FFR and IVUS
in Myocardial Bridging

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Myocardial Bridging

- **Common congenital coronary anomaly**
  - segment of a major epicardial coronary artery runs intramurally.
  - systolic narrowing, delayed diastolic relaxation → Induce ischemic heart disease.

- **Frequency varies from 0.5 - 33% by Coronary angiography.**
  - In autopsy series: 15-85%
Myocardial Bridging

- **Clinical relevance is debated**

  - Harmless normal variant,
  - but may cause angina, MI, life-threatening arrhythmia and even sudden cardiac death.

  - No study for long term clinical prognosis of MB.
CASE 1.

- 62/F
- Typical effort chest pain
- Thallium SPECT:
  Normal myocardial perfusion
- Treadmill test:
  Positive (at stage 4)
CASE 1.
CASE 2.

- 55/F
- Typical effort chest pain
- Thallium SPECT:
  Normal myocardial perfusion
- Treadmill test:
  Negative
CASE 2.
Myocardial bridging is generally believed to be a benign disease…

1. Can we reassure these patients confidently?

2. Treatment options?

   Medical treatment vs. Revascularization (Stenting or Surgery)
Myocardial bridging is not a benign variation of coronary anatomy

- Retrospective review: 2002-2005 (Follow up duration: $12 \pm 2$ months)
- 226 patients (1.57%) were symptomatic isolated myocardial bridging.
- Group I (< 50% systolic compression), Group II (50–70%), Group III (≥ 70%).

Can we evaluate the physiologic severity of MB with FFR?

Can we predict the prognosis of the patients with MB?

CASE 1

- Effort chest pain
- Thallium SPECT: Normal
- TMT: Positive at stage 4
- FFR: 0.84

CASE 2

- Effort chest pain
- Thallium SPECT: Normal
- TMT: Negative
- FFR: 0.87
Adequate identification of Myocardial bridging?

- Dynamic stenosis:
  - Degree of extravascular compression
  - Intra-myocardial tension (contractility)

- In rest conditions:
  
  might leave un-identified the hemodynamic relevance.

  (Ischemia only during exercise / situations of increased inotropism)
Dobutamine Challenge in Physiologic Assessment of MB


46.1 ± 10.5 → 68.7 ± 17.9% (p<0.0001)

1.5 ± 0.4 → 0.8 ± 0.4 mm (p=0.001)

12.4 ± 9.1 → 24.0 ± 9.2 mm (p=0.0005)
The “milking” of blood in the compressed epicardial segment against systole:

- Premature overshooting of intracoronary over aortic pressure
- Negative systolic pressure gradient across the MB.
- Diastole FFR avoids the influence of systolic negative intracoronary Pr.
- Allows quantification of the effect of the MB.
CASE 1

Thallium SPECT: Normal
TMT: Positive at stage 4
FFR: 0.84
Dobutamine FFR: 0.81
Diastole Dobutamine FFR: 0.74

CASE 2

Thallium SPECT: Normal
TMT: Negative
FFR: 0.87
Dobutamine FFR: 0.87
Diastole Dobutamine FFR: 0.84
Are there differences of prognosis between the two patients?
Clinical Follow-up of isolated MB patients

14 patients
median follow-up: 54 months (30-74m)

1 patient died from femur fracture

2 patients underwent TLR
(1 patient: PCI, initial FFR <0.75,
1 patient: CABG, diastolic FFR >0.76)

11 patients: free of symptom after Meds

Kyungil Park et al, Canadian Journal of Cardiology 27 (2011) 596–600
We need more study to prove...

- Evaluation of clinical prognosis in Myocardial bridging according to functional significance using diastolic FFR with dobutamine.

- Evaluation of concordance between diastole-FFR and other non-invasive stress test (TMT, Thallium SPECT, Dobutamine Echo)
## STUDY PROTOCOL in AMC

**Symptomatic Isolated Myocardial Bridging patients** diagnosed by coronary angiography (Total patients=100)

**FFR with dobutamine infusion (upto 40ug/kg/min)**

- IVUS
  - dFFR with dobutamine $<0.75$
  - dFFR with dobutamine $0.75 \leq <0.80$
  - dFFR with dobutamine $0.80 \leq$

(1) Thallium SPECT, Treadmill test  
(2) Dobutamine stress Echocardiography

**2-year, 5-year clinical follow up**

End point: Re-admission, Intractable chest pain with medication, MI, TLR, Life-threatening arrhythmia, cardiac death