

Mitral Valve Replacement

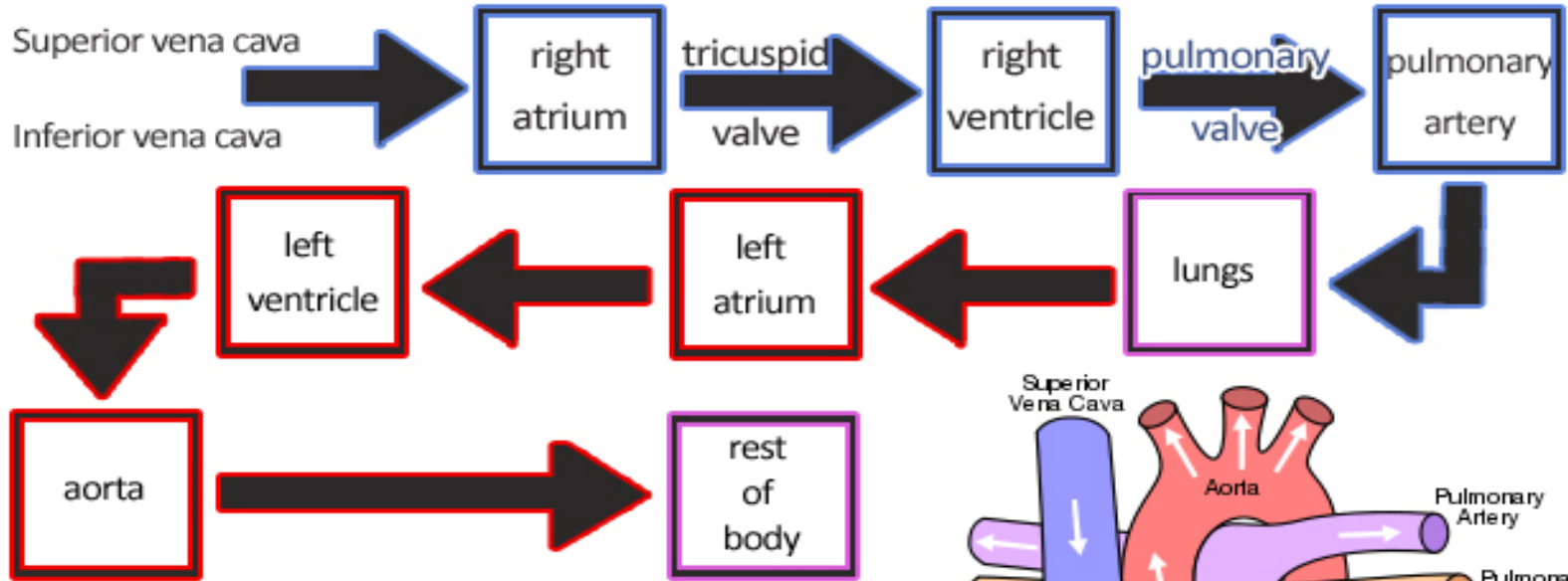
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Dr. Sun Section 1

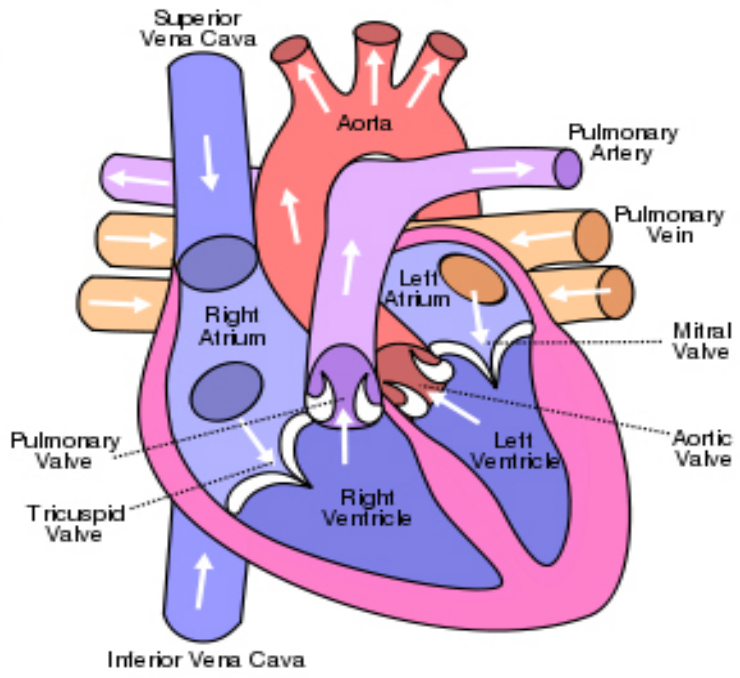
Mitral Valve

- The mitral valve is the valve between the left atrium and the left ventricle of the heart.
 - It consists of two tapered cusps.
 - Allow blood flow in only one direction.
 - Problems occur when the valve does not shut properly.

Blood Flow Through the Heart

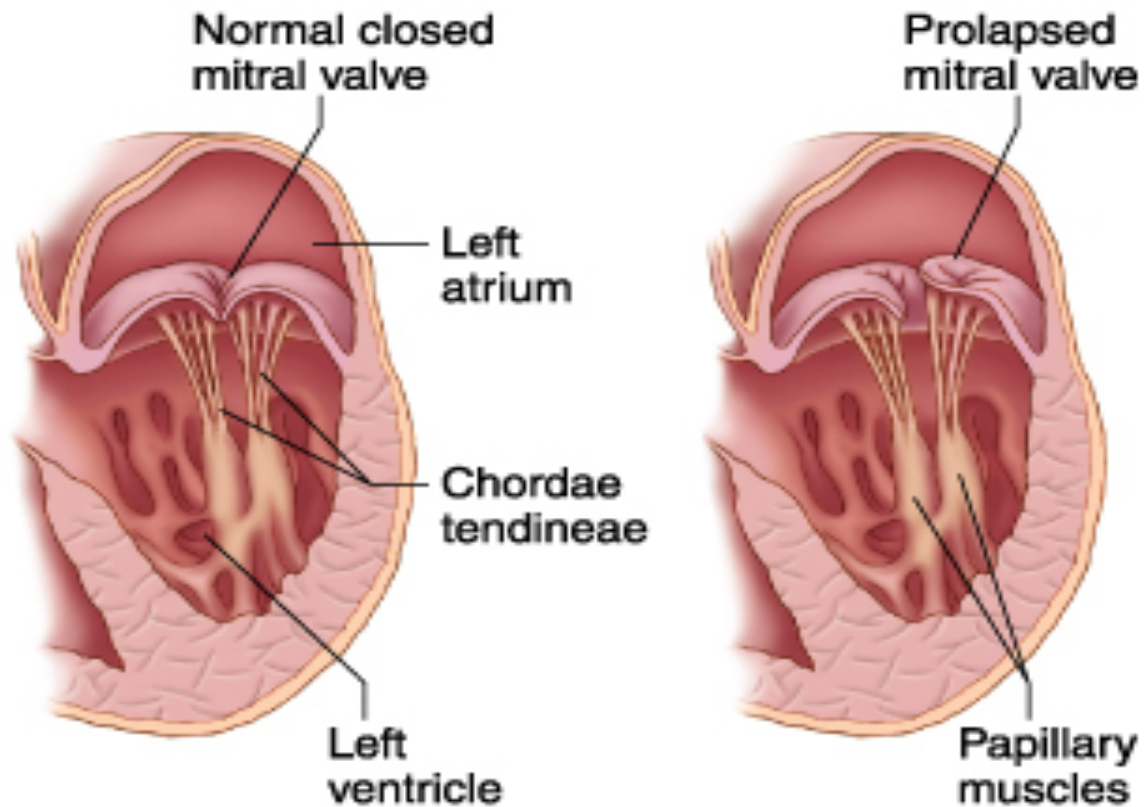


Circulation of Blood Through the Heart:

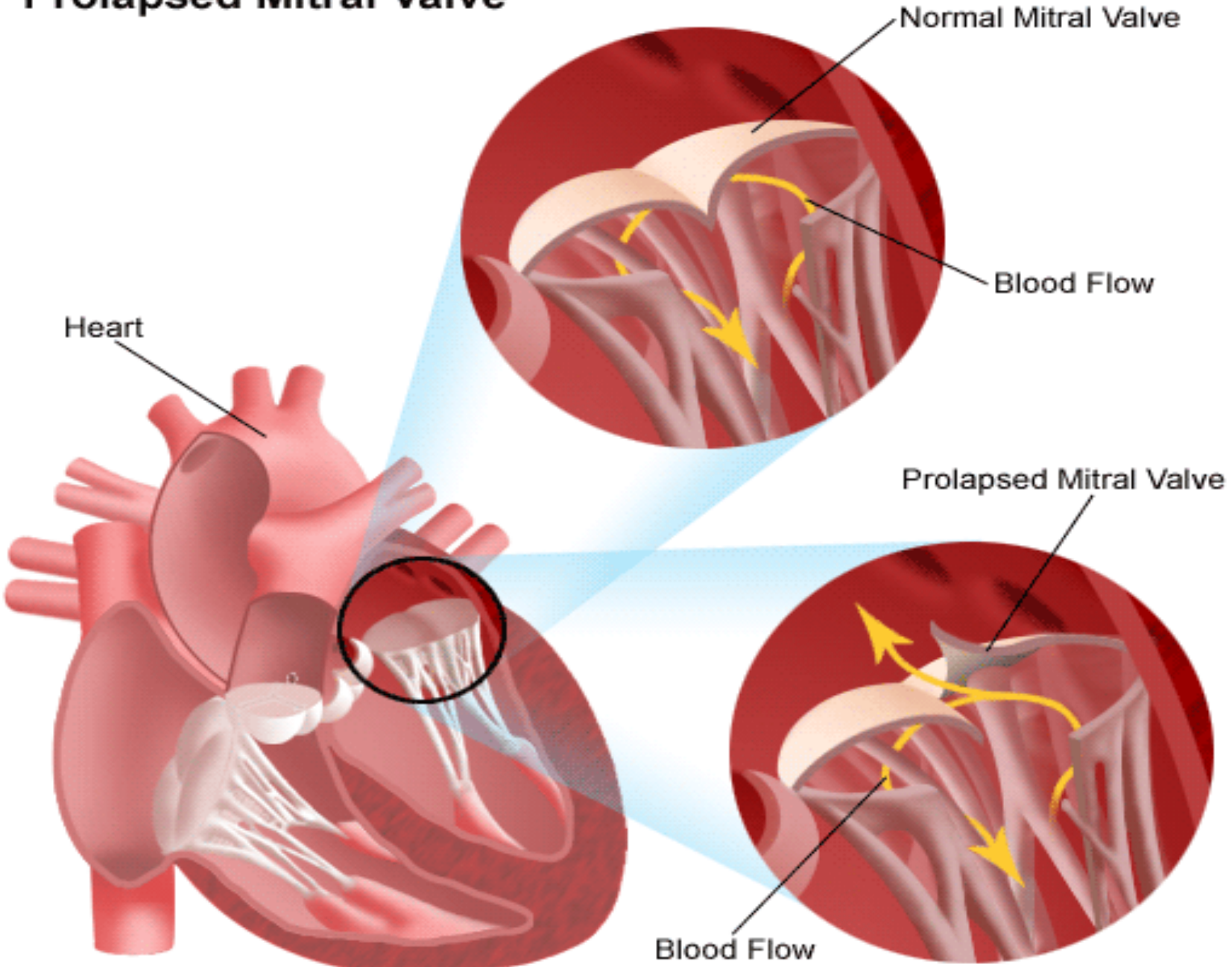


Mitral Valve Conditions

- Mitral Valve Regurgitation

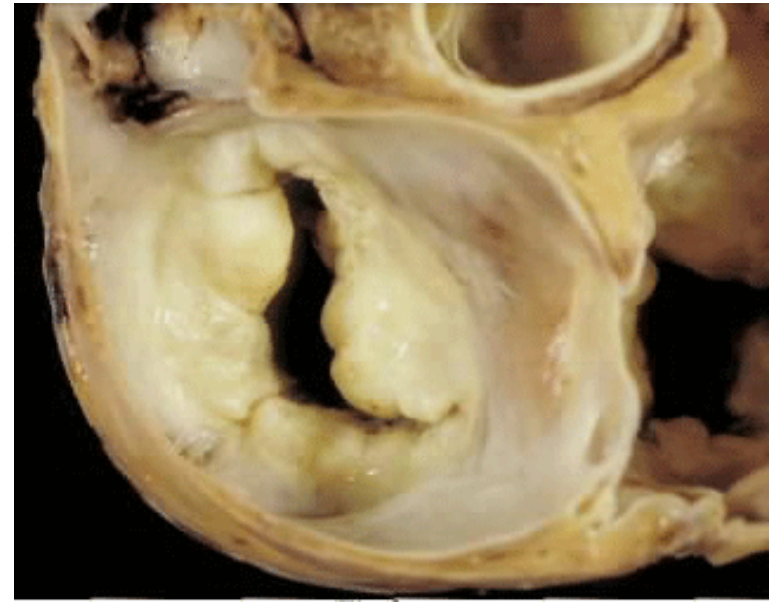


Prolapsed Mitral Valve



Symptoms

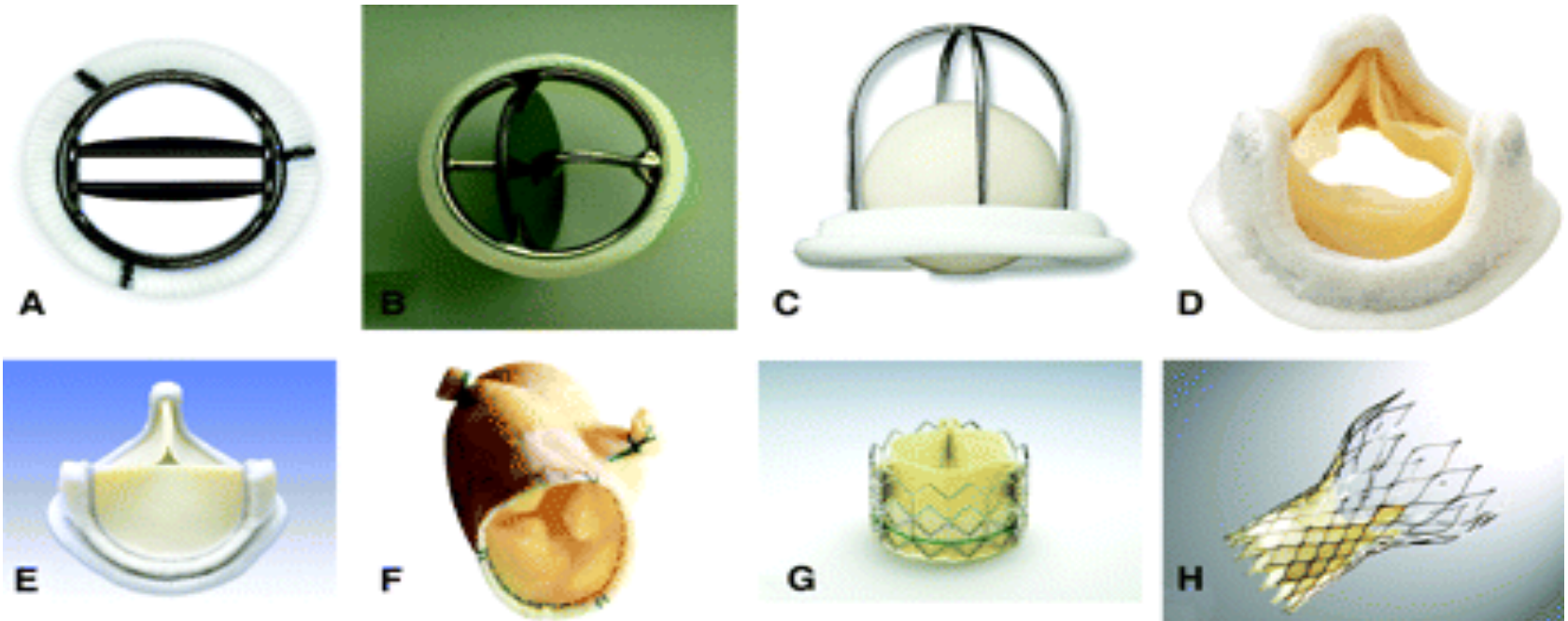
- Shortness of breath
- Fatigue
- Chest pains
- Pulse being faster than normal



Effects of Mitral Valve Regurgitation

- As the valve does not close properly, some blood is pumped back into the left atrium when the left ventricle contracts.
 - Minor leaks do not matter much.
 - Larger leaks, it cause an increase in the pressure in the atrium causing the wall of the atrium to become thicker.
 - Leads to congestive heart failure.

Different Types of Prosthetic Valves



A, Bileaflet mechanical valve (St Jude); B, monoleaflet mechanical valve (Medtronic Hall); C, caged ball valve (Starr-Edwards); D, stented porcine bioprosthesis (Medtronic Mosaic); E, stented pericardial bioprosthesis (Carpentier-Edwards Magna); F, stentless porcine bioprosthesis (Medtronic Freestyle); G, percutaneous bioprosthesis expanded over a balloon (Edwards Sapien); H, self-expandable percutaneous bioprosthesis (CoreValve).

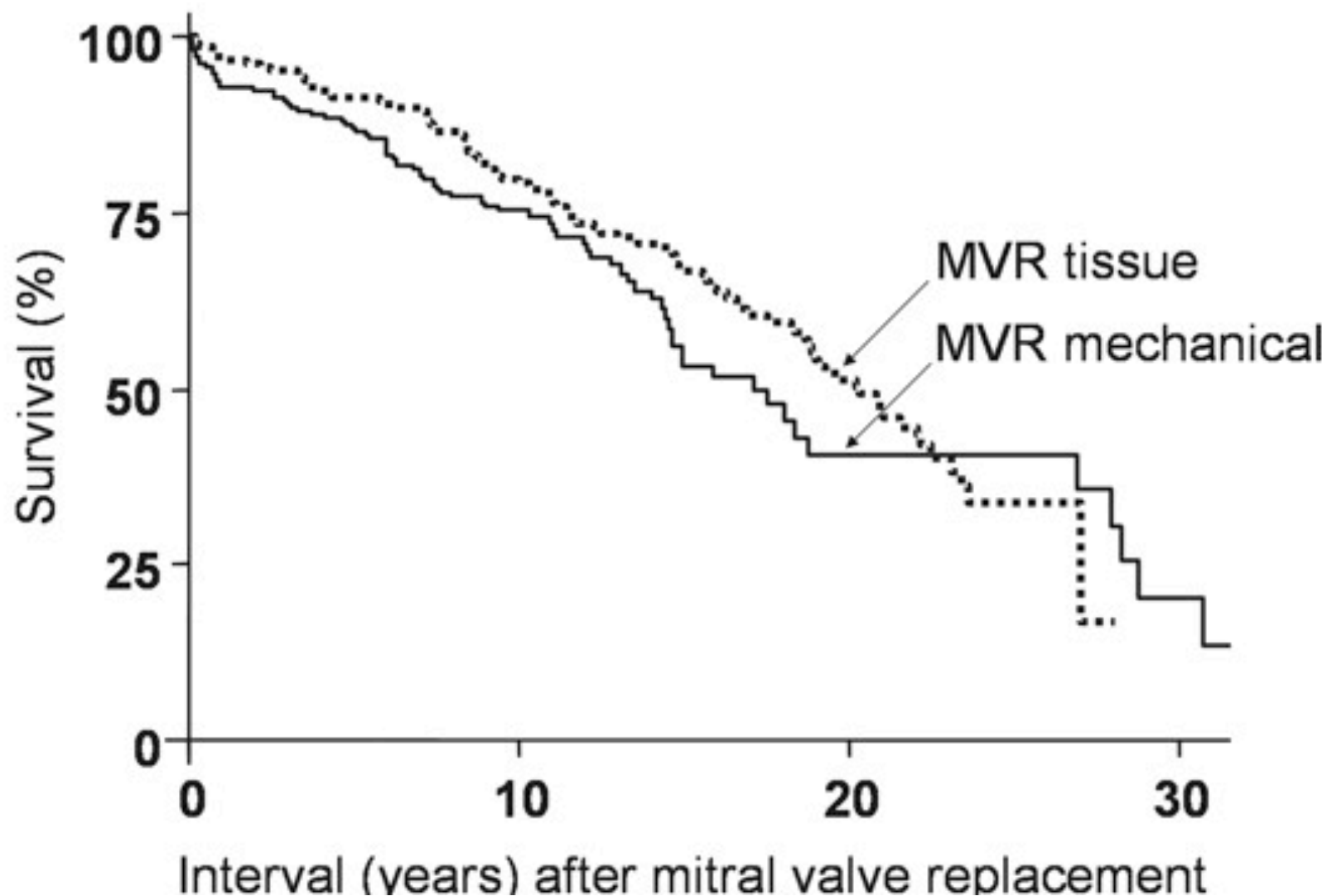
Two Types of Valves

- Mechanical Valves
- Biological Valves



Number of cohort patients at beginning of each interval

Tissue	170	115	82	-
Mechanical	144	77	35	10



Caged Ball Model (1952)

- The main characteristic of this mechanical valve is the forced peripheral flow of the blood
 - As a consequence, the heart must do extra work to compensate for the momentum lost in changing the direction of flow.



Tilting Disc Model (mid 60's)

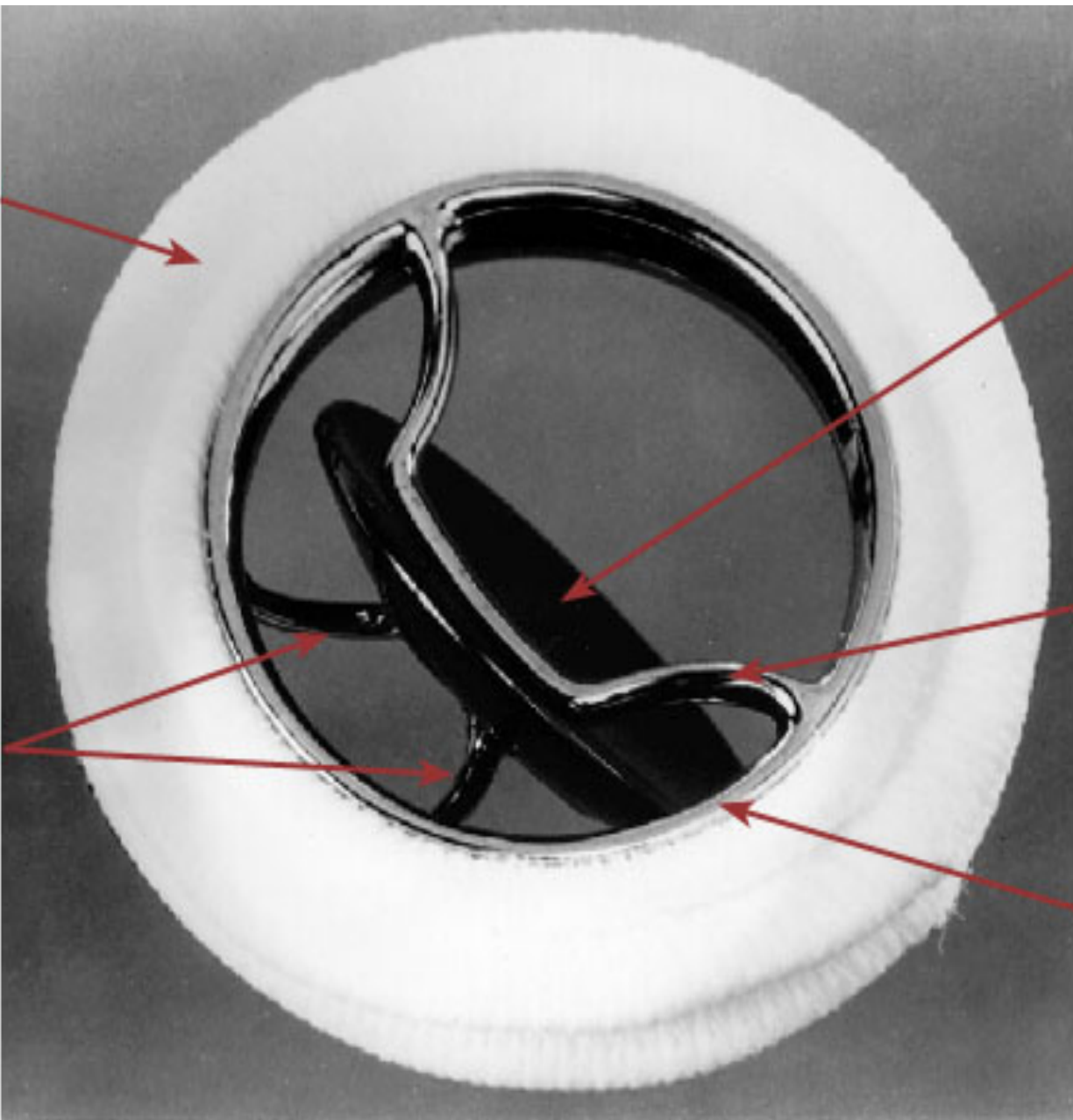
- The use of a tilting disc provided an increased central flow without allowing any back flow, thus reducing the occurrence of blood clotting.
- Attempts to further improve on the hemodynamics of the valve by increasing the tilting angle of the disc and by modifying the disc shape proved to be a disaster.



Tilting Disc Model Continued

- The valve was subject to mechanical failure caused by the fracture of both legs of the outlet strut leading to the escape of the disc and to the death of the patient.

Suture ring



Occluder disc

Inlet strut

Outlet strut

Flange

Tilting Disc Model Continued

- In 1986 it was removed from the market but by then an estimated 86,000 people worldwide had received the valve.

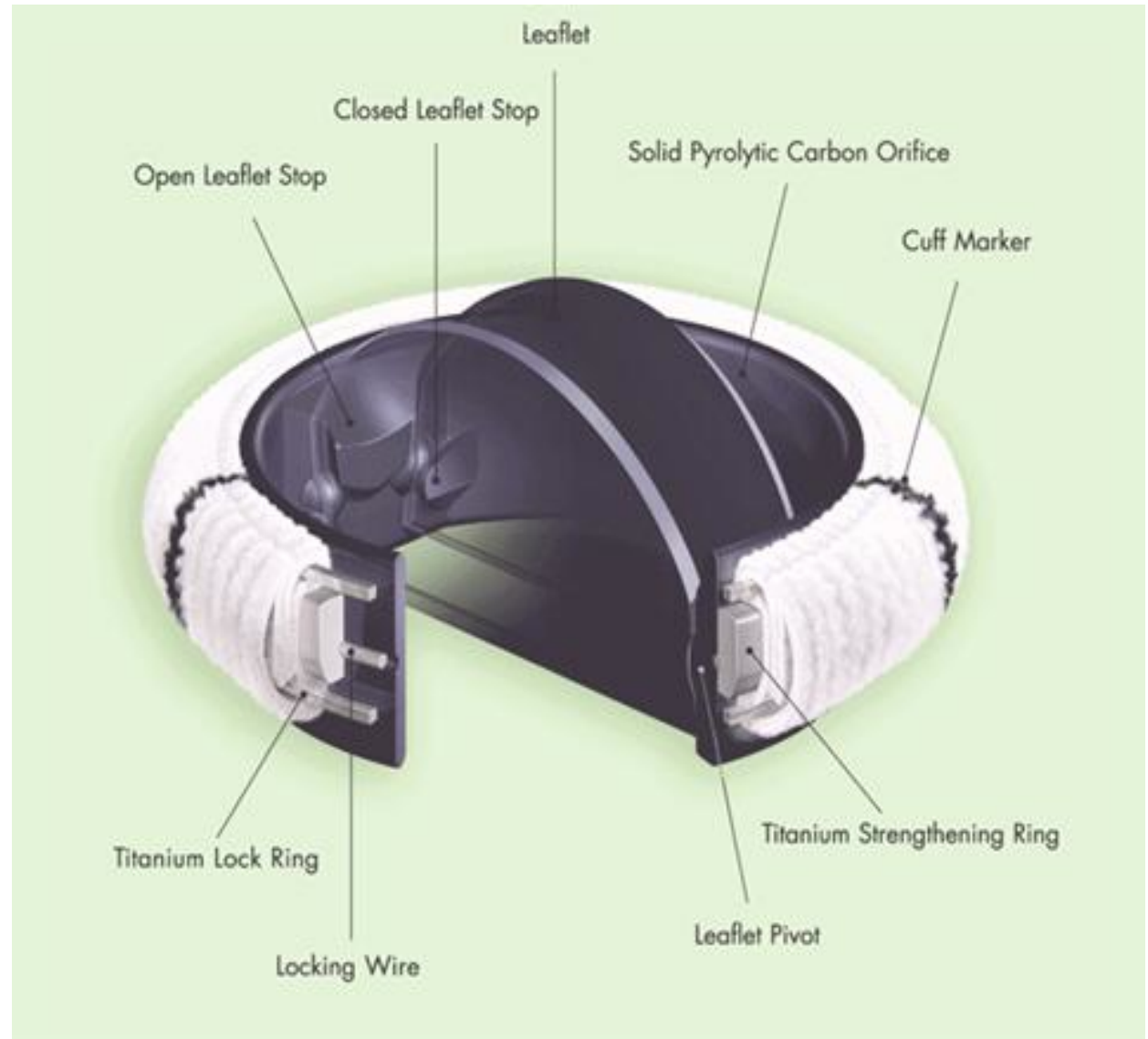
Bi-leaflet Model

- Leaflets swing open in a position nearly parallel to the flow thus enabling an essentially central flow.
 - However when the leaflets are in the closed position they never quite meet, allowing very slight back flow to occur.
- Today, this valve is known for its excellent durability.



Materials

- Pyrolytic carbon is the principal material still used for mechanical heart valves today.



Advantages of Mechanical Valve

- More durable than the biological valve and lasts more than fifteen years.
- Will relieve the severe symptoms of mitral valve regurgitation.

Disadvantages

- The valve alone costs between \$5,000 and \$7,000.
 - This does not include the surgery or the recovery time at the hospital after the procedure.
 - Price is expensive for anyone who does not have insurance.
- Some patients with a mechanical heart valve have said that they hear a clicking sound when they are in quiet areas.

Works Cited

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