Heart valve diseases and treatments

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No financial interest in this presentation or any of the companies mentioned in this presentation
The Heart

Pump Blood

Image by Bryan Christie
Heart Components

HEART CHAMBERS
(1) Right atrium
(2) Left atrium
(3) Right ventricle
(4) Left ventricle

Function
- Pump blood from one chamber to the next
Heart Components

HEART VALVES

(1) Mitral valve – two leaflets
(2) Aortic Valve – three leaflets
(3) Pulmonary Valve – three leaflets
(4) Tricuspid Valve – three leaflets

Function
- Allow unidirectional flow of blood
Heart Valve Diseases

- Most frequently diseased valves:
  - Mitral valve (MV)
  - Aortic valve (AV)

- Improper blood flow through the heart, which may be caused by:
  - Infection of valves
  - Rheumatic fevers
  - Calcification
  - A condition that you are born with.
  - Coronary artery disease (clogged)
  - Degenerative disease
  - Others
Mitral Valve Diseases

- **Regurgitation**
  - Blood leakage back to left atrium.

- **Stenosis**
  - Blockage of blood flow
  - Calcification of valve
Aortic Valve Diseases

- Calcification
- Impaired blood flow
  - Heart failure
  - Shortness of breath
- Chest pain.
Symptoms

- Shortness of breath
- Weakness or dizziness
- Discomfort in your chest
- Rapid heart rhythm, irregular heartbeat, skipped beats
- Swelling of your ankles, feet or abdomen
- Rapid weight gain
- **However, you may have no symptoms at all and have severe valve disease!!!**

**Solution?**

See doctors regularly for diagnosis
Valvular heart disease is responsible for nearly **20,000 deaths each year** in the US\(^1\).

Approximately **95,000 inpatient** valve procedures performed in the US\(^1\) and about **300,000 worldwide each year**.

Hospital discharges of about **48,000 aortic** and **38,000 mitral valve disorders** each year in US\(^1\).

\(^1\)[AHA, Heart Disease and Stroke Statistics–2007 Update]
Surgical Treatments

1) Valve replacements – completely replaces diseased valve.
   - Bioprostheses
   - Mechanical prostheses

2) Valve repairs – surgical techniques that fix the degenerative valves so that they can close and open properly
   - Valvuloplasty
   - Surgical annuloplasty
Valve Replacements

Mitral valve replacement with mechanical prosthesis
Valve Replacements

Aortic Valve Replacement with Prosthesis
Valve Replacements - Current Bioprostheses

- Carpentier-Edwards Supra-Annular (SAV)
- Carpentier-Edwards PERIMOUNT Pericardial Bioprosthesis
- Carpentier-Edwards Duraflex Low-Pressure Mitral Bioprosthesis
- Hancock II Porcine Bioprosthesis
- Carpentier-Edwards Biophysio Pericardial Aortic Bioprosthesis
- Sorin Pericarbon™ Freedom Solo Stentless Pericardial Bioprosthesis
Valve Replacements - Current Mechanical Prostheses

- St. Jude Medical Masters HP (Hemodynamic Plus) Mechanical Prosthesis.
- Omnicarbon Mechanical Prosthesis.
- Medtronic-Hall Mechanical Prosthesis.
- Triflo Mechanical Prosthesis.
- Starr-Edwards Mechanical Prosthesis.
- On-X Mechanical Aortic Prosthesis.
Facts about prostheses

- A bioprosthesis is reasonable for AV replacement in patients aged >65 years without risk factors for thromboembolism. **Structural valve deterioration** was greater with a bioprosthesis for AV for patients <65 years of age than for those >65 years of age\(^2\).

- A bioprosthesis is reasonable for MV replacement in patients >65 years. **Structural valve deterioration** occurred at higher rate in those age <65 years\(^2\).

- Major bleeding was more common with the mechanical prosthesis, although the mechanical prostheses currently marketed are free from structural failure\(^2\).

- A review of Medicare data\(^1\), involving 684 US hospitals and more than 142,000 patients, indicates that the average in-hospital mortality for AVR in patients over the age of 65 years is 8.8% (13.0% in low-volume centers and 6.0% in high-volume centers)
Valve Replacements

Mitral Regurgitation
- 19% from myocardial infarction
- 15% from dilated cardiomyopathy

Aortic Stenosis
- 7% of patients over 65 yr-old
- 30% cannot undergo surgery (high perioperative mortality rate)

High-risk patients
- Left ventricular failure
- Coronary artery disease
- Prior bypass graft surgery
- Advanced age

** Surgery is NOT performed on high-risk patients

There is a pressing need for less invasive techniques.

Valve repairs

- Mitral valve repair

Carpentier-Edwards Physio Annuloplasty Ring.

Medtronic-Duran Flexible Annuloplasty Ring
New Technique Valve Repairs

- Technological improvements of bioprotheses & mechanical protheses.

- **Catheter-based**, or **percutaneous**, techniques for aortic stenosis & mitral regurgitation.
Percutaneous treatments – Mitral Valve

Monarc System
Proximal anchor  Distal anchor

Bridge segment

Coronary sinus

Mitral valve

Carillon Mitral contour system
Percutaneous treatments – Mitral Valve

Short video of Percutaneous Transvenous Mitral Annuloplasty
Percutaneous treatments

- Less invasive compared to surgical valve repair and replacement
- Suitable for patients <65 years of age.
- Currently in clinical trials for both mitral and aortic valve percutaneous treatments. Very promising results from both studies.

1. **Webb et al., 20061 (MonarchTM, Edwards Lifesciences).** MR grade of 3.0±0.7 was reduced to 1.6±1.1

2. **Duffy et al., 20062 (CarillonTM, Cardiac Dimension).** A significant reduction in the septal-lateral mitral annular dimension from 35.5 ± 4.7 to 32.2 ± 4.6 mm.

3. **Dubreuil et al., 20073 (Viacor PTMATM, Viacor).** In three out of four patients, regurgitant volume was substantially reduced (45.5 ± 24.4 to 13.3 ± 7.3 ml)
Percutaneous treatments – Aortic Valve

Cribier-Edward PHV device

CoreValve PHV device
Percutaneous treatments – Aortic Valve

Short video of Percutaneous Edwards SAPIEN valve
Percutaneous treatments – Aortic Valve

Short video of Medtronic CoreValve valve
Conclusion

- For some patients, open-heart surgery might be strenuous, may consider the minimally invasive treatment option in the future.

- Contact your physicians for more information and treatment options that are appropriate for you.
Questions?