AORTIC STENOSIS

TRANSCATHETER AORTIC VALVE_IMPLANTATION (TAVI) – DR J VORSTER
Valvular heart disease

• Accounts for 10% - 20% of all cardiac surgical cases

• Primary causes of valve disease
  - Age-associated calcific valve changes
  - Congenital:
    1. Bicuspid aortic valve
    2. Myxomatous mitral valve
  - Rheumatic valve disease

• $\frac{2}{3}$ of valve procedures:
  - Aortic valve replacement (AVR)
    • Most often for aortic stenosis (AS)

• $\frac{1}{3}$ of valve procedures:
  - Mitral valve surgery:
    • Mitral regurgitation
      (Mitral stenosis treated percutaneously)
Left ventricular outflow obstruction

• **Valvular:**
  - Congenital aortic valve disease (e.g. bicuspid)
  - Age-associated calcific (tricuspid)
  - Rheumatic (tricuspid)

• **Supravalvular:**
  - Williams syndrome

• **Subvalvular:**
  - Discrete sub-aortic stenosis
  - Hyperthrophic Cardiomyopathy (HOCM)
Valvular Aortic Stenosis

A. Normal tricuspid valve
B. Bicuspid valve
C. Rheumatic aortic stenosis
D. Age-associated calcific
Calcific Aortic Valve Disease

• Age-related calcific (degenerative) AS
  - Most common cause of AS
    • 2% of persons ≥ 65 years (Otto)
  - Bicuspid / Tricuspid
    • 50% of patients undergoing AVR for AS bicuspid valve was present
      - ±60% of those < 70 years
      - ±40% of those > 70 years

• Risk factors similar to those for vascular atherosclerosis:
  - Initially theory: Mechanical stress
  - Evolving concept: Proliferative & inflammatory process
    • Progressive calcification
    • Ultimately: Bone formation
Pathophysiology

Aortic stenosis

LV outflow obstruction

↑ LV systolic pressure

↑ LV mass

LV dysfunction

↑ Myocardial O₂ consumption

↓ Diastolic time

↓ Myocardial O₂ supply

Myocardial ischemia

LV failure

↓ Ao pressure
Clinical Presentation

• **Exertional dyspnea**
  - Diastolic dysfunction $\rightarrow$ ↑ LVEDP $\rightarrow$ Pulmonary congestion
  - Fixed cardiac output

• **Angina (⅔ of patients)**
  - 50% associated CAD
  - Absence of CAD:
    - ↑ Myocardial O2 demand (LVH)
    - ↓ Coronary perfusion

• **Syncope**
  - ↓ Cerebral perfusion during exertion
  - Transient AF (at rest)
  - Transient AV block

• **Heart failure**
Physical Examination

- Pulses parvus et tardus
- Carotid shudder
- LV hypertrophy
- Presystolic distention of LV (precordial a wave)
- Systolic thrill
- Ejection systolic murmur
- Gallavardin phenomenon
ECG

- LV hypertrophy (85%)
- ST-segment depression with T-wave inversion (strain)
- LA enlargement
Echocardiography

• Severe AS:
  1. Mean gradient > 40mmHg (Max > 60)
  2. Valve area < 1cm² (or <0.6cm²/m²)
  3. Jet velocity > 4.0m/sec
Catheterization

ECG

mm Hg

Peak instantaneous 100

Peak-to-peak 47

Mean 60

LV
Ao
Natural history

Survival

Percent

Age

Onset severe symptoms

Latent Period (Increasing Obstruction, Myocardial Overload)

Angina
Syncope
Failure

Avg. survival Years

Age Years
Management

Severe Aortic Stenosis

- $V_{\text{max}} > 4 \text{ m/s}$
- $AVA < 1.0 \text{ cm}^2$

Undergoing CABG or other heart surgery?

Symptoms?

- Yes
  - Symptoms or hypotension
    - Class I
    - Class I
    - Class IIb

Exercise test

- Normal
  - LV ejection fraction
    - Normal
      - Clinical follow-up, patient education, risk factor modification, annual echo
    - < 0.50
      - Severe valve calcification, rapid progression, and/or expected delays in surgery

Reevaluation

- Yes
  - Aortic valve replacement
    - Preoperative coronary angiography
TAVI
TAVI

Edwards Sapien

Medtronic CoreValve
TAVI

- Symptomatic aortic stenosis:
  - Aortic valve area <0.8 cm²
  - High operative mortality risk / “non-operable”
  (Logistic EuroSCORE >20% or STS Score>10)

- Transfemoral or transapical
  - Without cardiopulmonary bypass