MITRAL VALVE STENOSIS: QUANTITATIVE METHODS

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MITRAL STENOSIS

• Diagnosis
• Quantification
• Management
Diastolic mitral leaflet doming concave toward the LA is seen in:

1. Only rheumatic MS
2. Rheumatic and calcific MS
3. Rheumatic and congenital MS
4. Rheumatic MS, and AI with flow impinging on the MV

Rheumatic MS
MITRAL STENOSIS

- Diagnosis
- Quantification
- Management

Pressure Gradient
Assessment of Mitral Stenosis

- Mitral valve area measurement
  - > 1.5 cm$^2$ - Mild
  - 1.1 to 1.5 cm$^2$ - Moderate
  - < or = 1.0 cm$^2$ - Severe

Quantification of Mitral Valve Area

- Direct Planimetry
- Pressure Half-Time
- Continuity / PISA
Real-Time 3D: Biplane Feature

Quantification of Mitral Valve Area

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Sebag AJC 2005
P1/2: Nonlinear Slope
A patient has mitral stenosis with an E-wave deceleration time of 1000 milliseconds. What is the mitral valve area?

1. 0.22 cm²
2. 0.75 cm²
3. Depends on cardiac output
4. 1.5 cm²

PHT = 29% of total deceleration time (DT)

\[
\text{MVA} = \frac{220}{\text{Pressure half time}}
\]

\[
\text{MVA} = \frac{750}{\text{Deceleration time}}
\]
Transmitral E-wave deceleration time varies most consistently with which physiological parameters?

1. Directly with mitral valve area, directly with ventricular stiffness

2. Directly with mitral valve area, inversely with ventricular stiffness

3. Inversely with mitral valve area, directly with ventricular stiffness

4. Inversely with mitral valve area, inversely with ventricular stiffness
Rheumatic Mitral Valve Stenosis: Case

MVA by Planimetry = 1.2 cm²
Rheumatic Mitral Valve Stenosis

MVA by $P^{\frac{1}{2}}t = 1.6 \text{ cm}^2$

45-year-old woman with mitral stenosis, dyspnea and fatigue
Dilated, hypokinetic LV
MVA = 0.66 cm²
MVA = 750 / Deceleration time
= 750 / 660 = 1.14 cm²
Take Home Message

• Rely on planimetry, esp. biplane
• Pressure half time area can be falsely elevated because of noncompliant (stiff) LA or LV, AI (at least moderate), or ASD.

Quantification of Mitral Valve Area

• Direct Planimetry
• Pressure Half-Time
• Continuity / PISA
AREA = Flow rate / velocity
PISA Method

MVA = Peak Flow/Peak MS velocity

Leonardo Rodriguez

v = 38 cm/sec

r = 1.06 cm

α = 110°
Peak flow rate = $2\pi r^2 v (\alpha /180)$

$r = 1.06\, \text{cm}$
$v = 38\, \text{cm/sec}$
$\alpha = 110^\circ$

Peak flow rate = 164 cm$^3$/sec

MVA = Peak flow rate / Peak velocity

= $(164\, \text{cm}^3/\text{sec}) / (200\, \text{cm/sec})$

= 0.82 cm$^2$
Can we apply the continuity equation as we do across the aortic valve?
MITRAL STENOSIS

• Diagnosis
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CONTINUITY EQUATION

\[
\text{MV Area} = \frac{\text{Forward flow}}{\text{Velocity}} = \frac{\text{Systolic flow (AV, PV)}}{\text{Mitral CW time-velocity integral}}
\]

- No important MR
- No important AR (PR)
Commissural splitting

METHODS

Echocardiography

BEFORE PMV:
Echocardiographic Examination

- Standard Views
- Echocardiographic Score of Valve Morphology:
  - Mobility 0 - 4
  - Thickening 0 - 4
  - Calcification 0 - 4
  - Sub-Valvular 0 - 4

Total 0 - 16
Echo score < 8 associated with greater success of percutaneous mitral valvuloplasty

Mitral Stenosis-Low Echo Score-4

Mobility = 1
Thickening = 1
Calcification = 1
Subvalvular = 1
Rheumatic Mitral Valve Stenosis
High Echo Score -11

Mobility = 2
Thickening = 2
Calcification = 3
Subvalvular = 4
DON’T DO IT!

- Calcific MS
- Moderate MR
- High score
- LA thrombus
- Likely to tear
- Severe TR
Event Free Survival Rate After PMV Among 318 Patients With Mild, Moderate and Severe TR
MITRAL STENOSIS

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2014 AHA/ACC Guideline for the Management of Patients With Valvular Disease (Nishimura)

- > 1.5 cm² – “Progressive”
- 1.1 to 1.5 cm² – “Severe”
- ≤ 1.0 cm² – “Very severe”

Based on symptoms and improvement with intervention
But MVA ≤ 1.5 cm² may be as’xic!
Echo and Hydrodynamic Assessment of Mitral Stenosis

- Mitral valve area measurement
  - $> 1.5 \text{ cm}^2$ - Mild
  - 1.1 to 1.5 cm$^2$ - Moderate
  - $< \text{ or } = 1.0 \text{ cm}^2$ - Severe

Gorlin and Gorlin 1951