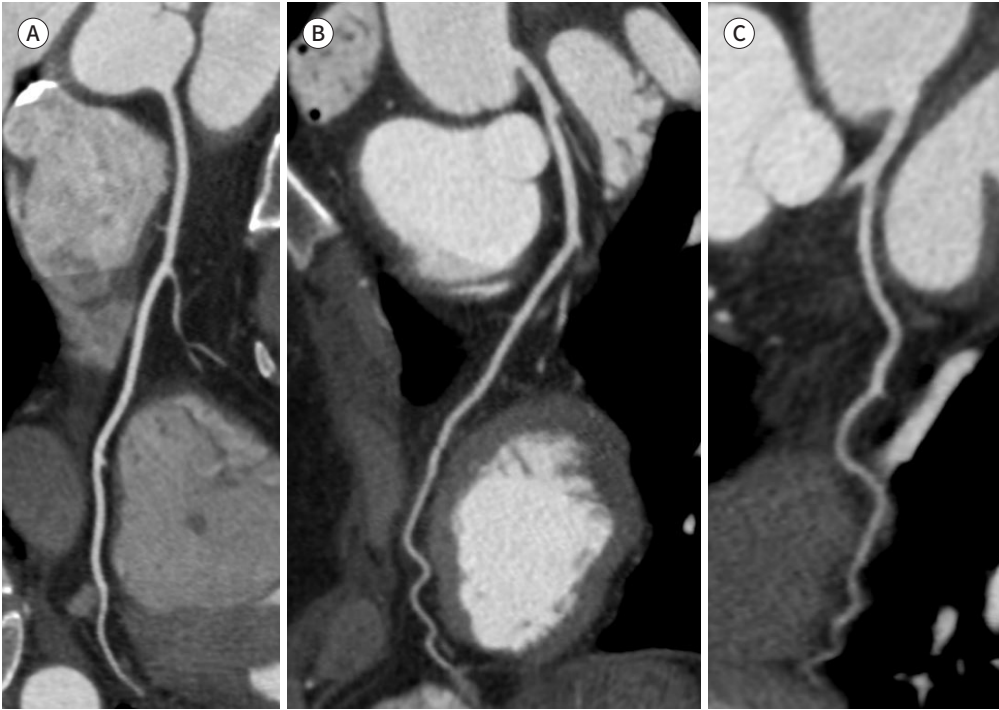


Fig. 2. Coronary Artery Disease-Reporting and Data System 1/P1.

Coronary CT angiography image from a 61-year-old man presenting with chest pain. Curved multiplanar reformatted image of the left anterior descending artery shows a small calcified plaque in the proximal section. The coronary artery calcium score was 15 and segment involvement score was 1, corresponding to P1 (mild coronary artery plaque burden).



Fig. 3. Coronary Artery Disease-Reporting and Data System 2/P1.

Coronary CT angiography image from a 61-year-old man presenting with chest pain. Curved multiplanar reformatted image of the left anterior descending artery shows a focal calcified plaque in the proximal segment causing mild stenosis (25%–49%). The coronary artery calcium score was 34 and segment involvement score was 1, corresponding to P1 (mild coronary artery plaque burden).

acute chest pain (Tables 2, 3). Each category reflects the most severe coronary stenosis observed in the patient, and the final radiology report should specify detailed information regarding the anatomical location, extent, and morphological characteristics of the coronary lesions.

CAD-RADS 3 represents moderate stenosis (50%–69%) and may require additional functional assessment to exclude the presence of myocardial ischemia (Fig. 4) (7, 8). In such cases, stress-based functional tests such as CT-derived fractional flow reserve (CT-FFR), cardiac CT perfusion (CTP), exercise treadmill testing (ETT), stress echocardiography, or cardiac MRI can be considered (9-13). These examinations can significantly influence treatment decisions depending on symptom persistence and the overall clinical condition of the patient. They are particularly recommended for patients with stable or acute chest pain who continue to experience symptoms despite optimal medical therapy. Furthermore, factors such as the anatomical location and severity of stenosis as well as the presence of high-risk plaque (HRP) features should be comprehensively evaluated. The decision to perform invasive coronary angiography (ICA) should be based on the integration of clinical information, imaging findings, and functional assessment results.

CAD-RADS 4 is subdivided into the 4A and 4B categories according to the severity and distribution of the lesions, with differing management recommendations for each. CAD-RADS 4A is defined as severe stenosis (70%–99%) in one or two major coronary arteries (Fig. 5). In this situation, further evaluation is required, and the anatomical characteristics of the le-

Table 2. CAD-RADS Reporting and Data System for Patients with Stable Chest Pain

Category	Degree of Maximum Stenosis	Interpretation	Further Cardiac Investigation	Management Considerations
CAD-RADS 0	0% (no stenosis or plaque)	Absence of CAD	None	- Reassurance - Consideration of non-atherosclerotic causes of symptoms
CAD-RADS 1	1%–24% (minimal stenosis or plaque with no stenosis*)	Minimal non-obstructive CAD*	None	- Consider non-atherosclerotic causes of symptoms - P1: Consider risk factor modification and preventive pharmacotherapy - P2: Risk factor modification and preventive pharmacotherapy - P3 or P4: Aggressive risk factor management and preventive pharmacotherapy
CAD-RADS 2	25%–49% (mild stenosis)	Mild non-obstructive CAD	None	- Consider non-atherosclerotic causes of symptoms - P1 or P2: Risk factor modification and preventive pharmacotherapy - P3 or P4: Aggressive risk factor management and preventive pharmacotherapy
CAD-RADS 3	50%–69% (moderate stenosis)	Moderate stenosis	Consider functional assessment†	- P1-P4: Aggressive risk factor management and preventive pharmacotherapy - Other treatments, including anti-angina therapy, should be considered according to guidelines‡ - In cases with I+, if symptoms persist after pharmacotherapy, ICA should be considered
CAD-RADS 4A	70%–99% stenosis	Severe stenosis	Consider ICA§ or functional assessment	- P1-P4: Aggressive risk factor management and preventive pharmacotherapy
CAD-RADS 4B	Left main ≥50% or 3-vessel severe stenosis (≥70%)		ICA is recommended	- Other treatments, including anti-angina therapy, should be considered according to guidelines‡
CAD-RADS 5	100% (total occlusion)	Total coronary occlusion or sub-total occlusion	Consider ICA, functional and/or viability assessment	- P1-P4: Aggressive risk factor management and preventive pharmacotherapy - Other treatments, including anti-angina therapy, should be considered according to guidelines‡
CAD-RADS N	Non-diagnostic study	Obstructive CAD cannot be excluded	Additional or alternative evaluation for CAD may be required	

The CAD-RADS classification should be applied to the patient unit based on the most clinically severe stenosis. Stenosis should be evaluated in all vessels with a diameter greater than 1.5 mm, while CAD-RADS does not apply to small vessels with a diameter of less than 1.5 mm.

*CAD-RADS 1: Includes cases with plaque without stenosis and positive remodeling.

†Functional assessment: Includes CT-FFR, CTP, exercise treadmill test, stress echocardiography, SPECT, PET, cardiac MRI, or invasive FFR.

‡Management: Refer to AHA/ACC guidelines (2021 AHA/ACC Chest Pain Guideline, 2012 ACC/AHA Guideline for the Diagnosis and Management of Patients with Stable Ischemic Heart Disease, 2019 ACC/AHA Prevention Guidelines). For CAD-RADS 3 and 4A, lesion evaluation by functional imaging or coronary angiography is necessary (if symptoms persist).

§ICA: Consider performing in cases with high-grade stenosis (>90%), high-risk plaque, I1 supplementary markers (evidence of myocardial ischemia on CT-FFR or perfusion defects on CTP), or confirmed myocardial ischemia on other tests. Revascularization benefits only patients with persistent symptoms despite optimal medical therapy.

ACC = American College of Cardiology, AHA = American Heart Association, CAD-RADS = Coronary Artery Disease-Reporting and Data System, CTA = CT angiography, FFR = fractional flow reserve, ICA = invasive coronary angiography

Table 3. CAD-RADS Reporting and Data System for Patients with Acute Chest Pain

Category	Degree of Maximum Stenosis	Interpretation	Further Cardiac Investigation	Management Considerations
CAD-RADS 0	0%	ACS highly unlikely	No further investigation is needed	- Reassurance - If Tn levels are elevated, other potential causes should be considered and evaluated
CAD-RADS 1	1%–24%*	ACS unlikely	No further investigation is needed	- If Tn levels are elevated, other potential causes should be considered and evaluated - P1 or P2: Referral for outpatient follow-up for risk factor modification and preventive pharmacotherapy - P3 or P4: Referral for outpatient follow-up for aggressive risk factor management and preventive pharmacotherapy
CAD-RADS 2	25%–49%	ACS less unlikely	If there is a high clinical suspicion of ACS, elevated Tn levels, or the presence of HRP features, then consider hospital admission with cardiology consultation	- P1 or P2: Referral for outpatient follow-up for risk factor modification and preventive pharmacotherapy - P3 or P4: Referral for outpatient follow-up for aggressive risk factor management and preventive pharmacotherapy
CAD-RADS 3	50%–69%	ACS possible	- Consider hospital admission with cardiology consultation - Consider functional assessment [†]	- P1–P4: Aggressive preventive management and preventive pharmacotherapy - Other treatments, including anti-angina therapy, should be considered according to guidelines [‡] - In cases with I _r , ICA should be considered
CAD-RADS 4A	70%–99% stenosis	ACS likely	Consider ICA [§] or functional assessment	- P1–P4: Aggressive preventive management and preventive pharmacotherapy
CAD-RADS 4B	Left main ≥50% or 3-vessel severe stenosis (≥70%)		ICA is recommended	- Other treatments, including anti-angina therapy, should be considered according to guidelines [‡]
CAD-RADS 5	100% (total occlusion)	ACS very likely	- Hospital admission with cardiology consultation - If acute occlusion is suspected, then consider ICA and revascularization	- P1–P4: Aggressive preventive management and preventive pharmacotherapy - Other treatments, including anti-angina therapy, should be considered according to guidelines [‡]
CAD-RADS N	Non-diagnostic study	ACS cannot be excluded	Additional or alternative evaluation for ACS may be required	

The CAD-RADS classification should be applied to the patient unit based on the most clinically severe stenosis. Stenosis should be evaluated in all vessels with a diameter greater than 1.5 mm, while CAD-RADS does not apply to small vessels with a diameter of less than 1.5 mm.

*CAD-RADS 1: Includes cases with plaque without stenosis and positive remodeling.

[†] Functional assessment: Includes CT-FFR, CTP, exercise treadmill test, stress echocardiography, SPECT, PET, cardiac MRI, or invasive FFR.

[‡] Management: Refer to AHA/ACC guidelines (2021 AHA/ACC Chest Pain Guideline, 2012 ACC/AHA Guideline for the Diagnosis and Management of Patients with Stable Ischemic Heart Disease, 2019 ACC/AHA Prevention Guidelines).

[§] ICA: Revascularization benefits only patients with persistent symptoms despite optimal medical therapy.

^{||} If confirmed by CT findings, clinical features, or patient's history, chronic total occlusion should be considered.

ACC = American College of Cardiology, ACS = acute coronary syndrome, AHA = American Heart Association, CAD-RADS = Coronary Artery Disease-Reporting and Data System, CTA = CT angiography, FFR = fractional flow reserve, ICA = invasive coronary angiography, Tn = troponin

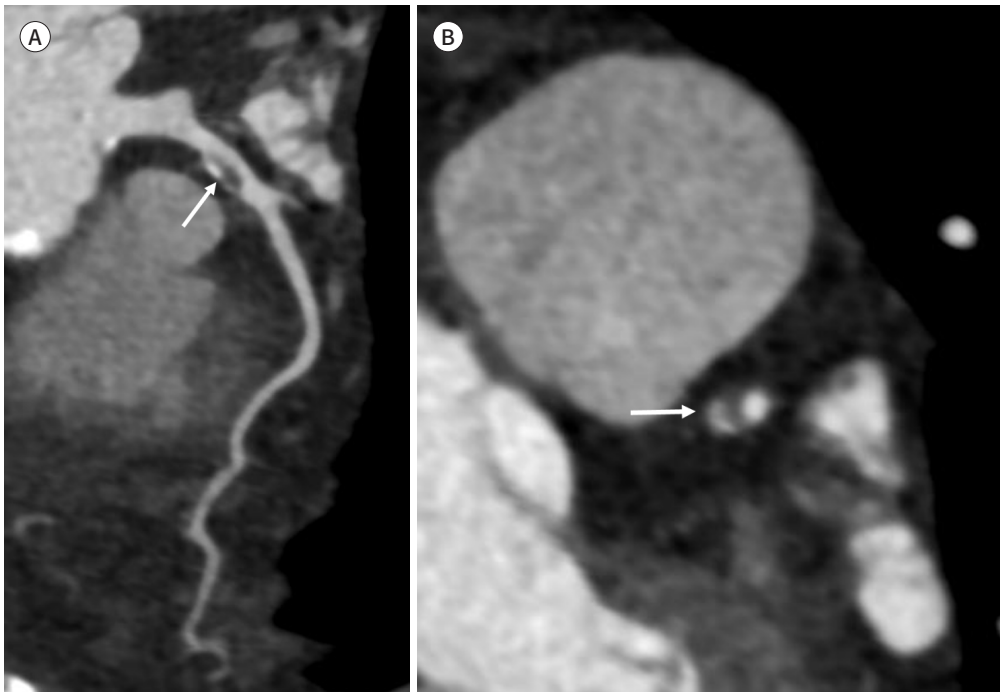
Fig. 4. Coronary Artery Disease-Reporting and Data System 3/P1.

Coronary CT angiography images from a 54-year-old man presenting with chest pain.

A. Curved multiplanar reformatted image of the LAD shows a focal mixed plaque (arrow) in the proximal segment.

B. Short-axis reformatted image at the corresponding site of the LAD demonstrates a mixed plaque (arrow) causing moderate stenosis (50%–69%). The coronary artery calcium score was 21 and segment involvement score was 1, corresponding to P1 (mild coronary artery plaque burden).

LAD = left anterior descending artery



sions, the patient's clinical symptoms experienced by the patient (particularly the frequency and intensity of angina), and the adequacy of ongoing medical therapy should be considered. Functional diagnostic tools such as CT-FFR, CTP, or various stress tests (ETT, stress echocardiography, or cardiac MRI) may be used to determine the need for ICA. When critical stenosis exceeding 90%, HRP features, or lesion-specific ischemia (e.g., decreased CT-FFR values or perfusion defects on CTP) are evident, revascularization therapy may be clinically beneficial, and ICA is recommended. In contrast, CAD-RADS 4B refers to cases in which $\geq 50\%$ stenosis is suspected in the left main (LM) coronary artery or $\geq 70\%$ severe stenosis is present in all three major coronary arteries. For these patients, particularly those with frequent symptoms despite optimal medical therapy, ICA and subsequent revascularization therapy are recommended.

CAD-RADS 5 indicates total occlusion of at least one coronary artery, which can be categorized clinically as either acute or chronic (Fig. 6). In cases of chronic total occlusion (CTO), several anatomical factors, such as lesion length, degree of proximal calcification, vessel tortuosity, and the extent of collateral circulation, play pivotal roles in determining treatment strategies and assessing the feasibility of revascularization (14-19).

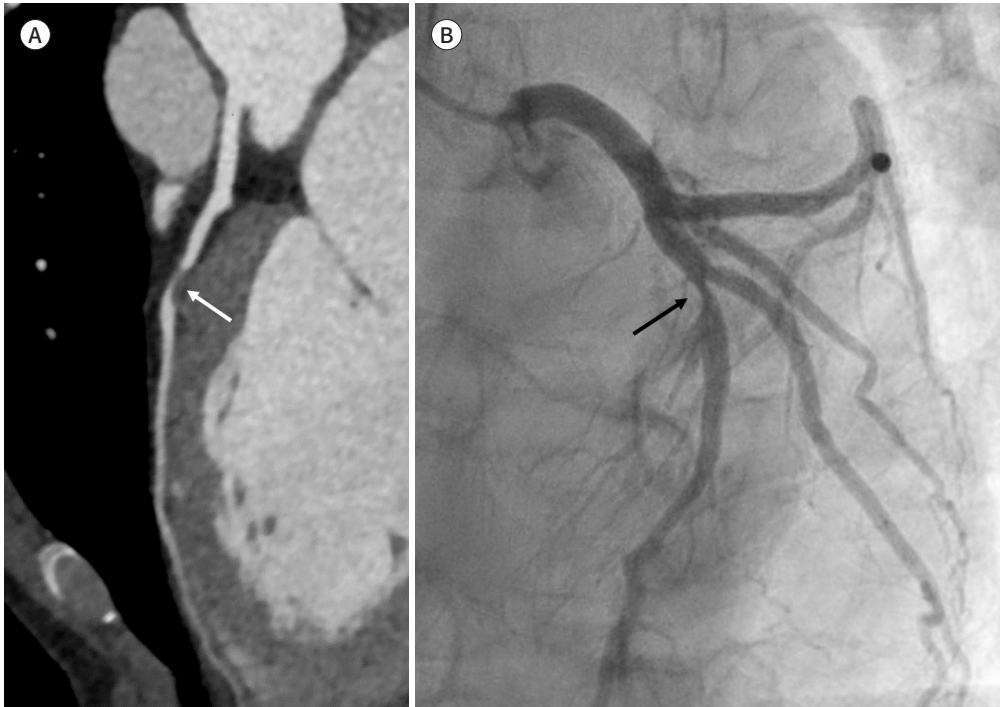
Fig. 5. Coronary Artery Disease-Reporting and Data System 4A/P1.

Coronary CT angiography image from a 65-year-old man presenting with chest pain.

A. Curved multiplanar reformatted image of the LAD shows a focal noncalcified plaque (arrow) in the proximal segment causing severe stenosis (70%–99%).

B. Invasive coronary angiography image of the LAD demonstrates severe stenosis of approximately 90% (arrow). The coronary artery calcium score was 0 and segment involvement score was 1, corresponding to P1 (mild coronary artery plaque burden).

LAD = left anterior descending artery



PLAQUE BURDEN CLASSIFICATION

The presence of coronary artery calcification is closely associated with the overall burden of atherosclerotic plaque, and an increased plaque burden has been shown to correlate with a higher risk of cardiovascular events (20-23). The latest CAD-RADS classification (CAD-RADS 2.0) introduced a new modifier (“P”), which represents the overall coronary plaque burden on a per-patient basis. The “P” category is subdivided into four grades: mild (P1), moderate (P2), severe (P3), and extensive (P4) (Table 4). CAD-RADS 0, which indicates the absence of both stenosis and plaque, does not require a P modifier.

Currently, no single standardized method has been accepted for quantifying total plaque burden. Therefore, CAD-RADS recommends that individual institutions select an appropriate assessment method based on their imaging protocols and clinical settings. However, the use of different methods for the same patient may result in substantial variability in plaque burden results. Consequently, radiologists are encouraged to select the most suitable method based on both the clinical characteristics of the patient and the institutional settings. When multiple assessment methods are available, the highest severity grade among the obtained results should be used to determine the final “P” category. A previous study has supported

Fig. 6. Coronary Artery Disease-Reporting and Data System 5/P2.

Coronary CT angiography image from a 71-year-old man presenting with chest pain.

A. Curved multiplanar reformatted image of the RCA shows noncalcified plaques (arrows) extending from the mid to distal artery, causing total occlusion.

B. Invasive coronary angiography image demonstrates total occlusion from the mid RCA without distal flow (arrow). The coronary artery calcium score was 0 and segment involvement score was 3, corresponding to P2 (moderate coronary artery plaque burden).

RCA = right coronary artery

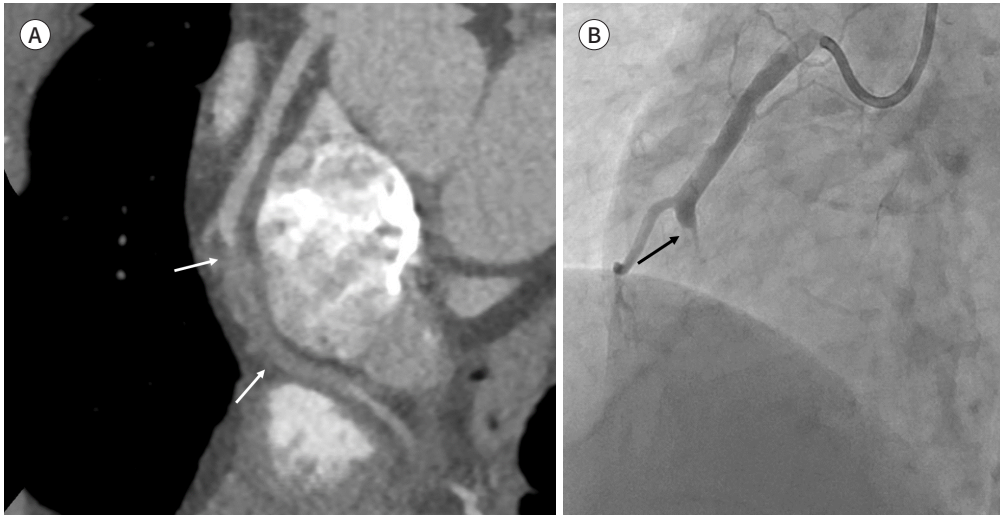


Table 4. Different Assessment Methods for Coronary Artery Plaque Burden

Plaque Grade*	CAC	SIS	Visual Estimation
P1 (mild)	1–100	≤2	Mild amount of plaque in 1–2 vessels
P2 (moderate)	101–300	3–4	Moderate amount of plaque in 1–2 vessels, or mild amount of plaque in 3 vessels
P3 (severe)	301–999	5–7	Moderate amount of plaque in 3 vessels, or severe amount of plaque in 1 vessel
P4 (extensive)	≥1,000	≥8	Severe amount of plaque in 2–3 vessels

Since grading classifications may not always align between different plaque burden grading methods, it is recommended to prioritize the use of CAC score or the total plaque burden quantification, if available. There is no single recommended standard for assessing total plaque burden, and CAD-RADS encourages selecting the most appropriate method based on the clinical context of each institution.

*CAD-RADS 0 refers to a state with no stenosis or plaque, so P0 is not included in the classification.

CAC = coronary artery calcium, CAD-RADS = Coronary Artery Disease-Reporting and Data System, SIS = segment involvement score

the use of the coronary artery calcium (CAC) score and segment involvement score (SIS) for plaque burden assessment (24).

CORONARY ARTERY CALCIUM SCORE

The CAC score is a highly reproducible and accurate method for quantifying the amount of calcified plaque. The total CAC score serves as a surrogate marker of overall plaque burden, and is usually measured using the Agatston method. When performed in conjunction with coronary CTA, the CAC score is a valuable quantitative tool for assessing total plaque volume (Table 4). However, because CAC reflects only calcified plaques, it should always be interpreted alongside qualitative analyses that also include non-calcified plaques. In clinical practice, the discovery of additional non-calcified plaques may warrant reclassification to a higher “P” category. Some institutions do not routinely perform CAC assessment as part of the coronary

CTA protocol. In addition, the CAC score alone limits the ability to quantify non-calcified plaque burden.

SEGMENT INVOLVEMENT SCORE

The SIS is an assessment method that quantifies the presence of atherosclerotic plaque in 16 coronary segments. Each segment with visible plaque receives one point, with a maximum possible score of 16 (24). The SIS indicates the anatomical extent of coronary plaque. Higher SIS values have been shown to significantly correlate with adverse outcomes such as myocardial infarction and cardiovascular death (23, 25).

VISUAL ESTIMATION OF TOTAL PLAQUE BURDEN

This approach involves assessing the relative amounts of calcified and non-calcified plaque in each major coronary artery to determine total plaque burden (Table 4). Although this method is vulnerable to inter-observer variability, it is relatively simple and can be applied effectively in routine clinical practice.

CAD-RADS MODIFIERS

The CAD-RADS classification incorporates several modifiers to complement the interpretation of coronary CTA findings which account for diagnostic limitations, prior therapeutic interventions, and the presence of HRP characteristics. In the 2022 revision (CAD-RADS 2.0), two new modifiers (functional ischemia [I] and exception lesion [E]) were added to the previously established modifiers non-diagnostic (N), stent (S), graft (G), and high-risk plaque (HRP).

N MODIFIER (NON-DIAGNOSTIC)

The “N” modifier is applied when parts or the entirety of the CTA examination are non-diagnostic. If one or more coronary segments are uninterpretable and at least one segment demonstrates $\geq 50\%$ stenosis, the final report should include both the CAD-RADS category and the “N” modifier (e.g., CAD-RADS $\geq 3/N$). Conversely, if the interpretable segments show no stenosis or only mild stenosis ($\leq 49\%$), but at least one segment remains non-diagnostic, the study is categorized as CAD-RADS N.

If total plaque burden can still be reasonably assessed, a plaque burden grade (P1–P4) may be assigned in conjunction with the “N” modifier, presented as “N/P.”

S MODIFIER (STENT)

The “S” modifier is used when coronary stents are present, regardless of whether in-stent restenosis is identified (Fig. 7). For example, if only mild non-stented coronary disease (25%–49%) is observed and the stent is patent, the final category would be CAD-RADS 2/S. Conversely, if severe stenosis (70%–99%) is detected either within the stent or in another coronary artery, it should be reported as CAD-RADS 4A/S. If the stented segment is non-diagnostic and no other vessel shows $\geq 50\%$ stenosis, the study should be classified as CAD-RADS N/S.



Fig. 7. Coronary Artery Disease-Reporting and Data System 4B/P3/S. Coronary CT angiography image from a 59-year-old man presenting with chest pain. Curved multiplanar reformatted image of the left LAD shows diffuse calcified and mixed plaques in the left main and proximal segment causing severe stenosis (70%–99%). The stent in the mid LAD is patent. Although images of the right coronary artery and left circumflex artery are not shown, the segment involvement score of this patient was 7, corresponding to P3 (severe coronary artery plaque burden). S indicates the presence of a coronary stent. LAD = left anterior descending artery

G MODIFIER (GRAFT)

The “G” modifier is applied to patients with a history of coronary artery bypass grafting. The CAD-RADS category should not be determined based on native coronary stenosis that has been effectively bypassed by a patent graft. However, both native coronary arteries and grafted vessels should be evaluated for plaque burden, and the overall “P” modifier should reflect the combined total plaque burden from both.

HRP MODIFIER (HIGH-RISK PLAQUE)

The “HRP” modifier indicates the presence of HRP features associated with an increased likelihood of lesion-specific ischemia and future acute coronary syndrome events (26-28). HRP is defined when two or more of the following four imaging characteristics are present (26): 1) positive remodeling, 2) low-attenuation plaque (<30 Hounsfield unit), 3) spotty calcification and 4) the napkin-ring sign (Fig. 8).

Patients with moderate stenosis (CAD-RADS 3) who also demonstrate HRP features require closer clinical follow-up and may benefit from a more aggressive management and treatment strategy than patients with stenosis alone.

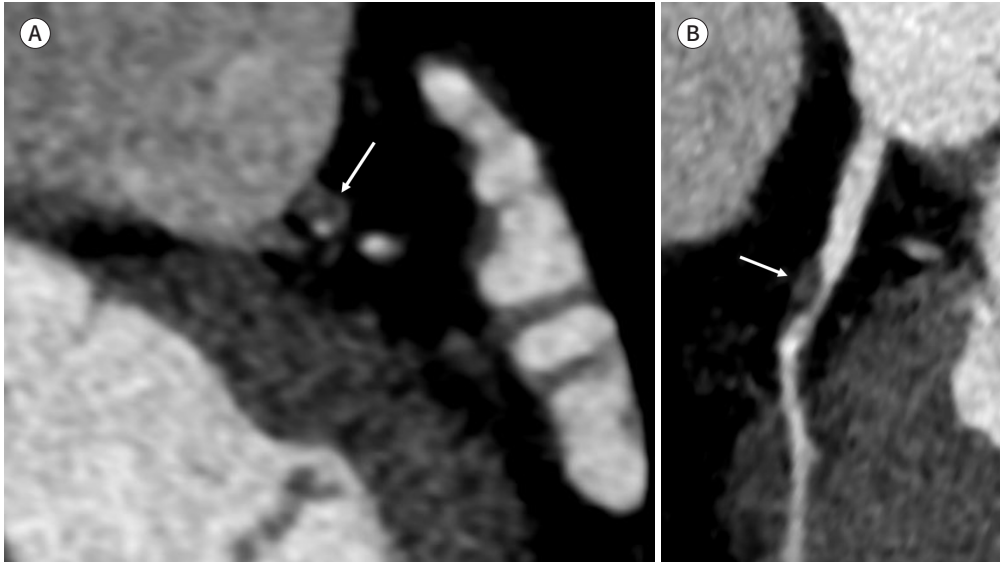
I MODIFIER (ISCHEMIA)

The “I” modifier is applied when a functional ischemia assessment, such as CT-FFR or CTP, has been performed. The results of the findings must be clearly documented within the main body or conclusion of the CTA report. In cases of borderline ischemia or discordance between anatomical stenosis and functional findings, detailed information should be included in the report. The CAD-RADS designation should include “I (+/-)” for borderline ischemia or “I (-)”

Fig. 8. Modifier high-risk plaque.

Coronary CT angiography images from a 46-year-old man presenting with chest pain.

A, B. Short-axis (**A**) and curved multiplanar (**B**) reformatted images of the left anterior descending artery shows a focal low-density plaque with positive remodeling (arrows), which are the features of a high-risk plaque.



for absence of ischemia. If a functional but non-diagnostic test has been performed, “I (-)” may be used. Alternatively, the “non-diagnostic” (N) modifier can be added when appropriate. In cases of multivessel CAD, the most anatomically severe lesion is not always functionally significant; therefore, lesion-specific interpretation is essential.

CT-DERIVED FRACTIONAL FLOW RESERVE

CT-FFR is a noninvasive technique that evaluates the functional significance of coronary artery stenosis by combining anatomical data with machine learning-based vessel extraction and computational fluid dynamics modeling to estimate pressure gradients across lesions. This parameter has been shown to exhibit a strong correlation with invasive FFR measurements (29-32).

According to CAD-RADS recommendations, the “I” modifier should be applied as follows (Fig. 9):

- A CT-FFR value of ≤ 0.75 measured 1–2 cm distal to the lesion should be designated as “I (+)” (positive ischemia).
- A value of ≥ 0.81 should be designated as “I (-)” (negative ischemia).
- Borderline values (between 0.76 and 0.80) should be designated as “I (+/-)” (borderline ischemia).

Lesions with CT-FFR values in the borderline range should be interpreted with caution, as their hemodynamic significance remains uncertain. In such cases, lesion location, symptom severity, CT-FFR gradient (Δ CT-FFR, or the pressure difference across the lesion), and concordance with anatomical stenosis should be considered when determining the need for ICA or percutaneous coronary intervention. If CT-FFR results are ambiguous or in disagreement with anatomical findings, the lesion should be classified as “I (+/-)” to indicate borderline ischemia.

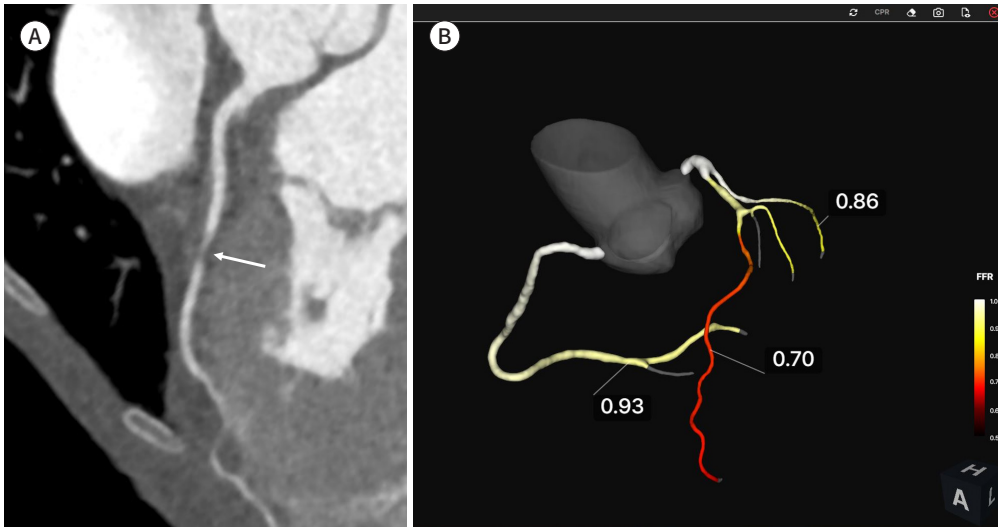
Fig. 9. Modifier I assessed by CT-FFR.

Coronary CT angiography images from a 51-year-old man presenting with chest pain.

A. Curved multiplanar reformatted image of the LAD shows a focal noncalcified plaque (arrow) in the mid segment causing severe stenosis (70%–99%).

B. The CT-derived FFR value of the LAD was 0.70, indicating positive ischemia “I (+).”

FFR = fractional flow reserve, LAD = left anterior descending artery



MYOCARDIAL CT PERFUSION

Recent advances in CT technology have significantly improved the functional accuracy of CTP imaging, enabling quantitative assessment of myocardial blood flow under stress conditions. Stress CTP visualizes myocardial perfusion during either exercise- or pharmacologically induced stress, demonstrating high sensitivity and specificity compared with cardiac MRI, SPECT, or invasive FFR (33-36). Compared with coronary CTA alone, the combination of coronary CTA and CTP enhances diagnostic accuracy, particularly in patients with moderate- to high-risk CAD. This combined approach allows simultaneous evaluation of both anatomical stenosis, such as moderate (50%–69%) or severe ($\geq 70\%$) stenosis, or heavily calcified lesions, and the presence or absence of functional ischemia within a single examination.

The interpretation of stress CTP results follows these criteria:

- “I (+)” (positive ischemia) should be assigned when a reversible perfusion defect is observed under stress.
- “I (-)” (negative ischemia) should be assigned when no ischemia is present, or only fixed perfusion defects consistent with prior myocardial infarction are identified.
- When the distinction between stress and rest perfusion is unclear, or when discrepancies exist between anatomical and functional findings, “I (+/-)” (borderline ischemia) or “I (-)” (negative ischemia) may be reported as appropriate.

E MODIFIER (EXCEPTION)

The CAD-RADS classification primarily focuses on the assessment of atherosclerotic CAD. However, in clinical practice, coronary stenosis or occlusion may also arise from non-atherosclerotic causes such as coronary dissection, anomalous coronary arteries, coronary aneurysm or pseudoaneurysm, vasculitis, or coronary arteriovenous fistula. Although these enti-

ties are relatively uncommon, they hold significant clinical importance for differential diagnosis and therapeutic decision-making. Their detection has become increasingly feasible with advances in imaging technology. To clearly distinguish these atypical (non-atherosclerotic) lesions, the updated CAD-RADS 2.0 introduced the “E” (Exception) modifier. This modifier indicates the presence of stenosis or occlusion due to non-atherosclerotic causes, and is added after the primary CAD-RADS grade. For example, a case involving an inter-arterial anomalous coronary artery course with moderate stenosis would be reported as CAD-RADS 3/E.

MODIFIER REPORTING ORDER

In the CAD-RADS classification, the final designation consists of three components separated by slashes (“/”): stenosis severity, plaque burden, and modifiers. When multiple modifiers apply, they should be listed in the following order to maintain interpretive consistency and inter-report comparability: 1) N (non-diagnostic), 2) HRP (high-risk plaque), 3) I (ischemia), 4) S (stent), 5) G (graft) and 6) E (Exception).

CLINICAL APPLICATION AND LIMITATIONS OF THE CAD-RADS CLASSIFICATION SYSTEM

Recent studies have provided increasing evidence regarding the implementation, diagnostic performance, and clinical impact of CAD-RADS 2.0 in real-world clinical practice (37).

Regarding diagnostic performance, observational studies have indicated that CAD-RADS 2.0 maintains a high negative predictive value for obstructive CAD, comparable to that of conventional coronary CTA, while offering enhanced risk stratification (5, 38, 39). Recent meta-analyses have shown that higher CAD-RADS categories are associated with a stepwise increase in the risk of MACE and all-cause mortality, with pooled area under the curve values of approximately 0.82 (38). Furthermore, a large multicenter cohort study of emergency department patients presenting with acute chest pain revealed that higher CAD-RADS 3-5 and the presence of HRP were independently associated with future cardiac events (39). Collectively, these findings support the role of CAD-RADS 2.0 not only as a stenosis grading system but also as a clinically relevant tool for risk stratification and decision-making.

The CAD-RADS provides a standardized framework for interpreting and reporting coronary CTA results. It has been demonstrated to be clinically relevant by improving diagnostic accuracy and prognostic prediction. However, despite these advantages, its clinical application is not without limitations. Variability in interpretation among users introduces subjectivity, which can lead to inconsistencies in the diagnosis and terminology, potentially complicating clinical decision-making and patient management.

CAD-RADS primarily classifies patients based on maximal luminal stenosis without fully incorporating lesion location, overall plaque burden, or functional significance. For example, a proximal lesion, which carries a higher clinical risk, could be classified at the same level as a less significant distal lesion. This structural limitation may lead to clinically meaningful discrepancies between lesions of different anatomical relevance.

Interpretation discrepancies in CAD-RADS reports can be divided into two categories. First, errors may occur during image interpretation due to inaccurate assessment of lesion extent,

severity, or morphological characteristics. The accuracy of coronary CTA interpretation depends heavily on the clinical experience of the reader, which can lead to variability and subjectivity in the results (40). Second, errors may occur during the CAD-RADS grading process, even when lesions are correctly identified. An inadequate understanding of the criteria can lead to misclassification. One common example is confusion within the CAD-RADS 4 subcategories. For instance, CAD-RADS 4A corresponds to 70%–99% stenosis in one or two major coronary arteries, while CAD-RADS 4B indicates $\geq 50\%$ stenosis of the LM coronary artery or 70%–99% stenosis in all three major coronary arteries. These subcategories are designed to distinguish high-risk anatomical patterns, and incorrect application can mislead clinical management and therapeutic decision-making.

Furthermore, inter- and intra-reader variability in lesion characterization remains a significant challenge. This variability undermines reporting consistency, decreases diagnostic reliability, and may lead to unnecessary testing or inappropriate treatment decisions. Structured reporting platforms and ongoing reader education are essential to improve standardization, reproducibility, and communication among healthcare providers and thus mitigate these issues (41).

While CAD-RADS includes several modifiers to provide supplementary diagnostic information, improper use of these modifiers can further complicate interpretation, reduce report reliability, and impair clinical decision-making. For instance, the use of non-existent classifications such as “1/N” or “2/N” reflects misinterpretation of non-diagnostic segments. In such cases, lesions should be simply classified as CAD-RADS N, indicating non-diagnostic image quality, rather than being assigned to a combined category.

The identification of HRP features on coronary CTA provides valuable prognostic information; however, consistency and reproducibility remain problematic. CAD-RADS defines HRP as the presence of two or more high-risk features within a single lesion. Nevertheless, in clinical practice, plaques may be contiguous or diffusely distributed throughout the vessel, which makes strict adherence to this criterion difficult. As a result, the application of the HRP modifier may vary among readers (42). Inaccurate or inconsistent use of the HRP modifier can introduce ambiguity in patient management and compromise the reliability and standardization of datasets based on CAD-RADS.

FUTURE PERSPECTIVES

Recent technological advances have brought increasing attention to the integration of AI into the analysis and interpretation of coronary CTA. In particular, automated quantification of coronary stenosis and plaque burden has emerged as a major area of development. Given that CAD-RADS provides a standardized framework for grading CAD severity, automation of this classification process represents a significant step towards enhancing diagnostic efficiency and reproducibility.

Early studies on AI-assisted coronary CTA interpretation systems have demonstrated high diagnostic accuracy and strong agreement with expert readers (43–45). A study published in 2022 described the development of an AI-based system that automatically segments atherosclerotic plaques within coronary arteries and quantitatively assesses plaque volume and stenosis severity. Validation across multicenter datasets revealed an excellent correlation be-

tween AI-derived and expert assessments. Furthermore, application of this technology to the The Scottish Computed Tomography of the Heart (SCOT-HEART) cohort demonstrated that AI-derived plaque volume was significantly associated with mortality and MACE (46). These findings suggest that AI-driven quantitative analysis can serve not only as a diagnostic aid but also as a prognostic biomarker in clinical practice. High-resolution coronary CT imaging combined with AI-based quantification has the potential to improve risk stratification and inform preventive cardiovascular strategies. Several major imaging equipment manufacturers have recently introduced AI-powered coronary CTA interpretation software, which is currently available for research or early clinical evaluation (47).

Currently, AI-based CAD-RADS classification algorithms exhibit a high negative predictive value for obstructive CAD, supporting their potential use as clinical triage tools for assessing chest pain. However, their relatively modest positive predictive value indicates that these systems remain insufficient as standalone diagnostic modalities. Rather, they currently function best as computer-aided diagnostic tools that complement expert interpretation. Automated measurement of coronary stenosis, plaque characteristics, and total plaque burden represents a new paradigm in AI research. These technologies are expected to play an increasingly important role in diagnostic automation, prognostic modeling, and clinical decision support.

Future development of CAD-RADS should extend beyond technological innovation to enhance its clinical applicability and long-term impact on patient care. Although AI provides significant support for automated quantification of coronary stenosis and plaque characteristics, as well as report standardization, additional efforts are required to refine reporting standards and thus improve clarity and consistency, particularly in the application of modifiers and borderline lesion categories. Structured reader education and training are essential to minimize interobserver variability and ensure reliable implementation across institutions with varying levels of expertise (40, 41). Furthermore, integration of CAD-RADS into routine clinical workflows through standardized reporting templates embedded within Picture Archiving and Communication Systems (PACS) and electronic health record systems may enhance communication between radiologists and referring clinicians, and promote guideline-compliant management decisions (48). Importantly, prospective, multicenter, outcome-based studies are needed to determine whether strategies guided by CAD-RADS translate into improved clinical outcomes, more appropriate downstream testing, and more efficient allocation of healthcare resources. Continued refinement of AI algorithms is expected to enhance the efficiency and precision of CT-based cardiovascular diagnostics, which will ultimately enhance healthcare quality and patient outcomes.

CONCLUSION

The CAD-RADS provides a standardized framework for coronary CTA interpretation and supports risk-based clinical decision-making. Over the past several years, CAD-RADS has undergone extensive validation and has been shown to be a reliable clinical classification system with high diagnostic accuracy for CAD compared with ICA. In particular, lesions with moderate-to-severe stenosis serve as important references for decisions regarding invasive diagnostic or therapeutic procedures. Structured reports should include the CAD-RADS category

along with detailed information on lesion location, plaque characteristics, and clinical significance, and each grade should be accompanied by recommendations for further testing or management to support evidence-based clinical decision-making. Systematic implementation of CAD-RADS enhances interpretive consistency, supports evidence-based decisions, and is expected to facilitate further research on the diagnostic and prognostic value of coronary CTA. Therefore, the standardized application of CAD-RADS and the maintenance of interpretive consistency, which requires structured reporting tools and comprehensive reader training programs, are essential to ensure high-quality coronary CT-based care.

Supplementary Materials

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Conflicts of Interest

The authors have no potential conflicts of interest to disclose.

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REFERENCES

1. Cury RC, Abbara S, Achenbach S, Agatston A, Berman DS, Budoff MJ, et al. CAD-RADS(TM) coronary artery disease – reporting and data system. An expert consensus document of the Society of Cardiovascular Computed Tomography (SCCT), the American College of Radiology (ACR) and the North American Society for Cardiovascular Imaging (NASCI). Endorsed by the American College of Cardiology. *J Cardiovasc Comput Tomogr* 2016;10:269-281
2. Xie JX, Cury RC, Leipsic J, Crim MT, Berman DS, Gransar H, et al. The coronary artery disease-reporting and data system (CAD-RADS): prognostic and clinical implications associated with standardized coronary computed tomography angiography reporting. *JACC Cardiovasc Imaging* 2018;11:78-89
3. Nam K, Hur J, Han K, Im DJ, Suh YJ, Hong YJ, et al. Prognostic value of coronary artery disease-reporting and data system (CAD-RADS) score for cardiovascular events in ischemic stroke. *Atherosclerosis* 2019;287: 1-7
4. Popa LE, Petrescu B, Cătană C, Moldovanu CG, Feier DS, Lebovici A, et al. Association between cardiovascular risk factors and coronary artery disease assessed using CAD-RADS classification: a cross-sectional study in Romanian population. *BMJ Open* 2020;10:e031799
5. Lee JW, Kim JY, Han K, Im DJ, Lee KH, Kim TH, et al. Coronary CT angiography CAD-RADS versus coronary artery calcium score in patients with acute chest pain. *Radiology* 2021;301:81-90
6. Cury RC, Leipsic J, Abbara S, Achenbach S, Berman D, Bittencourt M, et al. CAD-RADS™ 2.0 - 2022 coronary artery disease-reporting and data system: an expert consensus document of the Society of Cardiovascular Computed Tomography (SCCT), the American College of Cardiology (ACC), the American College of Radiology (ACR), and the North America Society of Cardiovascular Imaging (NASCI). *JACC Cardiovasc Imaging* 2022;15:1974-2001
7. Pijls NH, Tanaka N, Fearon WF. Functional assessment of coronary stenoses: can we live without it? *Eur Heart J* 2013;34:1335-1344
8. Dewey M, Siebes M, Kachelrieß M, Kofoed KF, Maurovich-Horvat P, Nikolaou K, et al. Clinical quantitative

- cardiac imaging for the assessment of myocardial ischaemia. *Nat Rev Cardiol* 2020;17:427-450
9. van de Hoef TP, Meuwissen M, Escaned J, Davies JE, Siebes M, Spaan JA, et al. Fractional flow reserve as a surrogate for inducible myocardial ischaemia. *Nat Rev Cardiol* 2013;10:439-452
 10. Taylor CA, Fonte TA, Min JK. Computational fluid dynamics applied to cardiac computed tomography for noninvasive quantification of fractional flow reserve: scientific basis. *J Am Coll Cardiol* 2013;61:2233-2241
 11. Rossi A, Merkus D, Klotz E, Mollet N, de Feyter PJ, Krestin GP. Stress myocardial perfusion: imaging with multidetector CT. *Radiology* 2014;270:25-46
 12. Nous FMA, Geisler T, Kruk MBP, Alkadhi H, Kitagawa K, Vliegenthart R, et al. Dynamic myocardial perfusion CT for the detection of hemodynamically significant coronary artery disease. *JACC Cardiovasc Imaging* 2022;15:75-87
 13. Rochitte CE, George RT, Chen MY, Arbab-Zadeh A, Dewey M, Miller JM, et al. Computed tomography angiography and perfusion to assess coronary artery stenosis causing perfusion defects by single photon emission computed tomography: the CORE320 study. *Eur Heart J* 2014;35:1120-1130
 14. Virani SS, Newby LK, Arnold SV, Bittner V, Brewer LC, Demeter SH, et al. 2023 AHA/ACC/ACCP/ASPC/NLA/PCNA guideline for the management of patients with chronic coronary disease: a report of the American Heart Association/American College of Cardiology Joint Committee on clinical practice guidelines. *Circulation* 2023;148:e9-e119
 15. Azzalini L, Karpaliotis D, Santiago R, Mashayekhi K, Di Mario C, Rinfret S, et al. Contemporary issues in chronic total occlusion percutaneous coronary intervention. *JACC Cardiovasc Interv* 2022;15:1-21
 16. Lee SW, Lee PH, Ahn JM, Park DW, Yun SC, Han S, et al. Randomized trial evaluating percutaneous coronary intervention for the treatment of chronic total occlusion. *Circulation* 2019;139:1674-1683
 17. Kang J, Chun EJ, Park HJ, Cho YS, Park JJ, Kang SH, et al. Clinical and computed tomography angiographic predictors of coronary lesions that later progressed to chronic total occlusion. *JACC Cardiovasc Imaging* 2019;12(11 Pt 1):2196-2206
 18. Choi JH, Kim EK, Kim SM, Kim H, Song YB, Hahn JY, et al. Noninvasive discrimination of coronary chronic total occlusion and subtotal occlusion by coronary computed tomography angiography. *JACC Cardiovasc Interv* 2015;8:1143-1153
 19. Wu Q, Yu M, Li Y, Li W, Lu Z, Wei M, et al. Natural history of untreated coronary total occlusions revealed with follow-up semi-automated quantitative coronary CT angiography: the morphological characteristics of initial CT predict occlusion shortening. *Korean J Radiol* 2018;19:256-264
 20. Budoff MJ, Nasir K, McClelland RL, Detrano R, Wong N, Blumenthal RS, et al. Coronary calcium predicts events better with absolute calcium scores than age-sex-race/ethnicity percentiles: MESA (multi-ethnic study of atherosclerosis). *J Am Coll Cardiol* 2009;53:345-352
 21. Hecht HS, Blaha MJ, Kazerooni EA, Cury RC, Budoff M, Leipsic J, et al. CAC-DRS: coronary artery calcium data and reporting system. An expert consensus document of the Society of cardiovascular computed tomography (SCCT). *J Cardiovasc Comput Tomogr* 2018;12:185-191
 22. Mortensen MB, Dzaye O, Steffensen FH, Bøtker HE, Jensen JM, Rønnow Sand NP, et al. Impact of plaque burden versus stenosis on ischemic events in patients with coronary atherosclerosis. *J Am Coll Cardiol* 2020;76:2803-2813
 23. Bittencourt MS, Hulthen E, Ghoshhajra B, O'Leary D, Christman MP, Montana P, et al. Prognostic value of nonobstructive and obstructive coronary artery disease detected by coronary computed tomography angiography to identify cardiovascular events. *Circ Cardiovasc Imaging* 2014;7:282-291
 24. Shaw LJ, Blankstein R, Bax JJ, Ferencik M, Bittencourt MS, Min JK, et al. Society of Cardiovascular Computed Tomography/North American Society of Cardiovascular Imaging - expert consensus document on coronary CT imaging of atherosclerotic plaque. *J Cardiovasc Comput Tomogr* 2021;15:93-109
 25. Williams MC, Earls JP, Hecht H. Quantitative assessment of atherosclerotic plaque, recent progress and current limitations. *J Cardiovasc Comput Tomogr* 2022;16:124-137
 26. Motoyama S, Sarai M, Harigaya H, Anno H, Inoue K, Hara T, et al. Computed tomographic angiography characteristics of atherosclerotic plaques subsequently resulting in acute coronary syndrome. *J Am Coll Cardiol* 2009;54:49-57
 27. Puchner SB, Liu T, Mayrhofer T, Truong QA, Lee H, Fleg JL, et al. High-risk plaque detected on coronary CT angiography predicts acute coronary syndromes independent of significant stenosis in acute chest pain: results from the ROMICAT-II trial. *J Am Coll Cardiol* 2014;64:684-692

28. Ferencik M, Mayrhofer T, Bittner DO, Emami H, Puchner SB, Lu MT, et al. Use of high-risk coronary atherosclerotic plaque detection for risk stratification of patients with stable chest pain: a secondary analysis of the PROMISE randomized clinical trial. *JAMA Cardiol* 2018;3:144-152
29. Min JK, Leipsic J, Pencina MJ, Berman DS, Koo BK, van Mieghem C, et al. Diagnostic accuracy of fractional flow reserve from anatomic CT angiography. *JAMA* 2012;308:1237-1245
30. Koo BK, Erglis A, Doh JH, Daniels DV, Jegere S, Kim HS, et al. Diagnosis of ischemia-causing coronary stenoses by noninvasive fractional flow reserve computed from coronary computed tomographic angiograms. Results from the prospective multicenter DISCOVER-FLOW (diagnosis of ischemia-causing stenoses obtained via noninvasive fractional flow reserve) study. *J Am Coll Cardiol* 2011;58:1989-1997
31. Nørgaard BL, Leipsic J, Gaur S, Seneviratne S, Ko BS, Ito H, et al. Diagnostic performance of noninvasive fractional flow reserve derived from coronary computed tomography angiography in suspected coronary artery disease: the NXT trial (analysis of coronary blood flow Using CT angiography: next steps). *J Am Coll Cardiol* 2014;63:1145-1155
32. Zhuang B, Wang S, Zhao S, Lu M. Computed tomography angiography-derived fractional flow reserve (CT-FFR) for the detection of myocardial ischemia with invasive fractional flow reserve as reference: systematic review and meta-analysis. *Eur Radiol* 2020;30:712-725
33. Huber AM, Leber V, Gramer BM, Muenzel D, Leber A, Rieber J, et al. Myocardium: dynamic versus single-shot CT perfusion imaging. *Radiology* 2013;269:378-386
34. Yang DH, Kim YH, Roh JH, Kang JW, Ahn JM, Kweon J, et al. Diagnostic performance of on-site CT-derived fractional flow reserve versus CT perfusion. *Eur Heart J Cardiovasc Imaging* 2017;18:432-440
35. Sliwicka O, Sechopoulos I, Baggiano A, Pontone G, Nijveldt R, Habets J. Dynamic myocardial CT perfusion imaging-state of the art. *Eur Radiol* 2023;33:5509-5525
36. Celeng C, Leiner T, Maurovich-Horvat P, Merkely B, de Jong P, Dankbaar JW, et al. Anatomical and functional computed tomography for diagnosing hemodynamically significant coronary artery disease: a meta-analysis. *JACC Cardiovasc Imaging* 2019;12(7 Pt 2):1316-1325
37. Williams MC, Moss A, Dweck M, Hunter A, Pawade T, Adamson PD, et al. Standardized reporting systems for computed tomography coronary angiography and calcium scoring: a real-world validation of CAD-RADS and CAC-DRS in patients with stable chest pain. *J Cardiovasc Comput Tomogr* 2020;14:3-11
38. Kato S, Azuma M, Horita N, Utsunomiya D. Prognostic significance of CAD-RADS for patients with suspected coronary artery disease: a systematic review and meta-analysis. *Radiol Adv* 2024;1:umae007
39. Lee JW, Kim JY, Han K, Lee KH, Im DJ, Park CH, et al. Utility of CAD-RADS 2.0 plaque burden grades and stenosis categories on coronary CTA for predicting cardiac events in patients with acute chest pain: a multi-center study. *AJR Am J Roentgenol* 2025;225:e2533005
40. Maroules CD, Hamilton-Craig C, Branch K, Lee J, Cury RC, Maurovich-Horvat P, et al. Coronary artery disease reporting and data system (CAD-RADSTM): inter-observer agreement for assessment categories and modifiers. *J Cardiovasc Comput Tomogr* 2018;12:125-130
41. Szilveszter B, Kolossváry M, Karády J, Jermendy ÁL, Károlyi M, Panajotu A, et al. Structured reporting platform improves CAD-RADS assessment. *J Cardiovasc Comput Tomogr* 2017;11:449-454
42. Yoo WS, Suh YJ, Lee S, Hur J, Kim YJ. Reporting trends and clinical impact of high-risk coronary plaques on cardiac CT angiography in CAD-RADS. *Eur Radiol* 2026;36:1108-1119
43. Choi AD, Marques H, Kumar V, Griffin WF, Rahban H, Karlsberg RP, et al. CT evaluation by artificial intelligence for atherosclerosis, stenosis and vascular morphology (CLARIFY): a multi-center, international study. *J Cardiovasc Comput Tomogr* 2021;15:470-476
44. Paul JF, Rohnan A, Giroussens H, Pressat-Laffouilhère T, Wong T. Evaluation of a deep learning model on coronary CT angiography for automatic stenosis detection. *Diagn Interv Imaging* 2022;103:316-323
45. Ihdahid AR, Sehly A, He A, Joyner J, Flack J, Konstantopoulos J, et al. Coronary artery stenosis and high-risk plaque assessed with an unsupervised fully automated deep learning technique. *JACC Adv* 2024;3:100861
46. Lin A, Manral N, McElhinney P, Killekar A, Matsumoto H, Kwiecinski J, et al. Deep learning-enabled coronary CT angiography for plaque and stenosis quantification and cardiac risk prediction: an international multicentre study. *Lancet Digit Health* 2022;4:e256-e265
47. Kay FU, Canan A, Kukkar V, Hulsey K, Scanio A, Fan C, et al. Diagnostic accuracy of on-premise automated coronary CT angiography analysis based on coronary artery disease reporting and data system 2.0. *Radiology*

2025;315:e242087

48. Ippolito D, Talei Franzesi C, Cangiotti C, Riva L, De Vito A, Gandola D, et al. Inter-observer agreement and image quality of model-based algorithm applied to the coronary artery disease-reporting and data system score. *Insights Imaging* 2022;13:176

CAD-RADS: 관상동맥 CT 혈관조영술 판독을 위한 표준화된 보고 시스템

허진* · 홍유진

관상동맥 CT 혈관조영술(CT angiography; 이하 CTA)은 관상동맥 질환을 비침습적으로 평가하는 신뢰성 있는 진단 기법으로 확립되어 왔다. 최근 제안된 관상동맥 질환 판독 및 데이터 시스템(Coronary Artery Disease Reporting and Data System; 이하 CAD-RADS)은 관상동맥 CTA 소견을 표준화하여 관상동맥 죽상경화증의 존재 여부, 병변의 범위 및 조성 등 다양한 정보를 보고할 수 있게 했다. CAD-RADS는 가장 중증도 높은 관상동맥 병변을 기준으로 환자별로 보고하는 통합 보고 시스템이며, 0 (관상동맥 질환 없음)부터 5 (관상동맥의 완전 폐색)까지 단계적으로 분류되며, 각 등급에 따라 적절한 추가 검사 및 치료 전략을 제시한다. 이는 영상의학과 의사와 임상 의 간의 효율적인 의사소통을 돕고, 관상동맥 CTA의 임상적 활용성을 높이며, 침습적 관상동맥 조영술의 적절한 적용을 촉진할 것으로 기대된다.

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