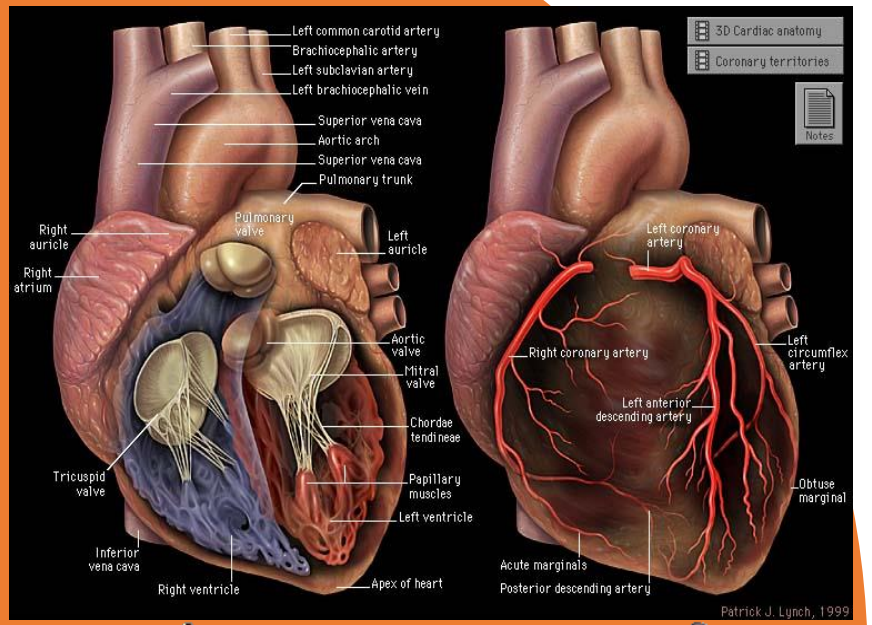
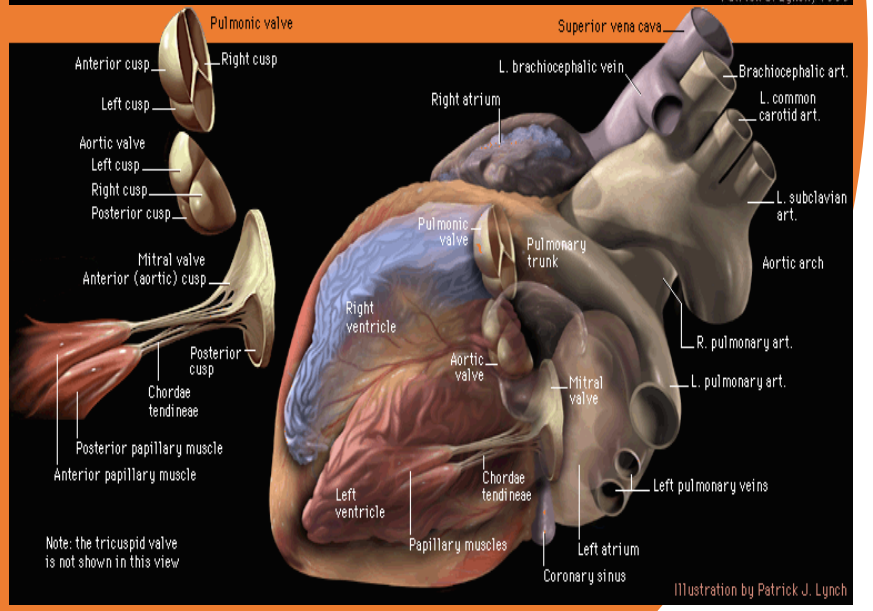




- **The mitral valve** lies between the left atrium and left ventricle. It is also known as the bicuspid valve due to its having two cusps, an anterior and a posterior cusp. These cusps are also attached via chordae tendinae to two papillary muscles projecting from the ventricular wall

- **The pulmonary valve** is located at the base of the pulmonary artery. This has three cusps which are not attached to any papillary muscles.

- **The semilunar aortic valve** is at the base of the aorta and also is not attached to papillary muscles. This too has three cusps which close with the pressure of the blood flowing back from the aorta.

Types of prosthetic valves

BIOPROSTHETIC

"PORCINE VALVE"

LIFE SPAN 10 YEARS

NO ANTICOAGULATION

OLDER PATIENTS

MECHANICAL

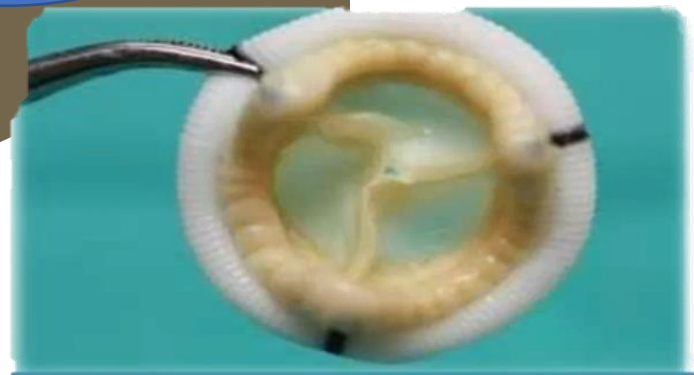
METAL

LIFE SPAN >20 YEARS

LIFELONG WARFARIN

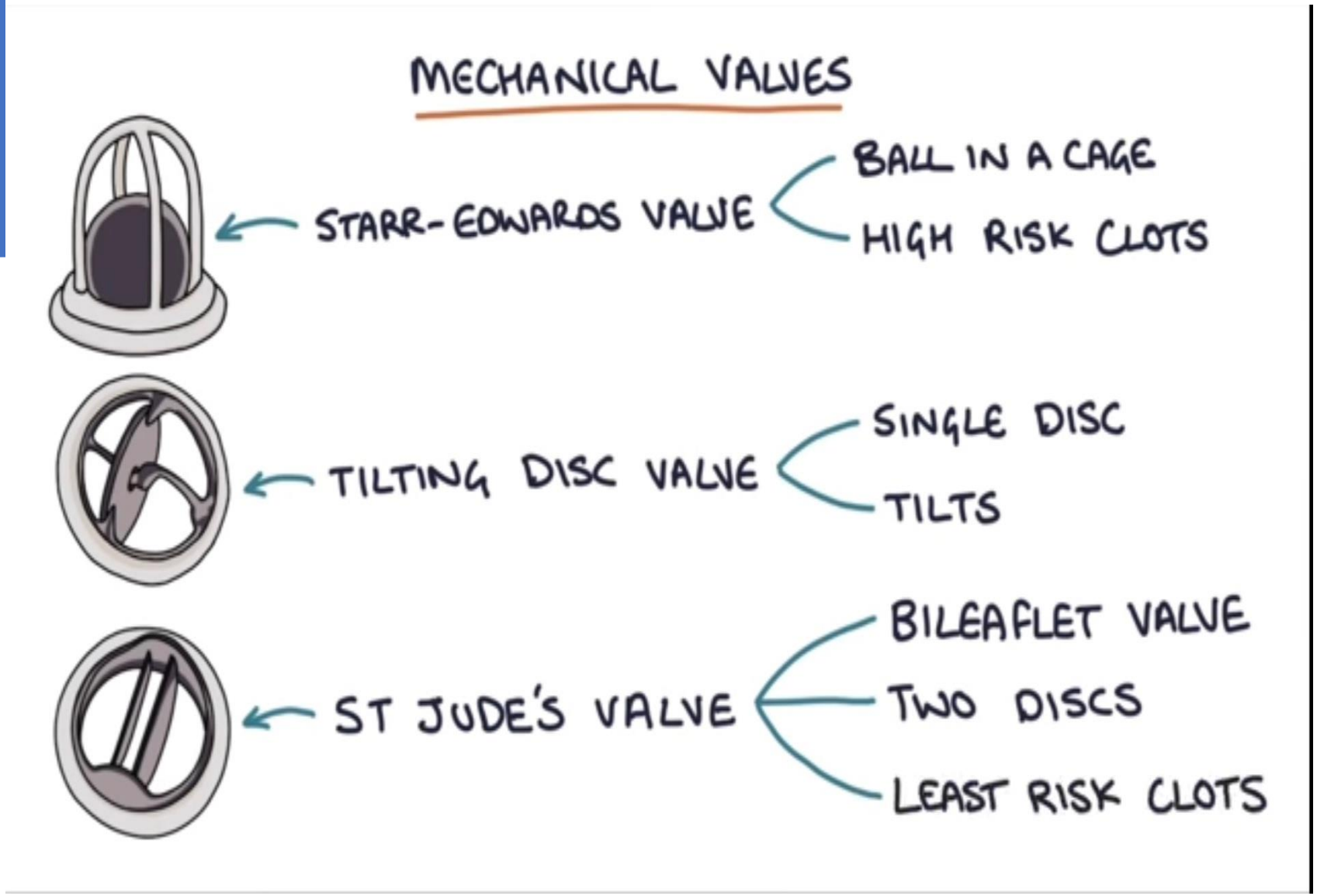
TARGET INR 2.5-3.5

Biological valve

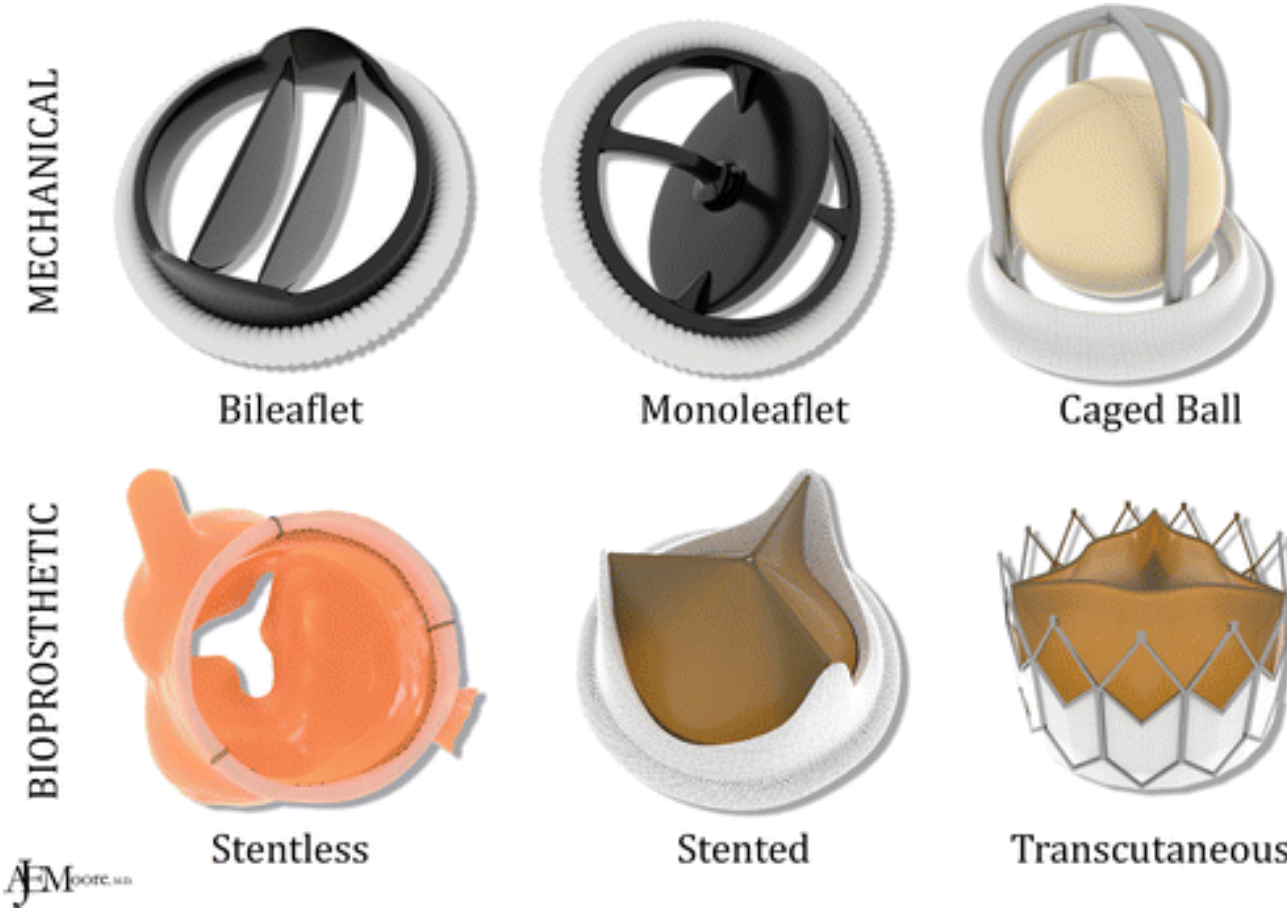


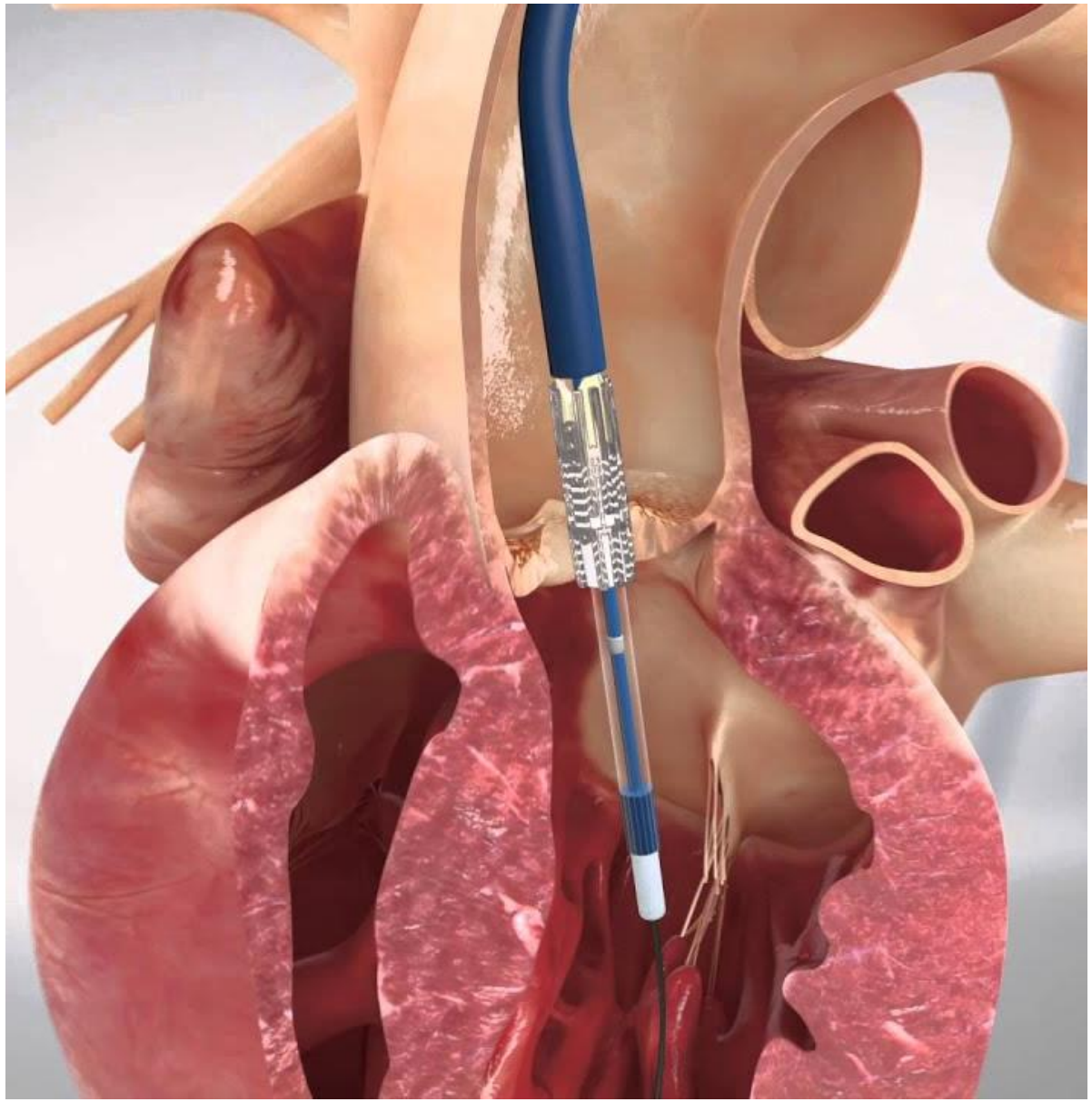
Porcine heterograft [XENOGRAFTS]	Pericardial heterograft	Homograft cadaver valve
Harvested aortic valve of pig that is preserved in glutraldehyde and mounted on specially designed sewing ring.	Three leaflets composed of pericardium from 16 to 18 months old that are preserved in glutraldehyde and mounted on Dacron covered frame	Harvested aortic valve from human cadaver that is initially needed for replacement then sewn into with special mounting material.

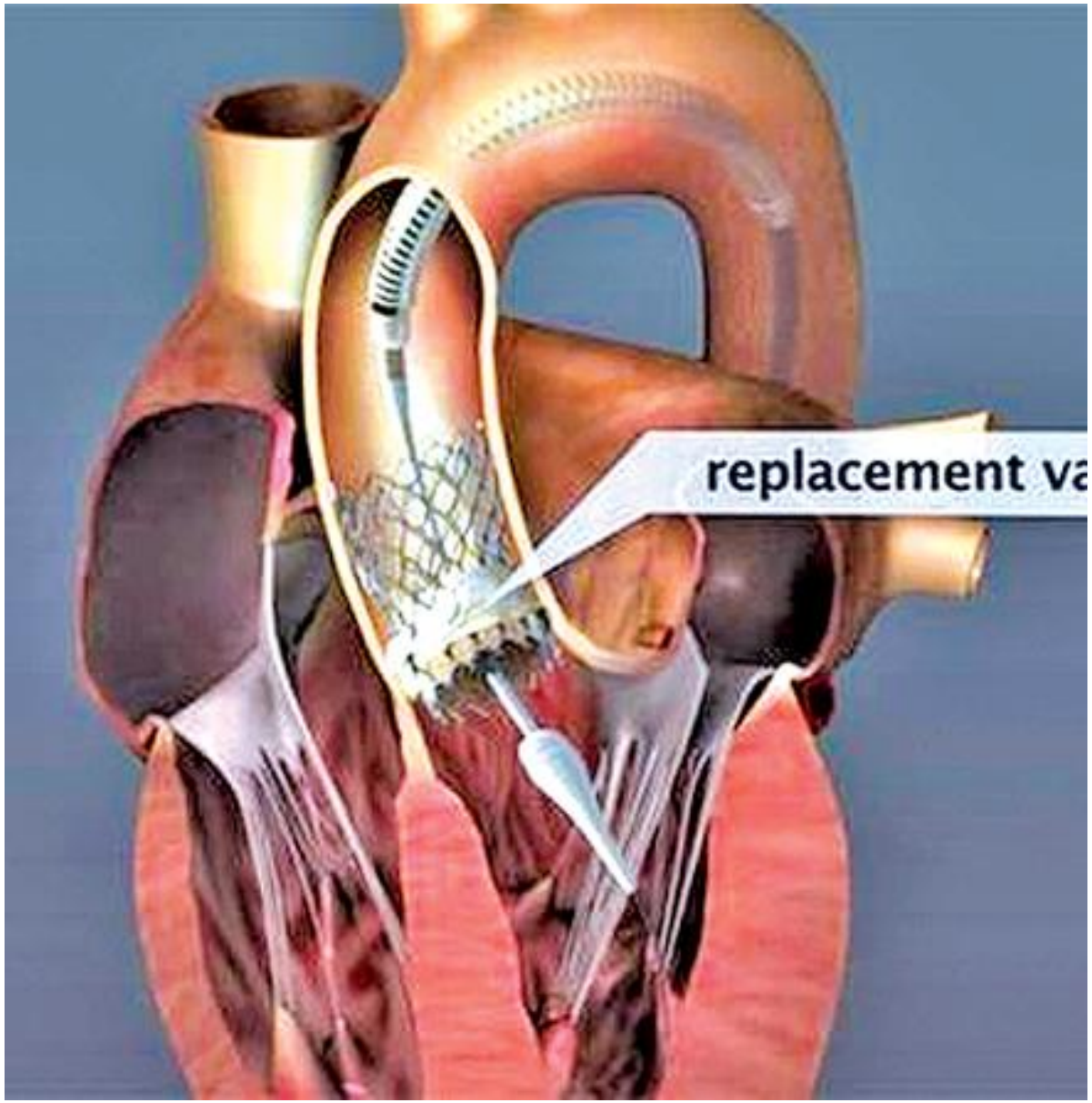
Mechanical valve



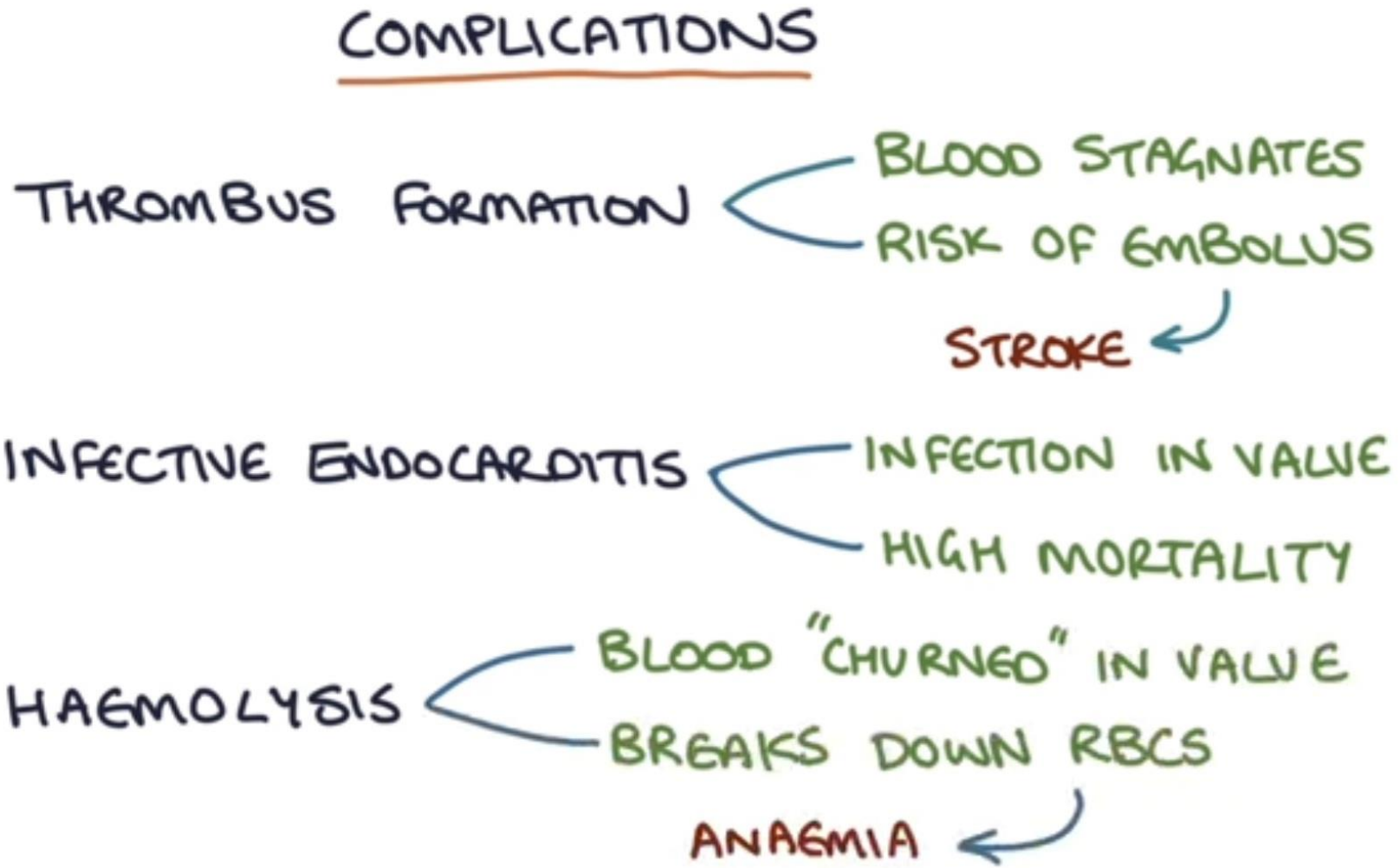
Mechanical valve



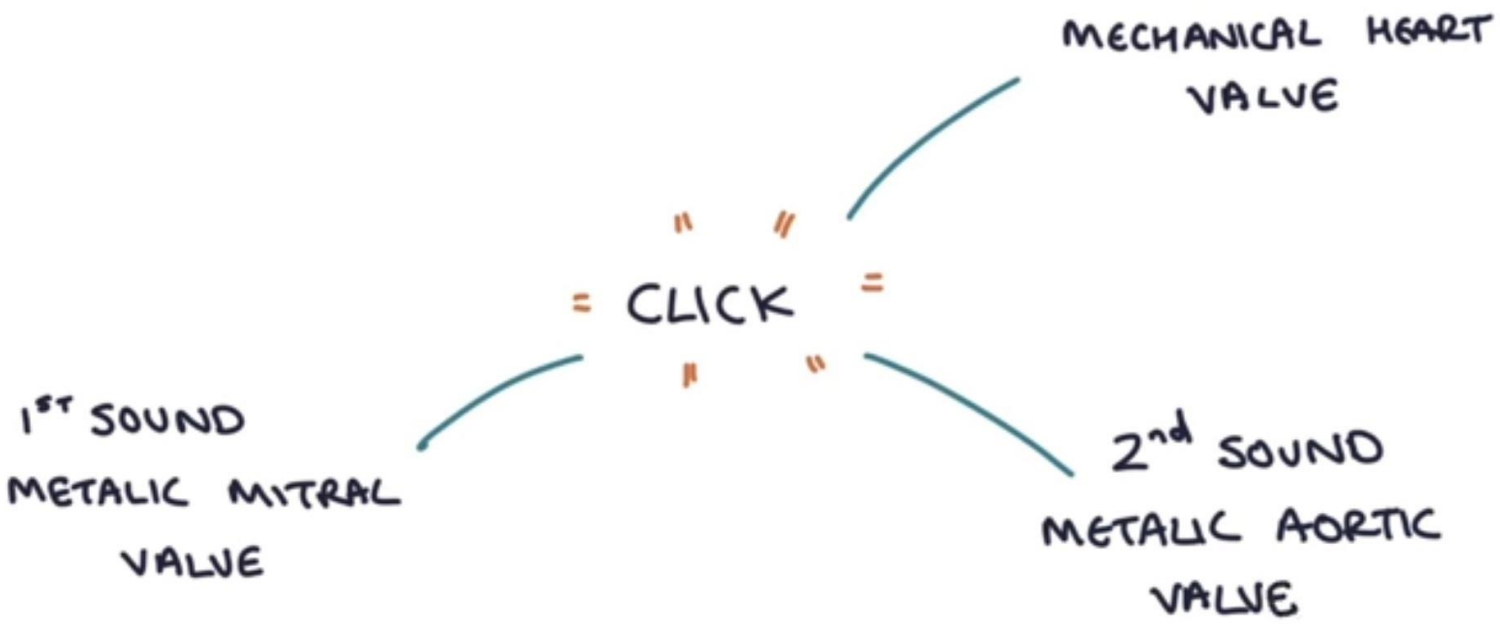



replacement va

Valve Replacement Complication



Valve Replacement: Auscultation

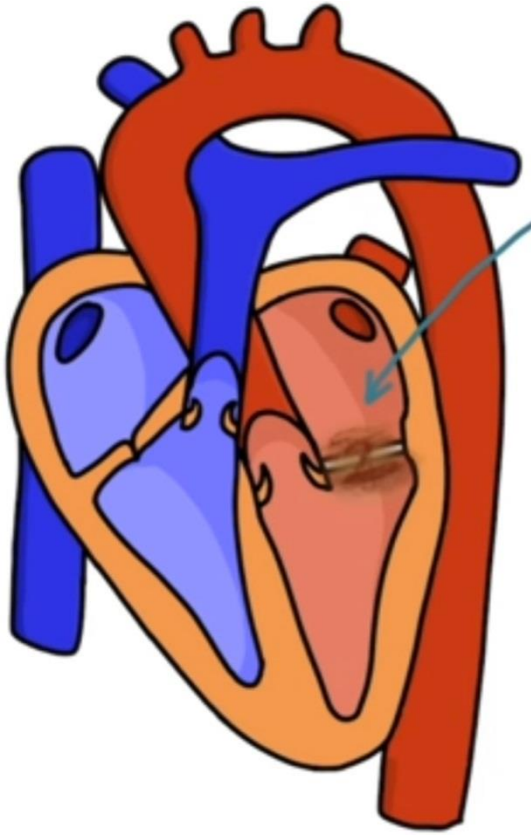


Valve Replacement Complication

Complications that may occur with mechanical or tissue valve implantation

- Blood clotting
  - Stroke (clot that migrates)
  - TIA (temporary stroke)
  - Clot on the valve (thrombosis)
- Bleeding
- Destruction of blood (hemolysis)
- Infection
- Leak around the valve
- Scar tissue growth
  - Reoperation
- Tissue degeneration, failure and reoperation (tissue valves only)

Valve Replacement Complication



INFECTIVE ENDOCARDITIS

2.5% SURGICAL VALVE REPLACEMENT

1.5% TAVI

HIGH MORTALITY ~ 15%

GRAM +VE COCCI
- STAPHYLOCOCCUS
- STREPTOCOCCUS
- ENTEROCOCCUS

ANTIBIOTICS – DENTAL PROCEDURES

Anticoagulants

INR

Blood test to measure effectiveness of warfarin (Coumadin).

Mechanical Valves

Current INR Guidelines*:

Aortic valve patients:
No risk factors = 2.0-3.0
Risk factors = 2.5-3.5

Mitral valve patients:
No risk factors = 2.5-3.5
Risk factors = 2.5-3.5

*ACC/AHA 2006 Guidelines for the Management of Patients With Valvular Heart Disease: A Report of the American College of Cardiology/American Heart Association Task Force on Practice Guidelines (Writing Committee to Revise the 1998 Guidelines for the Management of Patients With Valvular Heart Disease): Developed in Collaboration With the Society of Cardiovascular Anesthesiologists: Endorsed by the Society for Cardiovascular Angiography and Interventions and the Society of Thoracic Surgeons. Circulation 2006;114;84-231; DOI: 10.1161/CIRCULATIONAHA.106.176857

Anticoagulation Medication, Bleeding and INR

Warfarin sodium

INR Guidelines

Mechanical Valves

1. After AVR (aortic valve replacement) with bileaflet mechanical or Medtronic Hall prostheses, in patients with no risk factors,* warfarin is indicated to achieve an INR of 2.0 to 3.0. If the patient has risk factors, warfarin is indicated to achieve an INR of 2.5 to 3.5.

2. After AVR with Starr-Edwards valves or mechanical disc valves (other than Medtronic Hall prostheses), in patients with no risk factors,* warfarin is indicated to achieve an INR of 2.5 to 3.5.

3. After MV (mitral valve) replacement with any mechanical valve, warfarin is indicated to achieve an INR of 2.5 to 3.5.

Tissue valves

4. After AVR with a bioprosthesis and risk factors,* warfarin is indicated to achieve an INR of 2.0 to 3.0.

5. After MV replacement with a bioprosthesis and risk factors,* warfarin is indicated to achieve an INR of 2.5

Mechanical and Tissue Valves

8. The addition of aspirin 75 to 100 mg once daily to therapeutic warfarin is recommended for all patients with mechanical heart valves and those patients with biological valves who have risk factors.*

*Risk factors include atrial fibrillation, previous thromboembolism [stroke], LV [left ventricular] dysfunction, and hypercoagulable condition.

Anticoagulants

Spectrum of VHD

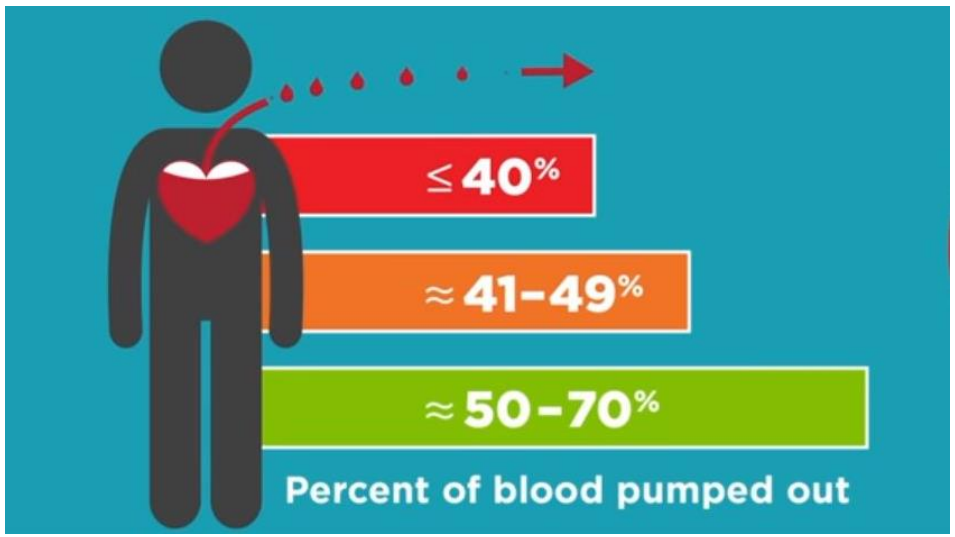
Aortic Valve	**Regurg**	**Acute**
		Chronic
	Stenosis	**Acute**
		Chronic
Mitral Valve	**Regurg**	**Acute**
		Chronic
	Stenosis	**Acute**
		Chronic
Tricuspid Valve	**Regurg**	**Acute**
		Chronic
	Stenosis	**Acute**
		Chronic
Pulmonic Valve	**Regurg**	**Acute**
		Chronic
	Stenosis	**Acute**
		Chronic

$$EF(\%) = \frac{SV}{EDV} \times 100$$

EF = ejection fraction

SV = stroke volume

EDV = end-diastolic volume



Stroke Volume

The SV represents the volume of blood ejected from the ventricle with each heartbeat. It can be calculated as the difference between the volume inside the ventricle at the end of diastole (end-diastolic volume) and the end of systole (end-systolic volume):

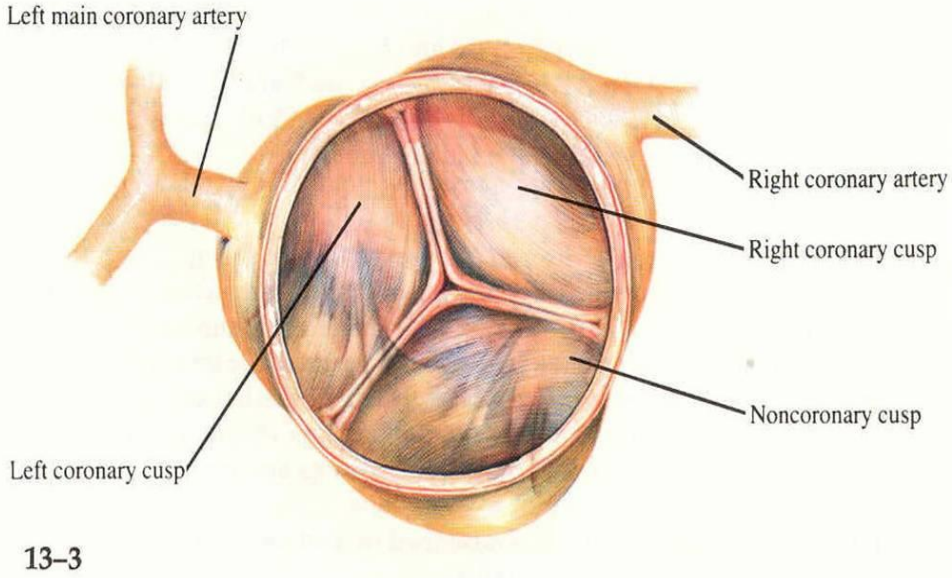
$$\mathrm{SV} = \mathrm{EDV} - \mathrm{ESV}$$

Aortic Valve

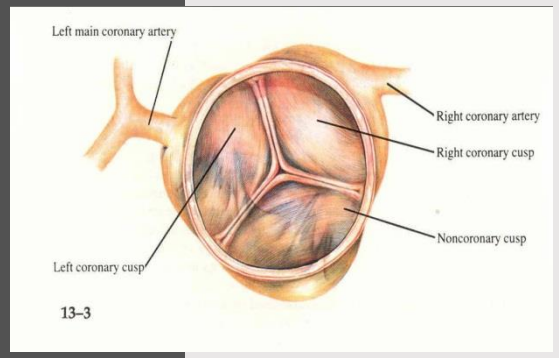
- Aortic Stenosis
- Aortic Regurgitation

Aortic Valve Disease: Etiology

AS



- **Aortic Stenosis**
  - **Degenerative calcific (senile)**
  - **Congenital – Uni or bicuspid**
  - **Rheumatic**
  - **Prosthetic**



Aortic Valve Disease: Etiology AR

Acute Aortic Insufficiency

- Infective endocarditis
- Acute Aortic Dissection
- Marfan's Syndrome
- Chest trauma

Chronic Aortic Insufficiency

- Aortic leaflet disease
  - Infective endocarditis
  - Rheumatic
  - Bicuspid Aortic valve
  - Prolapse & congenital VSD
  - Prosthetic
- Aortic root disease
  - Aortic aneurysm/dissection
  - Marfan's syndrome
  - Connective tissue disorders
  - Syphilis
  - HTN
  - Annulo-aortic ectasia

Aortic Valve Stenosis and Insufficiency: C/P

Symptoms

- angina pectoris
- syncope
- Dyspnea
- Fatigue
- Palitation

Peripheral signs of aortic regurgitation:

- **Corrigan's pulse:** A rapid and forceful distension of the arterial pulse with a quick collapse
- **De Musset's sign:** Bobbing of the head with each heartbeat (like a bird walking)
- **Muller's sign:** Visible pulsations of the uvula
- **Quincke's sign:** Capillary pulsations seen on light compression of the nail bed
- **Traube's sign:** Systolic and diastolic sounds heard over the femoral artery ("pistol shots")
- **Duroziez's sign:** Gradual pressure over the femoral artery leads to a systolic and diastolic bruit
- **Hill's sign:** Popliteal systolic blood pressure exceeding brachial systolic blood pressure by ≥ 60 mmHg (most sensitive sign for aortic regurgitation)
- **Shelly's sign:** Pulsation of the cervix
- **Rosenbach's sign:** Hepatic pulsations
- **Becker's sign:** Visible pulsation of the retinal arterioles
- **Gerhardt's sign (aka Sailer's sign):** Pulsation of the spleen in the presence of splenomegaly
- **Mayne's sign:** A decrease in diastolic blood pressure of 15 mmHg when the arm is held above the head (very non-specific)
- **Landolfi's sign:** Systolic contraction and diastolic dilation of the pupil

Aortic Stenosis

Aortic Valve Stenosis: Indications for surgery

Bicuspid Aortic Valve Stenosis

Recommendations on indications for intervention[a] in symptomatic (A) and asymptomatic (B) aortic stenosis and recommended mode of intervention (C)

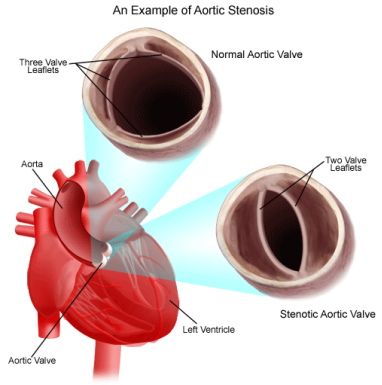
A) Symptomatic aortic stenosis	Class[b]	Level[c]
Intervention is recommended in symptomatic patients with severe, high-gradient aortic stenosis [mean gradient ≥40 mmHg, peak velocity ≥4.0 m/s, and valve area ≤1.0 cm^2 (or ≤0.6 cm^2/m^2)].[235,236]	I	B
Intervention is recommended in symptomatic patients with severe low-flow (SVi ≤35 mL/m^2), low-gradient (<40 mmHg) aortic stenosis with reduced ejection fraction (<50%), and evidence of flow (contractile) reserve.[32,237]	I	B
Intervention should be considered in symptomatic patients with low-flow, low-gradient (<40 mmHg) aortic stenosis with normal ejection fraction after careful confirmation that the aortic stenosis is severe[d] (*Figure 3*).	IIa	C
Intervention should be considered in symptomatic patients with low-flow, low-gradient severe aortic stenosis and reduced ejection fraction without flow (contractile) reserve, particularly when CCT calcium scoring confirms severe aortic stenosis.	IIa	C
Intervention is not recommended in patients with severe comorbidities when the intervention is unlikely to improve quality of life or prolong survival >1 year.	III	C

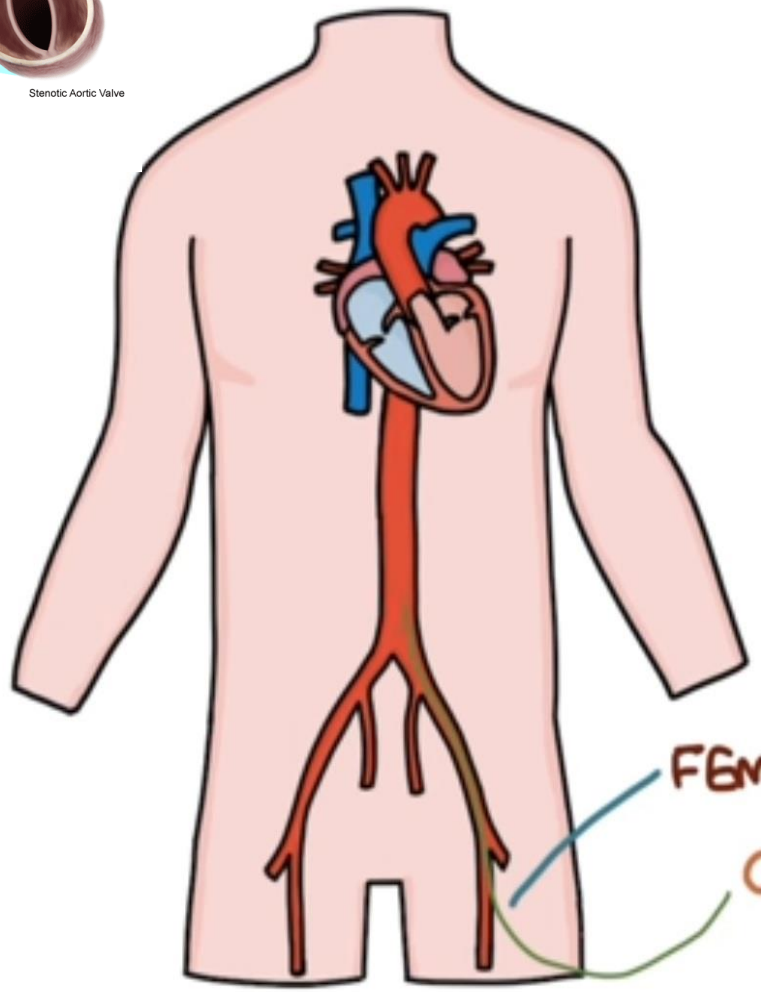
Aortic Valve Stenosis: Indications for surgery

B) Asymptomatic patients with severe aortic stenosis		
Intervention is recommended in asymptomatic patients with severe aortic stenosis and systolic LV dysfunction (LVEF <50%) without another cause.[9,238,239]	I	B
Intervention is recommended in asymptomatic patients with severe aortic stenosis and demonstrable symptoms on exercise testing.	I	C
Intervention should be considered in asymptomatic patients with severe aortic stenosis and systolic LV dysfunction (LVEF <55%) without another cause.[9,240,241]	IIa	B
Intervention should be considered in asymptomatic patients with severe aortic stenosis and a sustained fall in BP (>20 mmHg) during exercise testing.	IIa	C
Intervention should be considered in asymptomatic patients with LVEF >55% and a normal exercise test if the procedural risk is low and one of the following parameters is present: • Very severe aortic stenosis (mean gradient ≥60 mmHg or V_{max} >5 m/s).[9,242] • Severe valve calcification (ideally assessed by CCT) and V_{max} progression ≥0.3 m/s/year.[164,189,243] • Markedly elevated BNP levels (>3× age- and sex-corrected normal range) confirmed by repeated measurements and without other explanation.[163,171]	IIa	B

Continued

TAVI TAVR





(TAVI)

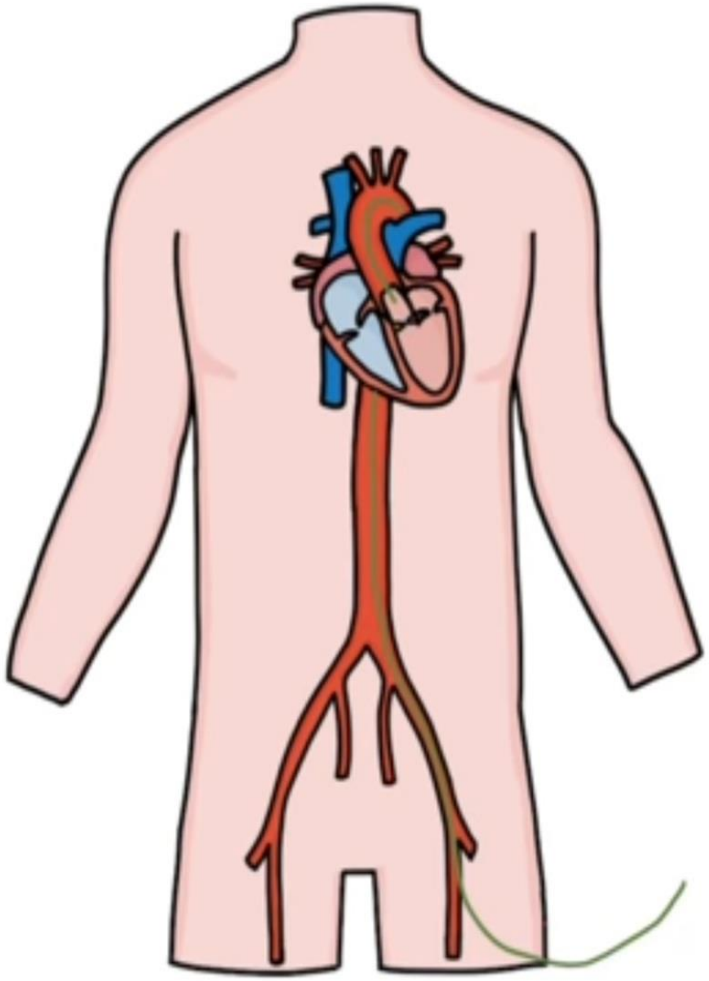
TRANS CATHETER AORTIC VALVE IMPLANTATION

SEVERE AORTIC STENOSIS

HIGH RISK FOR OPEN OPERATION

LOCAL/GENERAL ANAESTHETIC

TAVI TAVR



(TAVI)

TRANS CATHETER AORTIC VALVE IMPLANTATION

SEVERE AORTIC STENOSIS

HIGH RISK FOR OPEN OPERATION

LOCAL/GENERAL ANAESTHETIC

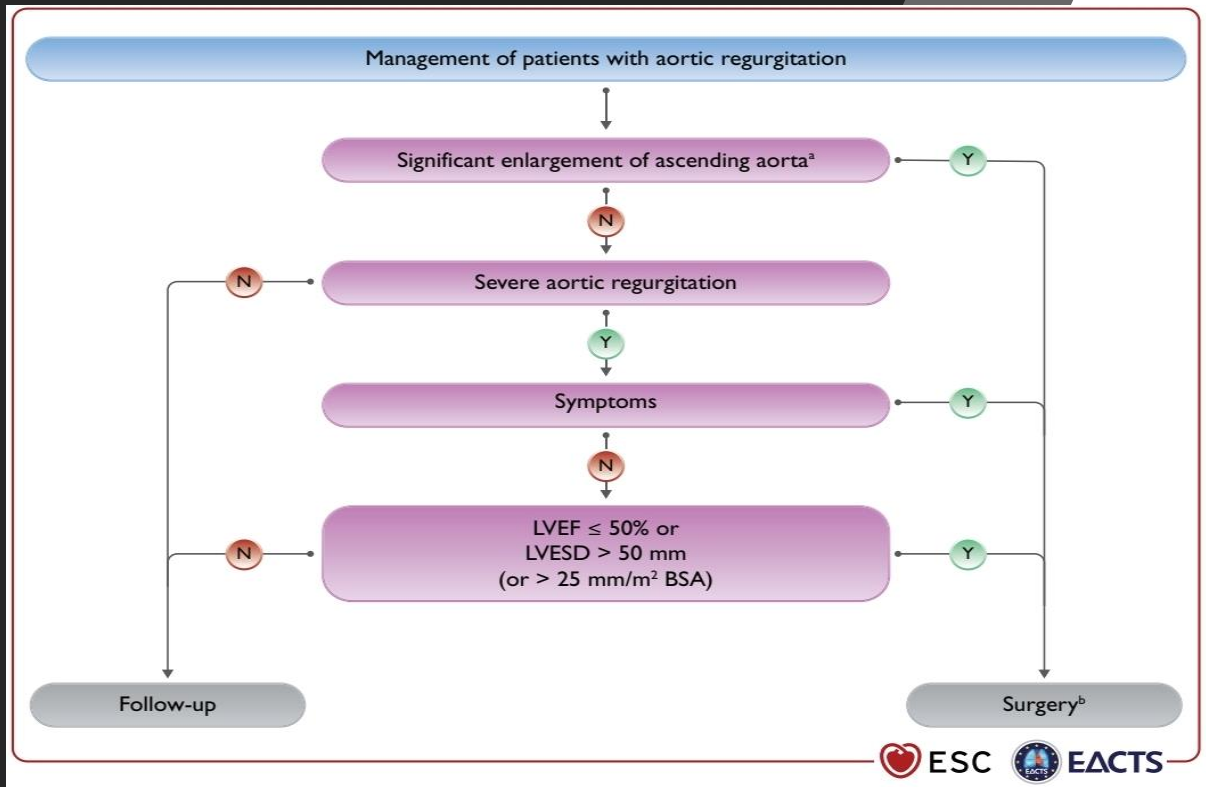
BIOPROSTHETIC VALVE

DON'T KNOW LONG TERM

DON'T REQUIRE WARFARIN

Aortic Regurgitation

Aortic Valve Regurgitation: Indications for surgery



Indications for surgery	Class[a]	Level[b]
A) Severe aortic regurgitation		
Surgery is recommended in symptomatic patients regardless of LV function.[105–109]	I	B
Surgery is recommended in asymptomatic patients with LVESD >50 mm or LVESD >25 mm/m^2 BSA (in patients with small body size) or resting LVEF ≤50%.[107,108,112,114,115]	I	B
Surgery may be considered in asymptomatic patients with LVESD >20 mm/m^2 BSA (especially in patients with small body size) or resting LVEF ≤55%, if surgery is at low risk.	IIb	C
Surgery is recommended in symptomatic and asymptomatic patients with severe aortic regurgitation undergoing CABG or surgery of the ascending aorta or of another valve.	I	C
Aortic valve repair may be considered in selected patients at experienced centres when durable results are expected.	IIb	C

Aortic Valve Stenosis: Management

C) Mode of intervention		
Aortic valve interventions must be performed in Heart Valve Centres that declare their local expertise and outcomes data, have active interventional cardiology and cardiac surgical programmes on site, and a structured collaborative Heart Team approach.	I	C
The choice between surgical and transcatheter intervention must be based upon careful evaluation of clinical, anatomical, and procedural factors by the Heart Team, weighing the risks and benefits of each approach for an individual patient. The Heart Team recommendation should be discussed with the patient who can then make an informed treatment choice.	I	C
SAVR is recommended in younger patients who are low risk for surgery (<75 years[e] and STS-PROM/EuroSCORE II <4%)[e,f], or in patients who are operable and unsuitable for transfemoral TAVI.[244]	I	B
TAVI is recommended in older patients (≥75 years), or in those who are high risk (STS-PROM/EuroSCORE II[f] >8%) or unsuitable for surgery.[197–206,245]	I	A
SAVR or TAVI are recommended for remaining patients according to individual clinical, anatomical, and procedural characteristics.[202–205,207,209,210,212 f,g]	I	B
Non-transfemoral TAVI may be considered in patients who are inoperable and unsuitable for transfemoral TAVI.	IIb	C
Balloon aortic valvotomy may be considered as a bridge to SAVR or TAVI in haemodynamically unstable patients and (if feasible) in those with severe aortic stenosis who require urgent high-risk NCS (*Figure 11*).	IIb	C

Medical Therapy: treats the symptoms not the cause

Surgery: Aortic Valve Replacement AVR

****SAVR (Surgical Aortic Valve Replacement)***

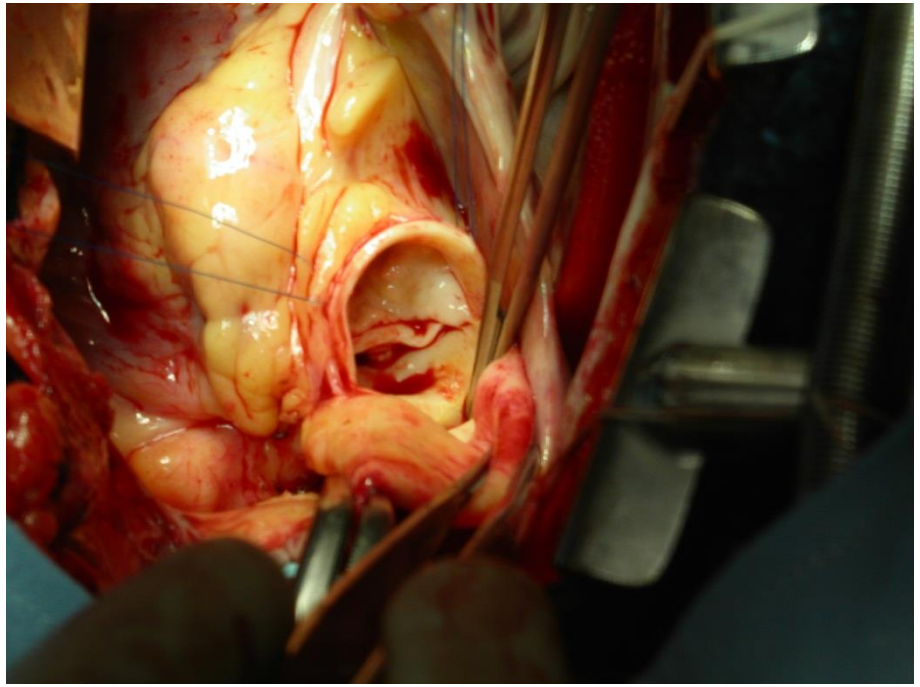
Mechanical - bio prothesis

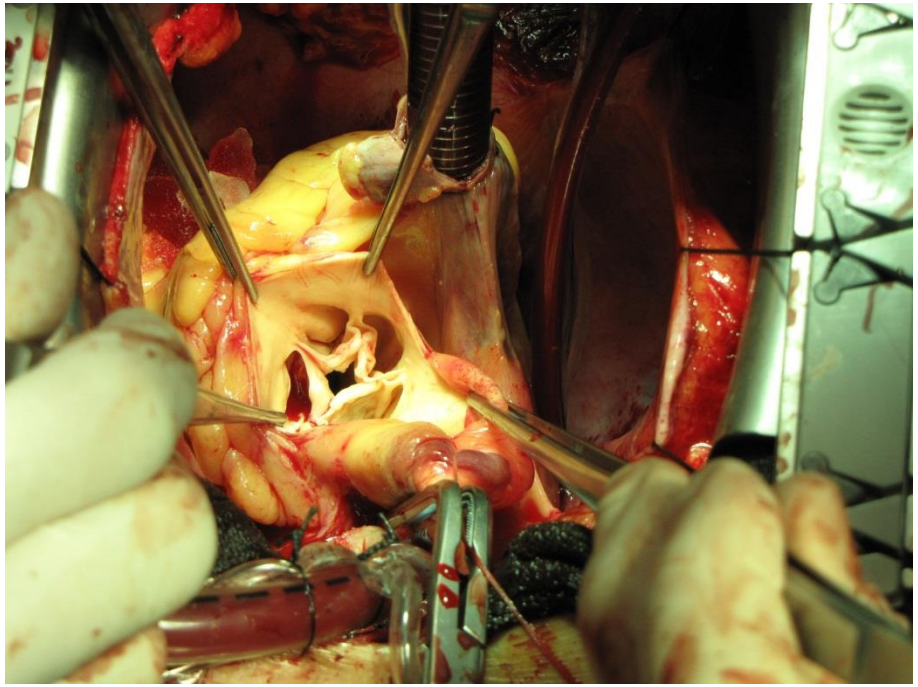
****TAVR (Transcatheter Aortic Valve Replacement) TAVI***

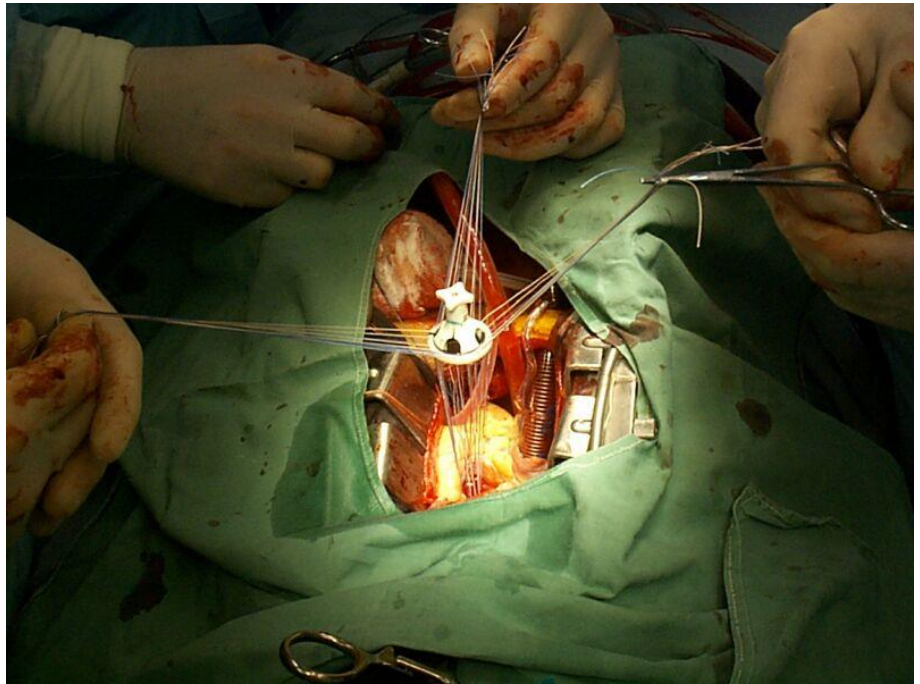
D) Concomitant aortic valve surgery at the time of other cardiac/ascending aorta surgery		
SAVR is recommended in patients with severe aortic stenosis undergoing CABG or surgical intervention on the ascending aorta or another valve.	I	C

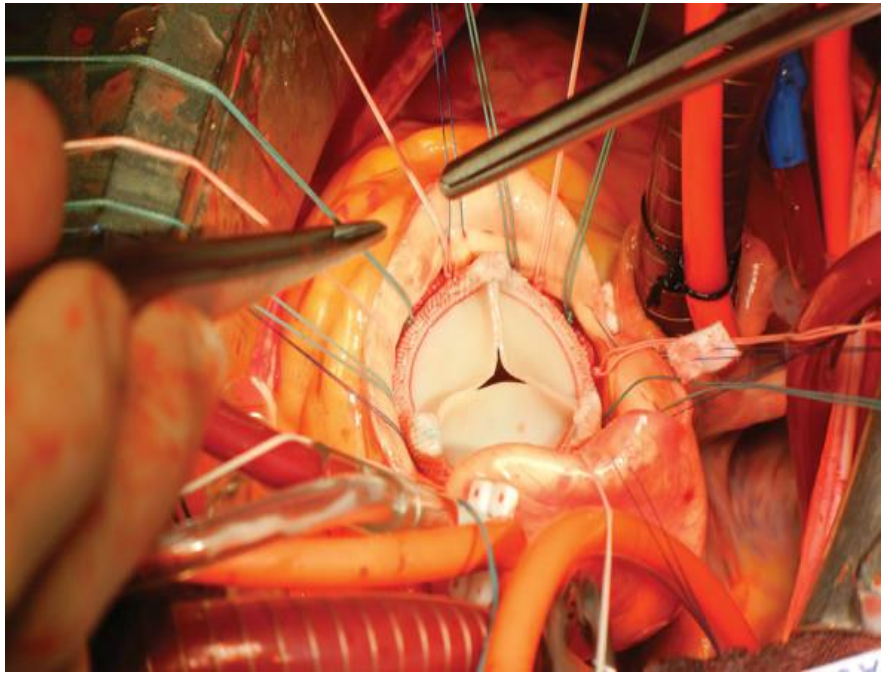
Aortic Valve Regurgitation: Management

- ***Medical Therapy: treats the symptoms not the cause***
    - ***Serial Check ups with Echos (EF, Severity AR)***
    - ***SBE Prophylaxis***
    - ***Vasodialators (Nifedipine, ACE-I)***
    - ***Diuretics***
- ***Surgery: Aortic Valve Replacement AVR***
- ****SAVR (Surgical Aortic Valve Replacement)***
- ***Mechanical - bio prothesis***

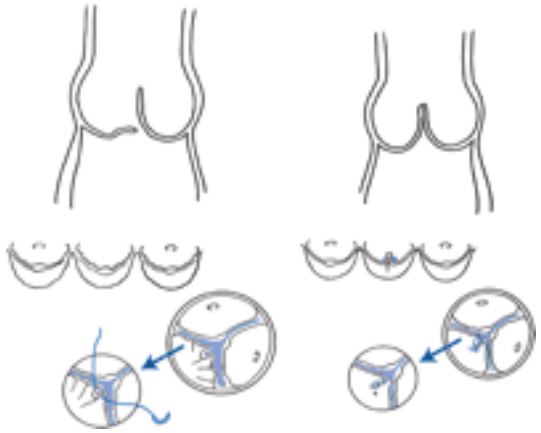


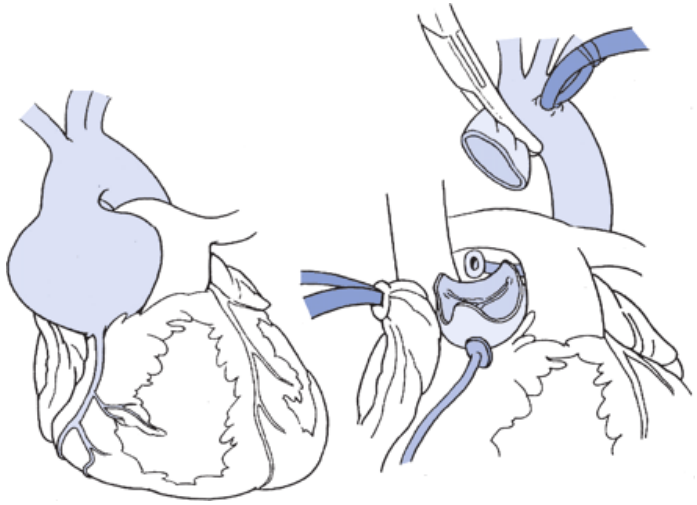


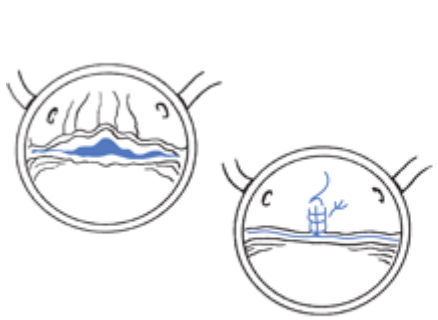


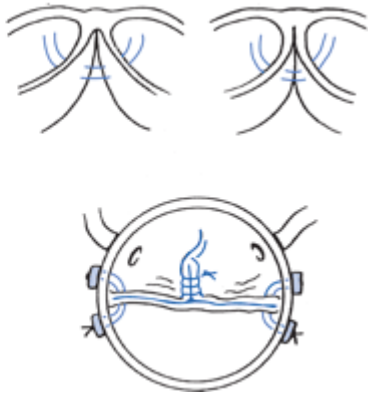


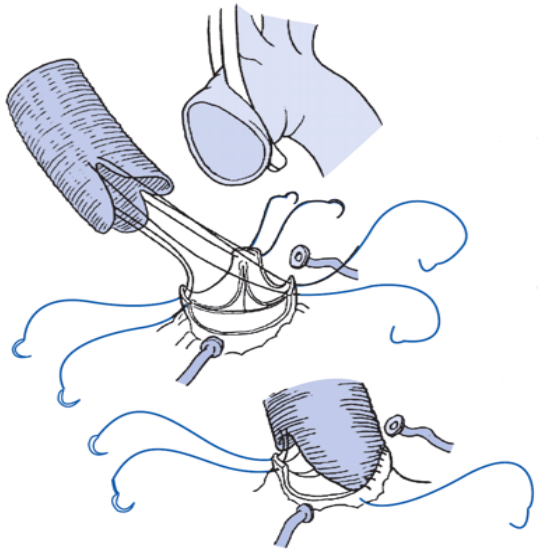
Aortic Valve Repair











Mitral Valve

- Mitral Regurgitation
- Mitral Stenosis

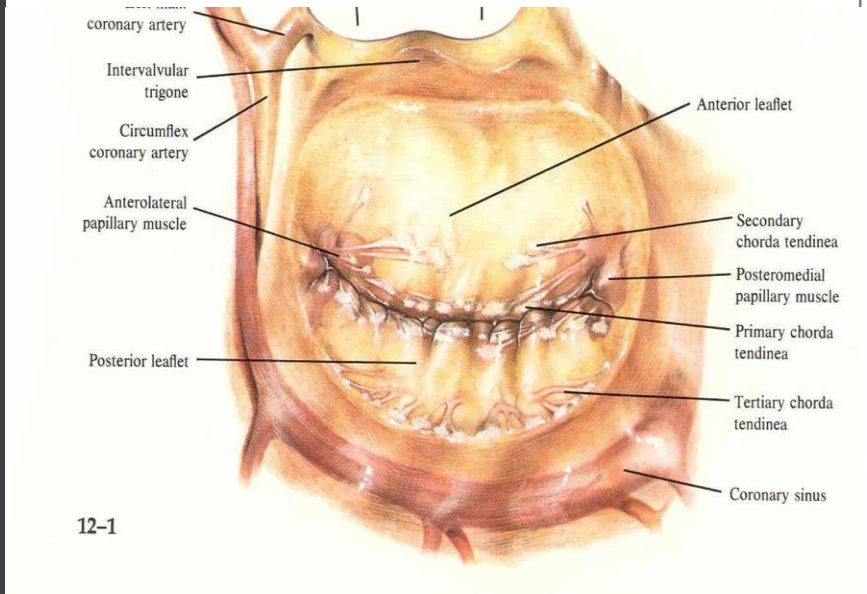
Mitral Valve Disease: Etiology

Mitral Stenosis

- Rheumatic - 99.9%!!!
- Congenital
- Prosthetic valve stenosis
- Mitral Annular Calcification
- Left Atrial Myxoma

Acute Mitral Regurgitation

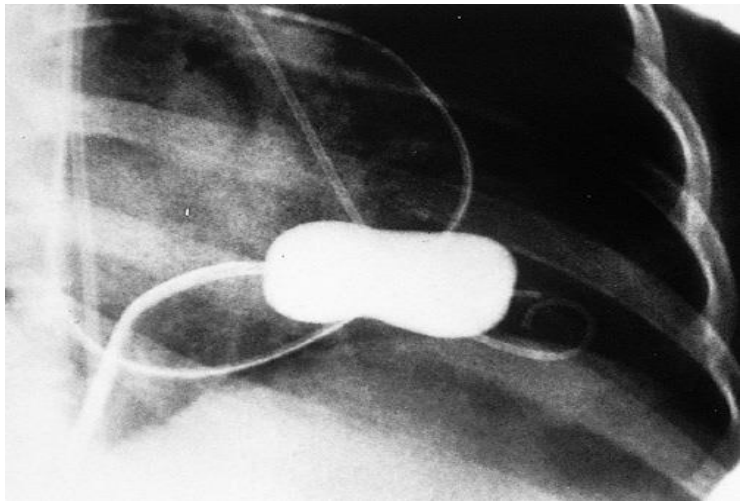
- Infective endocarditis
- Ischemic Heart disease
- Papillary ms rupture
- Mitral valve prolapse
- Chordal rupture
- Chest trauma



Chronic Mitral Regurgitation

- Ischemic Heart disease
- Papillary ms dysfunction
- Inferior & posterior MI
- Mitral Valve prolapse
- Infective endocarditis
- Rheumatic
- Prosthetic
- Mitral annular calcification
- Cardiomyopathy

Mitral stenosis indication for surgery



Recommendations on indications for percutaneous mitral commissurotomy and mitral valve surgery in clinically significant (moderate or severe) mitral stenosis (valve area $\leq 1.5\ cm^2$)

Recommendations	Class[a]	Level[b]
PMC is recommended in symptomatic patients without unfavourable characteristics[c] for PMC.[360,363–365,367]	I	B
PMC is recommended in any symptomatic patients with a contraindication or a high risk for surgery.	I	C
Mitral valve surgery is recommended in symptomatic patients who are not suitable for PMC in the absence of futility.	I	C
PMC should be considered as initial treatment in symptomatic patients with suboptimal anatomy but no unfavourable clinical characteristics for PMC.[c]	IIa	C
PMC should be considered in asymptomatic patients without unfavourable clinical and anatomical characteristics[c] for PMC and: • High thromboembolic risk (history of systemic embolism, dense spontaneous contrast in the LA, new-onset or paroxysmal AF), and/or • High risk of haemodynamic decompensation (systolic pulmonary pressure >50 mmHg at rest, need for major NCS, desire for pregnancy).	IIa	C

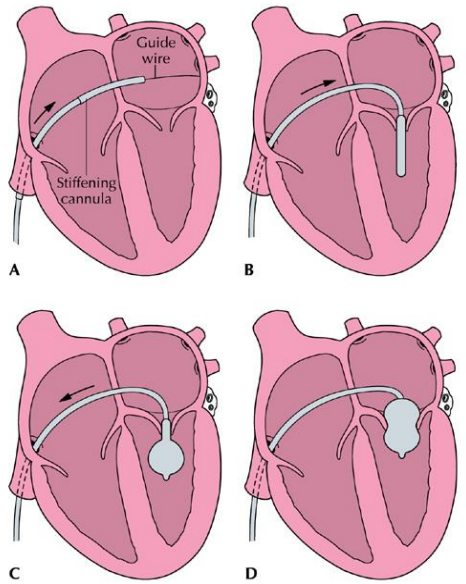


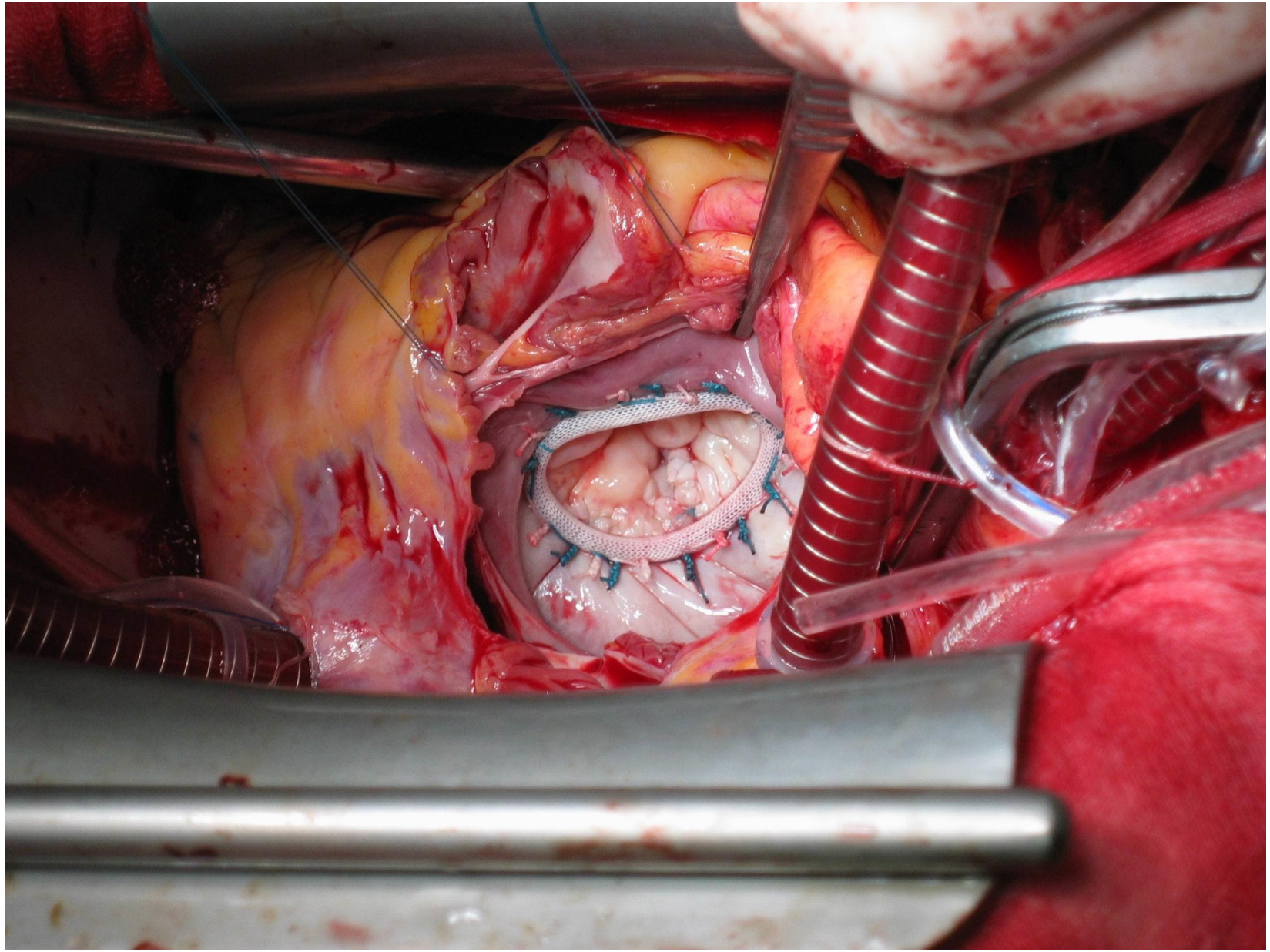
Table 8 **Contraindications for percutaneous mitral commissurotomy in rheumatic mitral stenosis[a]**

Contraindications
MVA >1.5 cm^{2a}
LA thrombus
More than mild mitral regurgitation
Severe or bi-commissural calcification
Absence of commissural fusion
Severe concomitant aortic valve disease, or severe combined tricuspid stenosis and regurgitation requiring surgery
Concomitant CAD requiring bypass surgery

Mitral regurgitation indication for surgery

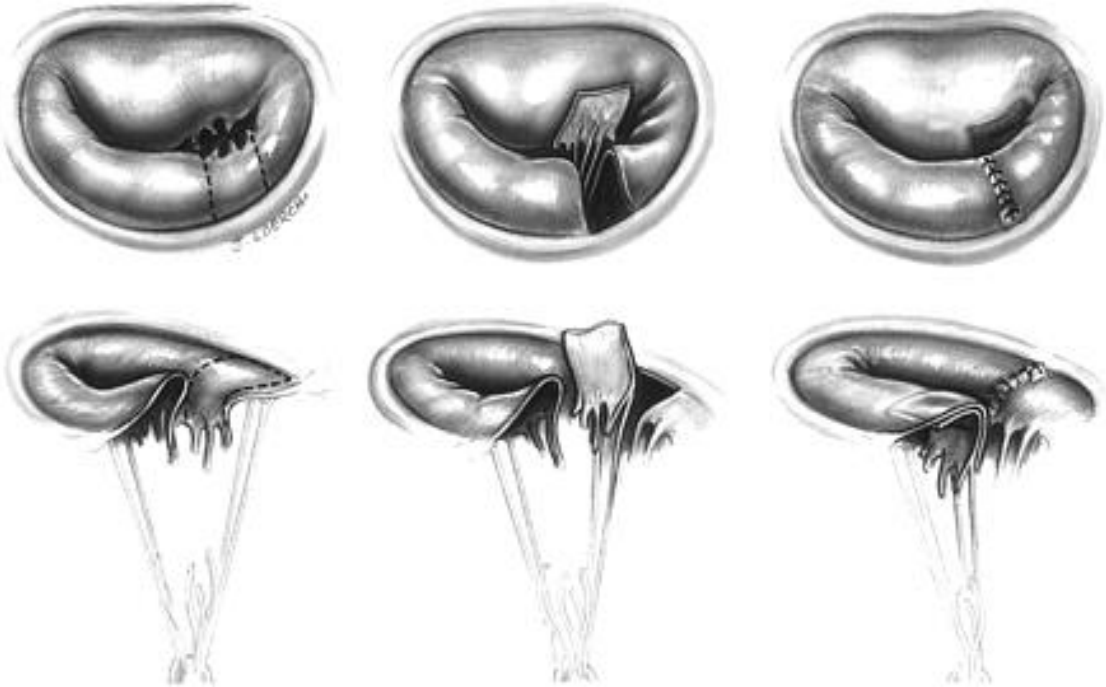
Recommendations on indications for intervention in severe primary mitral regurgitation

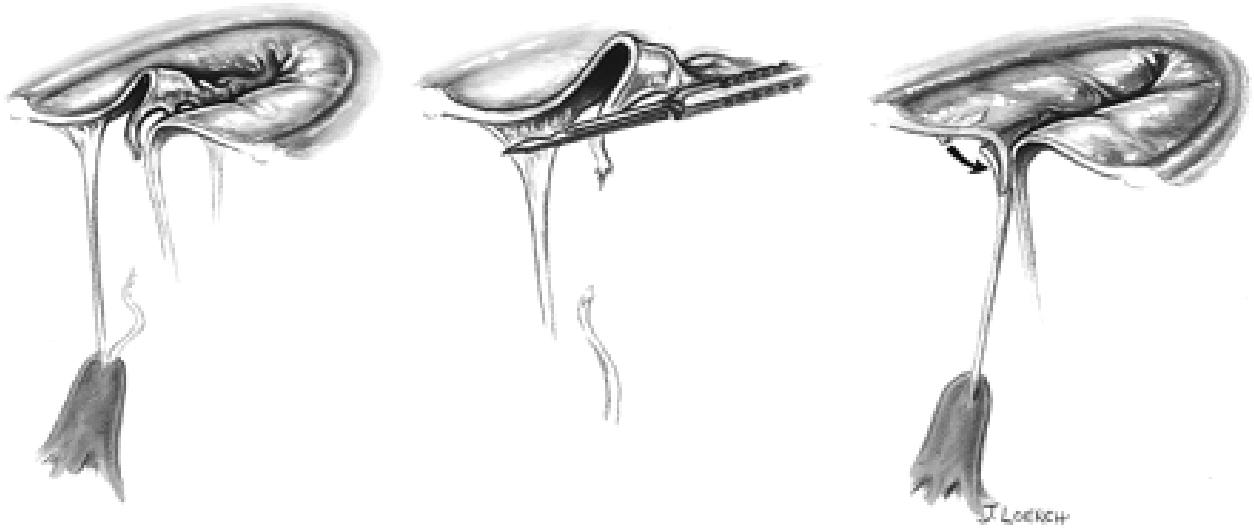
Recommendations	Class[a]	Level[b]
Mitral valve repair is the recommended surgical technique when the results are expected to be durable.[293–296]	I	B
Surgery is recommended in symptomatic patients who are operable and not high risk.[293–296]	I	B
Surgery is recommended in asymptomatic patients with LV dysfunction (LVESD ≥40 mm and/or LVEF ≤60%).[277,286,292]	I	B
Surgery should be considered in asymptomatic patients with preserved LV function (LVESD <40 mm and LVEF >60%) and AF secondary to mitral regurgitation or pulmonary hypertension[c] (SPAP at rest >50 mmHg).[285,289]	IIa	B
Surgical mitral valve repair should be considered in low-risk asymptomatic patients with LVEF >60%, LVESD <40 mm[d] and significant LA dilatation (volume index ≥60 mL/m^2 or diameter ≥55 mm) when performed in a Heart Valve Centre and a durable repair is likely.[285,288]	IIa	B



Mitral valve repair

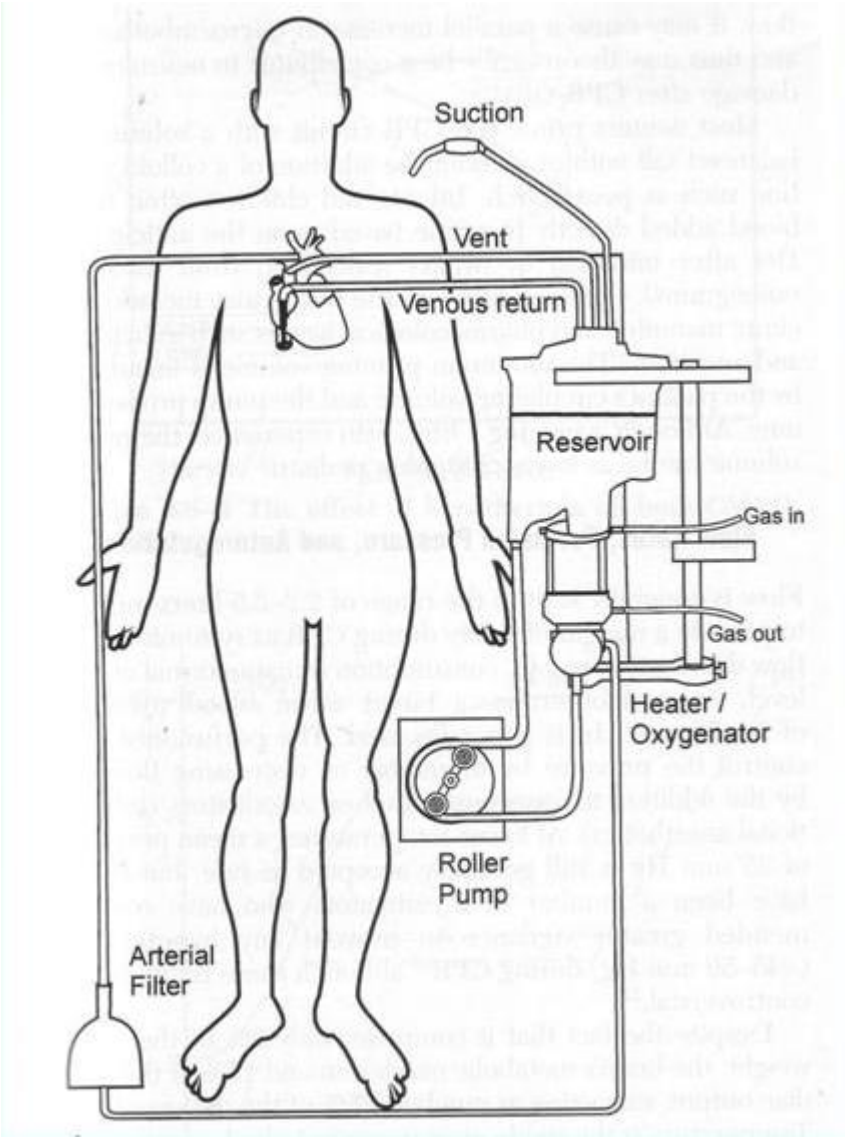
Chordal transfer



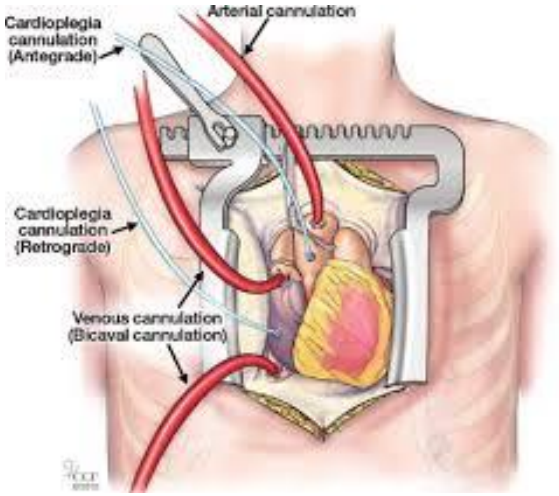


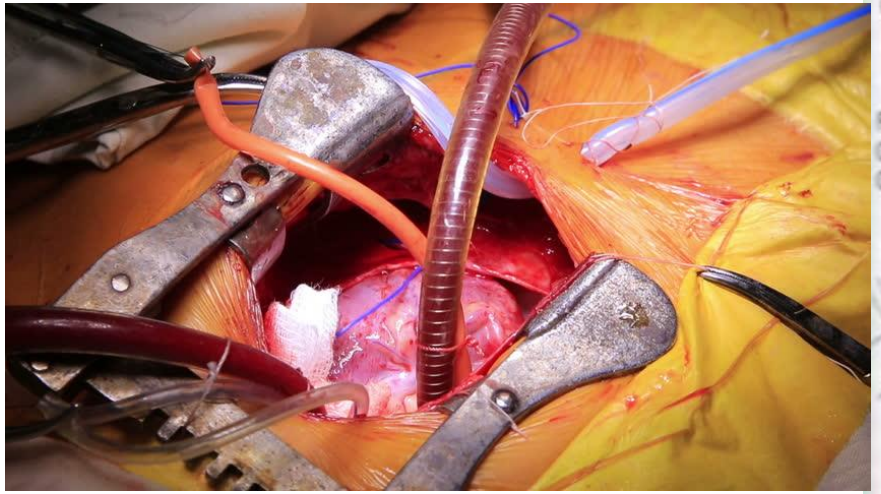
Mitral valve repair

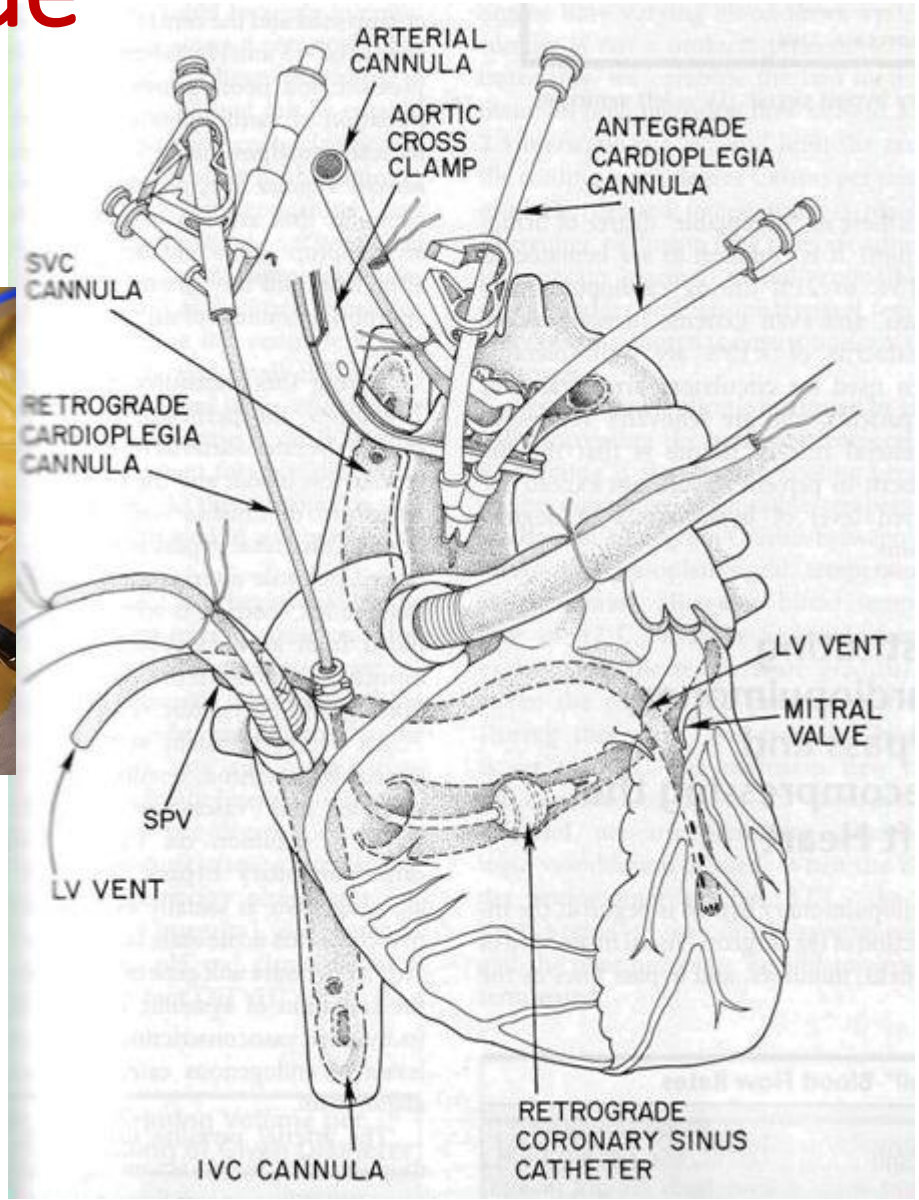
Surgical technique

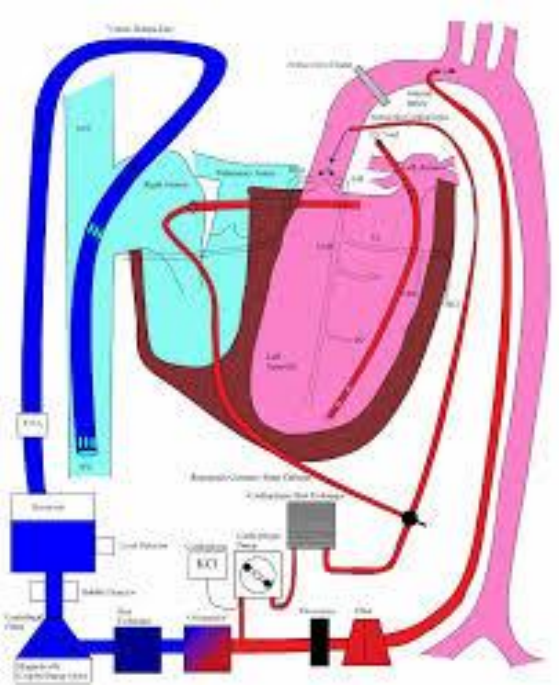


Surgical technique









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THANK YOU