Spontaneous coronary artery dissection

DR. RORY FARNAN

INTERVENTIONAL CARDIOLOGY

ESSENTIA FARGO

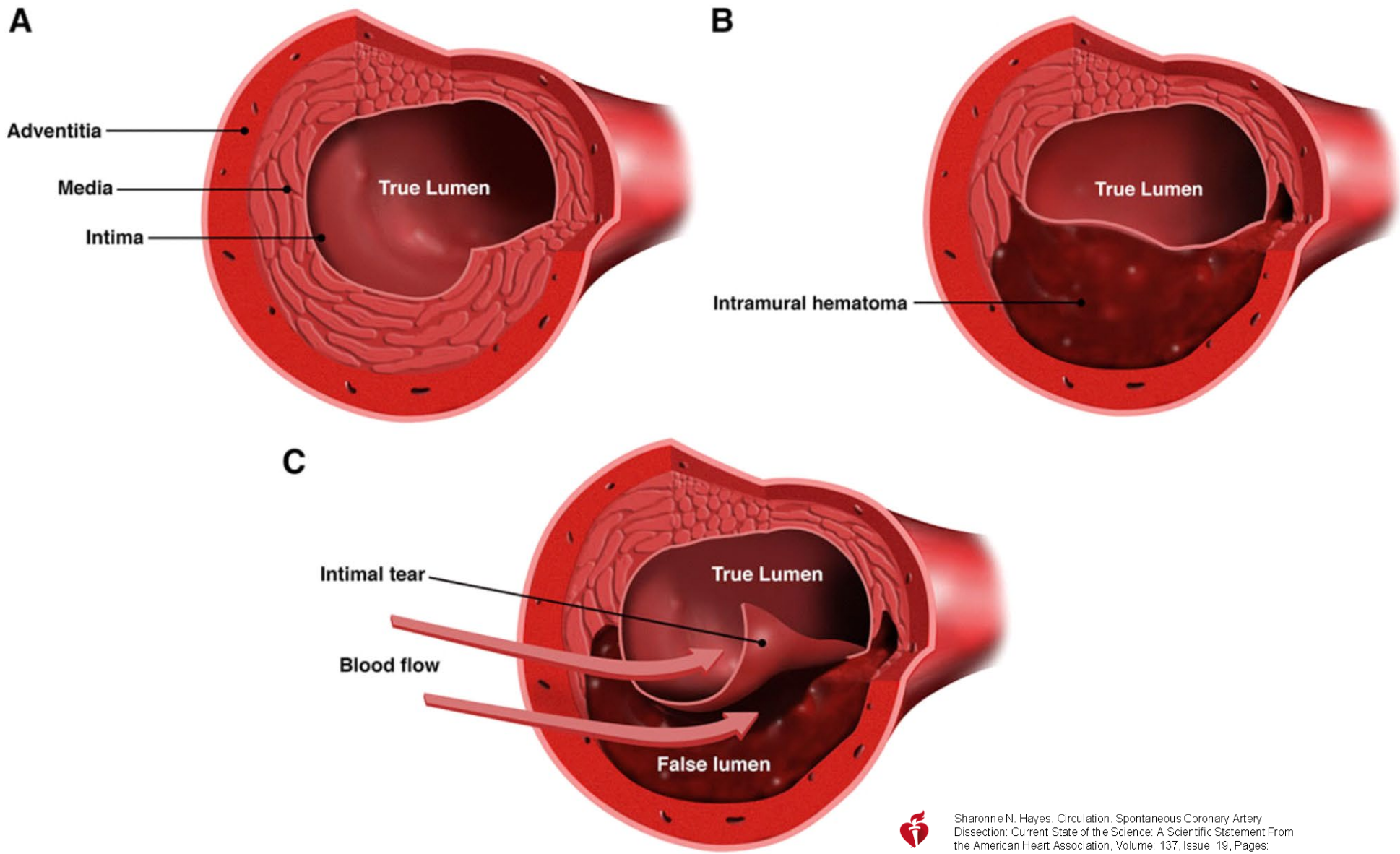
10/25/23

Objectives:

- **DEFINE** and describe SCAD including the **PATHOPHYSIOLOGY** of the disease
- Discuss the **EPIDEMILOGY** of SCAD
- Discuss **PRESENTATION** of SCAD
- Discuss **METHODS TO DIAGNOSE** SCAD
- Discuss **MANAGEMENT** of SCAD
- Discuss **PROGNOSIS**

Definition

- Non iatrogenic, non traumatic and non atherosclerotic separation of the coronary arterial wall



Sharonne N. Hayes. Circulation. Spontaneous Coronary Artery Dissection: Current State of the Science: A Scientific Statement From the American Heart Association, Volume: 137, Issue: 19, Pages: e523-e557, DOI: (10.1161/CIR.0000000000000564)

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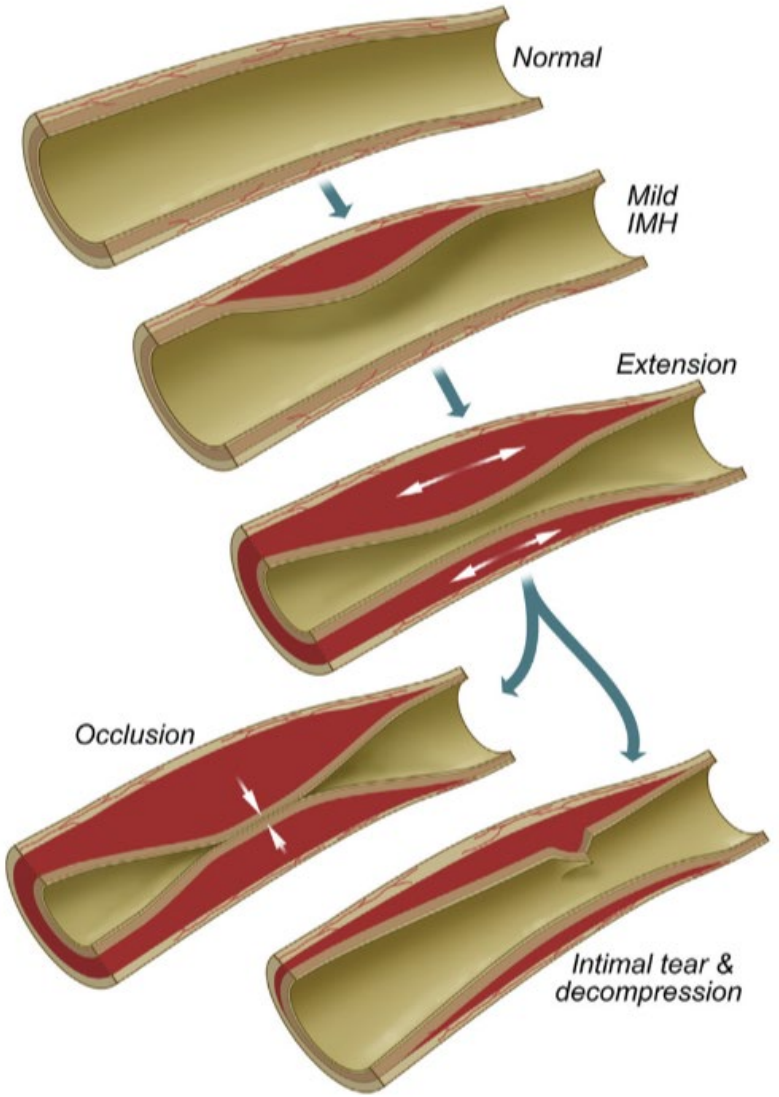
FIGURE 1 Pathogenesis and Natural History of Spontaneous Coronary Artery Dissection



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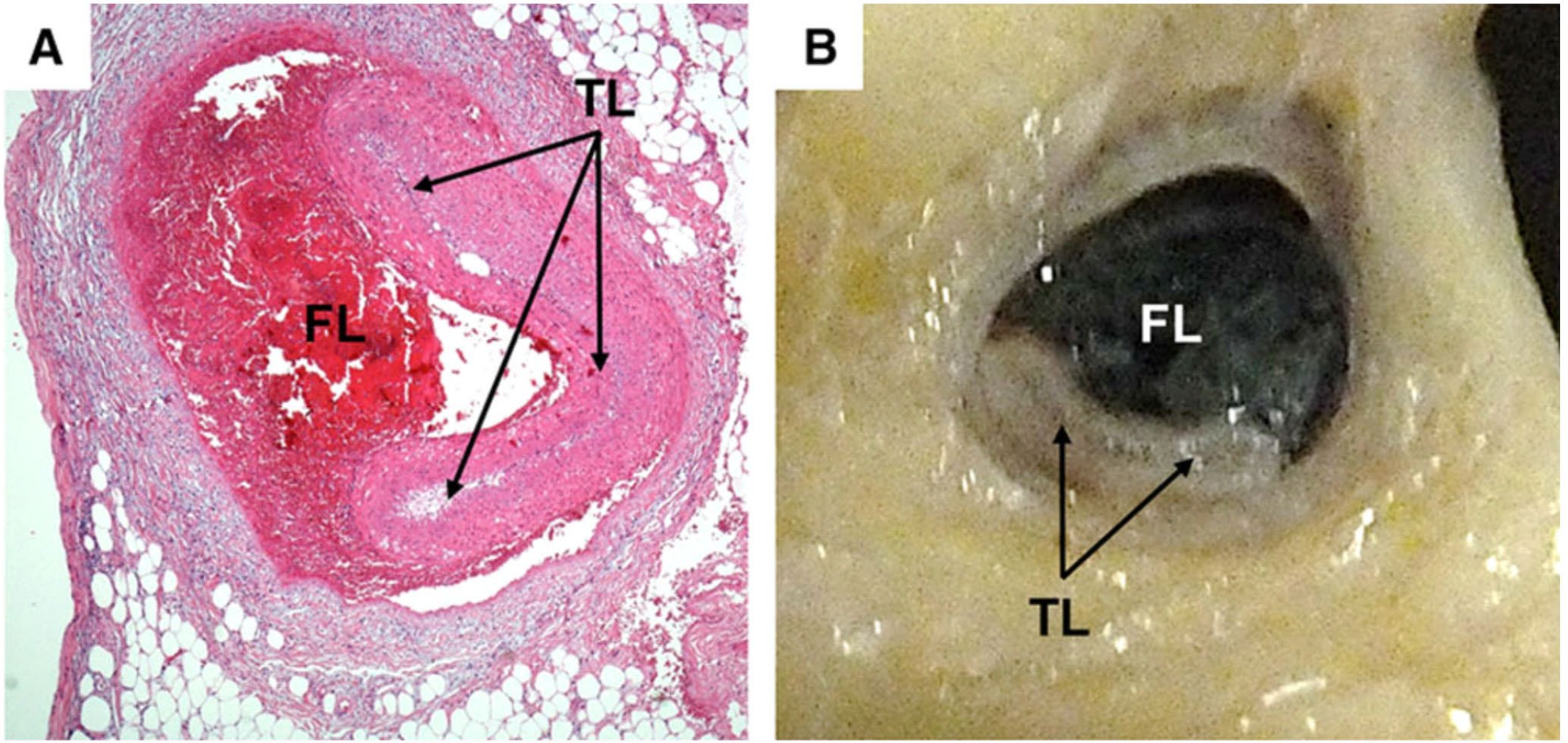
THE PRESENT AND FUTURE

JACC STATE-OF-THE-ART REVIEW

Spontaneous Coronary Artery Dissection

JACC State-of-the-Art Review

Sharonne N. Hayes, MD,[a] Marysia S. Tweet, MD,[a] David Adlam, DPhil,[b] Esther S.H. Kim, MD,[c] Rajiv Gulati, MD,[a] Joel E. Price, MD, MPH,[d] Carl H. Rose, MD[c]



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Pathophysiology

- Bleeding of vasa vasorum +/- intimal tear
- Inflammation
- Tortuosity

Epidemiology

- Incidence:
  - Up to 0.5% of those with ACS
  - Up to 1% of those undergoing LHC

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Epidemiology

- Underdiagnosed and misdiagnosed especially in the past

Epidemiology

- Sex:
  - F>M
    - 80-95%

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Epidemiology

- Age:
  - Mean age 43-52 years old

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Epidemiology

- Age:
  - Men present younger
    - 48.6 vs 52.3 years old

Pre-Disposing and Precipitating Factors in Men With Spontaneous Coronary Artery Dissection. Fahmy P, Prakash R, Starovoytov A, Boone R, Saw J. JACC Cardiovasc Interv. 2016;9(8):866.

Etiologies

- Idiopathic
  - 20%

Spontaneous coronary artery dissection: association with predisposing arteriopathies and precipitating stressors and cardiovascular outcomes. Saw J, Aymong E, Sedlak T, Buller CE, Starovoytov A, Ricci D, Robinson S, Vuurmans T, Gao M, Humphries K, Mancini GB. Circ Cardiovasc Interv. 2014 Oct;7(5):645-55. Epub 2014 Oct 7.

Etiologies

- Fibromuscular dysplasia
  - 25-86% cases of SCAD
- Connective tissue disorders (Marfans; vascular Ehlers-Danlos)
  - 1.2-3%
- Systemic inflammatory conditions (SLE, PAN, sarcoidosis, Crohns disease)
  - <1-8.9%

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Disease associations

- Pregnancy and post partum
  - Multiparity ≥ 4 births
    - 8.9-10%
  - 1st month post partum
- Other hormonal causes
  - IVF, HRT, OCP
    - 10.7-12.6%

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Triggers

- > 50%

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Triggers

- Emotional stress
  - 50%
- Exercise
  - 28.9%
- Drugs
  - Cocaine; methamphetamines

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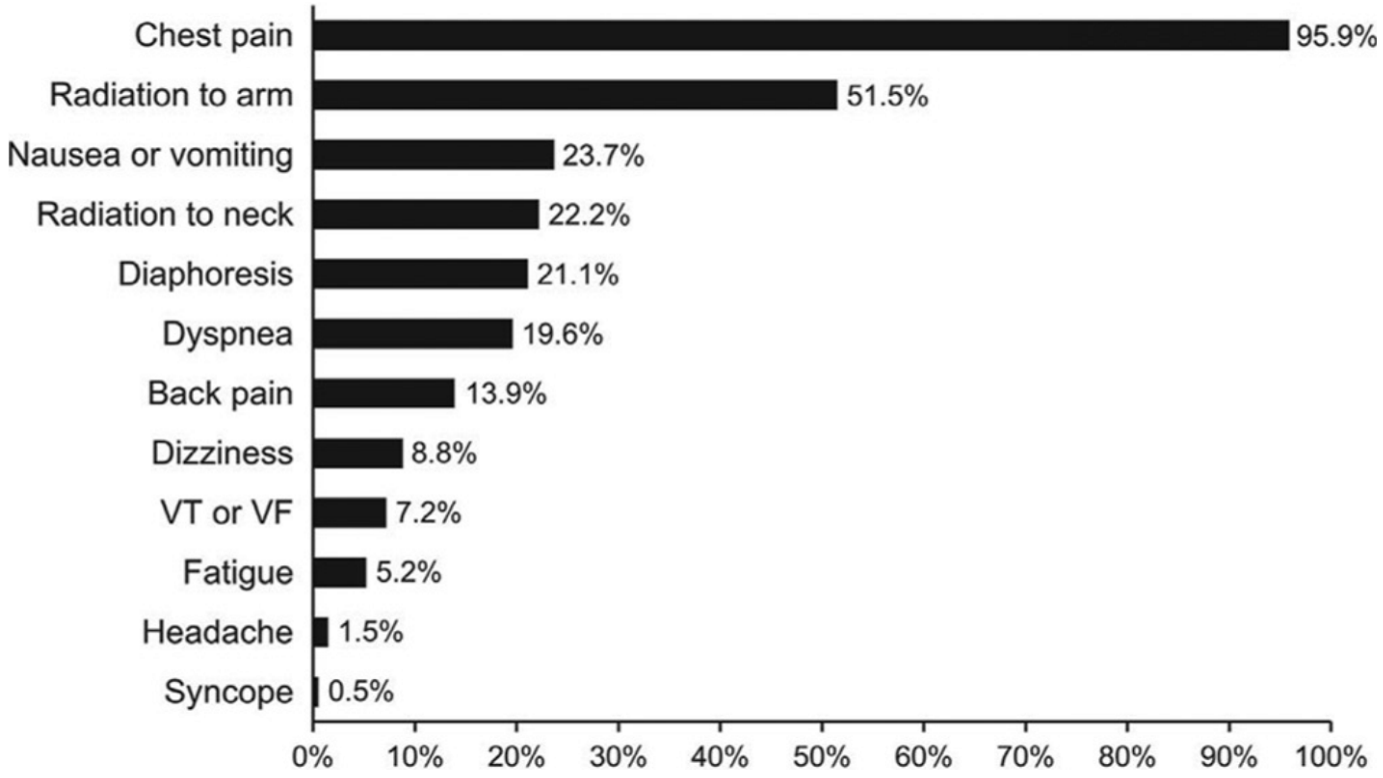
Presentation



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Diagnosis

- EKG
  - ST elevation
    - 46%
  - T wave abnormality
    - 22%
  - Normal
    - 16%

The presentation of spontaneous coronary artery dissection in the emergency department: Signs and symptoms in an unsuspecting population. Johnson AK, Tweet MS, Rouleau SG, Sadosty AT, Hayes SN, Raukar NP. Acad Emerg Med. 2022;29(4):423. Epub 2021 Dec 26.

Diagnosis

- Echocardiography

Diagnosis

- Angiogram

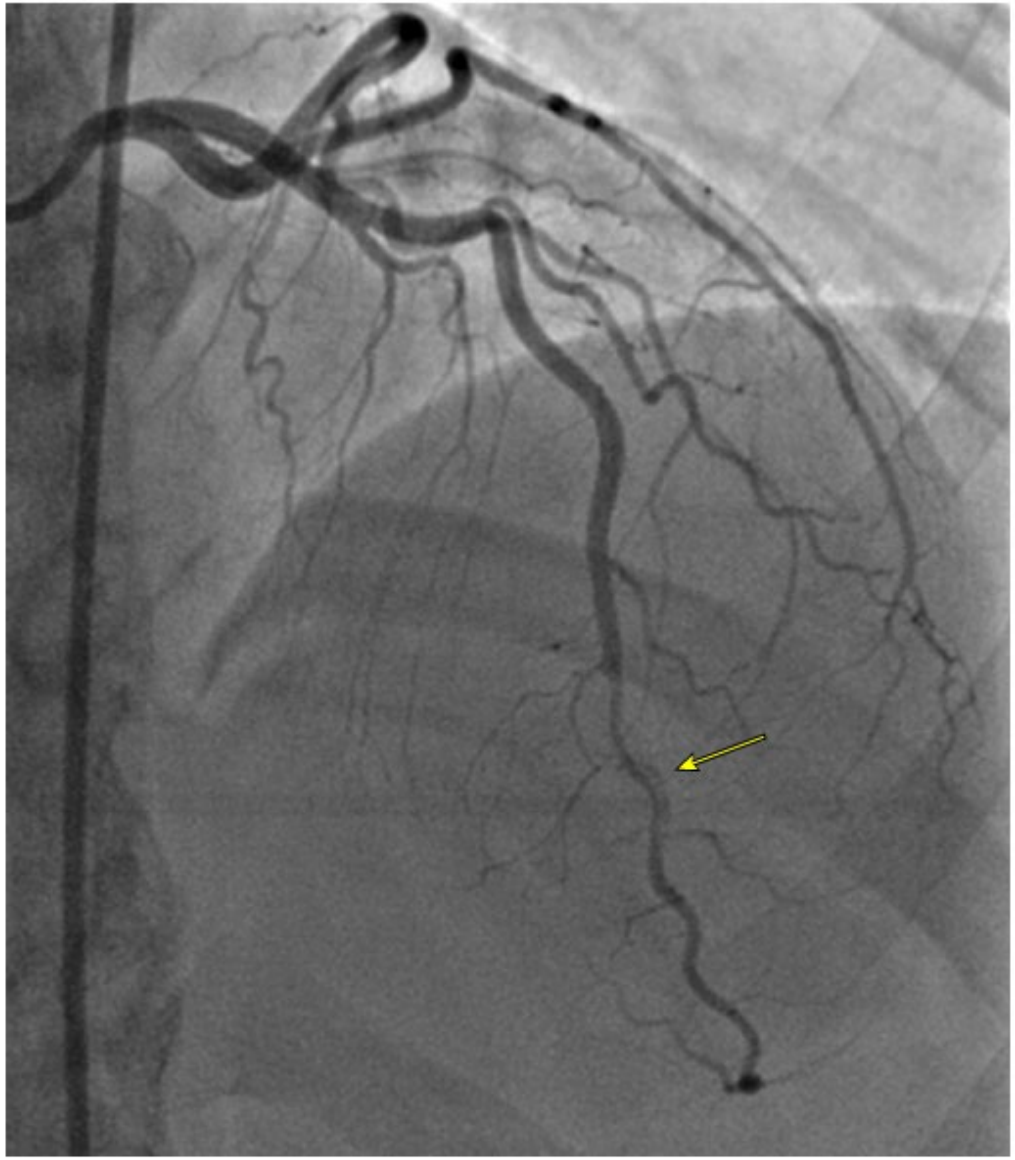
Diagnosis

- Angiogram:
  - Type I
  - Type II
  - Type III

TYPE I:

Contrast dye staining of arterial wall with multiple radiolucent lumen, with or without presence of dye hang up or slow contrast clearing

Type 1 angiographic spontaneous coronary artery dissection



Courtesy of Jacqueline Saw, MD.

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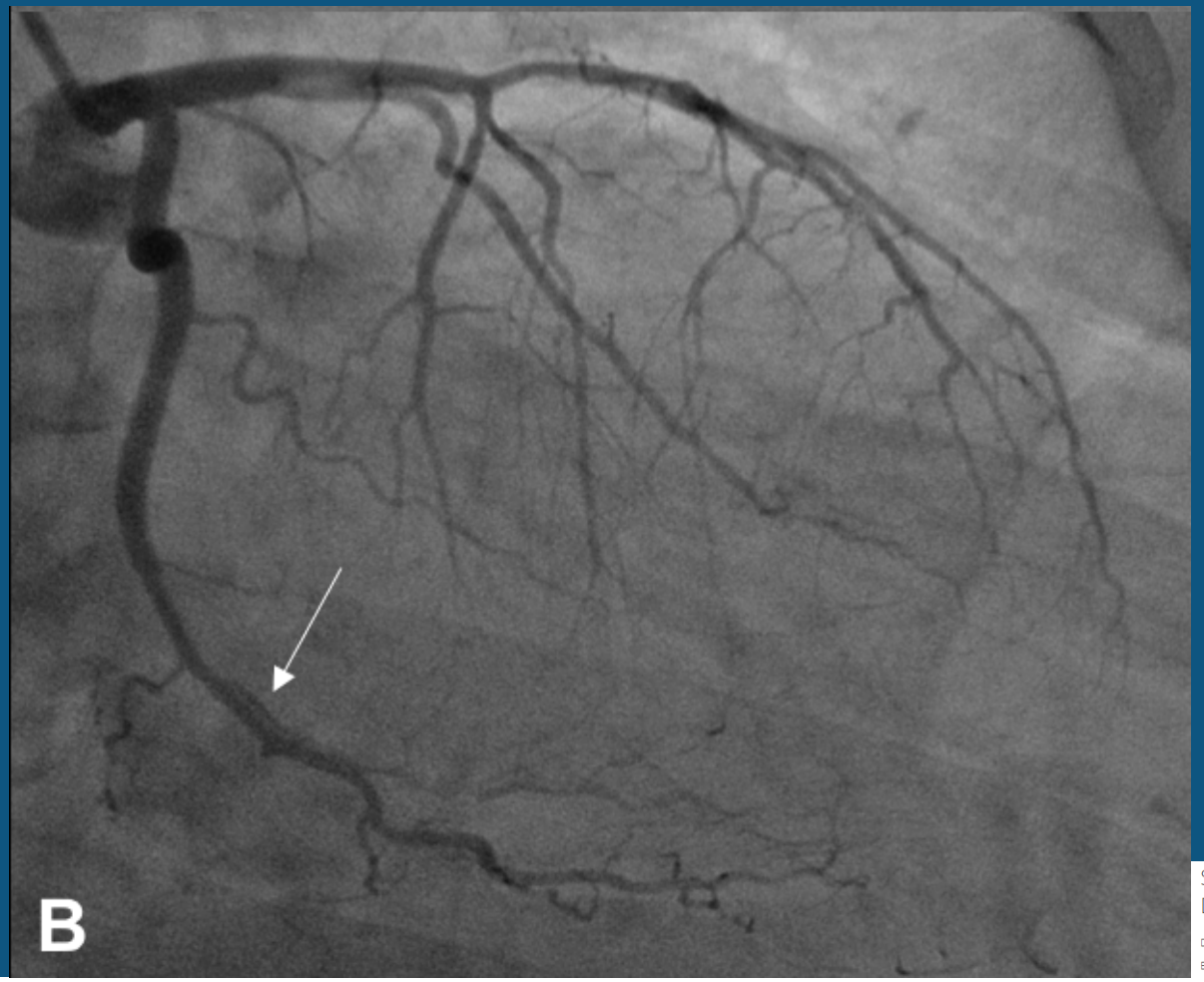
Diagnosis



Spontaneous Coronary Artery Dissection: Clinical Considerations in Diagnosis and Treatment

Dec 20, 2019 | ashkan parsa, MD; Jacqueline W. L. Saw, MD, FACC

Expert Analysis

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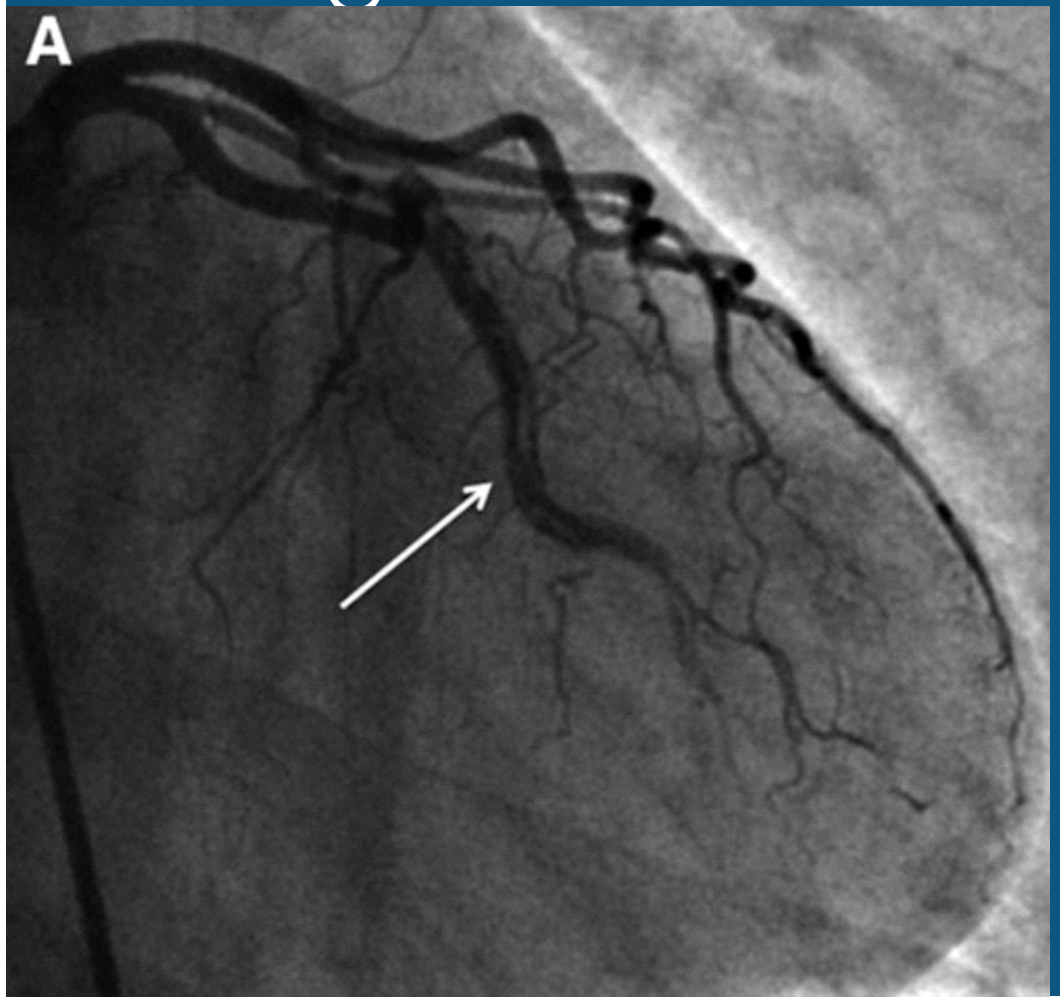
Diagnosis



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TYPE II:

Diffuse long and smooth stenosis that can vary in severity from mild to complete occlusion

Type 2 angiographic spontaneous coronary artery dissection

Courtesy of Jacqueline Saw, MD.

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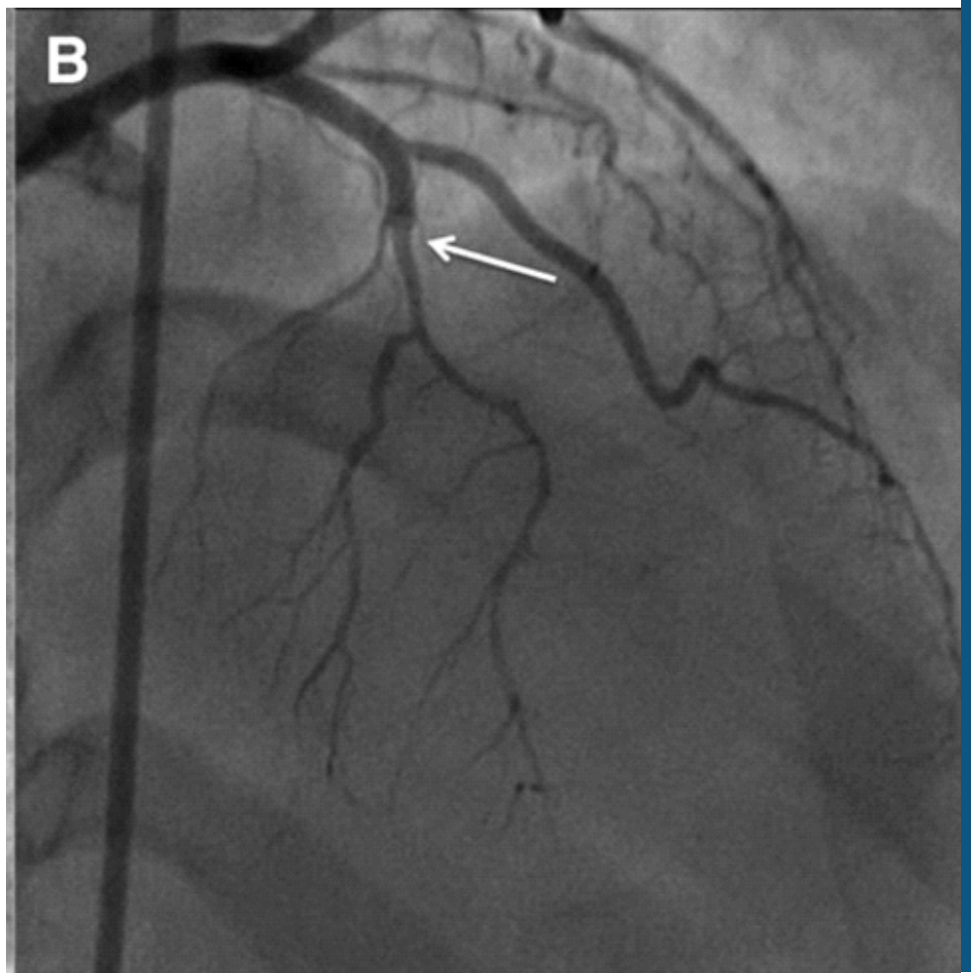
Diagnosis



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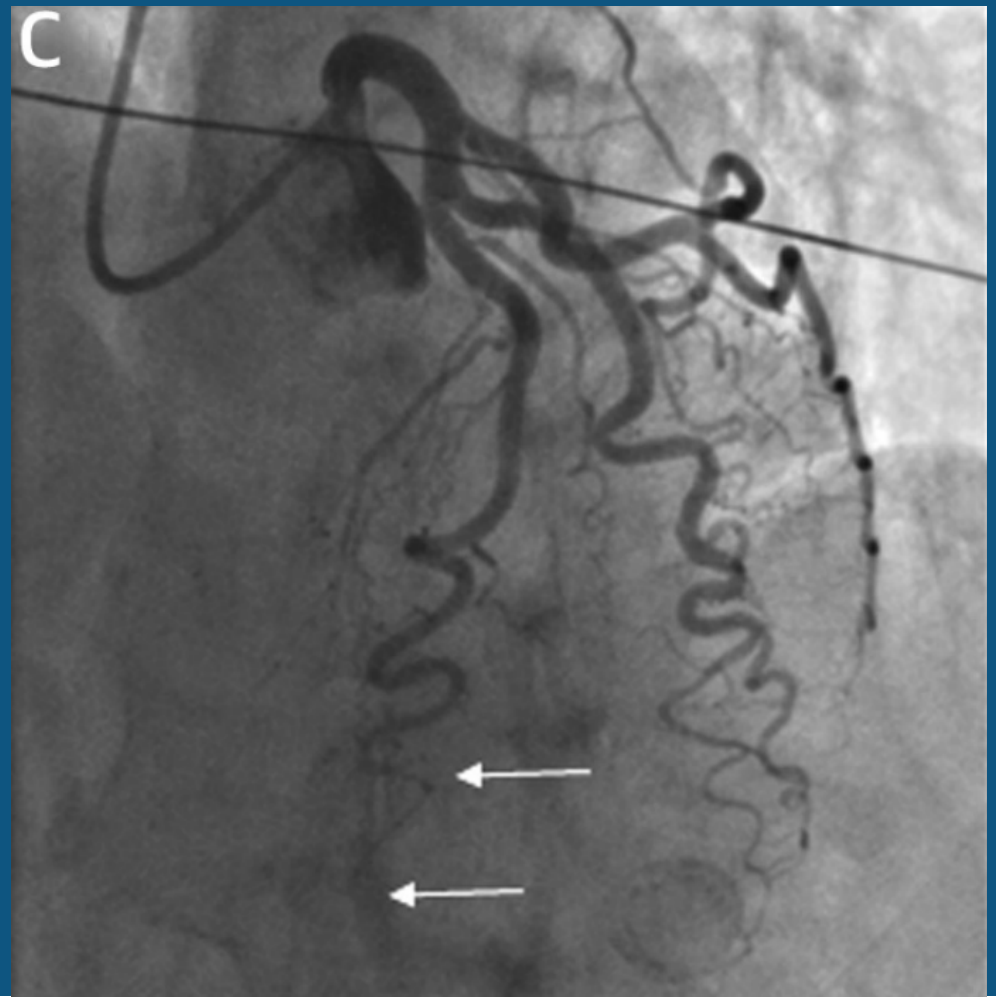
Diagnosis



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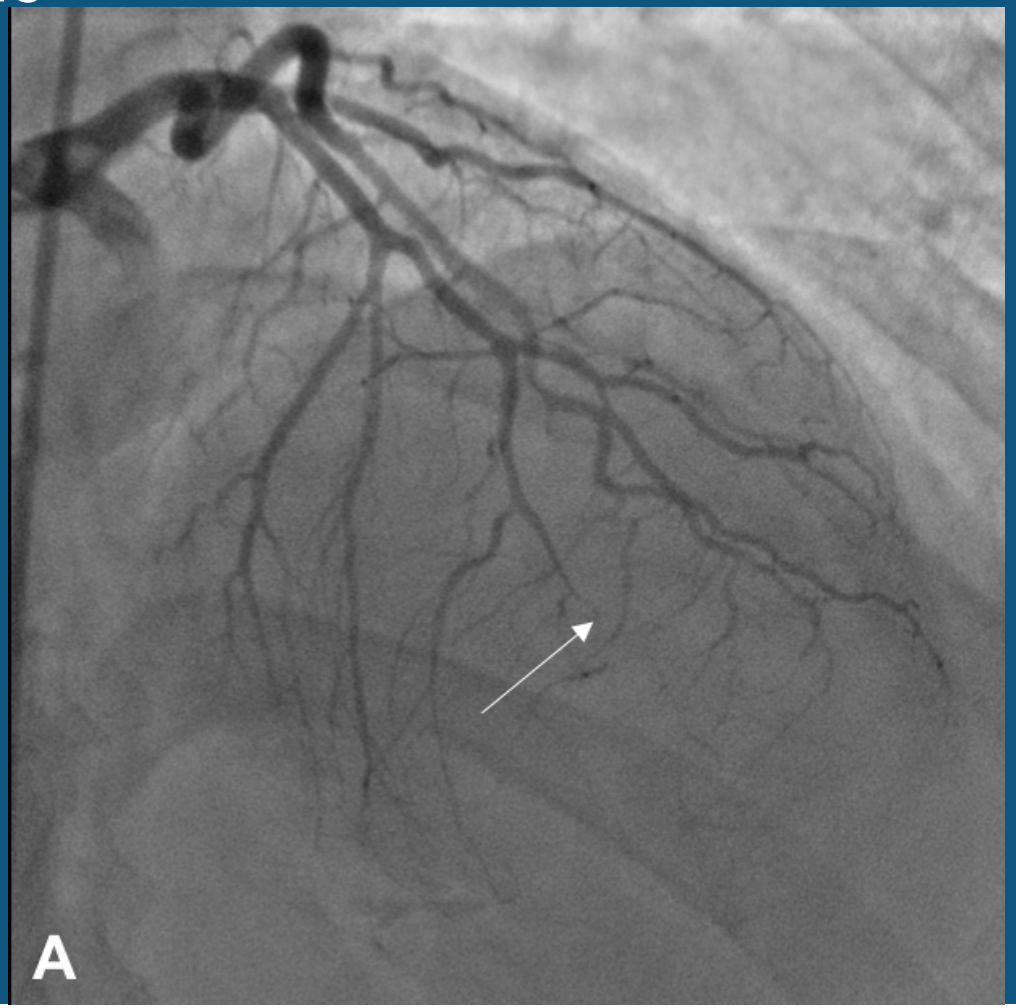
Diagnosis



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Dec 20, 2019 | ashkan parsa, MD; Jacqueline W. L. Saw, MD, FACC

Expert Analysis

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TYPE III:

Mimics atherosclerosis with focal or tubular stenosis and requires IVUS/OCT to differentiate the cause

Type 3 angiographic spontaneous coronary artery dissection

Courtesy of Jacqueline Saw, MD.

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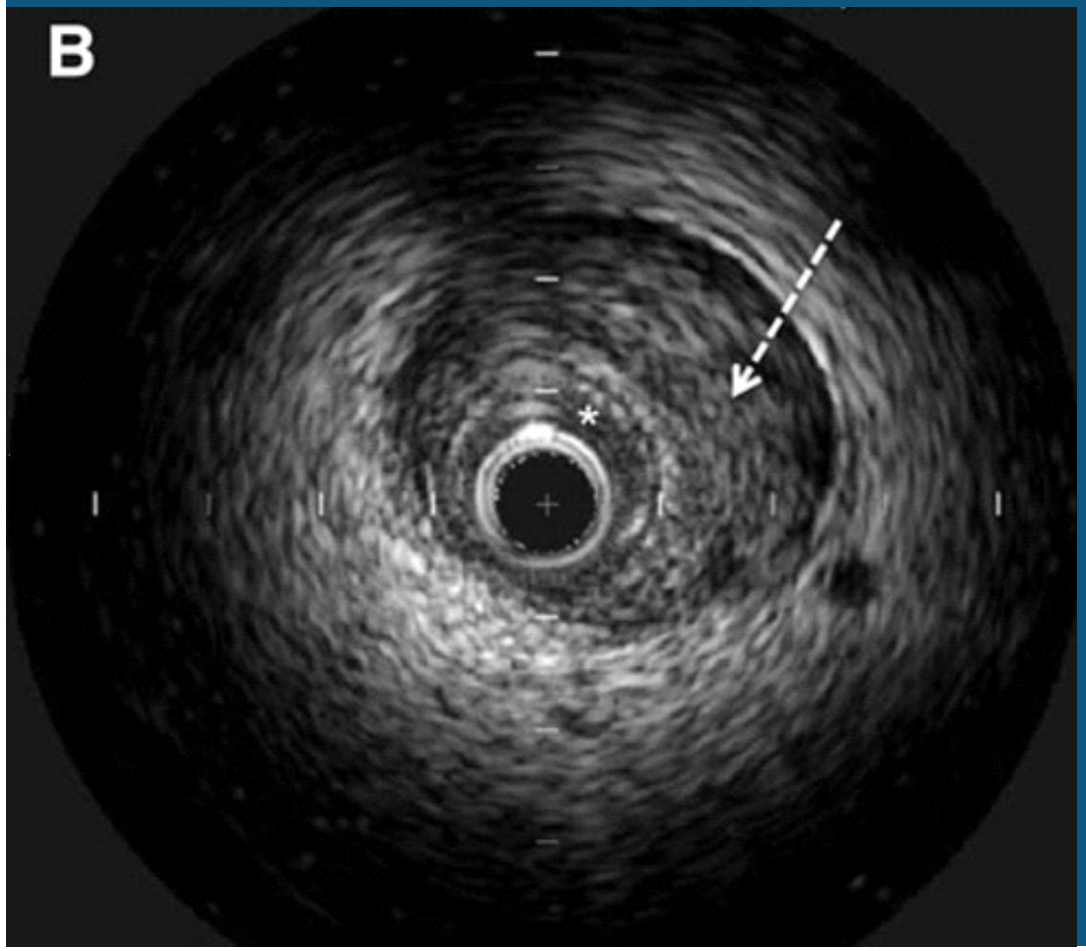
Diagnosis

- IVUS
  - Intravascular ultrasound
- OCT
  - Optical Coherence Tomography

Diagnosis



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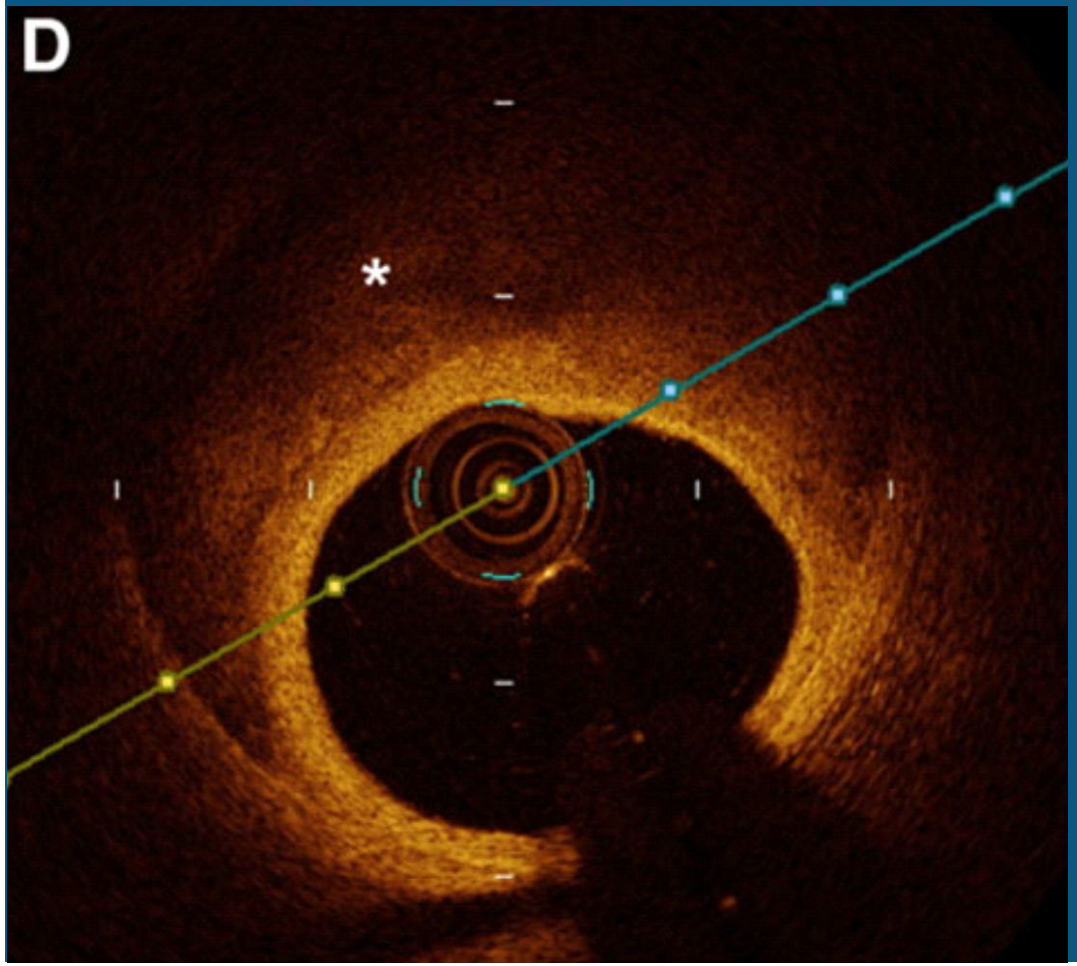
Diagnosis



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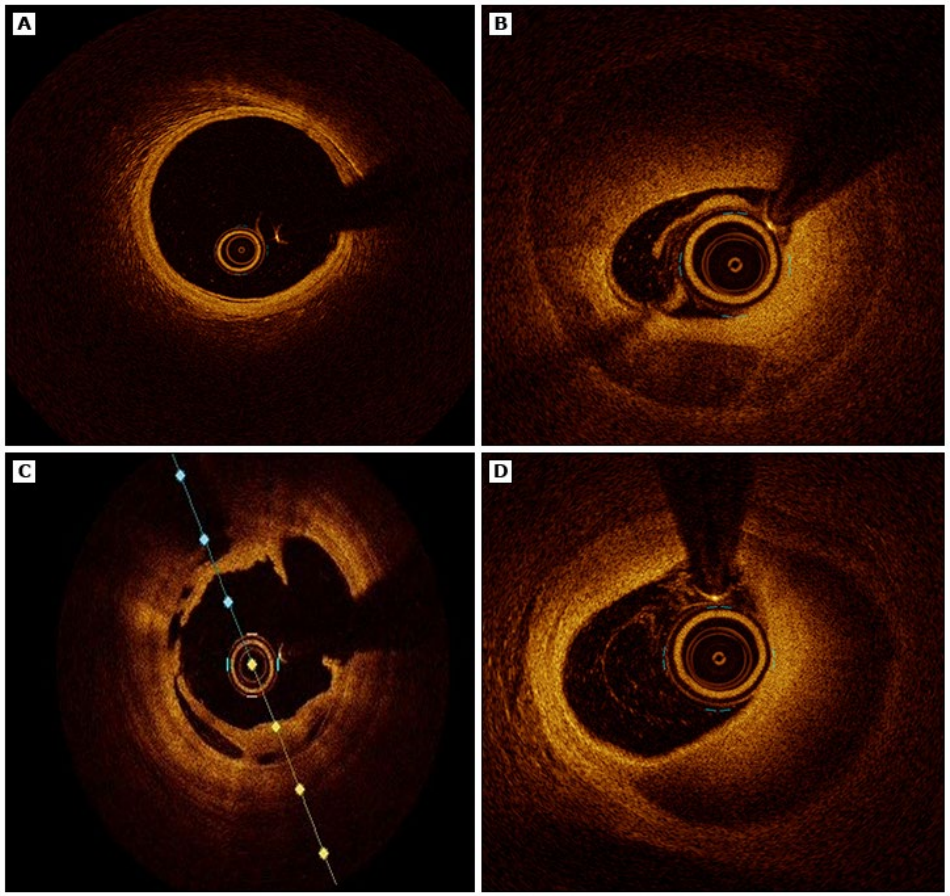
Diagnosis

Intraluminal images seen on optical coherence tomography



(A) normal coronary artery, (B) coronary dissection with double lumen view, (C) intracoronary dissection flap, and (D) intramural hematoma.

From: Barbieri L, D'Errico A, Avallone C, et al. Optical coherence tomography and coronary dissection: Precious tool or useless surplus? Front Cardiovasc Med 2022; 9:822998. Copyright © 2022 The Authors. https://www.frontiersin.org/articles/10.3389/fcvm.2022.822998 (Accessed on July 6, 2023). Reproduced under the terms of the Creative Commons Attribution License 4.0.

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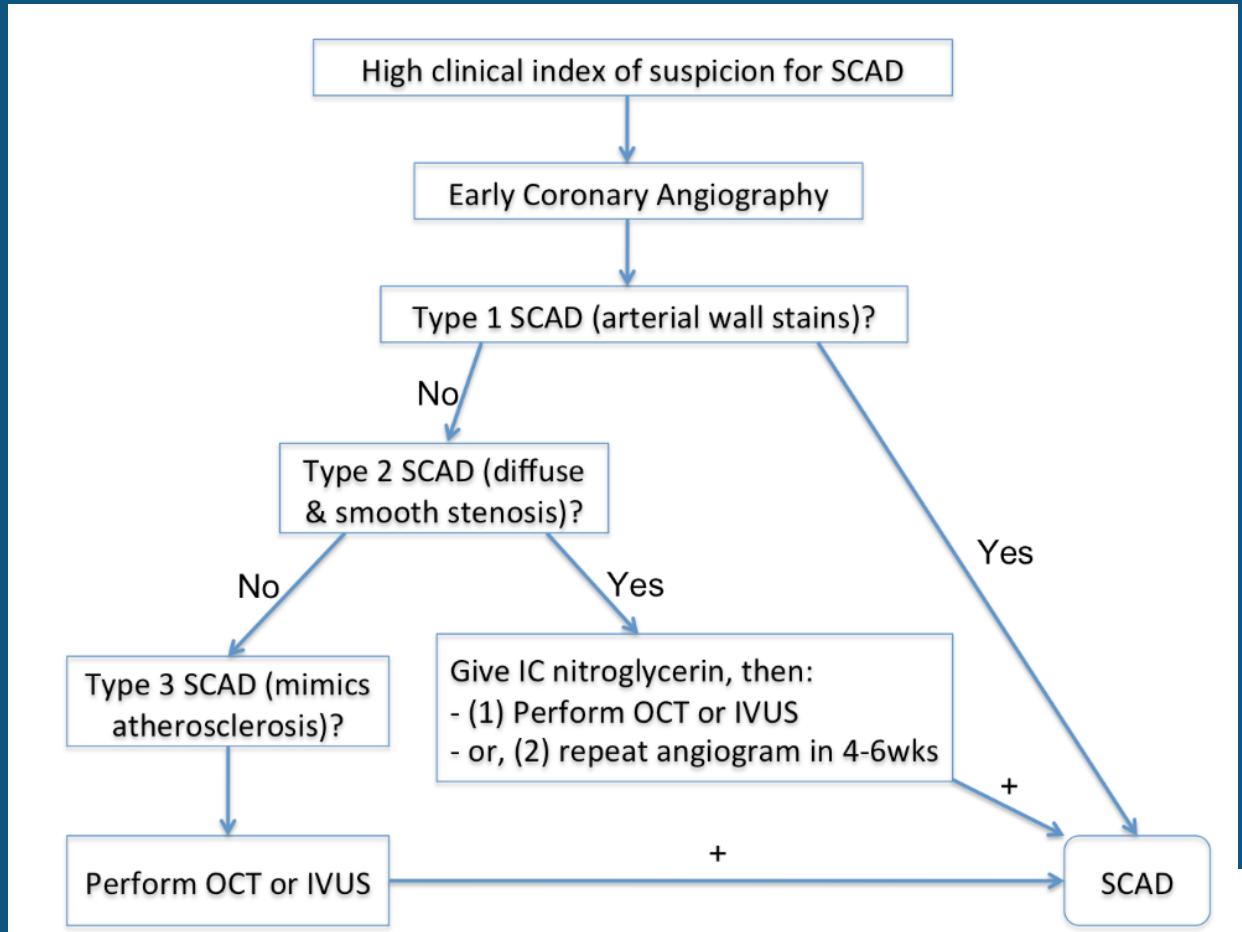
Diagnosis

- IVUS
  - Positive:
    - No contrast
- OCT
  - Positive:
    - Improved spatial resolution

Diagnosis



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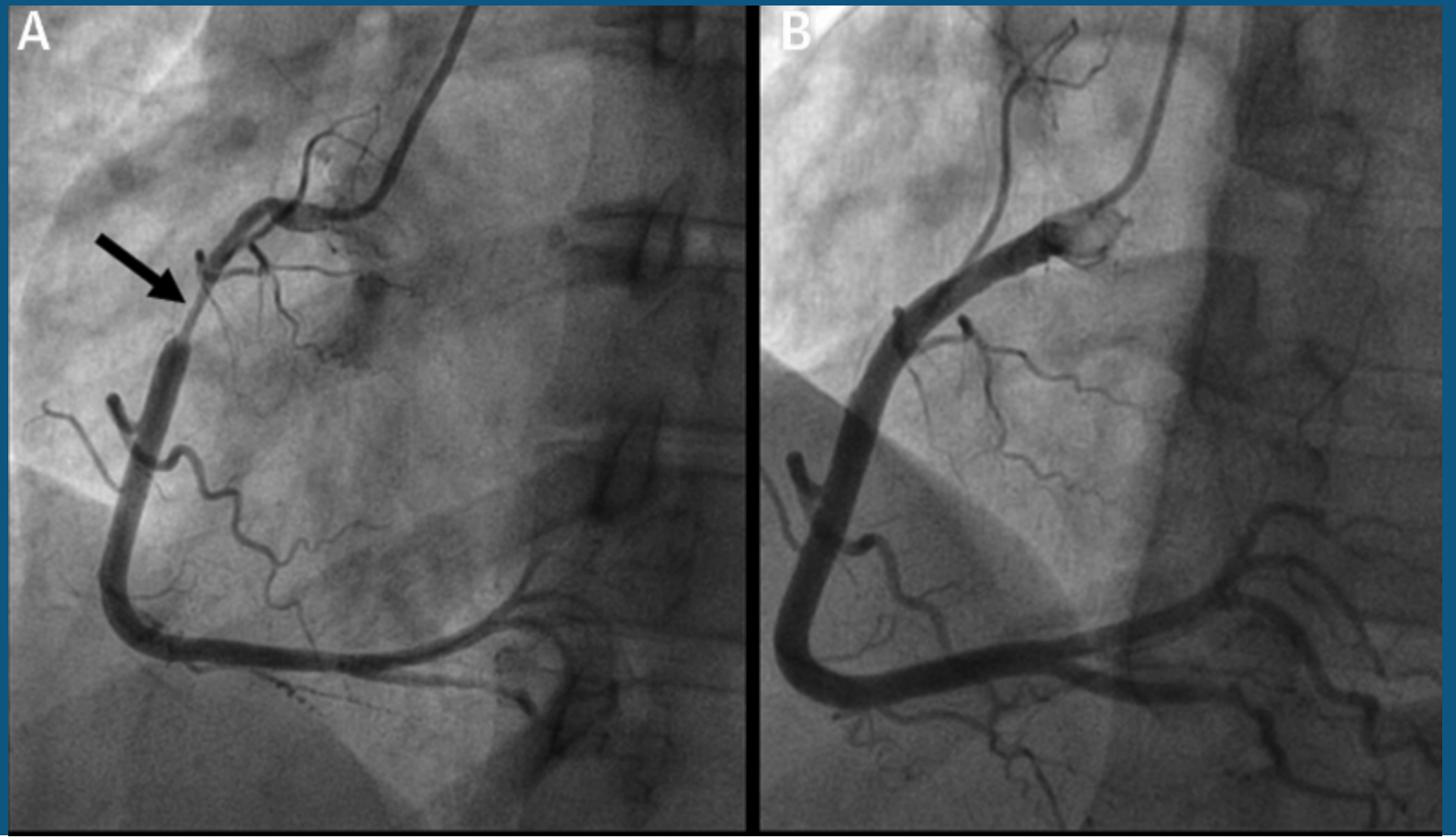
Diagnosis



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Diagnosis

- If diagnostic uncertainty, consider adjunctive diagnostic strategies
  - CCTA especially if proximal lesion

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Diagnosis

- One coronary artery
  - 87%
- LAD most likely involved
  - 40-70%
- Type II SCAD
  - 60-67%

Spontaneous coronary artery dissection: association with predisposing arteriopathies and precipitating stressors and cardiovascular outcomes. Saw J, Aymong E, Sedlak T, Buller CE, Starovoytov A, Ricci D, Robinson S, Vuurmans T, Gao M, Humphries K, Mancini GB. Circ Cardiovasc Interv. 2014 Oct;7(5):645-55. Epub 2014 Oct 7.

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Management [acute]

- Conservative
- Invasive

Management [acute]

- Conservative
  - Aspirin
  - Anti platelet
  - Beta blocker
  - Anti anginals for persistent CP

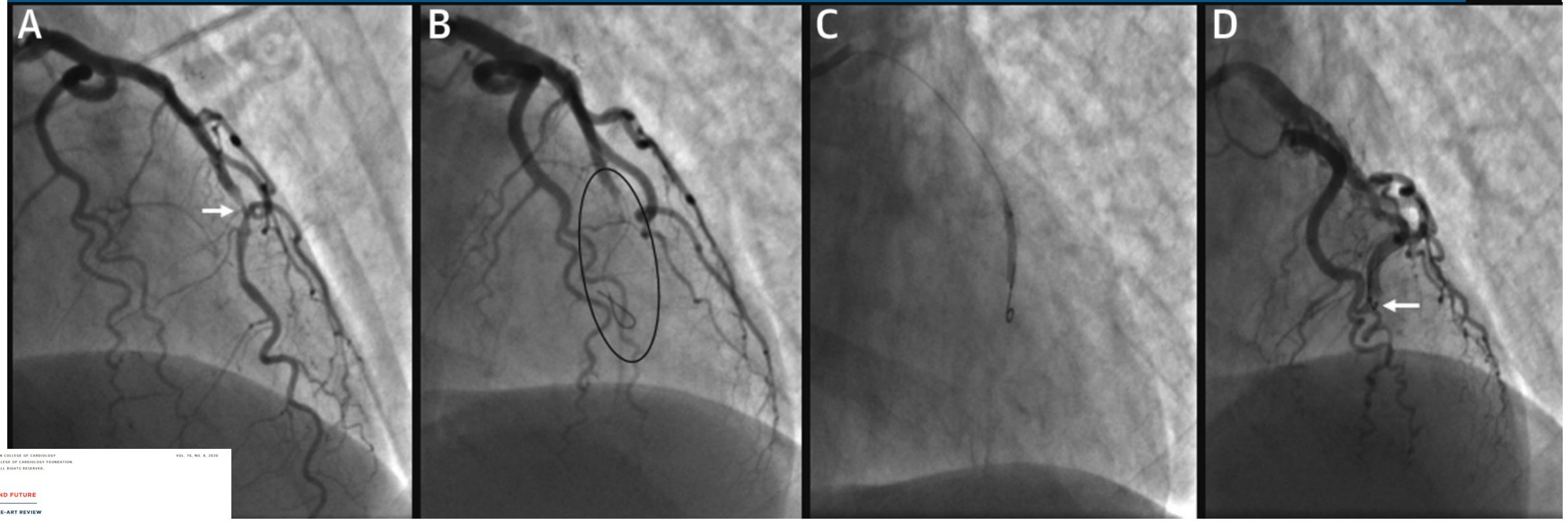
Management [acute]

- Invasive
  - Technically challenging
  - Higher rates of complications
    - 69.9% PCI success/partial success (Saw et al.)
    - 50% PCI failure (Tweet et al.)

Canadian spontaneous coronary artery dissection cohort study: in-hospital and 30-day outcomes. Saw J, Starovoytov A, Humphries K, Sheth T, So D, Minhas K, Brass N, Lavoie A, Bishop H, Lavi S, Pearce C, Renner S, Madan M, Welsh RC, Lutchmedial S, Vijayaraghavan R, Aymong E, Har B, Ibrahim R, Gornik HL, Ganesh S, Buller C, Matteau A, Martucci G, Ko D, Mancini GBJ. Eur Heart J. 2019;40(15):1188.

Spontaneous coronary artery dissection: revascularization versus conservative therapy. Tweet MS, Eleid MF, Best PJ, Lennon RJ, Lerman A, Rihal CS, Holmes DR Jr, Hayes SN, Gulati R. Circ Cardiovasc Interv. 2014;7(6):777.

Management [acute]



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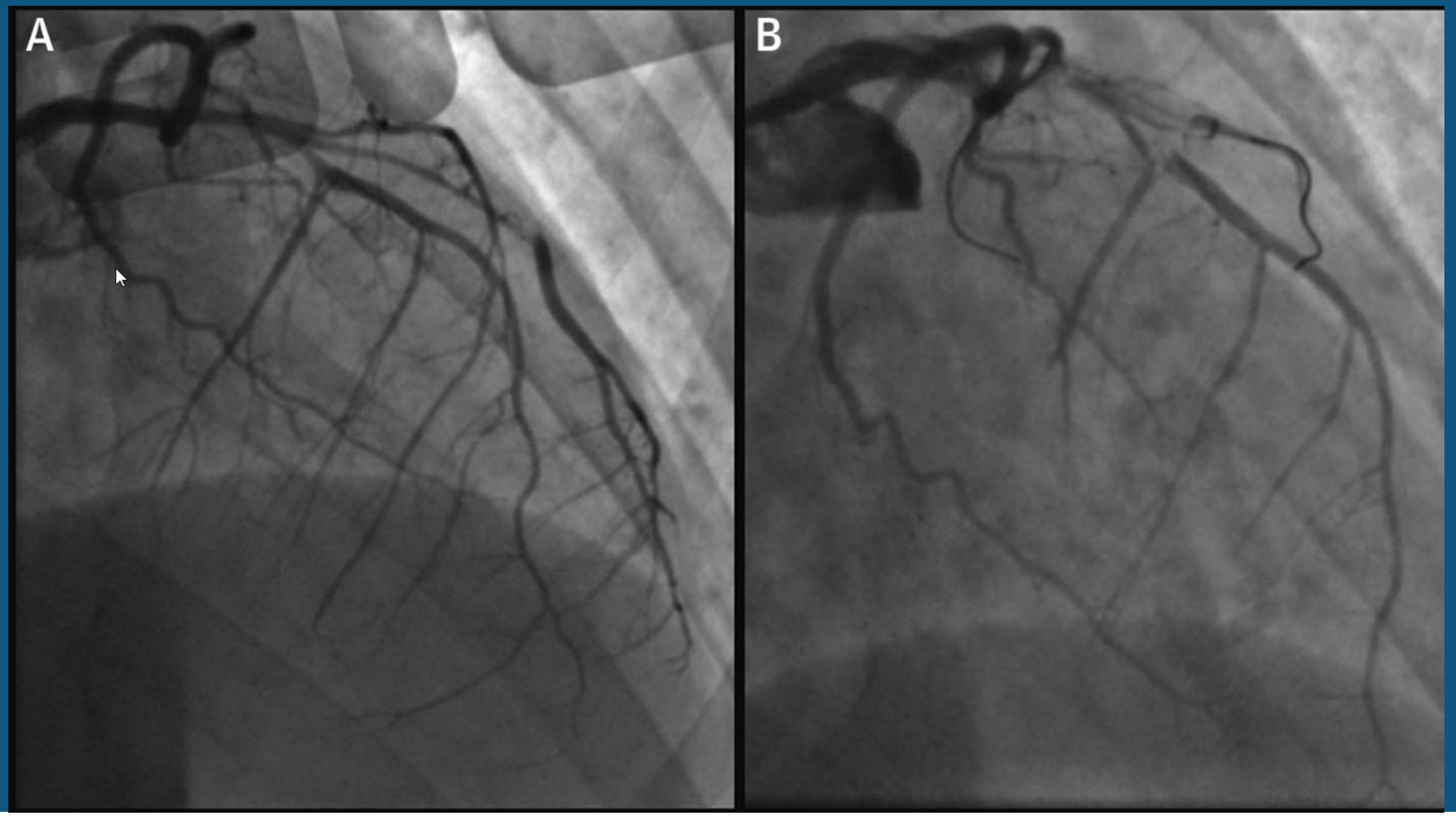
Management [acute]



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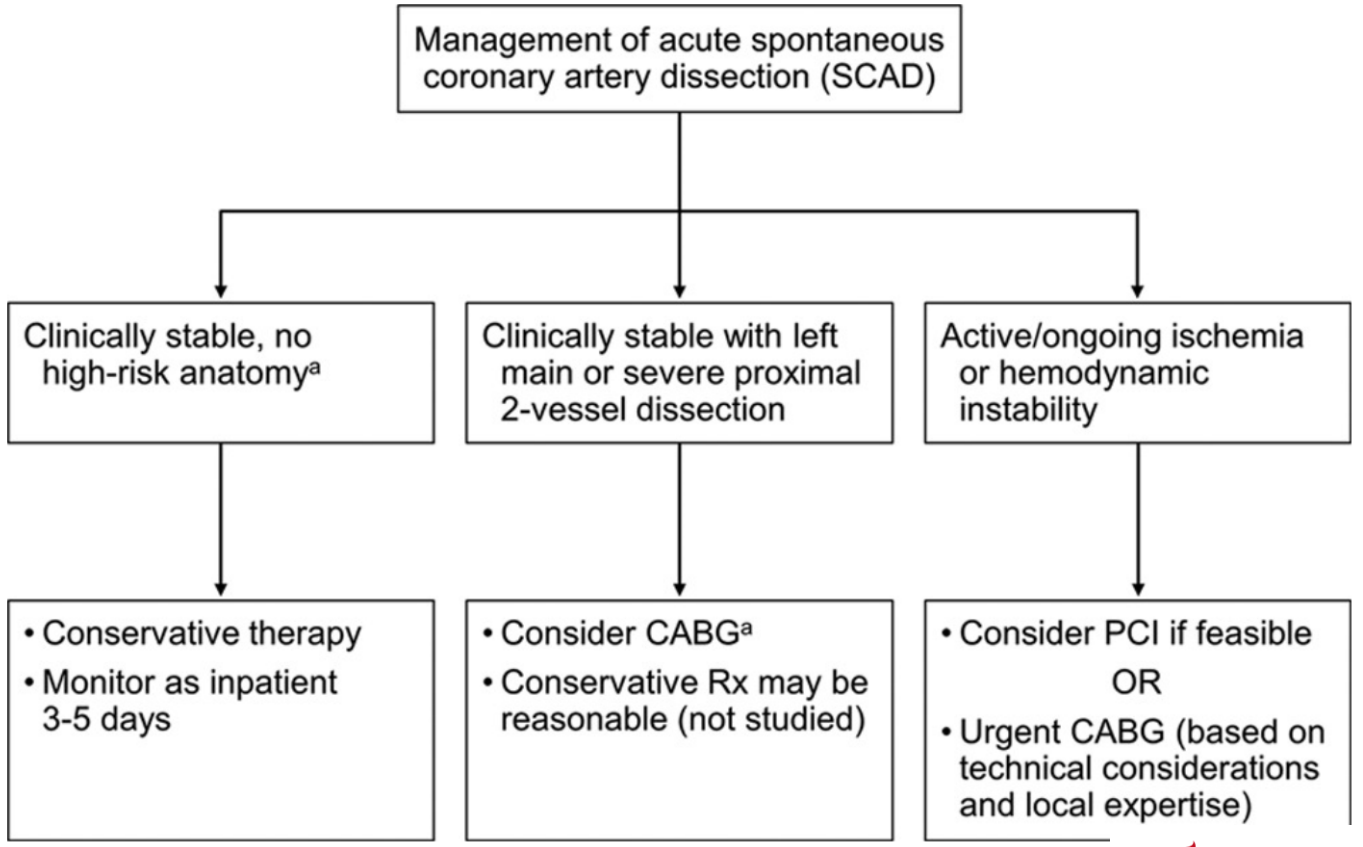
Prognosis [acute]

- All cause mortality
  - Conservative vs invasive
    - 2.9% vs 4.9% (OR 0.81; 95% CI 0.31-2.08)
- Target vessel revascularization
  - Conservative vs invasive
    - 5.9% vs 13% (OR 0.50; 95% CI 0.28-0.90)

Management [acute]



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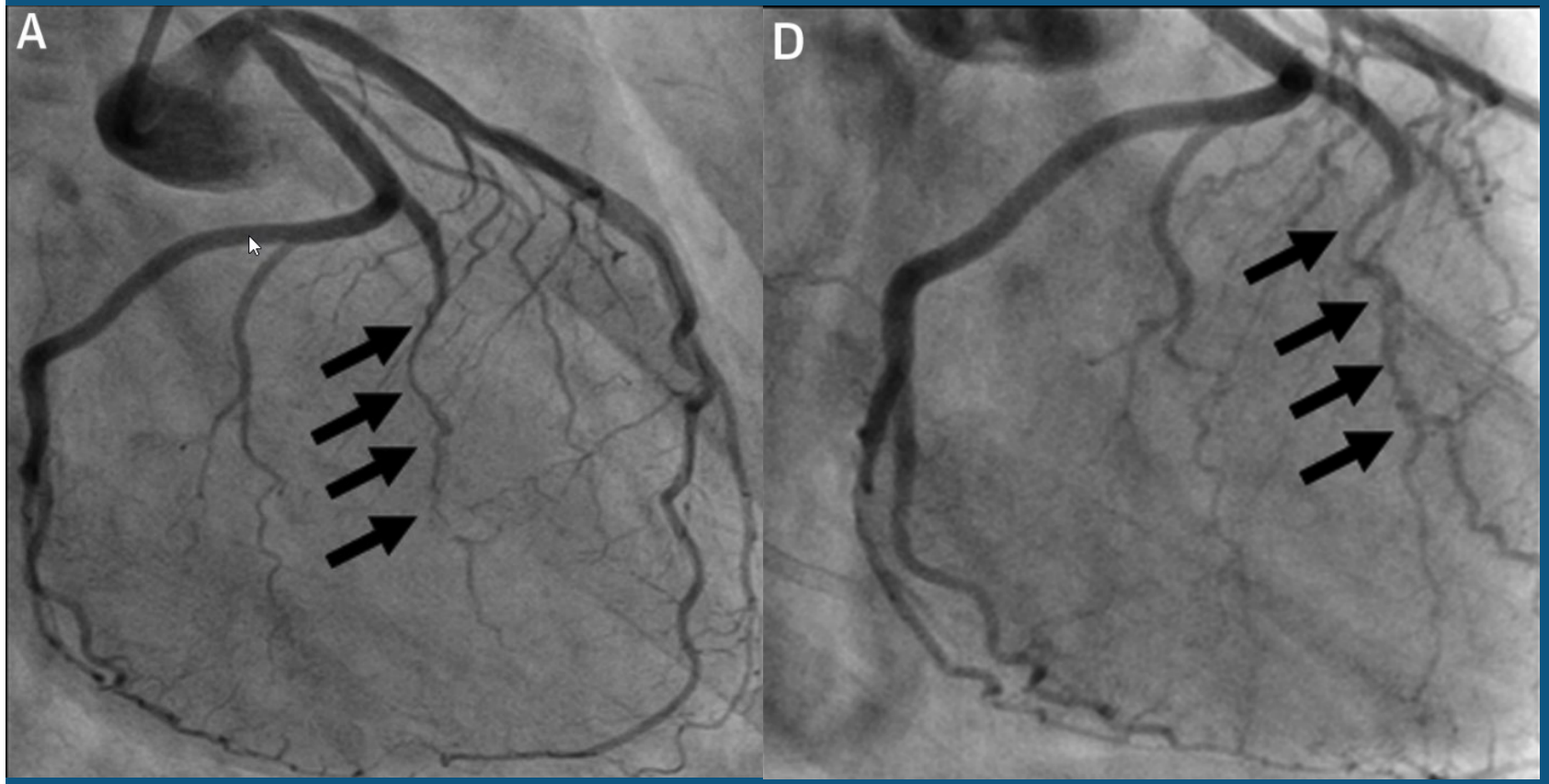
Management [acute]



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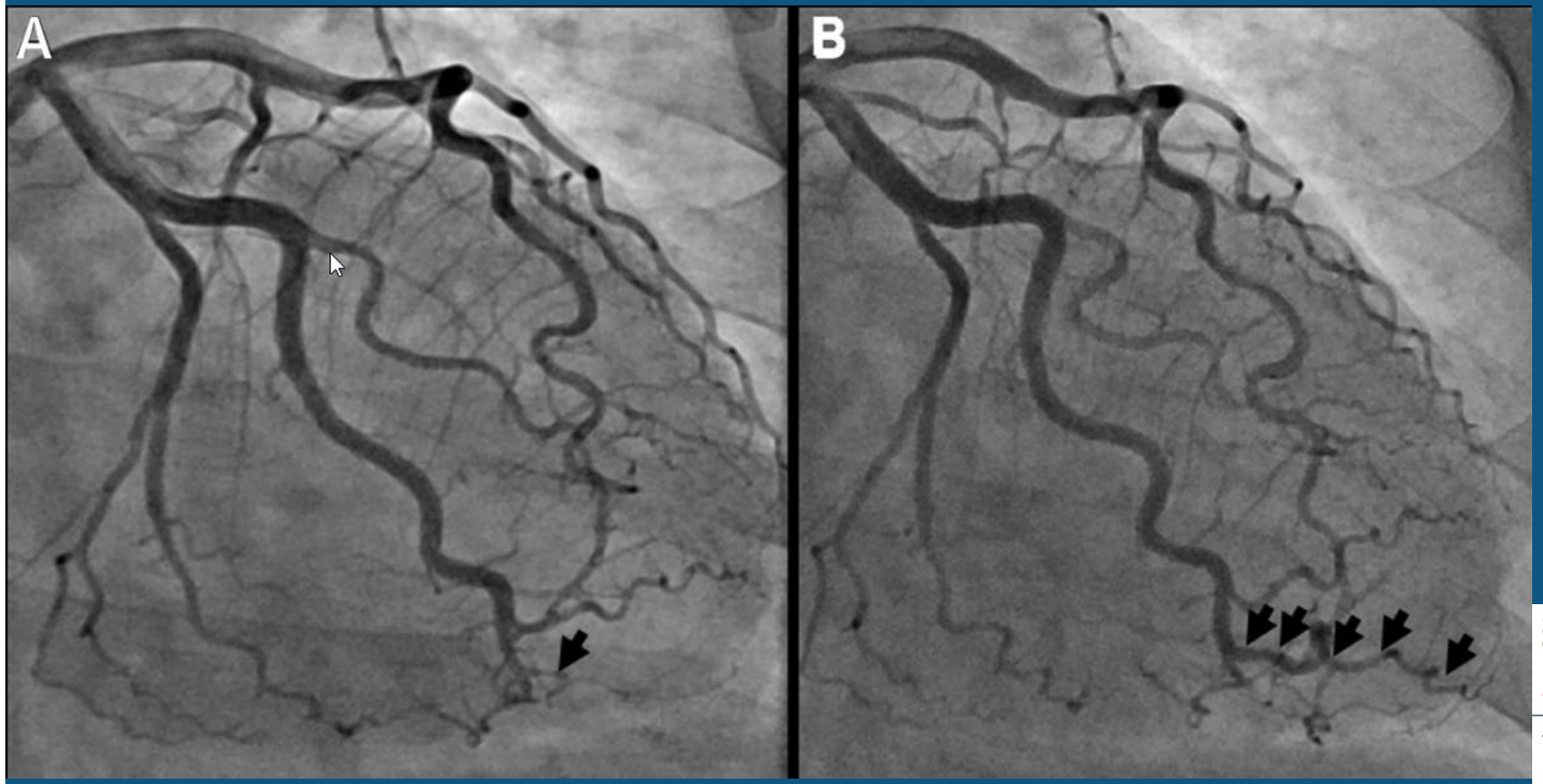
Management [acute]



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Prognosis [acute]

- Major adverse event rate
  - Recurrent MI
  - Unplanned revascularization
  - Shock
  - Mortality

Prognosis [acute]

- Recurrent in hospital MI
  - Up to 5% in pts with conservative strategy
- Unplanned revascularization
  - Up to 5% in pts with conservative strategy
- Life threatening arrythmias
  - 4-14%
- Shock
  - 2-19%

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Prognosis [acute]

- In hospital mortality
  - Higher in the past
    - 4.2% (database 2004-2015)
    - 0.1% more recently

Trends in Incidence, Characteristics, and In-Hospital Outcomes of Patients Presenting With Spontaneous Coronary Artery Dissection (From a National Population-Based Cohort Study Between 2004 and 2015). Krittanawong C, Kumar A, Virk HUH, Yue B, Wang Z, Bhatt DL. Am J Cardiol. 2018;122(10):1617. Epub 2018 Aug 20.

Canadian spontaneous coronary artery dissection cohort study: in-hospital and 30-day outcomes. Saw J, Starovoytov A, Humphries K, Sheth T, So D, Minhas K, Brass N, Lavoie A, Bishop H, Lavi S, Pearce C, Renner S, Madan M, Welsh RC, Lutchmedial S, Vijayaraghavan R, Aymong E, Har B, Ibrahim R, Gornik HL, Ganesh S, Buller C, Matteau A, Martucci G, Ko D, Mancini GBJ. Eur Heart J. 2019;40(15):1188.

Prognosis [long term]

Prognosis [long term]

- Chest pain
  - 40% (Johnson et al.)
- Recurrence
  - 16.5% (Johnson et al.)
    - May be higher in pregnancy associated SCAD
- Mortality
  - 0.8% at the 3 year median (Saw et al.)
    - Higher in patients with FMD (Saw et al.)
      - HR 1.51

The presentation of spontaneous coronary artery dissection in the emergency department: Signs and symptoms in an unsuspecting population. Johnson AK, Tweet MS, Rouleau SG, Sadosty AT, Hayes SN, Raukar NP. Acad Emerg Med. 2022;29(4):423. Epub 2021 Dec 26.

Spontaneous coronary artery dissection: association with predisposing arteriopathies and precipitating stressors and cardiovascular outcomes. Saw J, Aymong E, Sedlak T, Buller CE, Starovoytov A, Ricci D, Robinson S, Vuurmans T, Gao M, Humphries K, Mancini GB. Circ Cardiovasc Interv. 2014 Oct;7(5):645-55. Epub 2014 Oct 7.

Canadian spontaneous coronary artery dissection cohort study: in-hospital and 30-day outcomes. Saw J, Starovoytov A, Humphries K, Sheth T, So D, Minhas K, Brass N, Lavoie A, Bishop H, Lavi S, Pearce C, Renner S, Madan M, Welsh RC, Lutchmedial S, Vijayaraghavan R, Aymong E, Har B, Ibrahim R, Gornik HL, Ganesh S, Buller C, Matteau A, Martucci G, Ko D, Mancini GBJ. Eur Heart J. 2019;40(15):1188.

Management [long term]

- Decrease recurrence
  - Avoid triggers
  - Counseling re pregnancy
  - Avoidance of estrogen containing contraceptives
  - Counseling re exercise

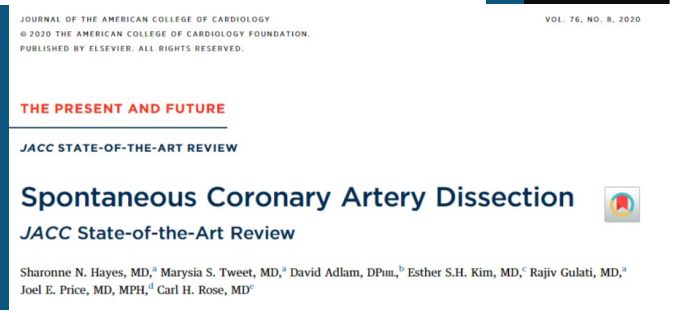
Management [long term]

TABLE 2 Pregnancy-Associated Spontaneous Coronary Artery Dissection

First Author, Year (Ref. #)	N	Design	Mean ± Age at SCAD (yrs)	Mean Gravidity	Left Main SCAD (%)	Multivessel SCAD (%)	Cardiac Function
Higgins et al., 2013 (96)	47	Case series	33.5 ± 5.3	2.7	36	34	Hemodynamically unstable*: 21%
Havakuk et al., 2017 (32)	120	Case series	34 ± 4	–	36	40	LVEF <40%: 44%
Koller et al., 1998 (97)	43	Case series	33.5 ± 5.3	3.1	18	18	–
Koul et al., 2001 (31)	58	Case series	33	2.1	24	40	–
Tweet et al., 2017 (30)	54	Registry cohort	35 ± 4	3.2	24	33	LVEF <35%: 26%
Faden et al., 2016 (38)	79	Population-based cohort†	33 ± 5.2	–	–	–	Cardiogenic shock: 20%

*3 patients underwent cardiac transplantation in this series. †National Inpatient Sample administrative database

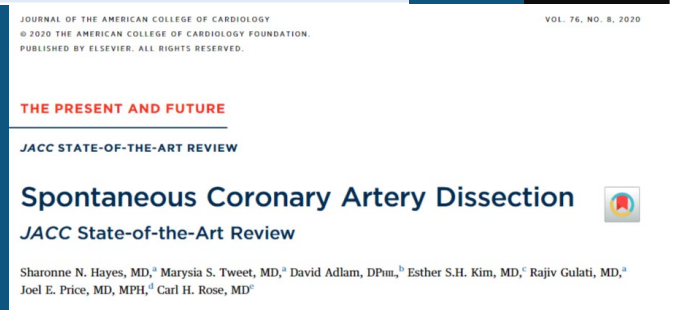
LVEF = left ventricular ejection fraction; SCAD = spontaneous coronary artery dissection.



Management [long term]

TABLE 7 Approach to the Pregnant Woman With Prior Spontaneous Coronary Artery Dissection

Pre-conceptual planning
1. Counseling with cardiology and maternal fetal medicine specialists to review risks of pregnancy in the context of the patient's medical history and current clinical status.
2. Review of symptoms, left ventricular function, and functional status. Consider stress testing.
3. Medication review: low-dose aspirin, clopidogrel, and beta-blocker medications do not appear to carry teratogenic risk, although beta-blockers have been associated with fetal growth restriction later in gestation; accordingly, all may be continued if clinically indicated angiotensin-converting enzyme (ACE) inhibitors and statin medications may be teratogenic, and are generally discontinued prior to conception or at time of identification of pregnancy (95).
At pregnancy diagnosis
1. If not recently assessed, cardiology consultation to assess symptoms, left ventricular function, and functional status.
2. Address the option and potential risks and benefits of pregnancy termination, especially if the pregnancy was unintended.
3. Medication review (as above).
4. Genetics referral for patients with potentially heritable syndromes.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Management [long term]

- Activities
  - Target HR 50-70% of heart rate reserve
    - HRR = MPHR – resting HR
      - MPHR = 208 bpm – (age x 0.7)
  - SBP < 130 mmHg during exercise
  - Lift
    - < 20-30 lbs (women)
    - < 50 lbs (men)

The First Dedicated Cardiac Rehabilitation Program for Patients With Spontaneous Coronary Artery Dissection: Description and Initial Results. Chou AY, Prakash R, Rajala J, Birnie T, Isserow S, Taylor CM, Ignaszewski A, Chan S, Starovoytov A, Saw J. Can J Cardiol. 2016;32(4):554. Epub 2016 Jan 18.

Management [long term]

- Decrease recurrence
  - Beta blocker
    - HR 0.36

Spontaneous Coronary Artery Dissection: Clinical Outcomes and Risk of Recurrence. Saw J, Humphries K, Aymong E, Sedlak T, Prakash R, Starovoytov A, Mancini GBJ. J Am Coll Cardiol. 2017;70(9):1148.

Management [long term]

- Screening for FMD

Management [long term]

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Management [long term]

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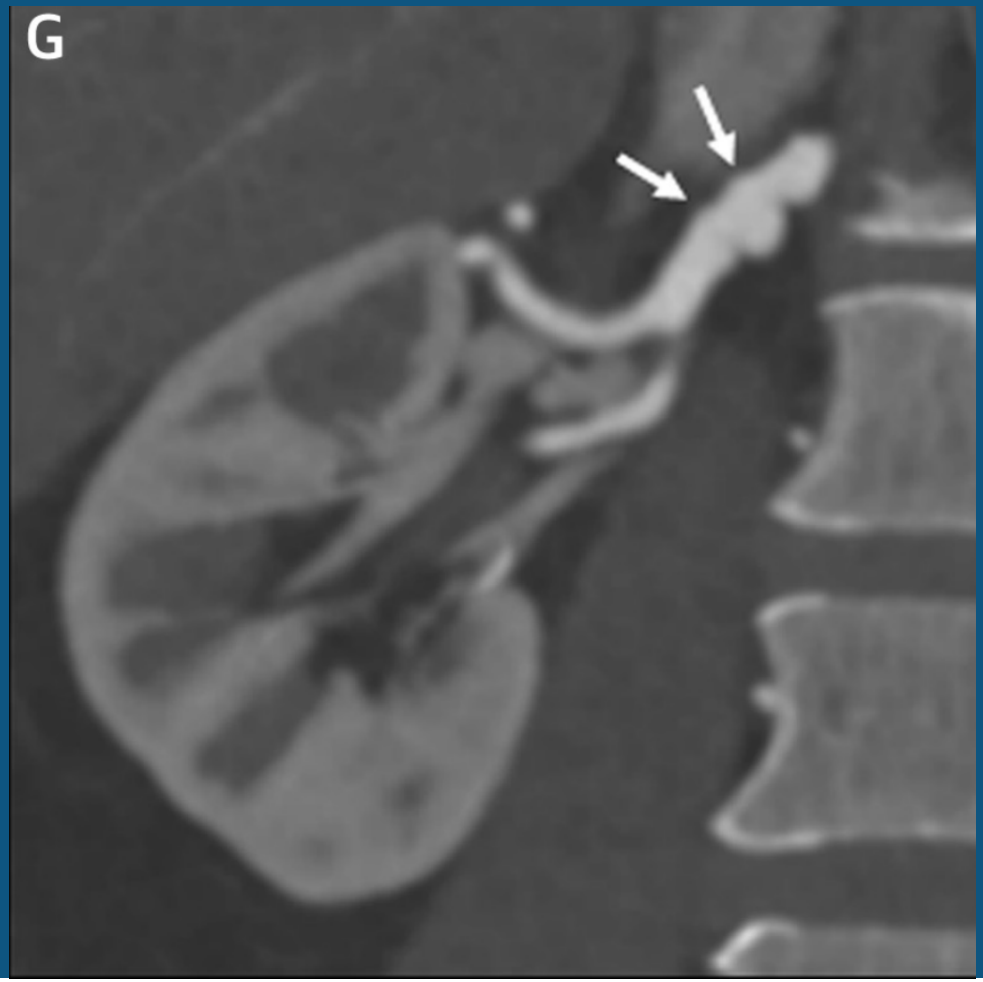
Management [long term]



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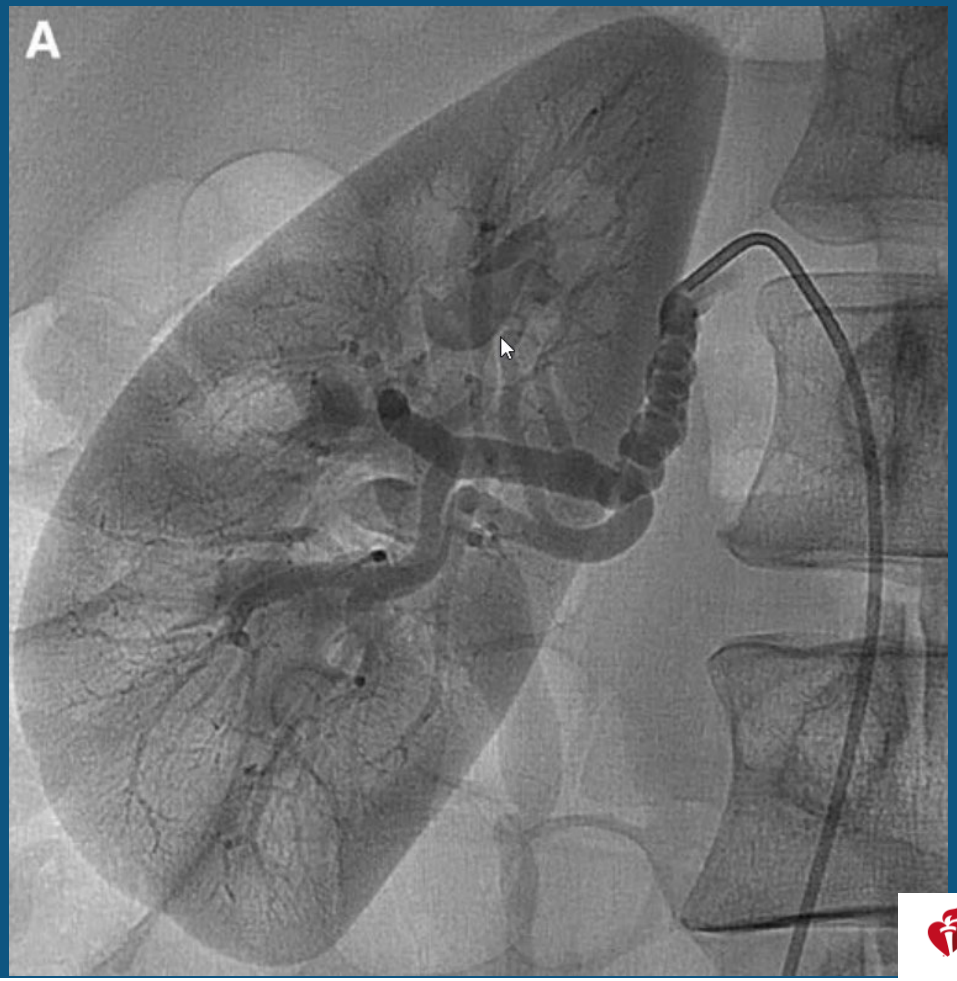
Management [long term]



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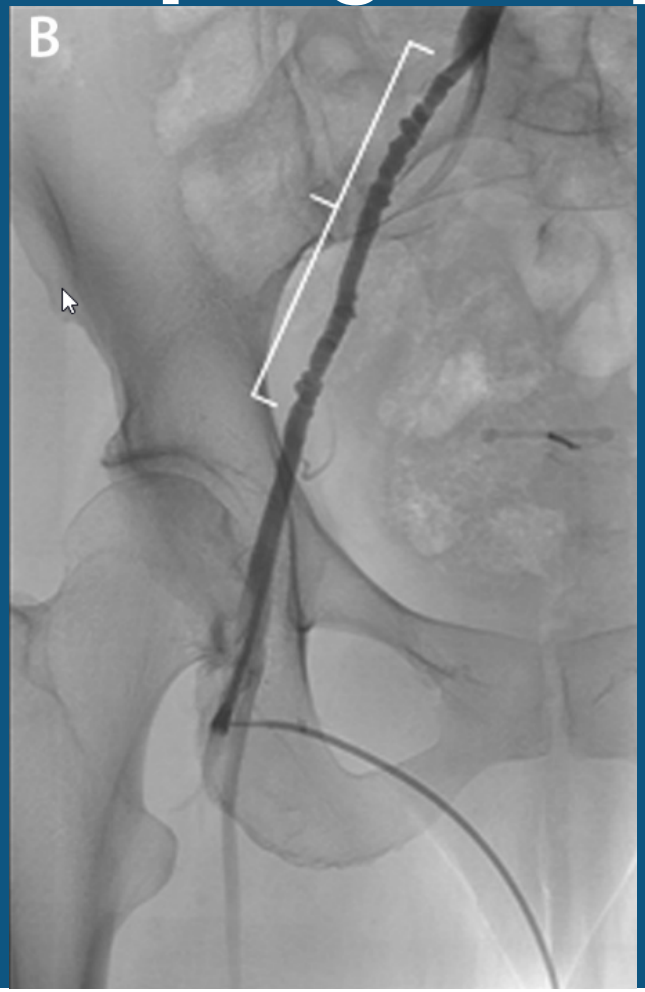
Management [long term]



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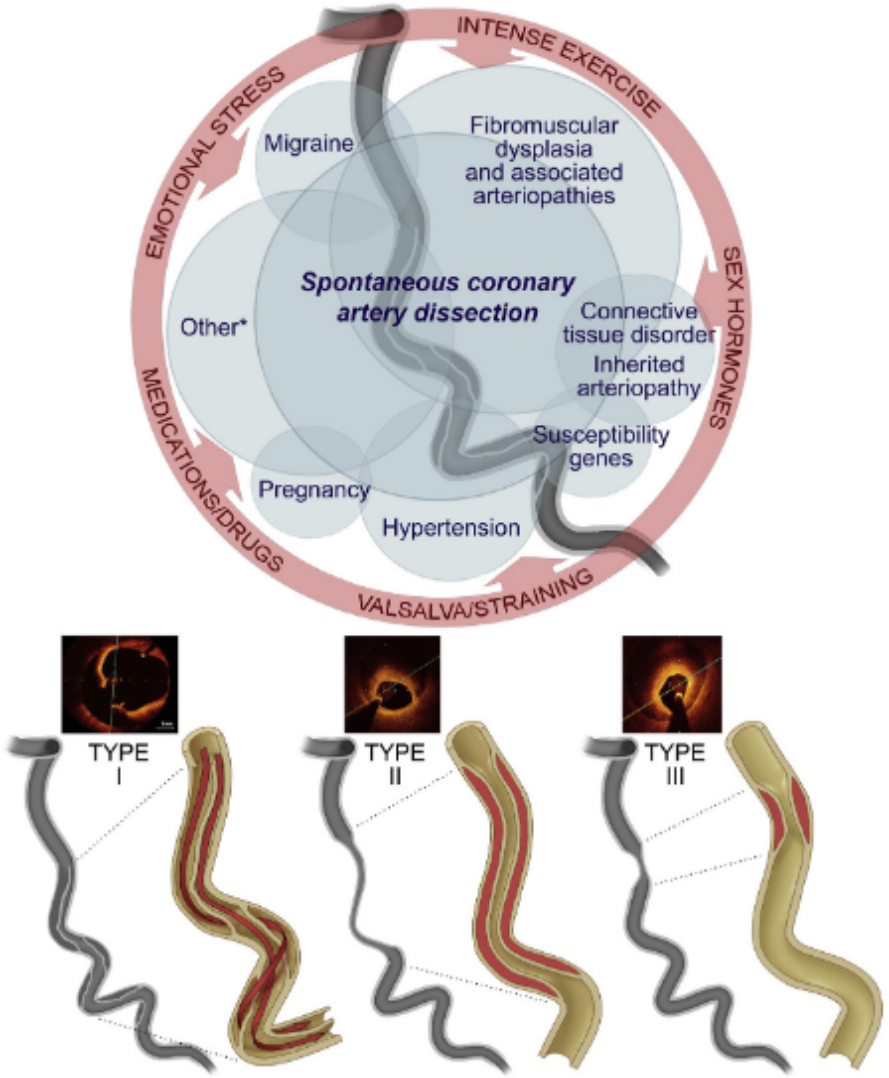
CENTRAL ILLUSTRATION Associated Conditions, Inciting Factors, and Angiographic Diagnosis of Spontaneous Coronary Artery Dissection



Hayes, S.N. et al. J Am Coll Cardiol. 2020;76(8):961-84.

Spontaneous coronary artery dissection often occurs in the setting of 1 or more overlapping conditions **(blue circles)**, often with a precipitant or trigger **(red outer ring)**. Angiographic, anatomic, and optical coherence tomographic representation of spontaneous coronary artery dissection types 1 to 3 (bottom). *Includes idiopathic, systemic inflammatory conditions, coronary vasospasm, and other less common associated conditions. © Mayo Clinic. Used with permission of Mayo Foundation for Medical Education and Research, all rights reserved.

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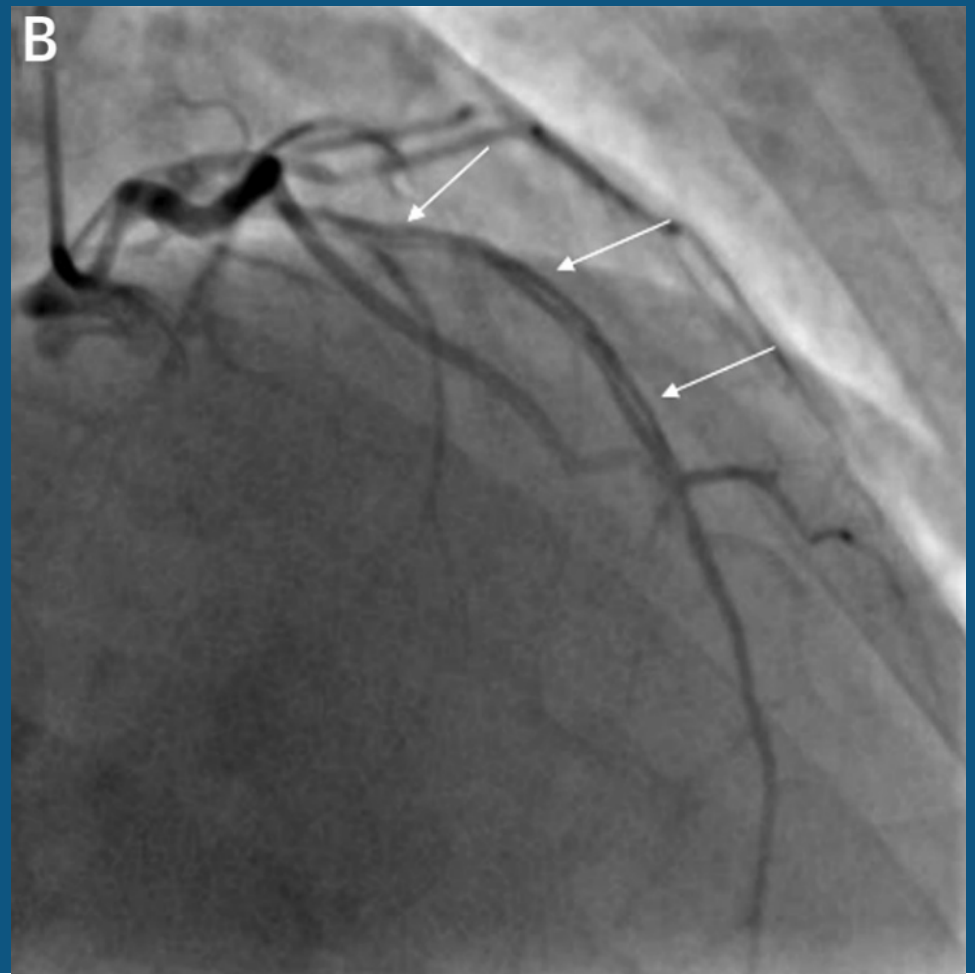
QUIZ



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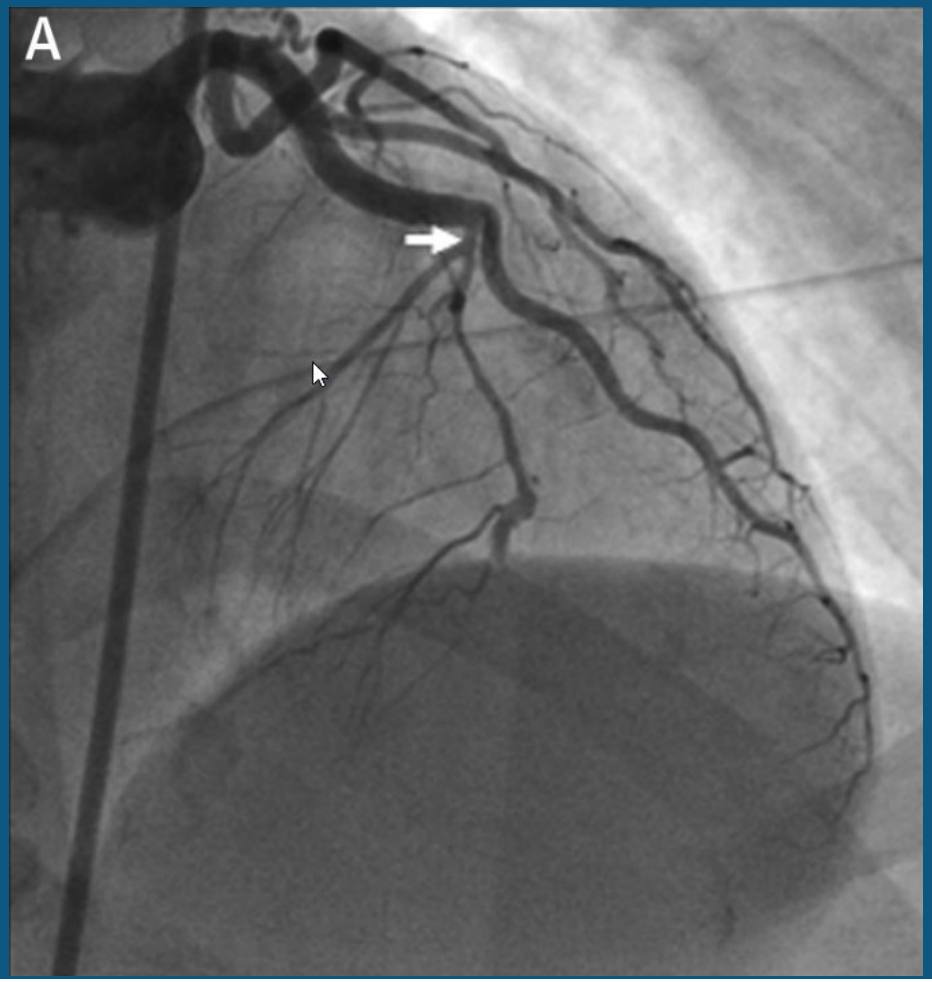

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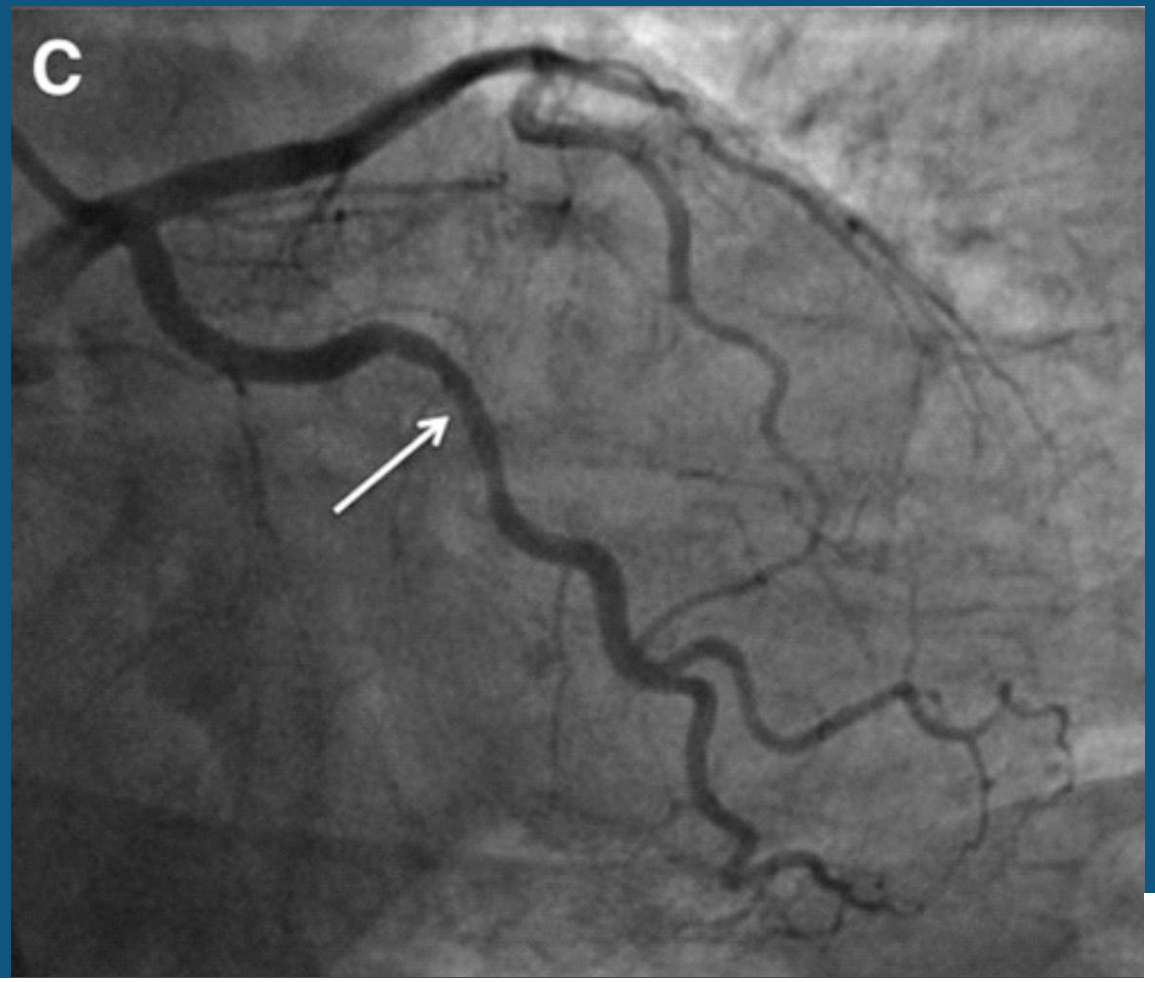

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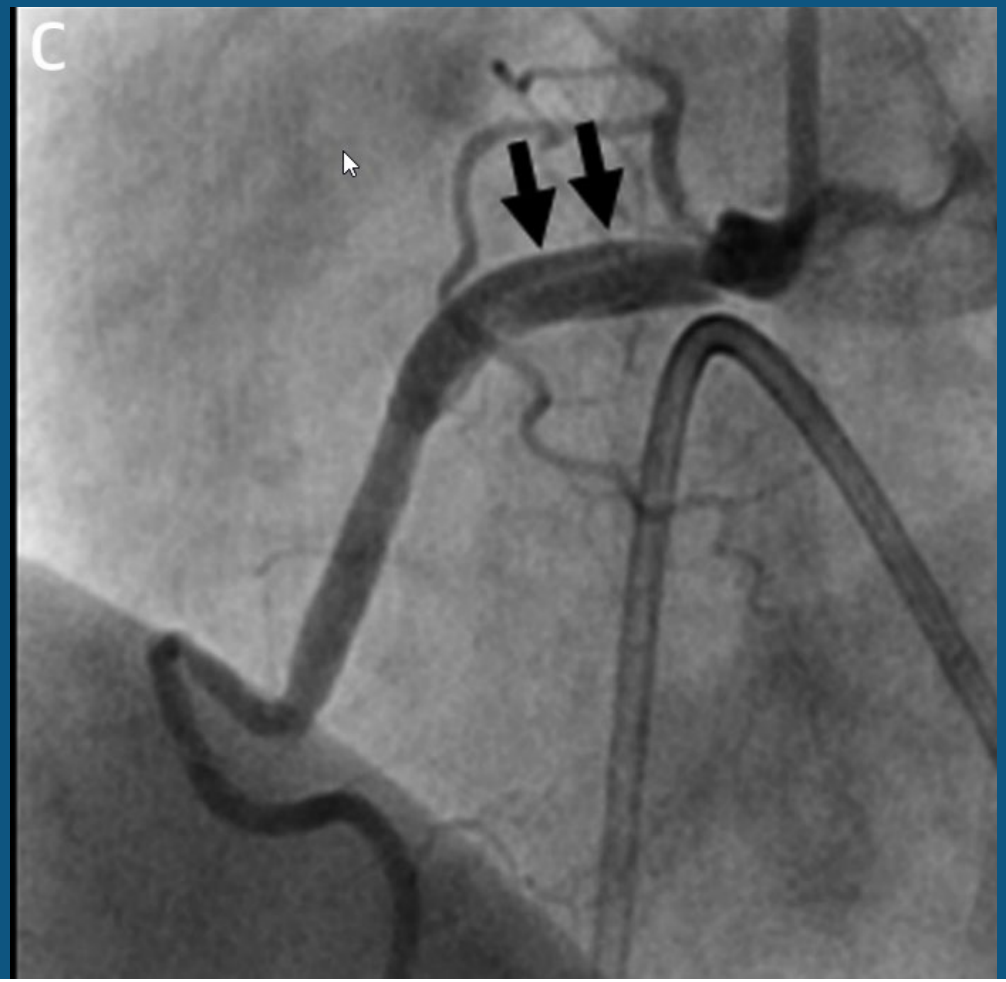

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Questions?

Thank you