Myocardial bridging

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DISCLOSURE

Relevant financial relationship(s) with industry
Itamar Medical: advisory board
Volcano/Philips consultant

Off Label Usage
None
A 19 college student a member of the rowing varsity team.

Several episodes of severe chest pain during intense training.

Admitted to the ER with ECG changes and Tn elevation

No CAD risk factors.

Normal physical examination.
What should be the next step to allow him to go back to his team?

1. Exercise Sestamibi
2. Multi slice CT
3. Coronary angiography
4. Echocardiography
5. The ECG and the Tn are secondary to intense exercise
Coronary angiography
19 year old male with Chest Pain

What should be the next step?

1. FFR in response to IV adenosine
2. Drug eluting stent
3. IVUS or OCT to rule out plaque rapture
4. Conservative therapy
5. Other coronary physiology study
Myocardial bridging: FFR in response to IV dobutamine and IC Adenosine

\[ \text{FFR}_{\text{Adenosine}} = 0.87 \]

Dobutamine (40µg/kg/min)

Target HR: 200 bpm
Conclusions: Physiologic assessment of MB should include dobutamine challenge. Diastolic FFR appears to be the technique of choice for MB assessment, where as mean FFR should be used with caution.
Corban et al: Myocardial Bridging; JACC Vol. 63, No. 22, 2014

**Myocardial Bridging**

Contemporary Understanding of Pathophysiology With Implications for Diagnostic and Therapeutic Strategies

Michel T. Corban, MD,* Olivia Y. Hung, MD, PtID, Parham Eshtehardi, MD,* Emad Rasoul-Arzrumly, MD,* Michael McDaniel, MD,* Girum Mekonnen, MD, MPH,* Lucas H. Timmins, PtID, Jerre Lutz, MD,* Robert A. Guyton, MD,‡ Habib Samady, MD*

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- Coronary arteries that tunnel through the myocardium are seen in as many as 40% to 80% of cases on autopsy; however, functional myocardial bridging is less commonly observed on angiography (0.5% to 16.0%) and can range from 4 to 80 mm in length.
- 67% to 98% occur in the left anterior descending coronary artery (LAD).
- Autopsy and intravascular ultrasound studies have shown that the intramural and distal segments of bridged vessels remain free from atherosclerotic disease while the proximal segment of the vessel is prone to developing atherosclerosis.

Systolic Narrowing at the Myocardial Bridge Accentuated by Intracoronary Nitroglycerin

Fingertip Phenomenon During Intracoronary Doppler Measurements

Intracoronary Hemodynamics from a Patient with Myocardial Bridging
Intracoronary shear stress analysis from a Patient with Myocardial Bridging
100 patients with angina but no significant obstructive coronary artery disease who had an intravascular ultrasound–detected MB in the left anterior descending artery

The correlation between arterial compression and Max proximal plaque in younger adults with ≤1 coronary risk factor.
Stress Echocardiography

‘transient late-systolic to early-diastolic buckling of the septum with apical sparing on exercise echocardiography’

Shin Lin et al. J Am Heart Assoc 2013;2:e000097
<table>
<thead>
<tr>
<th>Schwarz Type</th>
<th>Criteria</th>
<th>Objective Signs of Ischemia</th>
<th>Treatment</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Incidental finding on angiography</td>
<td>−</td>
<td>None</td>
</tr>
<tr>
<td>B</td>
<td>Ischemia on stress test</td>
<td>+</td>
<td>BB or CCB</td>
</tr>
<tr>
<td>C</td>
<td>Altered intracoronary hemodynamics (quantitative coronary angiography/coronary flow reserve/Doppler)</td>
<td>+/-</td>
<td>BB or CCB and/or revascularization</td>
</tr>
</tbody>
</table>
Progressive exertional chest pain in the past several months.

CAD risk factors: post menopausal, hypertension, hyperlipidemia.

Normal physical examination.

Exercise Echo: Septal wall motion abnormality with apical sparing

59 year old female with Chest Pain
Myocardial bridging

FFR to IC
adenosine : 0.90

FFR to IV
dobutamine with IC
adenosine: 0.87
What should be the next step?

1. CT angio
2. Drug eluting stent
3. IVUS or OCT to rule out plaque rapture
4. Conservative therapy
5. Other coronary physiology study
Coronary Endothelial Function Protocol

Diagnostic angiography

Acetylcholine (endothelium dependent vasodilator)

Epicardial

Microcirculation
Myocardial bridging and endothelial function
Myocardial bridging is associated with alteration in coronary vasoreactivity

Joerg Herrmann, Stuart T. Higano, Ryan J. Lenon, Charanjit S. Rihal, Amir Lerman*
59 year old female with Chest Pain

What should be the next step?

1. Drug eluting stent
2. IVUS or OCT to rule out plaque rapture
3. Conservative therapy: CCB
4. NTG and beta blockers
5. Surgical intervention
Myocardial bridging: Surgical experience at Mayo

- 63 patients 1996 to 2017 mean age of 48 years
- Unroofing was complicated by entry into the RV in three patients. Mean stay in the hospital 5 days
- No hospital mortality and no CV mortality on 30 days
- During follow-up (median 31 months, 95% CI 18-52 months), there were no cardiac-related deaths and 75% reported no chest pain.
Stress echo distinctive focal end-systolic buckling in the septum

- Early onset
- Late onset

Asymptomatic incidental findings

No treatment

- Hemodynamically FFR >0.8
  - Endothelial function
    - Medical therapy BB/CCB bASA statin
    - Selective DES
      - ISR~30%
      - MACE
      - IVUS/CT guided

Symptomatic ± evidence of ischemia

Coronary hemodynamically with FFR response to dobutamine

- Hemodynamically FFR <0.8
  - Endothelial dysfunction
    - Failure
    - Surgical intervention
    - Occlusion of grafts ↑

Yoshino & Lerman Circ J 78:685, 2014