# CAD-RADS: Pushing the Limits

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**Abbreviations:** CAD = coronary artery disease, CAD-RADS = CAD Reporting and Data System, ECG = electrocardiography, ICA = invasive coronary angiography, LAD = left anterior descending, LCX = left circumflex, MPR = multiplanar reformatted, RCA = right coronary artery

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See discussion on this article by Aviram and Wolak (pp 653–655).

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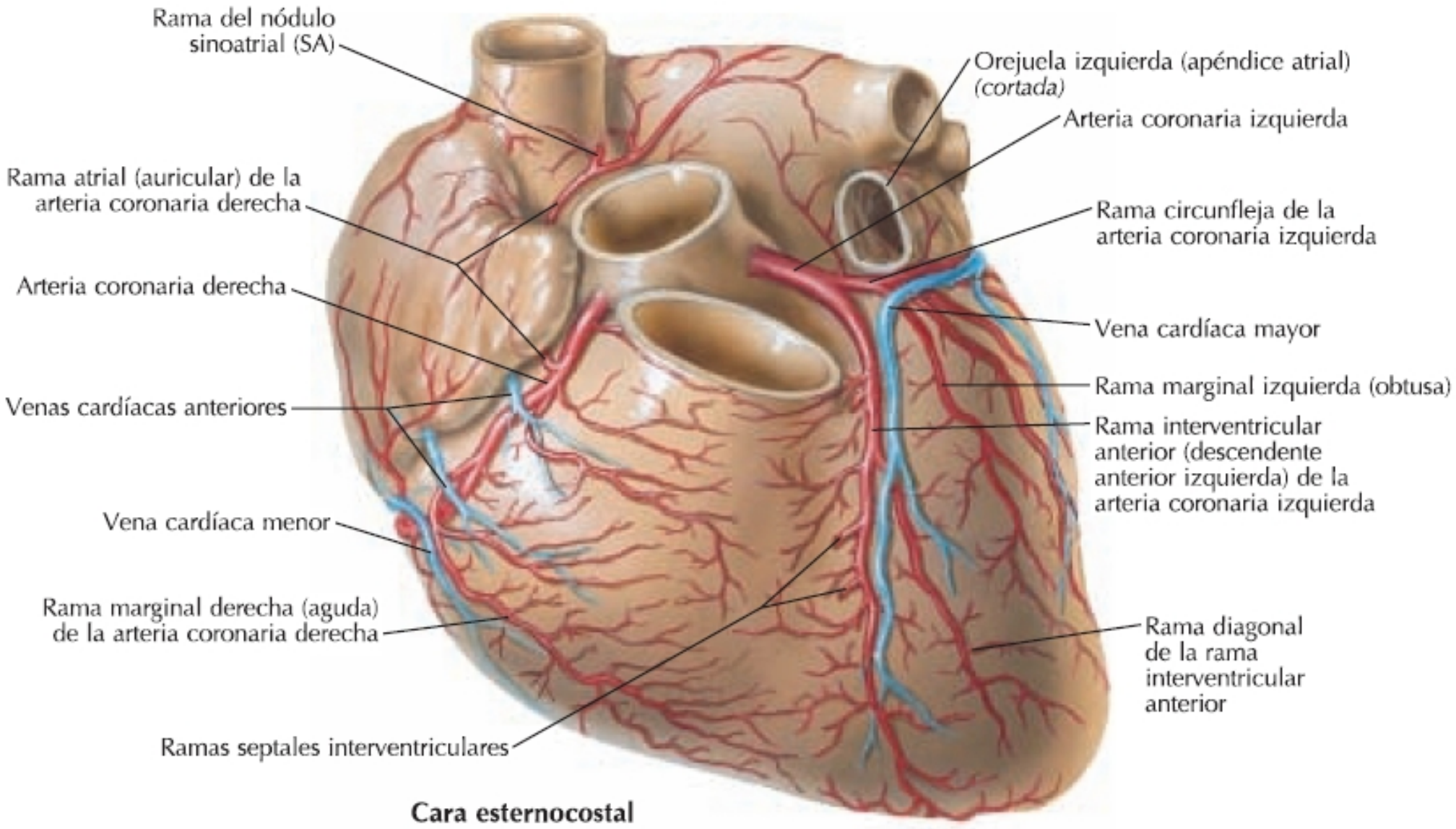
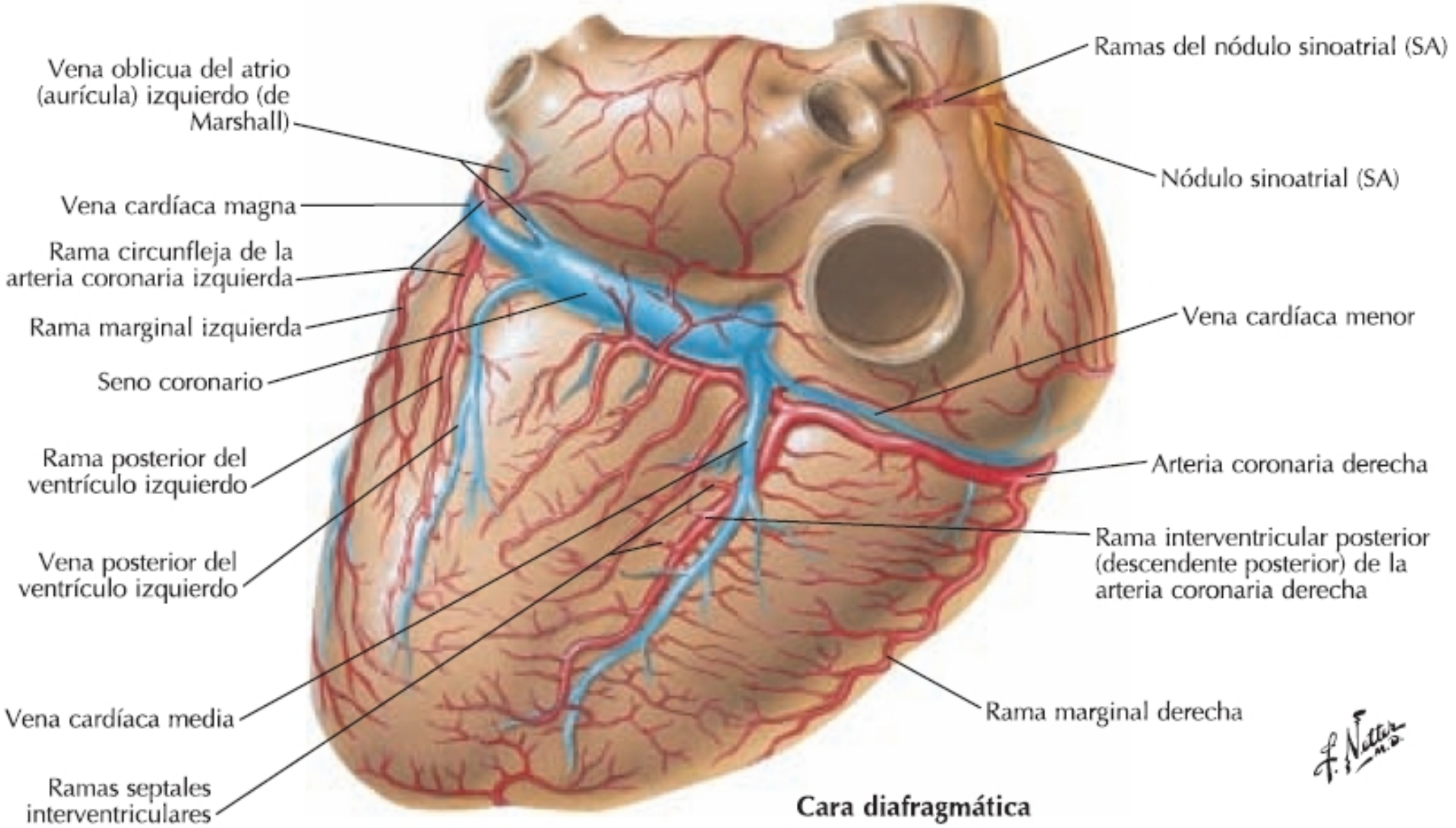
# INTRODUCCIÓN

# Angiografía coronaria por TC

- Examen de primera línea
- Exclusión de enfermedad de las arterias coronarias (CAD)
- Guía → toma de decisiones
- Variación en informes → clasificación estándar
- Objetivos
  - *Mejorar comunicación*
  - *Determinación en conjunto de manejo*
  - *Información consistente*




**Cara esternocostal**




**Cara diafragmática**

## SA-CME LEARNING OBJECTIVES

*After completing this journal-based SA-CME activity, participants will be able to:*

- Discuss the different categories and modifiers of CAD-RADS classification.
- Describe clinical scenarios in which CAD-RADS guidance is not clear and understand the management of such scenarios.
- List the scenarios that are not currently addressed in the CAD-RADS.

*See rsna.org/learning-center-rg.*

## TEACHING POINTS

- The main goals of the CAD-RADS are to enhance communication between interpreting and referring clinicians, allowing collaborative determination of the best course of patient care, and to generate consistent data for auditing, data mining, quality improvement, research, and education.
- CAD-RADS categories 0, 1, and 2 represent nonobstructive CAD (ie, stenosis of less than 50% of the vessel), which does not require any further evaluation.
- A patient assigned to CAD-RADS category 4A requires either a functional test or ICA, whereas a patient with CAD-RADS 4B requires ICA..
- Four modifiers are used to complement the CAD-RADS categories and provide additional information.
- High risk (vulnerable) plaque features are positive remodeling, spotty calcification, napkin-ring sign, and low-attenuation plaque.

# CATEGORÍAS CAD - RADS

# Categorías CAD – RADS

- Hallazgo más severo
- Rango de 0 – 5 (sin placa a obstrucción)
- Vasos de 1.5 mm o más de calibre
- Tablas 1, 2
- MPR (reformateo multiplanar) curvilíneo, paralelo y ortogonal
- Valoración cualitativa de estenosis
- Artefacto de Ca2+ (resolución espacial, colimación, filtro)

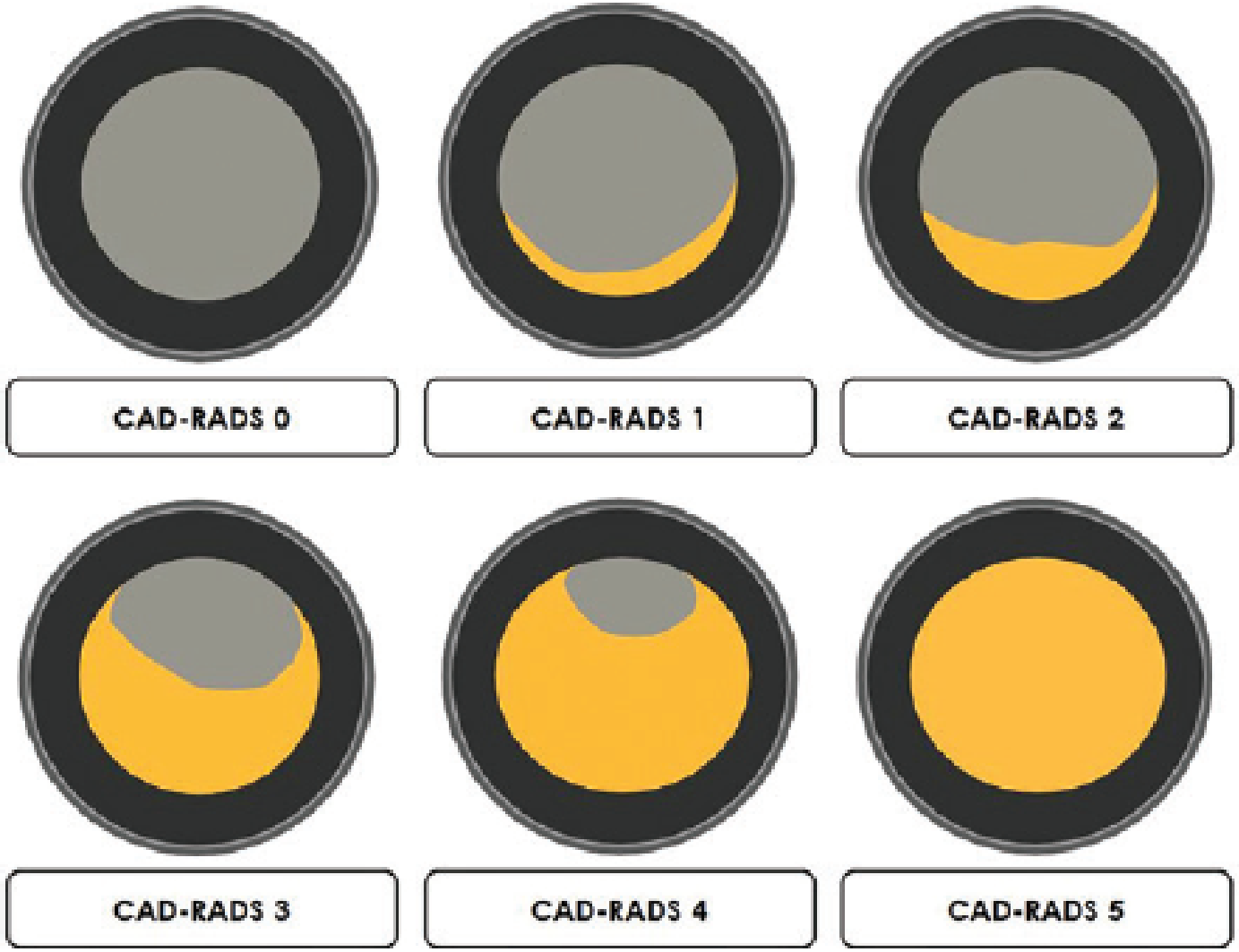



Figure 1. Illustration shows the five categories of CAD-RADS.

Table 1: CAD-RADS Classification for Patients with Stable Chest Pain

| CAD-RADS Category | Interpretation | Degree of Maximal Coronary Stenosis | Further Cardiac Workup | Management |
|---|---|---|---|---|
| 0 | Absence of CAD | 0%, no plaque or stenosis | None | Consider nonatherosclerotic causes of chest pain |
| 1 | Minimal CAD | 1%–24%, minimal stenosis or plaque without stenosis | None | Consider nonatherosclerotic causes of chest pain Preventive therapy and risk modification |
| 2 | Mild CAD | 25%–49% | None | Consider nonatherosclerotic causes of chest pain Preventive therapy and risk modification, especially for plaque in multiple segments |
| 3 | Moderate stenosis | 50%–69% | Functional assessment | Consider symptoms-guided anti-ischemic and preventive pharmacotherapy and risk factor modification per guideline-directed care |
| 4A | Severe stenosis | One or two vessels, 70%–99% | ICA or functional assessment | Consider symptoms-guided anti-ischemic and preventive pharmacotherapy and risk factor modification per guideline-directed care |
| 4B | Severe stenosis | Left main artery >50% or three vessels ≥70% | ICA is recommended | Other treatments including revascularization should be considered per guideline-directed care |
| 5 | Total occlusion | 100% | ICA and/or viability assessment | Same as for CAD-RADS 4A and 4B |
| N | Obstructive CAD cannot be excluded | Nondiagnostic | Additional or alternate evaluation | Additional or alternate evaluation |

Source.—Reference 15.

Note.—Modifiers include N (nonevaluable segment), S (coronary stent), G (coronary bypass graft), and V (vulnerable plaque). ICA = invasive coronary angiography.

Table 2: CAD-RADS Classification for Patients with Acute Chest Pain

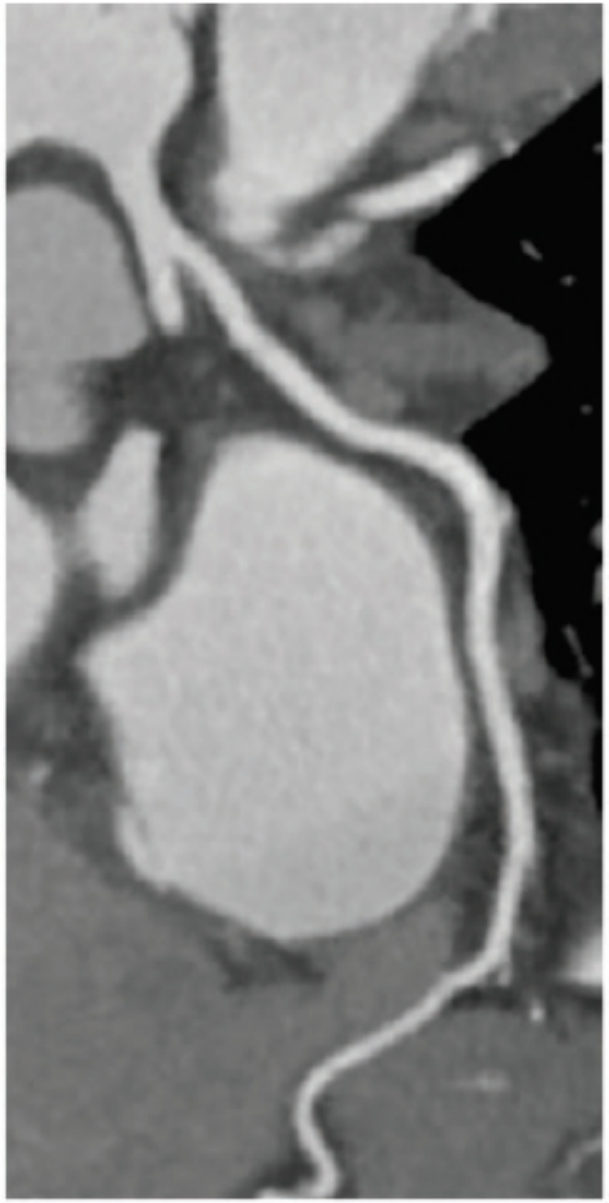
| CAD-RADS Category | Likelihood of Acute Coronary Syndrome | Degree of Maximal Coronary Stenosis | Further Cardiac Workup | Management |
|---|---|---|---|---|
| 0 | Highly unlikely | 0% | None | No further evaluation of acute coronary syndrome required; consider other causes |
| 1 | Highly unlikely | 1%–24% | None | Consider evaluation of causes of non–acute coronary syndrome, if troponin level is normal and there are no ECG changes |
| 2 | Unlikely | 25%–49% | None | Consider evaluation of causes of non–acute coronary syndrome, if troponin level is normal and there are no ECG changes |
| 3 | Possible | 50%–69% | Functional assessment | Consider hospital admission with cardiology consultation, functional testing, and/or ICA |
| 4A | Likely | One or two vessels 70%–99% | ICA or functional assessment | Consider hospital admission with cardiology consultation; further evaluation with ICA and revascularization, as appropriate |
| 4B | Likely | Left main artery >50% or three vessels ≥70% | ICA is recommended | Consider hospital admission with cardiology consultation; further evaluation with ICA and revascularization, as appropriate |
| 5 | Very likely | 100% | ICA and/or viability assessment | Consider expedited ICA and revascularization for acute occlusion |
| N | Cannot be excluded | Nondiagnostic | Additional or alternate evaluation | Additional or alternate evaluation for acute coronary syndrome |

Source.—Reference 15.

Note.—Modifiers include N (nonevaluable segment), S (coronary stent), G (coronary bypass graft), and V (vulnerable plaque). ECG = electrocardiographic.

2a.

2b.



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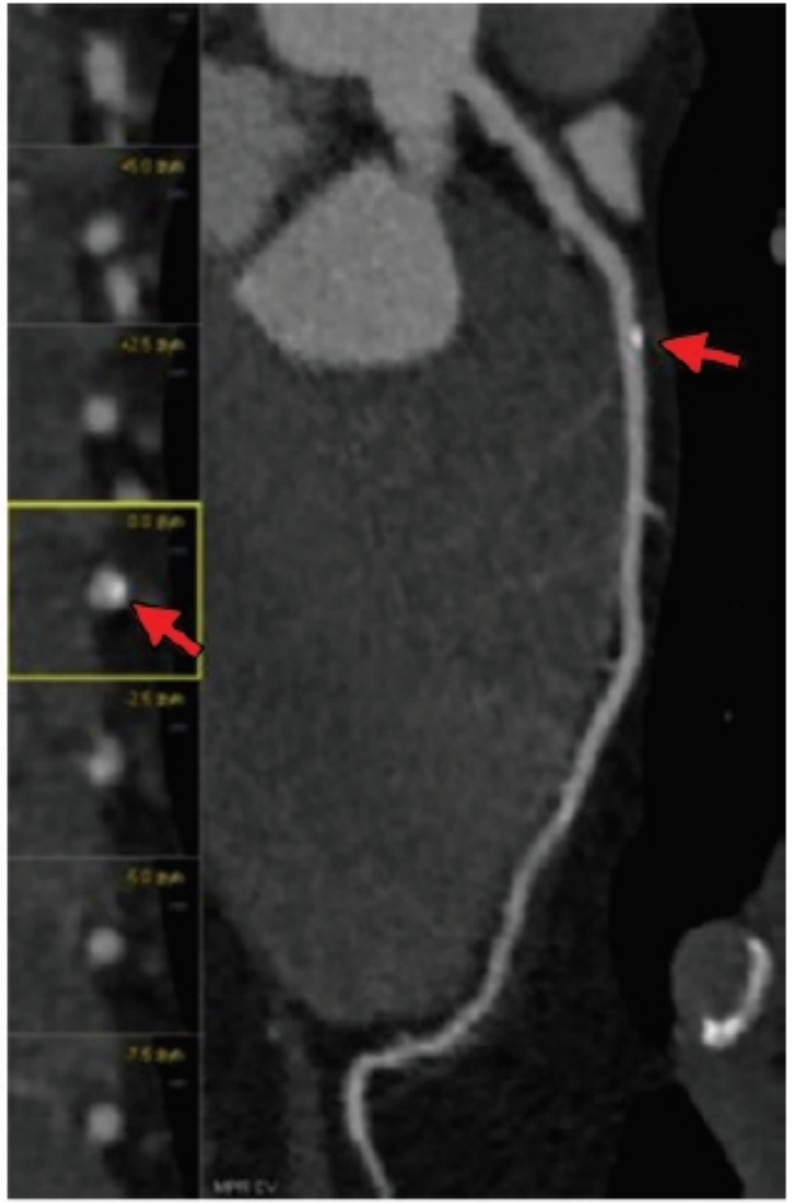

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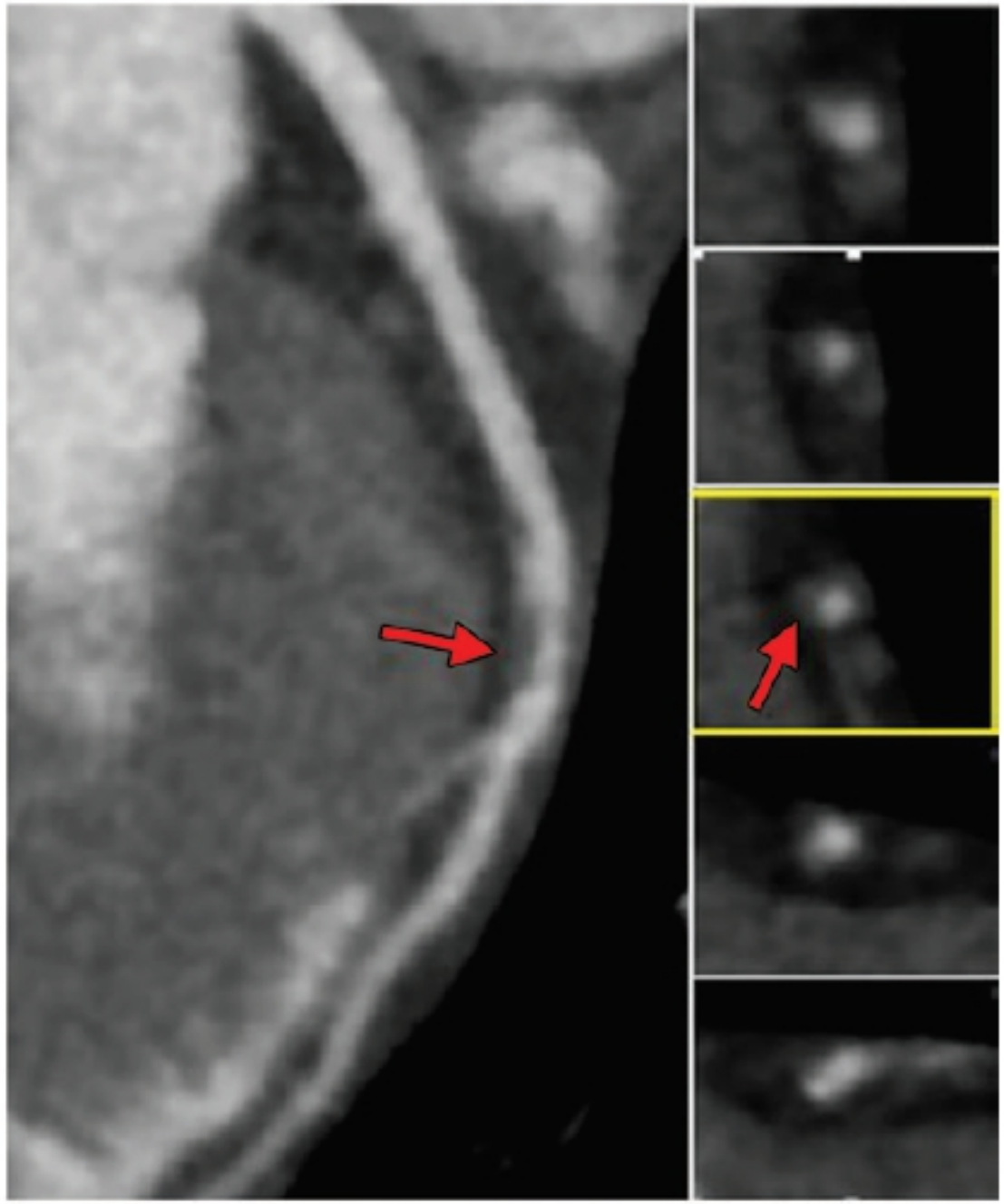

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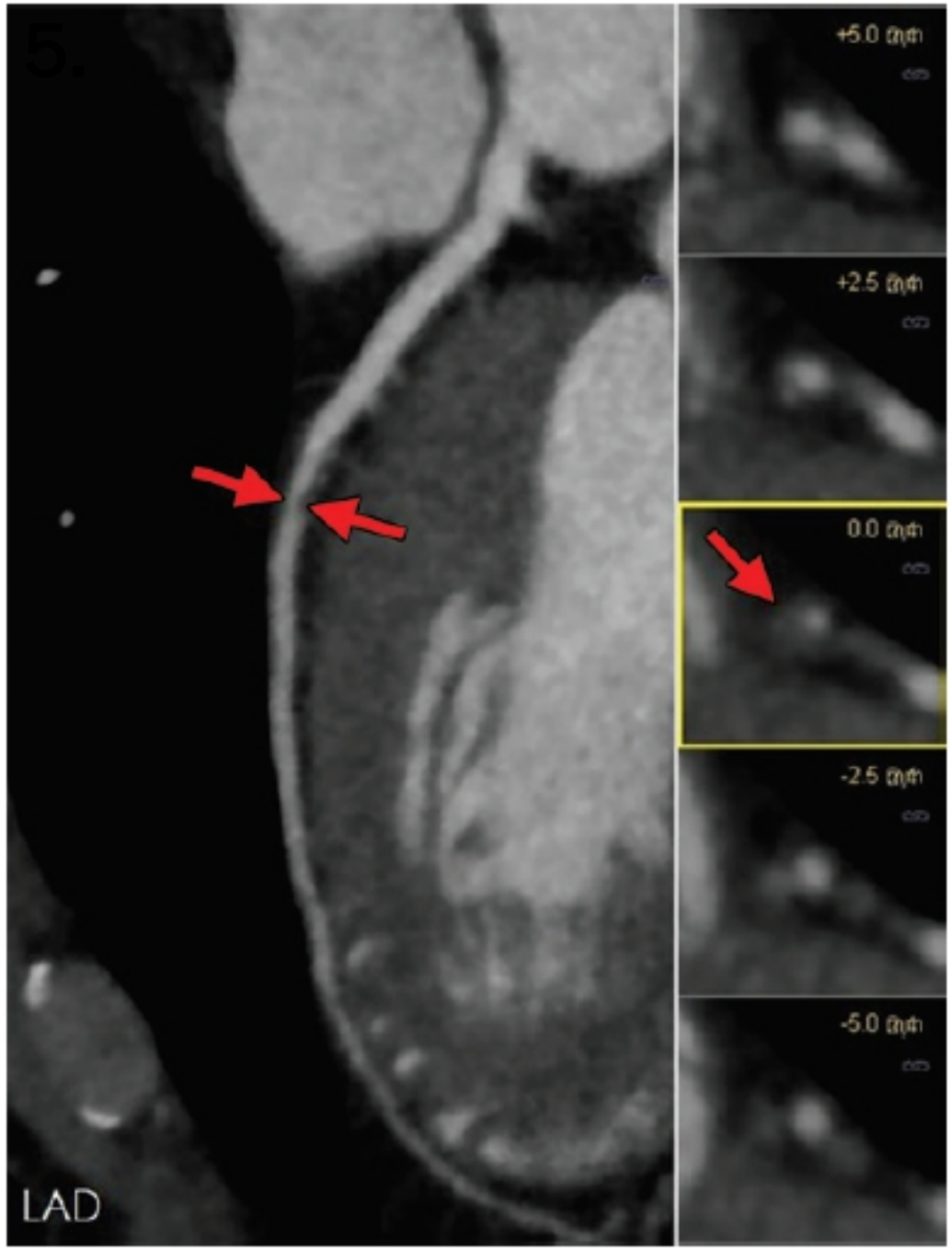
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+5.0 mm
+2.5 mm
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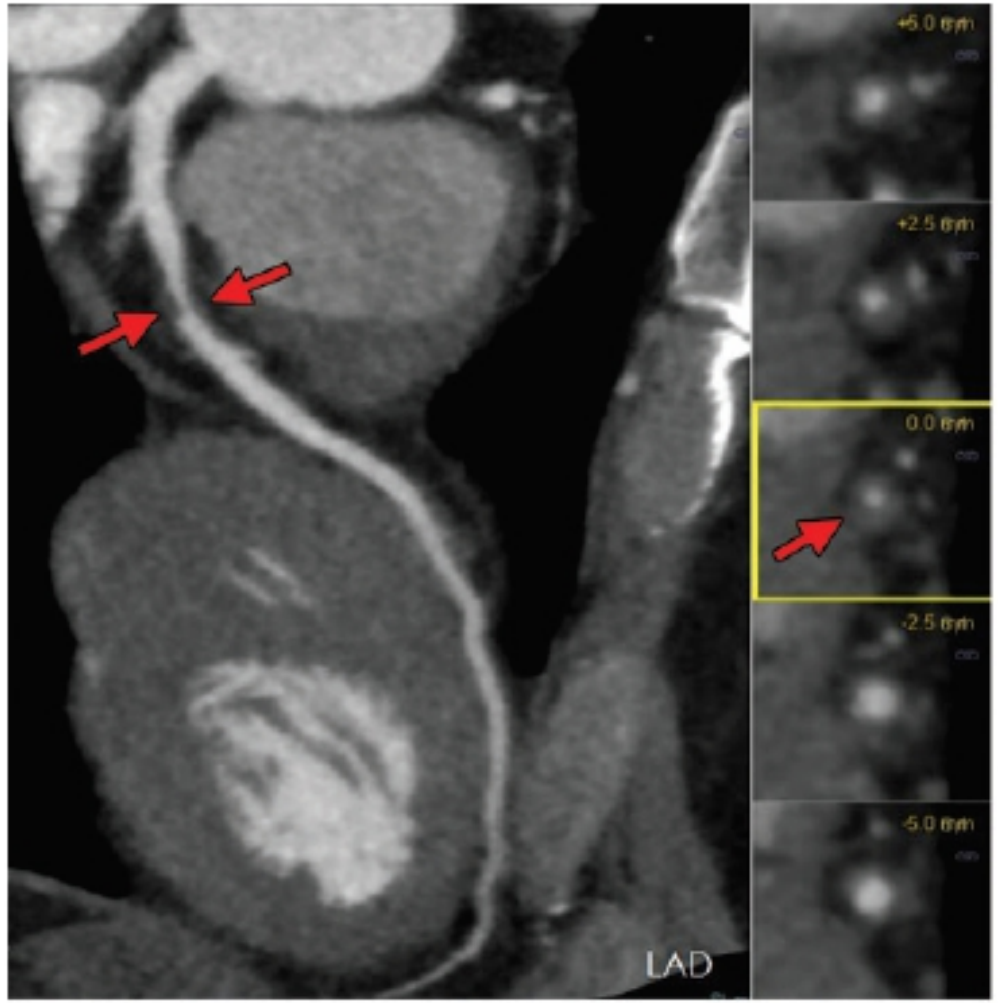


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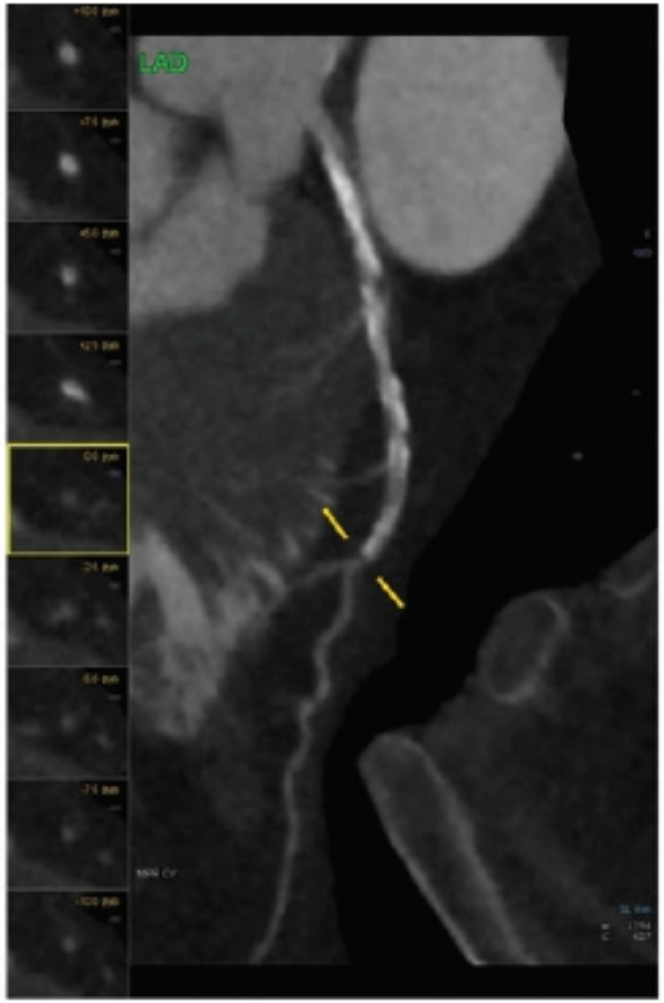


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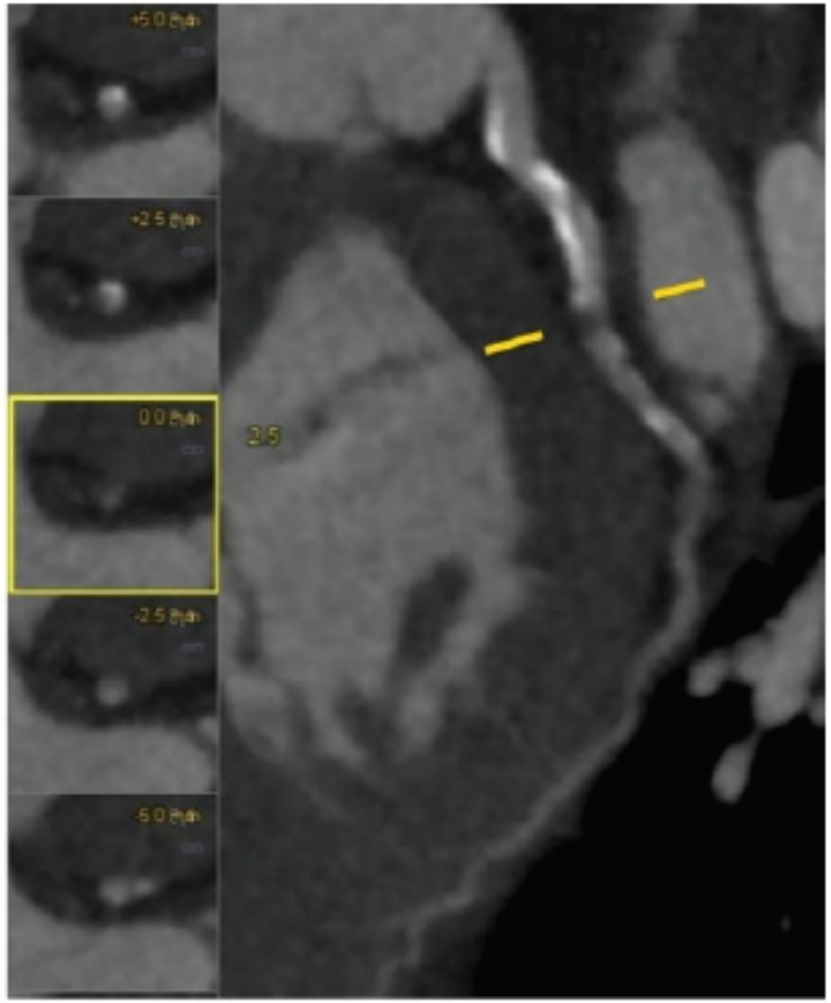


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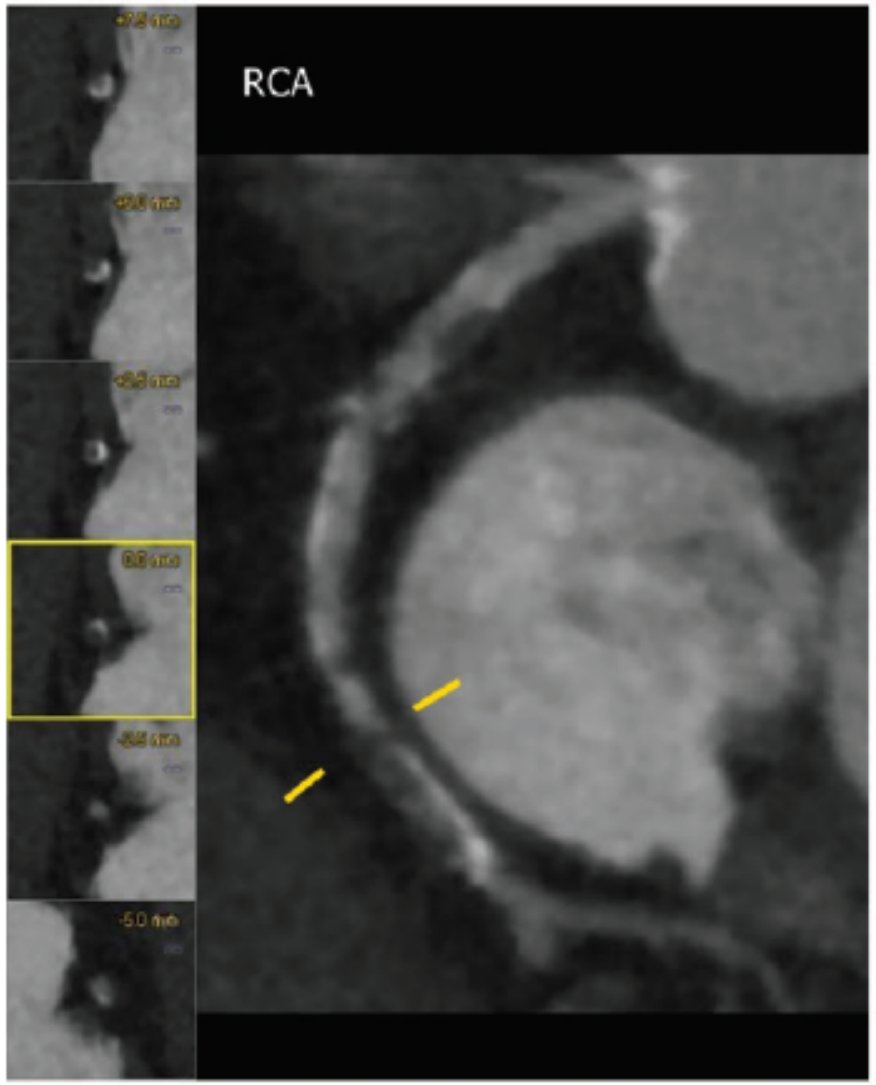


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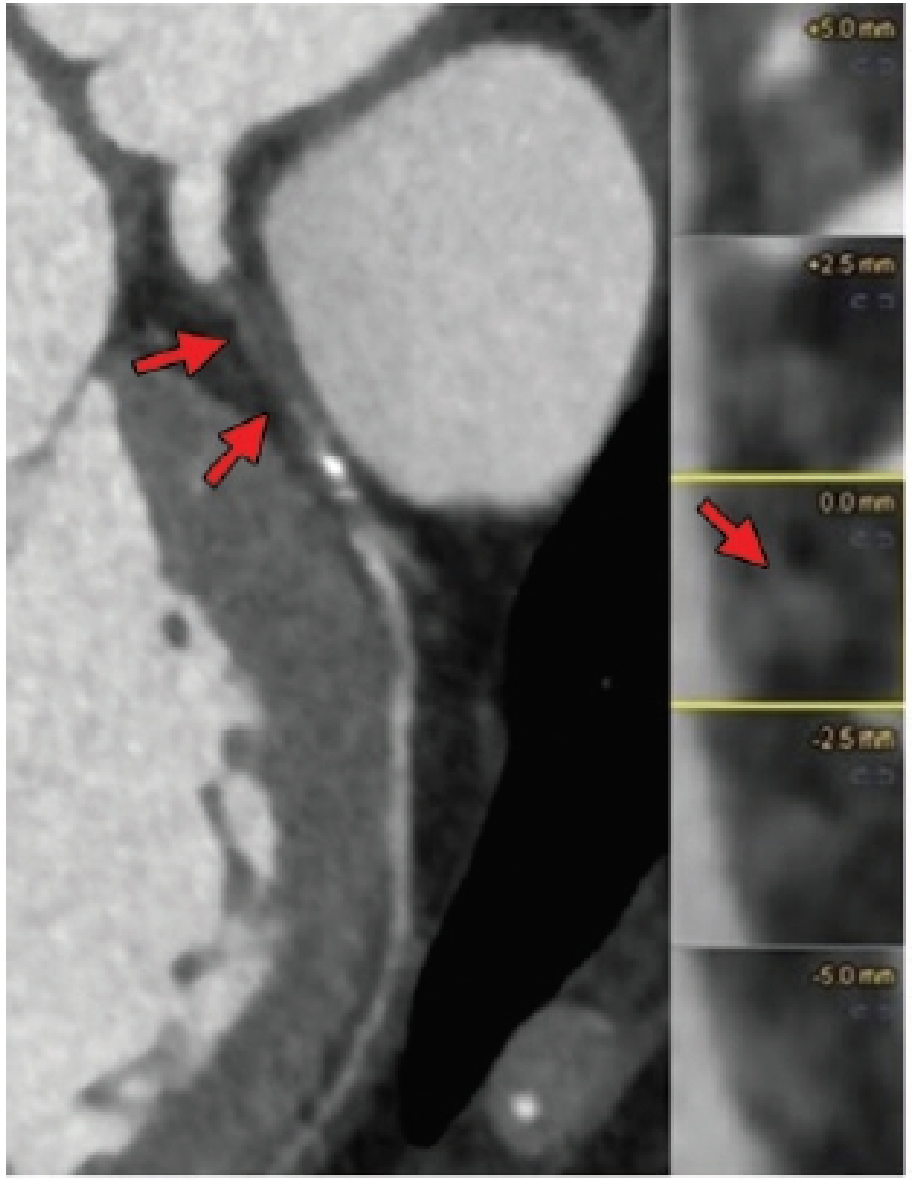


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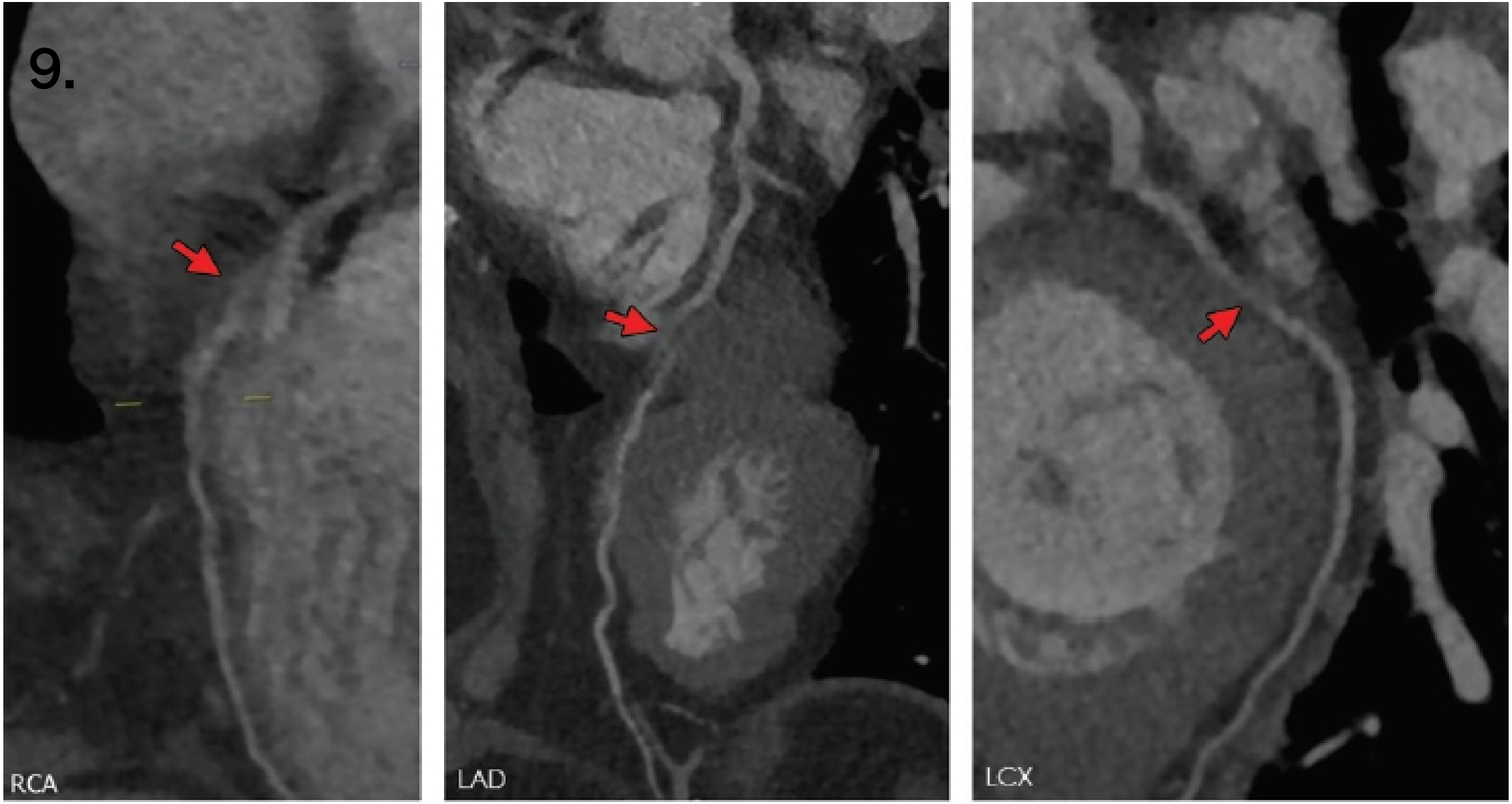


a. b. c.

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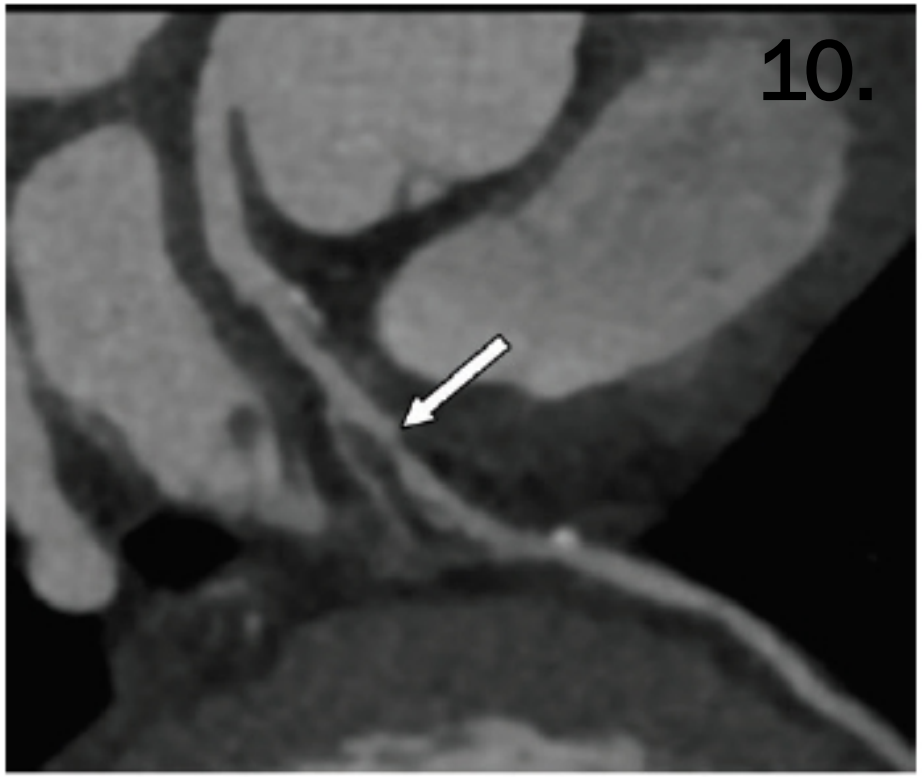

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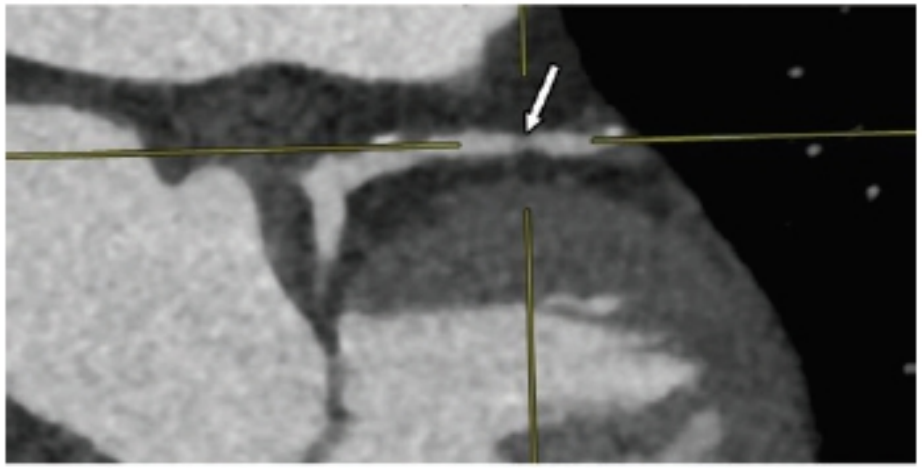

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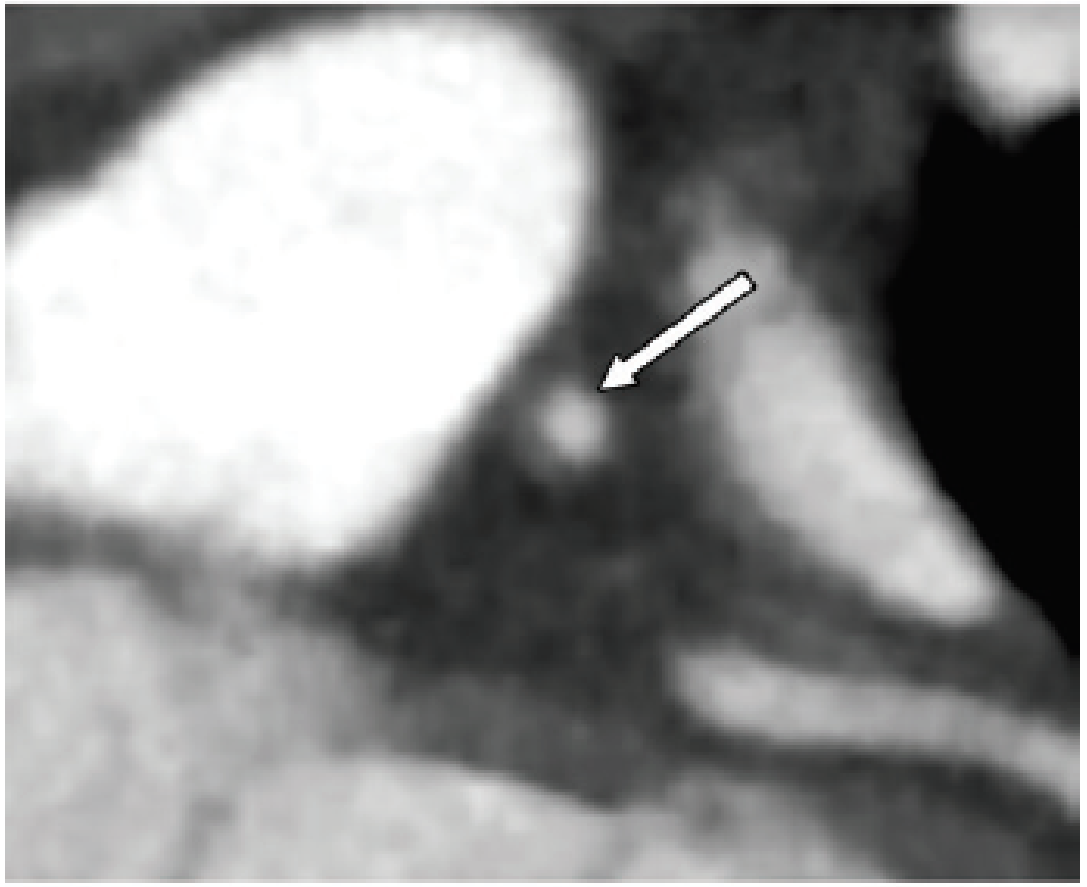

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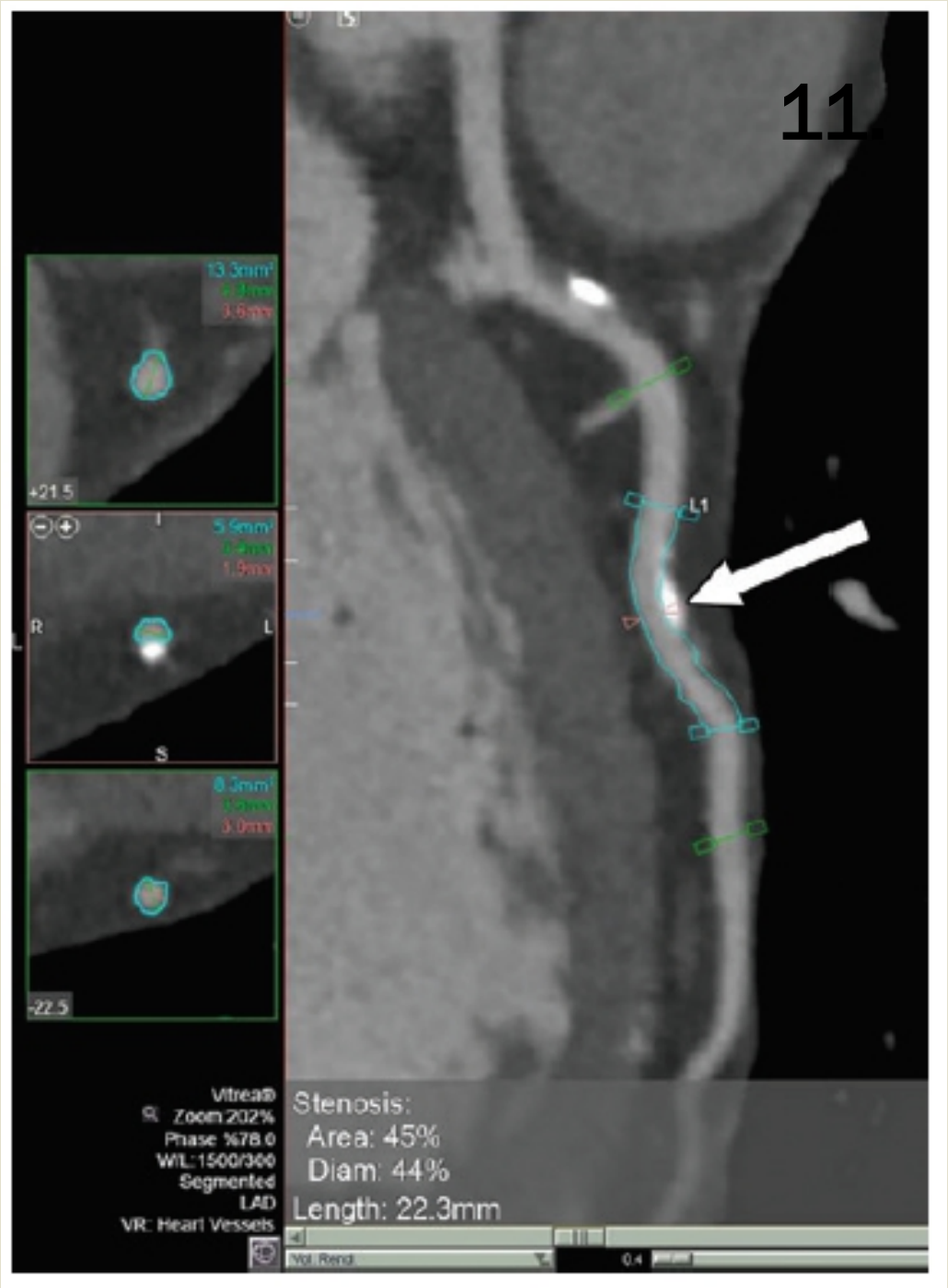
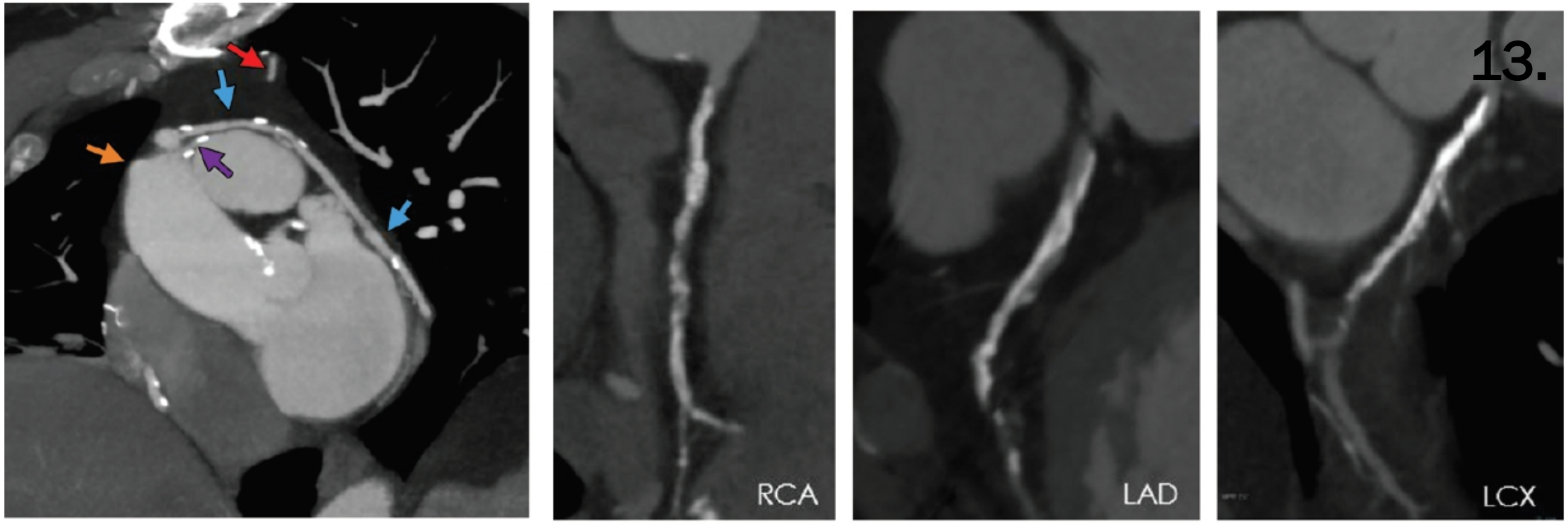

11
13.3mm²
+21.5
5.9mm²
1.9mm
R
L
S
8.3mm²
3.0mm
-22.5
L1
Vitrea®
Zoom 202%
Phase %78.0
WL:1500/300
Segmented
LAD
VR: Heart Vessels
Stenosis:
Area: 45%
Diam: 44%
Length: 22.3mm

a. b. c.

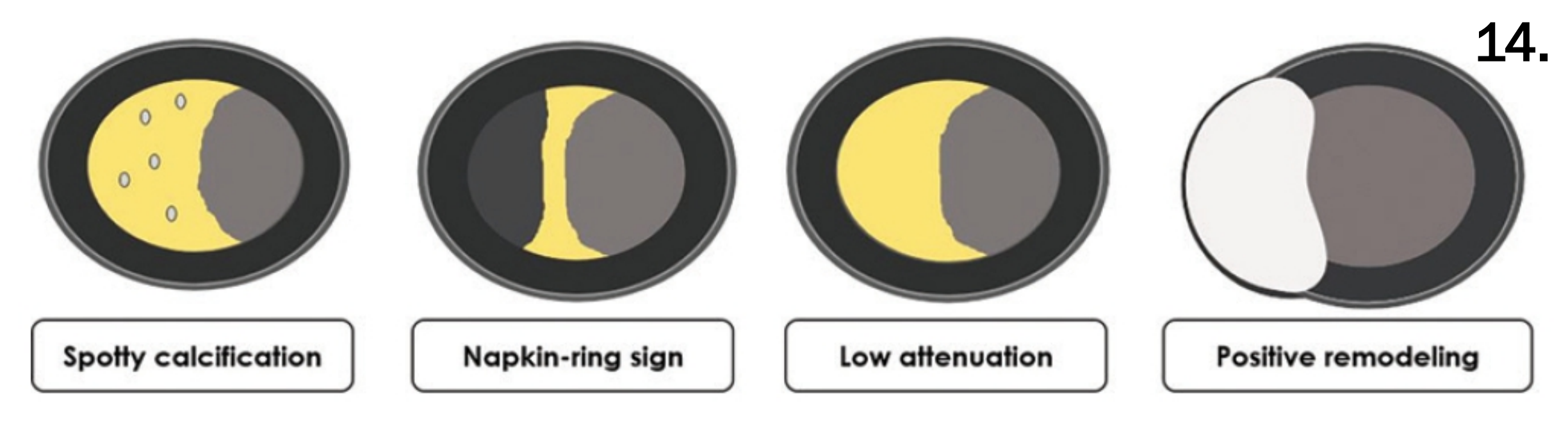



a. b. c. d.

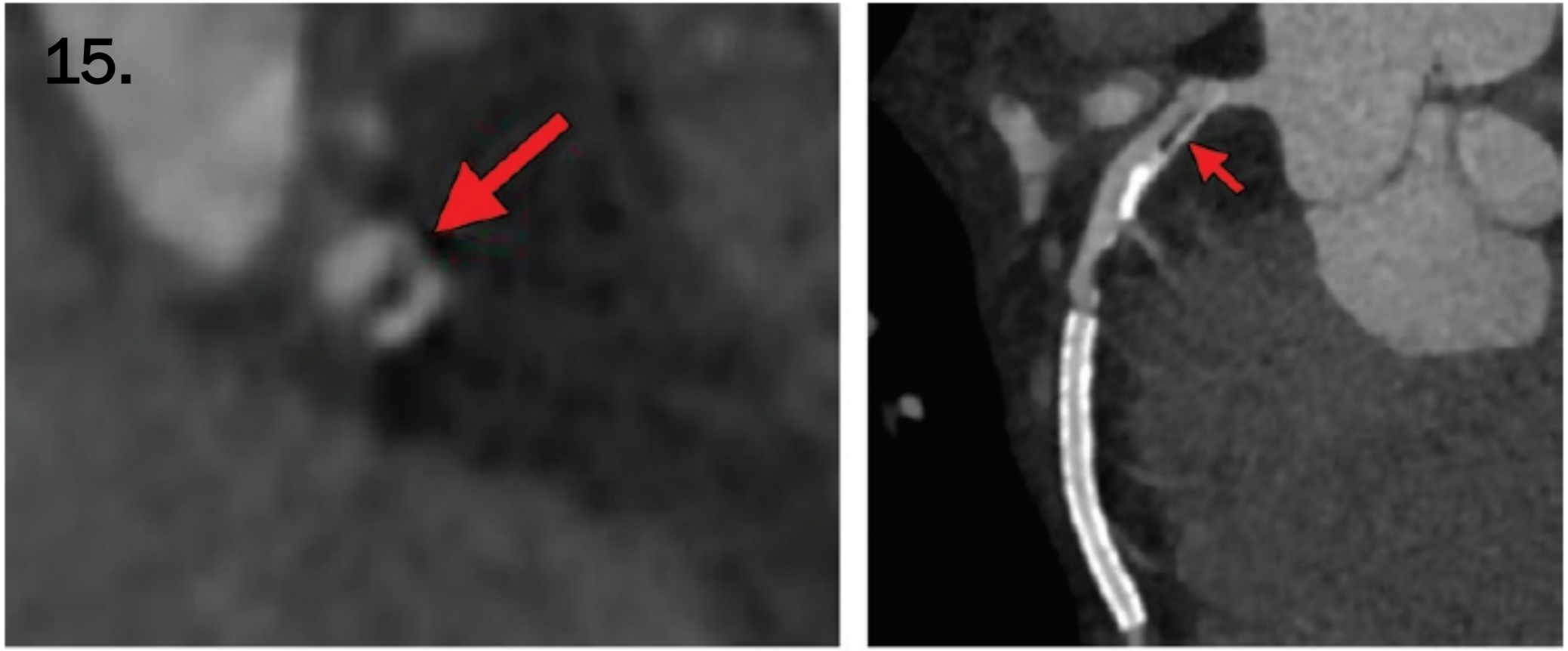
# MODIFICADORES

# Modificadores

- N --- **No valorable**: ante estenosis significativa (>50%) en otro segmento, término parcial (segmento no valorable)
- S --- **Stent** (presente tras 90% de intervenciones percutáneas)
- G --- **Injerto (Graft) de bypass coronario** (indica su presencia)
  - *Estenosis en segmento irrigado por bypass no considerado*
- V --- **Rasgos de placa vulnerable de alto riesgo (al menos dos en la misma placa)**
  - *Remodelación positiva – agrandamiento (placa) relativo proximal y distal*
  - *Calcificaciones en manchas – puntuadas, diminutas*
  - *Signo del anillo de servilleta – centro hipodenso rodeado por anillo hiperdenso*
    - Centro necrótico; más común en placas con ruptura
  - *Placa de baja atenuación (<30 HU)*




V = Rasgos de vulnerabilidad de placa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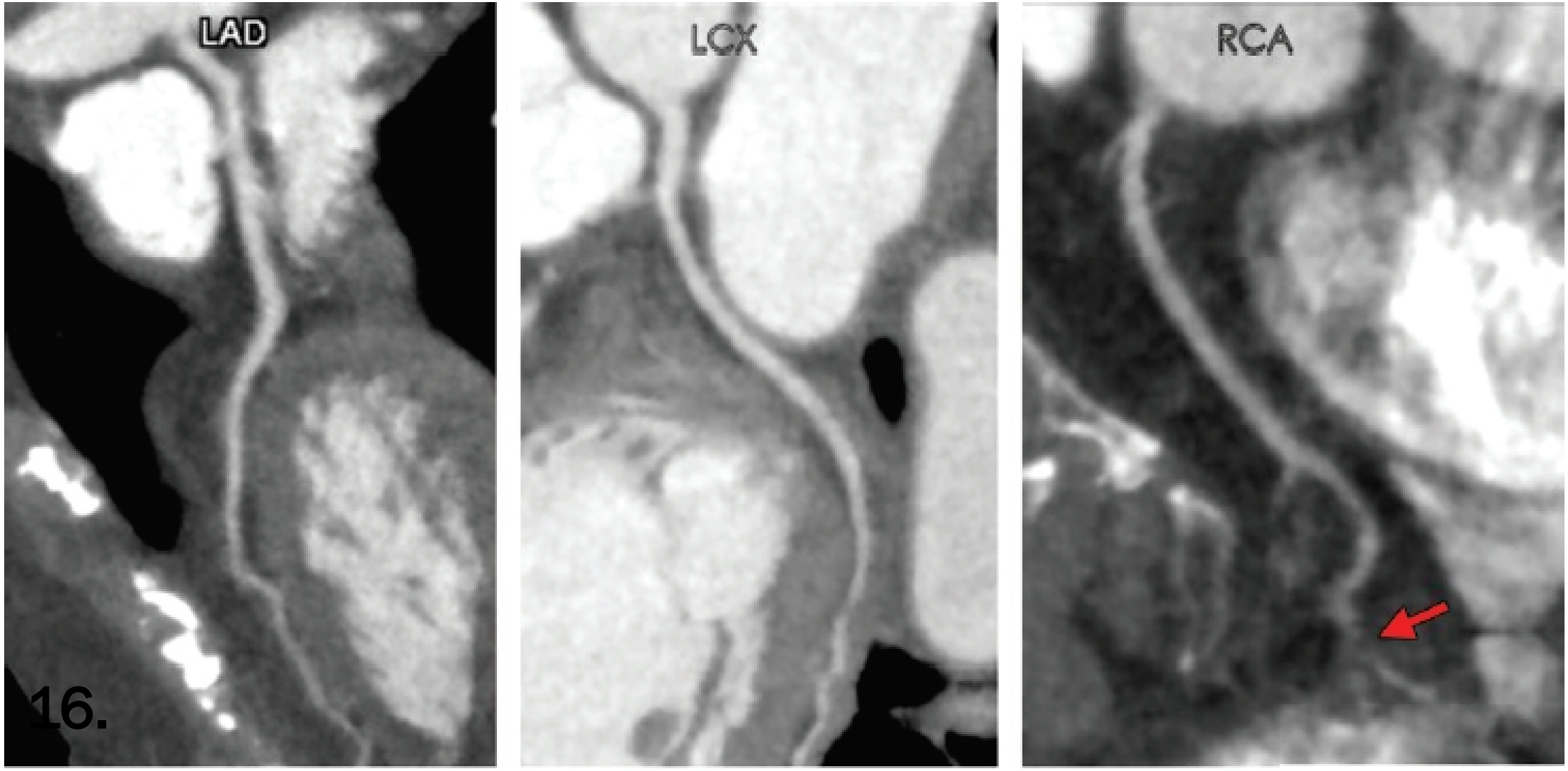


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a. b. c.

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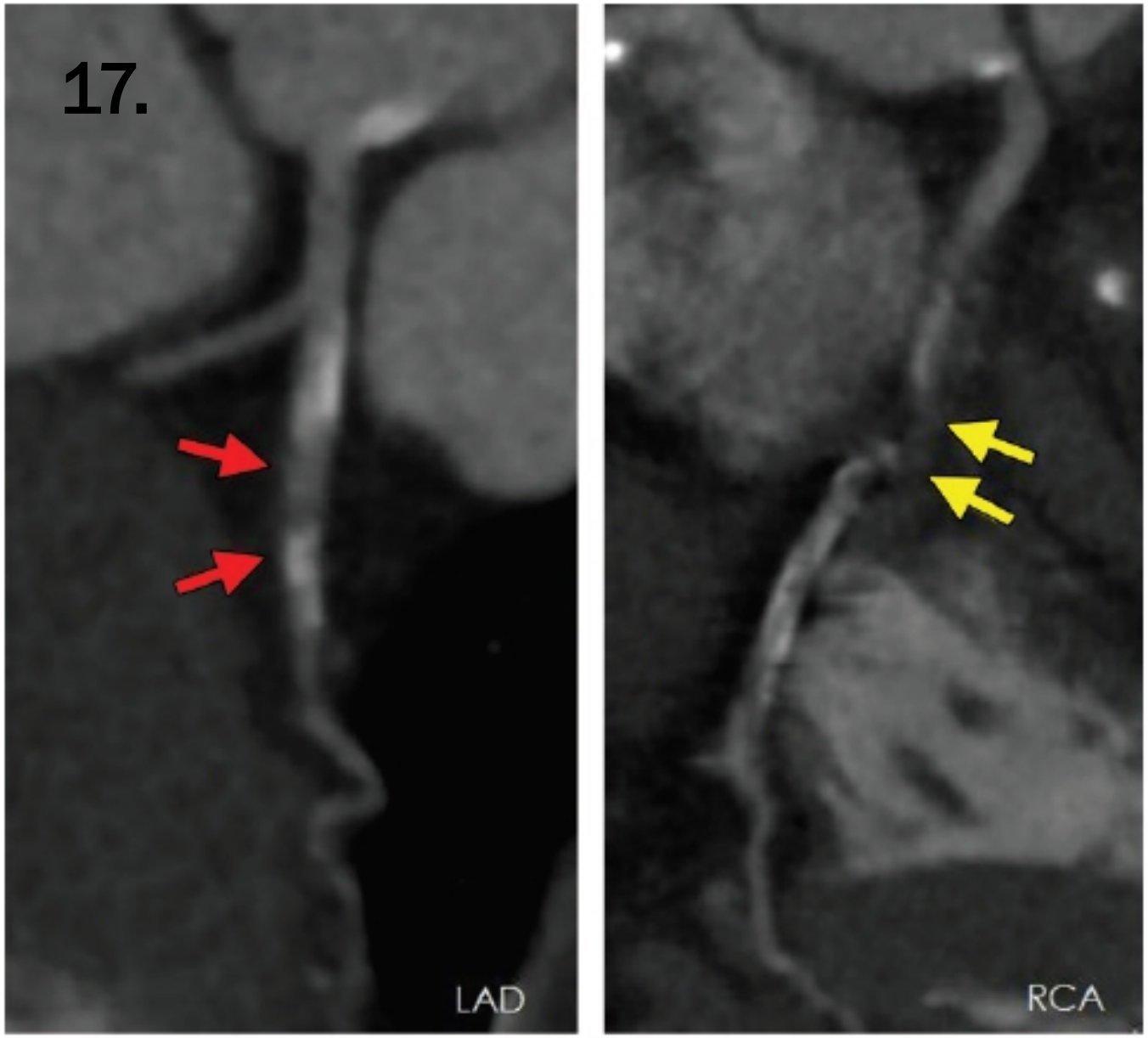


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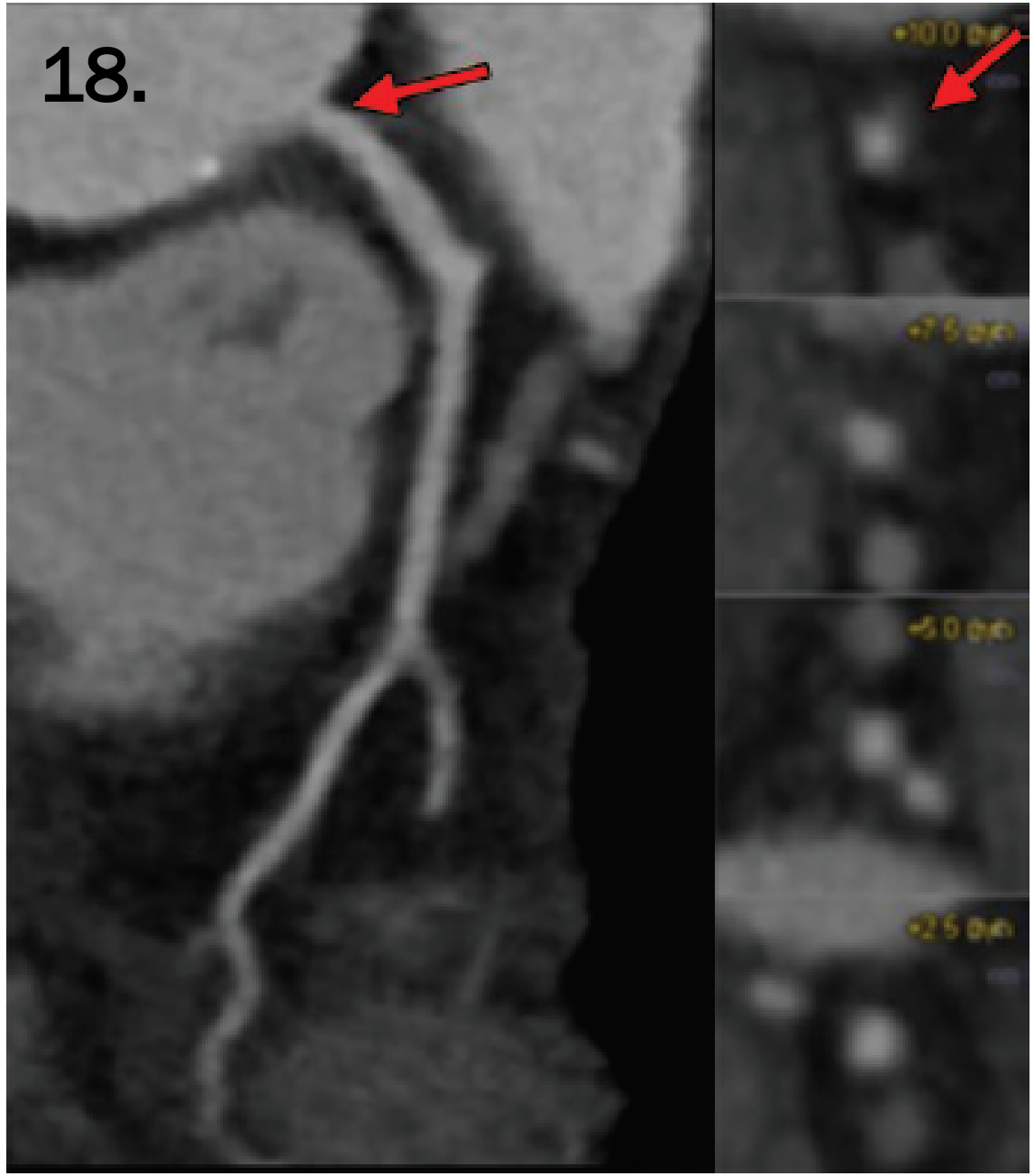
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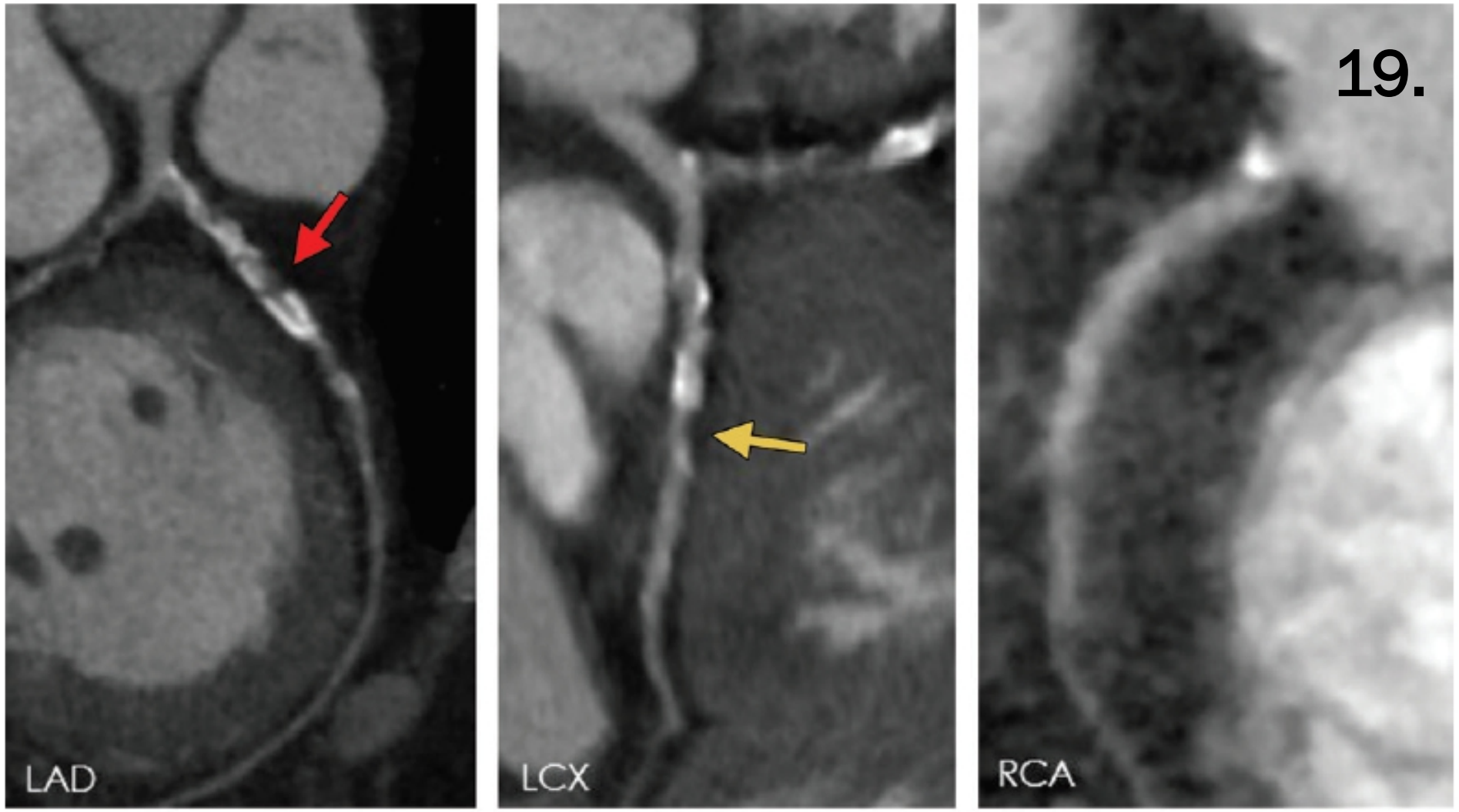


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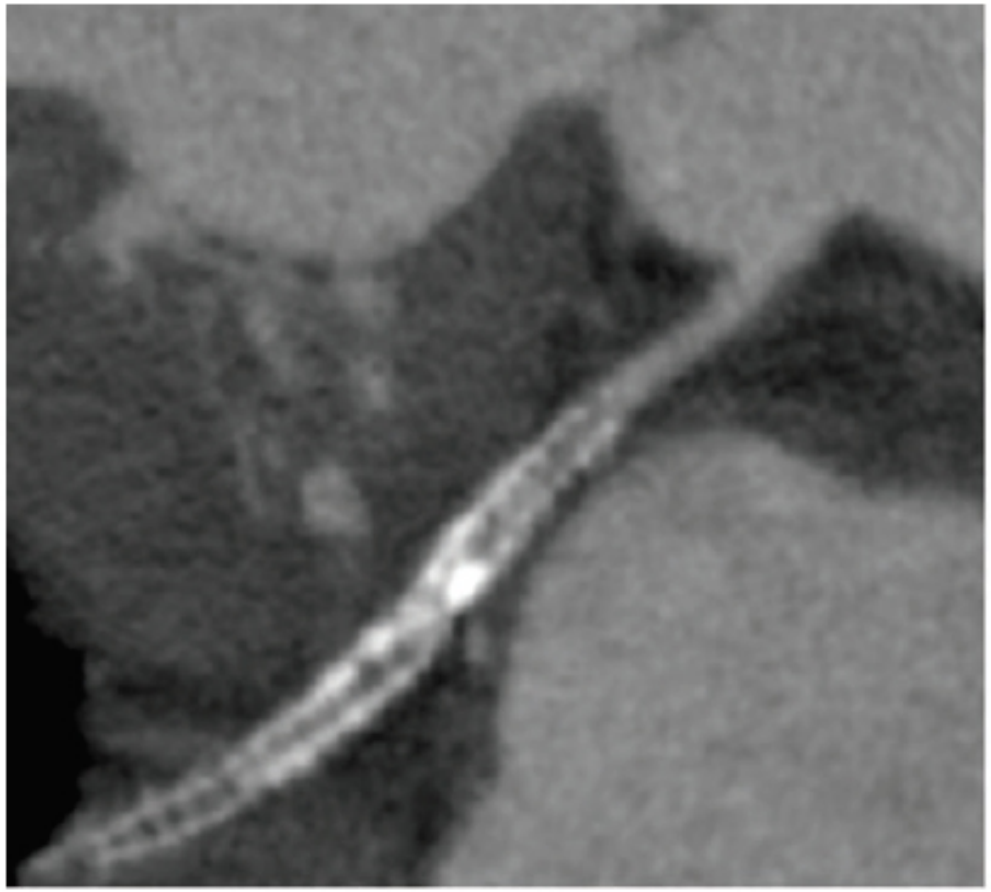

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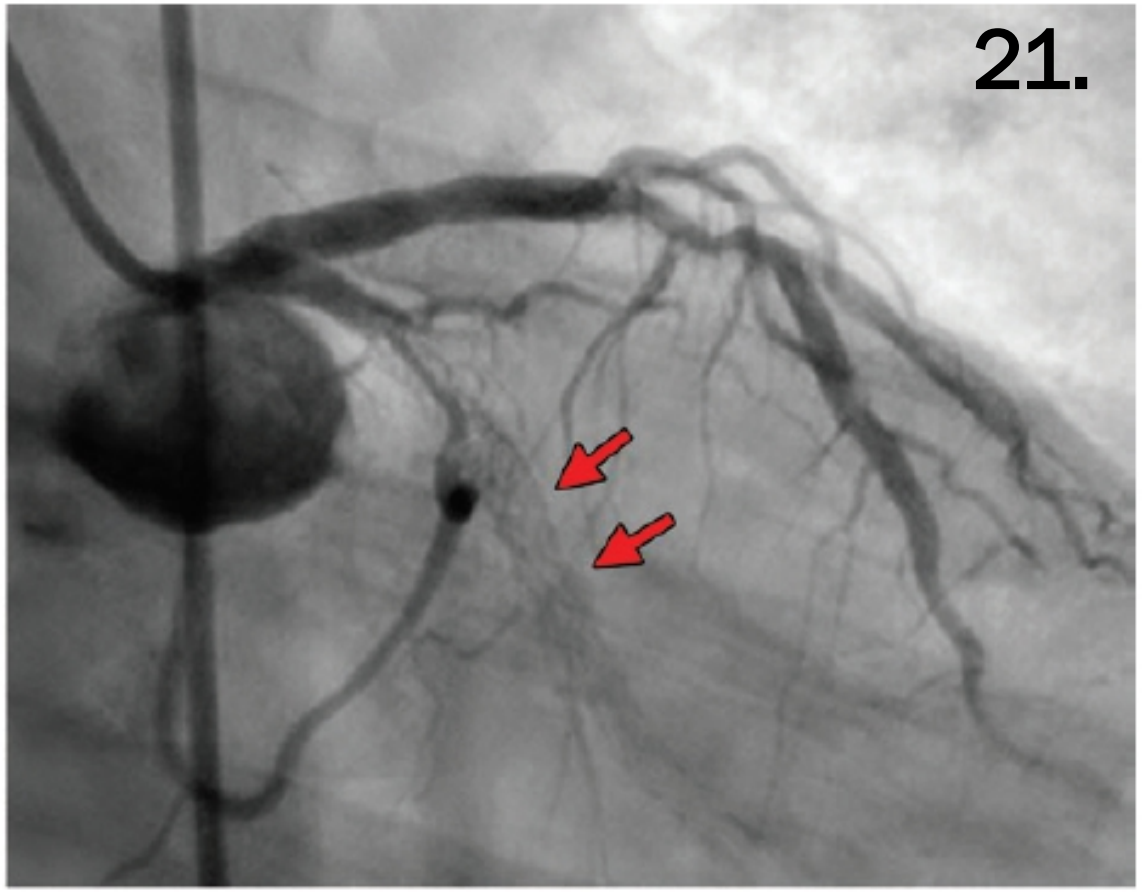


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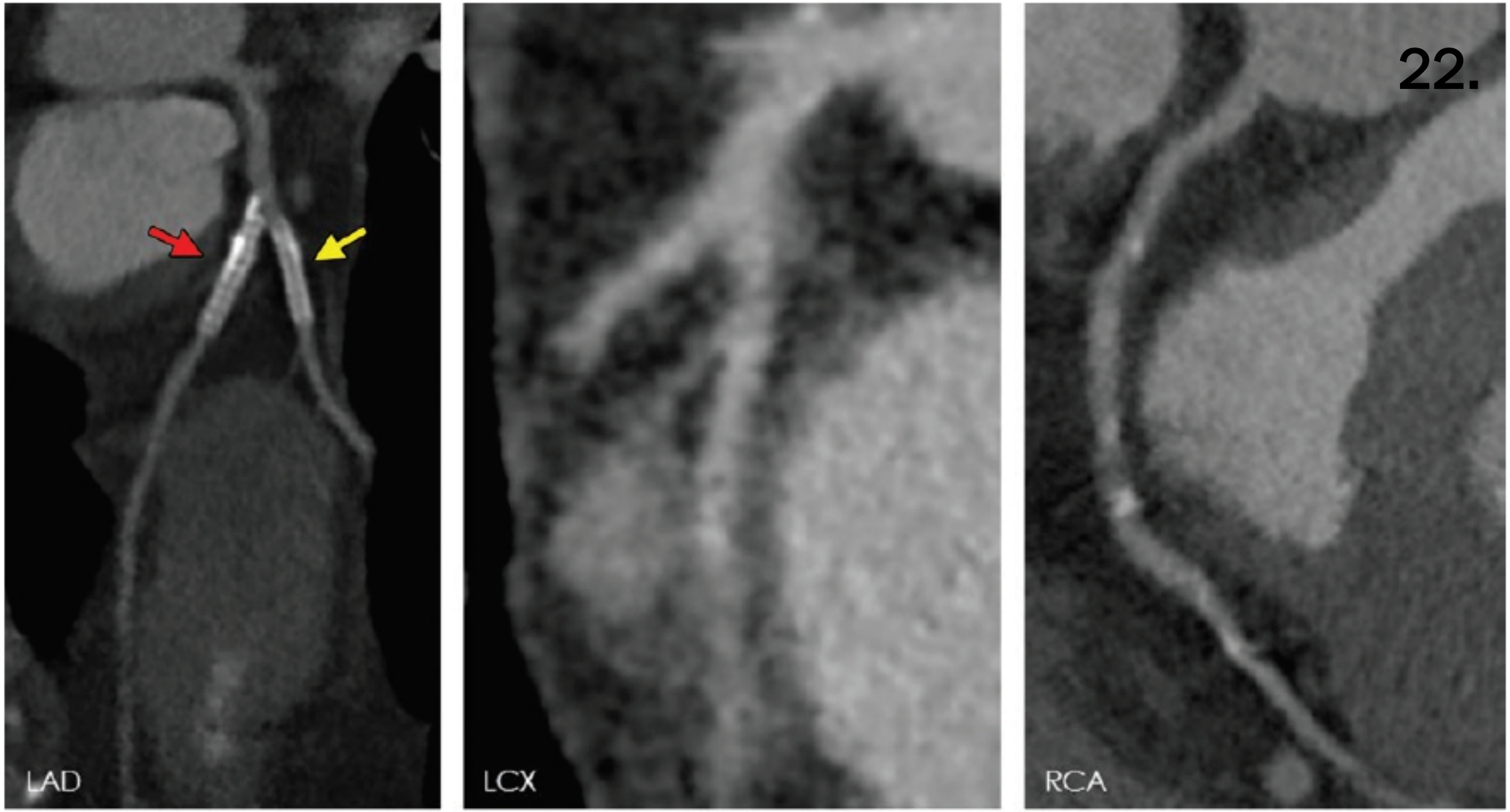
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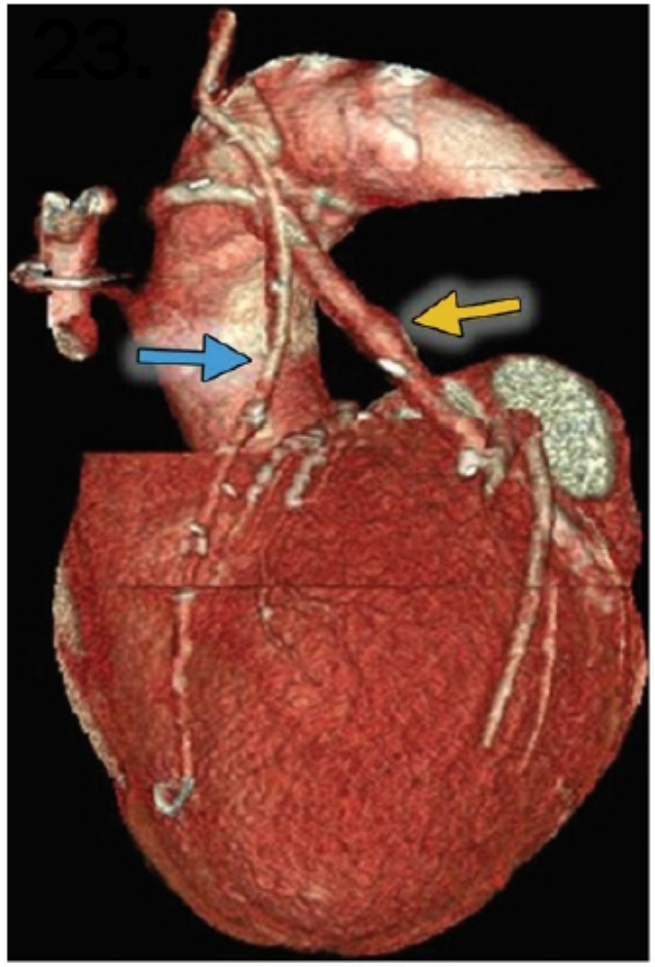


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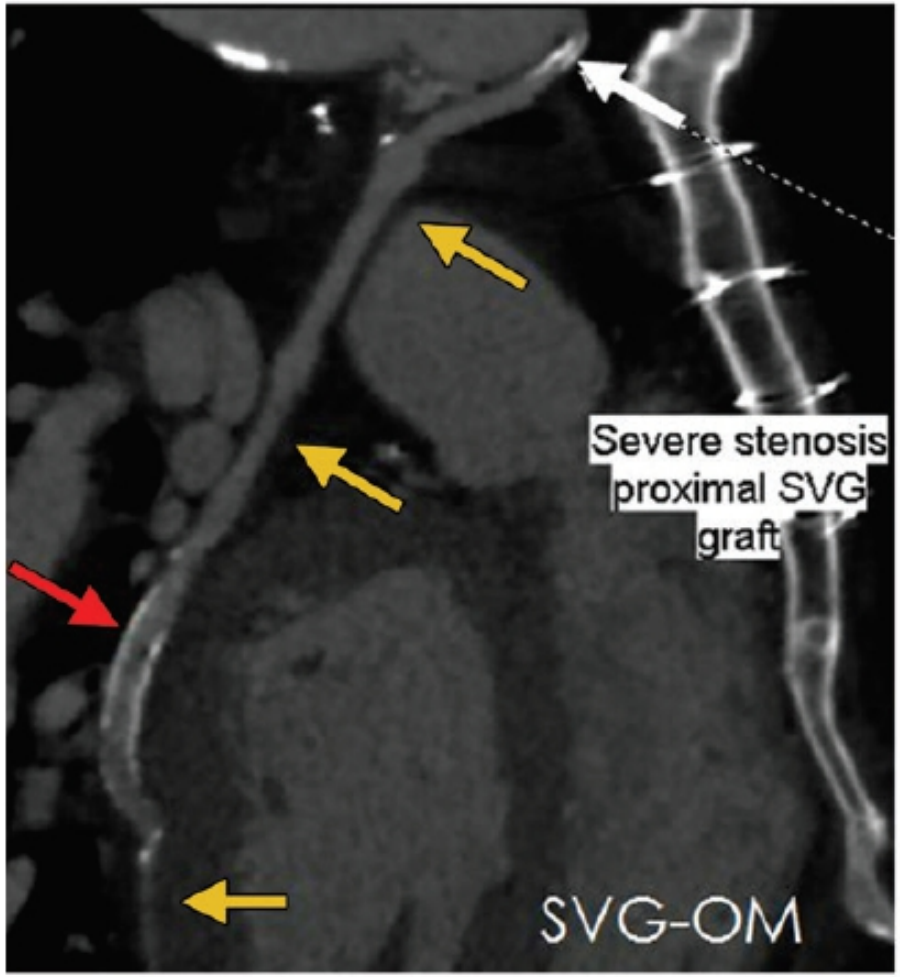


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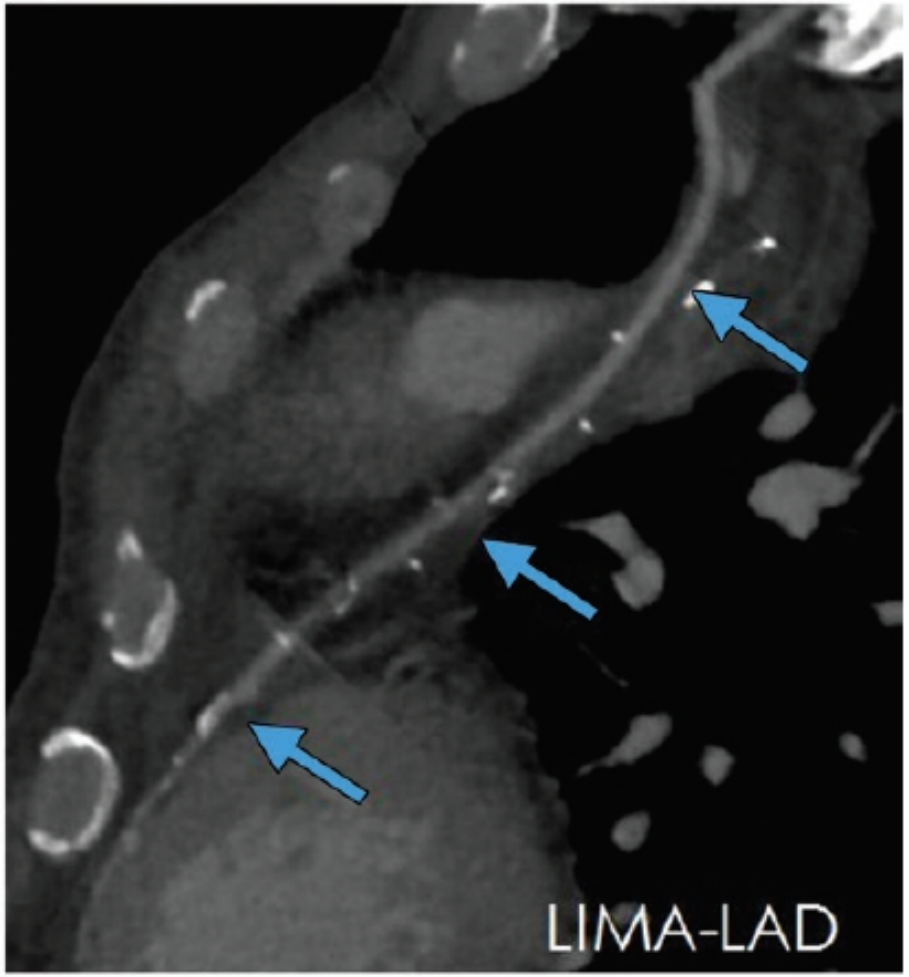


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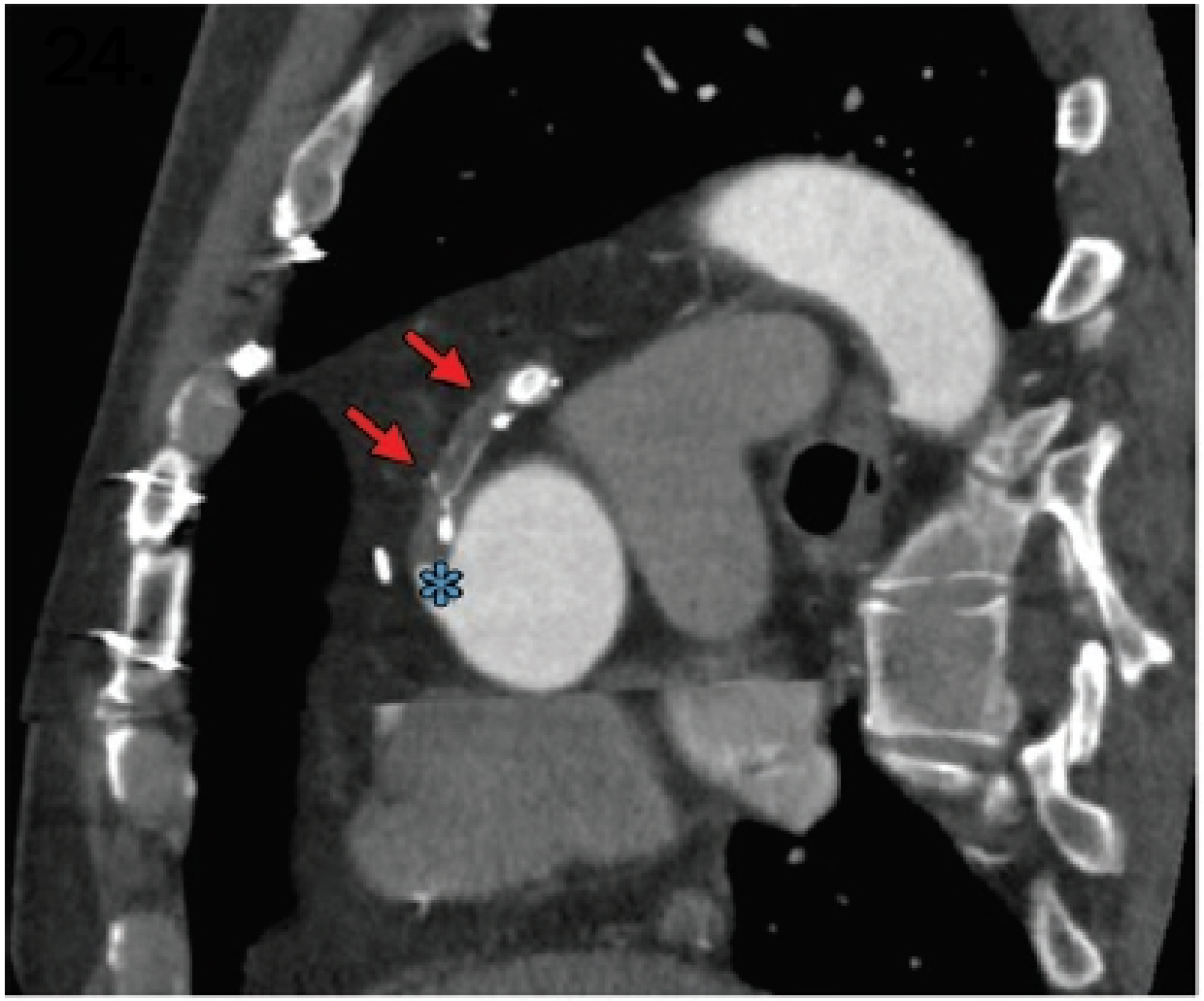

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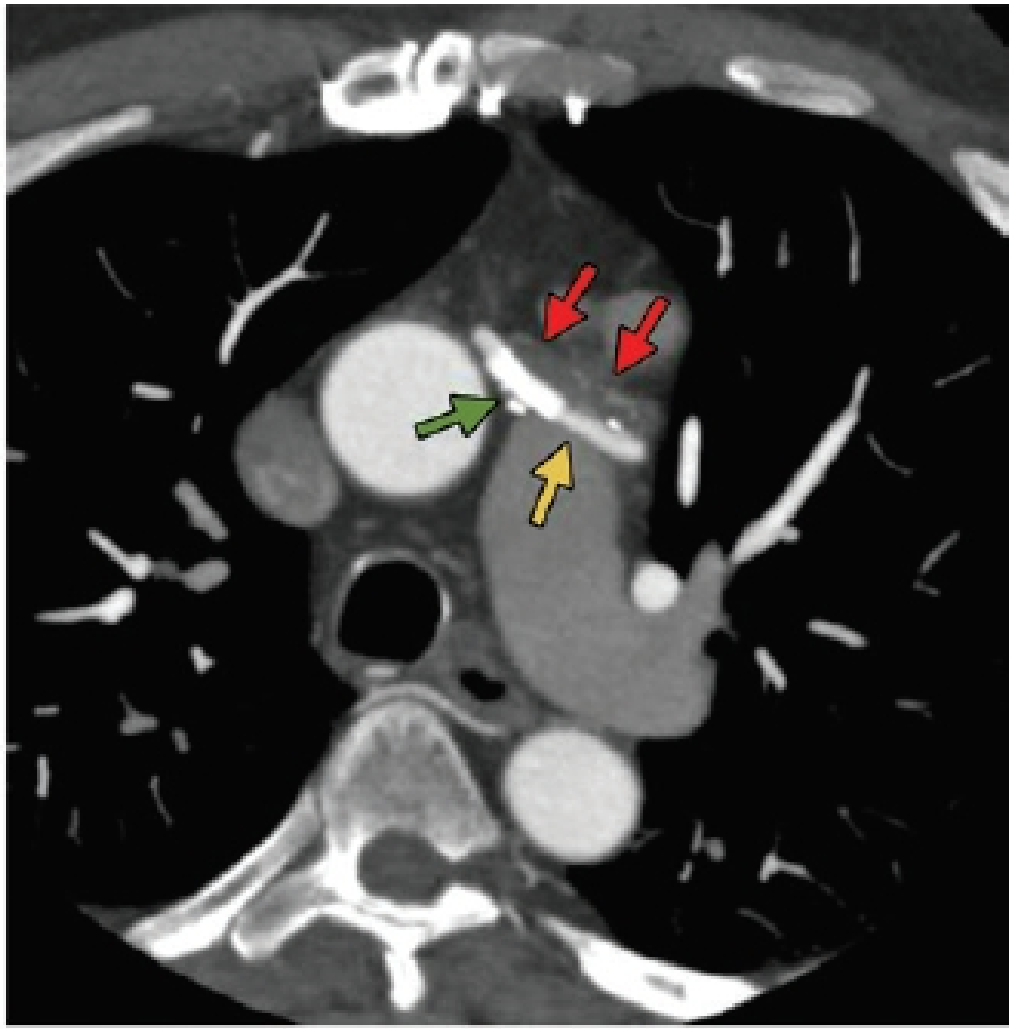

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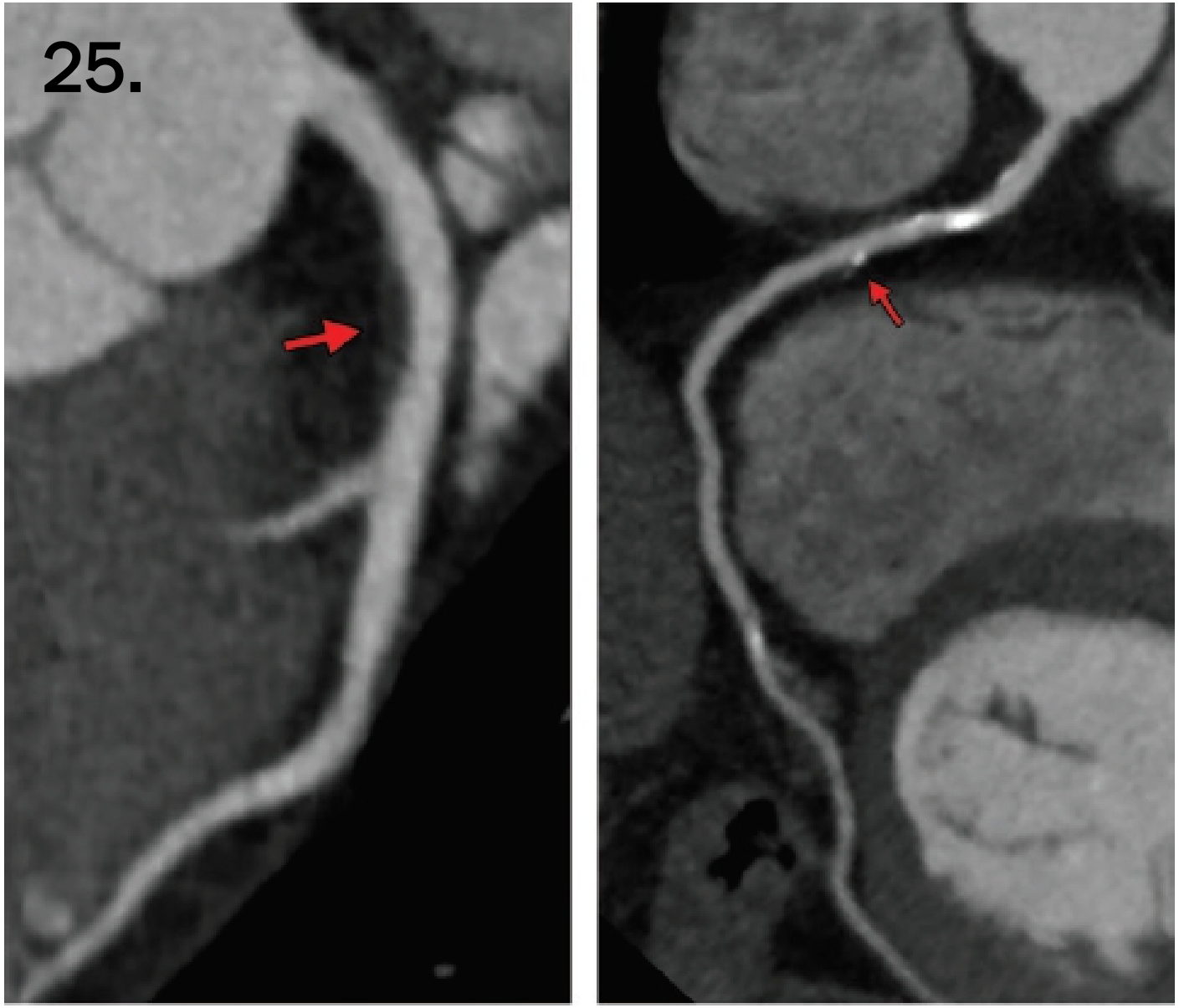


a. b.

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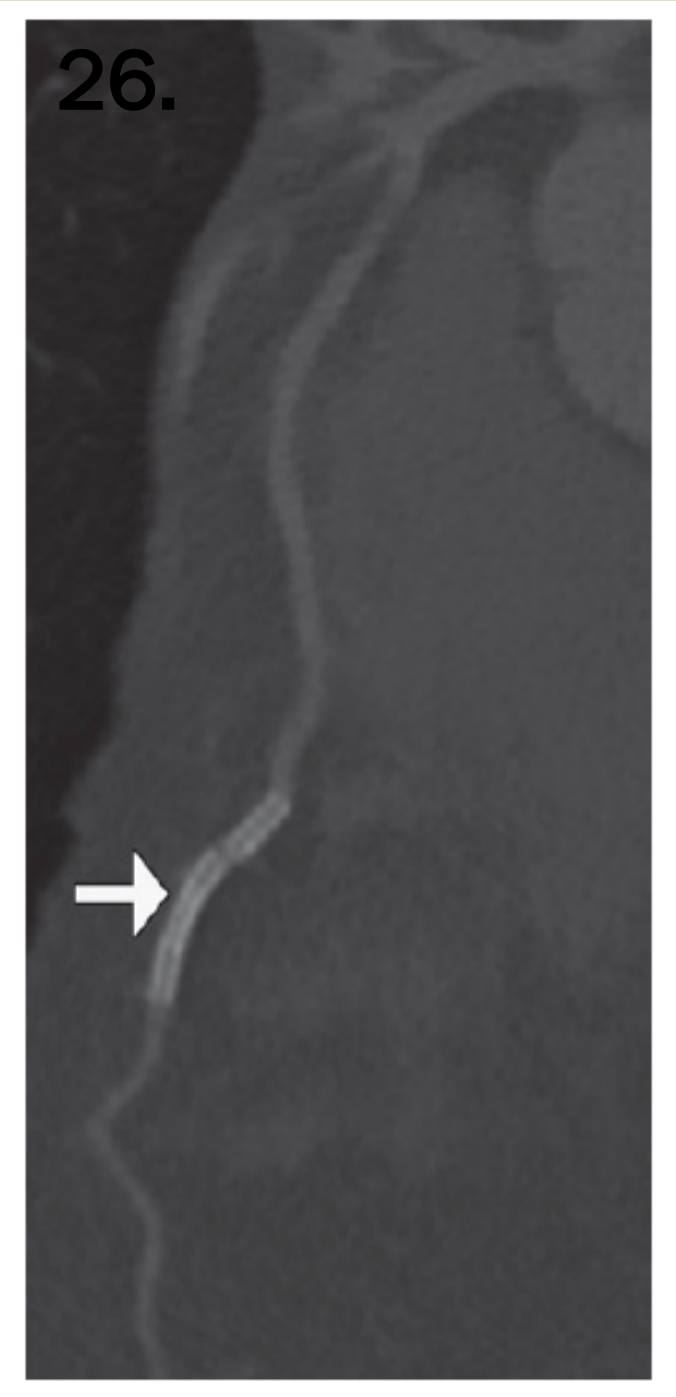
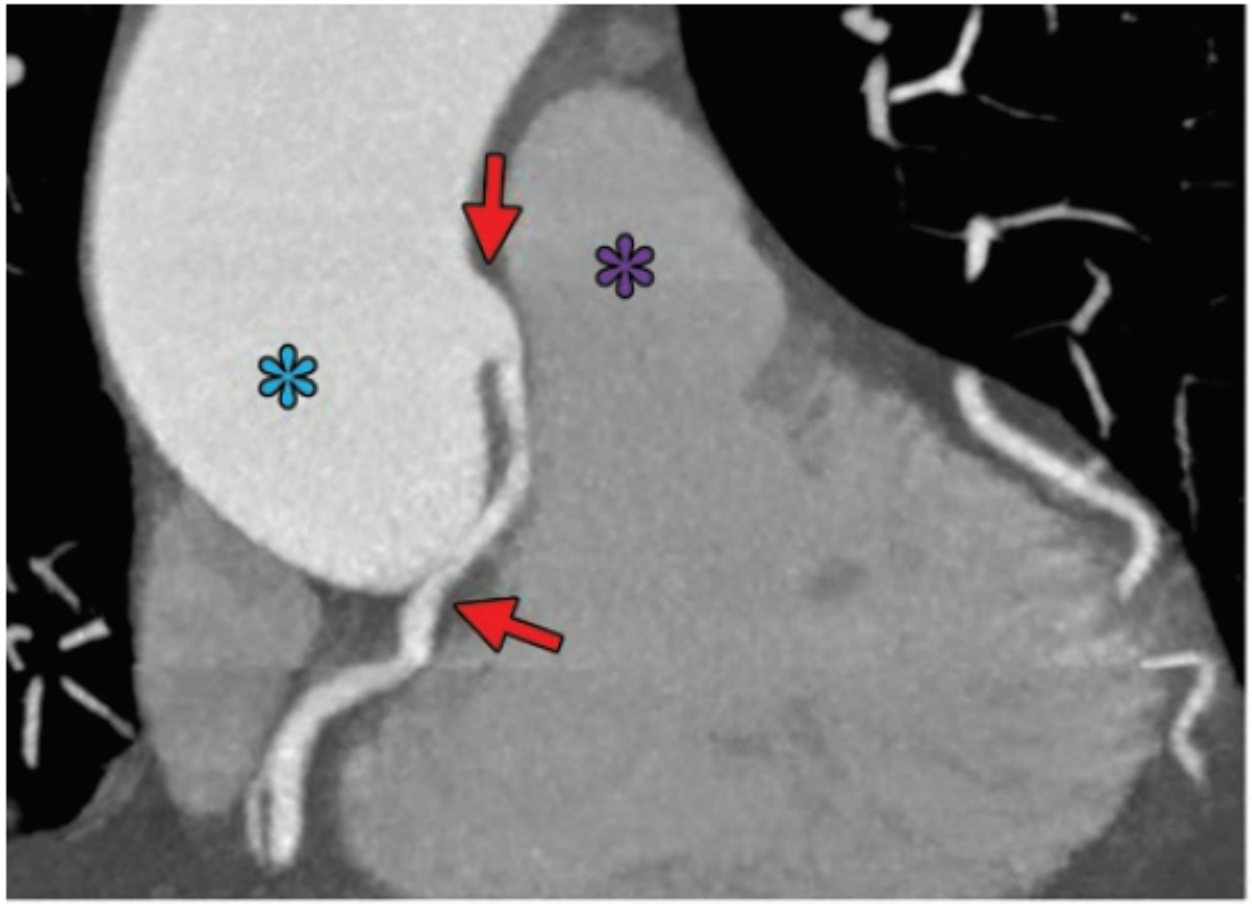

26.

a. b. c. d.



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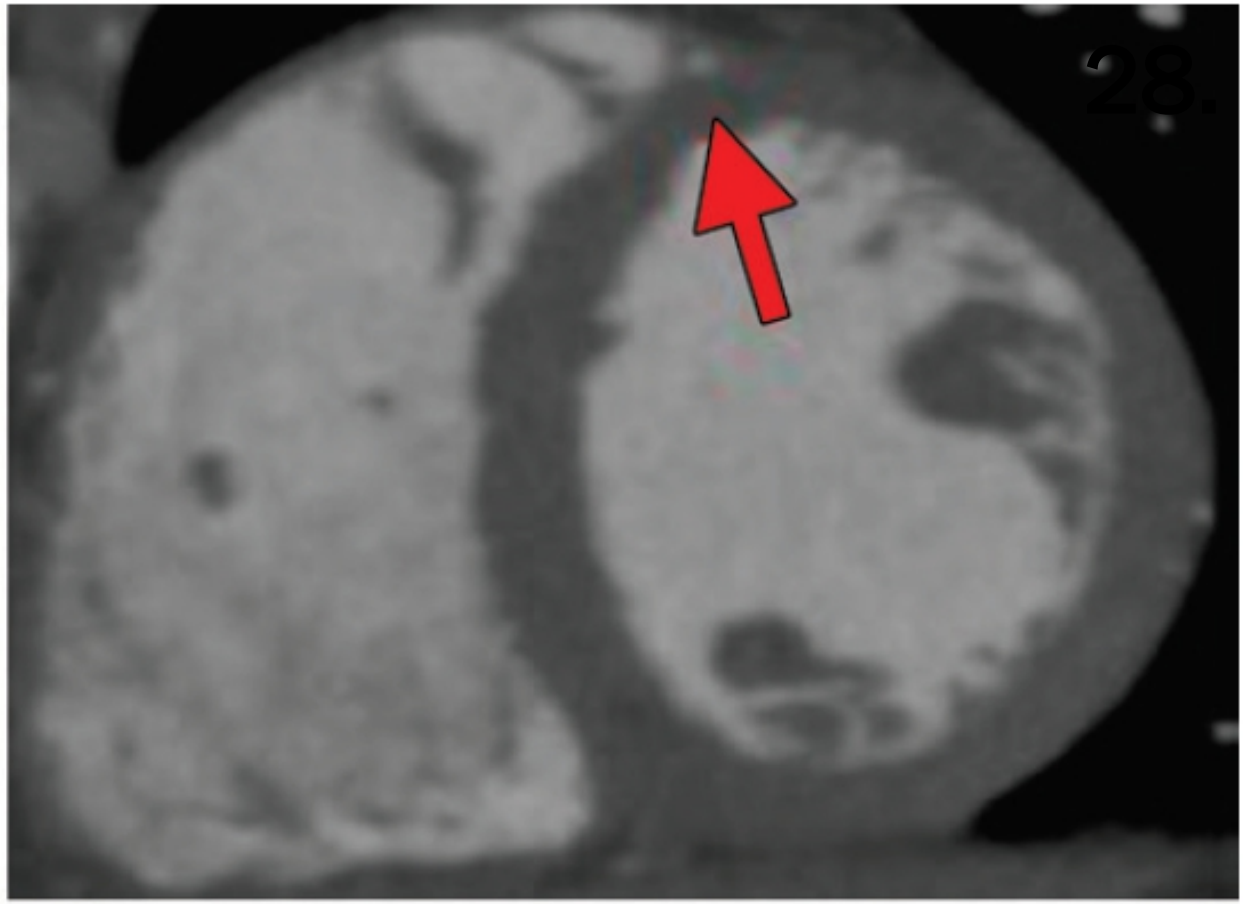

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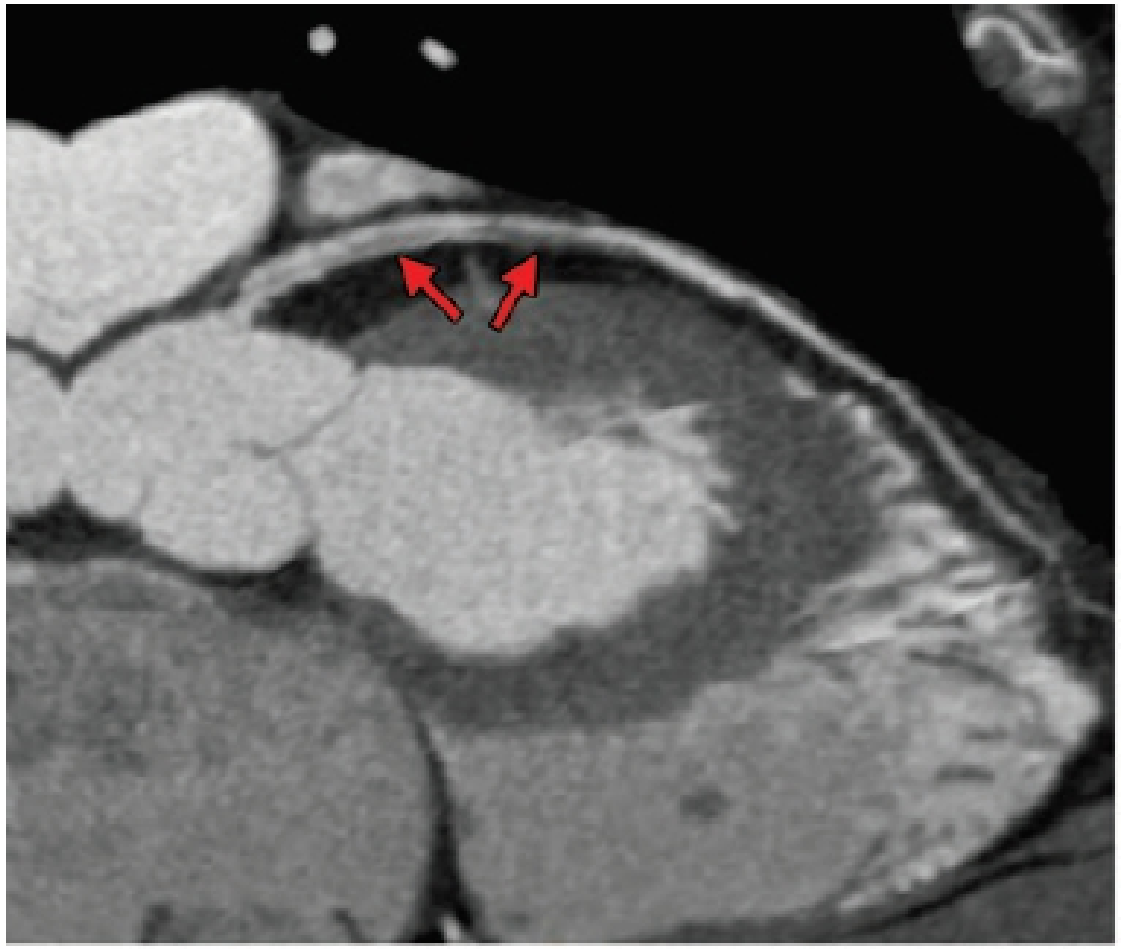

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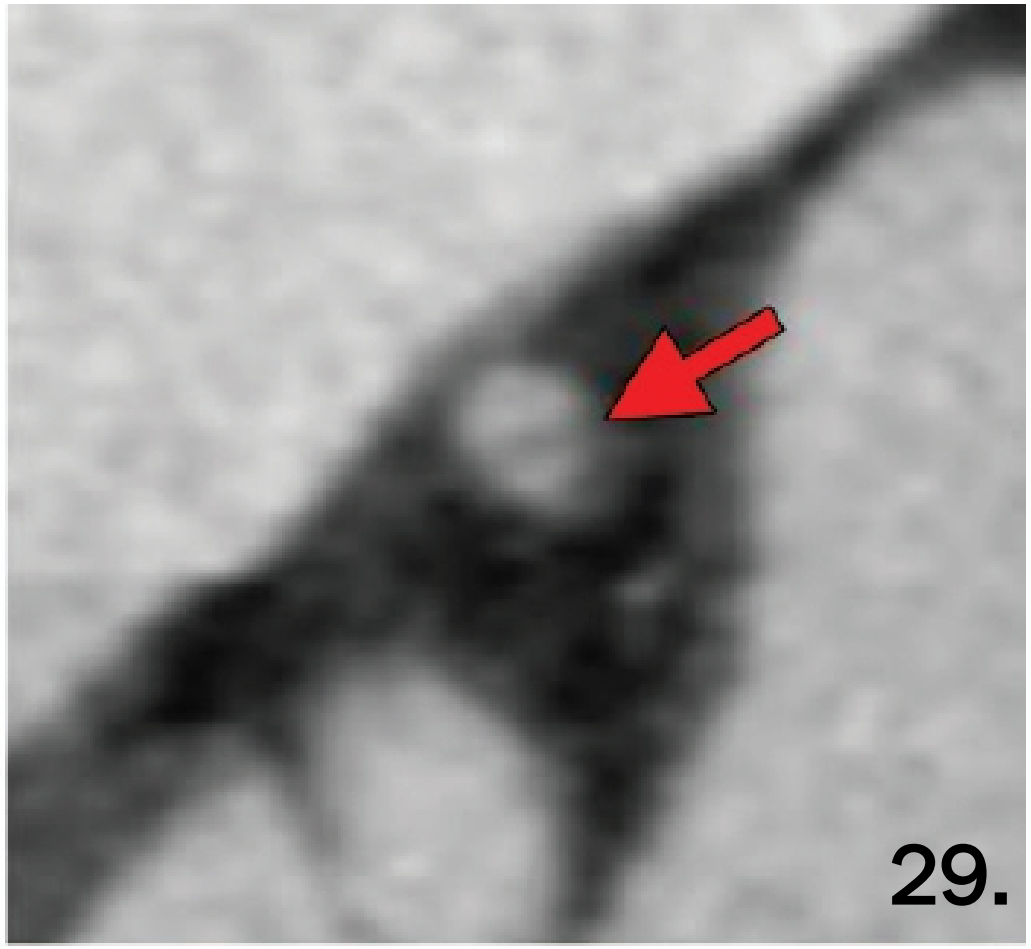
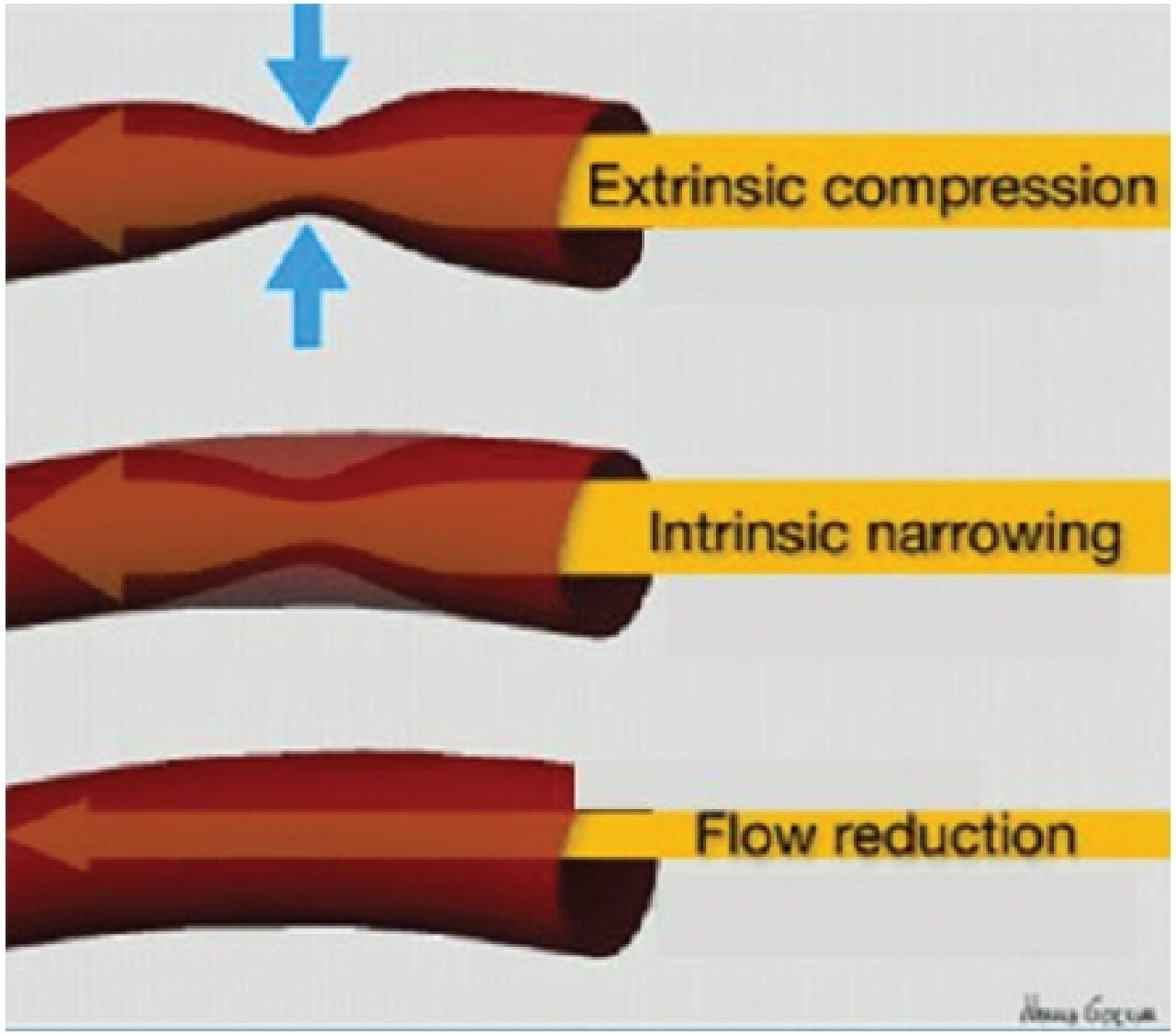
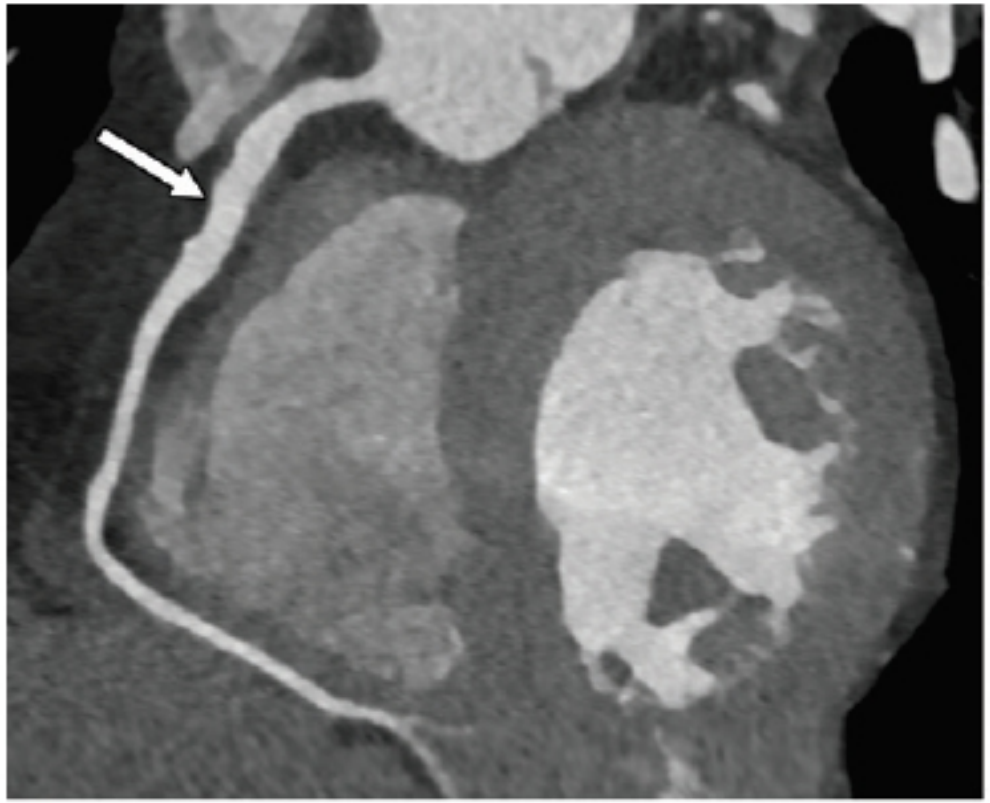



b.

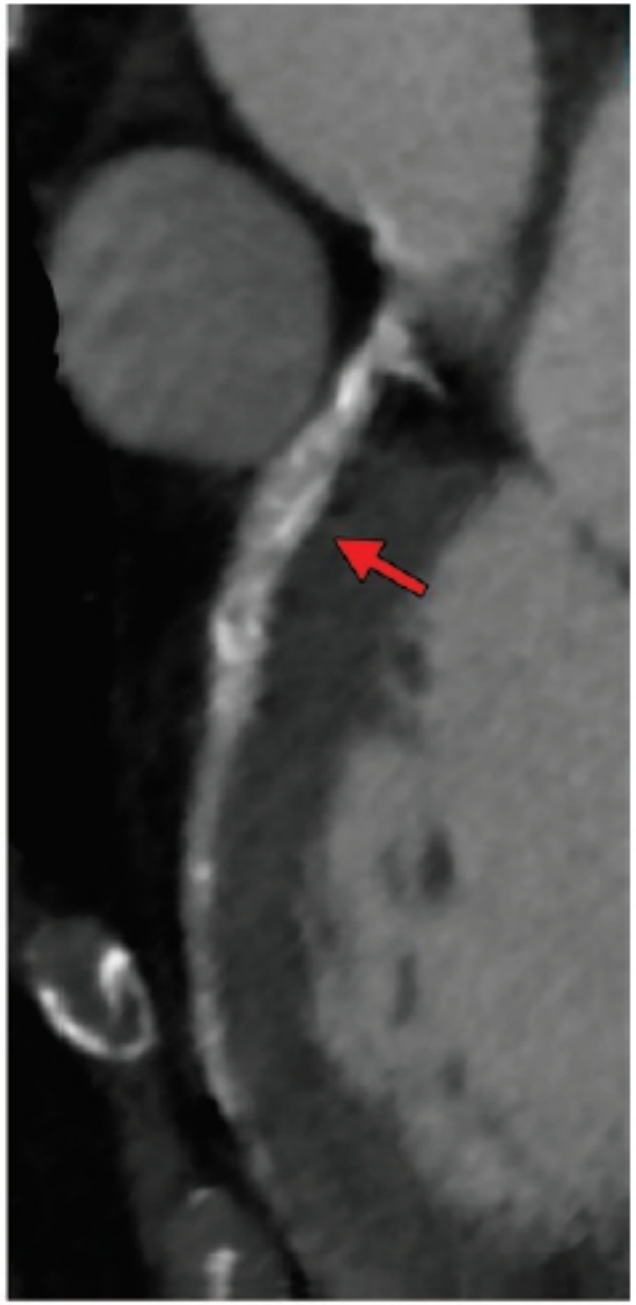
**Table 3: Nonatherosclerotic Causes of Coronary Artery Narrowing**

| Type of Coronary Artery Narrowing |
|---|
| **Extrinsic compression** |
| Interarterial course |
| Myocardial bridge |
| Mass (neoplastic or nonneoplastic) |
| Loop (kink) |
| Severe dilatation of pulmonary artery |
| **Intrinsic compression** |
| Embolus |
| Coronary dissection |
| Vasculitis |
| Fibromuscular hyperplasia |
| Idiopathic calcification |
| **Flow reduction** |
| High origin |
| Ostial obstruction |
| Vasospasm |
| Anomalous left coronary artery originating from pulmonary artery, and/or anomalous right coronary artery originating from pulmonary artery |
| Myocardial infarction with nonobstructive coronary arteries |
| Fistula |



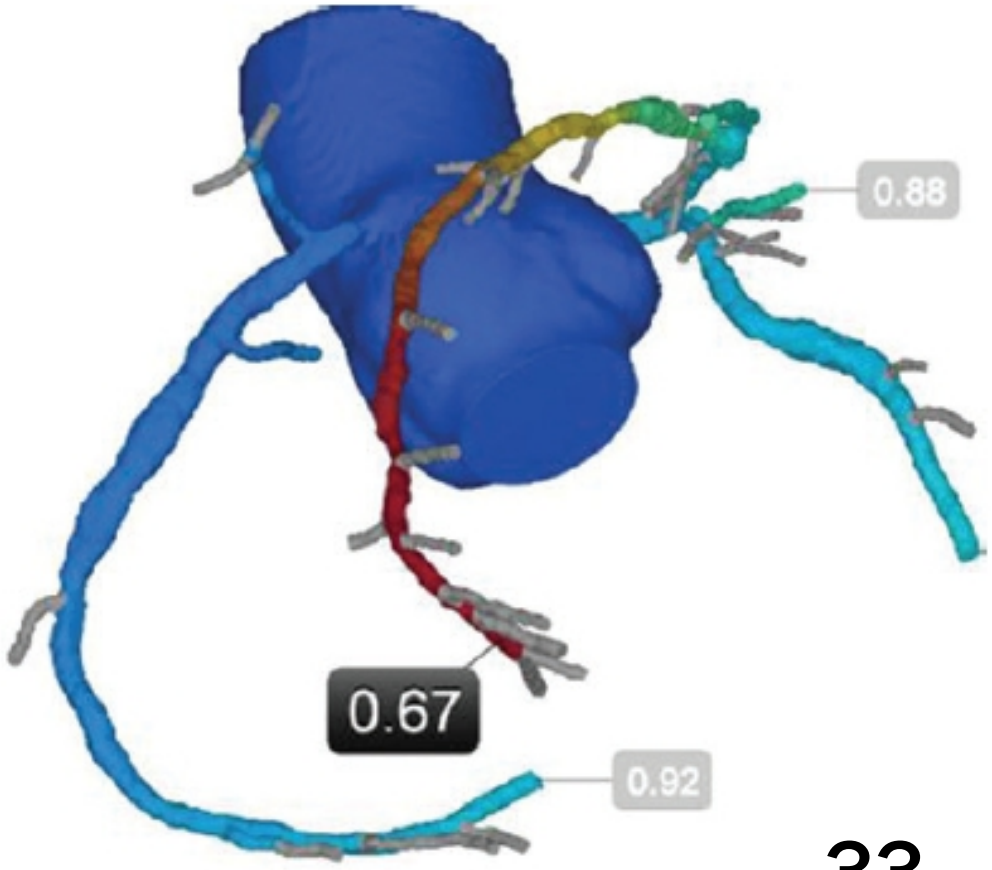


31.



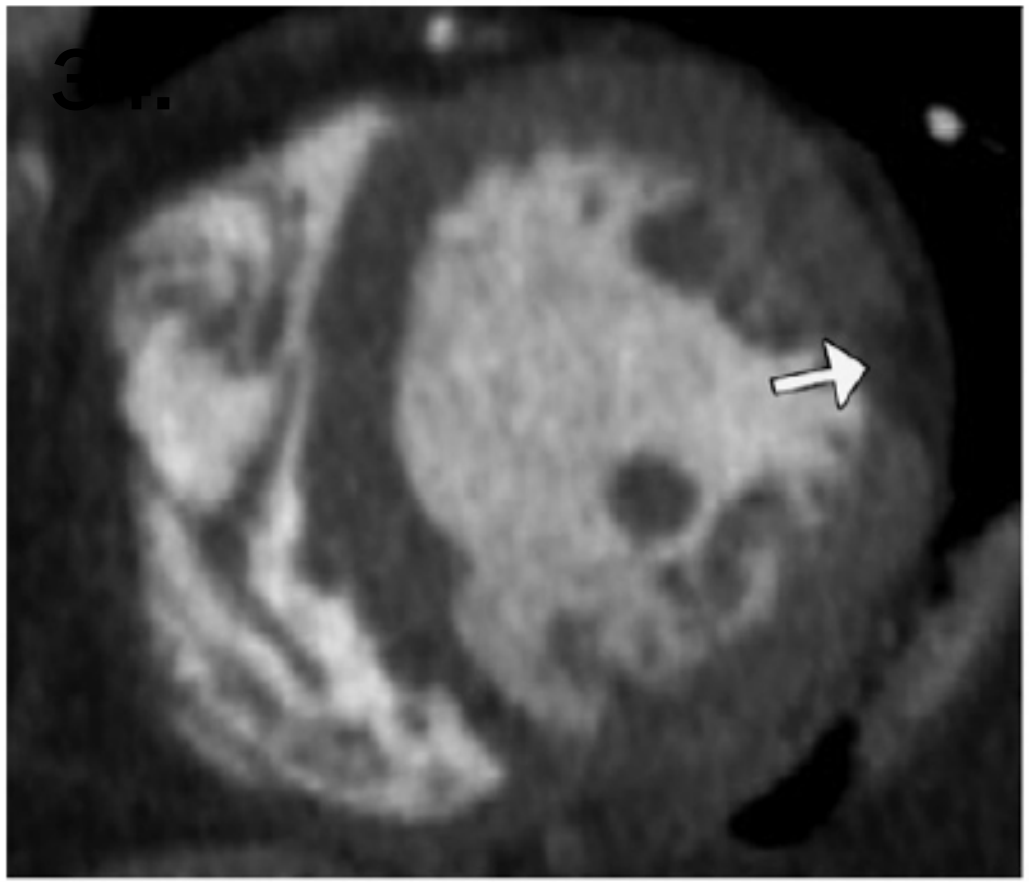
32.

a.

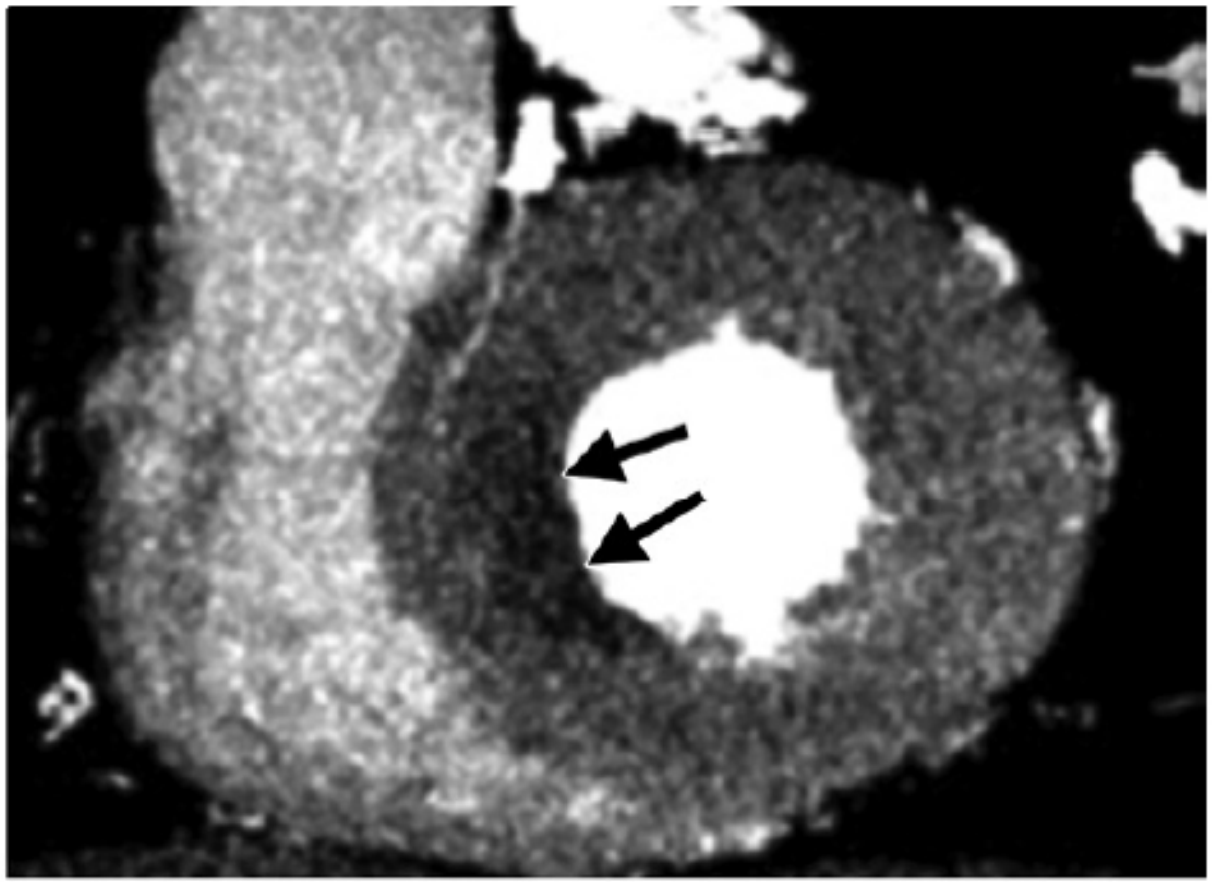



b.

33.



a.



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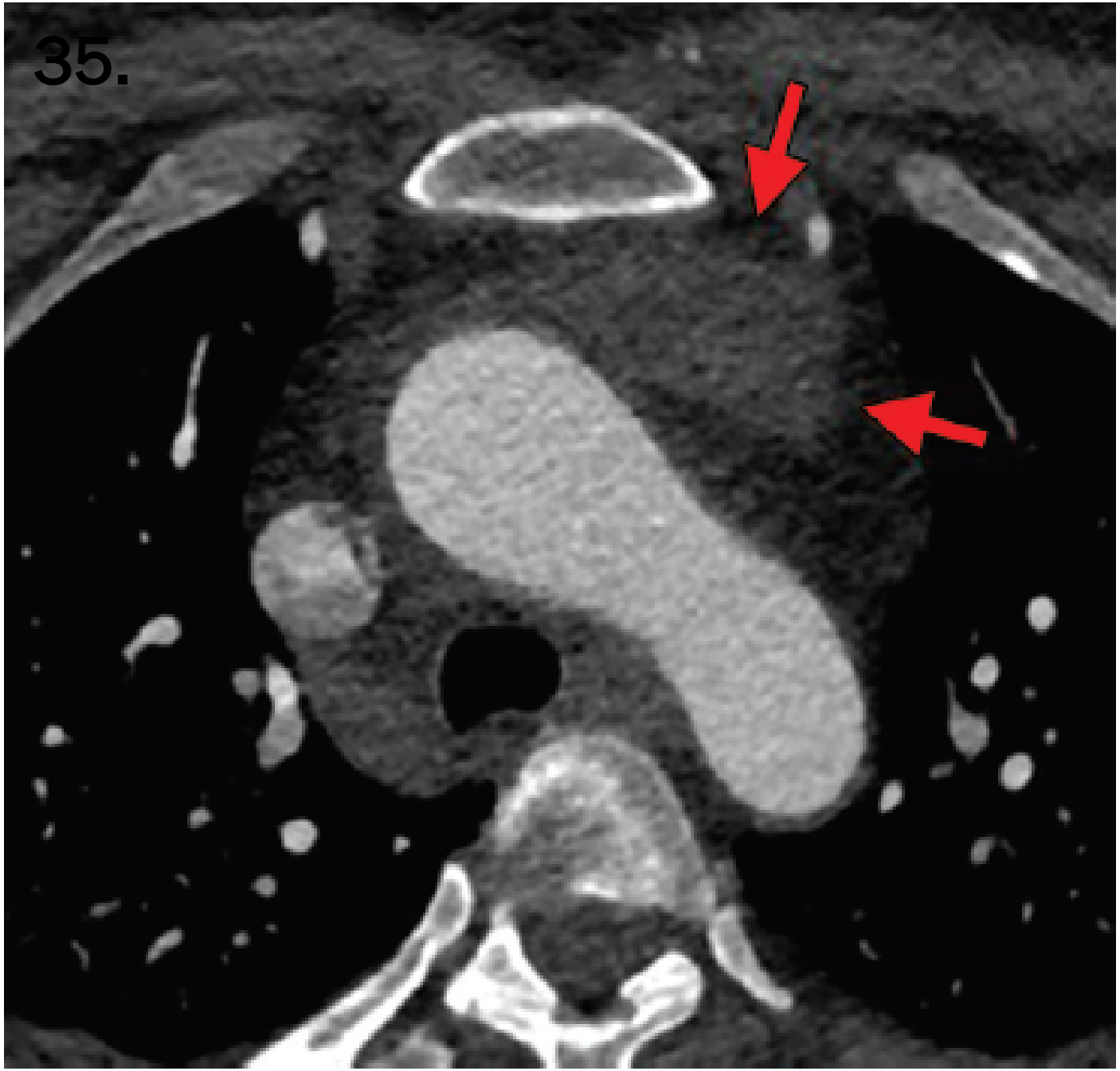
35.

# ESTATUS ACTUAL Y RUMBO FUTURO

# Estatus actual y rumbo futuro

- Alta reproducibilidad inter-observador
- Modificadores se agregan – lo esencial es la categoría
- Estudio CONFIRM con 5039 pacientes
  - *Índice libre de evento a los 5 años*
    - 95.2% para categoría 0
    - 0 - 69.3% para categoría 5

# CONCLUSIÓN

# Invited Commentary:
## CAD-RADS—Addressing the Gaps

*Galit Aviram, MD • Arik Wolak, MD*

See also the article by Canan et al in this issue.

**RadioGraphics 2020;** 40:653-655

**https://doi.org/10.1148/rg.2020190220**

**Abbreviations:** CAD = coronary artery disease, CAD-RADS = CAD Reporting and Data System

# A MODO DE SINAPSIS…