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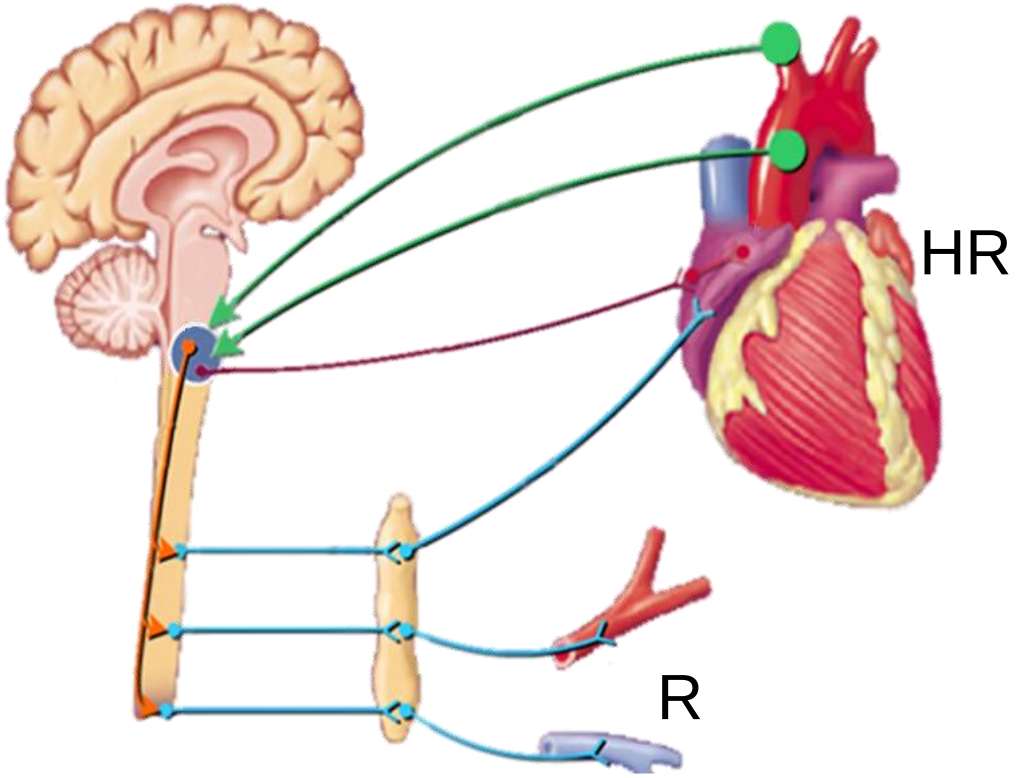
Compendium
CVS II

Baroreflex

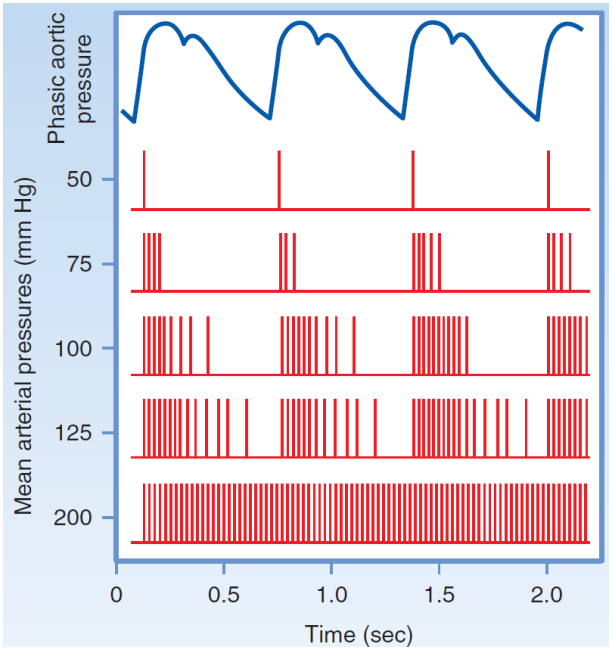
Aferent pathway
Parasympathetic pathway
Sympathetic pathway

BP=HR x SV x R



- Inotropic
- Chronotropic
- Dromotropic
- Batmotropic

} effect



BP=HR x SV x R

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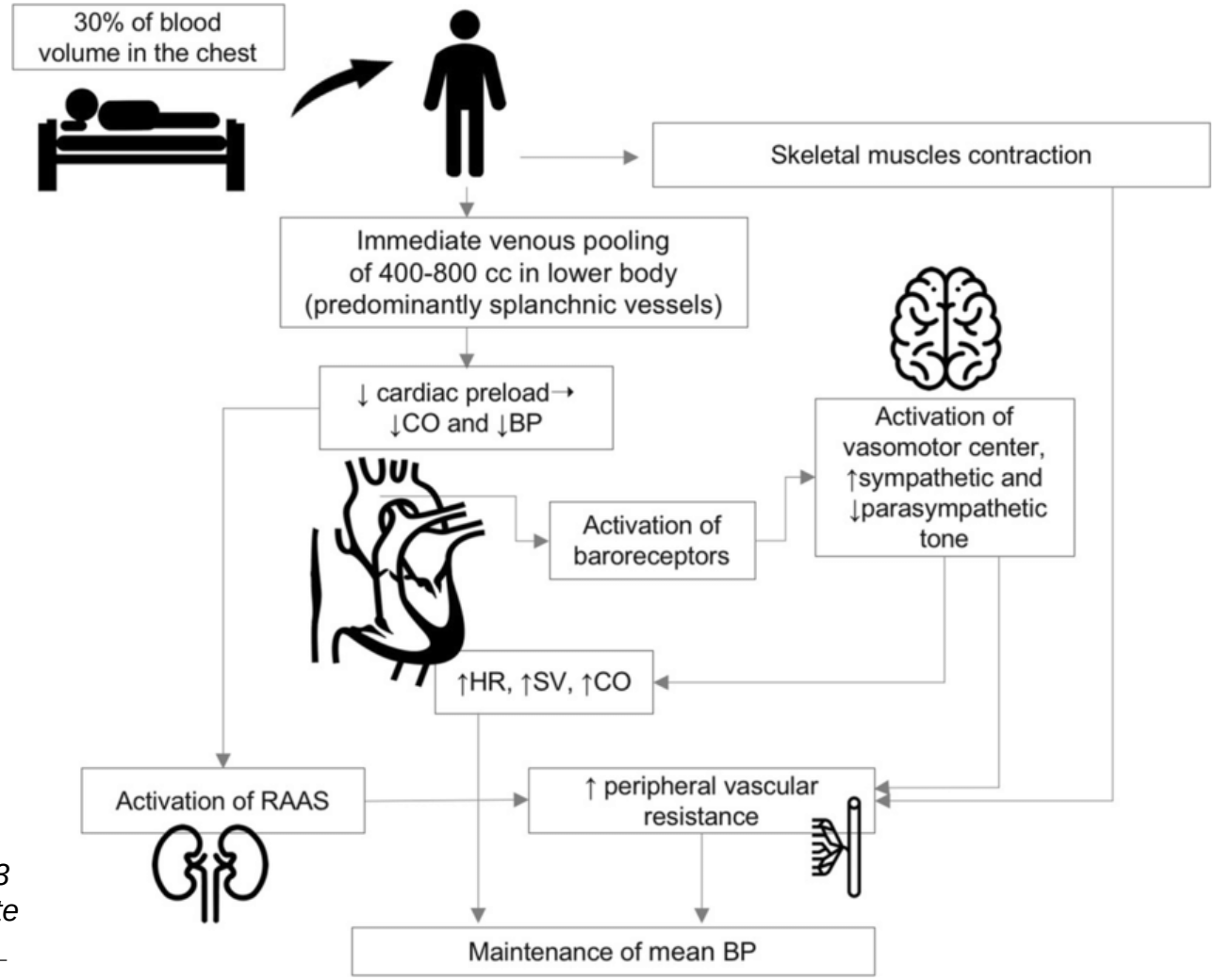
Regulation of blood circulation upon orthostasis



https://www.researchgate.net/publication/343407493_Addressing_Orthostatic_Hypotension_in_Heart_Failure_Pathophysiology_Clinical_Implications_and_Perspectives

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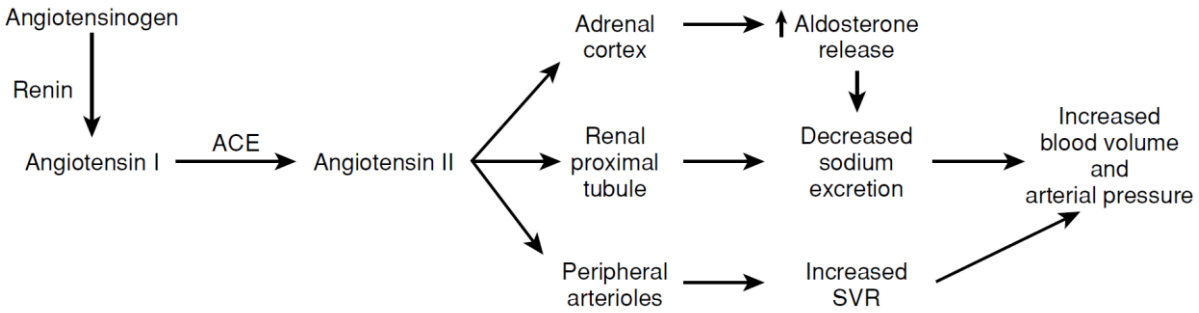
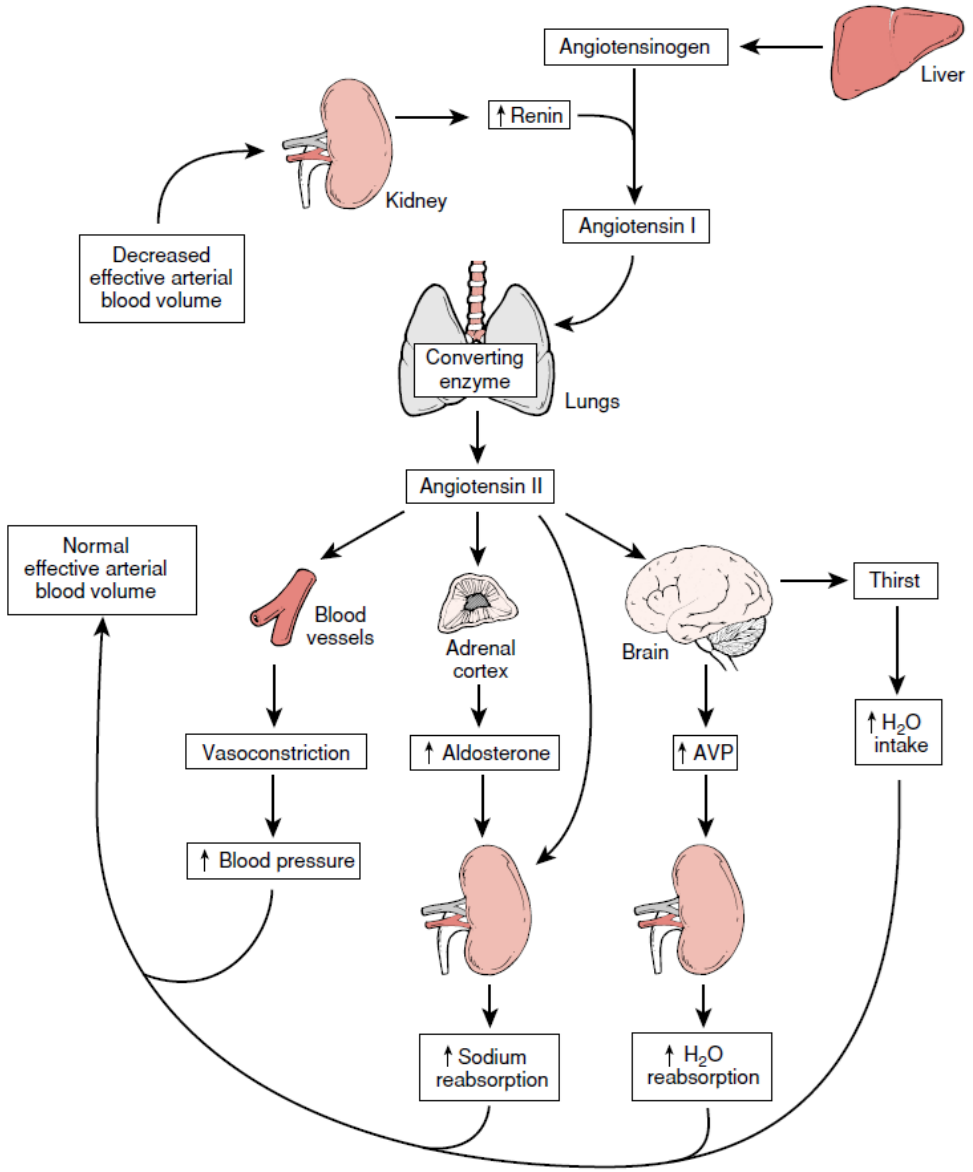
RAAS





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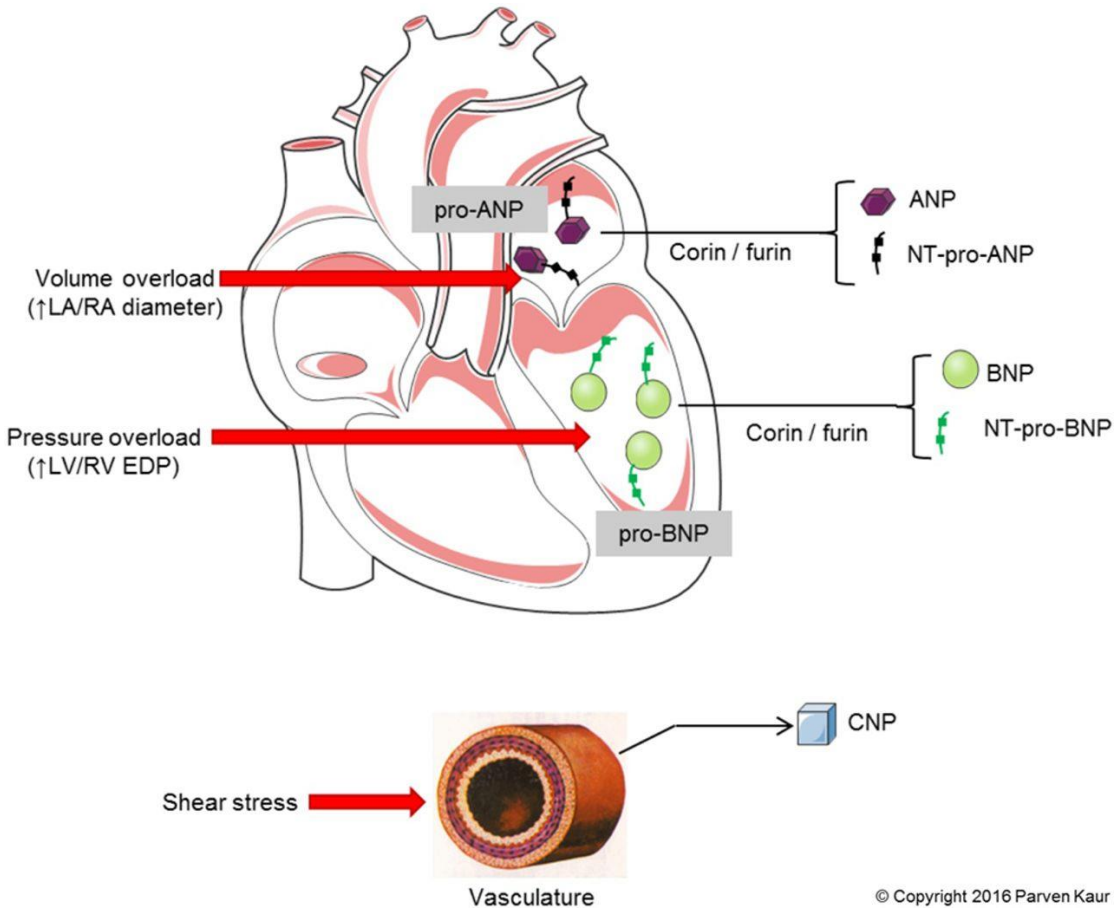
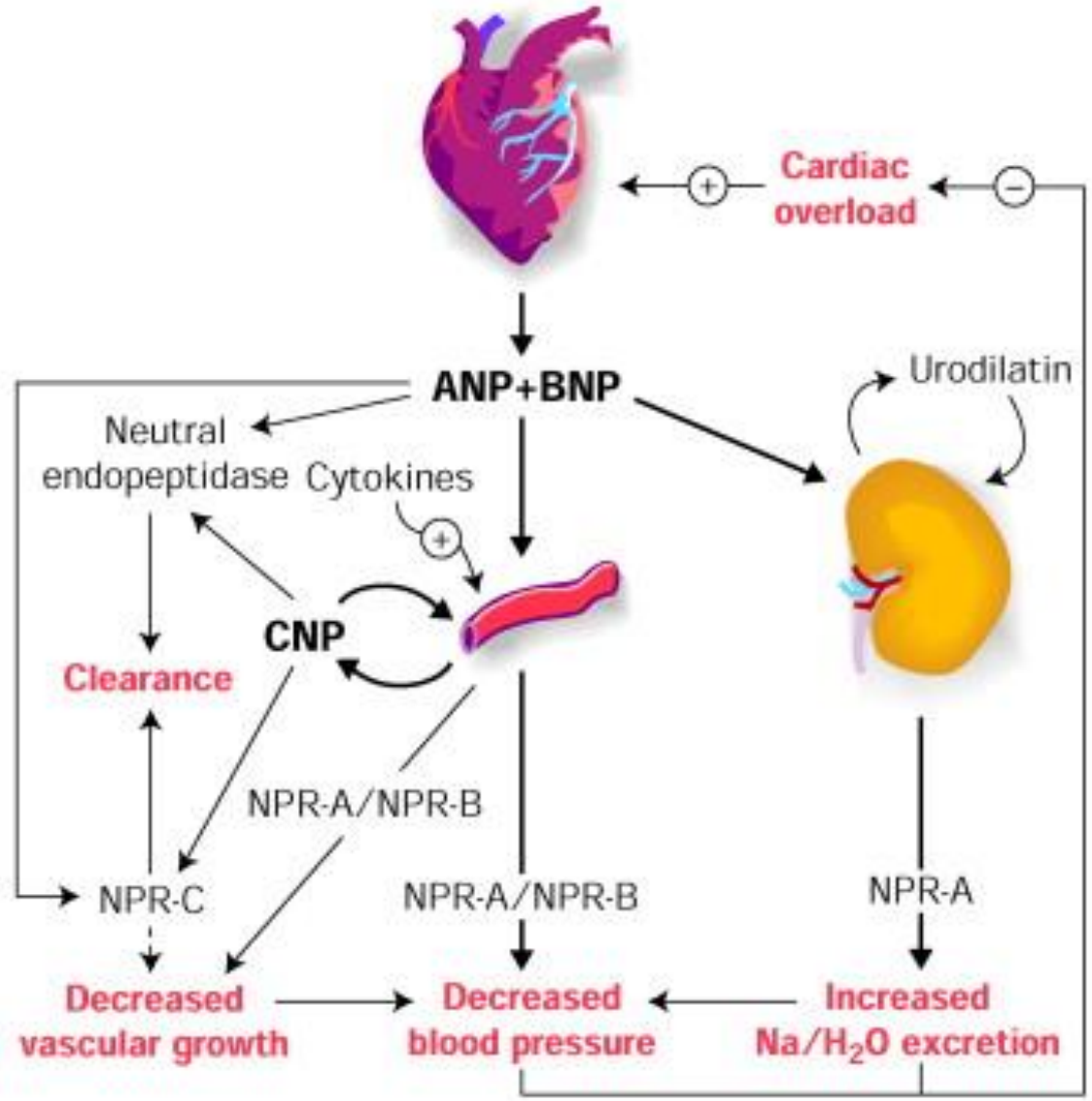
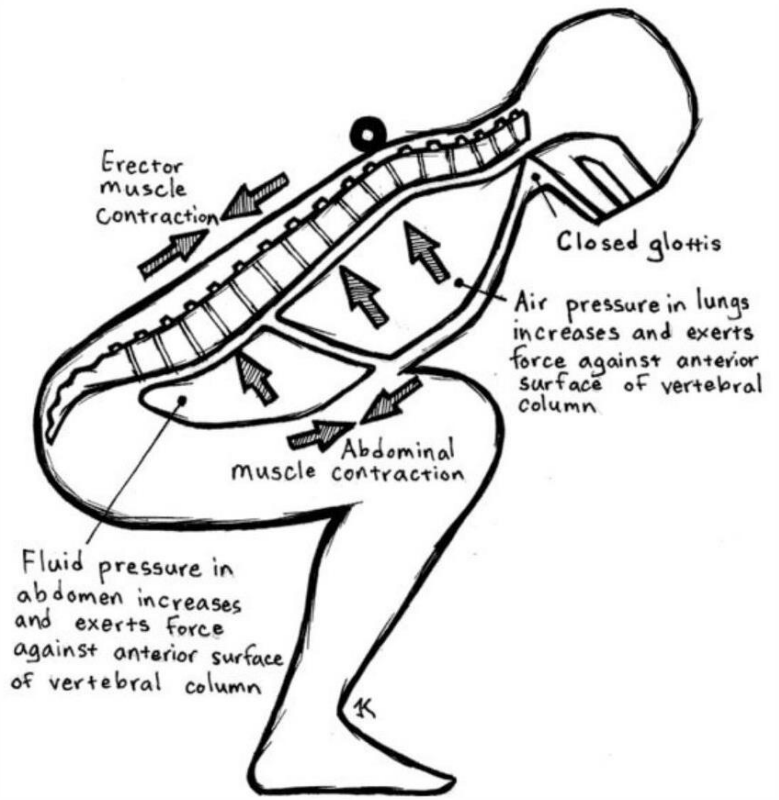
Natriuretic peptides

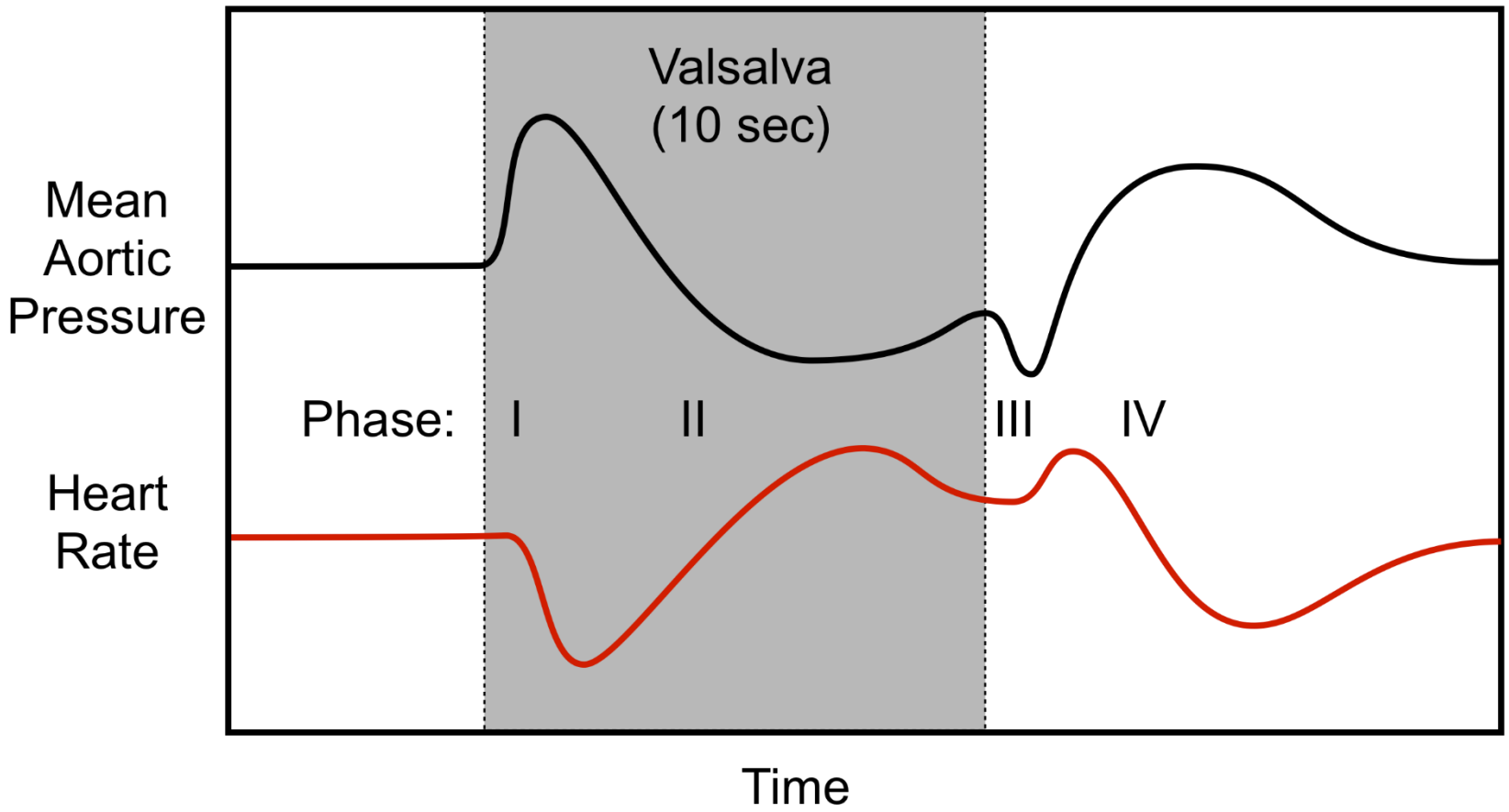




https://heart.bmj.com/content/103/20/1569

Valsalva maneuver





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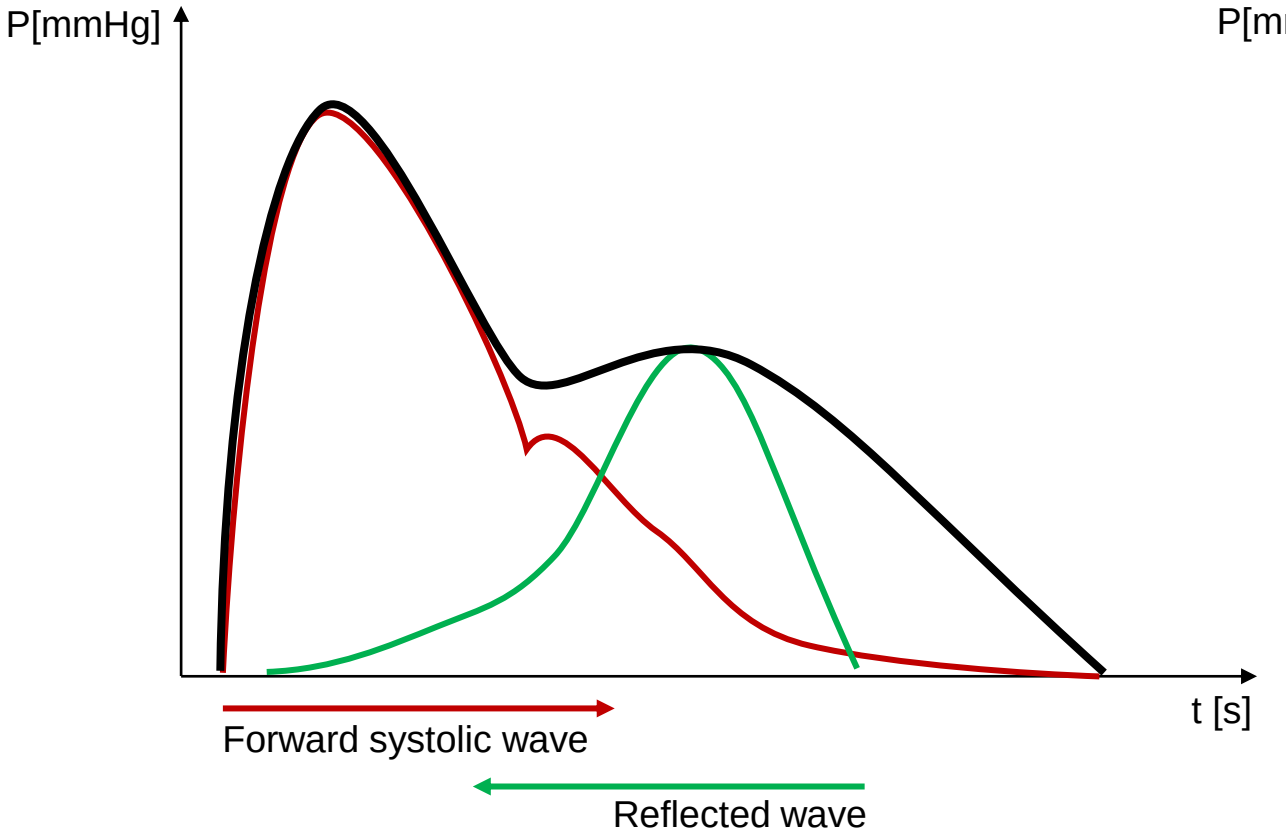
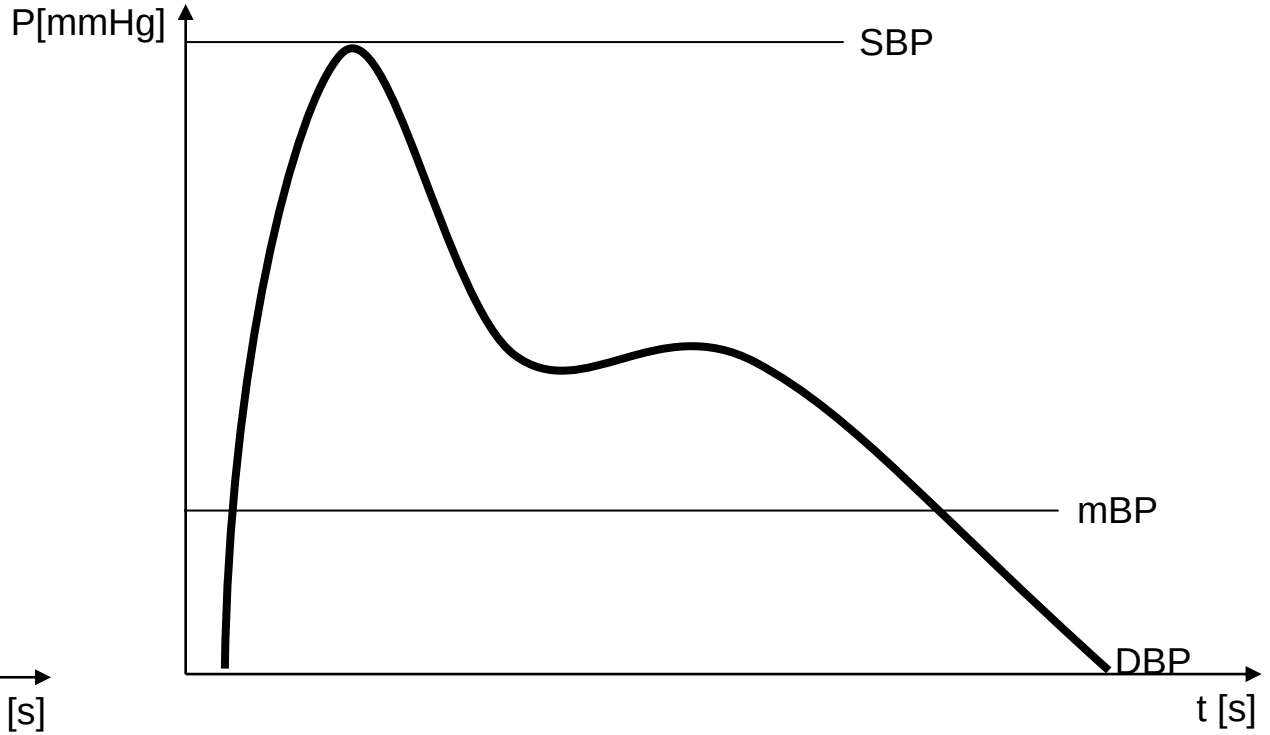
Pulse wave





PP=SBP – DBP

mBP=DBP+1/3PP

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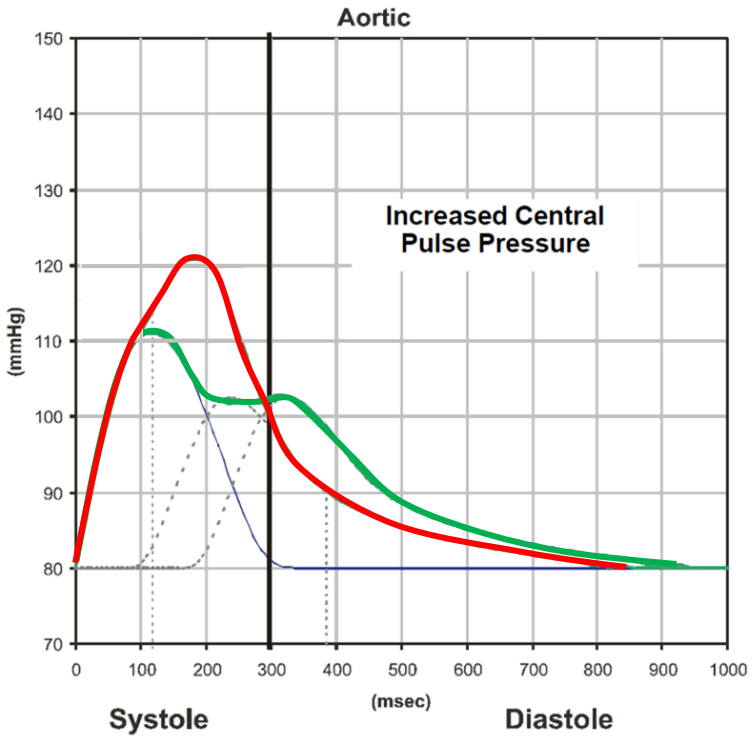
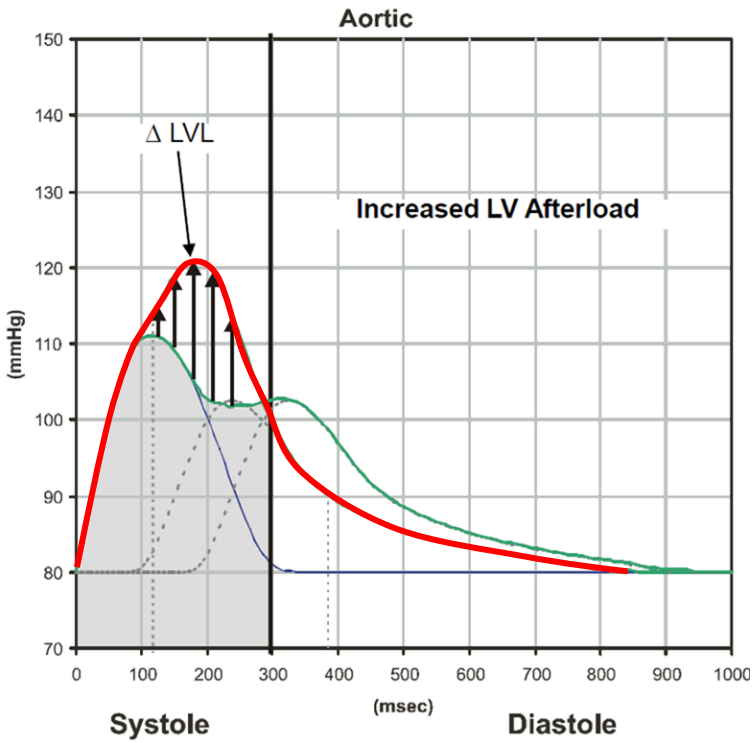
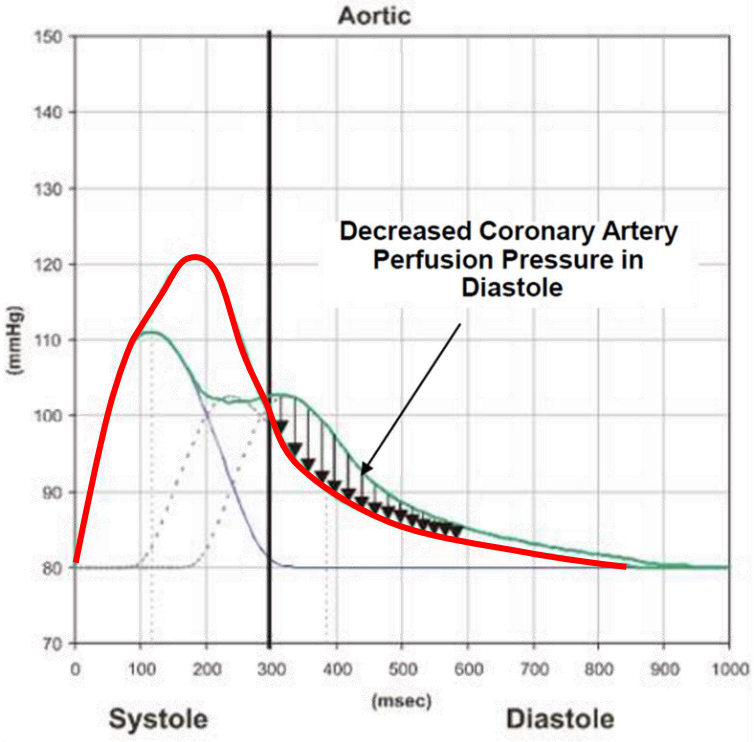
Higher arterial stiffness







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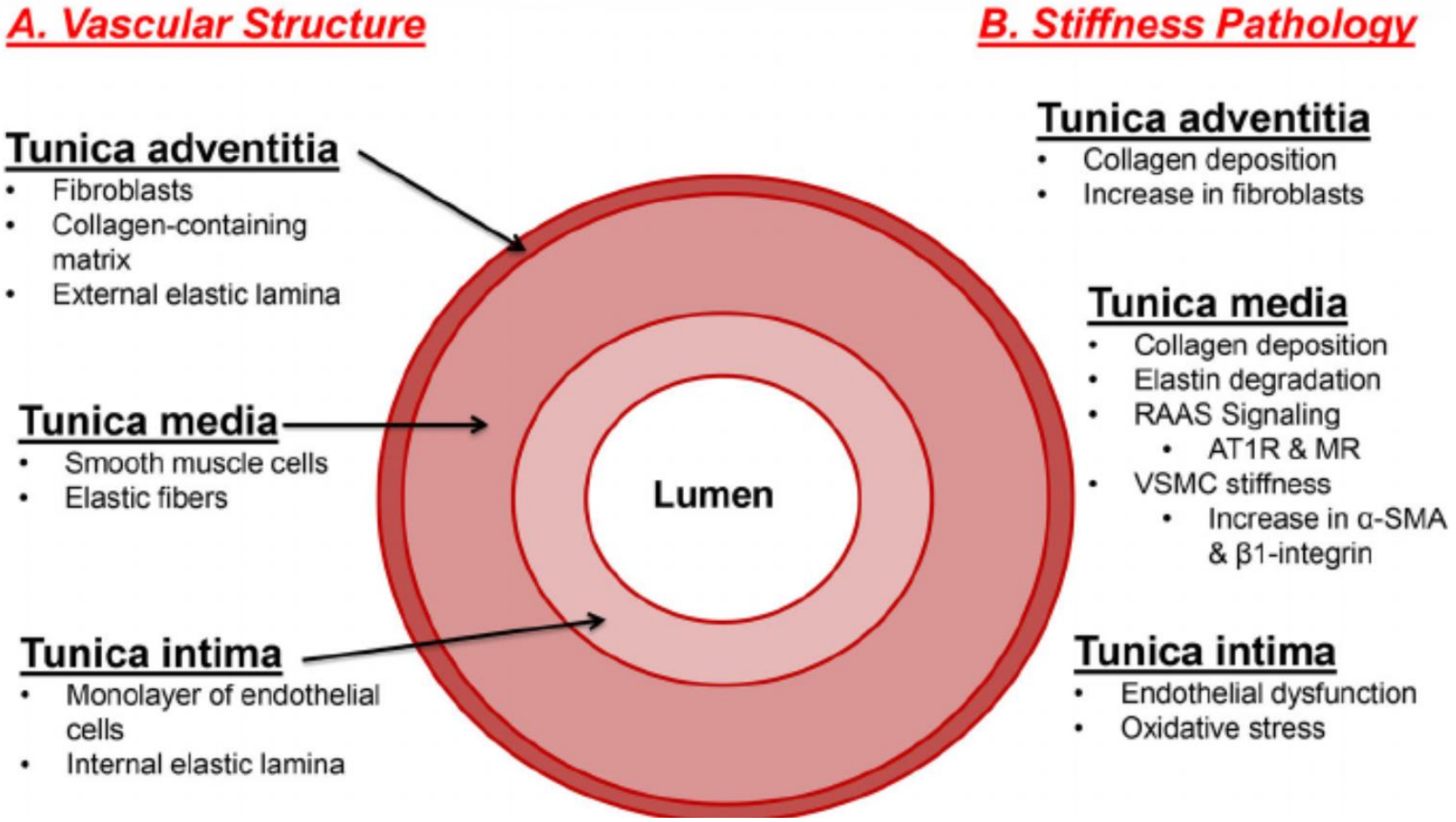
Factors of arterial stiffness changes



- Elastin degradation
- Collagen deposition
- Endothelial dyfunction

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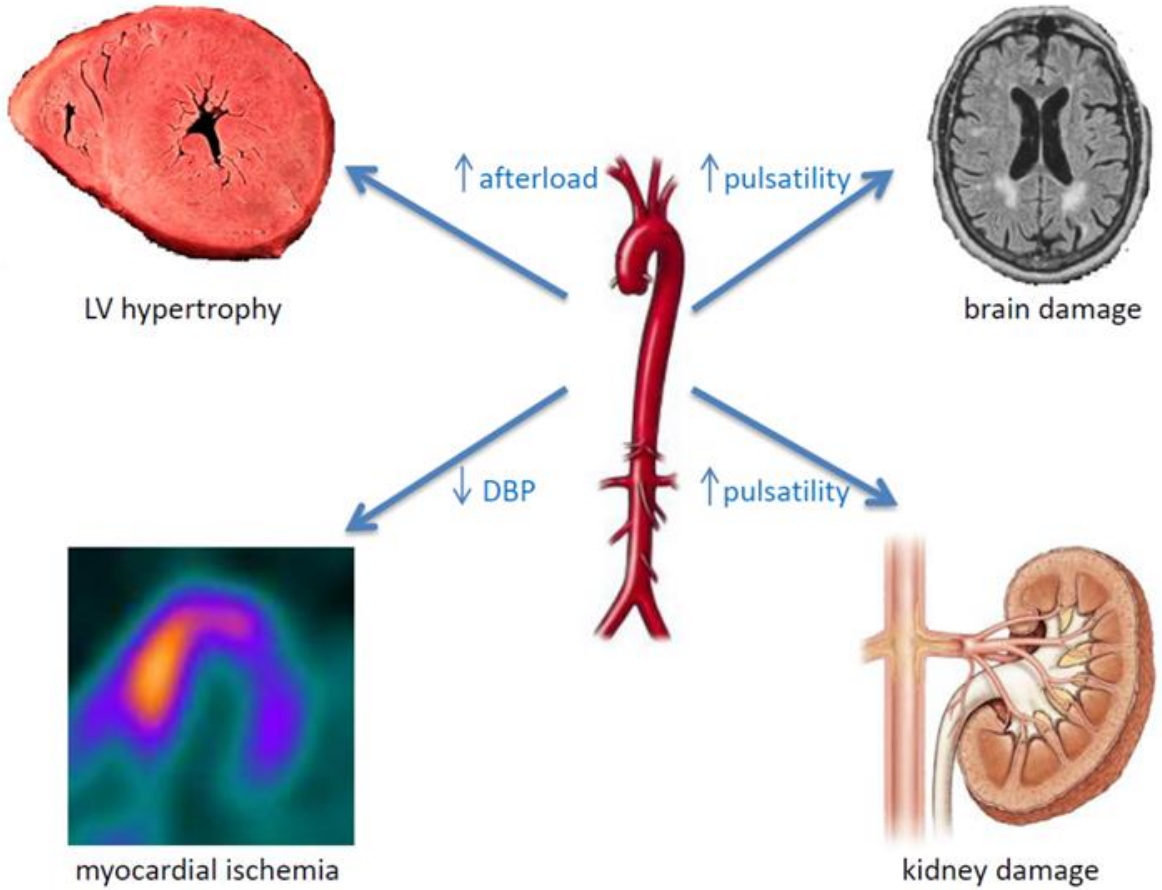
Complications of the higher arterial stiffness

- ↑SBP
- ↓DBP
- ↑PP



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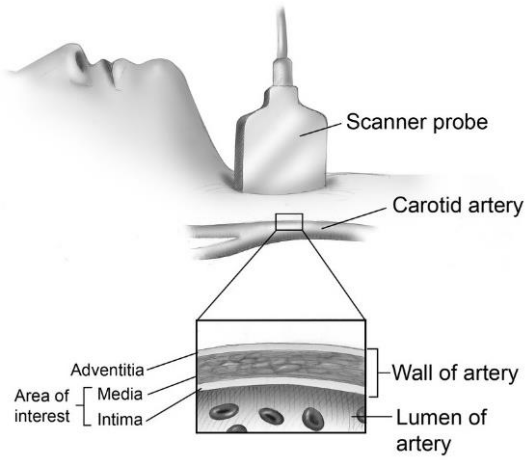
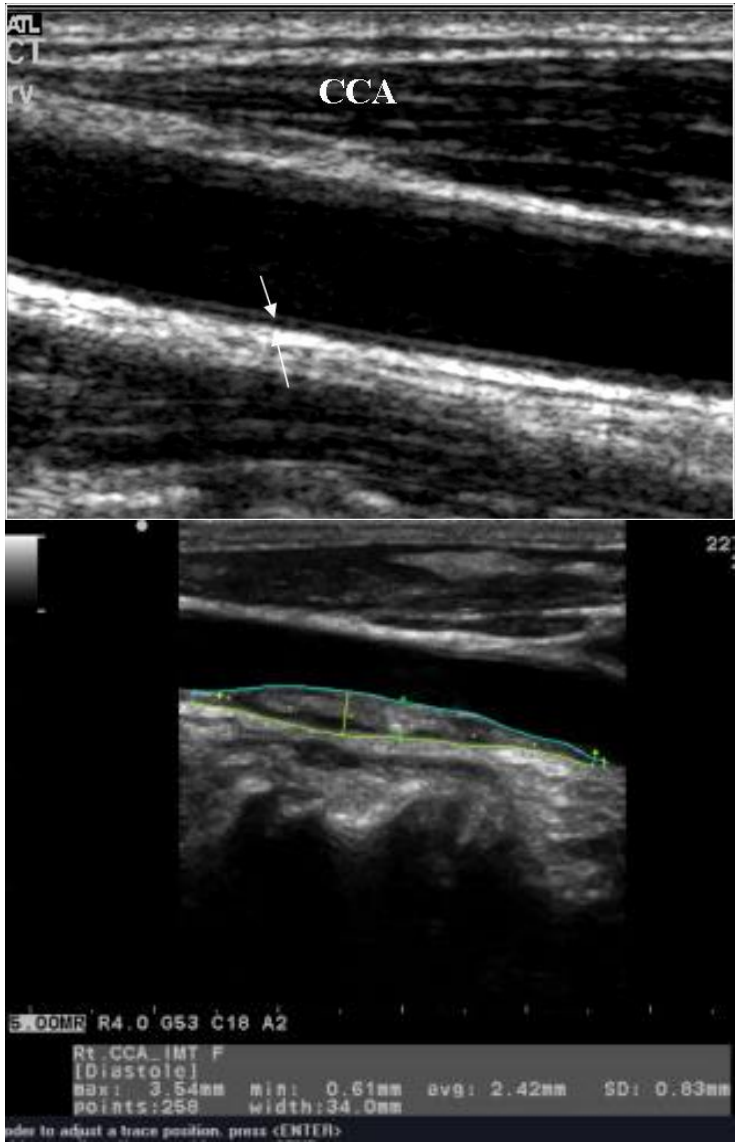
Ultrasound measurement





age		IMT_R (mm)	IMT_L (mm)
25-35	Mean	0.39±0.07	0.40±0.07
	V%	18.26	17.37
	CI	0.36<x<0.42	0.38<x<0.42
35-45	Mean	0.43±0.07	0.46±0.09
	V%	15.15	18.59
	CI	0.41<x<0.45	0.43<x<0.49
45-55	Mean	0.47±0.08	0.50±0.11
	V%	17.49	21.18
	CI	0.44<x<0.50	0.47<x<0.54
55-65	Mean	0.52±0.11	0.54±0.11
	V%	21.01	20.89
	CI	0.48<x<0.56	0.50<x<0.58
65-75	Mean	0.55±0.09	0.57±0.09
	V%	16.65	14.60
	CI	0.53<x<0.59	0.55<x<0.61

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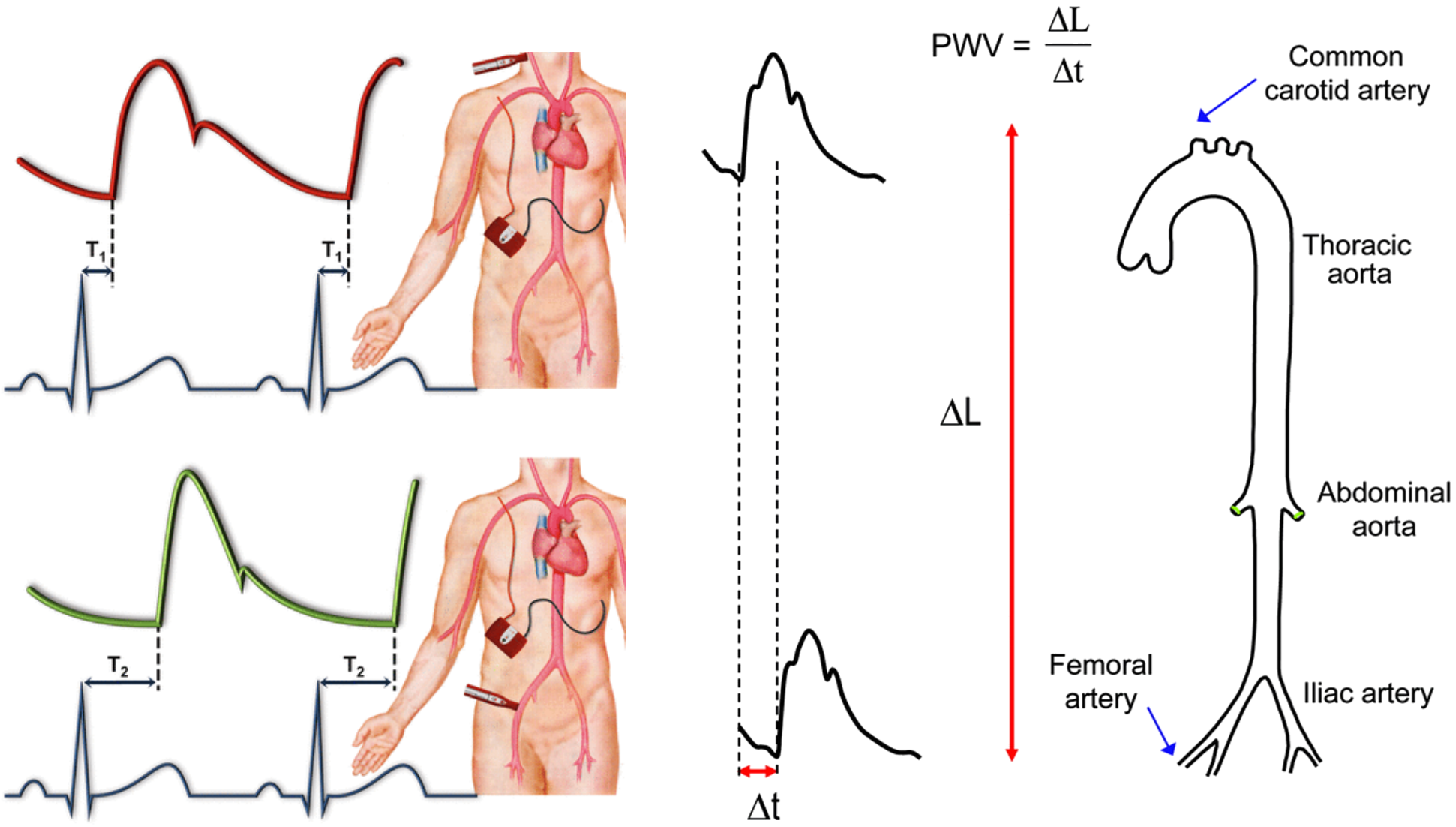
PWV



A highly compliant aorta has a relatively low PWV (< 6 m/s)

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Methods of the arterial blood pressure measurement

Palpatory
(sphygmomanometer)

Oscillometric

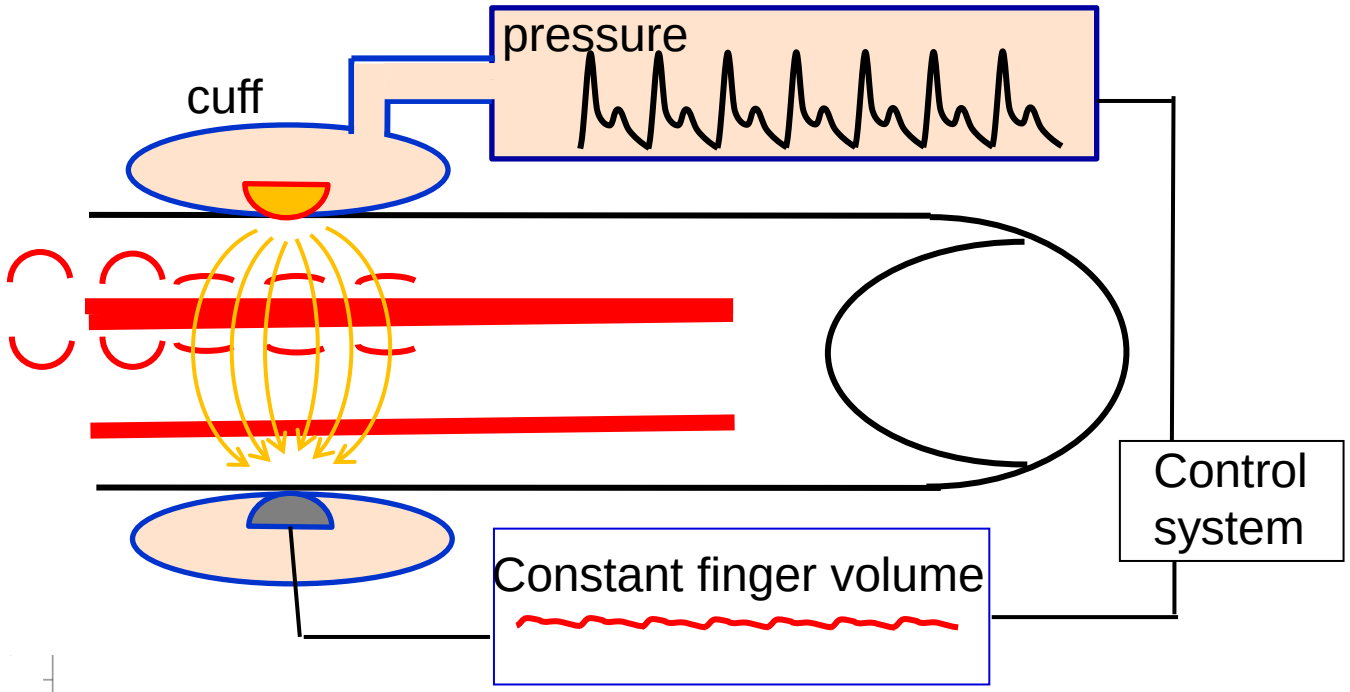
Auscultatory
(sphygmomanometer,
stethoscope)

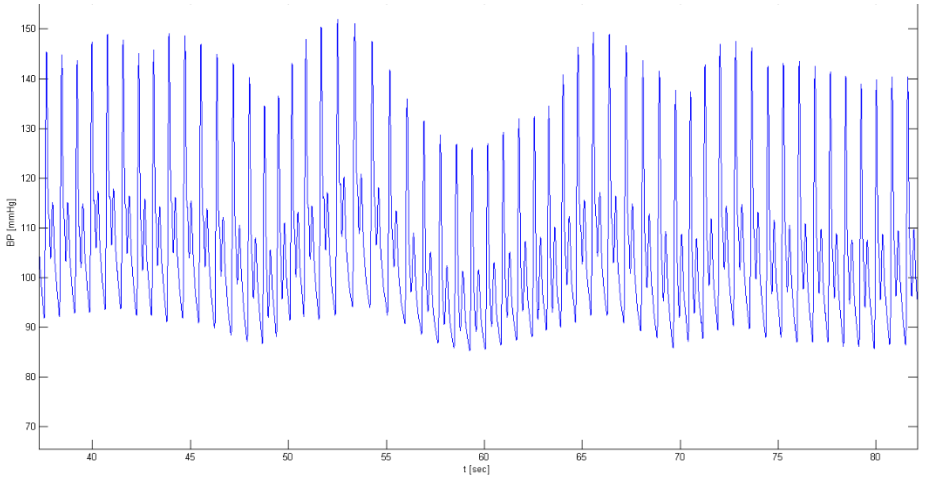
24-hour blood pressure
monitoring

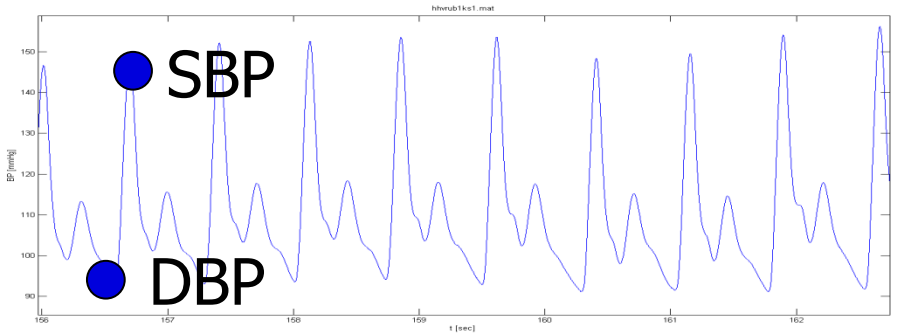
Photoplethysmographic
(volume-clamp method, Peňáz)

Photoplethysmography

Control system:
Correction of the pressure in the finger cuff according to the arterial lumen changes.
Aim: maintaining of constant arterial lumen through pressure changes in the cuff.







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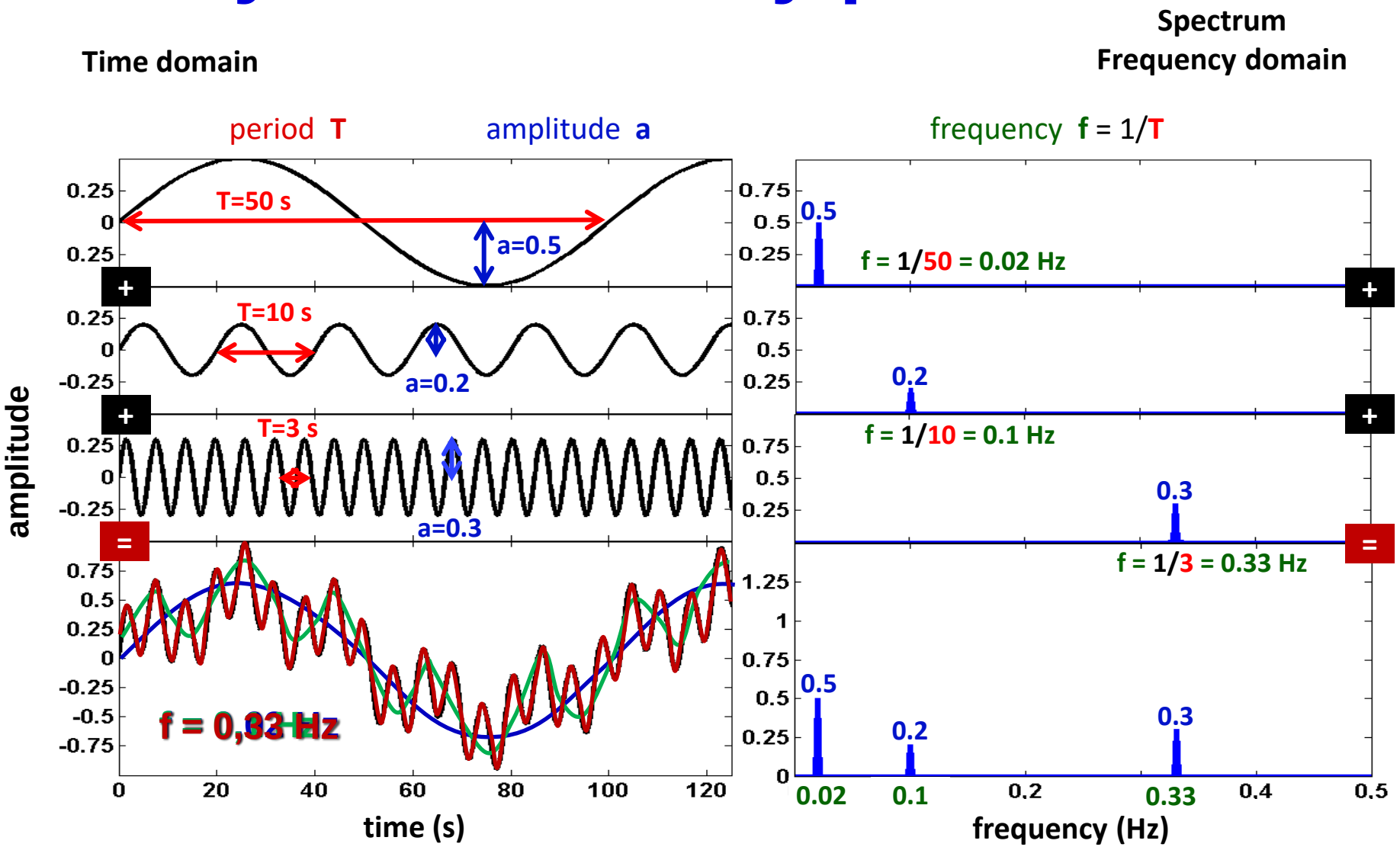
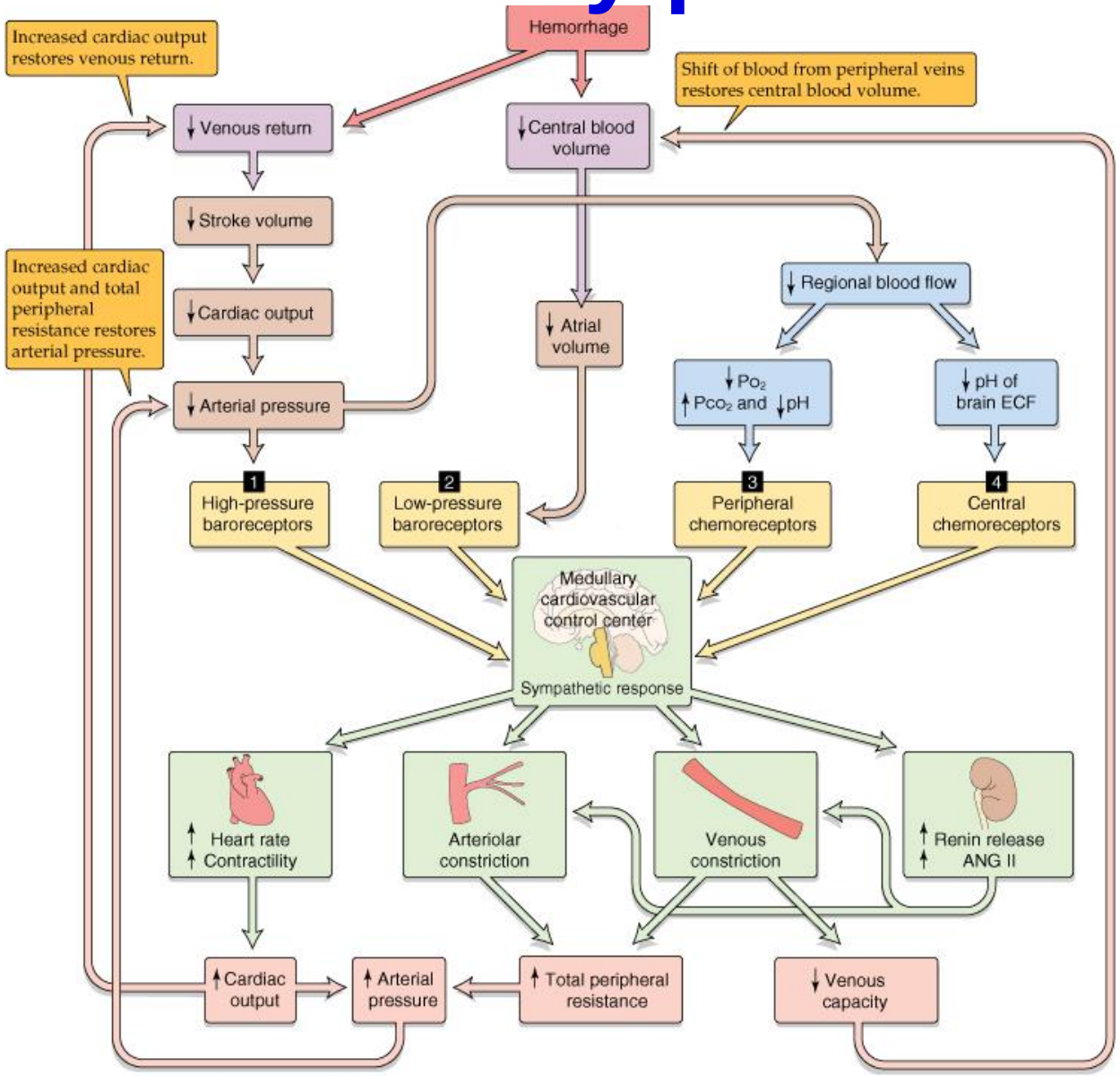
Variability of circulatory parameters



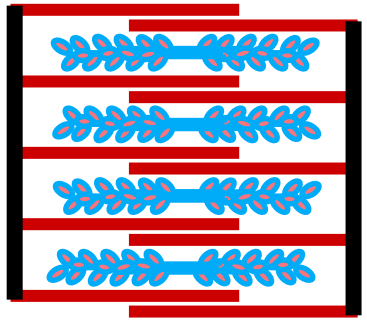
Variability of circulatory parameters



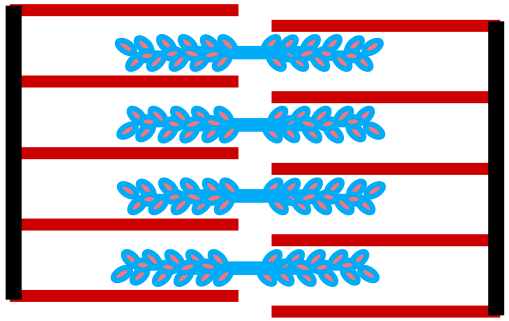
Elsevier, Boron and Boulpaep, Medical Physiology, Updated edition

Autoregulation of cardiac contraction

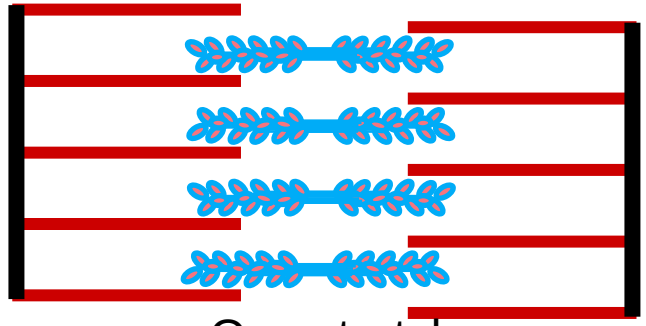
- Heterometric autoregulation



Resting filling

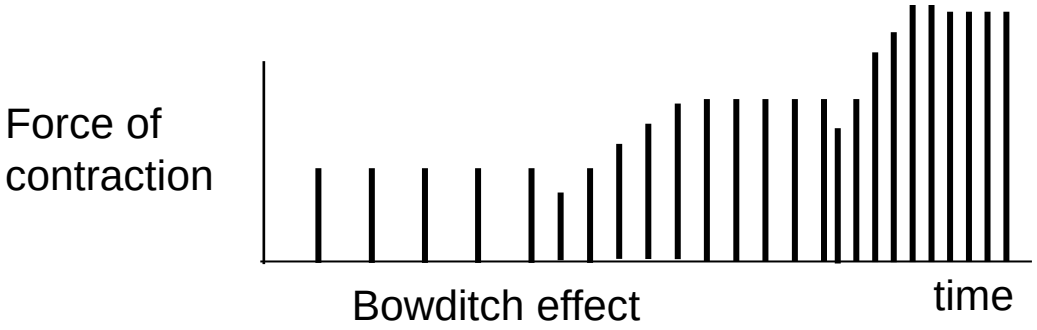


Ideal filling



Overstretch

- Homeometric autoregulation



Intracellular Ca
vs.
Extracellular Ca

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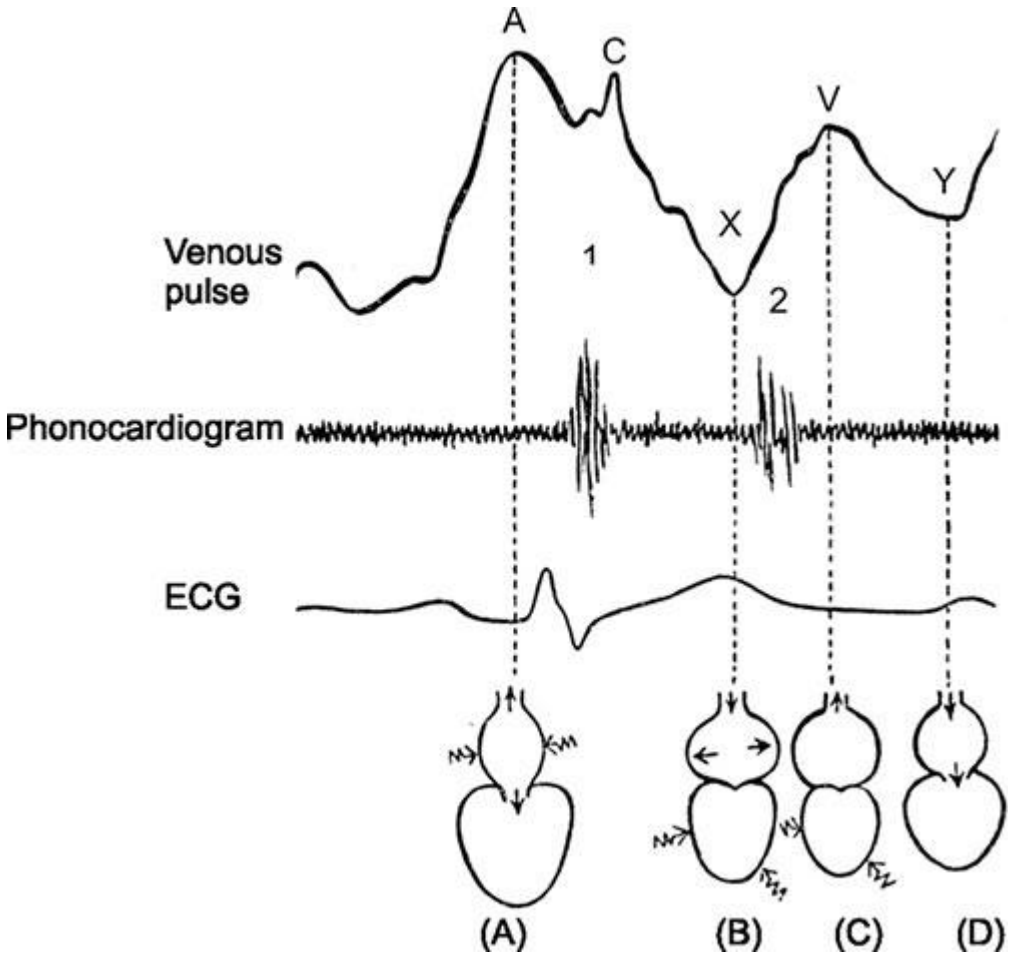
Phlebogram



- Atrial systole (a)
- Isovolumetric contraction (c)
- Ejection phase (x)
- Isovolumetric relaxation (d)
- Filling phase (y)

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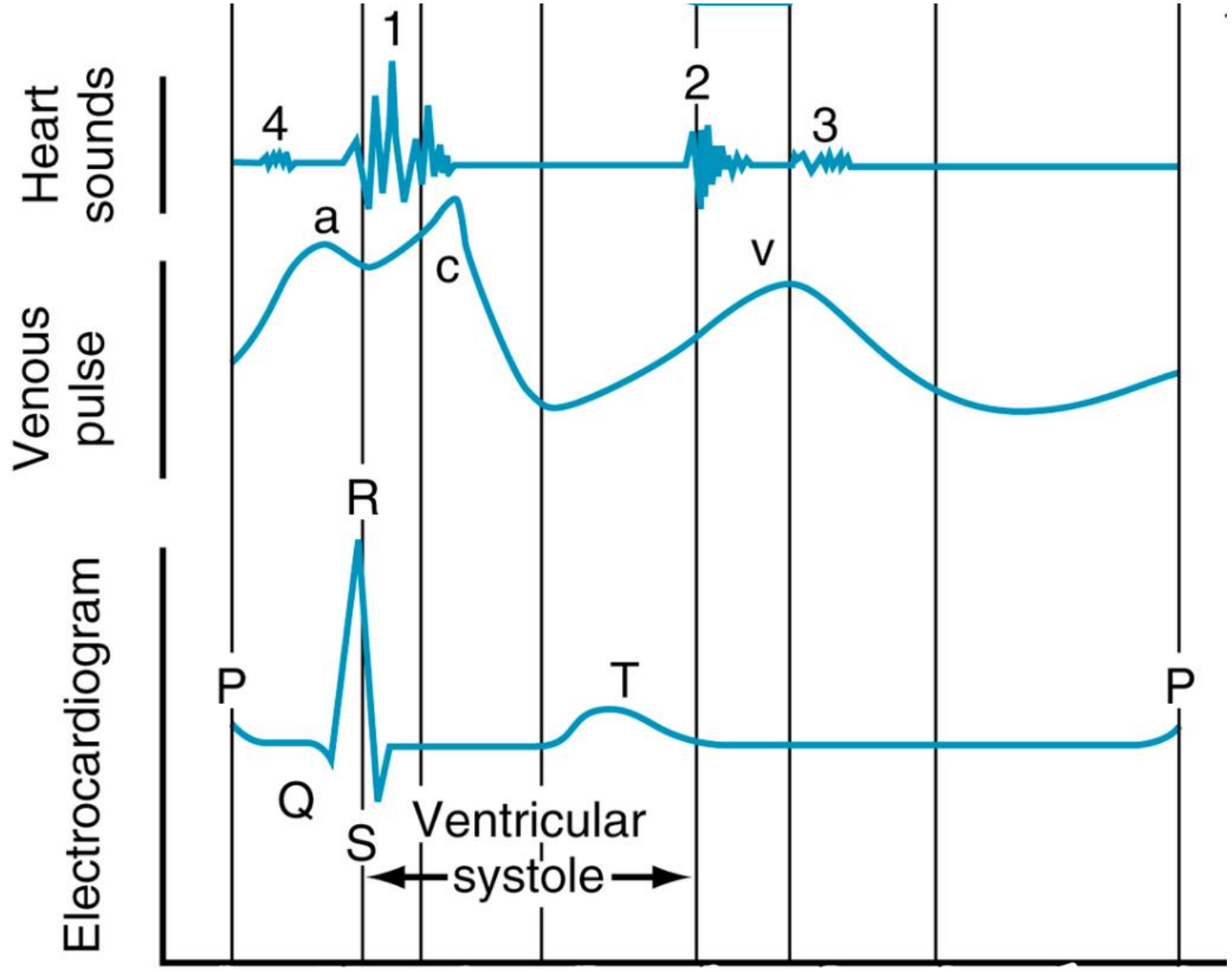
Phlebogram



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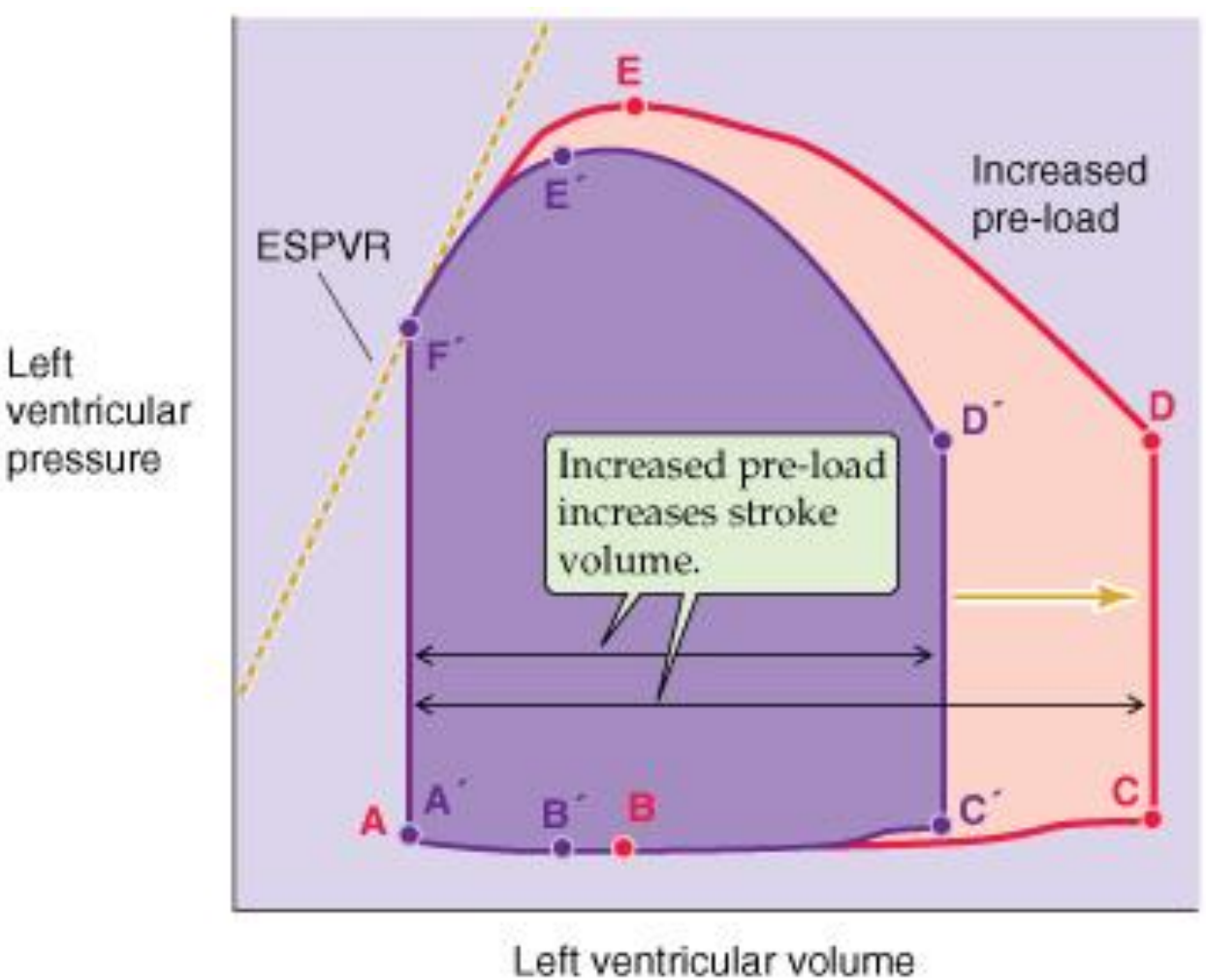
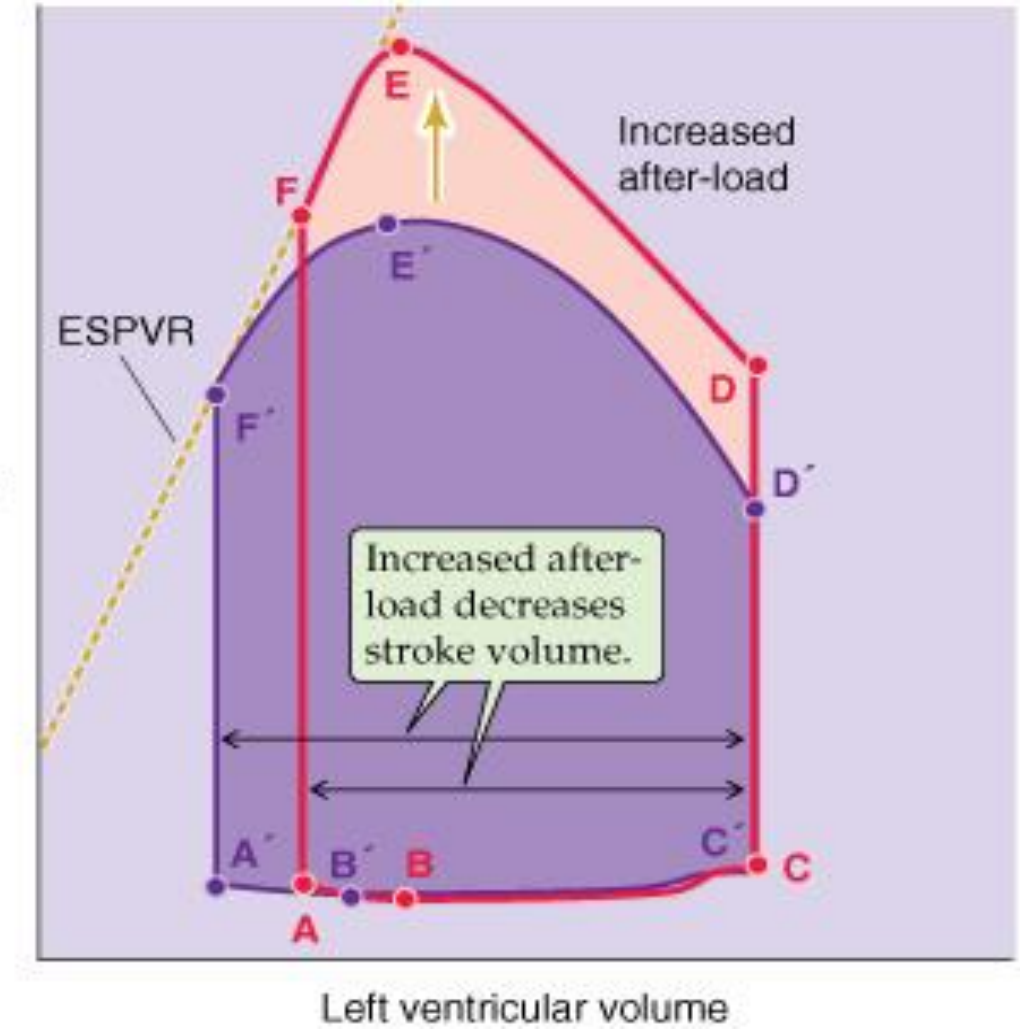
Determinnts of cardiac perfprmance





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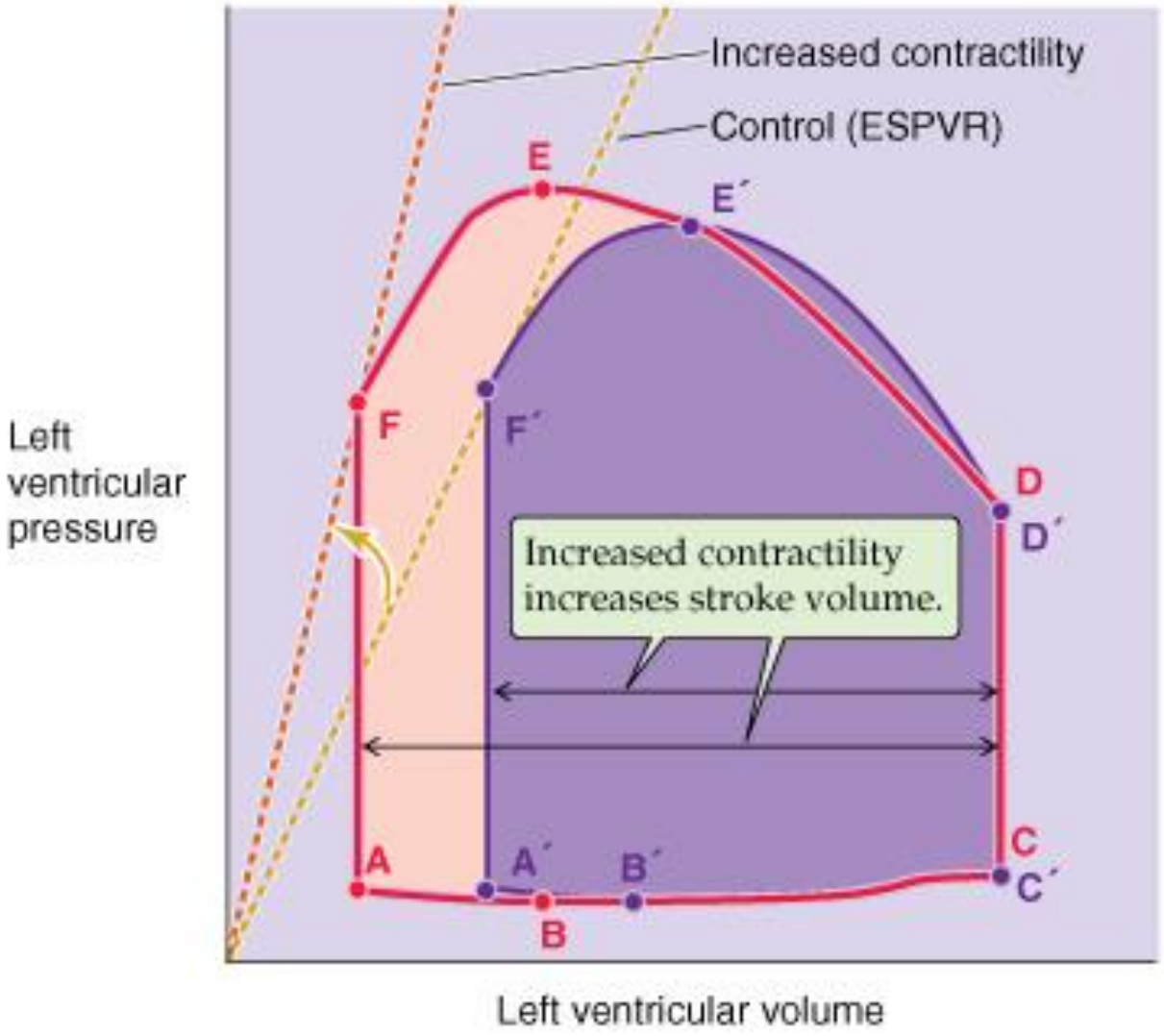
Determinnts of cardiac perfprmance



Contractility ≠ Force of contraction

Contractility => Force of contraction

Contractility = ability for contraction

ATP, Ca, O_2

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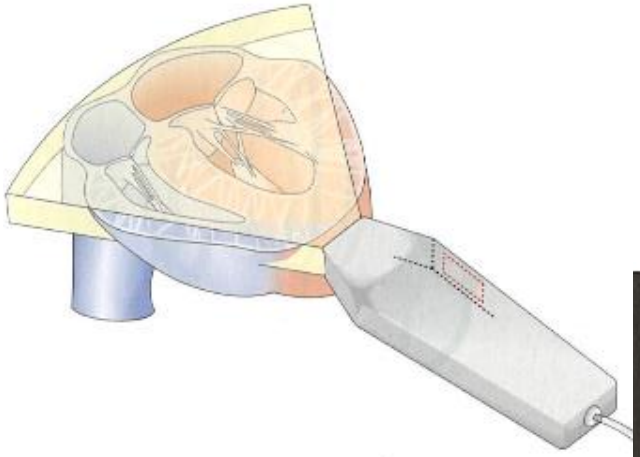
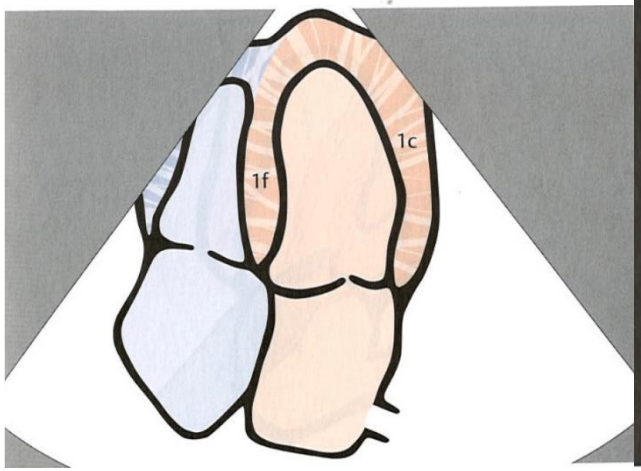
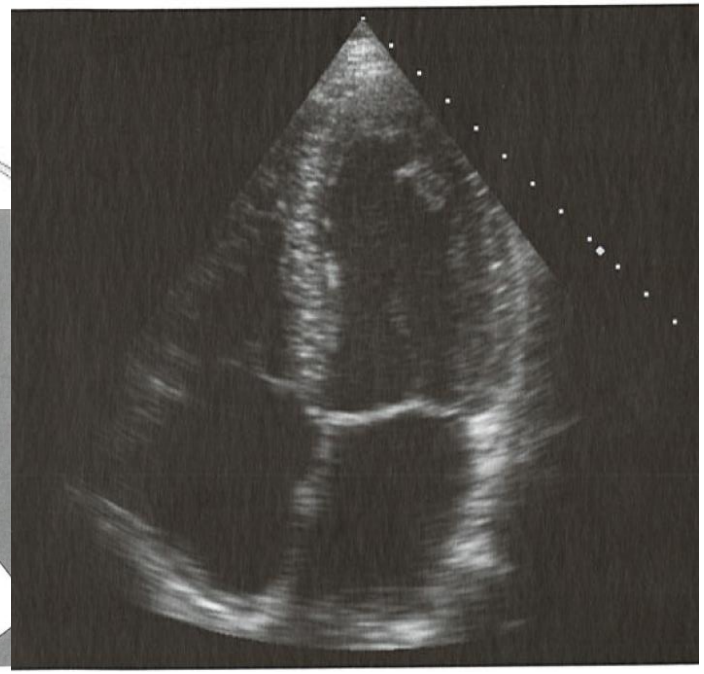
Contractility





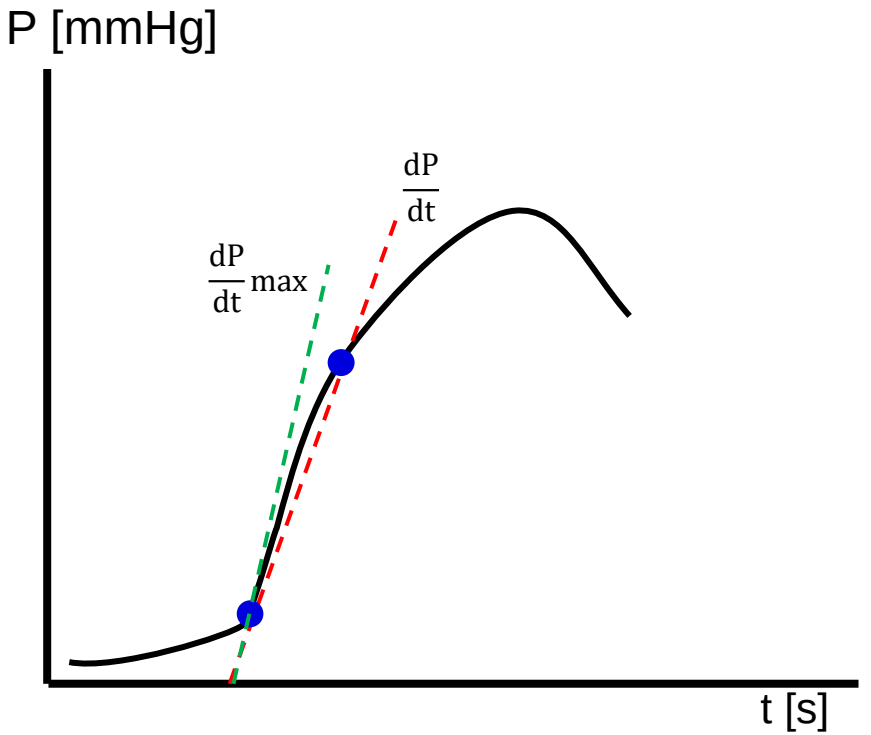
$$EF=\frac{SV}{EDV}100\%$$

EF>60%



$$\frac{dP}{dt}=\frac{DBP-EDBP}{IVC}$$

$$\frac{dP}{dt}max$$



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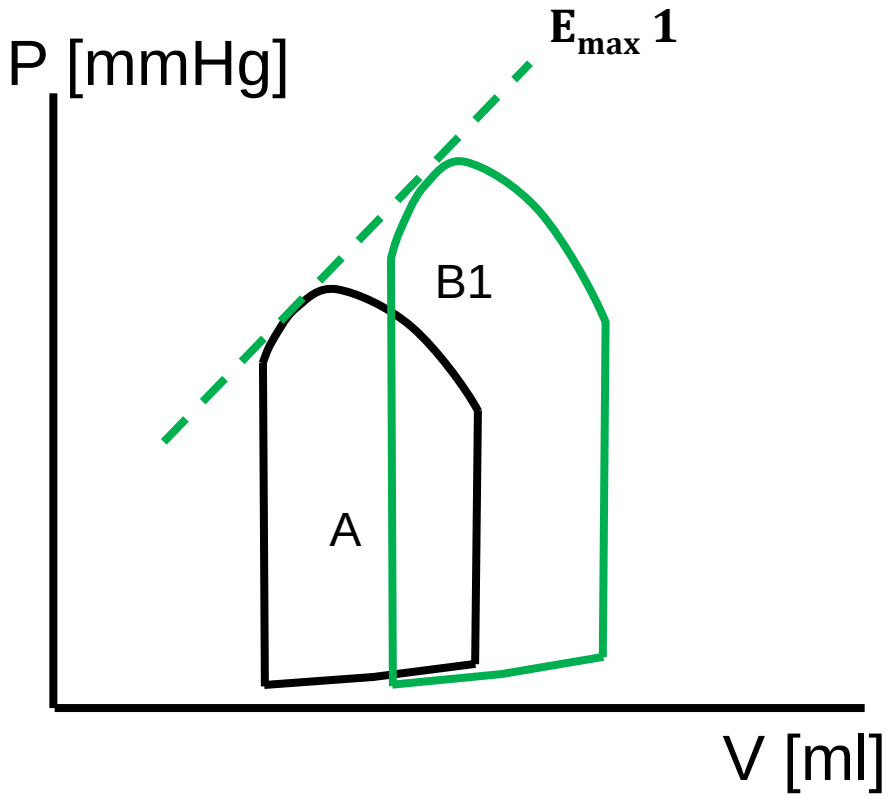
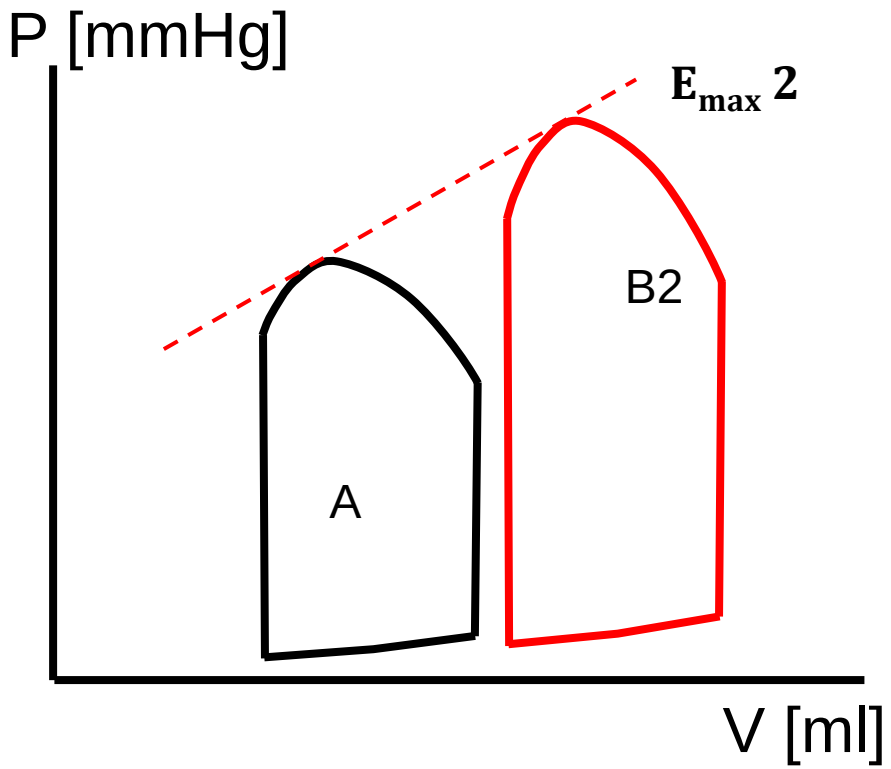
Contractility

$$\text{Emax} = \frac{\text{dP}}{\text{dV}}$$

Index podle Sagawa-Suga





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Thank you for your attention

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