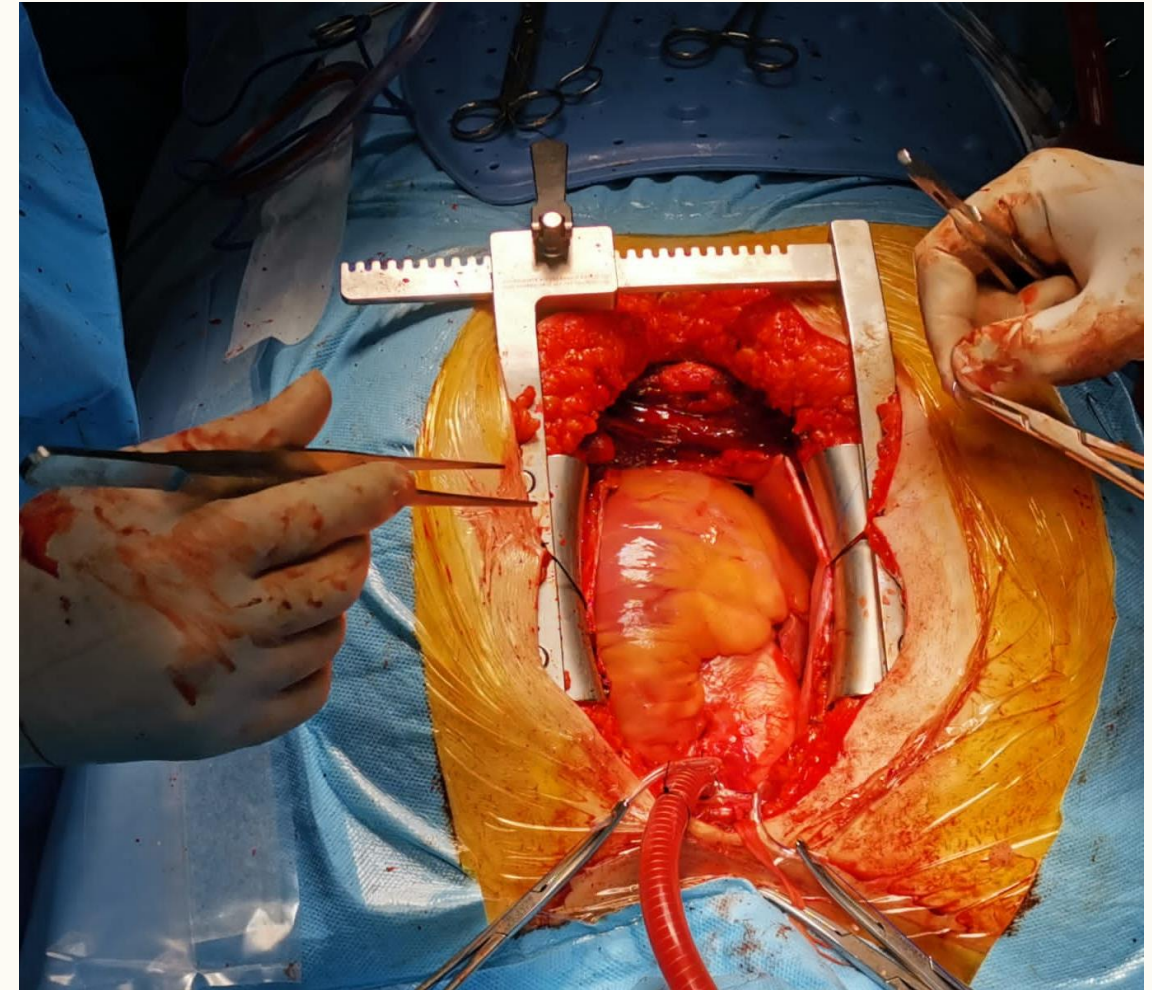


# Acquired heart Disease surgery



Dr saif Al-Mudhaffar Department  
of Surgery /Collage of Medicine /  
Al Mustansiriyah University

Duration: 50–60 minutes

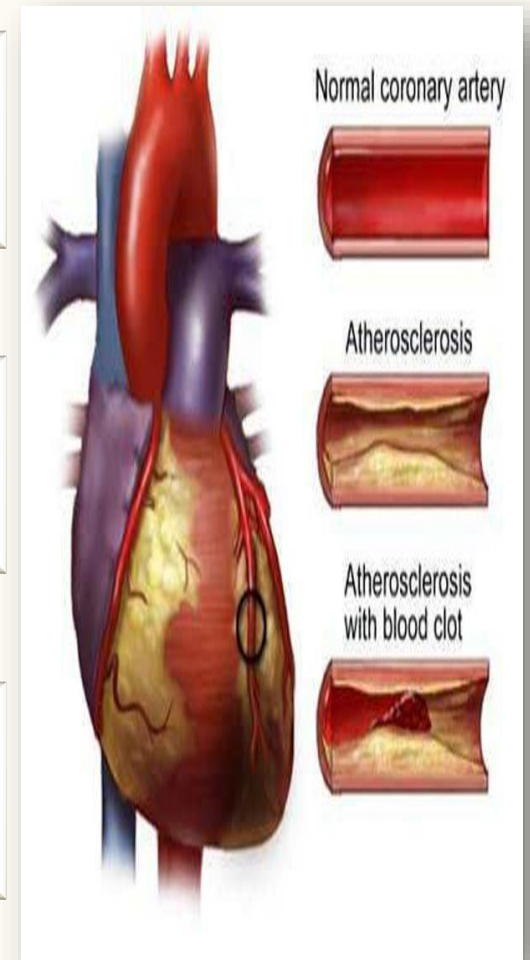


# prevalence of ischemic heart disease

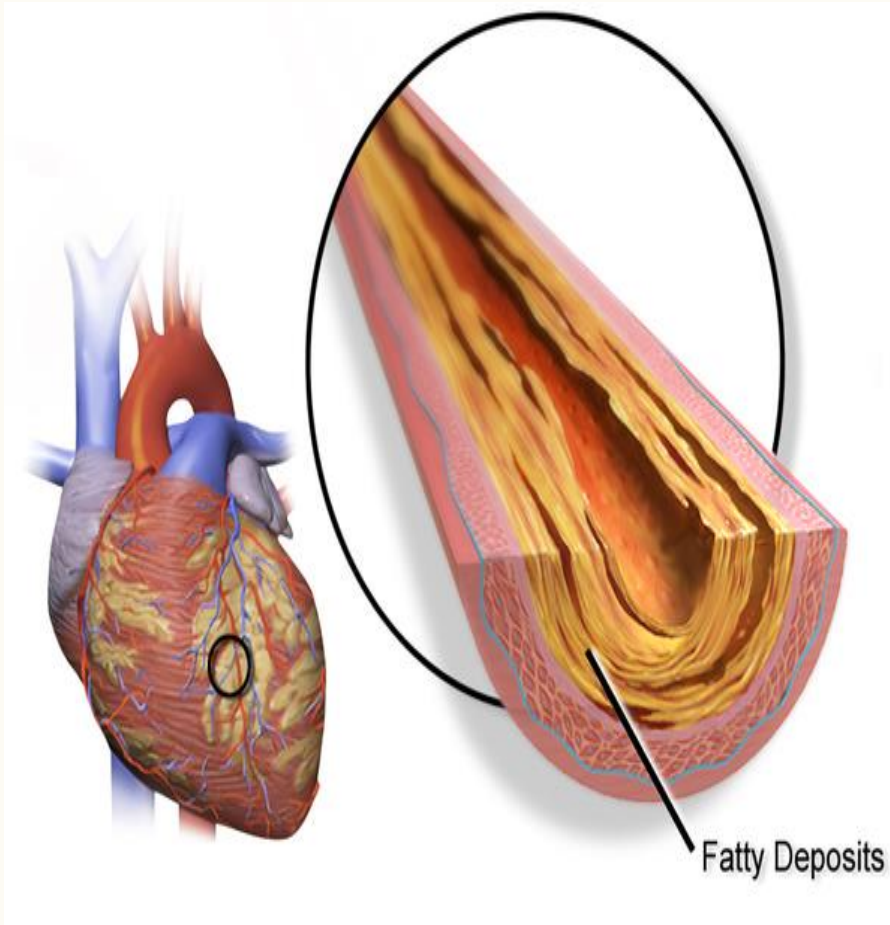
Ischemic heart disease IHD is a major cause of morbidity and mortality in resource rich countries..

In 2021, there were approximately 8.99 million deaths globally due to IHD mortality rate for IHD in 2021 was about 108.73 per 100,000 population. professional.heart.org

IHD deaths in 2025 would be somewhat greater than the 2021 value,. If we loosely project from 2021's ~8.99 million deaths, we might expect 9–10 million global deaths from IHD in 2025



# Pathophysiology



## The fatty streak.

- The first evidence of atherosclerosis can be found in children aged 10–14 years as a yellow streak running along the major arteries. The streak consists of smooth muscle cells, which are filled with cholesterol, and foam cells (lipid-laden macrophages).
- Fibrous plaque. A fibrous plaque consists of large numbers of smooth muscle cells, foam cells and leukocytes. As the fibrous plaque grows, it projects into the vessel lumen, causing narrowing that, in turn, can lead to ischemia or infarction.
- Complicated lesion. This occurs when the fibrous plaque ruptures, provoking activation of the coagulation cascade and the formation of thrombus.

# Symptoms and signs

## Heart Attack Signs and Symptoms

*Heavy chest pain*



*Cold and sweaty*



*Pain in neck or left arm*



*Nausea*



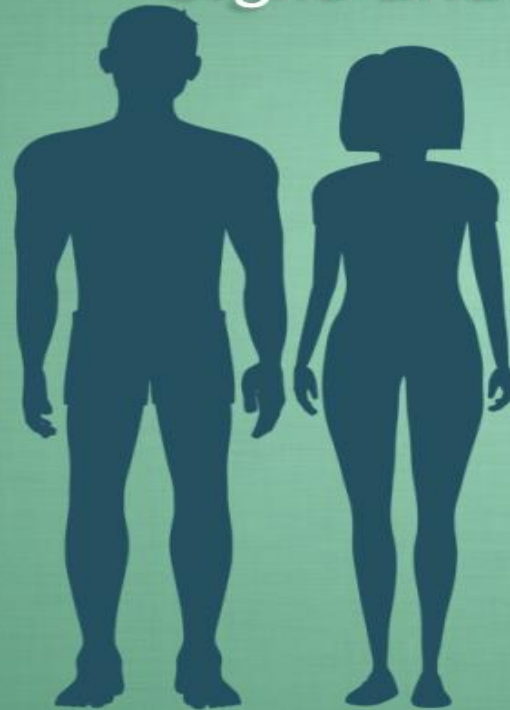
*Sudden onset of symptoms*



*Short of breath*



*More tired than usual*



Men and Women



Women



*Flu-like symptoms*



*Feelings of indigestion or heartburn*



*Symptoms for a number of days*



*Heartburn*

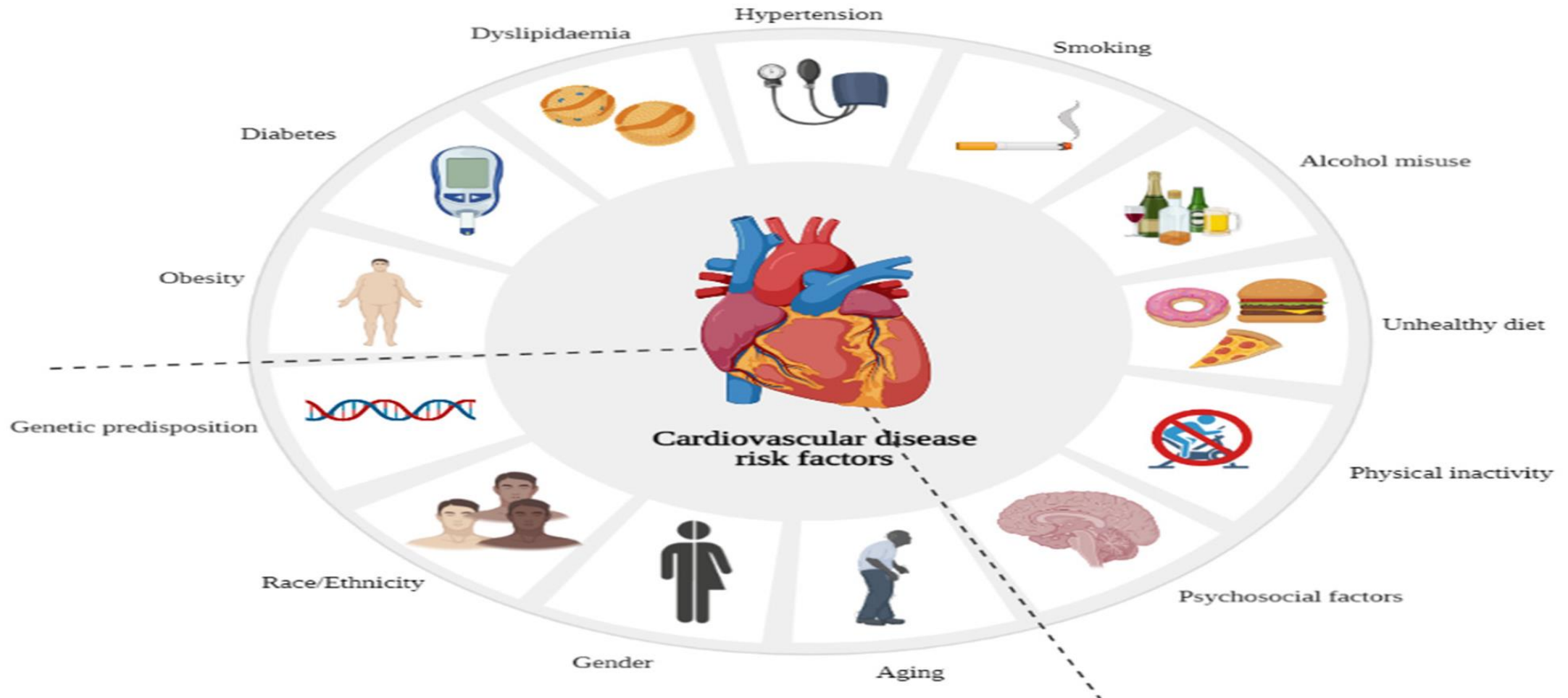
# GUESS WHO



Diego Maradona died on November 25, 2020, at the age of 60. His death was caused by a heart attack (cardiac arrest)

# Risk factors

## MODIFIABLE RISK FACTORS





## NON-INVASIVE METHODS OF DIAGNOSIS

---

Resting electrocardiography

---

Troponin and cardiac isoenzymes

---

Exercise tolerance testing

---

Echocardiography

---

Radionuclide studies and cardiac magnetic resonance imaging

---

Positron emission tomography

---

Computed tomography

## INVASIVE METHODS OF DIAGNOSIS

- Coronary angiography

---

Gold standard for imaging coronary anatomy

---

Demonstrates extent, severity and location of stenosis

---

Demonstrates quality and size of distal arterial tree

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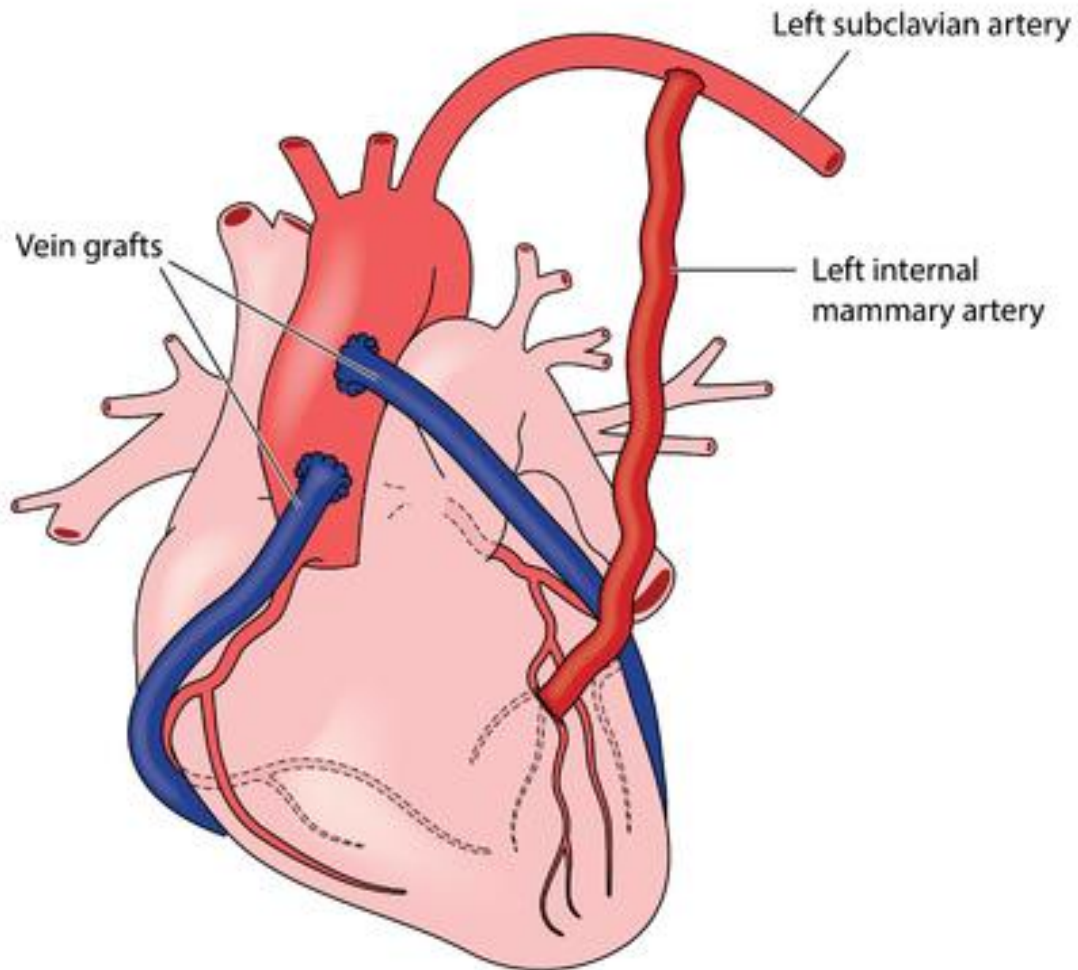
Aids diagnosis of ischemia

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Evaluates suitability for surgery

---

Aids in prognostic assessment



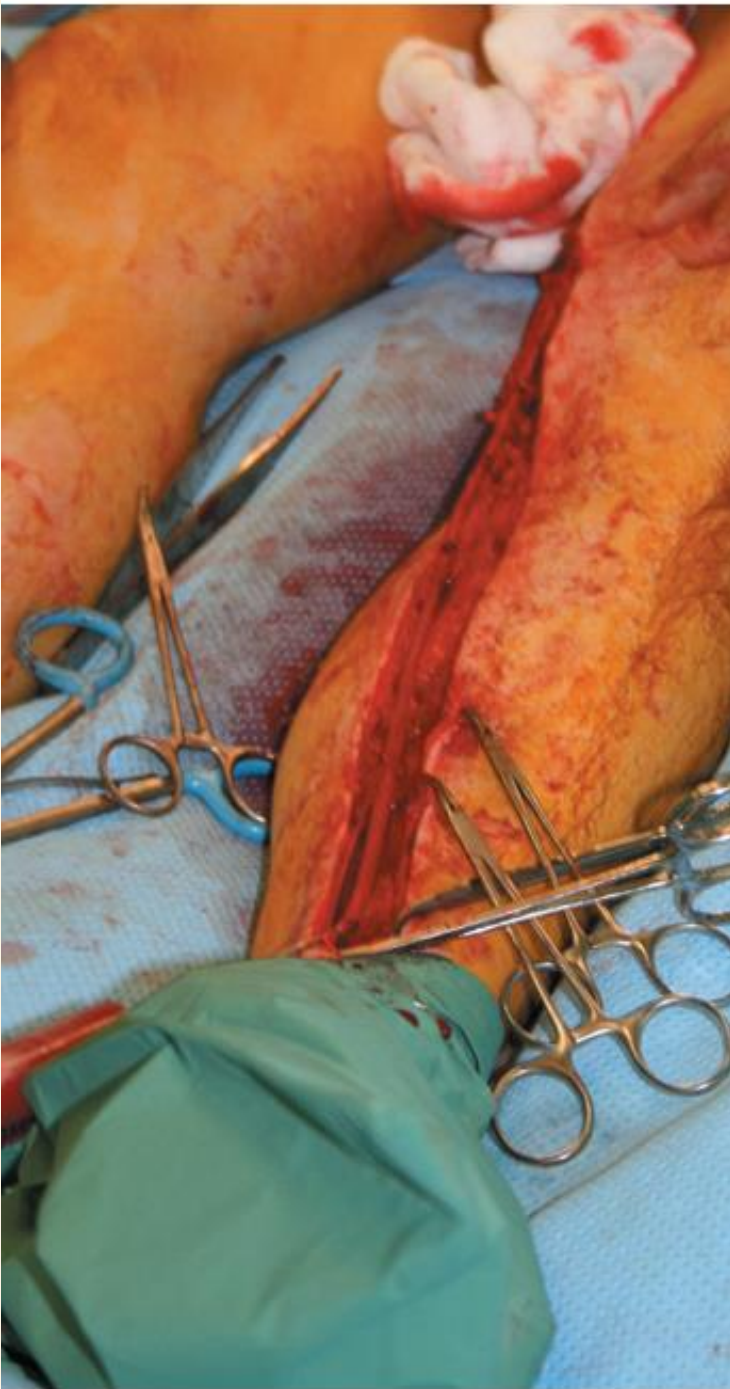
## Indications for surgery

>50% stenosis of the left main stem ('critical left main stem disease')

>50% stenosis of the proximal left anterior interventricular artery

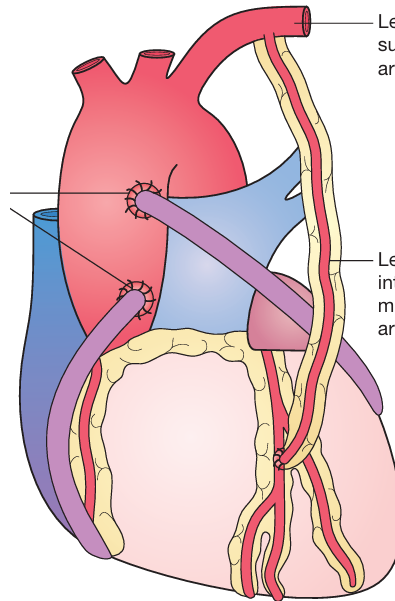
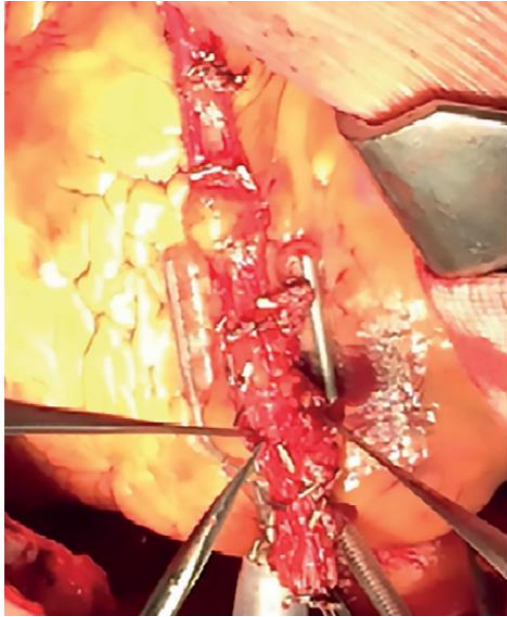
Three main coronary arteries diseased ('triple-vessel disease')

Two-vessel disease including the proximal LAD



# Selection of conduit

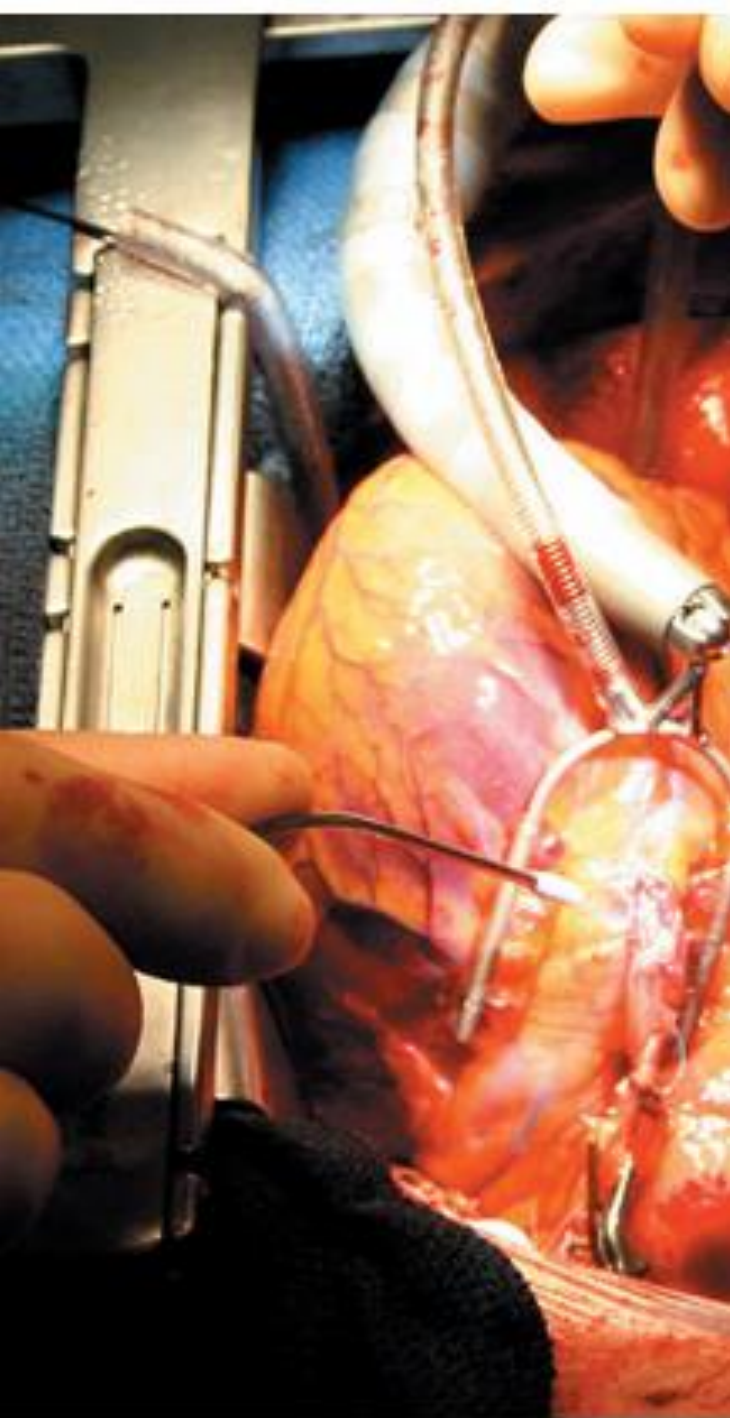
- **Venous grafts**
  - The long saphenous vein is the most commonly used venous conduit as it is straightforward to harvest, provides good length and is easy to handle. Historical studies showed a limited long term patency rate for long saphenous vein grafts (50–60% at 10 years). However, recent studies suggest that early postoperative use of lipid-lowering agents and antiplatelet agents such as low-dose aspirin can improve vein graft long-term patency.
  - Alternative vein conduits include the short saphenous vein or upper limb veins such as the cephalic vein; however, these grafts are associated with poorer long-term patency rates.



Completed coronary artery bypass grafts.

# Arterial grafts

- ❑ The left internal mammary artery (LIMA), or internal thoracic artery, has become the conduit of choice for LAD grafting. Evidence from the mid-1980s to the present day suggests a 10-year patency rate of >95%, with a lower reoperation rate.
- ❑ The use of the radial artery as an alternative arterial bypass graft has undergone a recent revival. This has been driven by the belief that total arterial revascularization (avoiding venous conduits) might improve long-term results of coronary surgery. Different studies have demonstrated excellent patency rates at 1 and 5 years with this strategy.



# Postoperative complications



Bleeding Significant bleeding occurs in approximately 2–3% of patients.



Arrhythmias The most common postoperative arrhythmia is atrial fibrillation (AF). 30–60% of patients



Poor cardiac output state Myocardial function typically declines in the first few hours following cardiac surgery



Neurological dysfunction Stroke occurs in approximately 2% of patients following CABG



Wound infection Significant deep wound infection resulting in sternal dehiscence and mediastinitis occurs in around 0.5–2% of patients.



Mortality In the UK, the mortality rate for patients undergoing CABG is 1–3%.  
M

# Coronary artery bypass surgery outcome

Mortality  
1–3%

Survival

Angina

>95% at  
1 year

90% at 5  
years

75% at  
10 years

Improved  
in >90%  
at 1 year

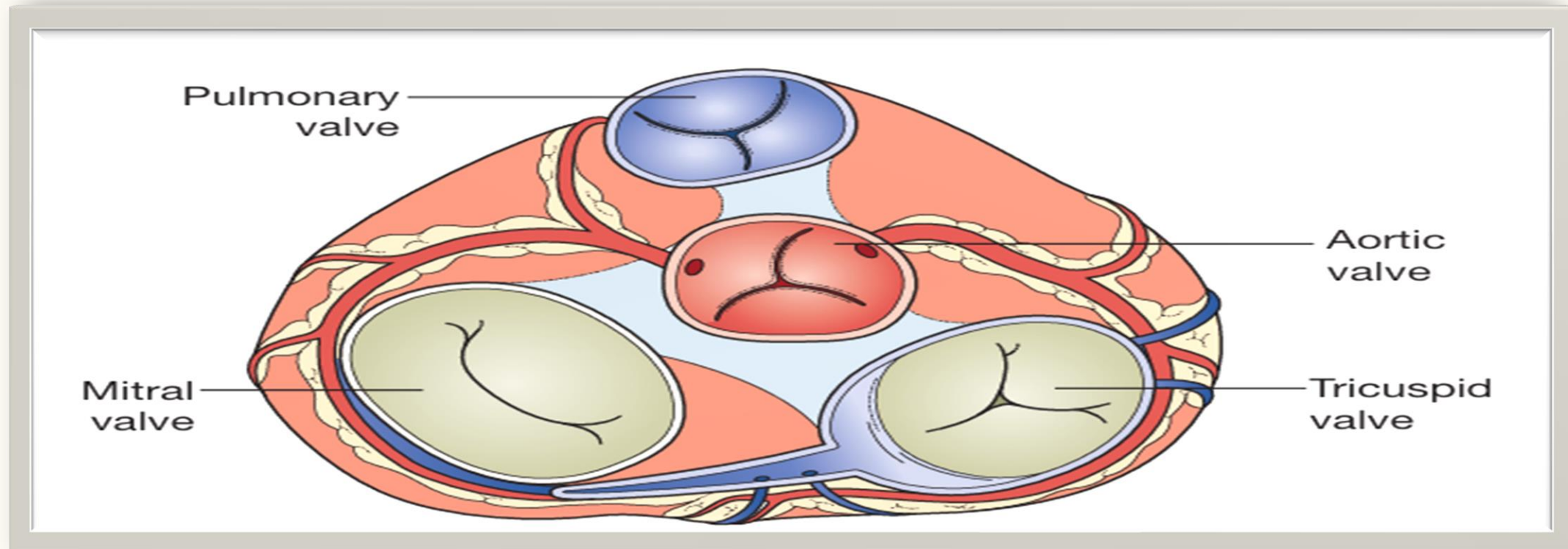
80% at  
5 years

60% at  
10 years

# VALVULAR HEART DISEASE

## Introduction

- The first prosthetic valve replacement was performed by Dwight Harken, who replaced an aortic valve, followed by a mitral valve replacement by Starr a year later
- Heart valves serve to maintain pressure gradients between cardiac chambers, thus ensuring a unidirectional flow of blood through the heart.



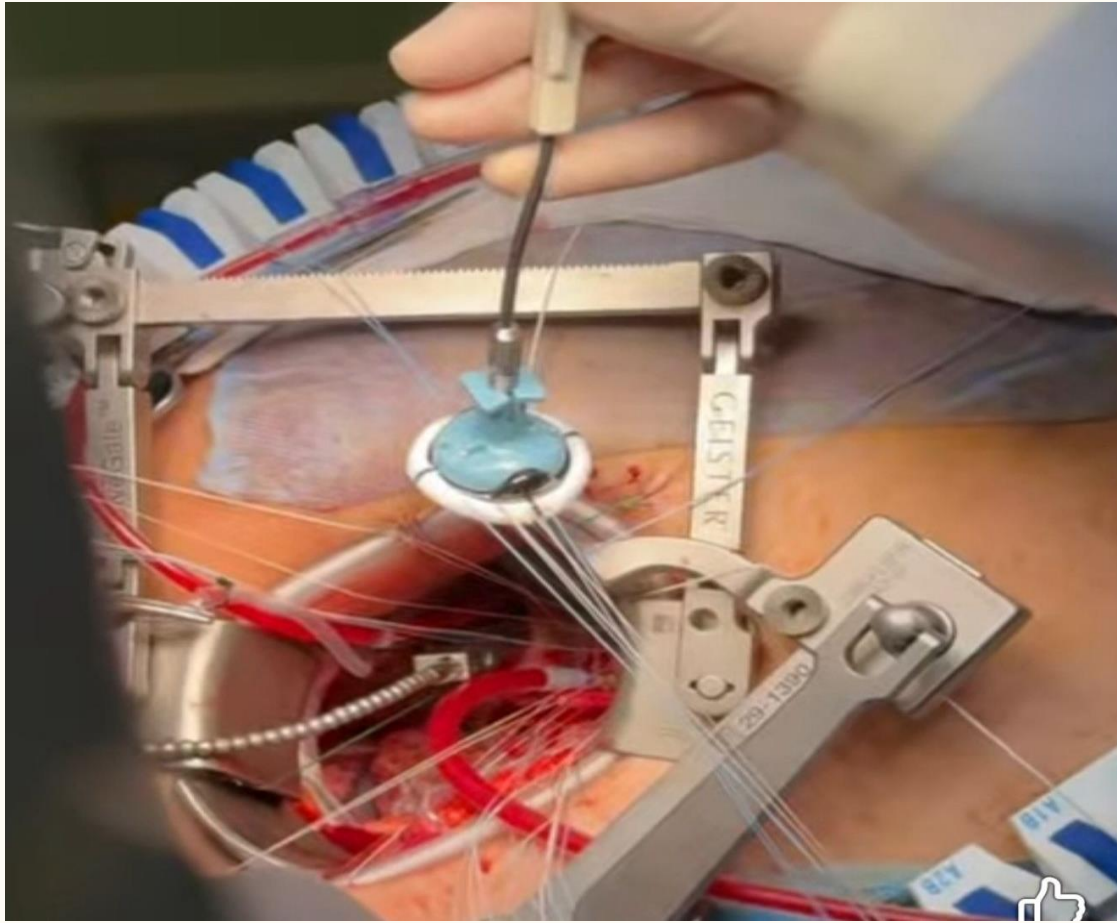
# Types of prosthetic valves

## MECHANICAL VALVES

Mechanical valves can be used in any age group to replace any valve (Figure 59.10). They are extremely durable but thrombogenic and patients require systemic anticoagulation, usually with warfarin. The patient should be warned about the risk of hemorrhagic (intracerebral, epistaxis, gastrointestinal bleed) or thrombotic (cerebral infarction) complications.

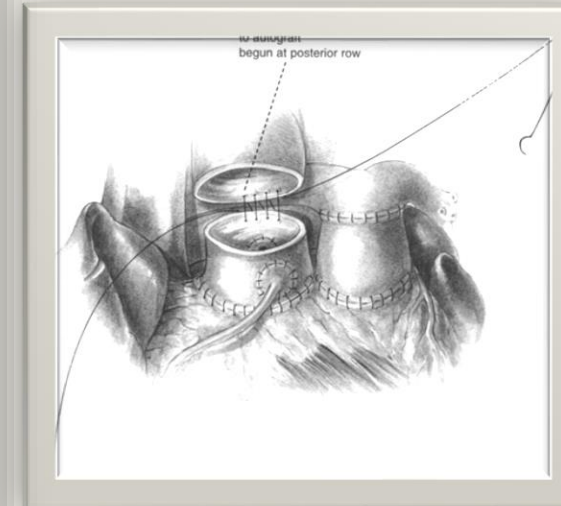


# Minimal cardiac surgery



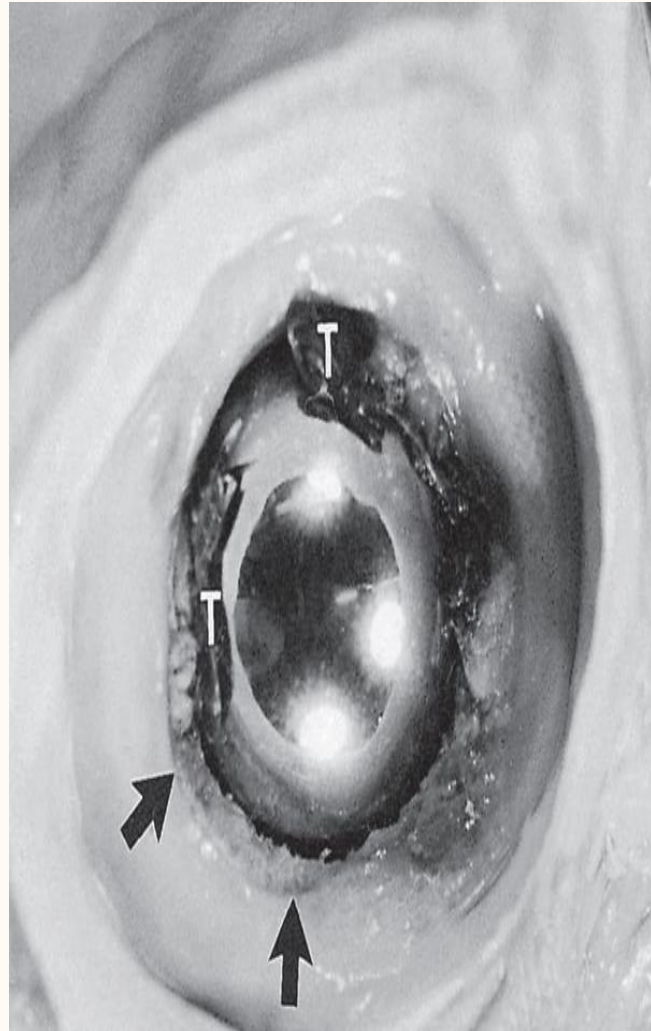
# Bioprosthetic (biological) valves

- cadaveric homograft (or allograft) valves
- autografts, a patient's own valve;
- most commonly, heterografts (or xenografts) prepared from animal tissues.
- All have three semilunar leaflets with central flow, so decreasing pressure gradients and minimizing turbulence .
- Heterograft 'tissue' valves are the most commonly used valves and can be stented with a limited durability of 10–15 years



# Prosthetic valve dysfunction and complications

- Structural valve failure
- Paravalvular leak
- Thrombosis and thromboembolism  
Thrombus formation is the most common complication of a mechanical valve



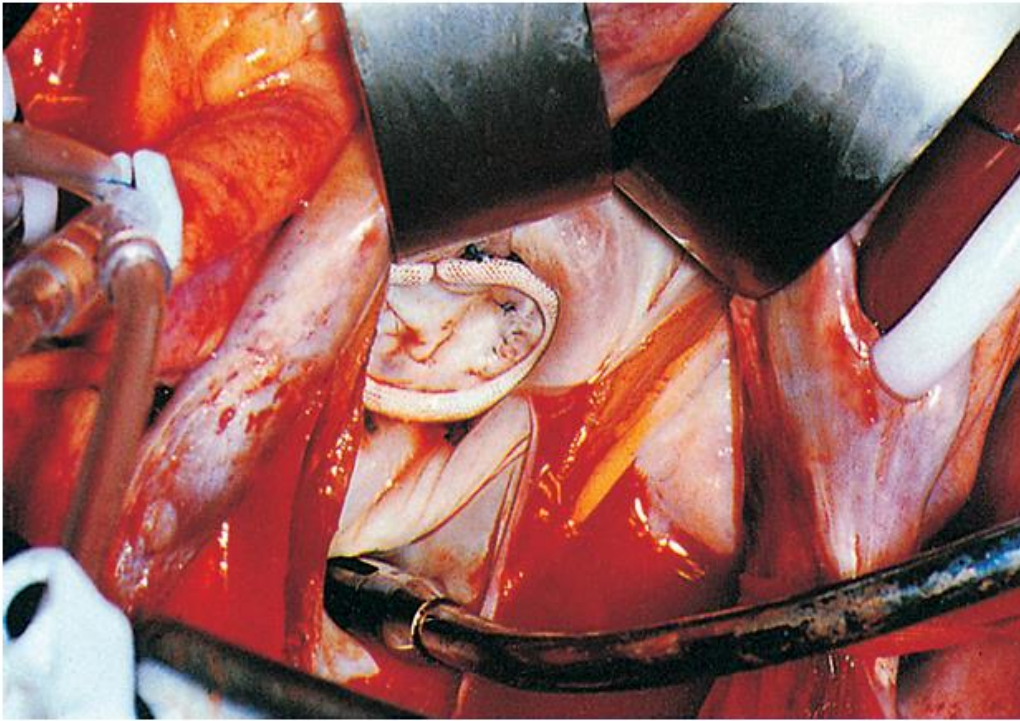
# Mitral valve disease (Mitral regurgitation)

**TABLE 59.4** Causes of mitral regurgitation.

Degenerative causes	Ventricular causes	Autoimmune and infective causes	Other causes
Barlow's disease (myxomatous degeneration)	Transient ischaemia and dynamic regurgitation	Infective endocarditis	Trauma (rarely)
Calcification of the leaflets or annulus	Myocardial infarction resulting in papillary muscle rupture	Rheumatic fever (post-streptococcal throat infection)	Congenital defects such as isolated mitral cleft
Marfan/Ehlers–Danlos syndromes and other connective tissue disorders	Cardiomyopathy and annular dilatation		Associated with certain medications (those containing ergotamine)
			Radiotherapy

# Indications for surgery in patients with primary mitral

regurgitation include severe symptoms or associated changes in left ventricular function or dimension (e.g. left ventricular end-systolic diameter)



**Figure 59.16** Operative view of the mitral valve repair using a Carpentier-Edwards annuloplasty ring (courtesy of A Murday, FRCS).

## Mitral Regurgitation

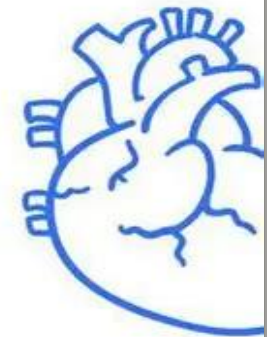
### Features

#### Symptoms

1. Dyspnea – pulmonary venous congestion
2. Odema, ascites – right heart failure
3. Palpation
4. Fatigue – low cardiac output

#### Signs

1. Atrial fibrillation/ flutter
2. Cardiomegaly
3. Apical pansystolic murmur ± thrill
4. Soft S1, apical S3
5. Pulmonary venous congestion
6. Pulmonary hypertension and right heart failure

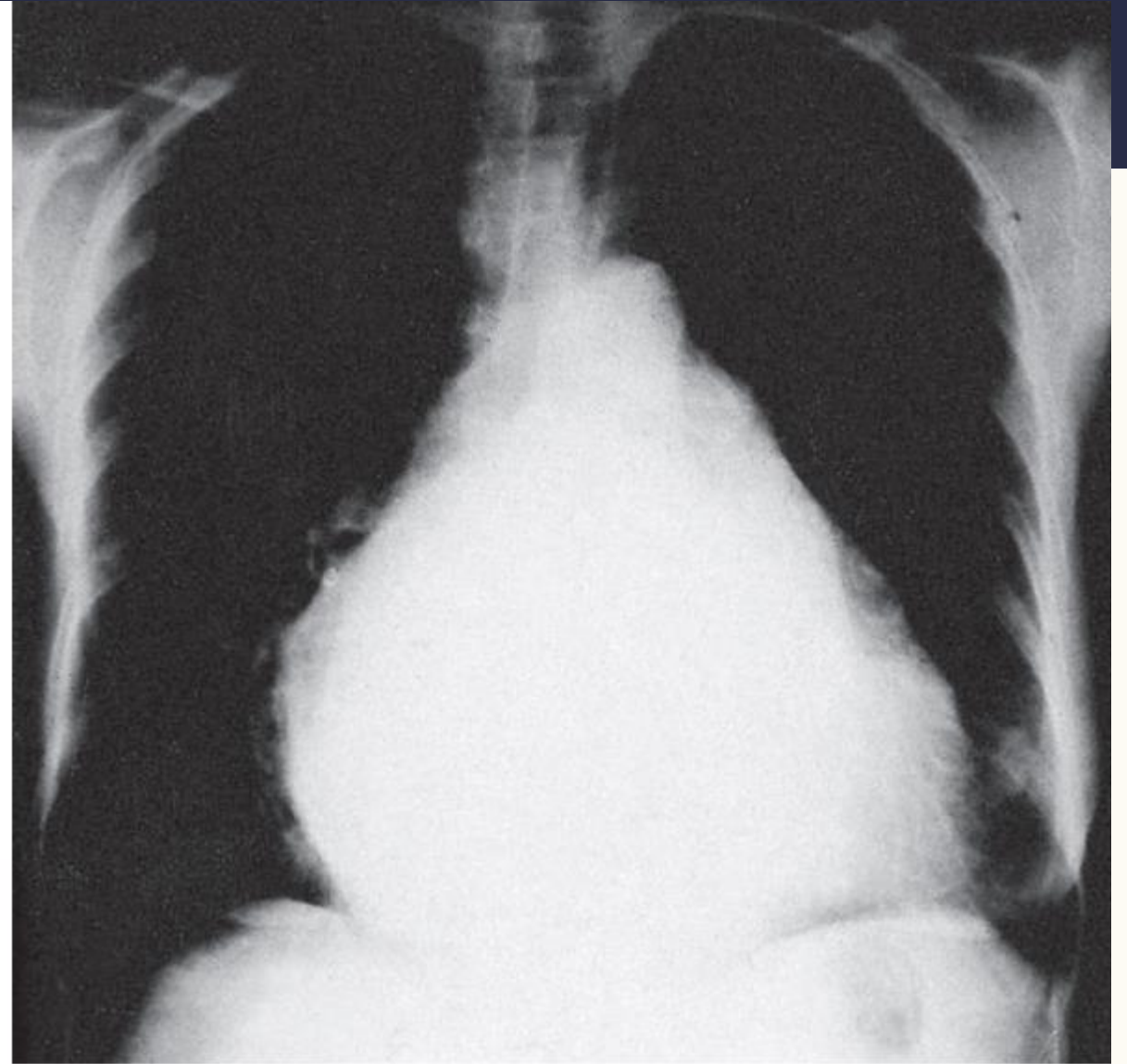


# Mitral stenosis

The most common cause of mitral stenosis worldwide remains rheumatic fever, despite the fact that the incidence of overt rheumatic fever in resource-rich countries has decreased.

During the healing phase of acute rheumatic fever, the valve leaflets become adherent to each other at their free border so that the commissures become obliterated, narrowing the valve orifice.

Symptoms of mitral stenosis usually develop more than 10 years after the acute attack.



**Figure 59.14** Chest radiograph of longstanding mitral stenosis showing a massive left atrium.

# Causes of mitral valve disease

## Stenosis

- Rheumatic heart disease (common)
- Calcification of valve or chordae tendinae
- Congenital (rare)

## Regurgitation

- Rheumatic heart disease
- Valve prolapse
- Left ventricular dilatation or hypertrophy
- Ischaemia
- Bacterial endocarditis

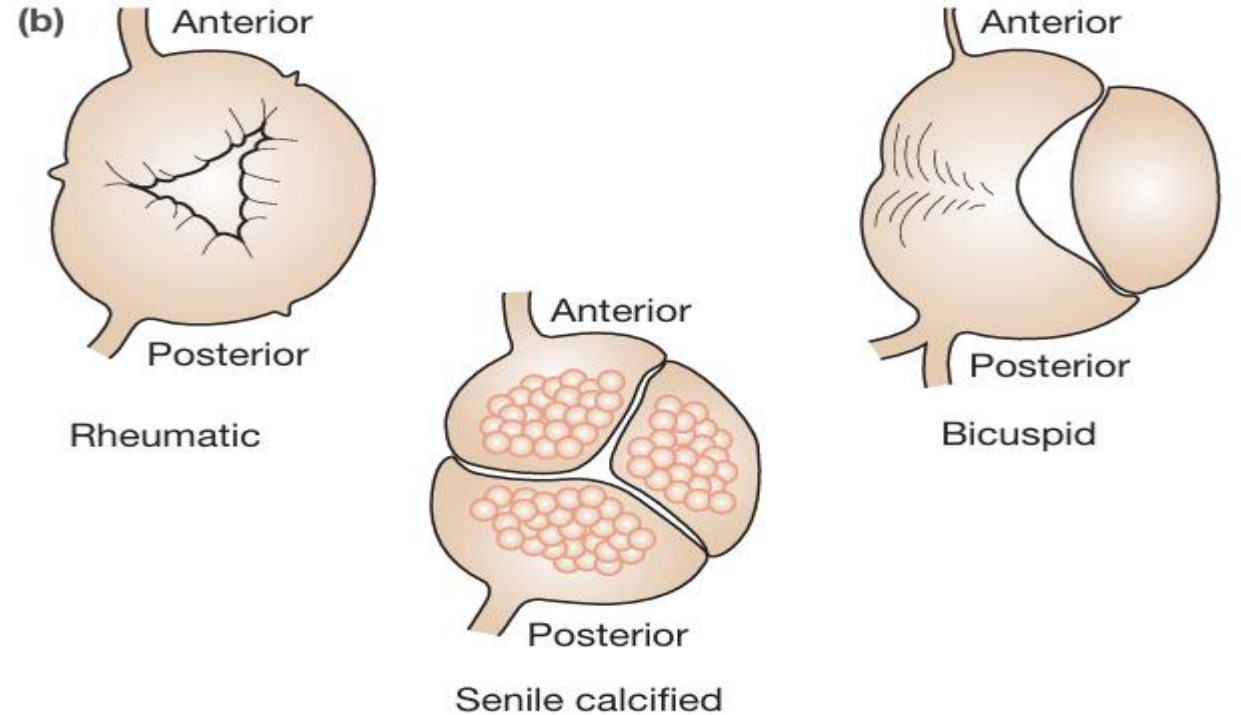
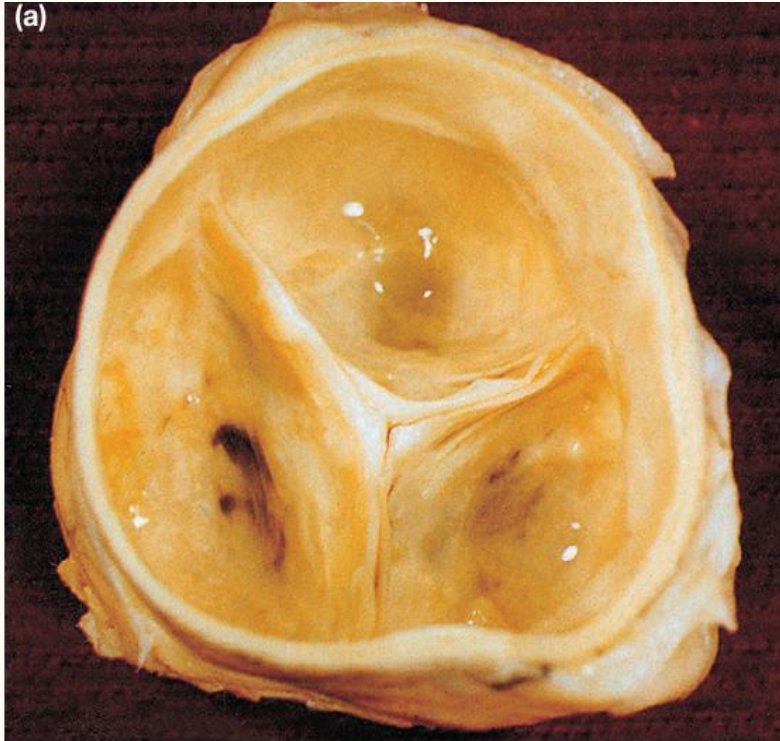
# Mitral valve operations

Mitral valve repair

Mitral valve replacement

Transcatheter mitral valve repair

# Aortic valve disease Aortic stenosis



The commonest cause of aortic stenosis in adults is an acquired, degenerative, calcific process that results in immobile aortic valve cusps. Progressive fibrosis and calcification of a congenitally abnormal valve can mimic this degenerative process. The usual congenital abnormality is commissural fusion, leading to a bicuspid aortic valve, which occurs in approximately 1% of the population

## Symptoms of Aortic Stenosis

- Shortness of breath
- Angina
- Fatigue
- Syncope or pre-syncope
- Other
  - Rapid or irregular heartbeat
  - Palpitations



Sandy  
Actual TAVR Patient  
Pre-Procedure  
Inoperable

The symptoms of aortic disease are commonly misunderstood by patients as 'normal' signs of aging.<sup>5</sup> Many patients initially appear asymptomatic, but on closer examination up to 37% exhibit symptoms.<sup>6</sup>

**TABLE 59.5** Classification of the severity of aortic stenosis.

	Mild	Moderate	Severe
Valve area (cm <sup>2</sup> )	>1.5	1.0–1.5	<1.0
Mean gradient (mmHg)	<20	20–40	>40
Velocity (m/s)	2.6–2.9 (<2.5 found in aortic sclerosis)	3.0–4.0	>4.0
Velocity ratio	>0.50	0.25–0.50	<0.25

## Indications for surgery

The natural history of symptomatic patients with aortic stenosis is dismal, with 10-year mortality around 80–90%. The risk of sudden death is related to the severity of stenosis.

- Surgery is indicated in asymptomatic patients with severe stenosis and impaired left ventricular function or when the patient is undergoing concomitant procedures such as CABG.
- An abnormal blood pressure response to exercise (low blood pressure) is also a sign that there is limited reserve in asymptomatic patients.

**TABLE 59.6** Causes of aortic regurgitation.

**Acute aortic regurgitation**

*Leaflet abnormalities*

Infective endocarditis  
Prosthetic valve dysfunction  
Traumatic leaflet rupture

*Aortic wall abnormalities*

Aortic wall dissection  
Aortic trauma

**Chronic aortic regurgitation**

Bicuspid aortic valve  
Calcific degeneration  
Fenfluramine usage (appetite suppressant)

Calcific degeneration  
Marfan syndrome, Ehlers–Danlos  
Aortic root dilatation  
Rheumatoid arthritis, systemic lupus erythematosus, ankylosing spondylitis

# Clinical features

asymptomatic until left ventricular failure develops,

exertional dyspnea (predominantly)

angina

A wide pulse pressure due to a reduction in diastolic pressure and a collapsing pulse (water hammer pulse).

visible capillary pulsation of the nail bed (Quincke's sign),

pulsatile head bobbing (de Musset's sign),

visible arterial pulsation in the neck (Corrigan's sign)

a 'pistol shot' sound on auscultating over the femoral artery (Traube's sign)

The apex is displaced laterally and is often visible and hyperdynamic or 'thrusting' in nature because of the left ventricular hypertrophy.

Auscultation reveals a high-pitched early diastolic murmur best heard at the left sternal edge

# Indications for surgery

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Asymptomatic patients with severe aortic regurgitation and left ventricular dysfunction should also be offered surgery.

---

Valve replacement should also be considered in asymptomatic patients with severe regurgitation if they are undergoing cardiac surgery for any other reason,

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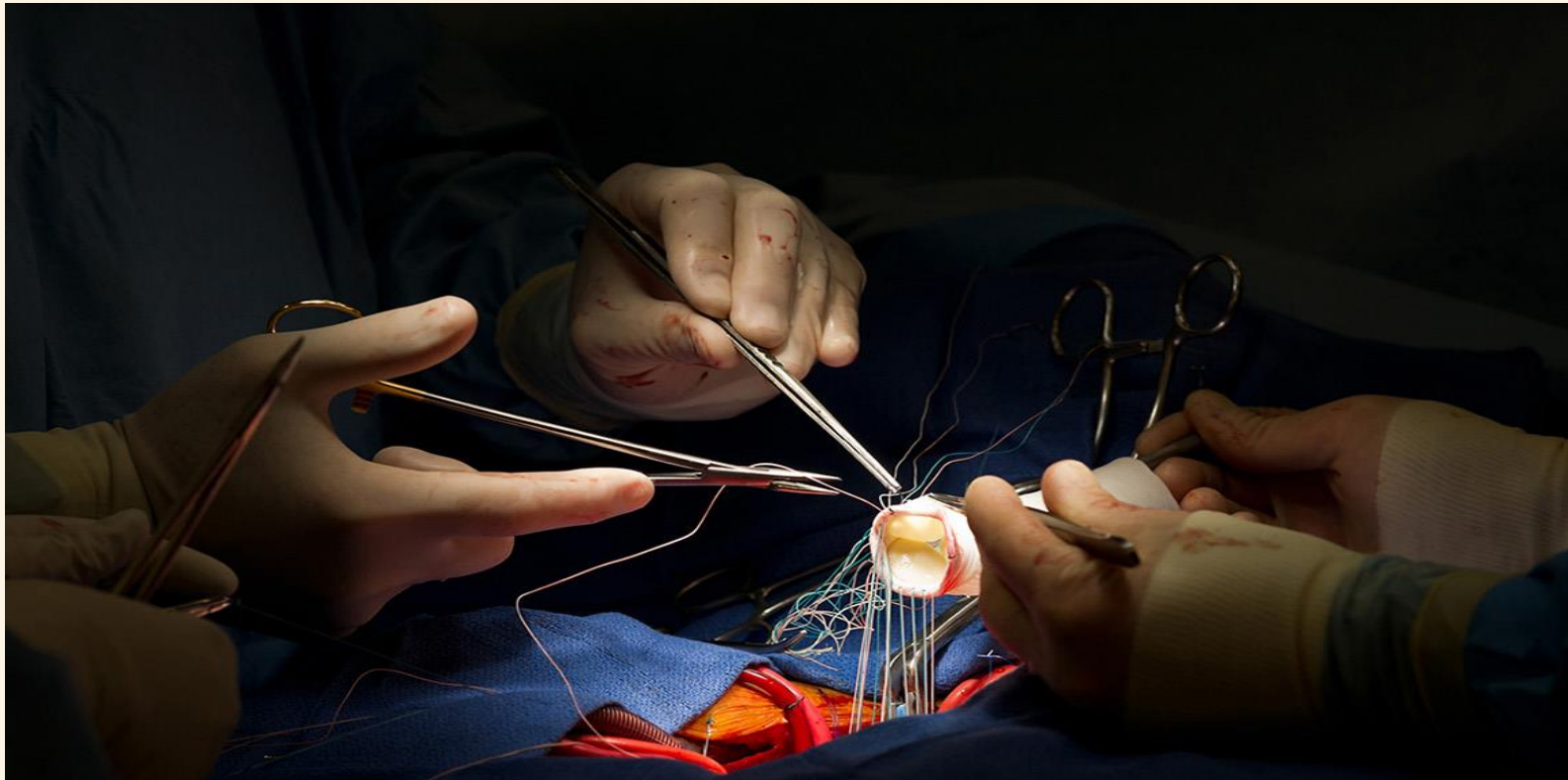
when there is evidence of progressive left ventricular dilatation (left ventricular end-systolic diameter  $>50$  mm).

---

Aortic valve replacement is recommended if there is a decrease in systolic function.

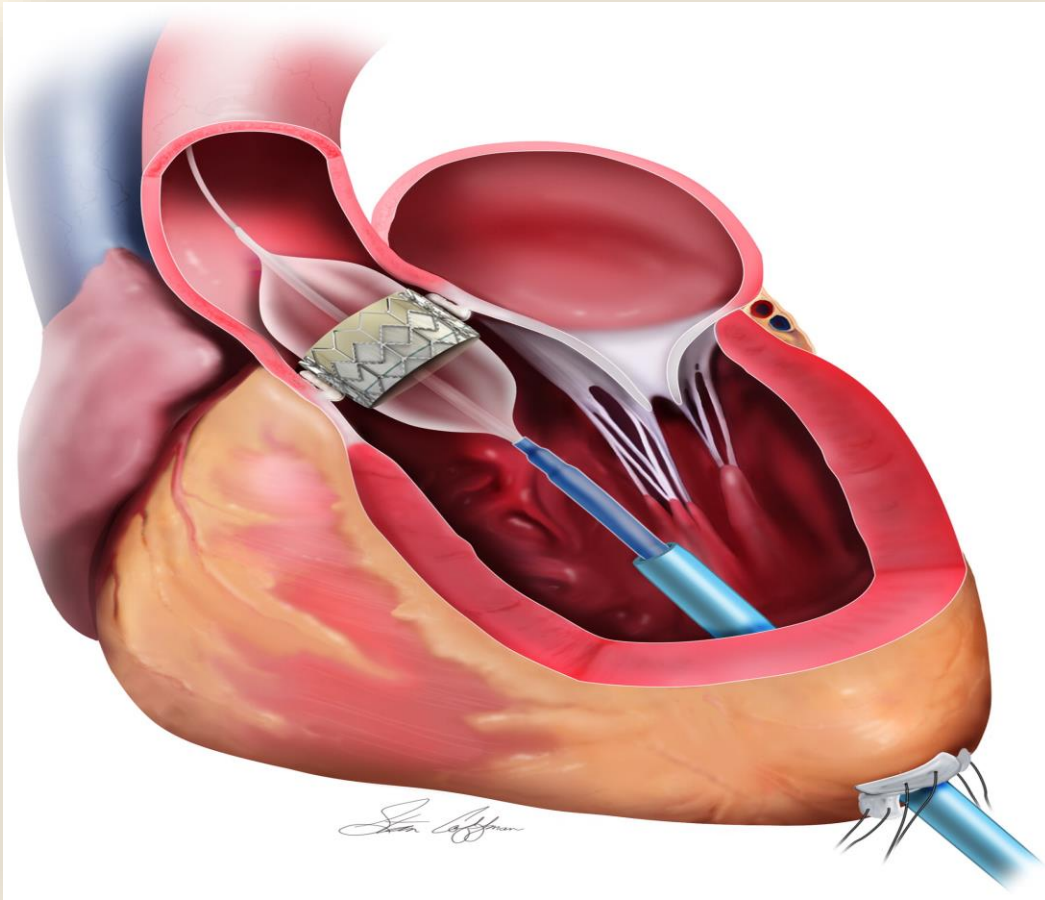
# Aortic valve surgery

## Aortic valve replacement

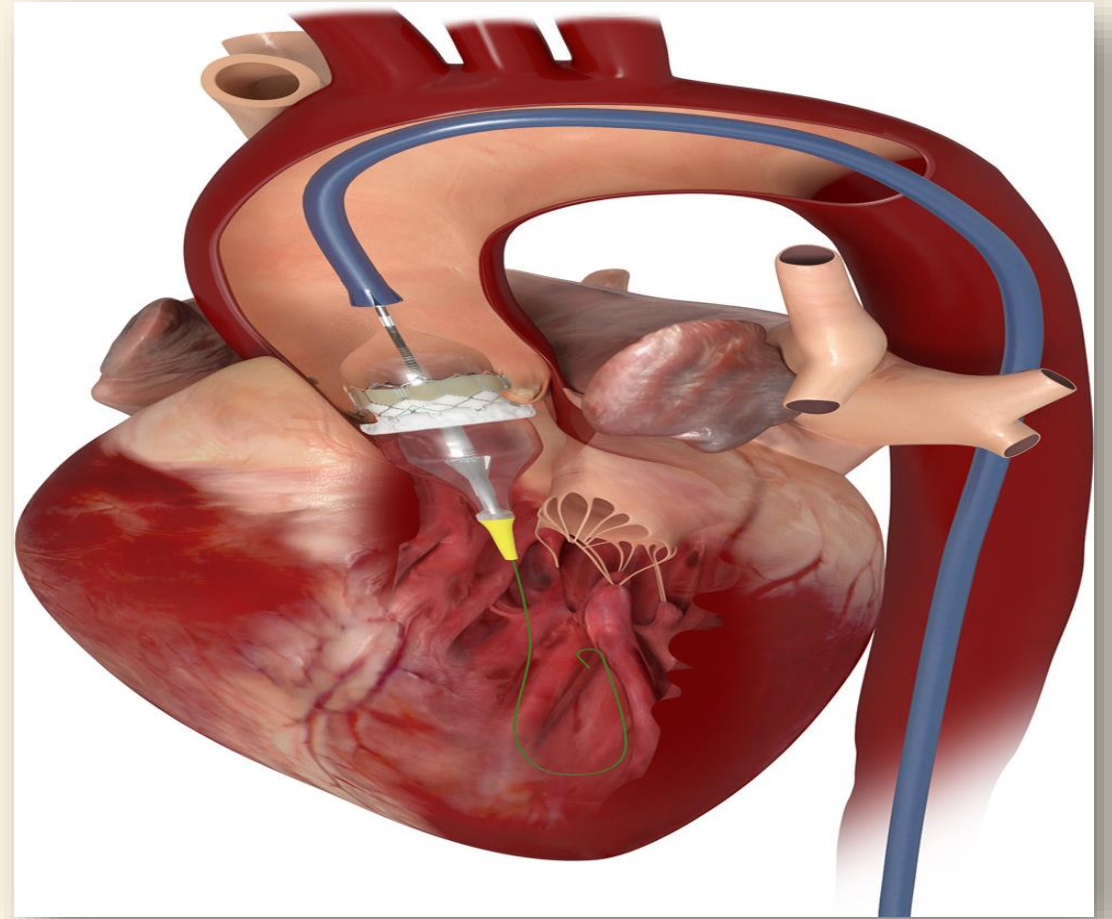


# Transcatheter aortic valve implantation

## Transapical approach



## Transluminal approach



# REFERENCE

*Bailey & Love's*  
SHORT  
PRACTICE of  
SURGERY

28<sup>th</sup> EDITION




Edited by  
P. RONAN O'CONNELL  
ANDREW W. McCASKIE  
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