

Heart failure

# Intro

- A chronic condition in which the heart doesn't pump blood adequately.
- Heart failure can occur if the heart cannot pump (systolic) or fill (diastolic) adequately.
- Symptoms include shortness of breath, fatigue, swollen legs and rapid heartbeat.

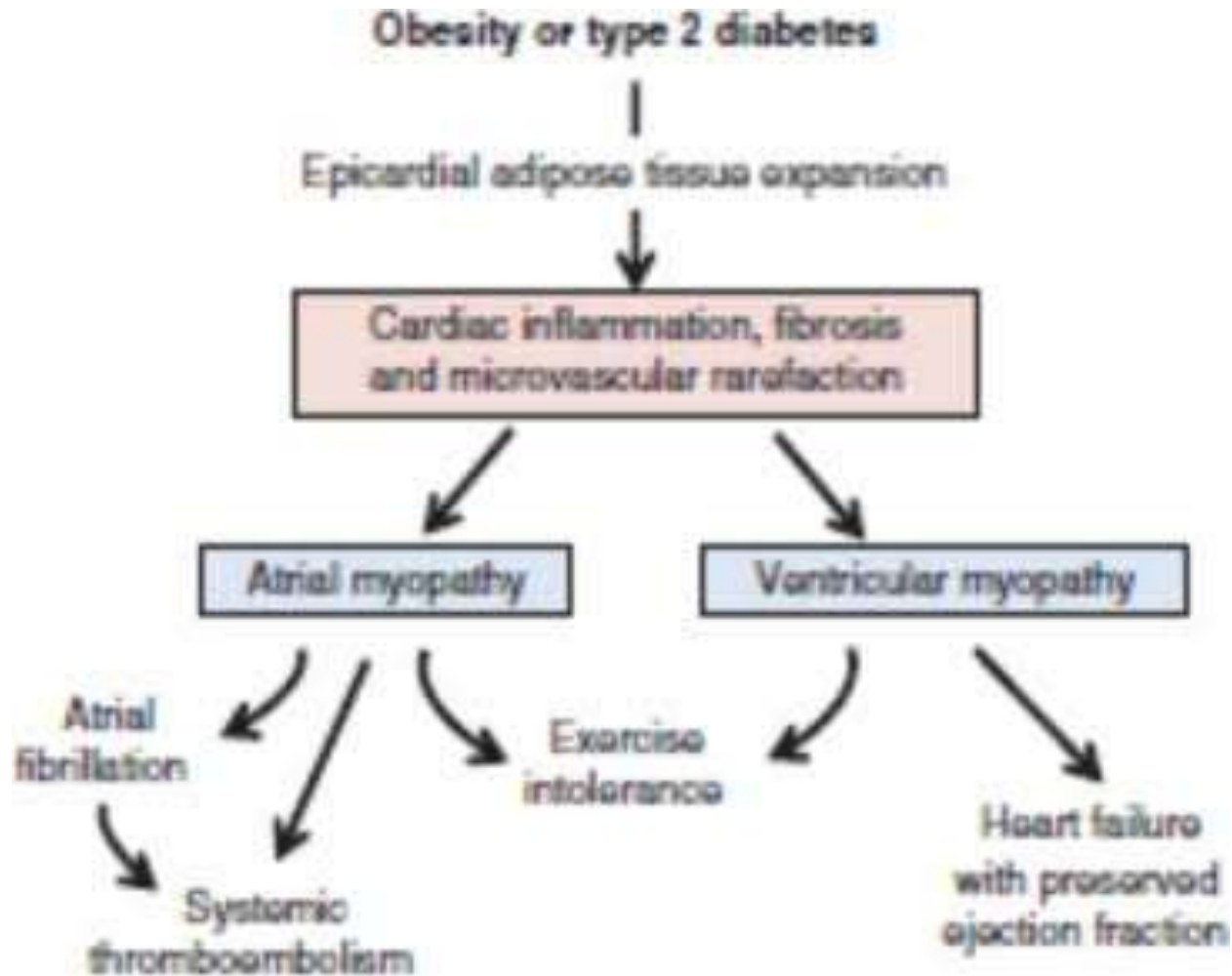
# Types of heart failure

- **Left-sided heart failure**-Fluid may back up in the lungs, causing shortness of breath.
- **Right-sided heart failure**-Fluid may back up into the abdomen, legs and feet, causing swelling.
- **Systolic heart failure** (also called heart failure with reduced ejection fraction)-The left ventricle can't contract vigorously, indicating a pumping problem.
- **Heart failure with preserved ejection fraction**-The left ventricle can't relax or fill fully, indicating a filling problem.

# Causes

- Coronary artery disease and heart attack
- High blood pressure.
- Damage to the heart muscle
- myocarditis -Inflammation of the heart muscle  
myocarditis
- congenital heart defect
- Arrhythmias
- Diabetes
- HIV
- thyroid disorder

# Pathophysiology



# Risk factors

- Alcohol
- Sleep apnea
- Smoking or using tobacco
- Obesity
- Viruses
- Congenital heart disease
- Diabetes

# Complications

- Kidney damage or failure
- Heart valve diseases.
- Liver damage

# Diagnosis

- **Blood test**
- **NT-pro B-type Natriuretic Peptide (BNP) blood test-** B-type natriuretic peptide (BNP) is a hormone produced by the heart. N-terminal (NT)-pro hormone BNP (NT-proBNP) is a non-active prohormone that is released from the same molecule that produces BNP. Both BNP and NT-proBNP are released in response to changes in pressure inside the heart. These changes can be related to heart failure and other cardiac problems.
- **Cardiac Catheterization-** Cardiac catheterization (also called cardiac cath or coronary angiogram) is an invasive imaging procedure to evaluate your heart function.
- **Chest X-ray**
- **Echocardiogram (echo)**
- **Magnetic resonance imaging (MRI)**



# Diagnosis

- **Electrocardiogram (EKG or ECG)**
- **Multigated Acquisition Scan (MUGA scan)**- A multigated acquisition (MUGA) scan is an imaging test. It measures a percentage called ejection fraction (EF).
- **Stress test**- An exercise stress test helps determine how heart responds during times when it's working its hardest. It typically involves walking on a treadmill or pedaling on a stationary bike while hooked up to an EKG to monitor your heart's activity.

# Prevention

- Controlling certain conditions, such as high blood pressure and diabetes
- Staying physically active
- Eating healthy foods
- Maintaining a healthy weight
- Reducing and managing stress

# Stage A

- **Stage A**
- Stage A is considered pre-heart failure. It means the high risk of developing heart failure because there will be a family history of heart failure or have one or more of these medical conditions:
  - Hypertension.
  - Diabetes.
  - Coronary artery disease.
  - Metabolic syndrome.
  - History of alcohol abuse.
  - History of rheumatic fever.
  - Family history of cardiomyopathy.
  - History of taking drugs that can damage the heart muscle, such as some cancer drugs.

# Treatment

## **Stage A treatment**

The usual treatment plan for people with Stage A heart failure includes:

- Regular exercise, being active, walking every day.
- Stopping the use of tobacco products.
- Treatment for high blood pressure (medication, low-sodium diet, active lifestyle).
- Treatment for high cholesterol.
- Not drinking alcohol or using recreational drugs.
- Angiotensin-converting enzyme inhibitor (ACE-I) or an angiotensin II receptor blocker (ARB) if the patient have coronary artery disease, diabetes, high blood pressure, or other vascular or cardiac conditions.
- Beta-blocker for high blood pressure.

# Stage B

- Stage B is considered pre-heart failure. Most people with Stage B heart failure have an echocardiogram (echo) that shows an ejection fraction (EF) of 40% or less.

# Stage B

## **Stage B treatment**

The usual treatment plan for people with Stage B heart failure includes:

- Treatments listed in Stage A.
- Angiotensin-converting enzyme inhibitor (ACE-I) or angiotensin II receptor blocker (ARB) (if you aren't already taking one).
- Beta-blocker if the patient had a heart attack and the EF is 40% or lower
- Aldosterone antagonist if the patient had a heart attack or diabetes and an EF of 35% or less.
- Possible surgery or intervention as a treatment for coronary artery blockage, heart attack, valve disease (valve repair or replacement) or congenital heart disease.

# Stage C

## Stage C

People with Stage C heart failure have a heart failure

**There are many possible symptoms of heart failure. The most common are:**

- Shortness of breath.
- Feeling tired (fatigue).
- Less able to exercise.
- Weak legs.
- Waking up to urinate.
- Swollen feet, ankles, lower legs and abdomen (edema).

# Stage C

## Stage C treatment

The usual treatment plan for people with Stage C HF-rEF includes:

- Treatments listed in Stages A and B.
- Beta-blocker.
- Aldosterone antagonist if a vasodilator medicine (ACE-I, ARB or angiotensin receptor/neprilysin inhibitor combination) and beta-blocker
- Hydralazine/nitrate
- A diuretic ("water pill") may need if symptoms continue.
- Restriction of sodium (salt) in diet.
- fluid restriction.
- cardiac resynchronization therapy (biventricular pacemaker).
- implantable cardiac defibrillator (ICD) therapy.



# Stage D

- People who have Stage D HF-rEF have advanced symptoms and this is the final stage of heart failure.

- **Stage D treatment**
- The usual treatment plan for people who have Stage D heart failure includes treatments listed in Stages A, B and C. In addition, it includes evaluation for more advanced treatment options, including:
  - Heart transplant.
  - Ventricular assist devices.
  - Heart surgery.
  - Continuous infusion of intravenous inotropic drugs.
  - Palliative or hospice care.
  - Research therapies.

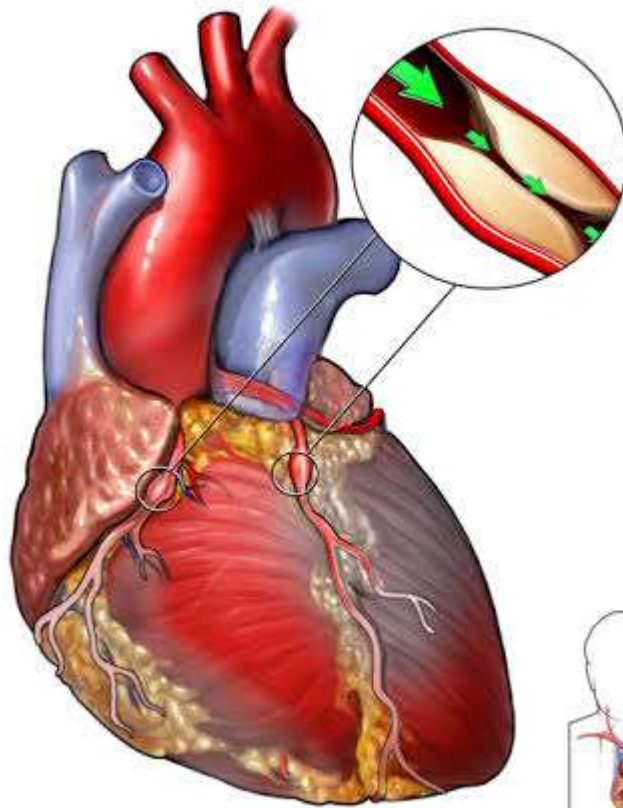
- **Stages C and D with preserved EF**
- Treatment for people with Stage C and Stage D heart failure and preserved EF (HF-pEF) includes:
- Treatments listed in Stages A and B, although some may not be appropriate.
- Medications for the treatment of medical conditions that can cause heart failure or make the condition worse, such as atrial fibrillation, high blood pressure, diabetes, obesity, coronary artery disease, chronic lung disease, high cholesterol and kidney disease.
- Diuretic ("water pill") to reduce or relieve symptoms.

# Surgical procedure

- **Coronary bypass surgery**-Coronary artery bypass surgery, also known as coronary artery bypass graft surgery, and colloquially heart bypass or bypass surgery, is a surgical procedure to restore normal blood flow to an obstructed coronary artery.
- **Implantable cardioverter-defibrillators (ICDs)**-An implantable cardioverter-defibrillator or automated implantable cardioverter defibrillator is a device implantable inside the body, able to perform defibrillation, and depending on the type, cardioversion and pacing of the heart.
- **Cardiac resynchronization therapy (CRT)**-Cardiac resynchronisation therapy is the insertion of electrodes in the left and right ventricles of the heart, as well as on occasion the right atrium, to treat heart failure by coordinating the function of the left and right ventricles via a pacemaker, a small device inserted into the interior chest wall.

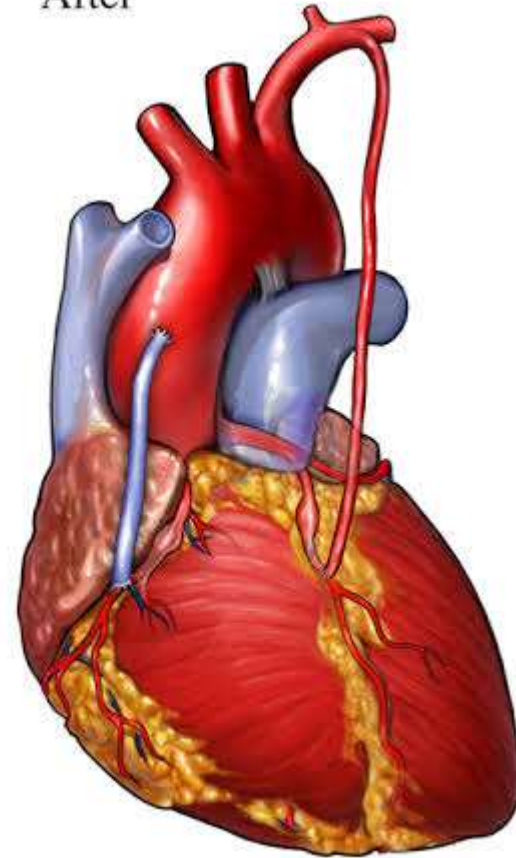
# Coronary bypass surgery

Before



Decreased blood flow

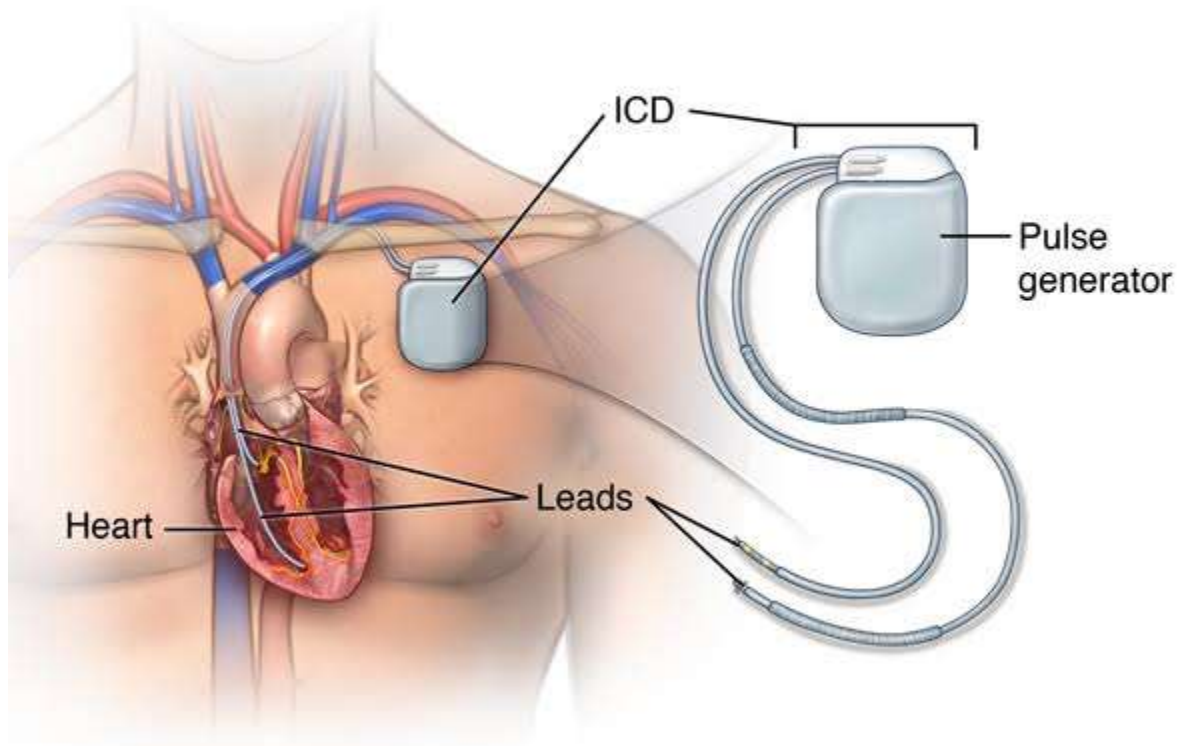
After



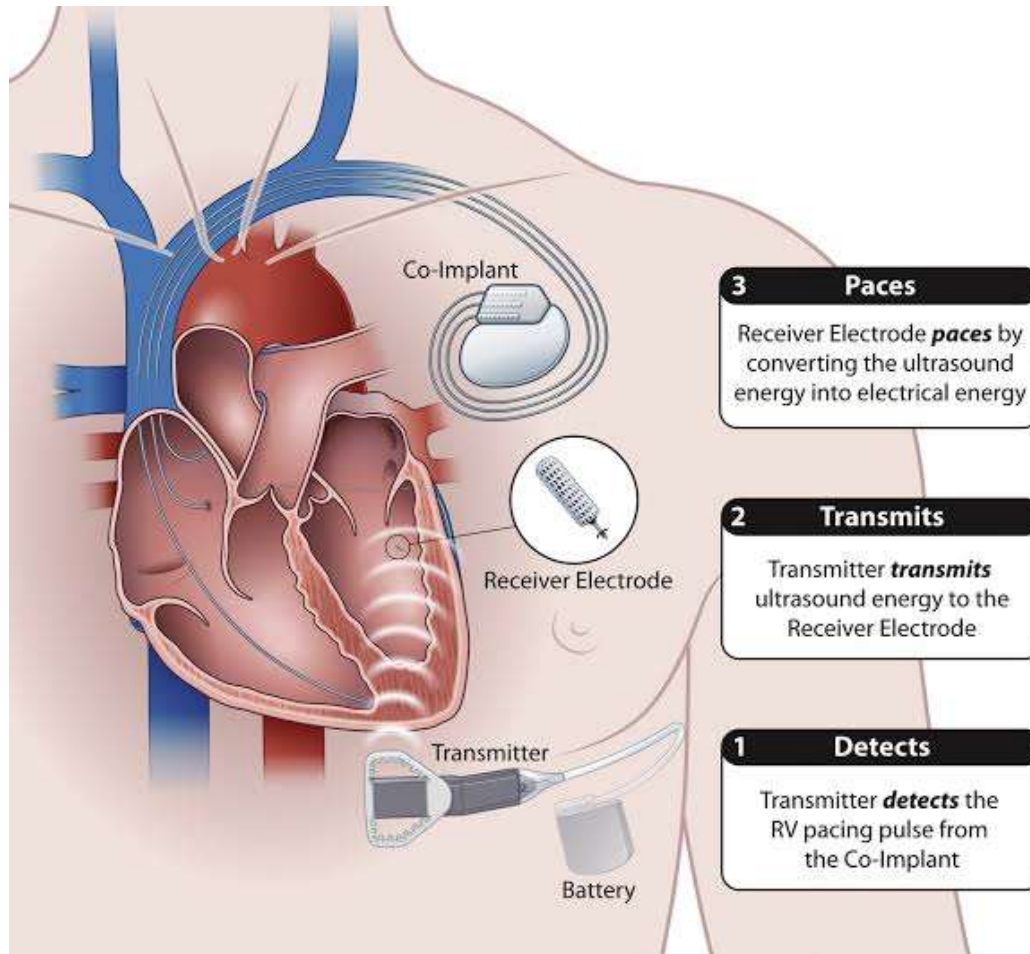
Normalized blood flow

# Implantable cardioverter-defibrillators

Implantable cardioverter defibrillator (ICD)



# Cardiac resynchronization therapy (CRT)



# Surgical procedure

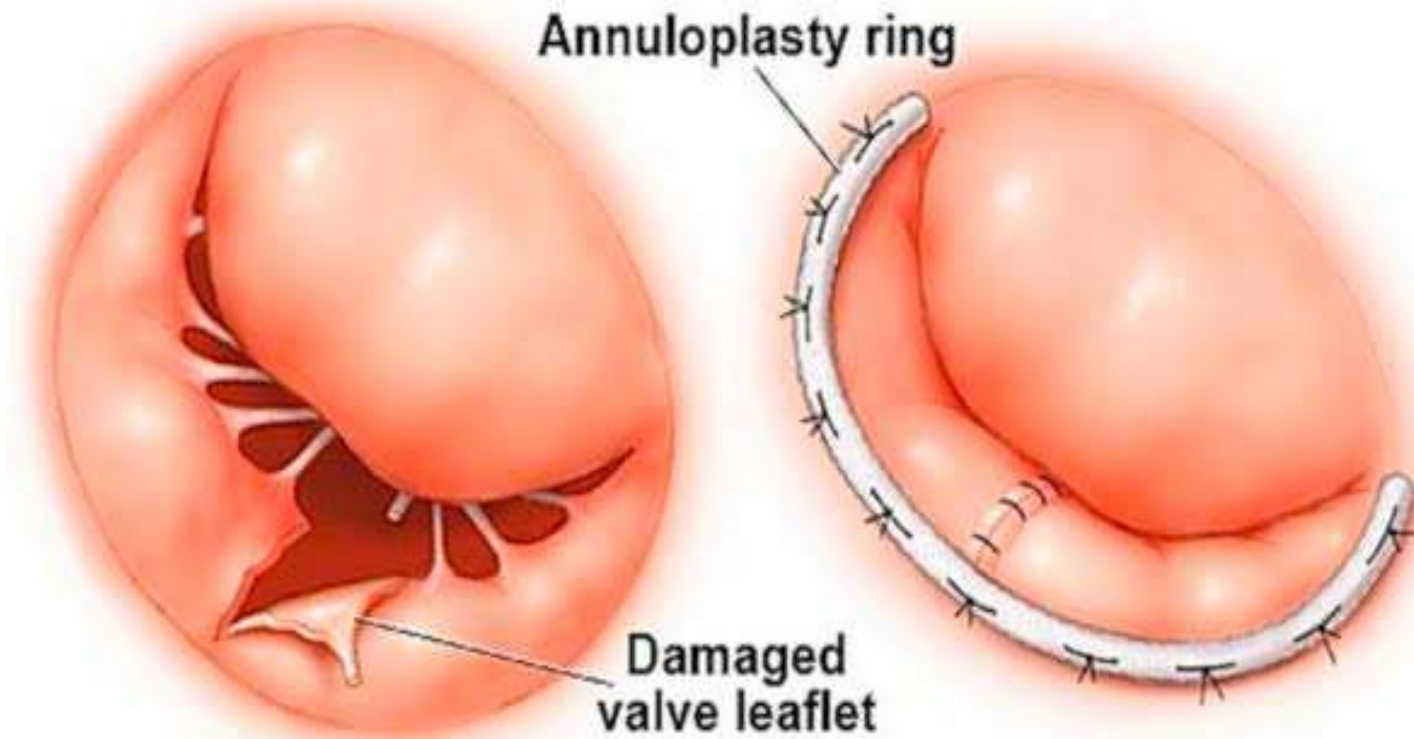
- **Heart valve repair or replacement-An annuloplasty** is a procedure to tighten, reshape or reinforce the ring (annulus) around a valve in the heart. It may be done during other procedures to repair a heart valve.
- **A valvuloplasty** is a procedure to repair a heart valve that has a narrowed opening.

Valvuloplasty may also be called:

- Balloon valvuloplasty
- Balloon valvotomy
- Percutaneous balloon valvuloplasty

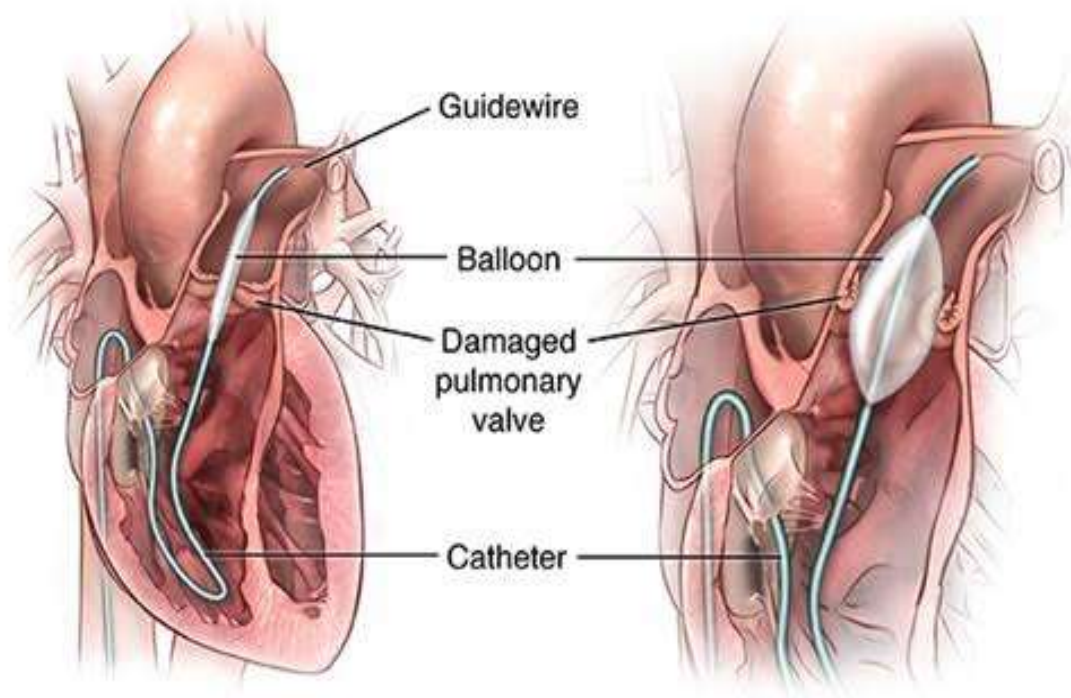


# Annuloplasty



# valvuloplasty

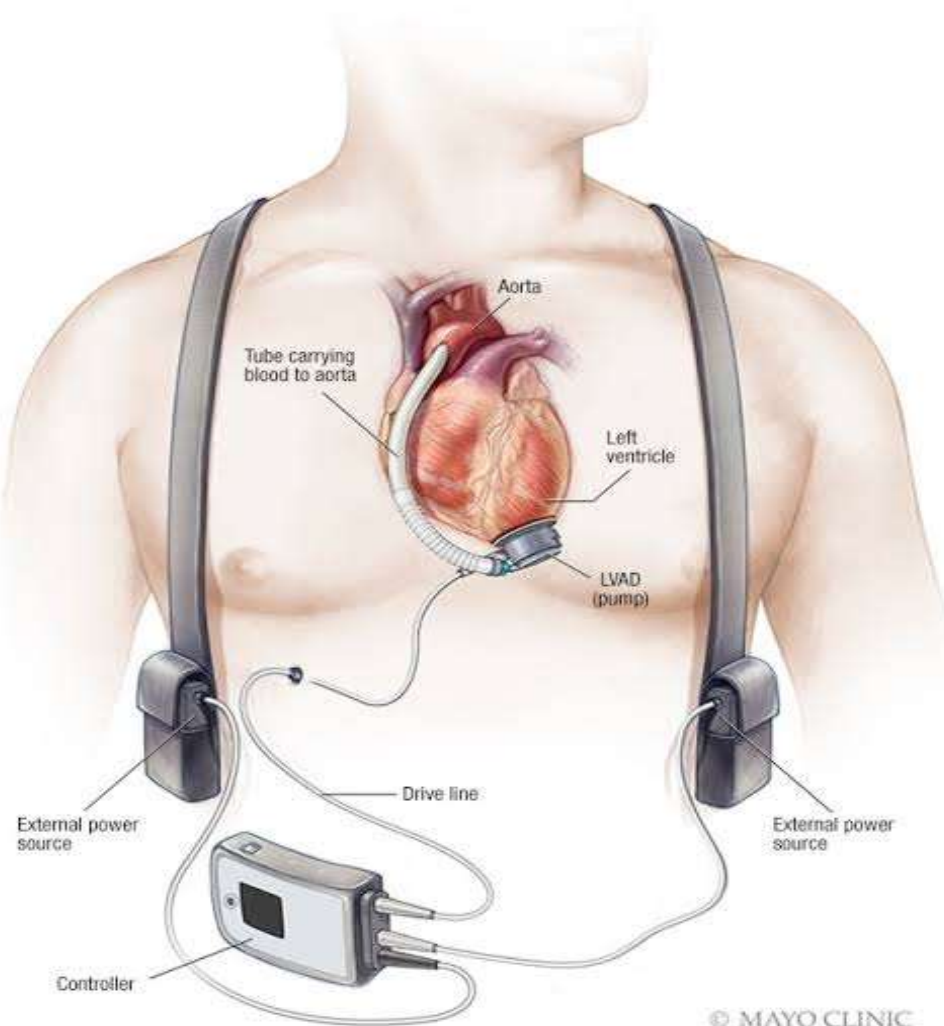
## Pulmonary valvuloplasty



# Surgical procedure

- **Ventricular assist devices (VADs)**-A ventricular assist device (VAD) — also known as a mechanical circulatory support device — is **a device that helps pump blood from the lower chambers of your heart (ventricles) to the rest of your body.**
- **Heart transplant**- A heart transplant, or a cardiac transplant, is a surgical transplant procedure performed on patients with end-stage heart failure or severe coronary artery disease when other medical or surgical treatments have failed.

# Ventricular assist devices (VADs)



# Heart transplant

