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Prosthetic Valve Implantation; Indication and Technique

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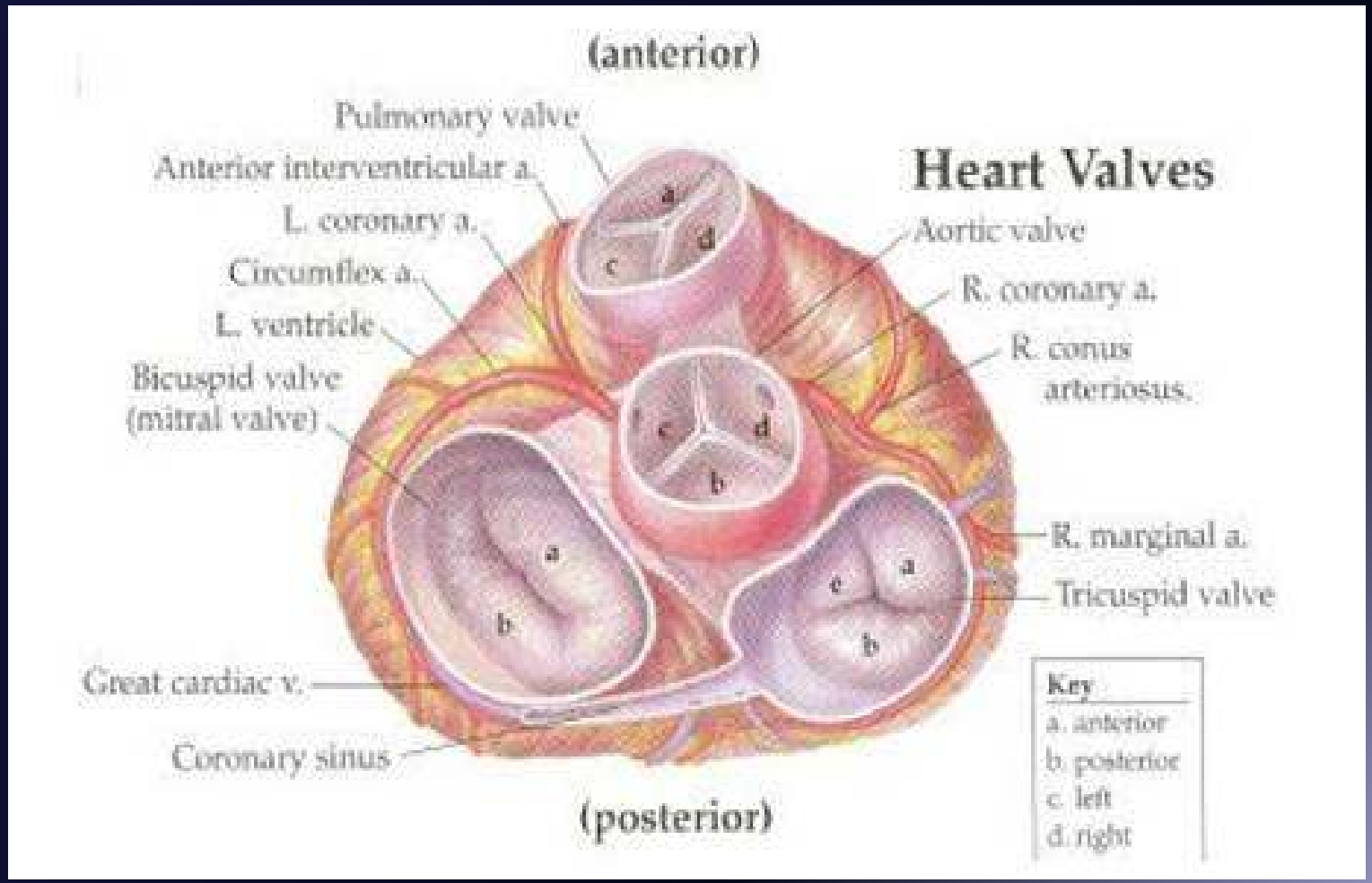
Valvular Heart Surgry

- Decreased rheumatic HD
- Increased degerative HD
- Extended application of valve repair
- Minimal invasive surgery

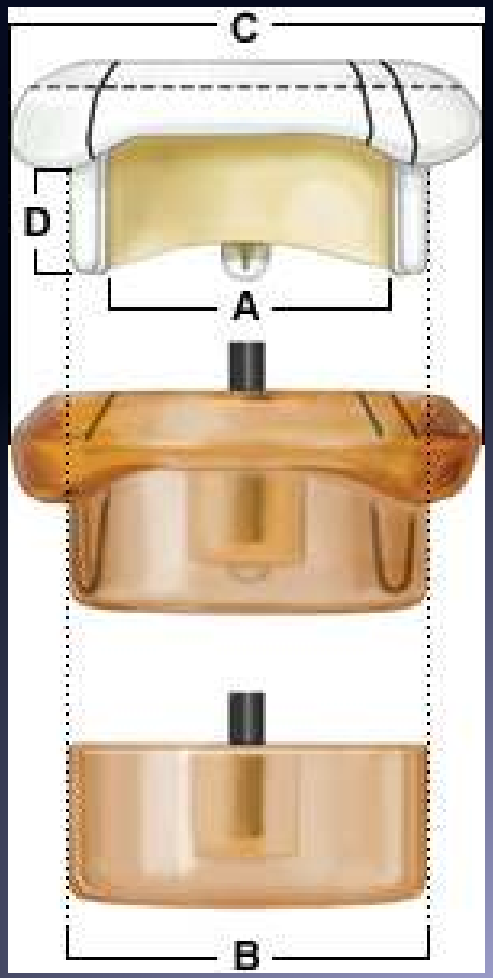
Normal Anatomy of Cardiac Valve



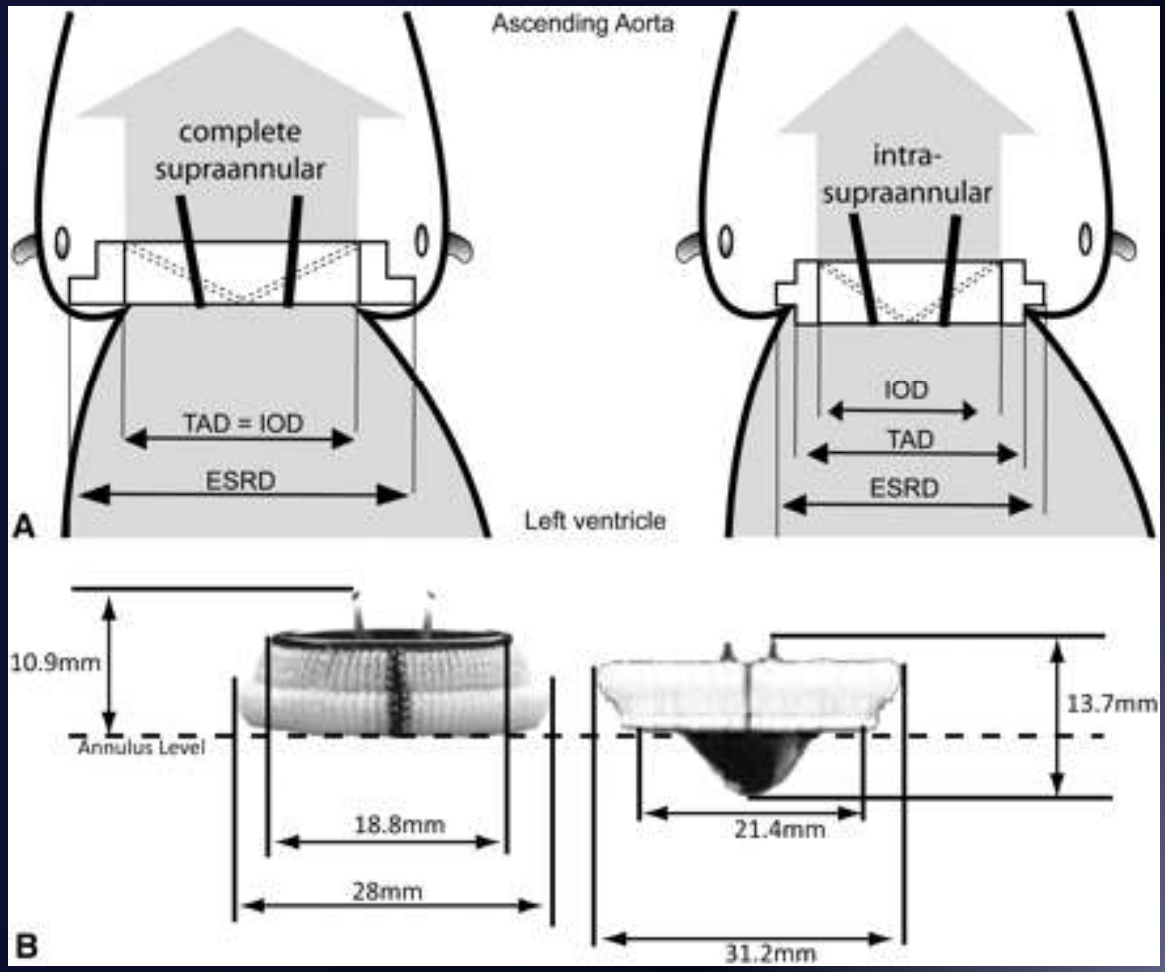
Ternminology of Valve Device Parameters.
Diameter (Valve Size)

Size	25 mm	27 mm	29 mm	31 mm	33 mm
A	25	27	29	31	31
B	28	29.5	31.5	33.5	33.5
C	36	38	40	42	44
D	7	7.5	8	8.5	8.5

A	IOD, Stent diameter
B	Tissue annulus diameter (TAD)
C	External sewing ring diameter (ESRD)
D	Anterior effective profile



Ternminology of Valve Device Parameters. Diameter (Valve Size)

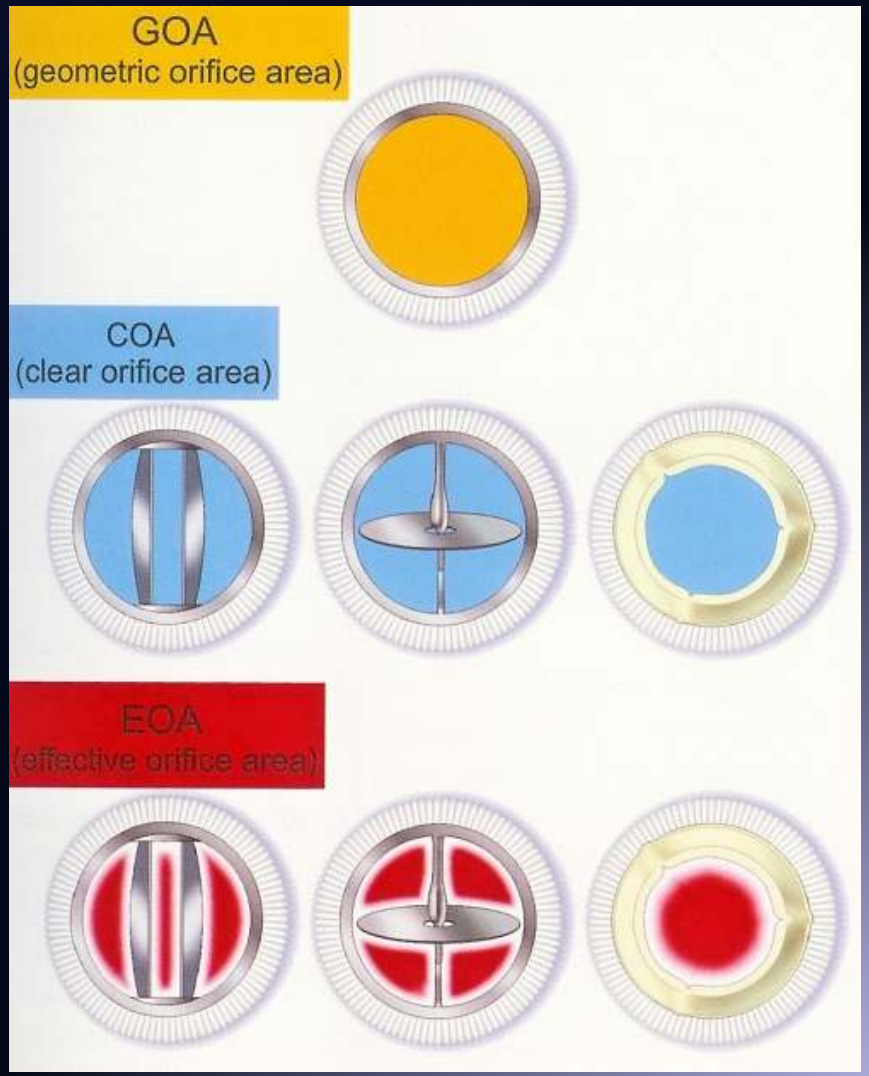


J Thorac Cardiovasc. Surg. 2008;136:462-471.

Ternminology of Valve Device Parameters. Effective Orifice Area (EOA)

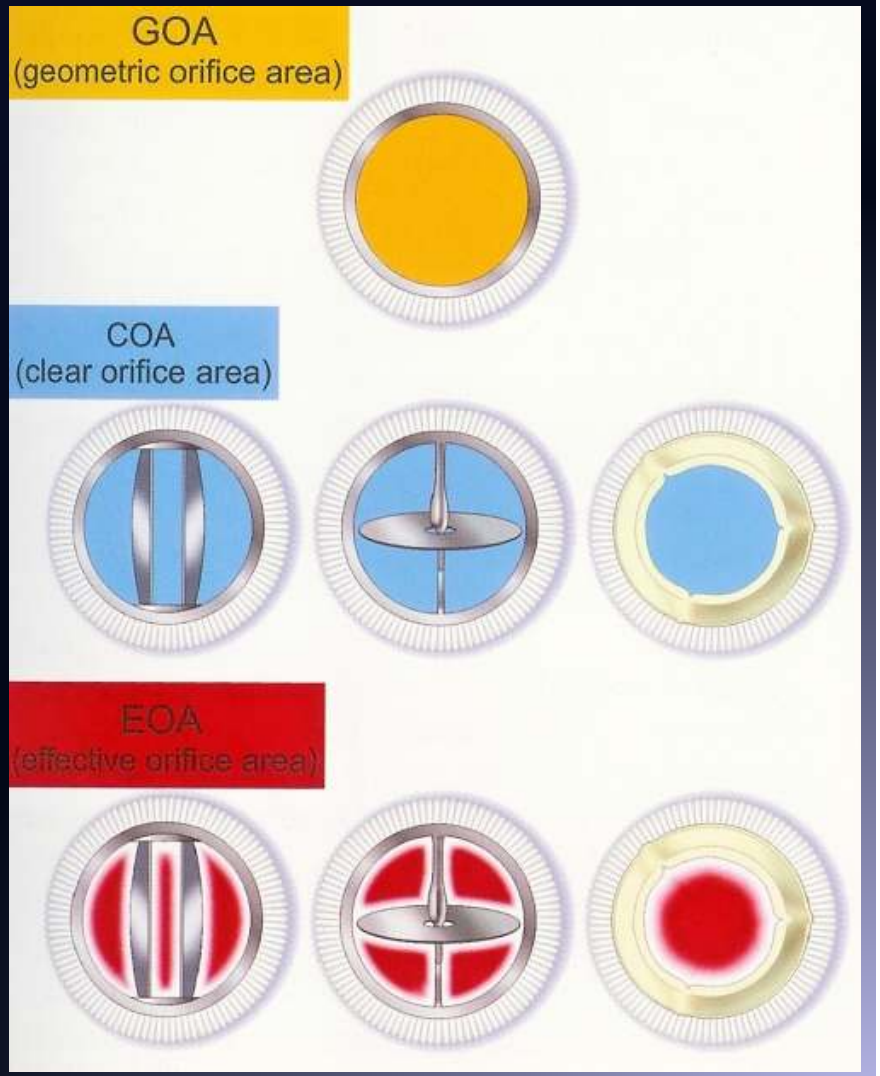
- Hemodynamically, the most important parameter.
- Both mechanical and tissue valve

- EOA, the blood really flows.
- Indexed EOA (IEOA) : EOA related to $1m^2$ of pt's BSA.



Ternminology of Valve Device Parameters. Effective Orifice Area (EOA)

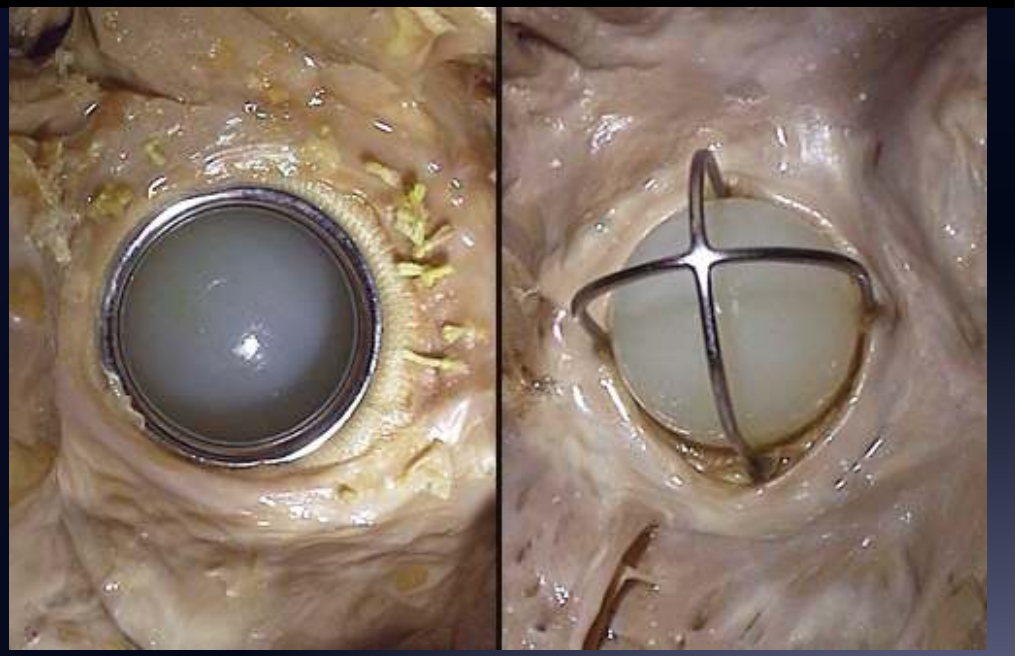
<u>For preventing PPM</u>
IEOA should be greater than
- 0.85 cm^2/m^2 in aortic position
- 1.2 cm^2/m^2 in mitral position

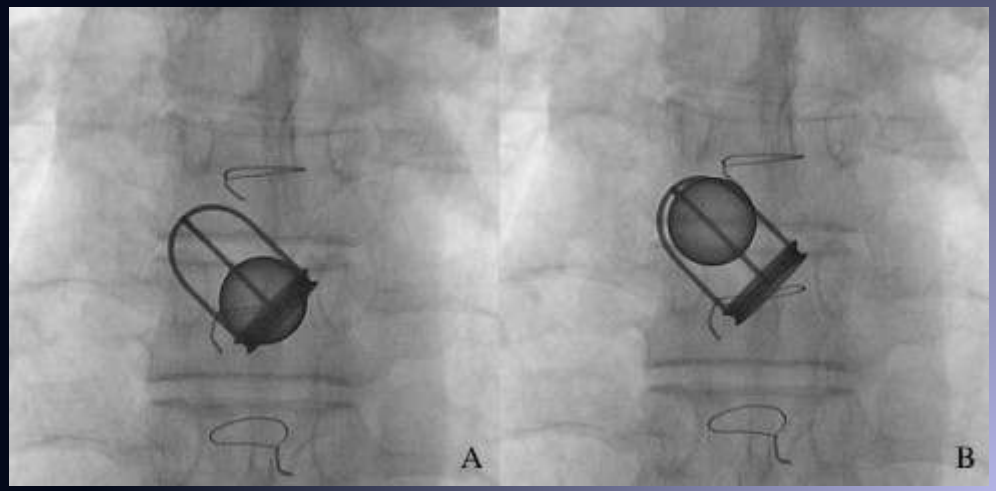


Mechanical Valves
Caged-Ball valves

- 1960, first clinical use in mitral replacement.

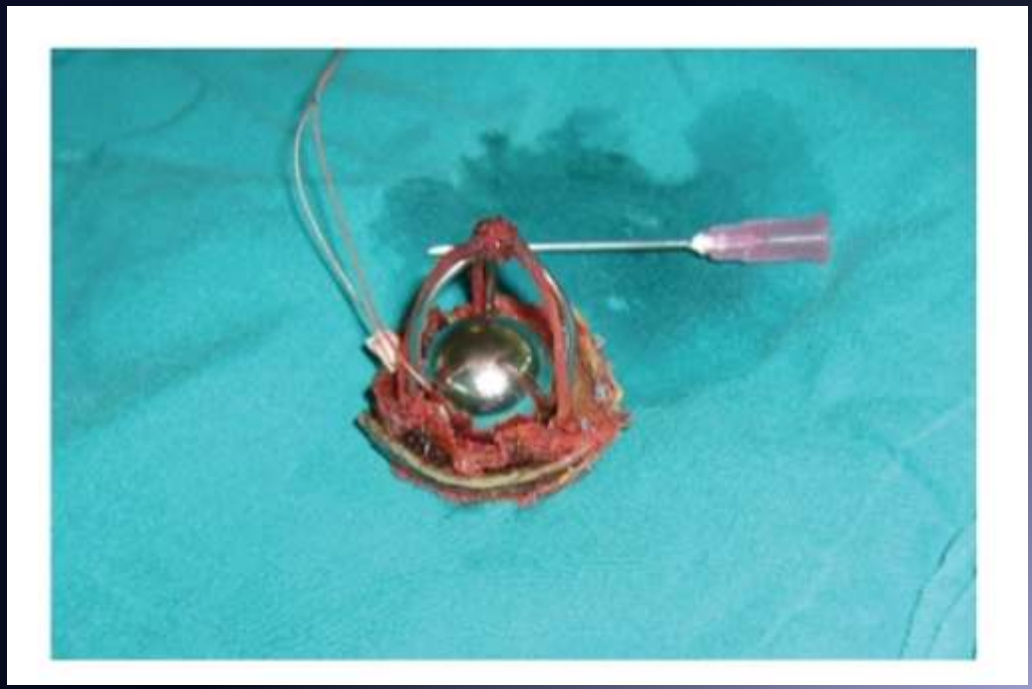
- No central blood flow
- Increased work-load
- Blood cell damage
- Thromboembolism





Mechanical Valves
Caged-Ball valves

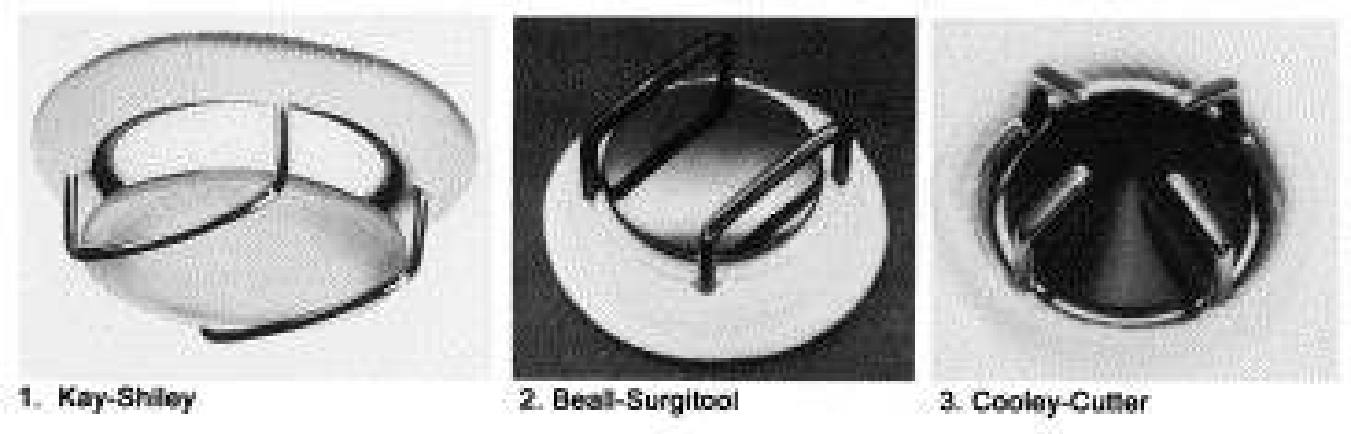
- Cloth-covered developed but tearing occured



Mechanical Valves
Non-tilting Disc Valves

- Low profile design, easy implantation, little opening resistance, short closure delay time (low AR or MR).

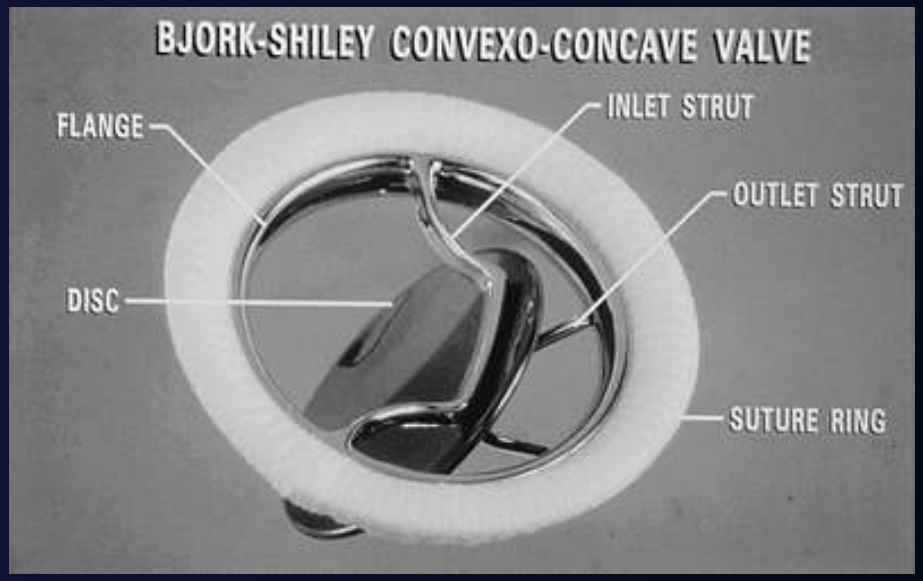
- But, higher flow gradient, significant turbulence, hemolysis, thromboembolic complications.



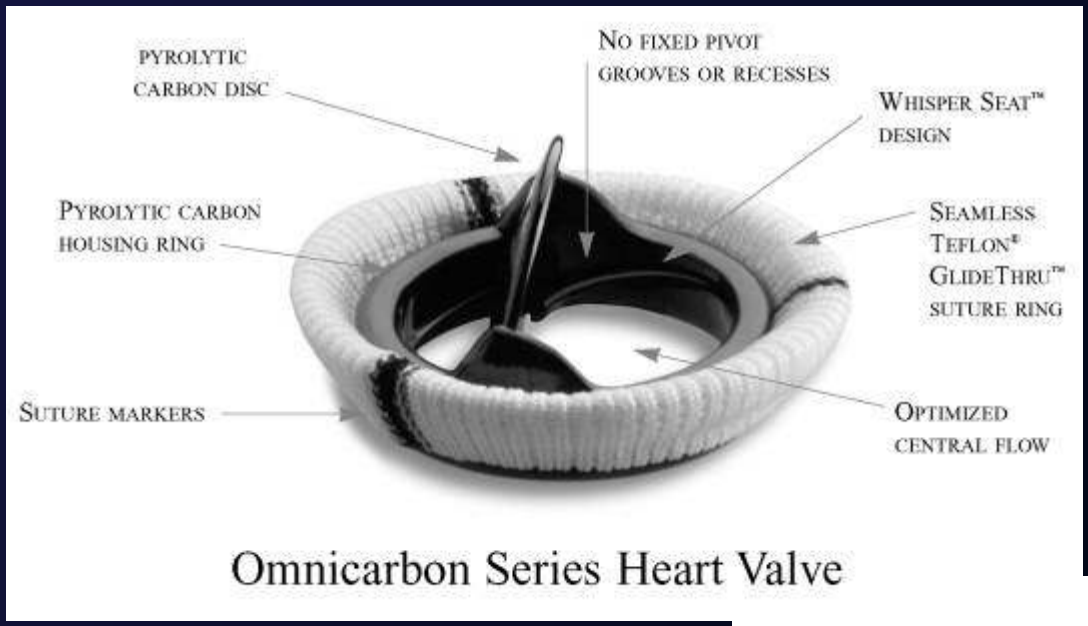
Mechanical Valves
Tilting Mono-Disc Valves (Bjork-Shiley valves)

- First model in 1969.
- Carbon flat disc tilting up to 60°-70°
- Standart type → convex concave type → monostrut type

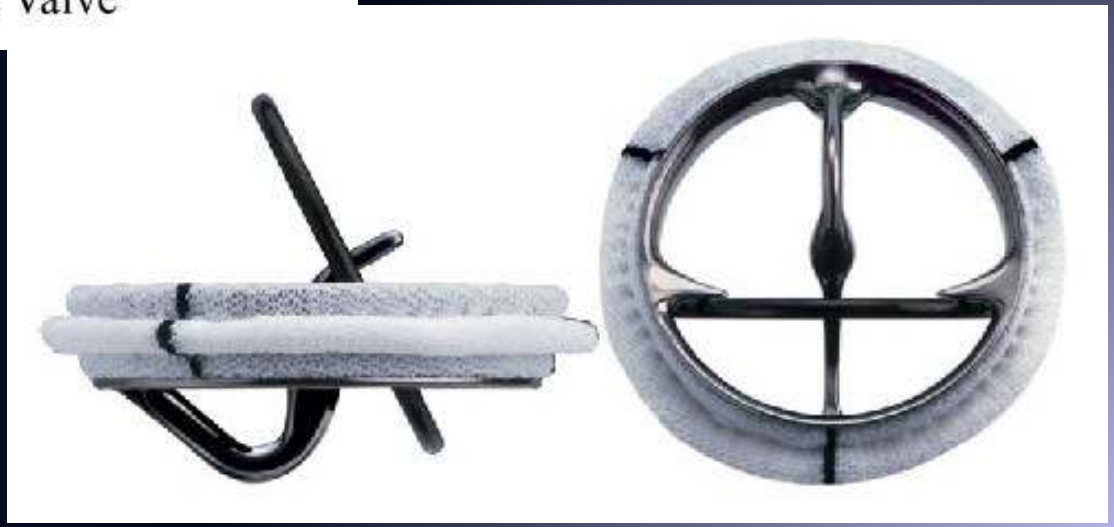
- But, inflow bar broken and disc escape !! (2%/year)



Mechanical Valves
Tilting Mono-Disc Valves (Omniscience, Medtronic-Hall)



Omnicarbon Series Heart Valve



Mechanical Valves
Bileaflet Valves

- First model in 1977 (St. Jude medical)
- Different tilting angle, pivot design, sewing ring design.
- Open up to 85°, close at 30°

- SJM HP (1992) and SJM Regent (1998) : reduced sewing ring and enlarged EOA.
  standart SJM 21mm, EOA 1.51cm^2
  SJM HP EOA 2.03cm^2
  SJM Regent EOA 2.47cm^2

** Regent 19mm EOA 1.51
(sufficient to prevent significant PPM with BSA of 2m^2)

Biological Valves
porcine

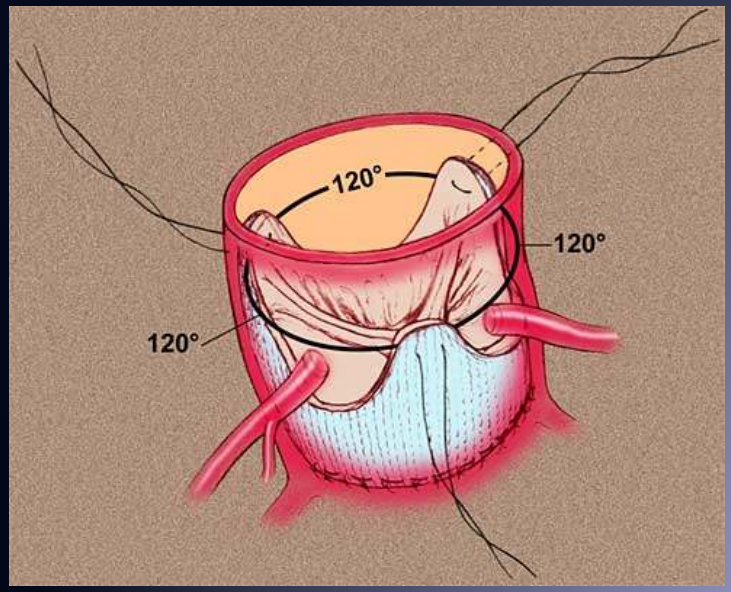
- St Jude epic, Hancock, Shelhigh, Medtronic-Mosaic

Biological Valves
bovine pericardium

- Sorin-Soprano, CE Perimount Magna

Biological Valves
Stentless bioprosthesis

- Toronto SPV, 1988 by T. David.
- Edward prima, shelhigh superstentles, Sorin Freedom
- Neither stent nor sewing ring,
- larger EOA and lower transvalvular pressure gradient.
- But, superiority in long-term data ? (vs. supraannular)
- More technical demanding and time-consuming.



Choice of Valve Replacement Device
1. Age

- Tissue valve should be preferred over 65 years in aortic position and over 70 years in mitral position.

- But reoperation really risky ???
- Or, life expectancy would be longer than present ???

Choice of Valve Replacement Device
2. Attitude to the Anticoagulation therapy

- Contra-indication for anticoagulation ?
  alcoholism, under-developing country, intolerance…

Choice of Valve Replacement Device
2. Size and Quality of annulus

- For heavily calcified, rigid, rough annulus it is advantageous to choose the valve with wide and soft sewing ring.

- Damaged annulus such as endocarditis, allograft or stentless biopresthesis are preferred.

- Small annulus 19mm tissue valve vs. mechanical valve

Choice of Valve Replacement Device
3. Risk of thromboembolism

- Risk factors : A fib. Large LA size (>55mm), Hx of embolism
- Should be given a mechanical valve.

Choice of Valve Replacement Device
4. Pregnancy

- If aortic position, Ross operation is preferred.
- Warfarinization during first trimester, 5-10% risk rate of fetal anomaly.

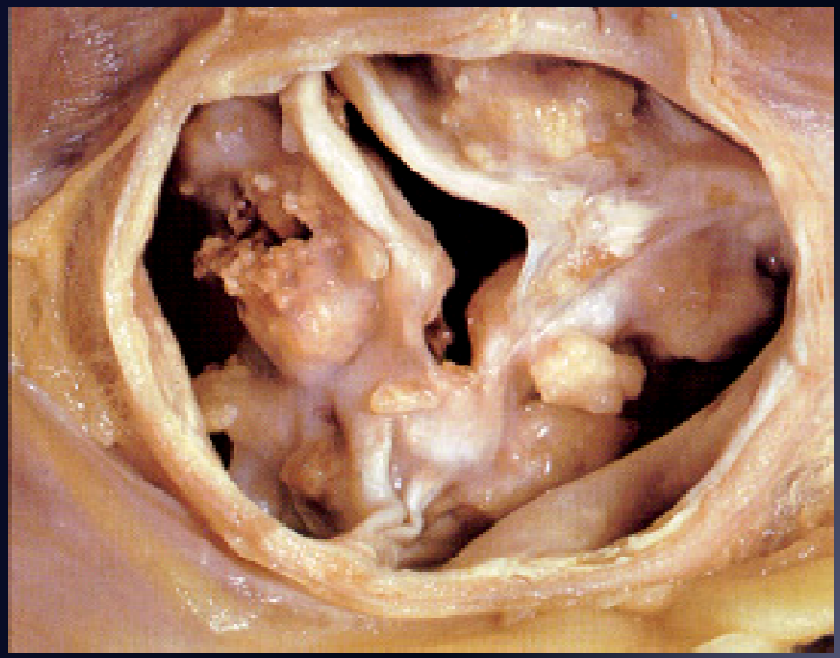
Choice of Valve Replacement Device
5. Other factors

- ESRD : Mechanical ?
- Valve position : Tricuspid vs. Mitral vs. Aortic

Aortic Valve Replacement

Three leading etiologies

- Degenerative
- Congenital bicuspid or unicuspid, quadricuspid, subaortic stenosis
- Rheumatic



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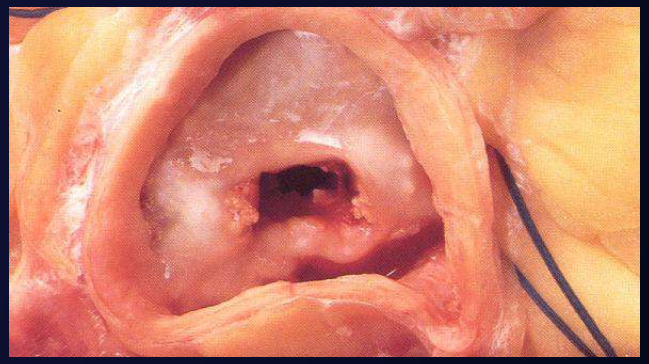

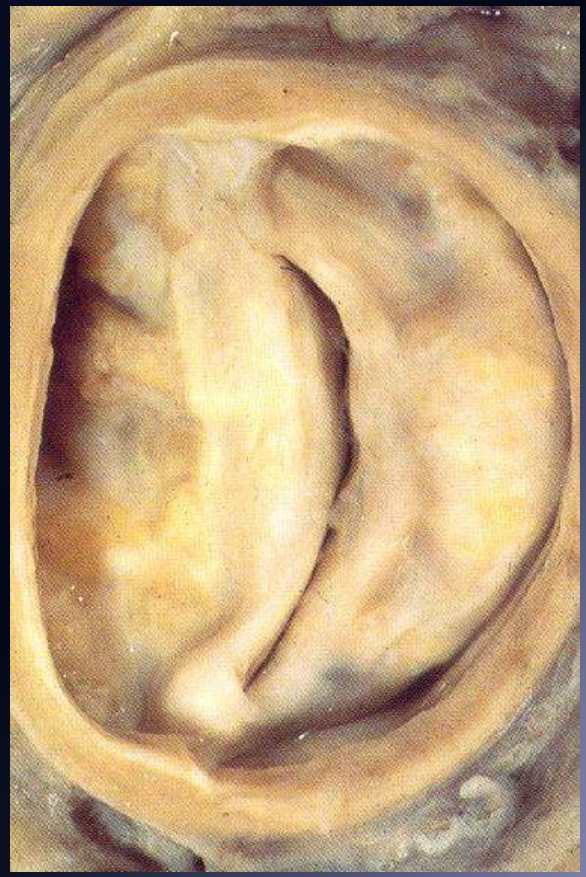

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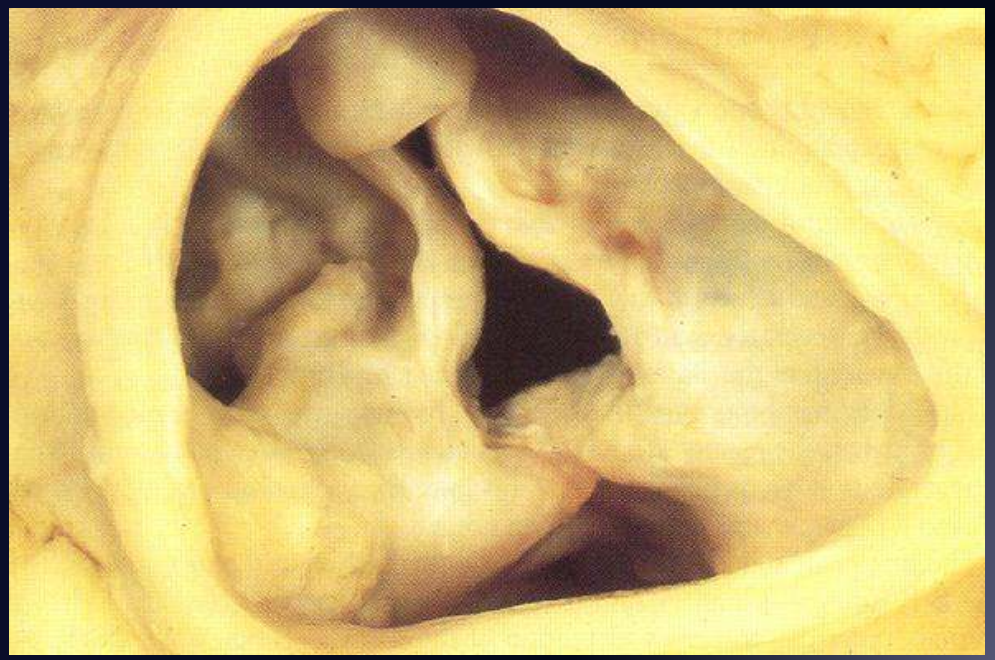
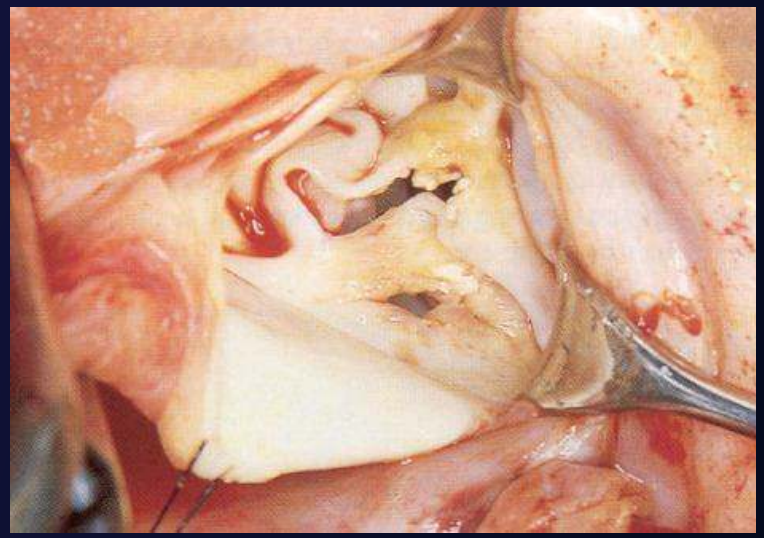
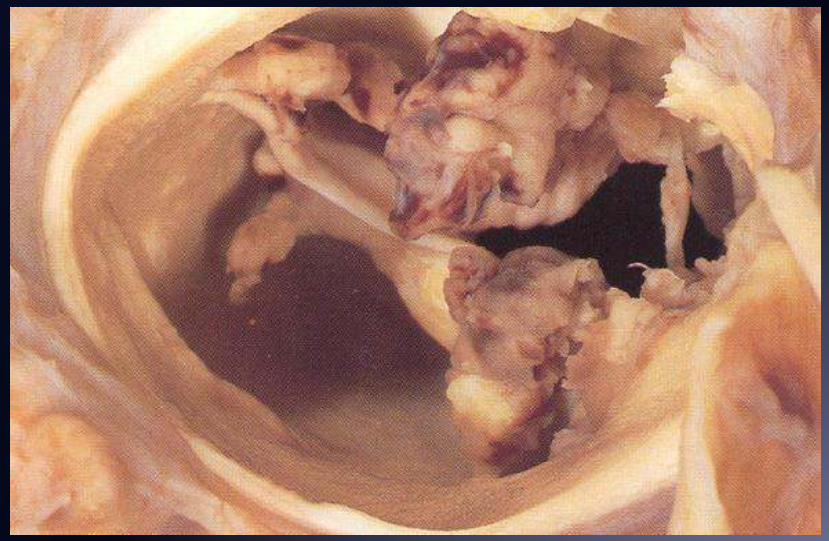


Endocarditis





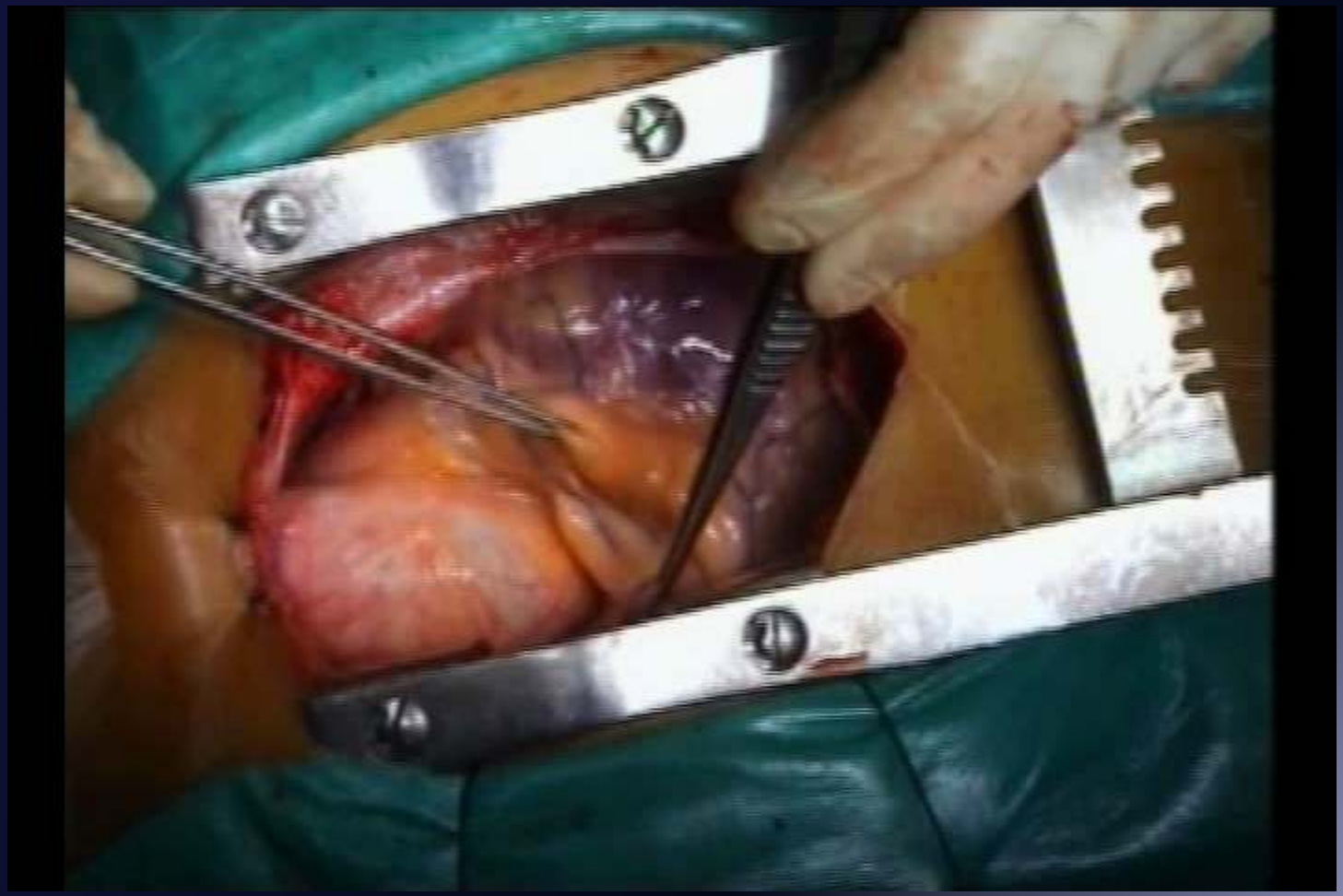
Surgical Technique for AVR
2. Cannulation

1. Aorta suture and A-line insertion
2. SVC suture and SVC line insertion
3. IVC suture and IVC line insertion
4. SVC snaring
5. IVC snaring
6. Retrograde CPS line insertion
7. RUPV vent catheter insertion
8. Root CPS line insertion
9. AP window dissection
10. ACC on and CPS on

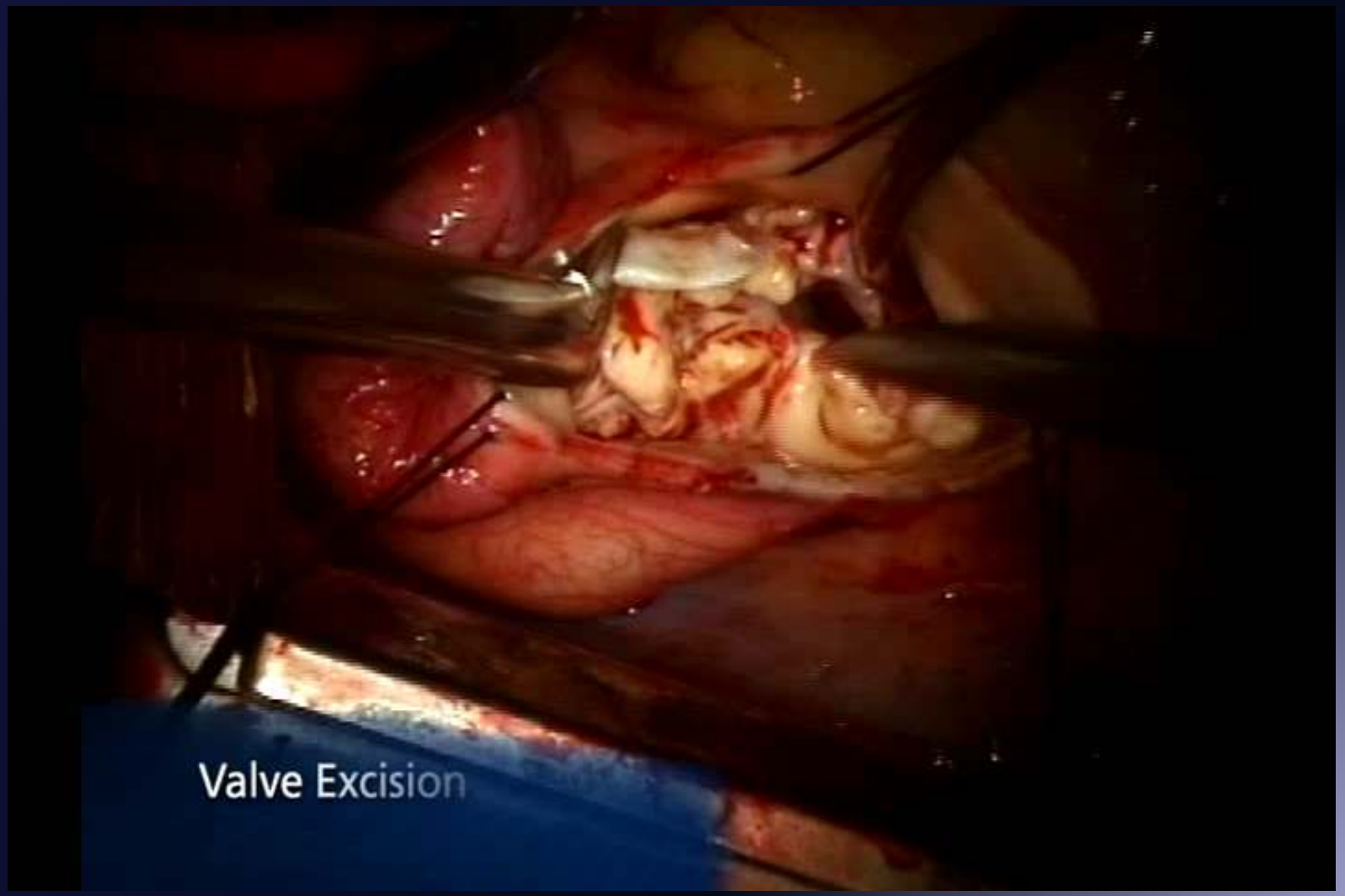
** if AR grade II-III ?
** if LA thrombi ?
** if VF onset before ACC ?
** if severe preoperative MR ?

Surgical Technique for AVR
3. Cannulation

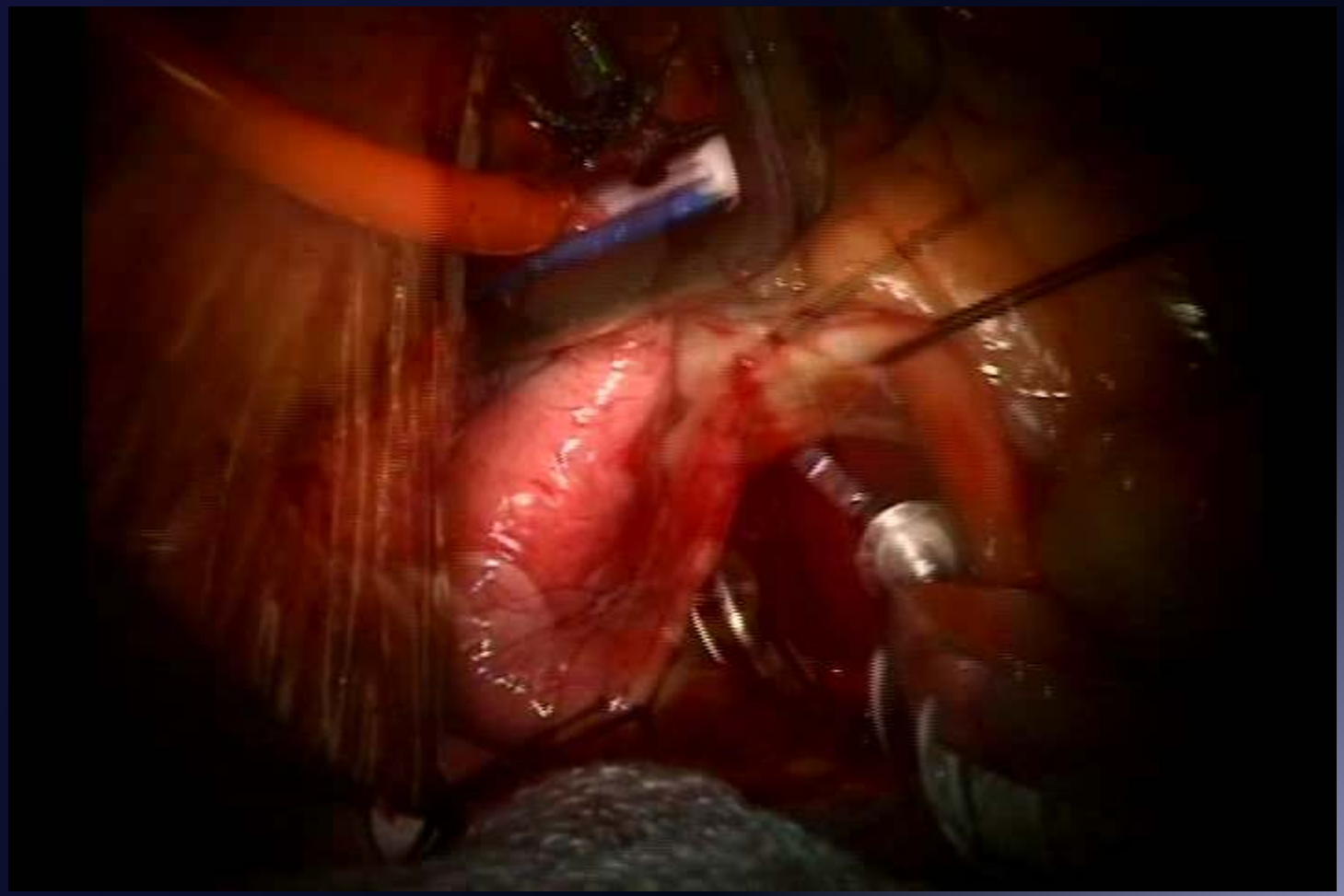
Surgical Technique for AVR
3. Aortotomy and valve resection - rheumatic



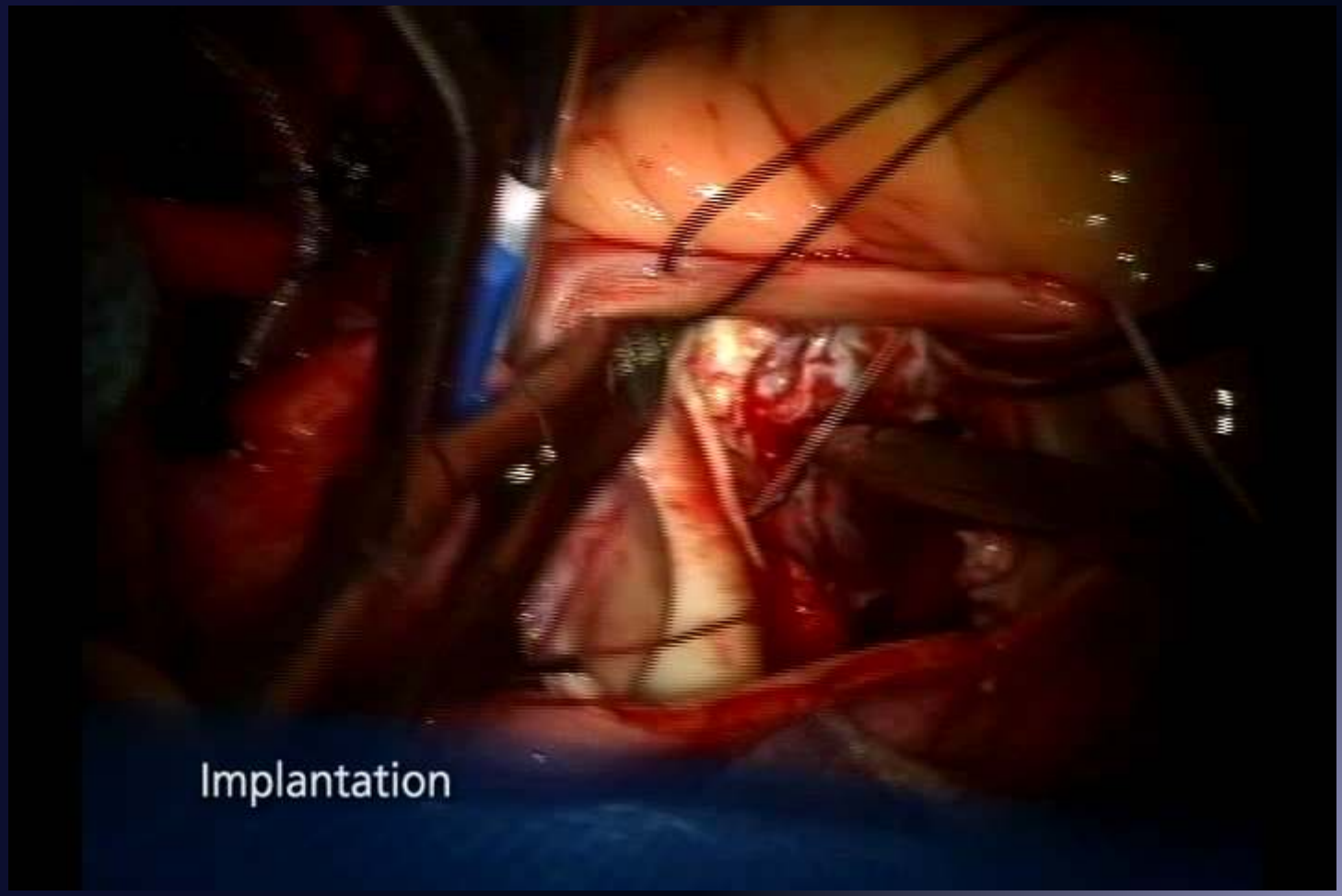
Surgical Technique for AVR
3. Aortotomy and valve resection - degenerative



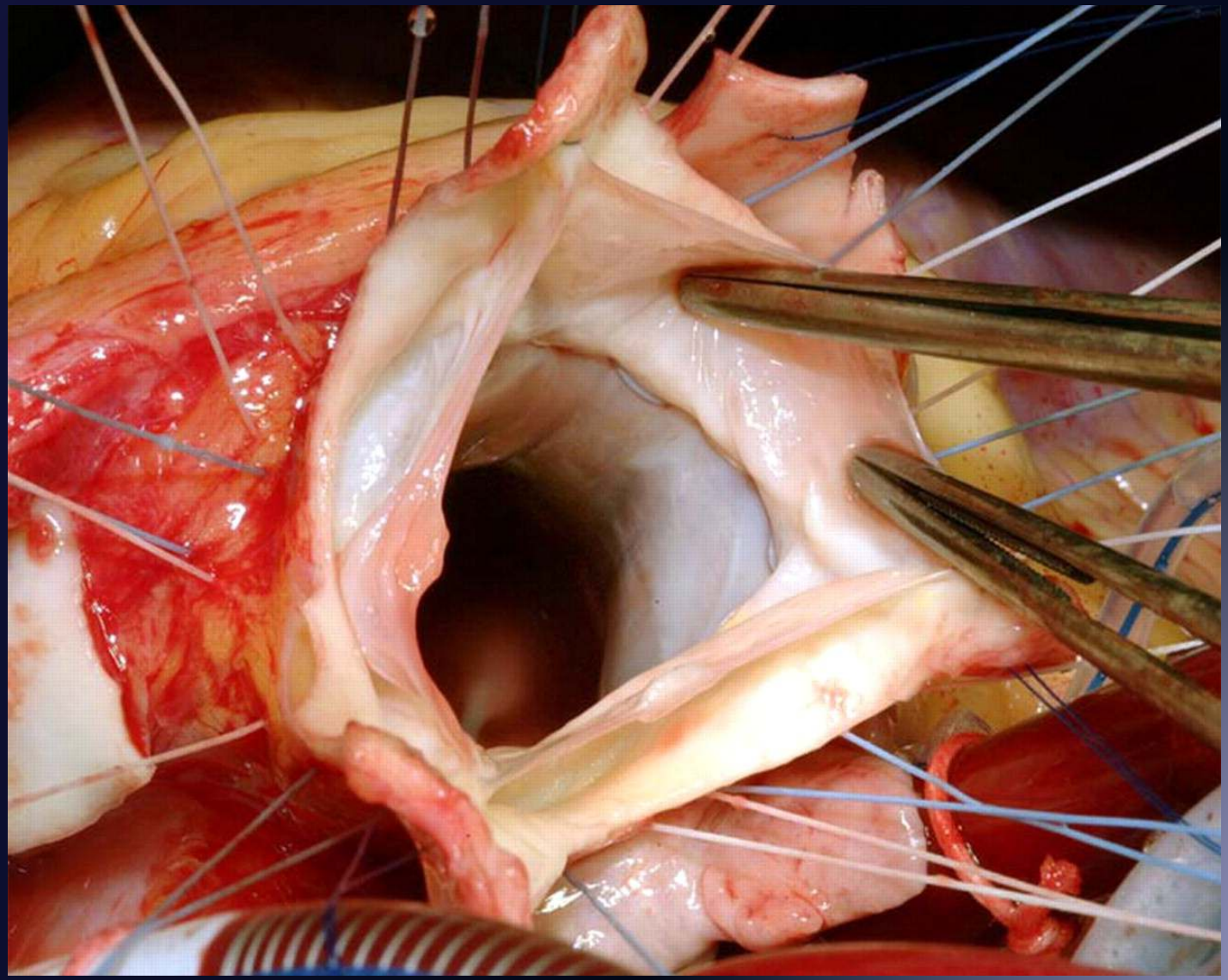
Surgical Technique for AVR
4. Test Sizing



Surgical Technique for AVR
5. Valve Suture

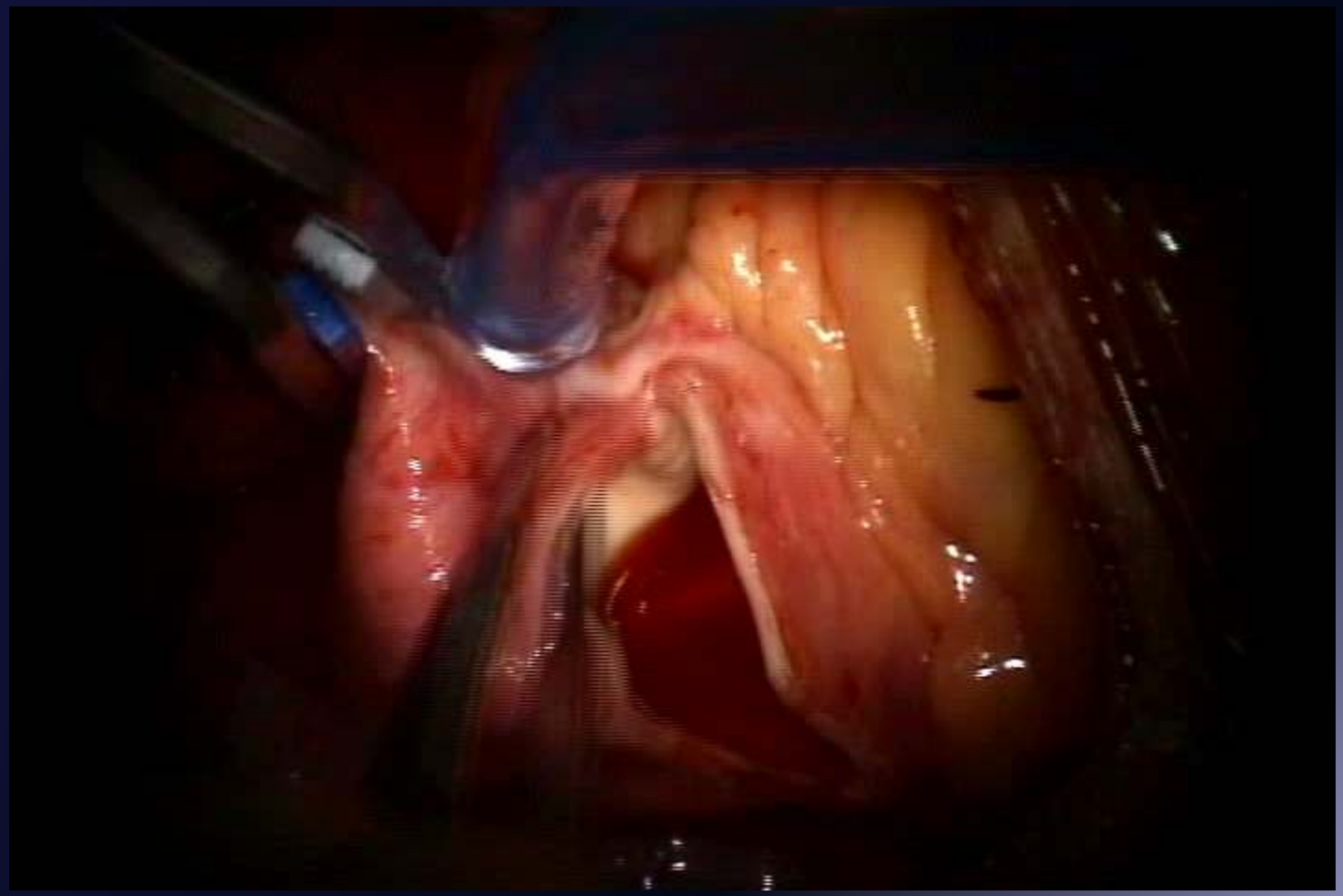


Surgical Technique for AVR
5. Valve Suture



Surgical Technique for AVR
6. optimal size choice and Valve Suture with tie

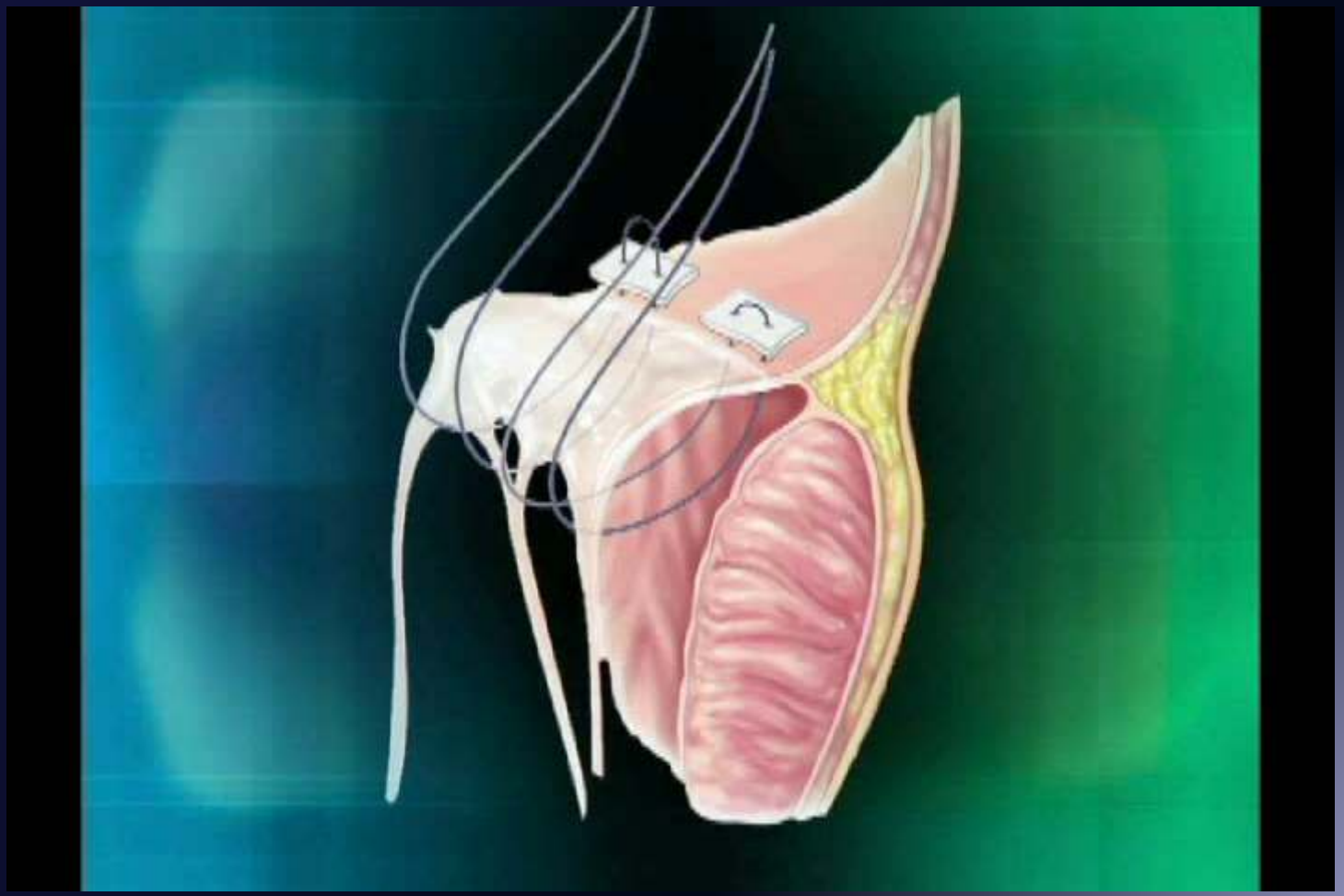
Surgical Technique for AVR
7. Aorta closure



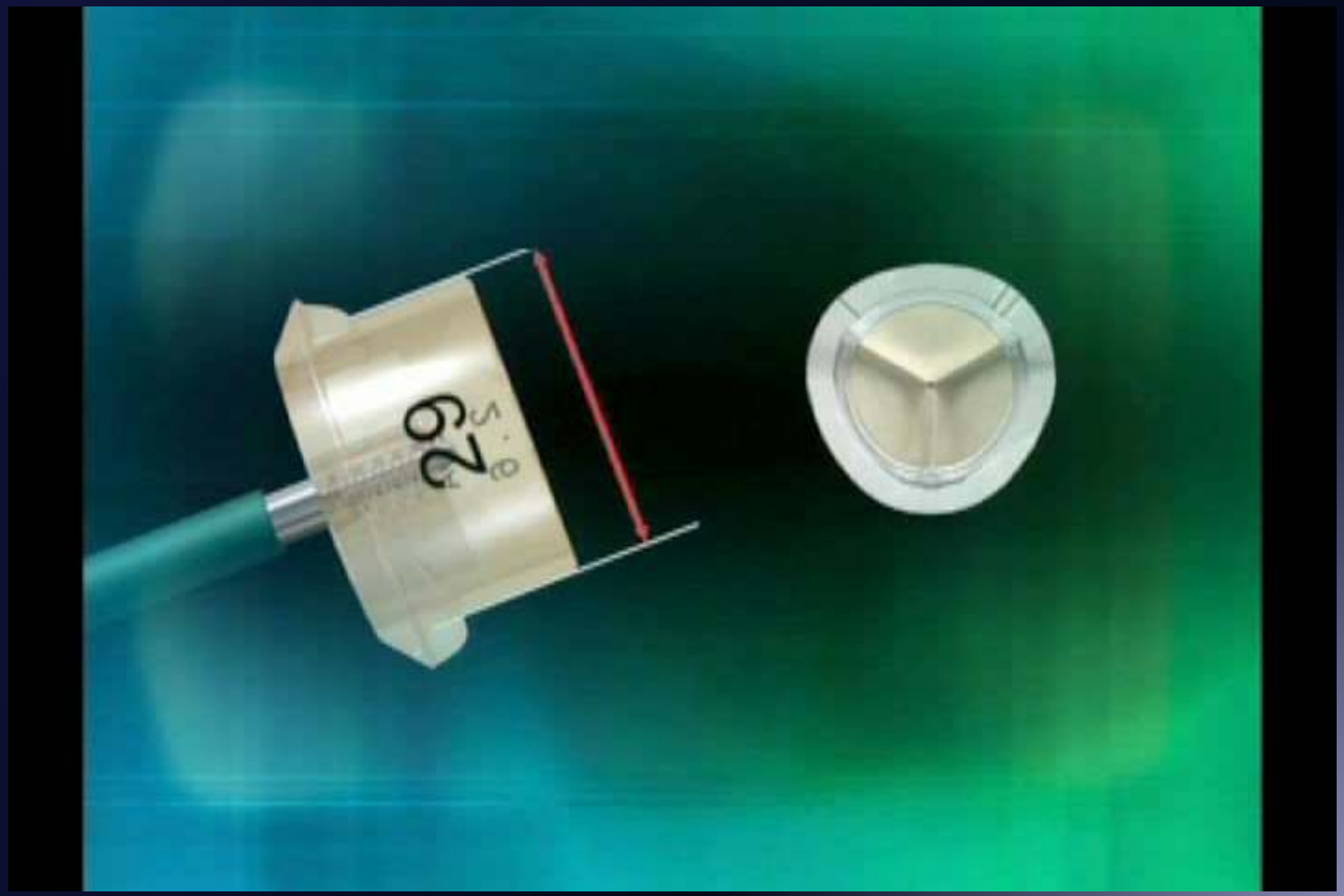
Surgical Technique for AVR
7. Aorta closure

Mitral Valve Replacement

Surgical Technique for MVR
Mitral Annular Suture



Surgical Technique for MVR
Mitral valve sizing



Surgical Technique for MVR
Mitral valve sizing

Surgical Technique for MVR
Mitral valve Replacement

Take Home Message

1. **Anatomy !**

2. **Pre-Planned Surgery !**