



WELCOME

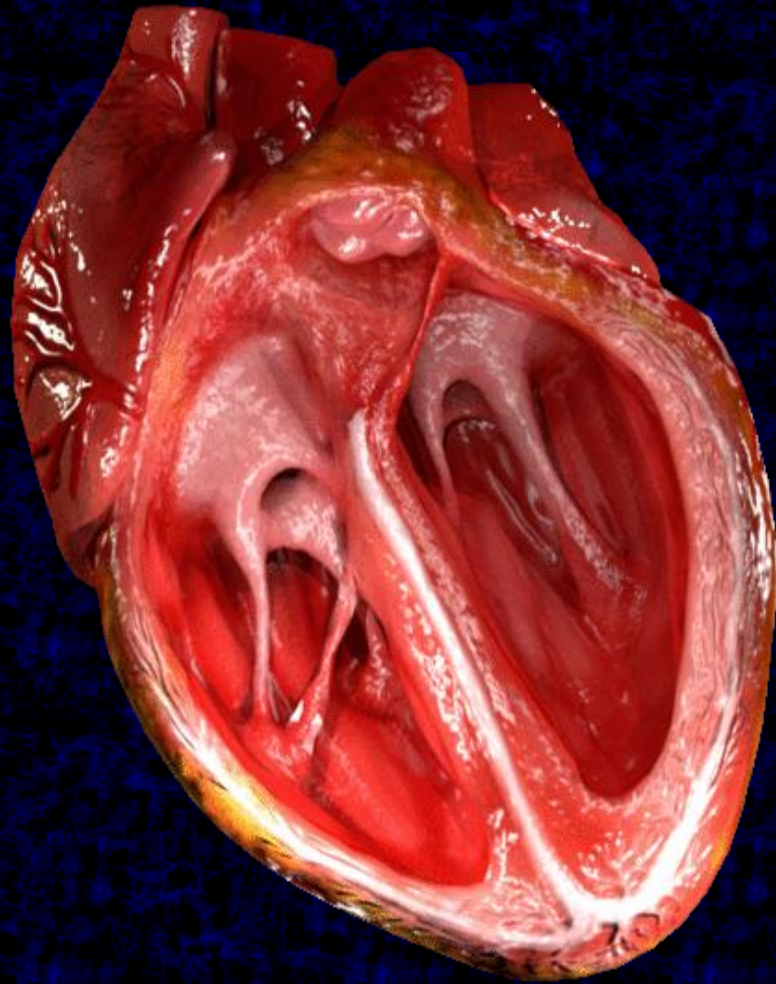
Heart failure

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Professor of Medicine

Anwer Khan Modern Medical College & Hospital

Senior Vice President, BSM

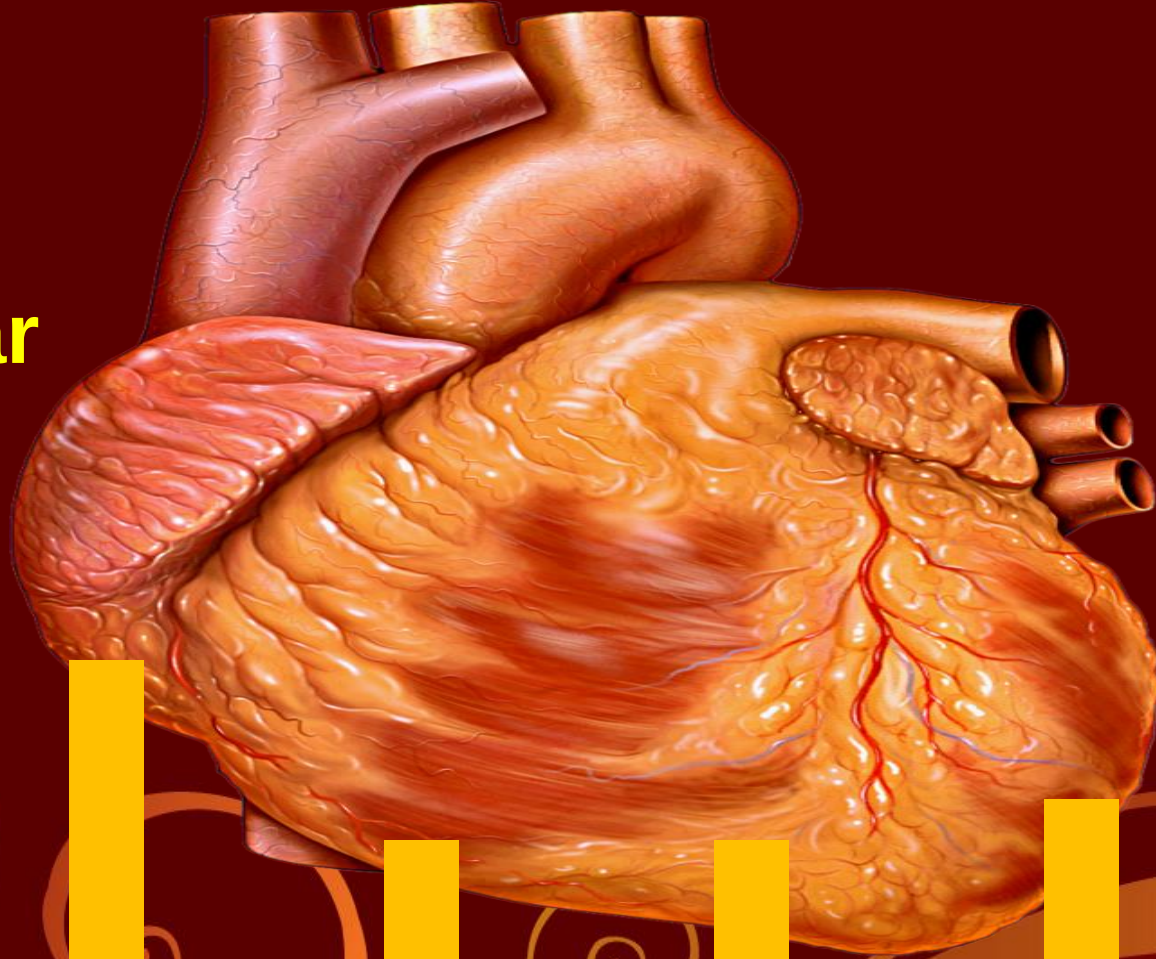


Egyptian, Greek, Indian, and Chinese

Ibn al-Nafis - Arab physician 13th century-
pulmonary circulation

William Harvey - English physician— systemic
circulation

Four pillar



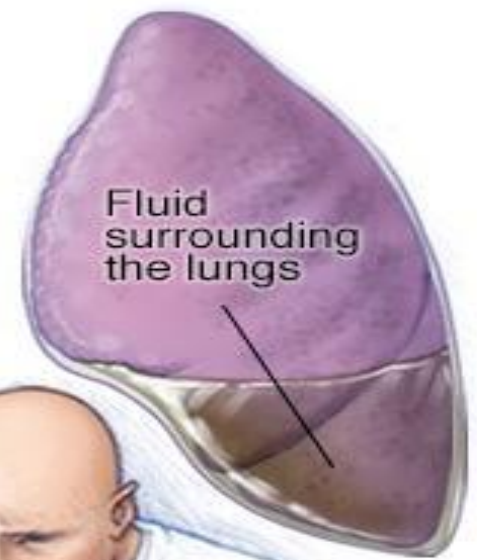
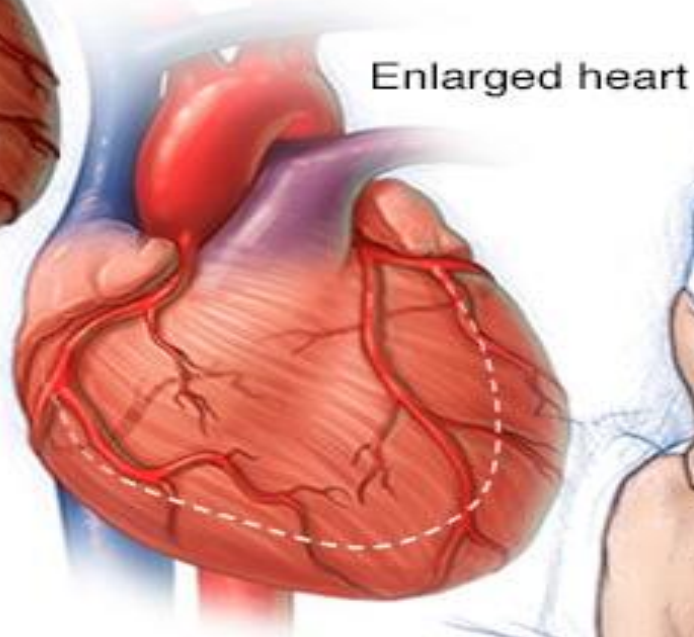
Myocyte

Preload

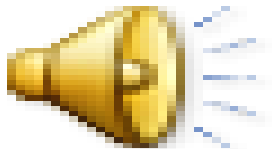
After load

Rhythm

Heart Failure



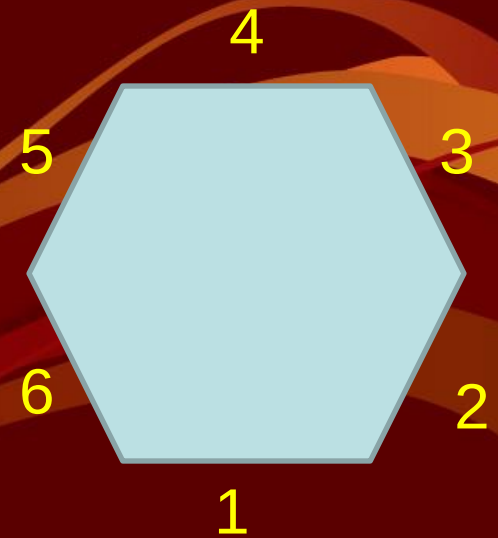
Swollen feet



Hidden in my heart
I didn't see
looking outward
how could see!

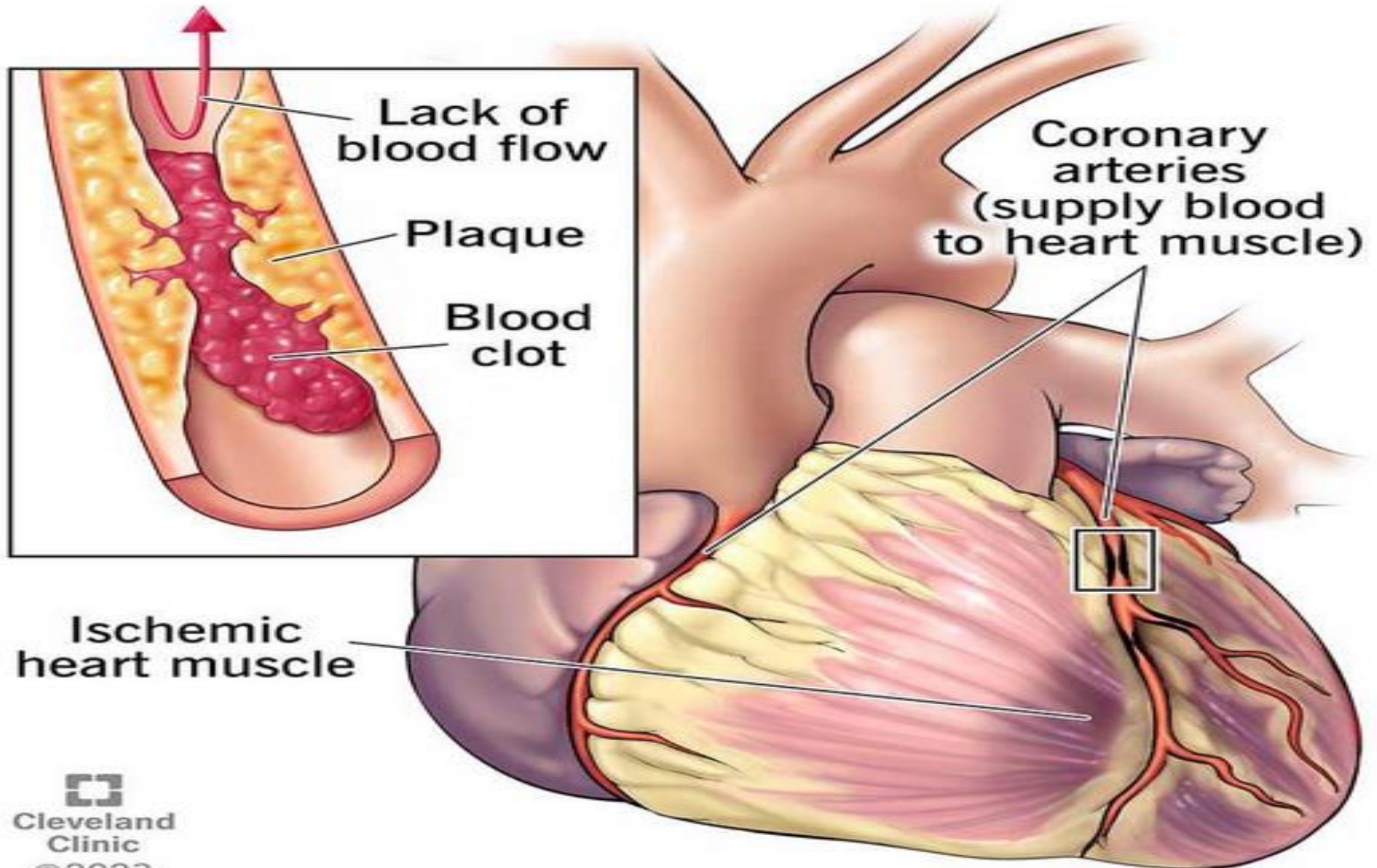
Evaluation

1. Cause?
2. PPT factor
3. Stages of HF
4. Classification (Echo based)
5. Clinical pattern
6. Complications

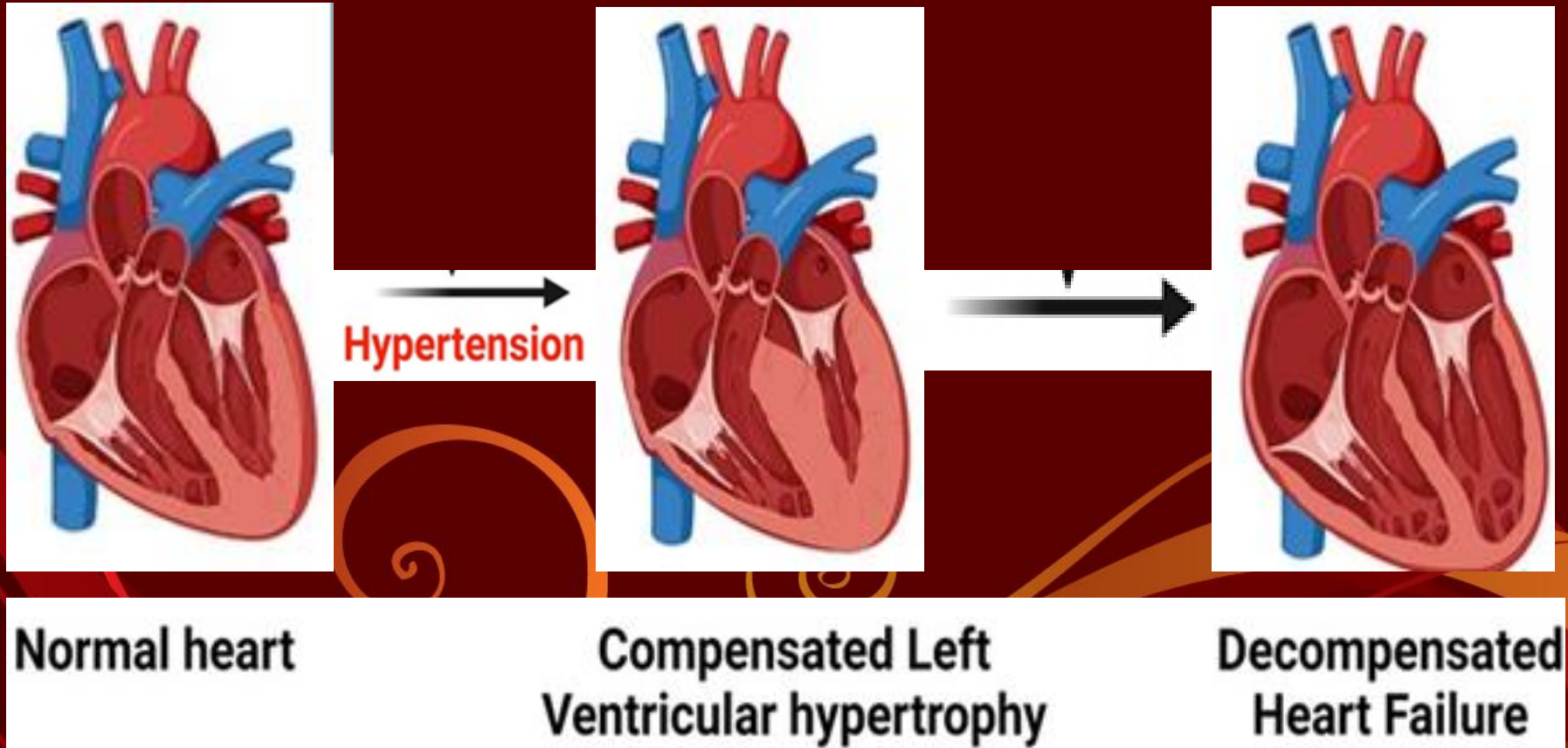


1. Cause

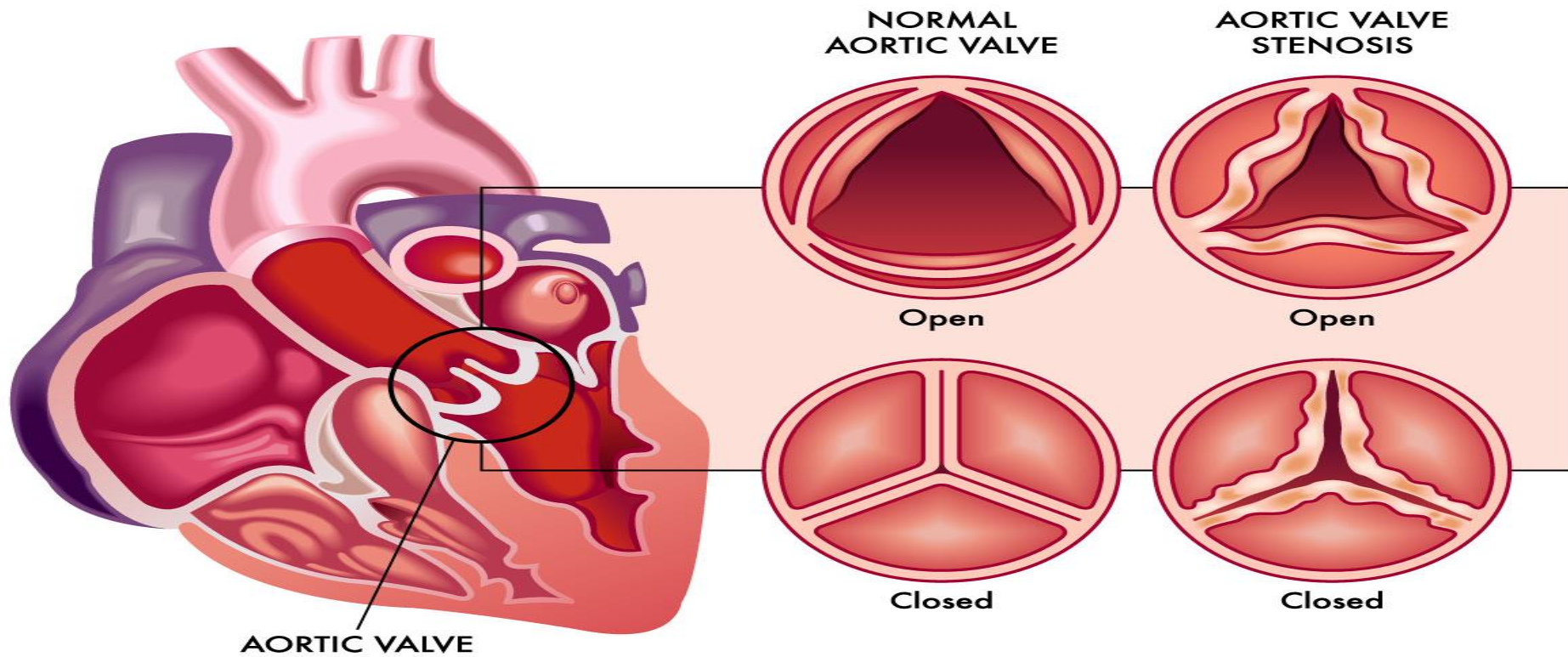
Ischemic Cardiomyopathy



Hypertensive heart failure



Aortic valvular disease



Mitral stenosis

Typical heart

Mitral valve stenosis

Left atrium

Mitral valve

Left
ventricle

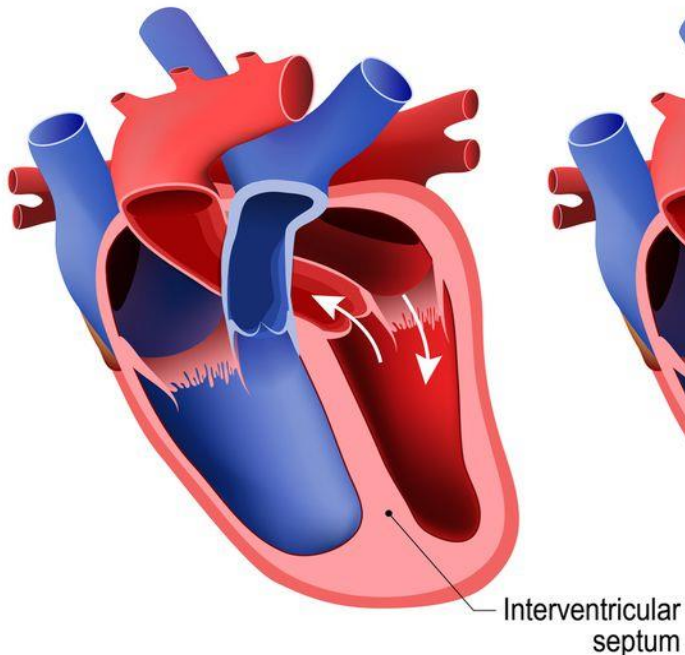
Typical
mitral valve

Narrowed
mitral valve

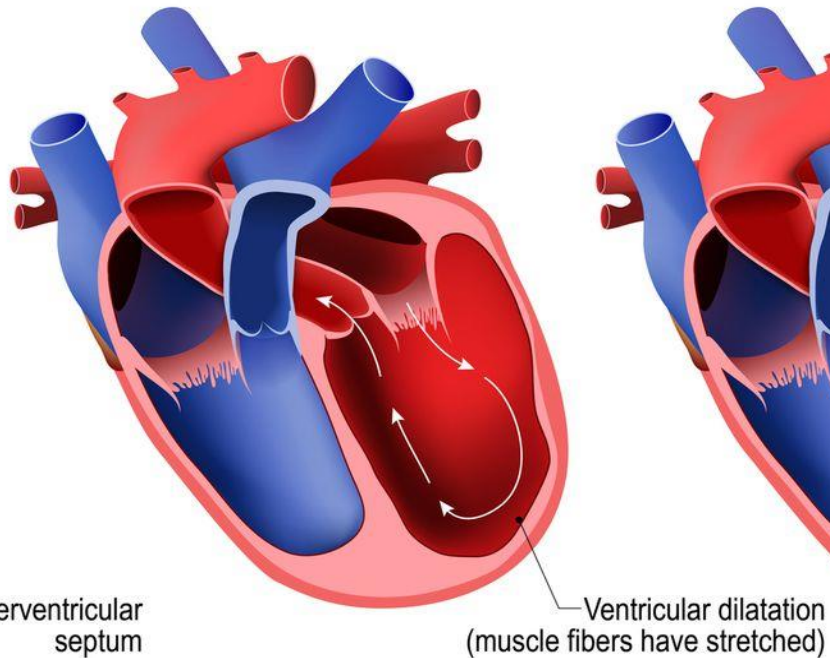
Cardiomyopathy

CARDIOMYOPATHY

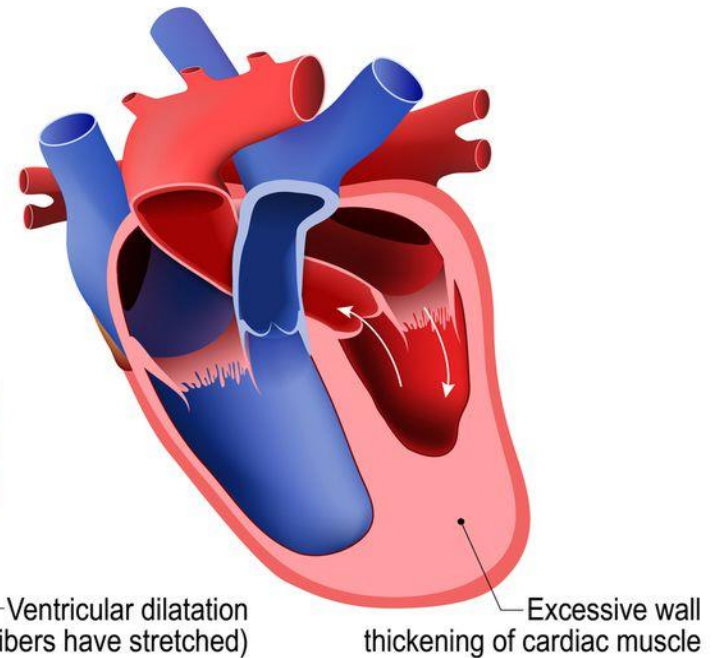
Normal heart



Dilated cardiomyopathy



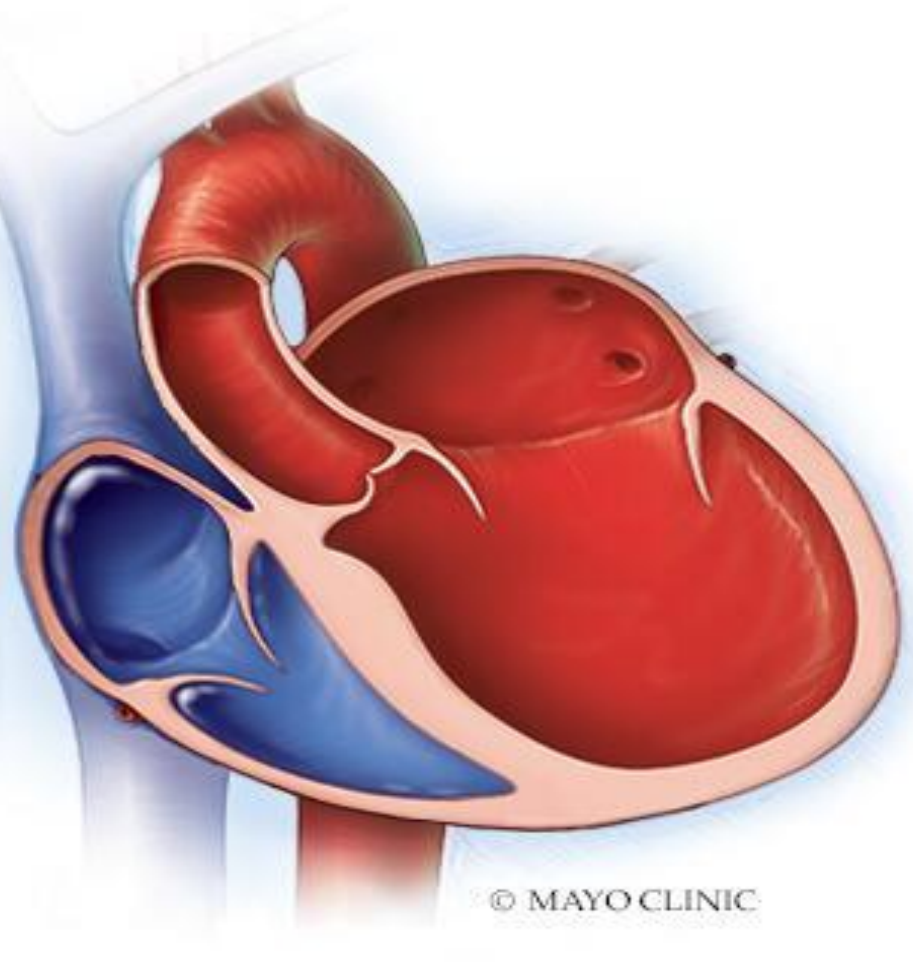
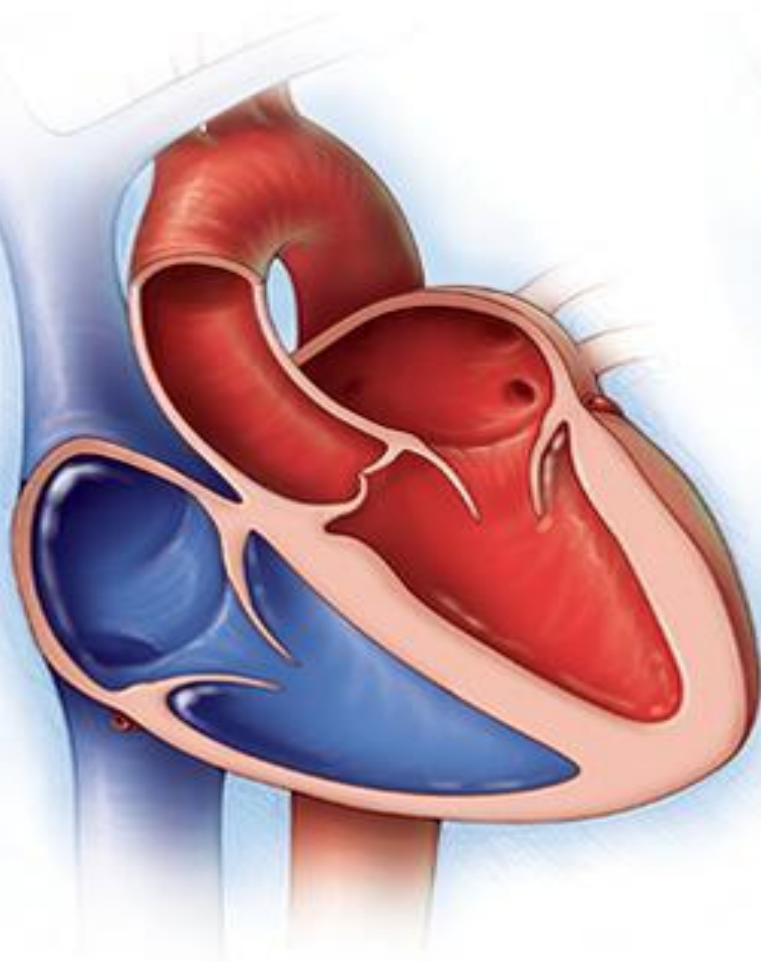
Hypertrophic cardiomyopathy



Dilated Cardiomyopathy

Typical heart

Dilated cardiomyopathy



© MAYO CLINIC

beriberi

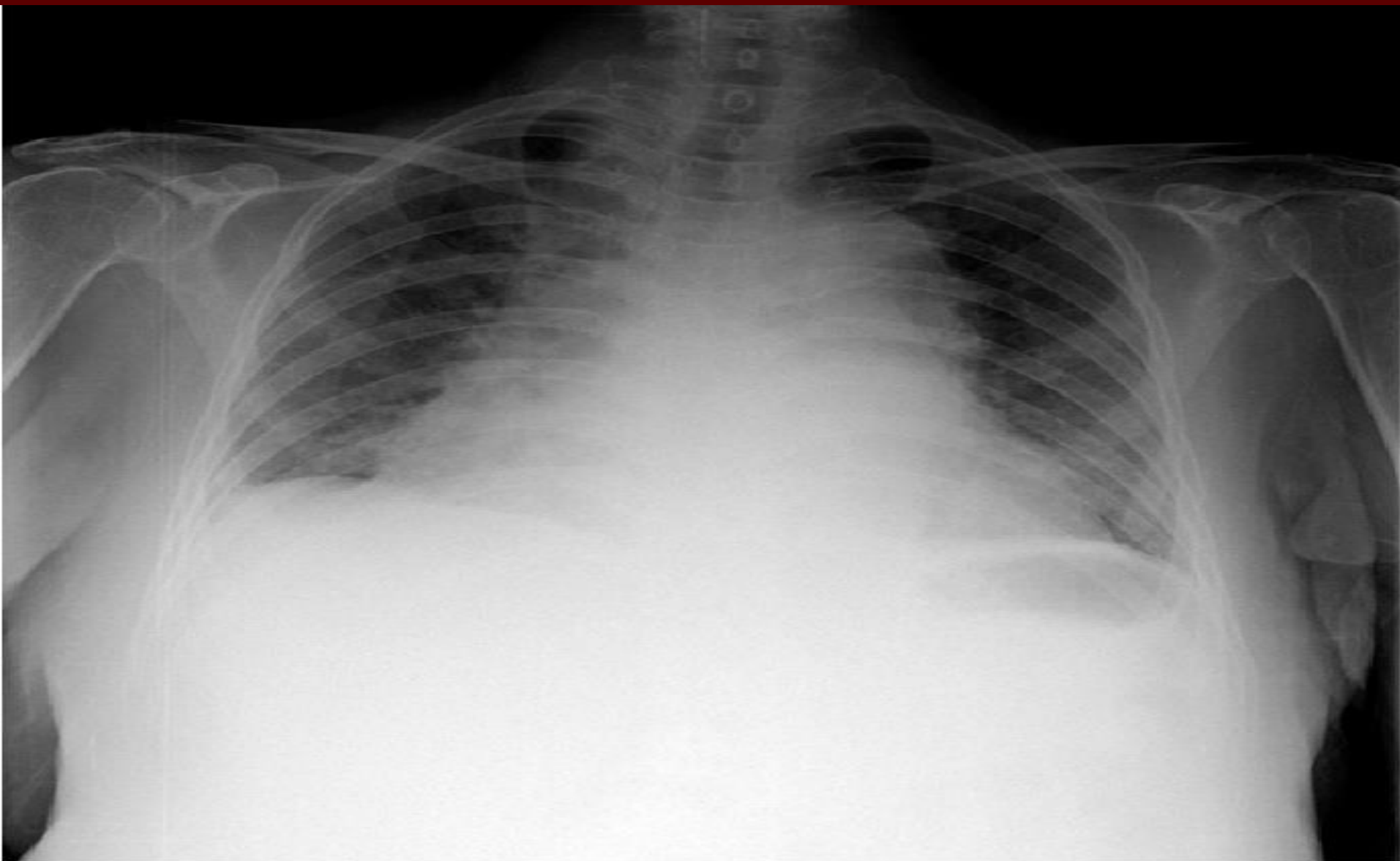


Fig. 2. Chest radiography showing cardiomegaly with mild pulmonary

Sleep apnea

Oh my
beloved wife !
how you endure
Snoring night !!

কহিব তারে আমার প্রিয়ারে
নাক ডাকা রাত সহিবে কেমনে 



Sleep apnea

*Day time down
& pressure up*

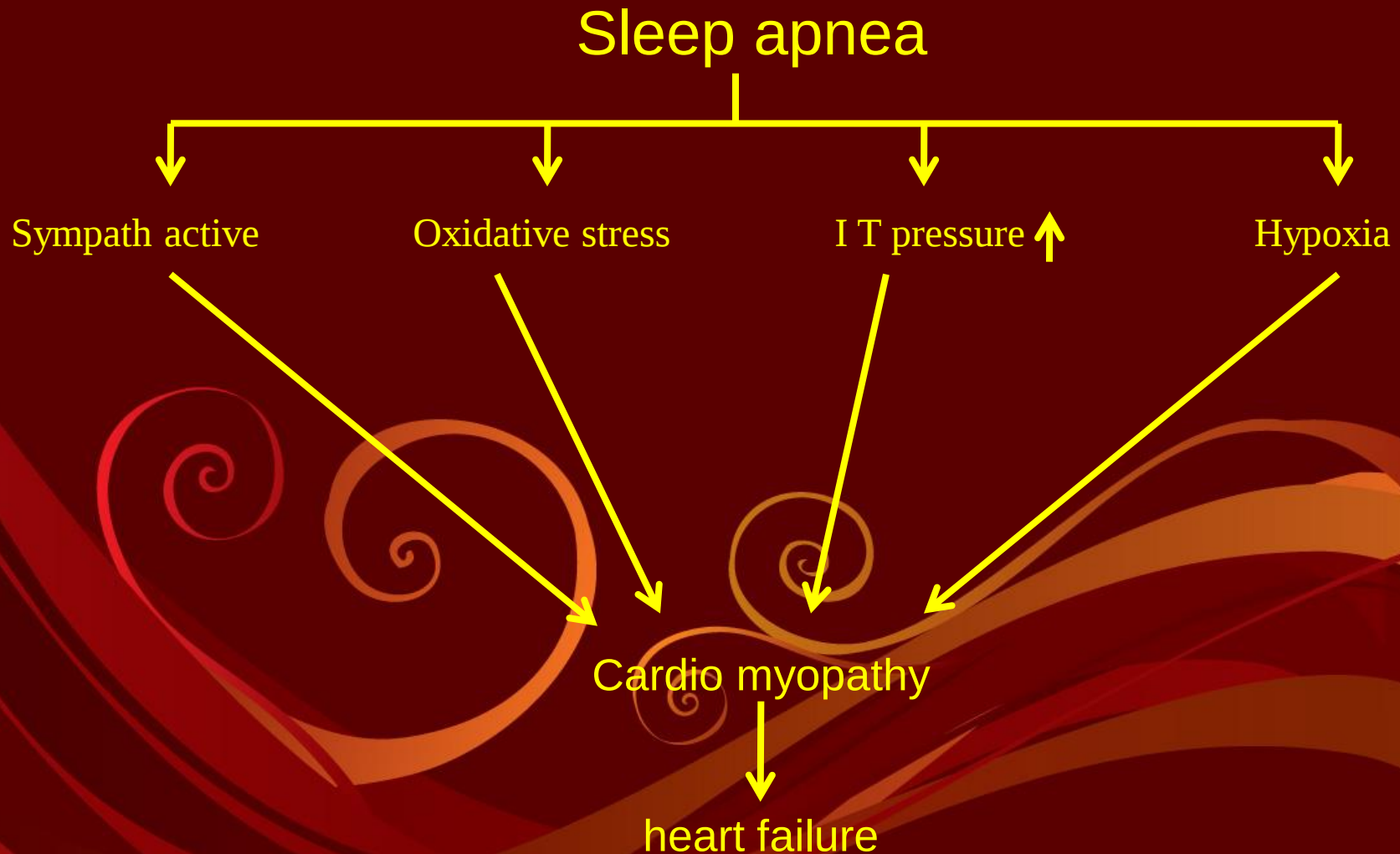
Sound is more
where sound sleep less
Days are fatigue
Don't feel fresh

Sleep apnea

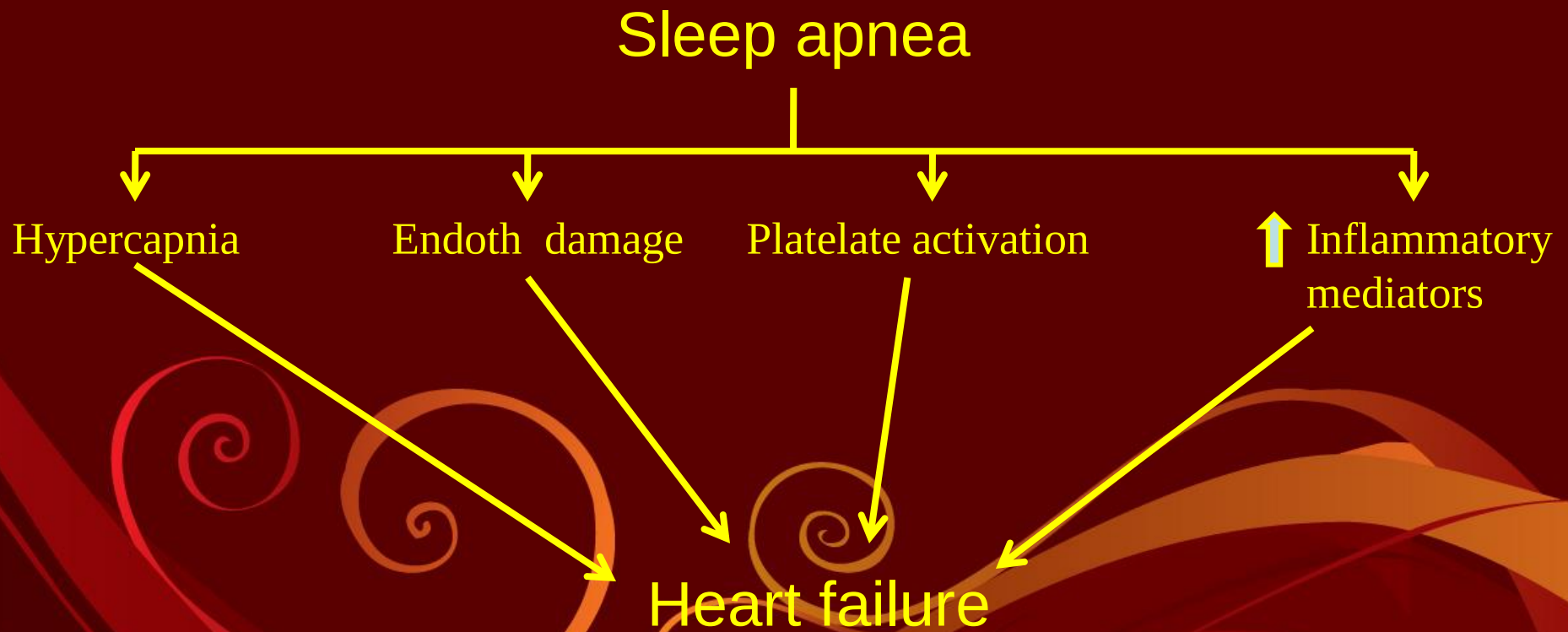
Day time down
where pressure up
In the long run
Heart can't pump

----- OSAS

Sleep apnea & heart failure



Sleep apnea & heart failure



Obesity



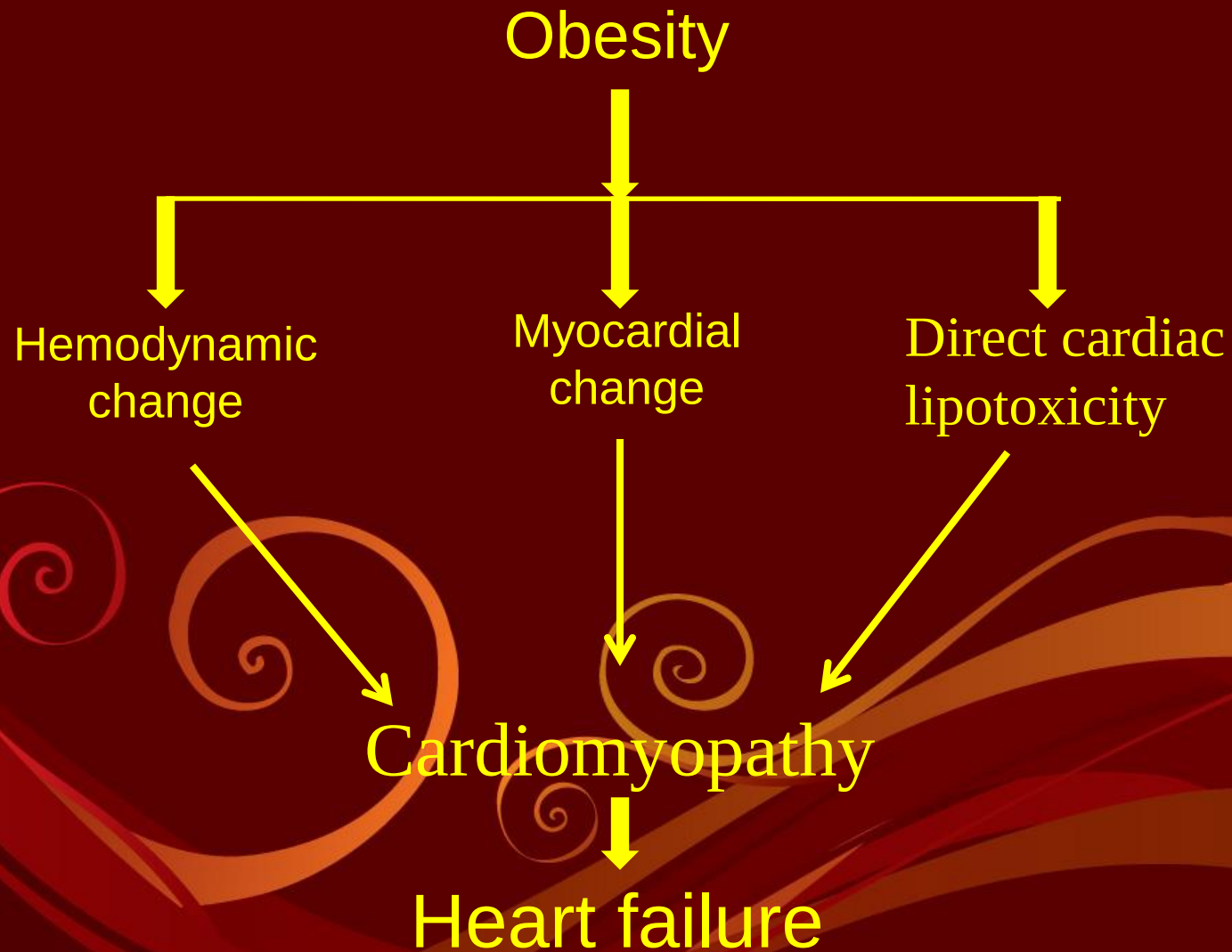
Obesity and Heart failure

Obesity-related factors

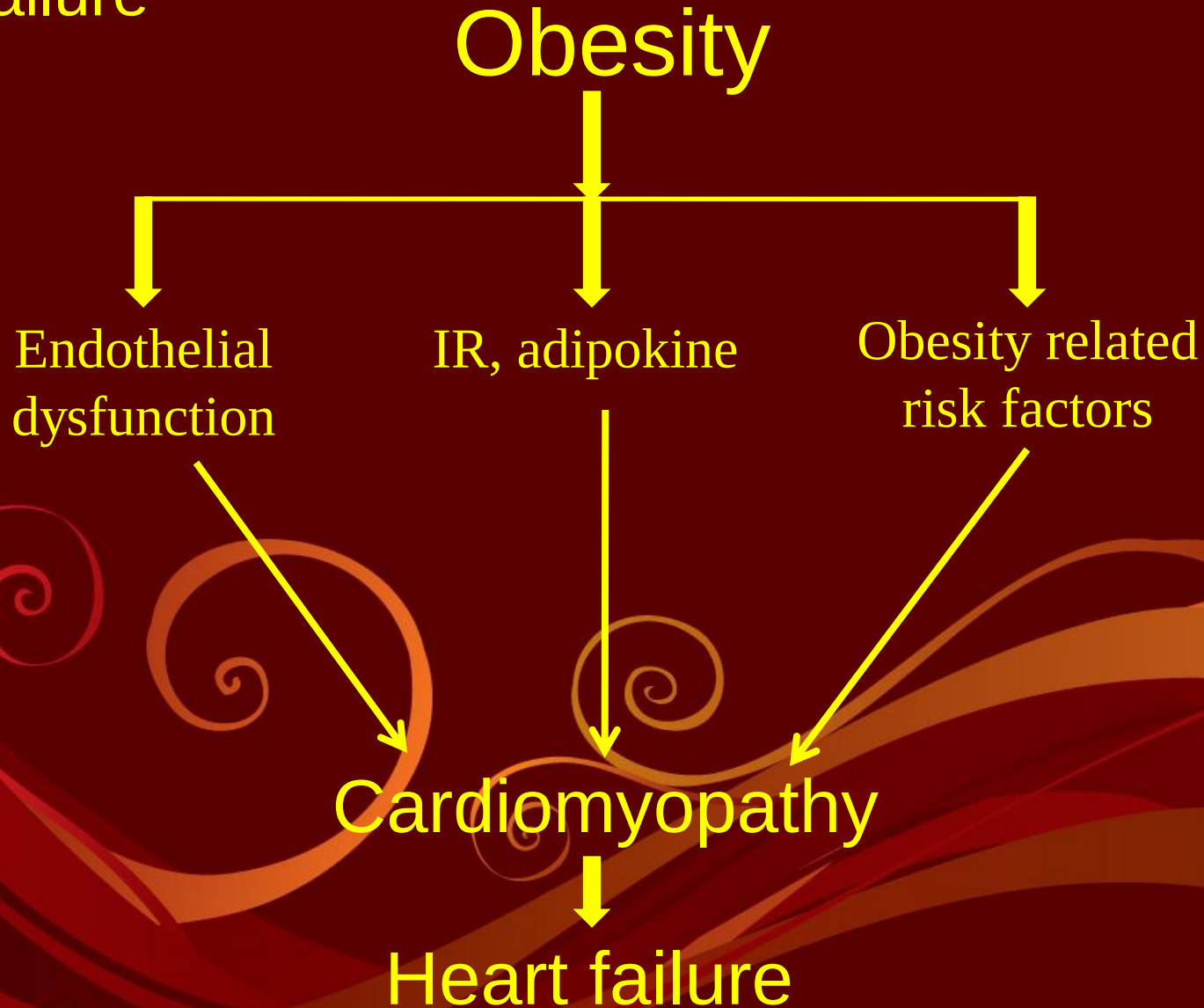
11% in men and

14% in women.

Obesity & Heart failure



Obesity & Heart failure



1. Etiology

Group A : Cardiac

Ischemic heart disease

Hypertensive heart disease

Valbular heart disease

Cardiomyopathy

Shunt anomaly

Myocarditis

Constrictive Pericarditis

Arrhythmia

Group B : Hyperdynamic circulation

Anemia

Beriberi

Thyrotoxicosis

Pregnancy

Group C : Miscellaneous

Obesity

Sleep apnea syndrome

2. PPT factor

A = Arrhythmia

E = Exercise, Embolism (pulmonary embolism)

I = Ischemia or infraction (MI)

Intercurrent illness,

Inappropriate reduction of therapy

O = Overload of I/V fluid

U = Unidentified factor

D = Drug

M = Metabolic demand increased

Anaemia, Beriberi, Thyrotoxicosis, Pregnancy



The last straw that break the camels back



**It was the straw
that broke
the camel's back.**

**But his back is healed,
and he's ready
for another load!**

3. Stages of HF (Pathophysiological basis)

Stage A



At risk
(no cardiac insult, only
predis factor)

Stage B



Beginning
(cardiac insult but no
symptom)

Stage C



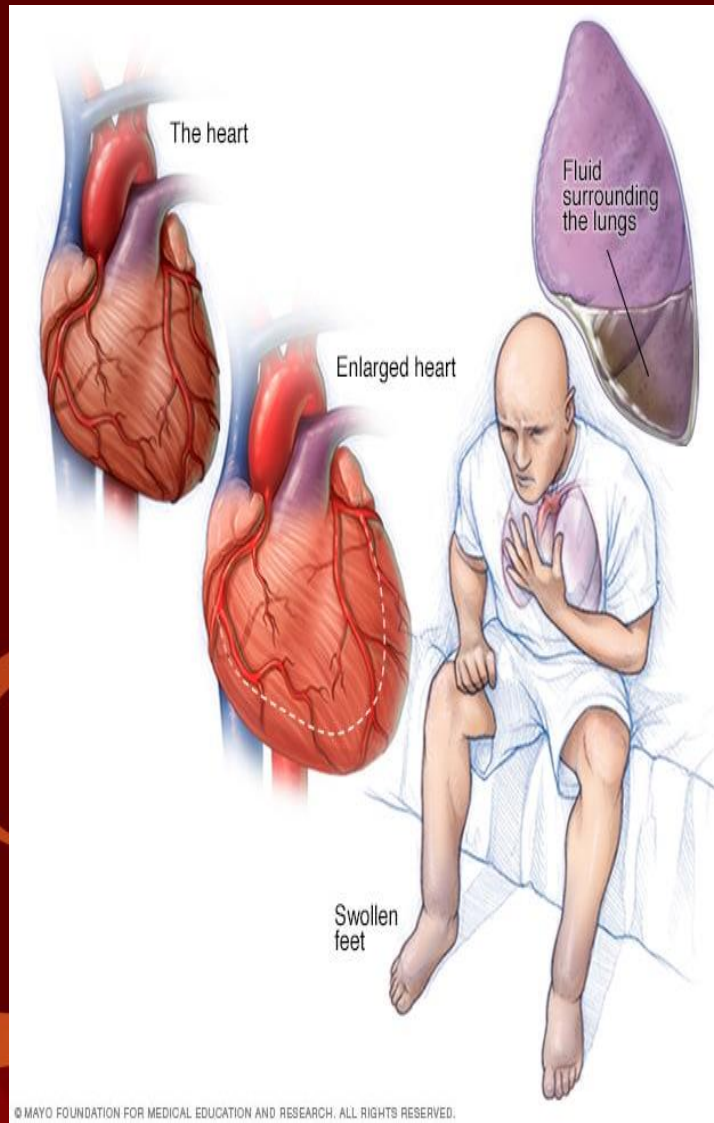
Compensated HF

Clinical



Decompensated HF

Stage D



Deteriorating / Refractory HF

Save me!
Save me!!

Compensated
CHF

Decompensated
CHF

I can't
I can't

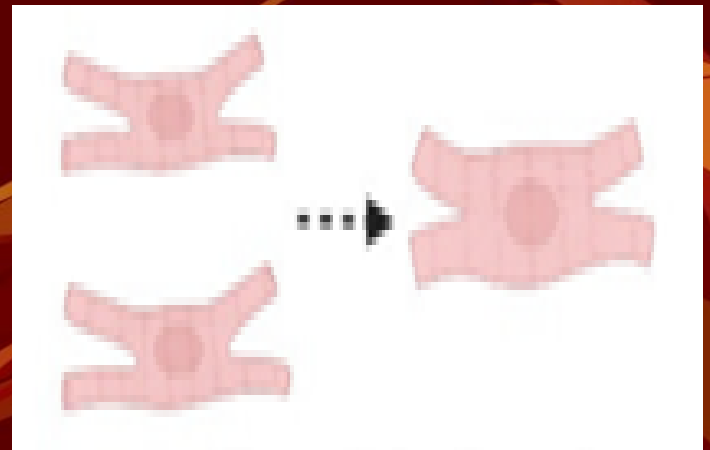
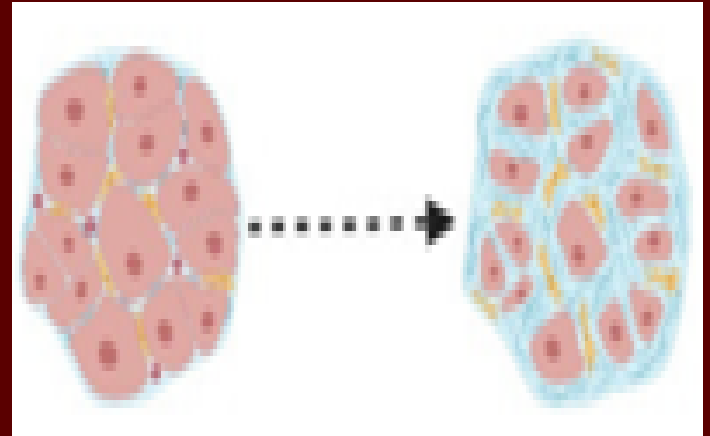
Compensated HF

I will be saved-----

by myself

by humeral system

by Neural system



Rebellion song of heart

I am harder

I am stiff

Remodeled myself

To be more fit

All the neuron all the hormone

Come forward

I will be fighting

its my word

Decom HF

Threnody of failing heart

I am sinking

I am drowning

water water that's I see

What I do what could be

Body fluidy, breath heavy
Tense belly, legs bloaty
Neck vein high up, liver tender
Life is infirm, hopeless rendered

Neck vain engor

Liver tender

Depen edema

Anasarca

Ascites

Pulm edema

4. Classification – Echo based (EF & HF)

Ejection fraction (EF)

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

EJECTION FRACTION CLASSIFICATIONS

EF	TERMINOLOGY	HEART FUNCTION
55 - 70%	Normal	Normal
$\geq 50\%$	HFpEF	Diastolic dysfunction
41 - 49%	HFmrEF	Likely mixed systolic and diastolic dysfunction
$\leq 40\%$	HFrEF	Systolic dysfunction
$\leq 40\%$ at baseline, then $\geq 10\%$ increase and 2nd EF $> 40\%$	HFimpEF	EF improved with treatment

HFpEF = preserved ejection fraction

HFmrEF = moderately reduced ejection fraction

HFrfEF = Reduced ejection fraction

HFimpEF = improved ejection fraction

HFpEF & Cause

- Obesity
- Hypertension (high blood pressure)
- Diabetes mellitus
- Coronary artery disease
- Atrial fibrillation
- Chronic kidney disease
- Chronic obstructive pulmonary disease (COPD)
- Obstructive sleep apnea
- Anemia

What are the 4 grades of diastolic dysfunction?

Diastolic function grades:

Grade 0:- Left ventricular (LV) diastolic function ranges from normal

Grade I: - Delayed relaxation

Grade II: - Pseudonormal

Normal doppler E:A = Normal

Tissue doppler = Delayed relaxation

Grade III: - restrictive filling

Grade IV: - irreversibly restrictive

Changing of structure



stiff the heart



Inadequate filling



CO↓ but EF preserved



symptoms of low cardiac output

HFrEF

Definition : LVEF <35%

Etiologies :

Ischemic Cardiomyopathy

Nonischemic Cardiomyopathy

Familial

Metabolic

Toxic

Tachycardiac

Inflammatory

Infiltrative

peripartum

Rherumatologic

HFmrEF

Mixed systolic and diastolic dysfunction

HFimpEF or HFrecEF

Variable definition

LVEF > 35%

LVEF $\geq$ 40%

LVEF $\geq$ 45%

LVEF $\geq$ 50%

Predictive Factors

Young age

Nonischemic Cardiomyopathy

NYHA class I/II

Greater Initial EF

Atrial Function

ACEi / ARB Use

Beta Blocker Use

5. Clinical pattern

- a. Left heart failure
- b. Right heart failure
- c. Biventricular failure
- d. Congestive cardiac failure
- e. High output failure

6. Complications

Arrhythmia

Electrolyte imbalance

Thromboembolism

Impaired renal function

Impaired liver function

Sudden cardiac death

Investigation

1. CBC
2. Chest X-ray
3. ECG
4. Echo
5. ANP, BNP, CNP, N-T Pro BNP
6. Troponin-I
7. ETT
8. CT scan of heart
9. Heart MRI scan
10. Coronary angiogram
11. Myocardial biopsy

Natriuretic peptide

ANP, BNP, CNP, N-T Pro BNP

ANP- (Atrial natriuretic peptide)

Secreted from cardiac atrium (Right atrium)

BNP- (Brain natriuretic peptide)

Secreted by cardiac myocytes of ventricle

CNP- (C-type natriuretic peptide)
Secreted by endothelium

N-T Pro BNP-

N-Terminal
Prohormone
Brain natriuretic peptide

Natriuretic peptide

Cardiac

1. LVH
2. Right ventricular overload
3. Ischemia
4. Tachycardia

Pulmonary

1. Hypoxemia
2. Sepsis
3. COPD
4. Pneumonia

Others

1. Diabetes
2. Liver cirrhosis
3. Age more than 70
4. EGFR less than 60ml/min

Treatment

A- life style modification

B- treatment of cause

C- treatment of precipitating factor

D- treatment of heart failure itself

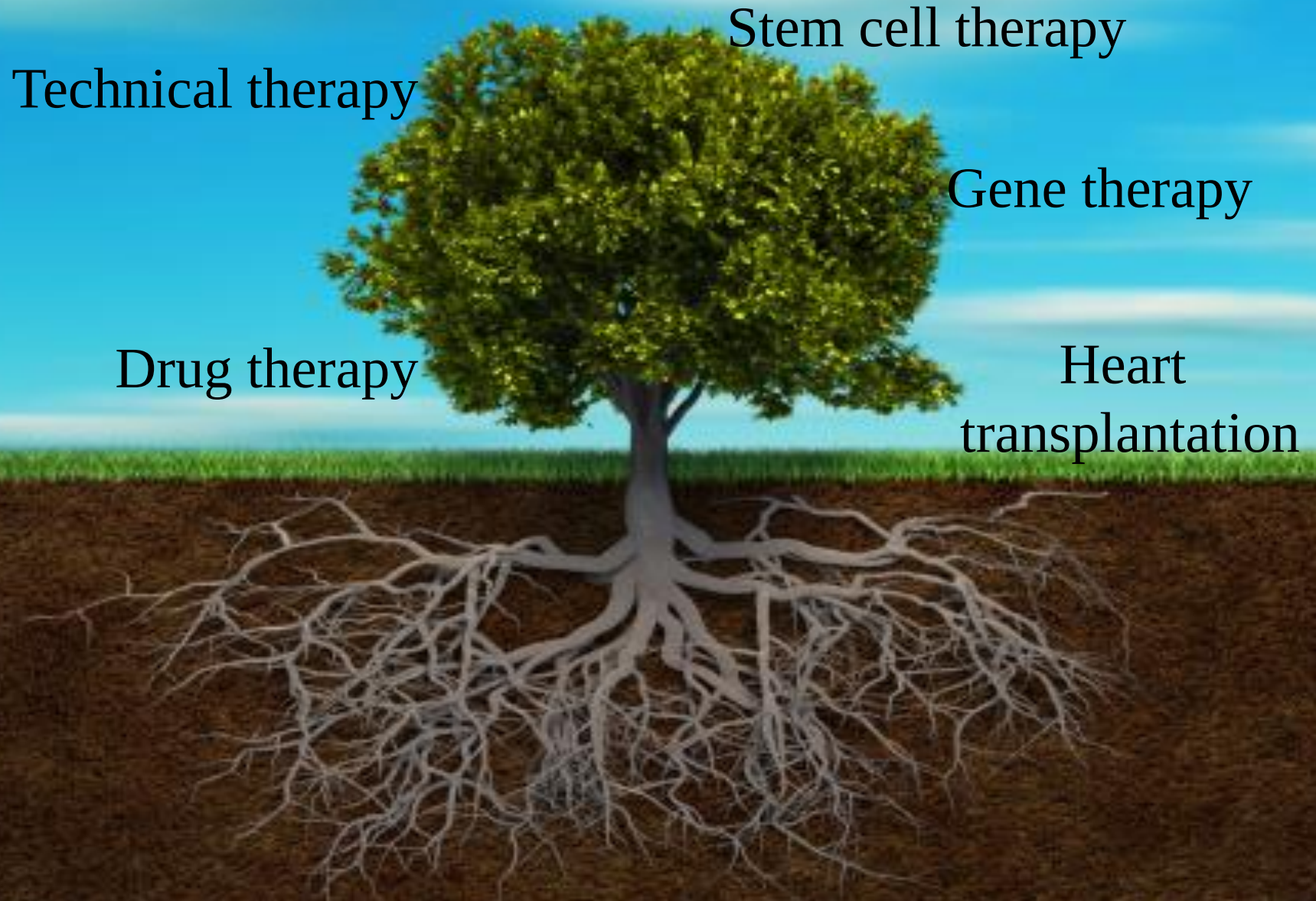
Drug therapy,

Technical therapy,

Regenerative therapy,

Heart transplantation

Treatment of heart failure



Drug therapy of heart failure:

Past, present and future

Remote past

200 year back: Digoxin

100 year back: Diuretics (1919)

Near past

40 year back: ACE Inhibitor (1981),

ARB (1995),

Beta-blocker(1997)

Present

10 year back: ARNI(2015)

Ivabradine(2015)

SGLT 2 Inhibitor (2020)

Future: ???

Future drug therapy:-

Tolvaptan- vasopressin antagonist

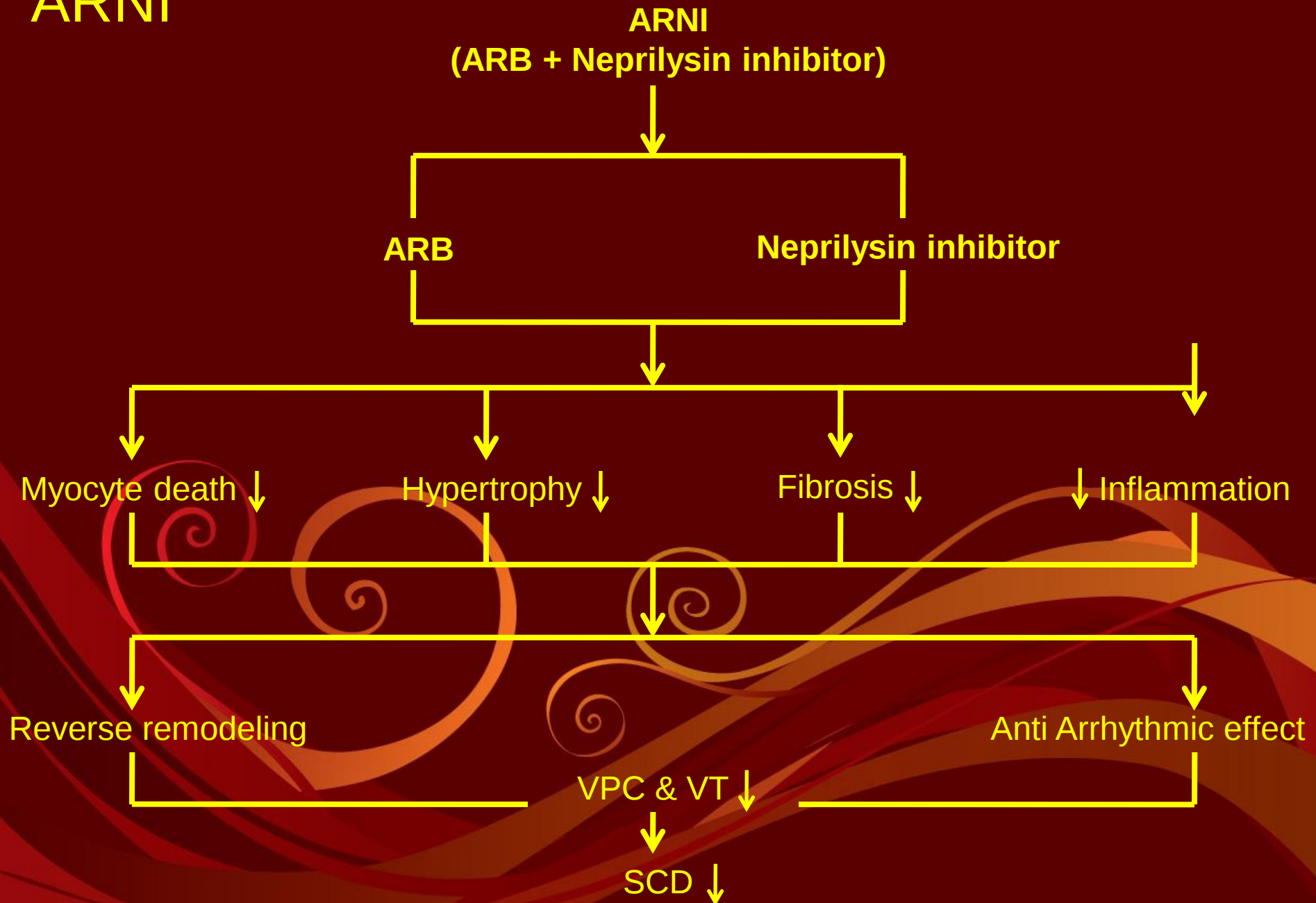
Omecamtiv mecarbil ----- myosin binding peptide

serelaxin– Vasodilator

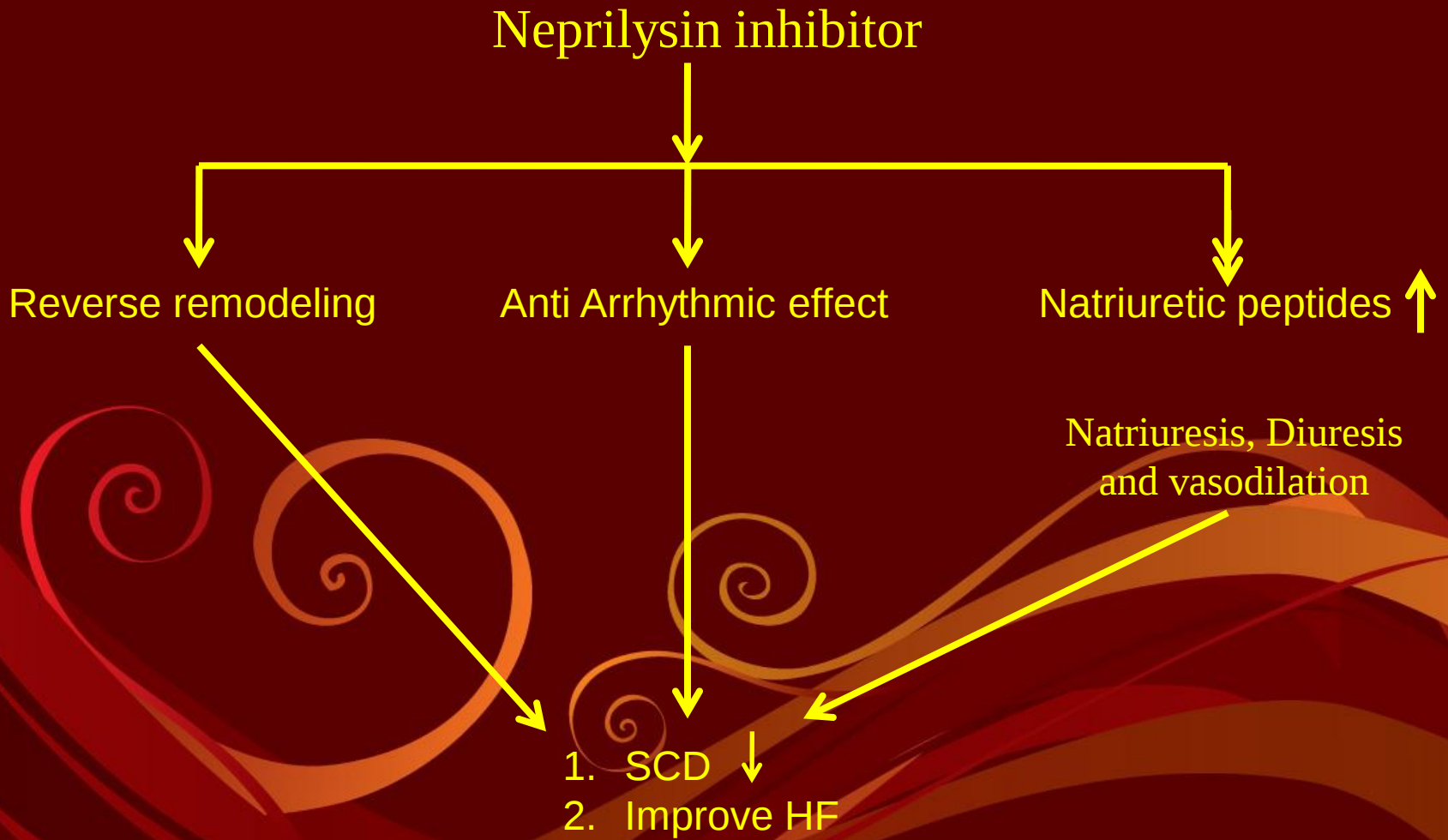
ularitide– Vasodilator

cardiotrophin – sarcomere hypertrophy

ARNI



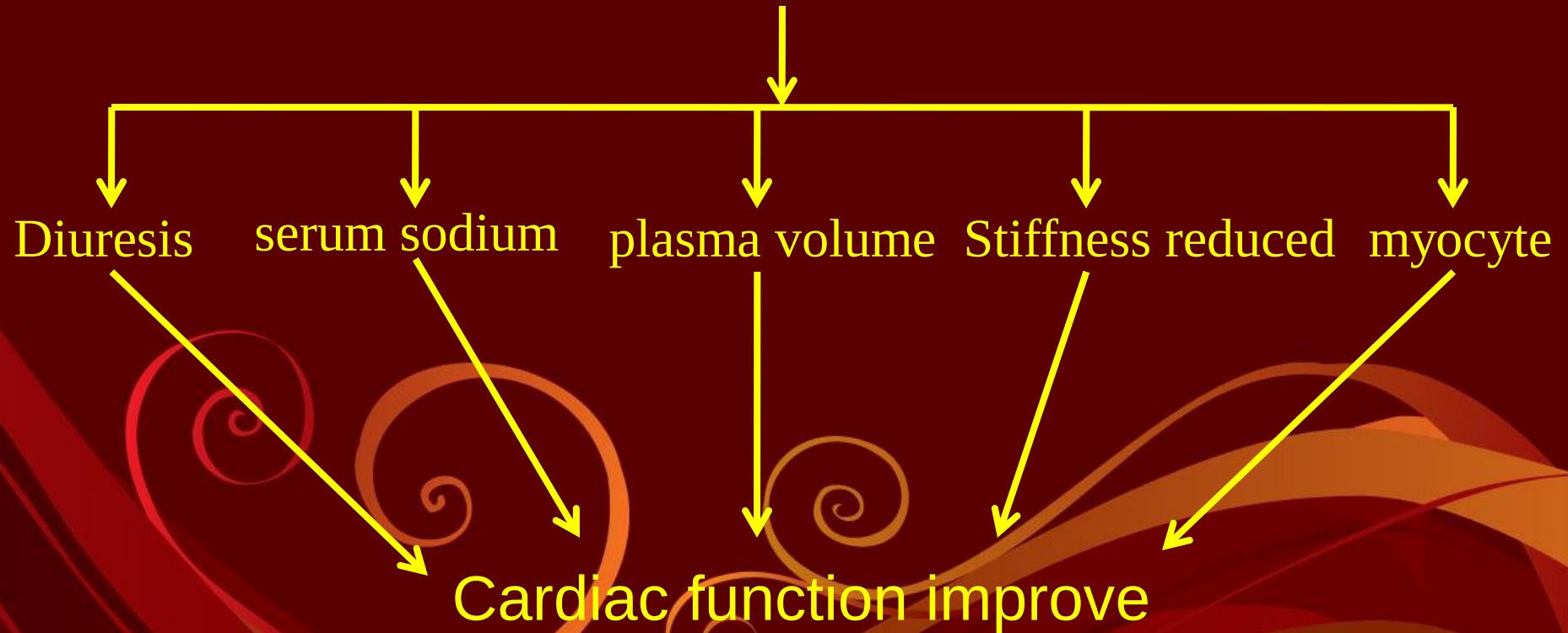
Neprilysin inhibitor



SGLT 2

It reduces
the risk of clinical events
in patients with heart failure
regardless of ejection fraction

SGLT 2 i



β -Blocker

Bisoprolol

Carvedilol

Metoprolol

Nebivolol

β blocker function :- 4 way

inotropic action ↓

chronotropic action ↓

dromotropic action ↓

lusitropic action ↑

Which drug increases ejection fraction?

Beta blocker

ACE inhibitor

ARB

MRA

Drugs that reduce mortality in heart failure

ARNI

Beta blocker

MRA

SGLT 2 Inhibitor

Patient gain
most benefit
from combined treatment
with above drugs

Treatment strategy

Treatable causes (Ischemia, valvular pathology, etc.)

Lifestyle
Exercise
Diet
Supplements
(Q10, Omega3)
Etc.

MCS
/ HTx

Comorbidities
Hypertension
Atrial fibrillation
Diabetes
Iron deficiency
Etc.

CRT / ICD

Ivabradine

Digoxin

H-ISDN

MRA

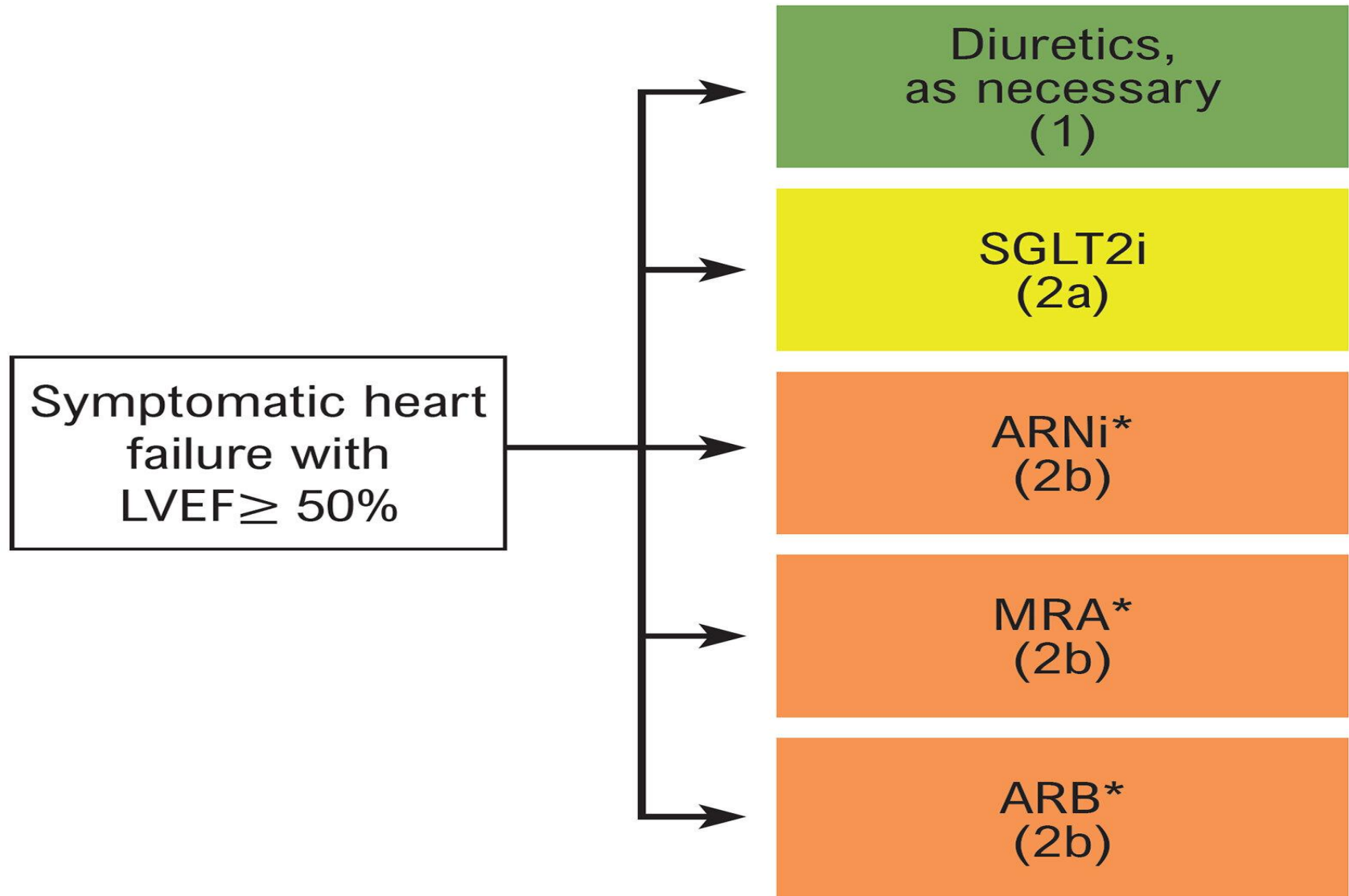
ACEI / ARB*

ARNI**

Beta-blocker

Diuretics to relief signs and symptoms of congestion

Treatment of HFpEF



Treatment of HFmrEF

Symptomatic HF with
LVEF 41%–49%

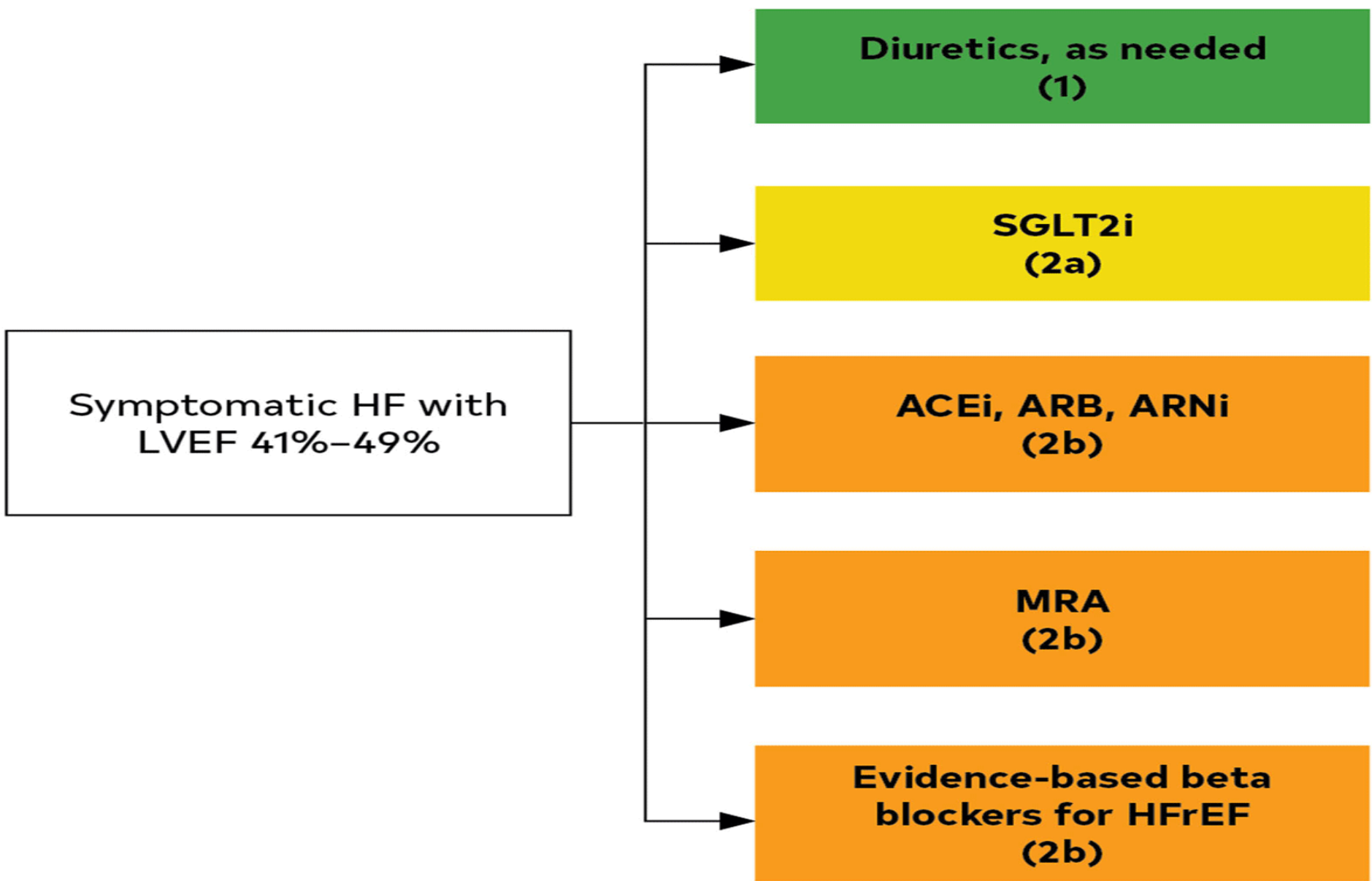
**Diuretics, as needed
(1)**

**SGLT2i
(2a)**

**ACEi, ARB, ARNi
(2b)**

**MRA
(2b)**

**Evidence-based beta
blockers for HFrEF
(2b)**



Heart failure therapy in future:

Drug therapy(discussed)

Regenerative therapy:

Stem cell therapy

Gene therapy

Stem cell therapy

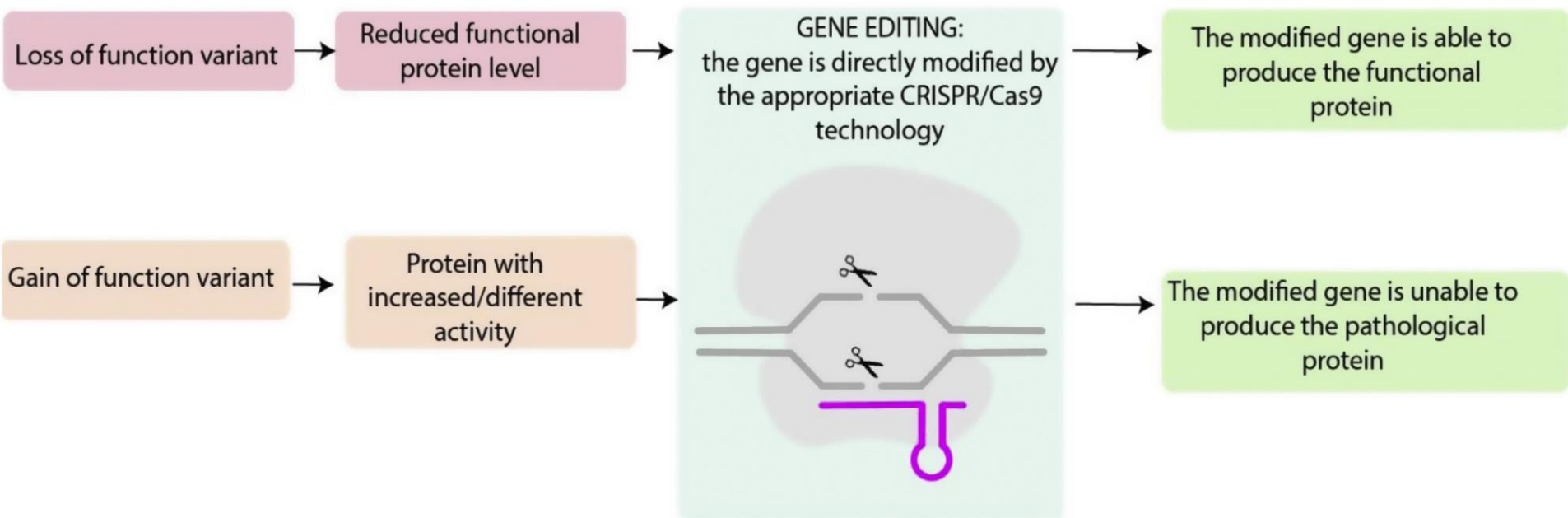
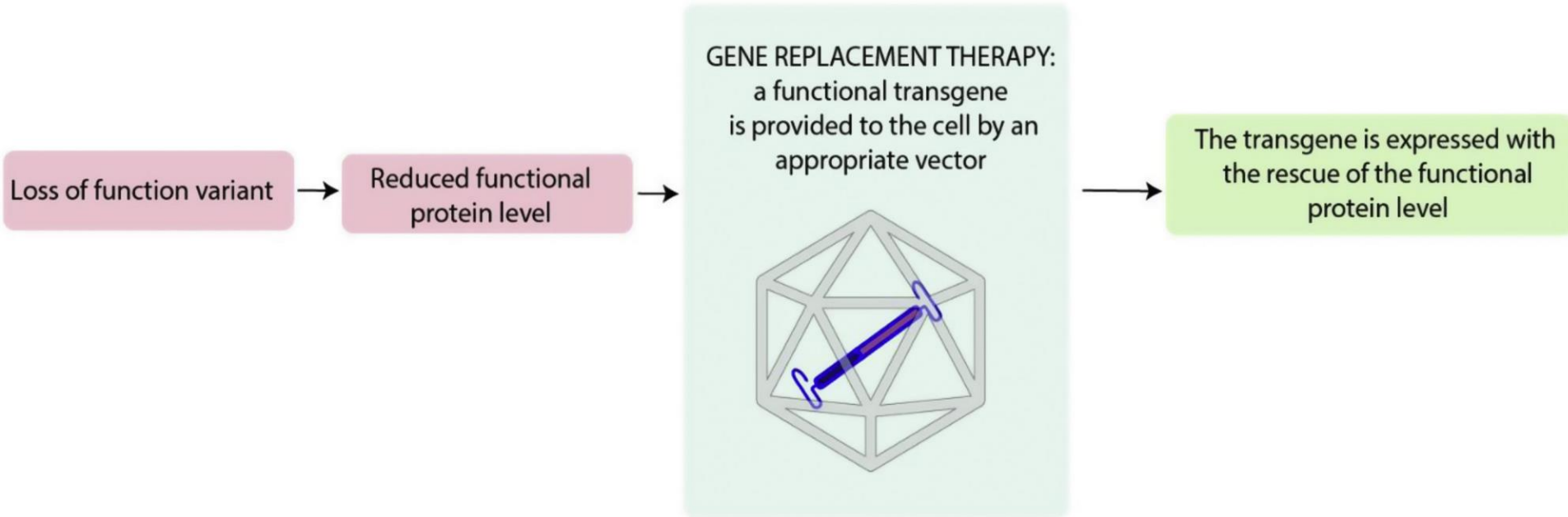
Bone marrow mononuclear cells

Cardiac-derived stem cells

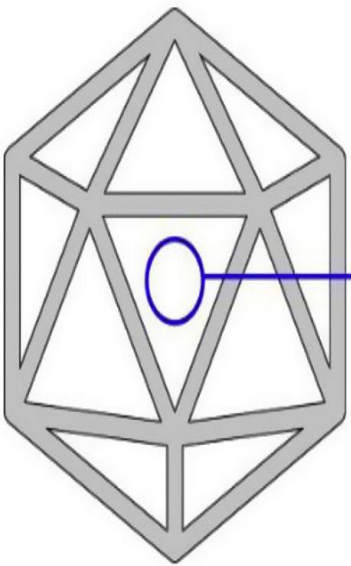
Mesenchymal stromal cells

Proangiogenic progenitor cells

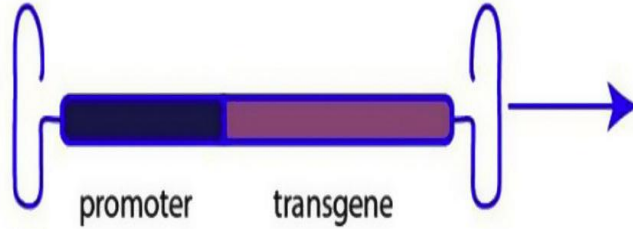
Gene therapy



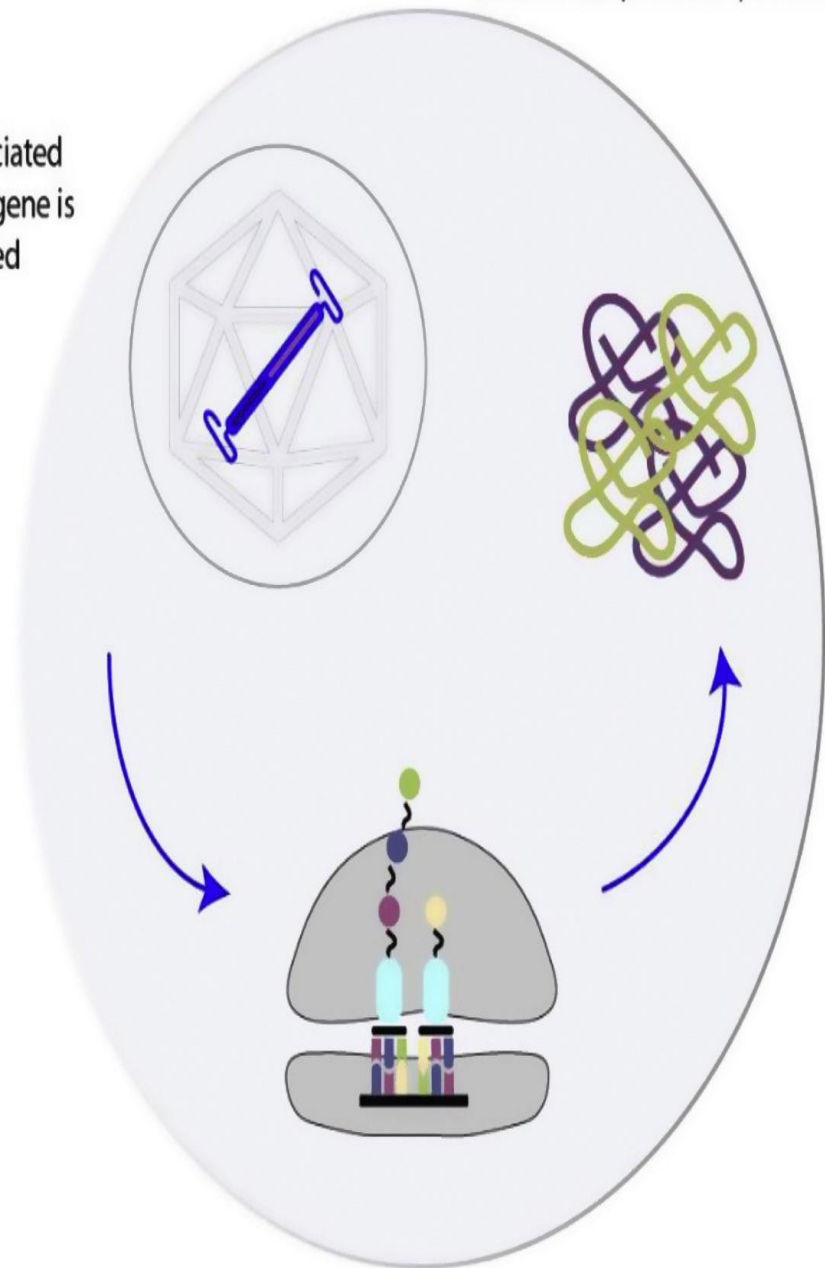
a functional protein is produced



adeno-associated virus enclosing transgene



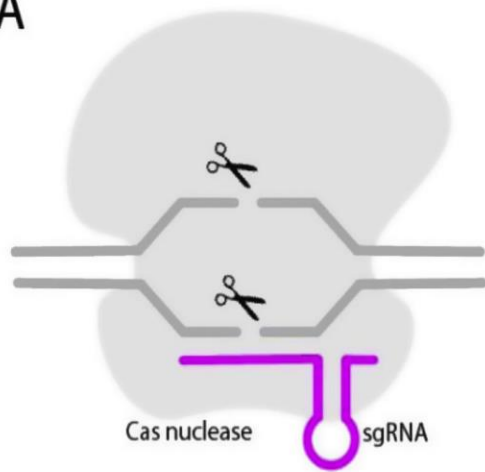
adeno-associated
virus + transgene is
endocytosed



the transgene mRNA is translated

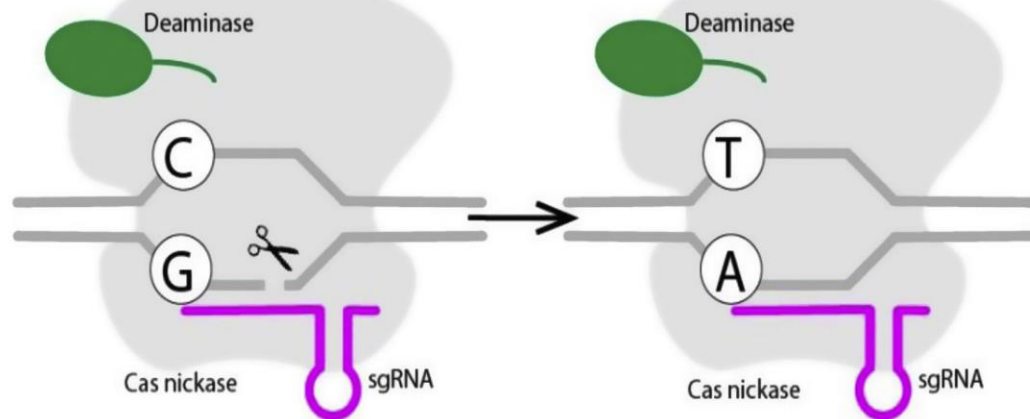
NUCLEASES

A



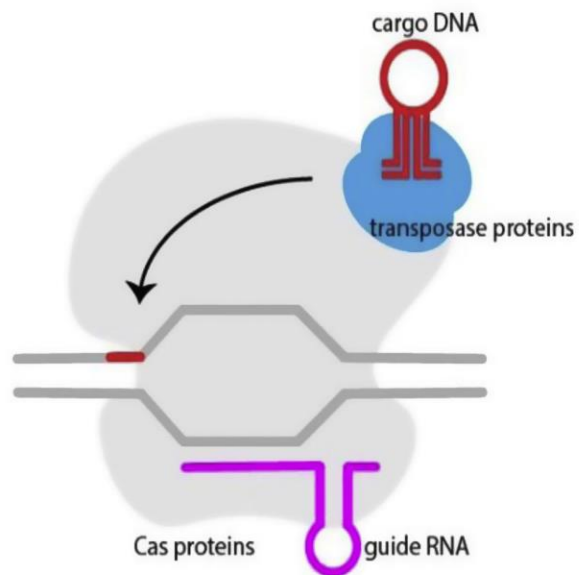
BASE EDITORS

B



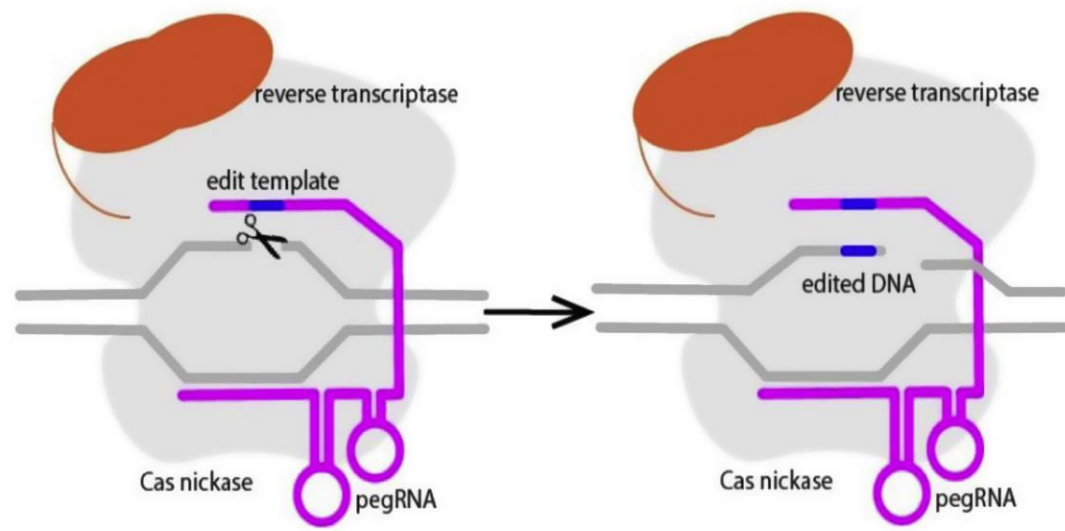
C

TRANSPOSASES



D

PRIME EDITORS



Take home message

1. Treat predisposing factor
2. Pre heart failure is to be diagnosed early
3. Echocardiography is a revolutionized investigation

4. New drugs has also revolutionized the management of heart failure.

5. Yet sometimes heart failure is unmanageable.

We are looking forwards for some new approach of therapy and then the management successful.



Heart with full pulse

Body impulsed

Brain is fresh and

Mind is free

Oh mighty

Almighty

Alas! We don't know when
our heart will be ranga joba
When we will be
free from heart failure

**Healthy Heart
Healthy Life**

Thank You

