Multimodality Imaging in Spontaneous Coronary Artery Dissection in the Peripartum Period

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DISCLOSURE

No relevant financial relationship(s) with industry

Off Label Usage: None
Overview

• Basics of spontaneous coronary artery dissection (SCAD)
• Pregnancy-related SCAD
• Multimodality imaging for SCAD
39 yo G6P4 Woman

- 5 days postpartum
  - Chest pain
  - ECG negative at urgent care
- 8 days postpartum
  - Recurrent CP
  - ECG negative, CT PE negative
- 13 days postpartum
  - Severe 10/10 CP
  - EMS called, v fib arrest
  - Resuscitated
Recurrent CP
Cardiac MRI
Spontaneous Coronary Artery Dissection (SCAD)

• Acute coronary syndrome without atherosclerosis
• Intramural hematoma +/- intimal dissection flap
• Diagnosed via:
  - Coronary angiography
  - IVUS
  - OCT
Optical Coherence Tomography (OCT)
Intramural Hematoma on OCT
SCAD Coronary Tortuosity

A. Intravessel symmetry
B. Multivessel symmetry
C. Corkscrew sign
D. Coronary artery microaneurysm
E. Coronary fibromuscular dysplasia

Eleid et al., Circ Cardiovasc Interv 2014
SCAD Baseline Characteristics

• Mostly female
• Young (mean 42-52 yrs)
• Minimal CAD risk factors

• Potential risk factors: coronary tortuosity, fibromuscular dysplasia (FMD), postpartum/pregnancy, extreme emotion or exercise, connective tissue disease (CTD), family history

Tweet et al., Circulation 2012
Saw et al., Circ Cardiovasc Interv 2014
SCAD Prevalence

- Reported as 0.07-1.1%
- Likely higher
- ~18% (perhaps less) associated with pregnancy
- Cause of MI in 10-30% of women <50 yo
- Most common etiology of peripartum MI

Tweet et al., Circ 2012
Vanzetto et al., Cardiothorac Surg 2009
Mortensen et al., Cardiovasc Interv 2009
Saw et al., Can Jour of Cardiol 2014
Elkayam et al., Circ 2014
Peripartum SCAD, N=41

Tweet et al., AHA
Peripartum SCAD

Tweet et al., AHA
All-Comers
SCAD Presentation (n = 87)

STEMI n=43
• Single-vessel (34)
• Multi-vessel (9)
• V fib/tach (10)

NSTEMI n=38
• Single-vessel (29)
• Multi-vessel (9)
• V fib/tach (2)

UA n=6
• Single-vessel (4)
• Multi-vessel (2)

Tweet et al., Circulation 2012
SCAD Major Adverse Cardiac Events (MACE)

MACE = Death, Recurrent SCAD, MI, CHF

Survival free of MACE (%)

Years after index event

No. at risk

87  64  56  48  39  32  27  26  18  14  11

Tweet et al., Circulation 2012
Recurrence of SCAD

• Recurrence in 15/71 females, 0/16 males (p = 0.023)
• Median 2.8 yrs (3 days - 12 yrs)
• 3rd episode SCAD (n = 2) at 1 and 11 mos after prior event

Tweet et al., Circulation 2012
SCAD Acute Management
Retrospective review (N = 189)

• Treated with balloon and/or stent(s):
  - Failure to cross lesion (7/23)
  - Final loss of flow (8/23)
  - Residual stenosis >30% (8/23)

• Conservative therapy:
  - Uneventful hospital course
  - 73% of 59 with repeat CA showed healing
  - 9 (10%) early SCAD progression requiring stent or bypass surgery (mean 4 days, 2-7)

Tweet et al., Circ Cardiovasc Interv 2014
Proposed Algorithm for Acute Management of Initial SCAD

Acute SCAD on angiography

- No
  - OCT/IVUS: False lumen or intramural hematoma?
    - Yes
      - TIMI flow assessment
        - Yes
          - TIMI 2-3 and clinically stable
            - Conservative management with inpatient monitoring for 5-7 days
        - No
          - TIMI 0-1 or clinically unstable
            - Revascularize with inpatient monitoring for 5-7 days, consider CABG in high volume surgical centers
    - No
      - Revascularize with inpatient monitoring for 5-7 days, consider CABG in high volume surgical centers

Tweet et al., Circ Cardiovasc Interv 2014
Imaging for SCAD

- Coronary Angiography
  - OCT
  - IVUS
- Echo
- CCTA
- CMR
- Stress Imaging
  - Stress echo
  - MPI

Tweet et al., JACC Imaging 2016
Role of Echocardiography

• Demonstrates regional wall motion abnormalities
  • Expect to be consistent with involved SCAD territory
• Can be a ‘clue’ for reviewing a ‘normal’ angiogram more carefully
• Do not be misled by a takotsubo appearance
32 yo F with postpartum STEMI
Cardiac CT 3 days after SCAD

Tweet et al., JACC Imaging 2016
Cardiac CT after SCAD

3 days post

10 days post

Tweet et al., JACC Imaging 2016
CCTA

- Can show coronary dissection
- Myocardial hypoperfusion
- Limitations include motion and vessel size
- Not first line diagnostic tool
SCAD pt with recurrent CP assessed by CCTA

Treated medically without invasive angio

Tweet et al., JACC Imaging, 2016
SCAD and Vascular Abnormalities on CT

- 115 Mayo Clinic SCAD outpatients

- Overall Vascular Abnormalities 66%
  - Overall FMD 45%
  - Dissection
  - Aneurysm
  - Dilatation
  - Tortuosity
  - Undulating aorta

Prasad, Tweet et al., Am J Cardiol 2015
SCAD & Connective Tissue Disease (CTD)

- 116 Mayo Clinic SCAD pts evaluated in Genetics Clinic
  - 41% with FMD
  - 59 underwent genetic testing
    - 3 (5.1%) diagnosed with CTD
      - Marfan and Vascular Ehlers-Danlos

Henkin et al., Heart 2016
Cardiac Magnetic Resonance Imaging

- Assess for regional wall motion abnormalities
- Assess extent of myocardial injury or recovery
  - Sequences to assess for edema
  - Delayed gadolinium enhancement
SCAD Take Home Points

- SCAD affects young women without CAD
- Presentation is heart attack, unstable angina, cardiac arrest
- Associated conditions: coronary tortuosity, FMD, pregnancy-associated (postpartum), extreme emotion or exercise, CTD, family history
- Not always obvious on the coronary angiogram
  - OCT or IVUS can confirm
  - Echo, CCTA and CMR are integral for diagnosis and follow-up
- Important to diagnose because management is different than guidelines
- Will see more
  - ↑ awareness, ↑ diagnostic techniques, ongoing Mayo Clinic SCAD Registries
Mayo Clinic SCAD Registry World

>600 Confirmed SCAD Patients
>500 SCAD probands and >350 parents
Questions & Discussion

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