
Chronic heart failure

Martin Radvan

What we will talk about?

- Pathophysiology
- Clinical signs
- Diagnosis
- Therapy

Hemodynamics

- Stroke volume
- Ejection fraction
- Cardiac output
- Cardiac index

Hemodynamics

- Stroke volume = $EDV - ESV$
- Ejection fraction = SV / EDV
- Cardiac output = $SV \times HR$
- Cardiac index = CO / BSA

Definition of HF

- HF is a clinical syndrome characterized by typical symptoms that may be accompanied by typical signs caused by a structural and/or functional cardiac abnormality, resulting in a reduced cardiac output and/or elevated intracardiac pressures at rest or during stress

Definition of HF

- Low cardiac output despite normal heart filling (not enough for peripheral tissues)
- Normal filling only under condition of elevated filling pressures
- BNP, NT-proBNP

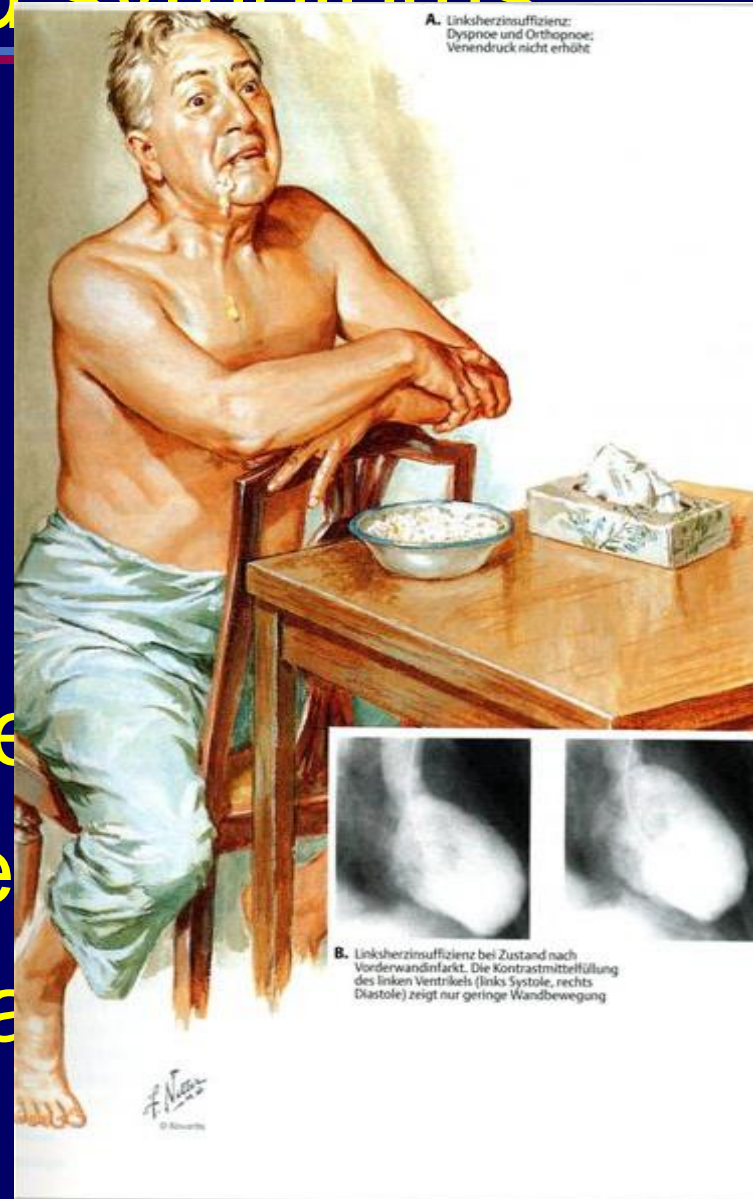
Signs and symptoms

- breathlessness
- ankle swelling
- fatigue

- elevated jugular venous pressure
- pulmonary crackles
- peripheral oedema
- orthopnoe

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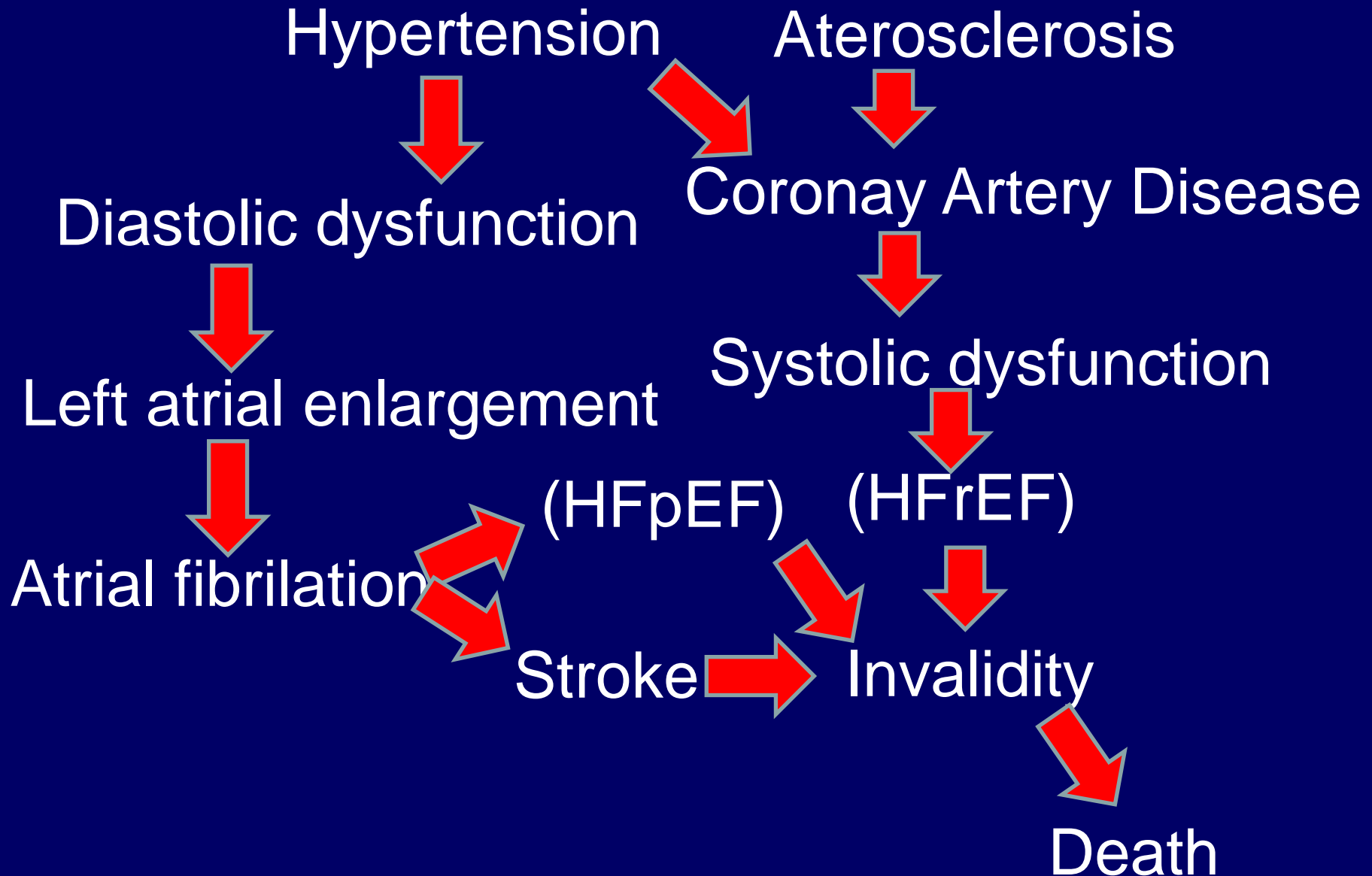
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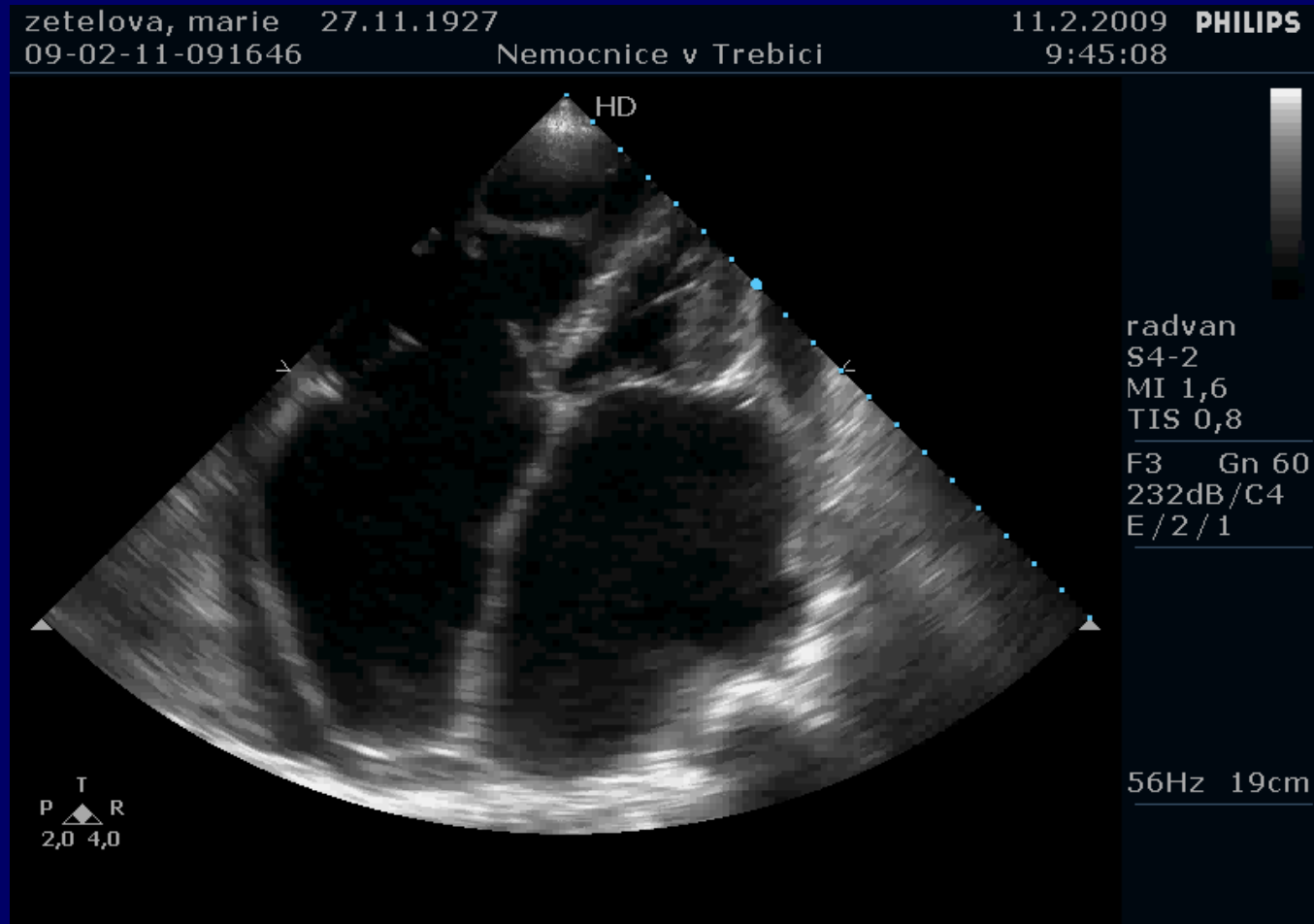
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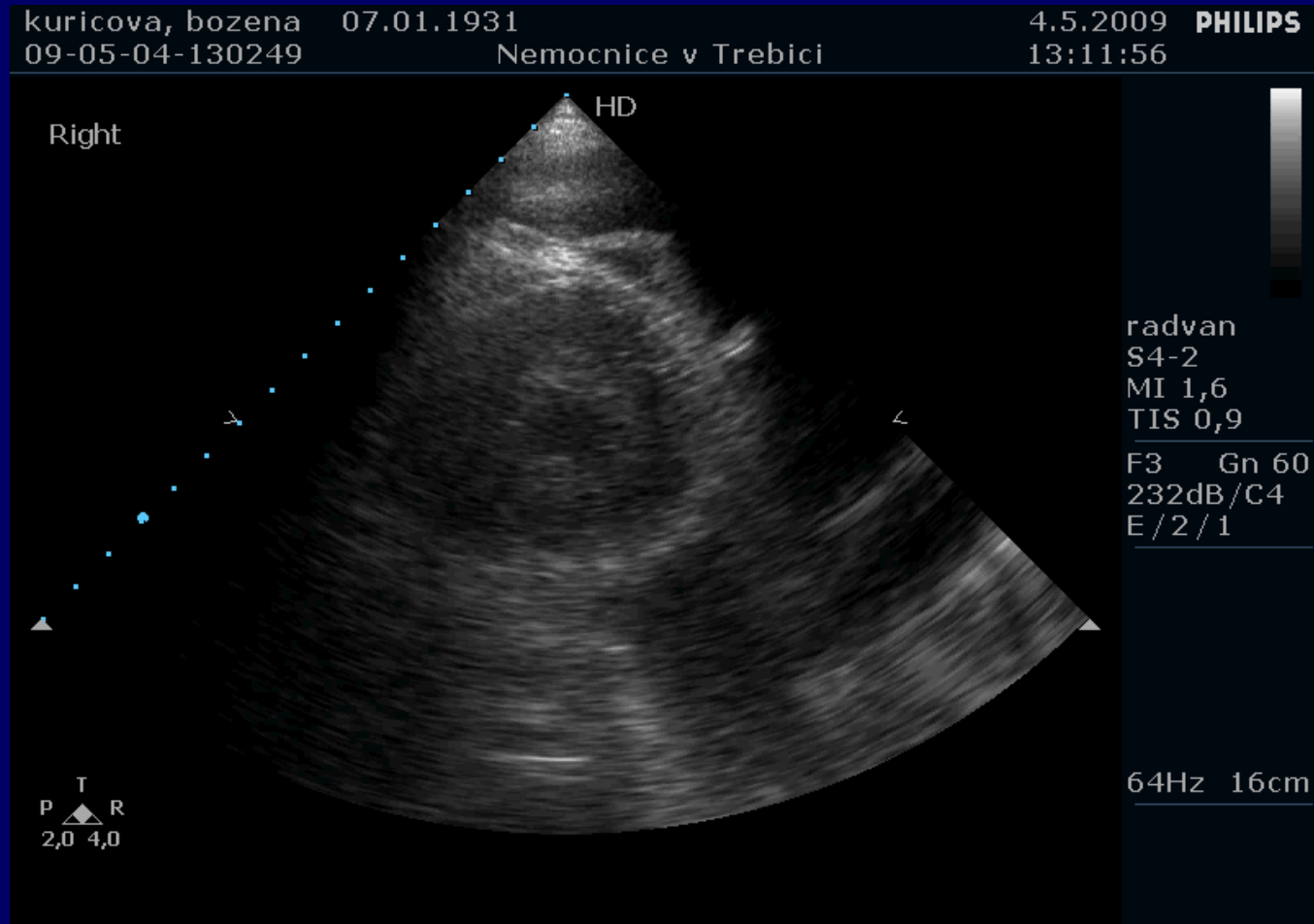
Patophysiology



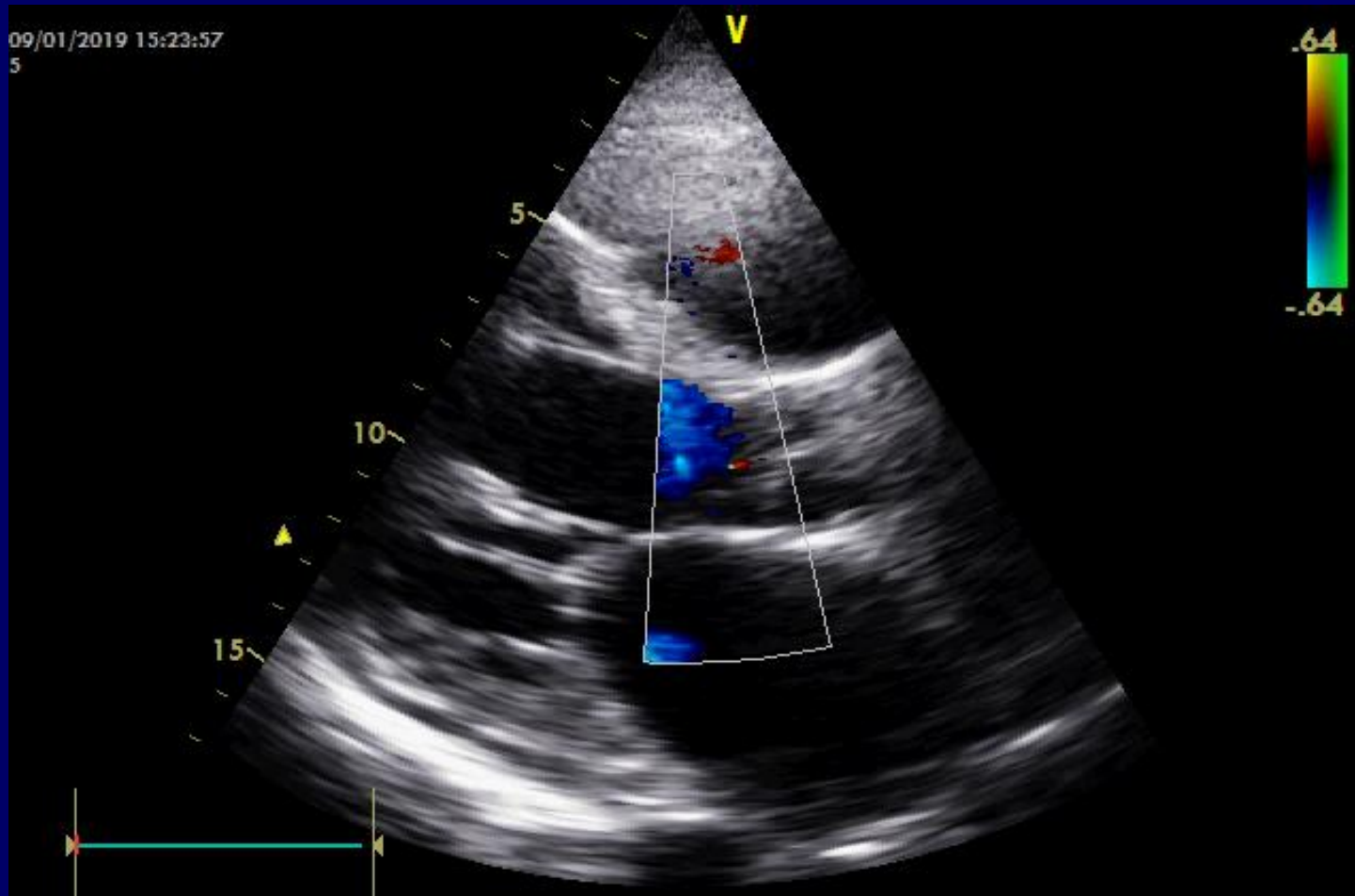
HFrEF vs HFpEF



HFrEF vs HFpEF



HFrEF vs HFpEF



Aetiology

- HFrEF – CAD, DCMP
- HFpEF
 - hypertension, diabetes, AF
 - CAD
 - HCMP
 - Right ventricle failure/PH
 - Valvular disease
 - High output HF
 - „zebras“

Diagnosis?

Diagnosis

- Anamnesis
- Clinical signs
- Ultrasonography
- X-ray of the chest
- Coronarography
- Stress tests
- Labs
- ...

Therapy of heart failure

- Prevention
- Therapy of the cause (CAD, myocarditis, DKMP..)
- Diuretics – furosemid, thiazidy
- Spironolakton, eplerenon
- β blokátory, ACEi a AT II
- *Digoxin*
- CRT/D
- Vaccination – flu, pneumococi
- Ivabradin
- Sacubitril/valsartan, gliflozins
- Heart transplant/MCS

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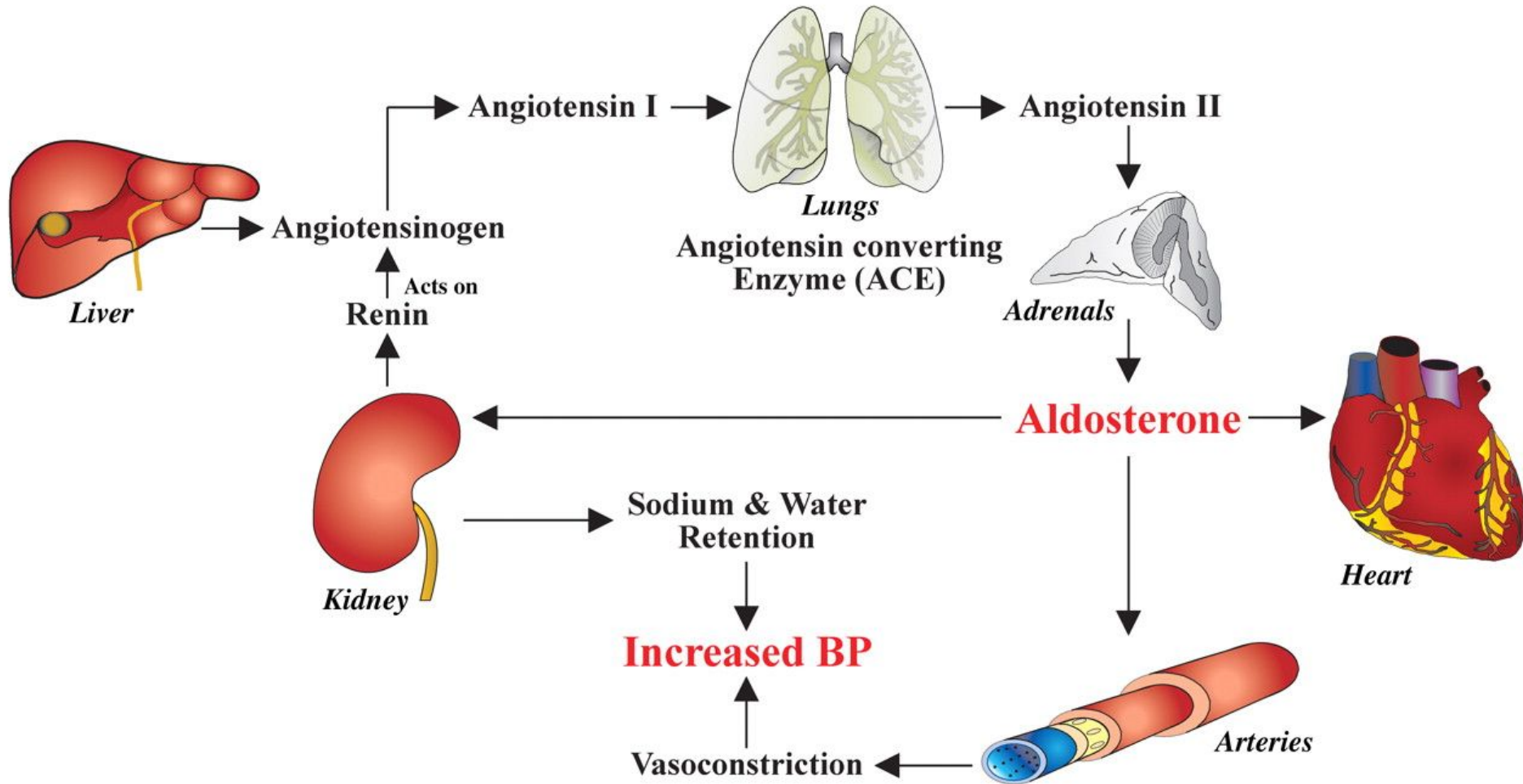
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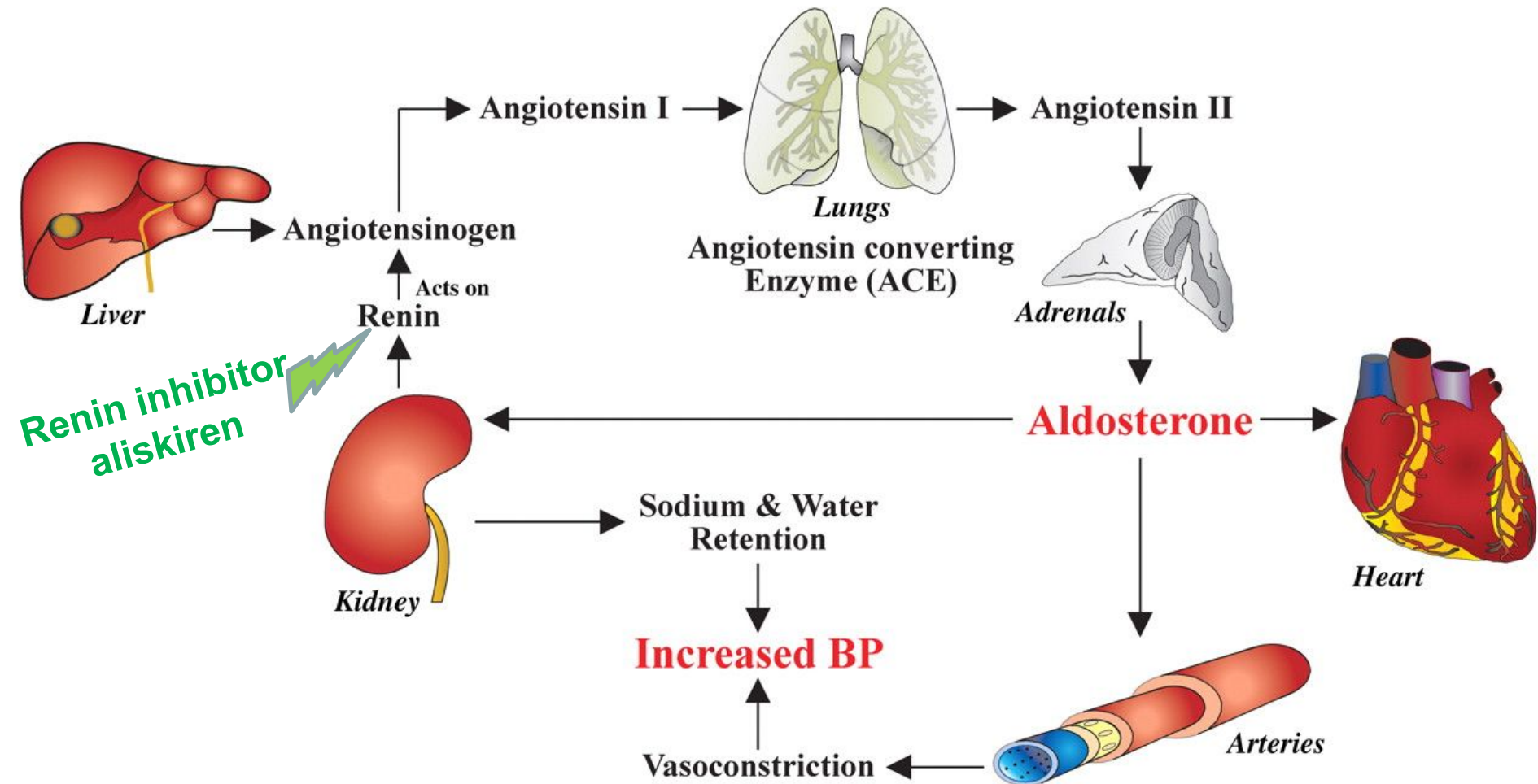
β - blokátory

- Bisoprolol
 - Carvedilol
 - Metoprolol sukcinát
 - *Nebivolol*
-
- Lower risk especially of sudden heart death
 - All studies made before ICD on the stage

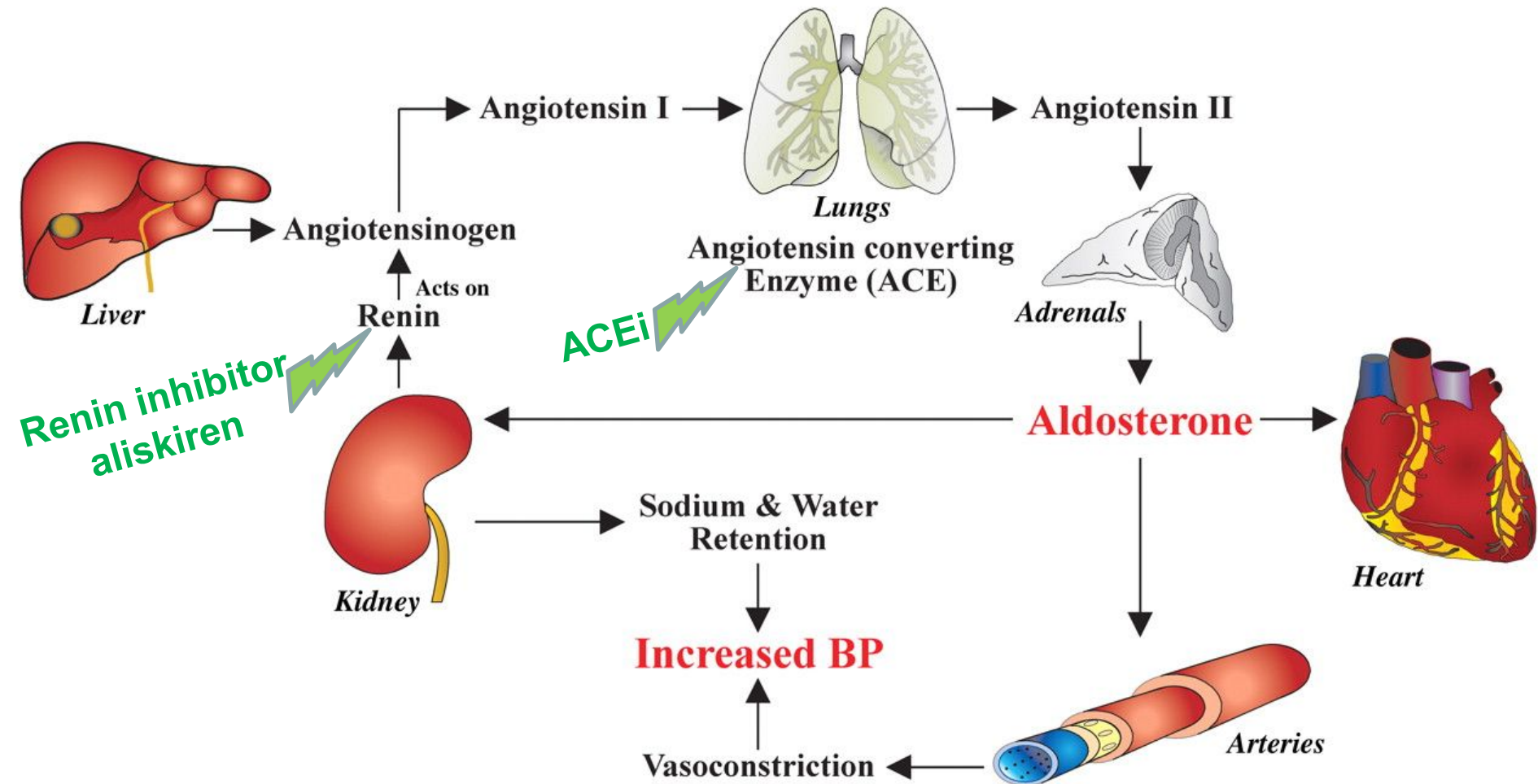
Renin-angitensin-aldosteron



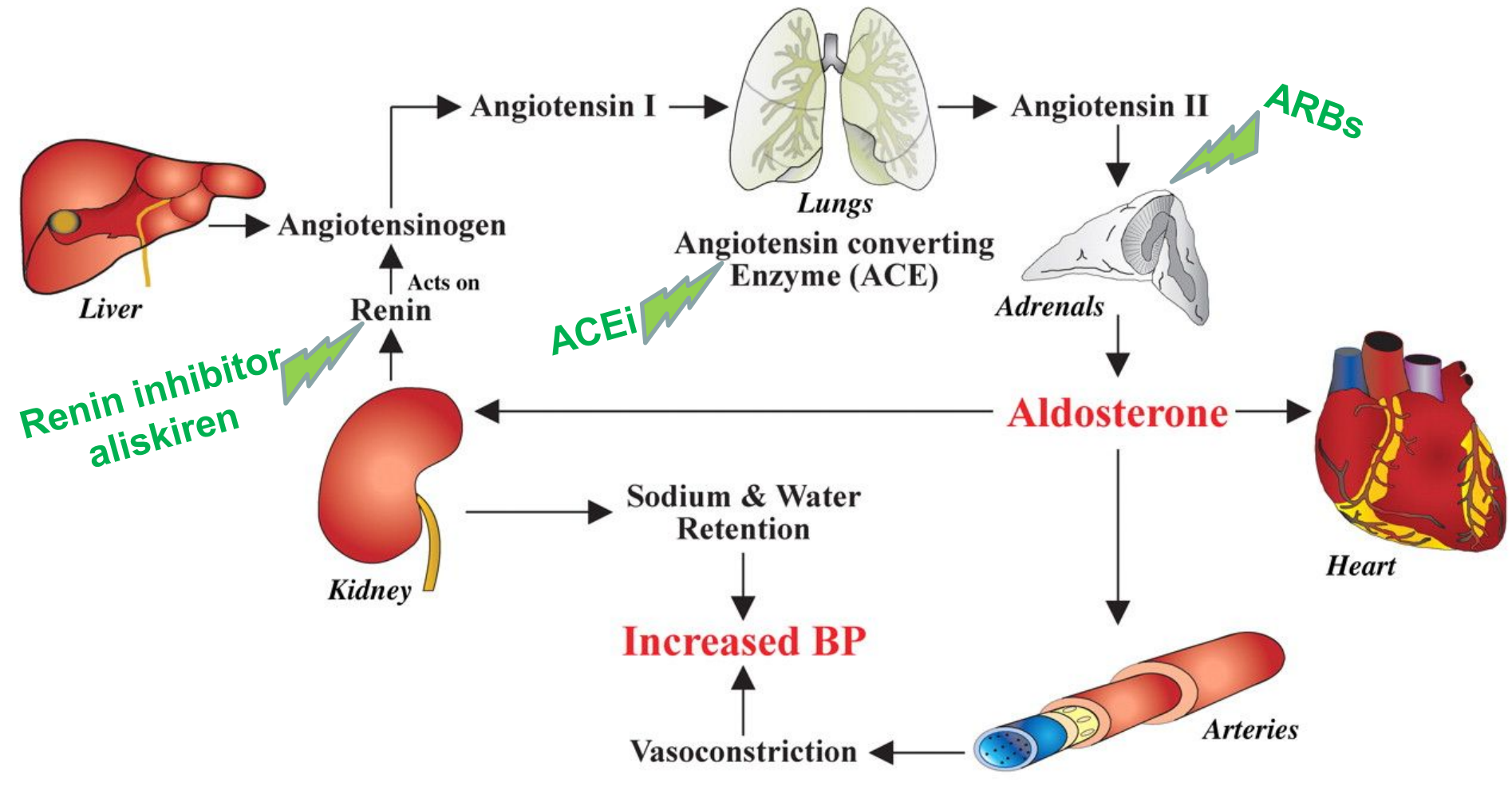
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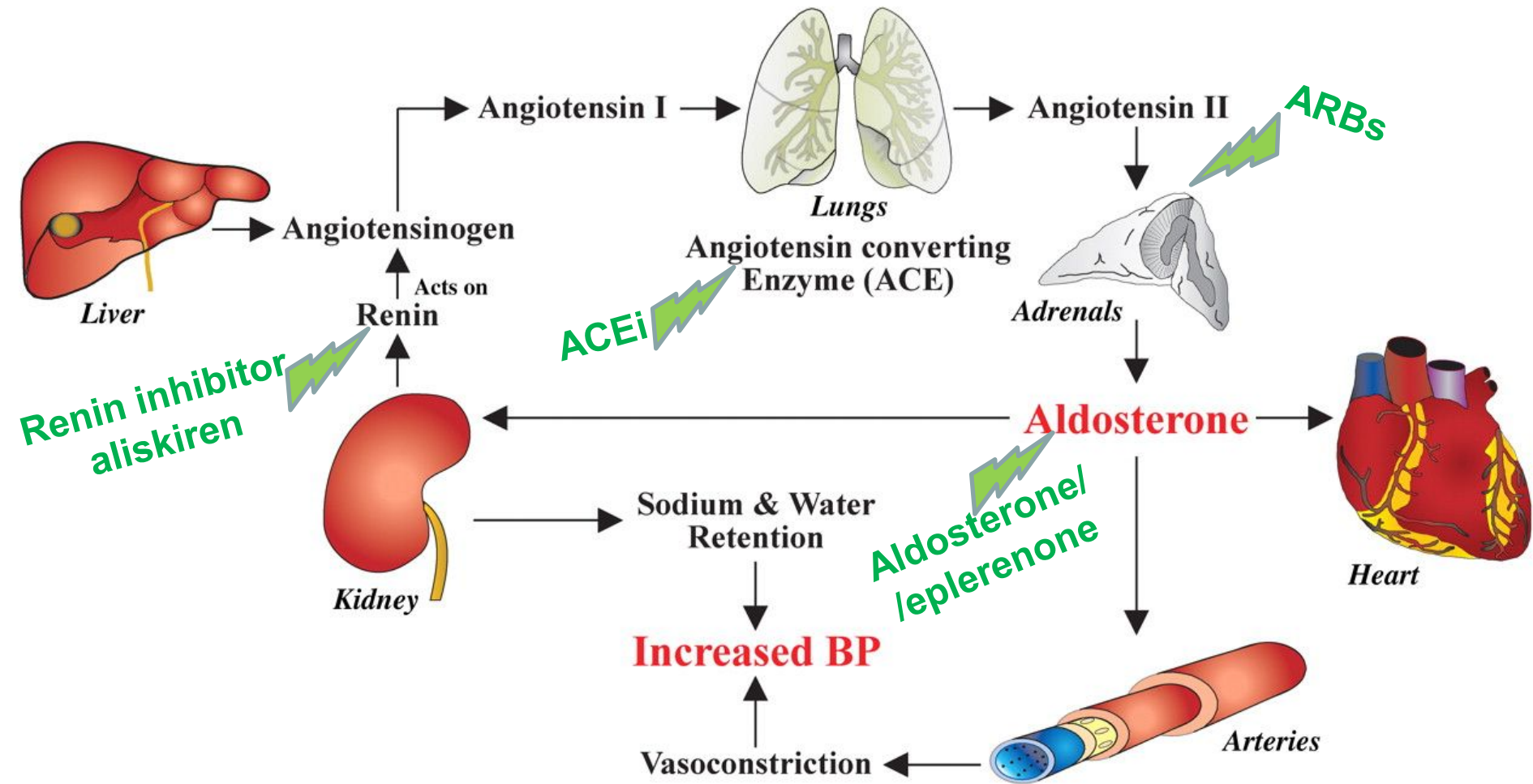
Renin-angitensin-aldosteron



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Renin-angitensin-aldosteron



ACE inhibitory

- Captopril (3x50mg)
- Enalapril (2x10-20mg)
- Ramipril (2x5mg)
- Trandolapril (1x4mg)
- Lisinopril (1x20-35mg)

- Titration to the maximal dosage

Sartans

- Candesartan (1x32mg)
- Losartan (1x150mg)?
- Valsartan (2x160mg)

- Only for ACEi intolerant
- Do not combine with ACEi

Diuretics

- Furosemid (two doses a day)
- 20mg-1g/day
- HCTH (12,5-25mg)

MRA

- Spironolactone 25mg (gynekomastie, mastodynie, erektilní dysfunkce)
- Eplerenon 25-50mg

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Ivabradin

- Selective binding: I_f receptor in sinoatrial node
- Decrease of HR in SR
- Symptomatic patient with HFrEF, SR above 70-75/min, symptomatic despite full heart failure therapy inclusive BBlokru
- 5mg BID → 7,5mg BID
- Well tolerated

Gliflozins – SGLT2 inhibitors

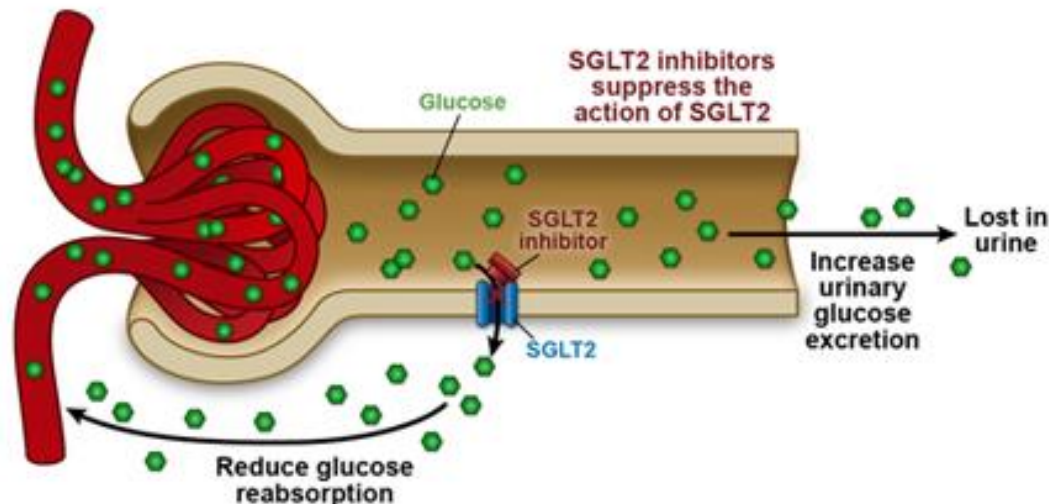
- Dapagliflozin, empagliflozin
- Glycosuric agent
- Originally in DM2 patients

Gliflozins – SGLT2 inhibitors

- Dapagliflozin
- Glyx-030
- Orig...

SGLT2 Inhibitors for Type 2 Diabetes

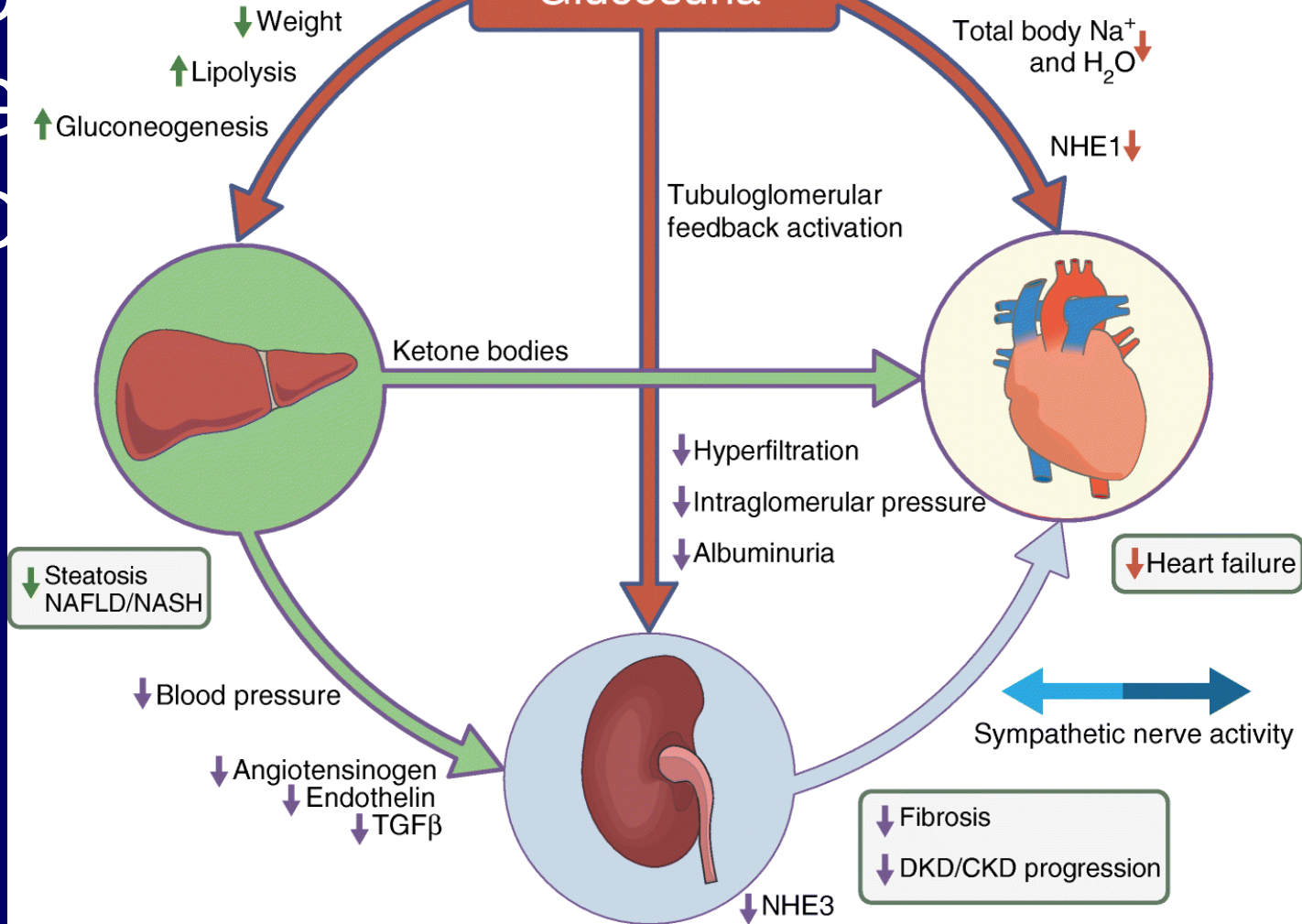
- SGLT2 inhibitors lower fasting, postprandial, and HbA_{1c}
 - Extra-glycemic effects include reduction of body weight and blood pressure



Zaccardi F, et al. *Diabetes Obes Metab.* 2016;18:783-794.

SGLT2 inhibition

Glucosuria



- D
- G
- C

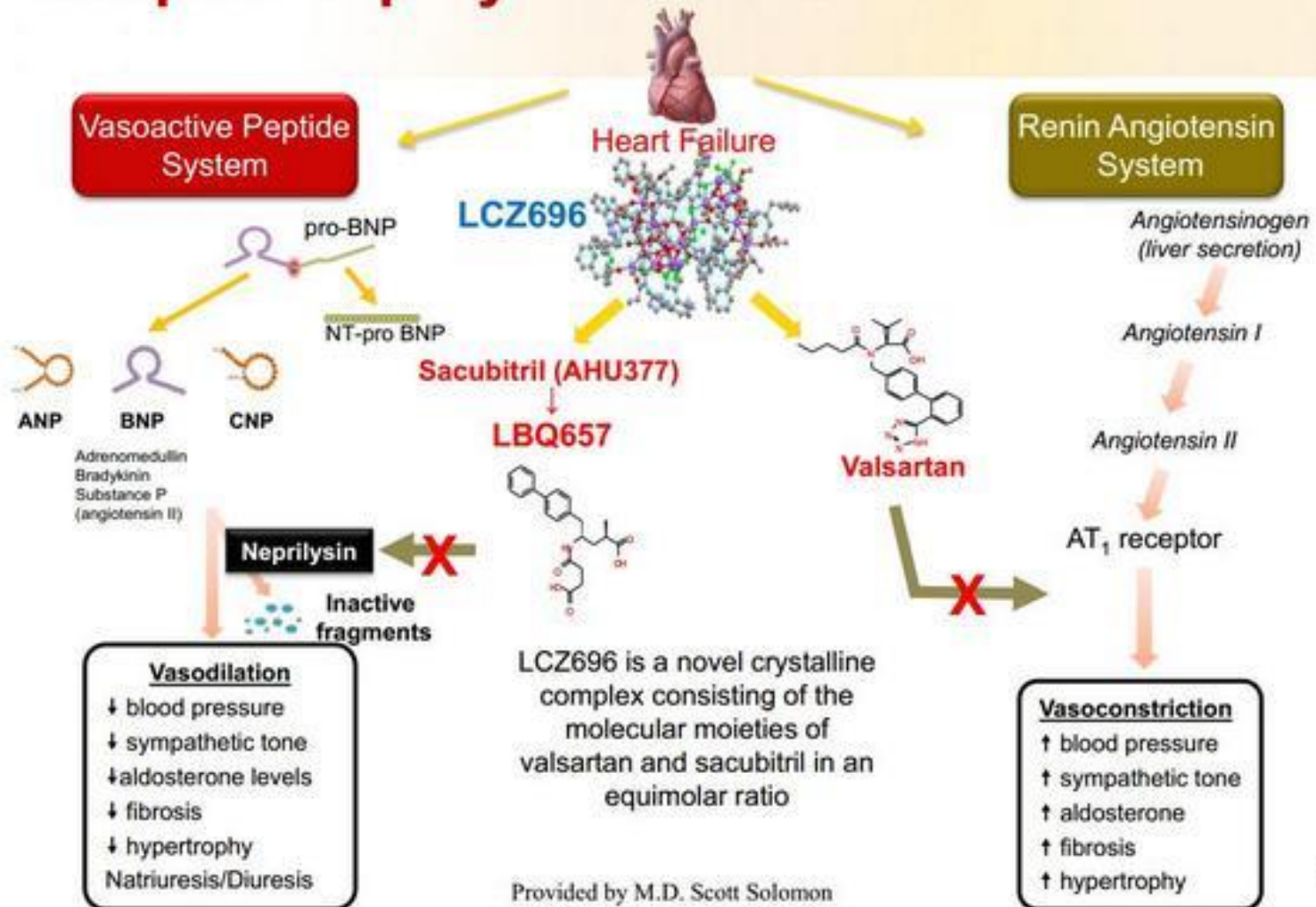
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Digoxin

- Symptomatic patient with normal GFR, especially in patients with atrial fibrillation to control frequency, symptomatic despite full therapy
- Low dose (0,125mg/daily)

Sacubitril/valsartan

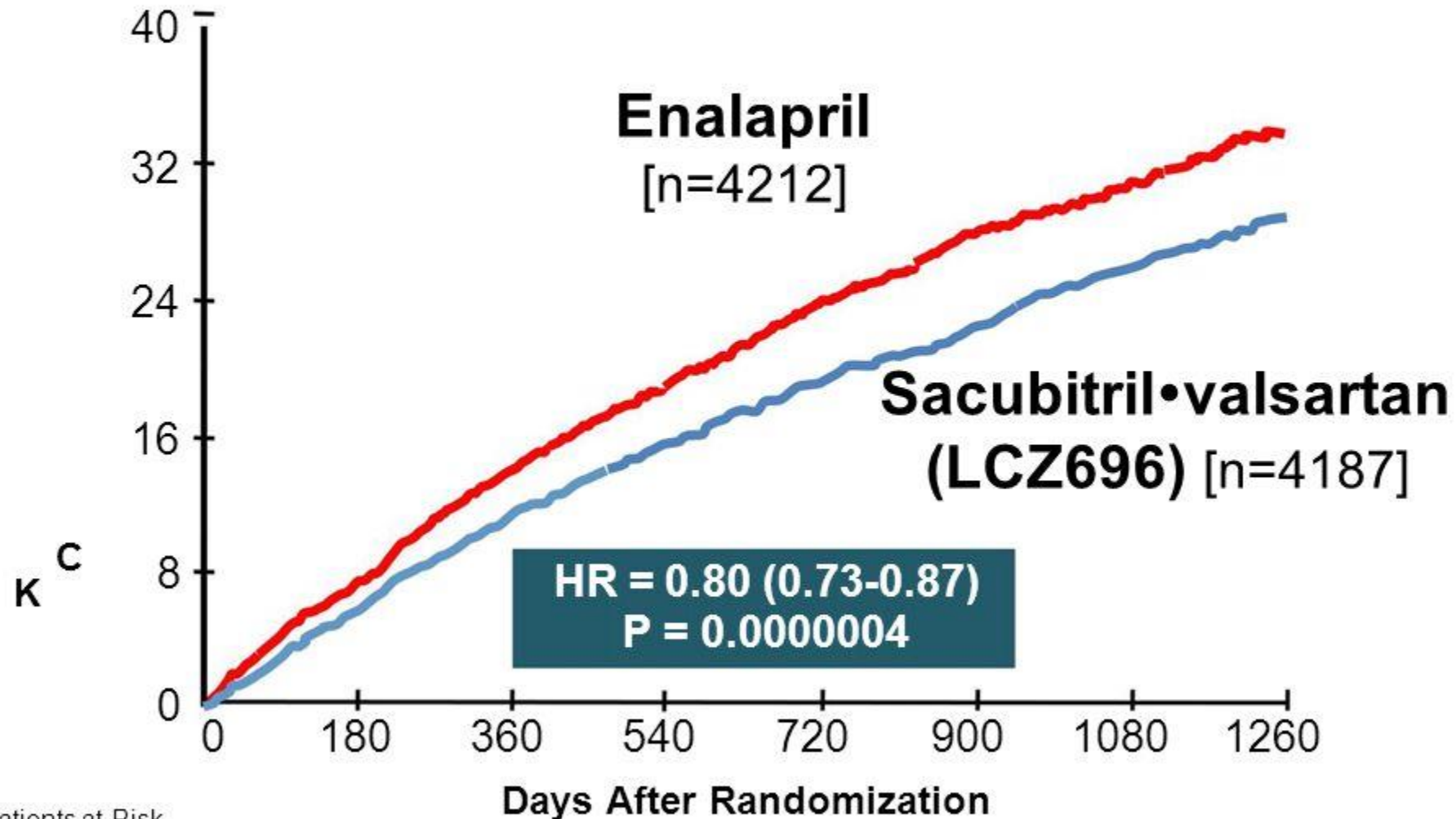
LCZ696 – A first-in-class Angiotensin Receptor Neprilysin Inhibitor



Sacubitril/valsartan

- HFrEF: EF LK $\leq 35\%$ (40)
- NYHA \geq II
- Doses 24/26, 49/51, 97/103mg BID
- Mortality and hospitalisation for HF: 20% decrease (Paradigm-HF)

PARADIGM-HF: Cardiovascular Death or Heart Failure Hospitalization (Primary Endpoint)



Patients at Risk

LCZ696	4187	3922	3663	3018	2257	1544	896	249
Enalapril	4212	3883	3579	2922	2123	1488	853	236

Sacubitril/valsartan

- Renal functions – $\text{GFR} \leq 30$ (20)ml/min/m²
- Hypotension
- Potassium level (combination with spironolactone)
- Wash-out period: 36h after last dose of ACEi
- Risk of angioedema (low)

Sacubitril/valsartan

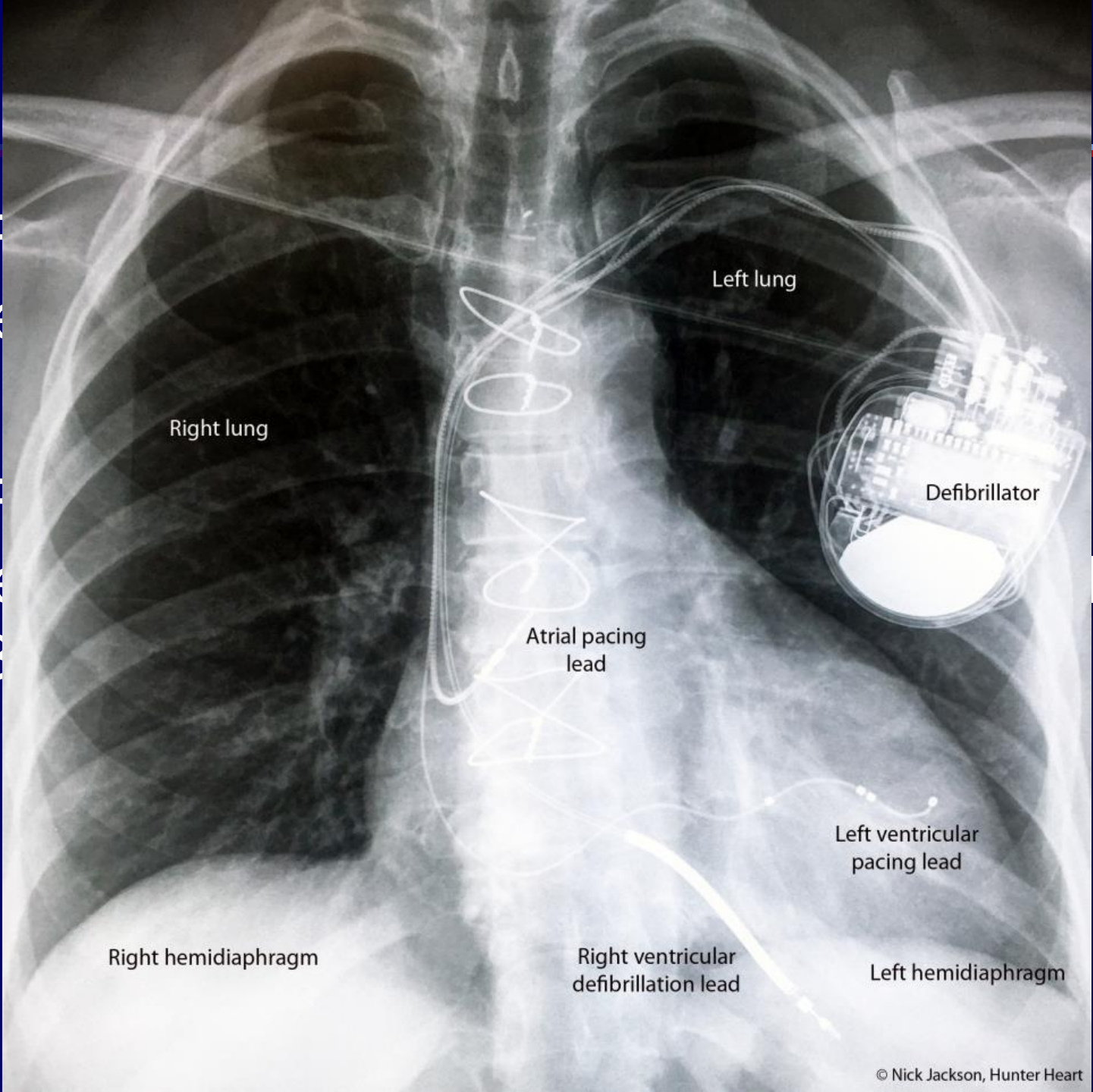
- Studies in HFpEF (Paragon, Paralax)
 - negative
- Studies with initiation during hospitalisation for acute decompensation of HFrEF (Transition trial)
 - positive

CRT a CRT-D

- EF LK \leq 35%, NYHA II, III despite full therapy
- EF LK \leq 35%, NYHA II, III despite full therapy, QRS wider then 0,12-0,15, ideally LBBB

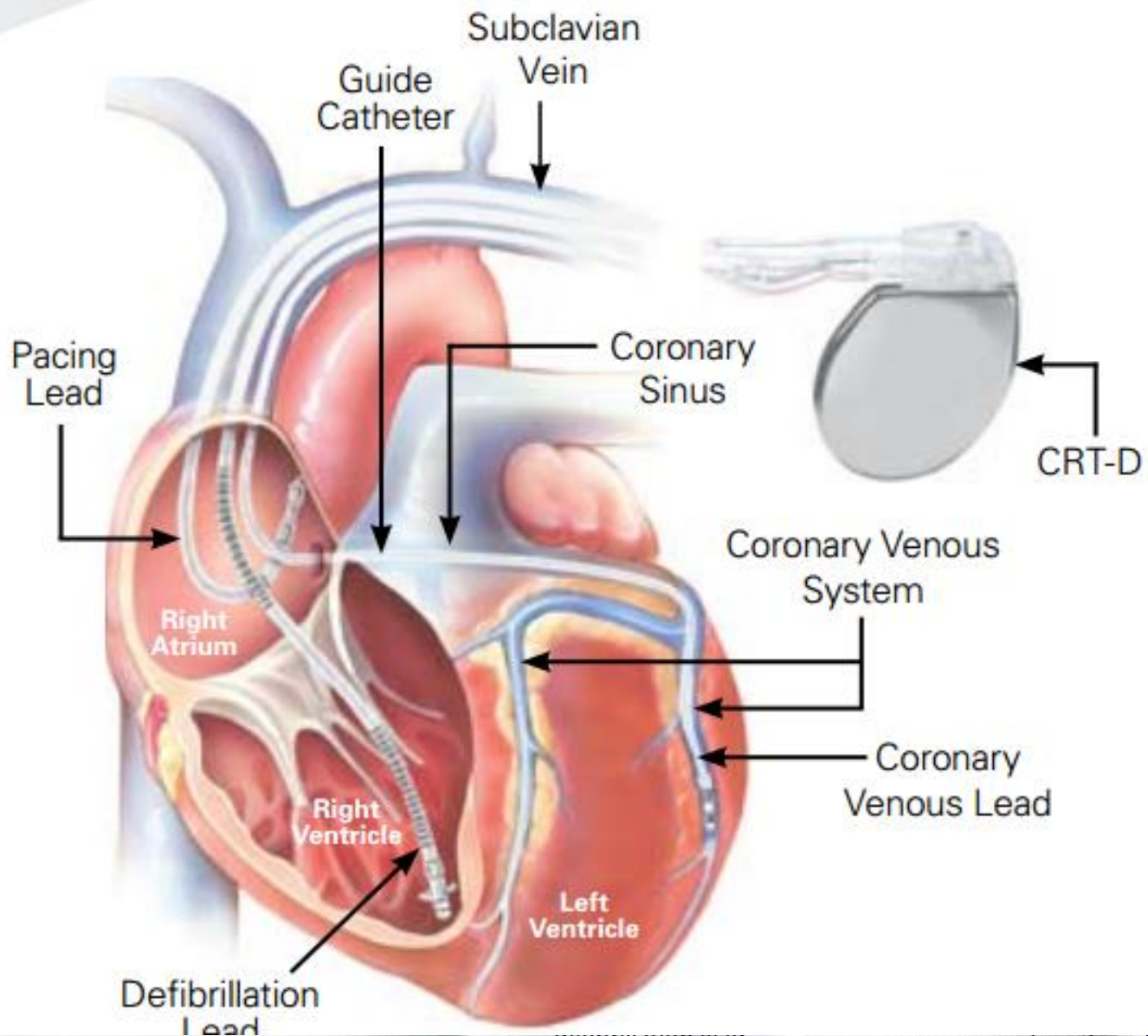
- EF
the

- EF
the
LB



ily

- EF
- the
- EF
- the
- LB



MCS

- LVAD
- Total artificial heart
- ECMO
- Impella

- Bridge to recovery/decision/transplantation
- Destination therapy

Transplantation

- Age?
- Life expectancy (except heart)
- Spiroergometry VO_2max

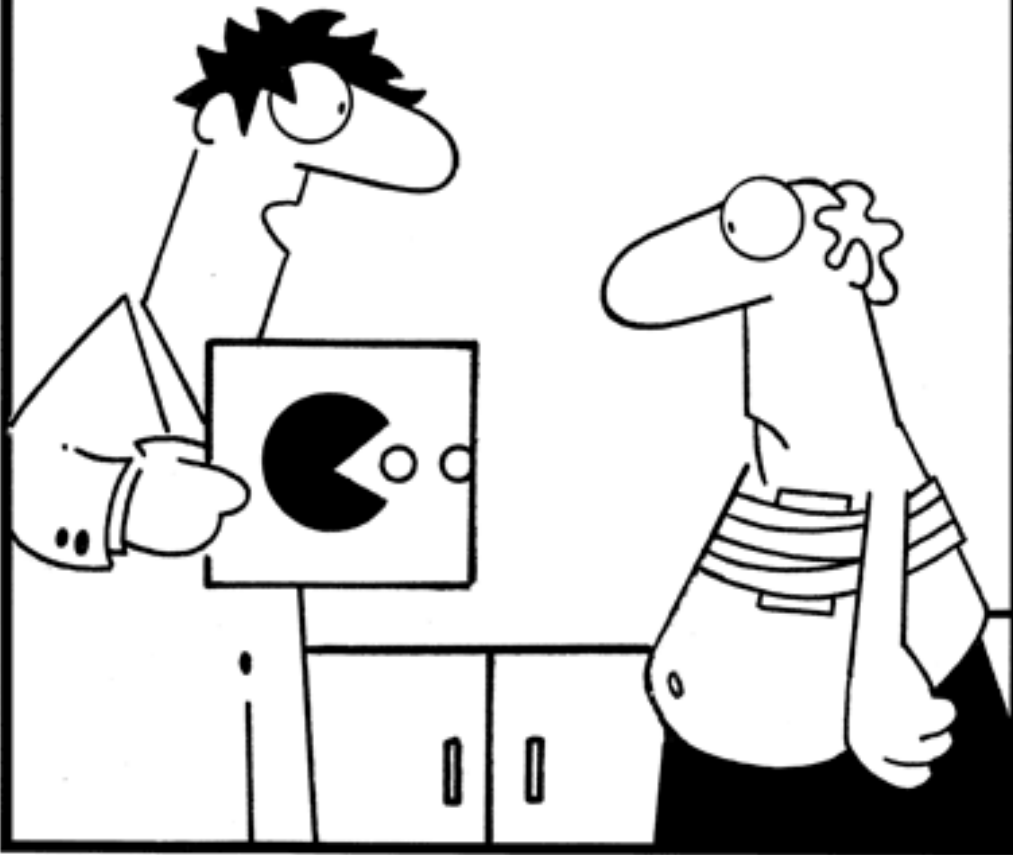
- Imunosuppression
- Rejection, infection
- Vasculopathy of the graft

Conclusions

- ❑ Heart failure is syndrome (not disease)
- ❑ Blood pressure control
- ❑ Therapy of the cause
- ❑ Pharmacotherapy
- ❑ Vaccination
- ❑ MCS
- ❑ Transplantation

GLASBERGEN

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**“Your new pacemaker includes a
Pac-Man game that gobbles up the
cholesterol in your arteries!”**

*Děkuji za
pozornost*