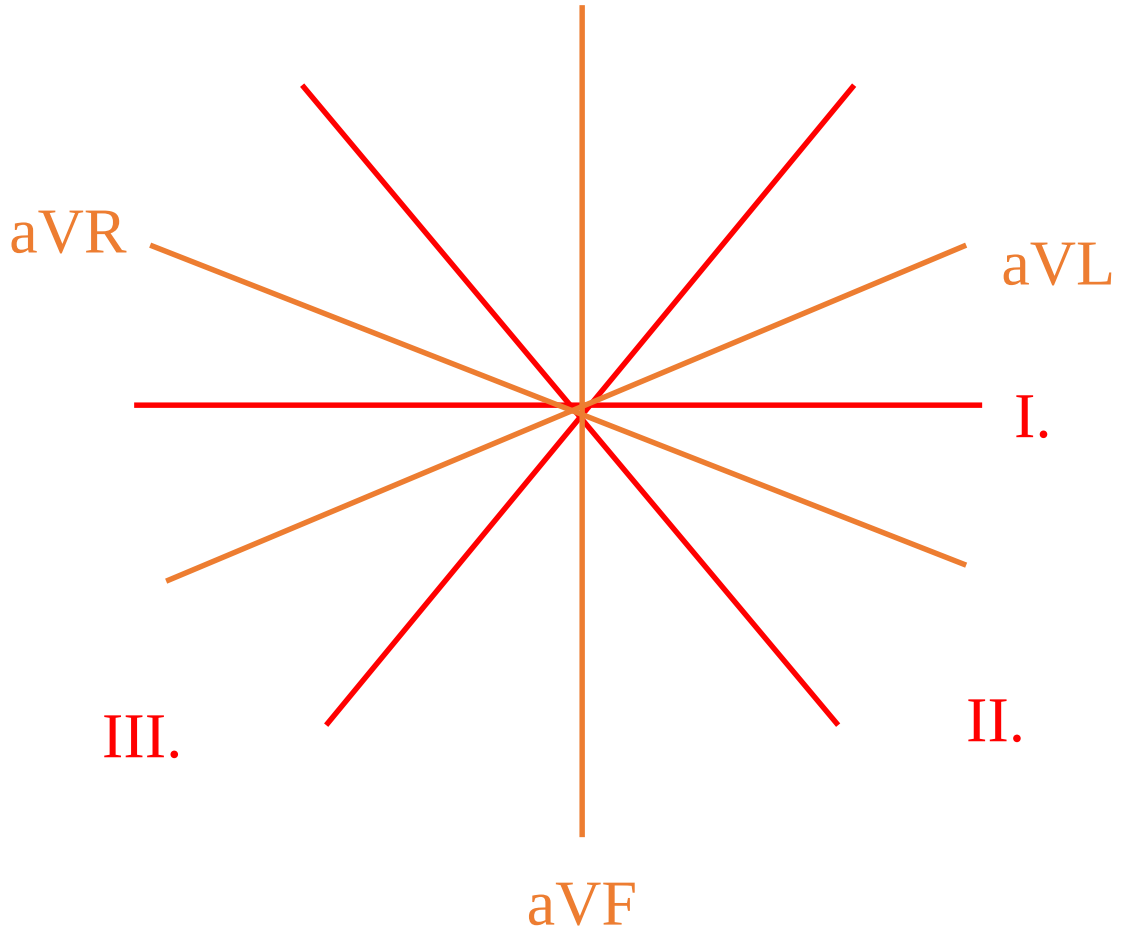
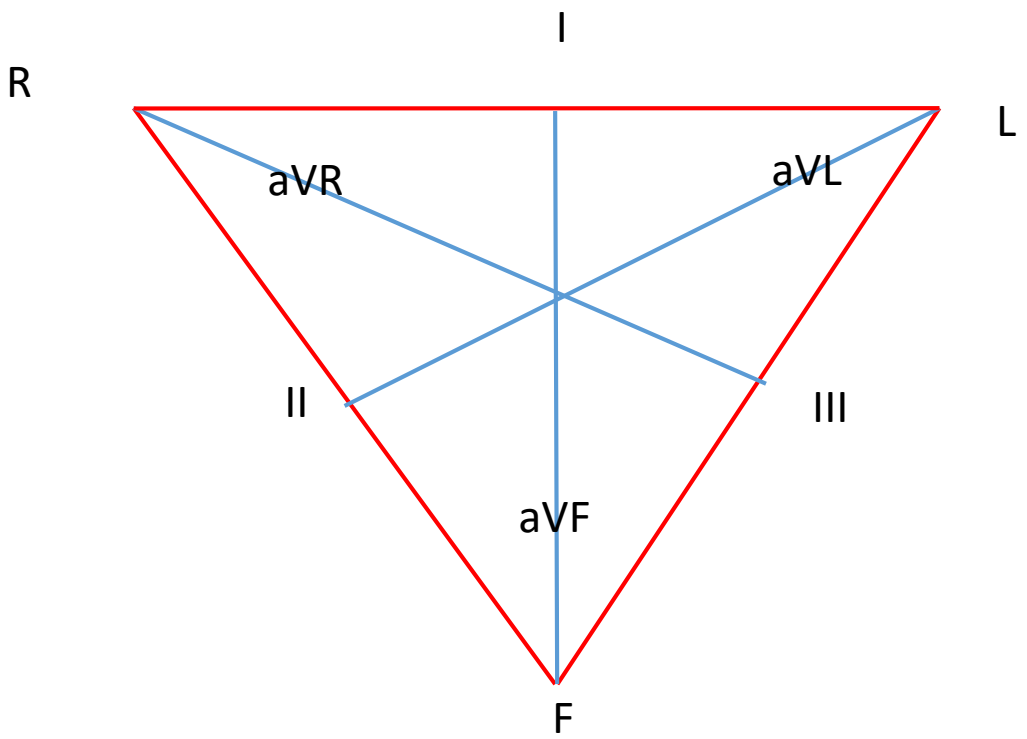
HEXAAXIAL SYSTEM




I
R
L
aVR
aVL
II
III
aVF
F

RESPIRATORY (SINUS) ARRHYTHMIA

1847, Ludwig, ECG and breathing of dog – respiratory sinus arrhythmia

Detectable already during prenatal life.

Present in numerous species in animal kingdom – in all vertebrates.

Physiological meaning ???? STABILISATION OF MEAN BP (protection against mechanical effect of intrathoracic pressure on arterial BP)

Key effect of parasympathetic NS(decrease of its tonus), sympathetic NS modulates.

MECHANISMS:

1) CENTRAL
2) REFLEXES FROM LUNGS
3) REFLEXES FROM BARORECEPTORS
4) REFLEXES FROM RECEPTORS IN THE RIGHT ATRIUM
5) LOCAL EFFECTS ON SA NODE
6) EFFECT OF OSCILLATIONS OF pH, paO_2, $paCO_2$

Central mechanisms

- Central generator of RSA
- Respiratory neurons in medulla oblongata hyperpolarise preganglionic vagal neurons
- Vagal tonus decreases during inspiration – HR increases

Reflexes from lungs – inflation reflexes

- Stimulation of vagal stretch-receptors during inspiration supresses

  inspiratory centre and also cardio-inhibitory centre in medulla

  oblongata

Reflexes from baroreceptors

- Diverse opinions about the effect of arterial baroreceptors on RSA

- Fluctuation of sensitivity of baroreceptors during respiratory cycle

Reflexes from receptors in the right atrium

- Bainbridge, 1915
- Reflex increase of HR during atria stretching
- Applicable in explanted (denerved) heart

Local effects on SA node

- Stretching of SA node causes faster spontaneous depolarisation
- Effect of mechanosensitive chloride channels
- Changes of SA node perfusion (a. centralis) and possible compression of SA node by expanding lungs

Effect of oscillations of pH, p_aO_2 a p_aCO_2

- Oscillatory activity of peripheral chemoreceptors contributes to formation of RSA and increases its amplitude