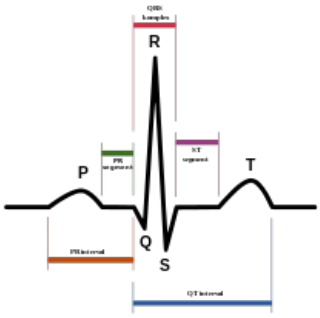
ECG (Paediatrics)

When recording ECG waveforms, we use a twelve-lead recording: three bipolar limb leads I, II, III; three unipolar limb leads (aVR from the right hand, aVL from the left hand and aVF from the left leg); six unipolar chest leads V1−V6.

- For children, we use a paper displacement speed of 50 mm/sec, then 1 mm = 0.02 s, a potential of 1 mV has a height of 10 mm.
- The artifact is only found in some leads, while a pathological finding - e.g. extrasystole is found in all simultaneously filmed leads.



ECG waveform

Basic characteristics of ECG

- Wave **R** = 1st positive wave in the QRS complex.
- Wave **Q** = 1st negative wave in the QRS complex.
- Wave **S** = negative oscillation following the R wave.
- We measure the **heart axis** according to the "biggest" oscillation in I. and III. drain:
  - if the vibrations go "towards each other" → tilt to the right → predominance of the P chamber (remembering aid: in "true" love, the vibrations go to each other);
  - if the oscillations go "apart from each other" → inclination to the left → predominance of the L chamber;
  - if the oscillations go "in one direction" → transitional forms.

- The predominance of the P chamber is further characterized by the predominance of positive R oscillations in leads from the right precordium V1−V3 and the predominance of negative S oscillations over the left precordium V5−V6.
- When the L chamber predominates, the opposite is true, negative S oscillations predominate over the right precordium, positive R oscillations over the left.

- *Hypertrophy PK* → R in V1 > 20 mm at any age.
- *LV hypertrophy* → S in V1 > 20 mm, R in V6 > 20 mm at any age.

- ***Up to 1 year, the P chamber predominates physiologically, from the age of 3 the L chamber begins to predominate.***

According to the ECG, we determine the frequency, rhythm, electrical axis, PQ, QRS and QTc intervals, the shape of the ST segment and the size of the heart compartments.

Determination of heart rate (SF)

We multiply the number of QRS complexes in the recording during 5 seconds by 12 times and get SF per minute.

According to the place of excitement, we will determine the heart rhythm

- Physiological is **sinus rhythm**, which has a positive P wave in standard limb leads I, II, III, which physiologically precedes the QRS complex.
- If we find a negative P wave in one of these leads and the QRS complex is normal, it is an **ectopic rhythm**.
- If the P wave is absent in all leads and the QRS complex is normal, it is a **junctional rhythm**.
- If th'e P wave is absent and the ventricular QRS complex is abnormal, it is a **ventricular rhythm**.
- If there is an abnormal single contraction (maximum of 3 contractions in a row) → it is an atrial, junctional, ventricular extrasystole.
- If there are abnormal more than 3 contractions in a row, we talk about **tachycardia**.

We evaluate the length of the individual intervals − the speed of propagation of the excitation in the conductive system

- The length of the **PQ** interval = the length of the transfer from the atria to the ventricles, it depends on the SF and the age of the child.
  - Prolongation of PQ is found in AV block, on the contrary, shortening in preexcitation syndrome WPW.
- Width of the ventricular complex **QRS** = rate of ventricular depolarization, the width changes with age, but should not exceed 0.10 s.
  - Expansion is found in branch block, ventricular extrasystoles, WPW syndrome, myocardial hypertrophy and hypokalemia.
- Length of the **QT** interval = rate of ventricular repolarization, measured from the beginning of the QRS complex to the end of the T wave; because the length changes significantly with the heart rate, we must correct the current measured length to a uniform heart rate of 60/min. → we get QTc = corrected QT interval.
  - Prolonged in hypocalcemia, hypokalemia and in myocarditis, congenital QT prolongation associated with high risk of ventricular fibrillation and sudden death is also known.
  - QT shortening is found in hypercalcemia, hyperkalemia and after administration of digitalis.

We evaluate shape and voltage deviations

P wave = atrial wave, physiologically it lasts < 0.10 s and is 2.5 mm high, it is best seen in II. drain.

- *P pulmonale* refers to a P wave with a height > 3 mm → right atrial hypertrophy.
- *P mitrale* means a P wave with a length > 0.10 s → left atrial hypertrophy.

QRS complex − the height of its oscillations depends on the size of the ventricular muscle.

The **ST segment** is normally isoelectric, physiological is any depression up to 0.5 mm and elevation up to 1 mm in any lead.

- Greater depression can also be physiological if the ST segment goes obliquely upwards and smoothly transitions into the T wave.
- Pathological depression is most often caused by ischemia, hypokalemia.
- Pathological elevation is a sign of ischemia or the early phase of pericarditis.

The **T wave** changes during childhood.

- After birth, the T wave is positive in all chest leads, as it is in adulthood.
- In the first hours and days of life, the *T wave in the right precordium V1−V4 inverts to negativity*.
- In childhood, negative T waves gradually become positive, when the inversion progresses from V4 to V1 → around the age of ten, T waves in all chest leads are positive again.
- Pathological changes in T waves occur in myocardial ischemia, pericarditis and myocarditis (low and flattened T).

Links

Related articles

- Electrocardiography
- ECG examination
- Description of ECG
- Axon

Used literature

- HAVRÁNEK, Jiří: *EKG.*