Καρδιογράφημα στα παιδιά

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Σύγκρουση συμφερόντων

Καμία
Circulation changes after birth

In utero, high pulmonary pressures exist and blood was shunted away from the pulmonary vasculature. Blood goes left through the patent ductus arteriosus and the foramen ovale.

After birth pulmonary pressures fall and circulation goes through the lungs.
At birth, the right ventricle is thick due to high pulmonary artery pressure in utero **RV dominance**

With the fall in pulmonary artery pressure during infancy RV wall stress and thickness decrease until right ventricular pressure approximates that of the adult **LV dominance**
The pediatric ECG changes quite dramatically during childhood, particularly during infancy due to the pathophysiological and anatomical changes in the heart.
So lets try.....to do a Systematic basic approach of a pediatric ECG
Pediatric Lead position

- Precordial leads: same bony landmarks as for adults.
- Limb electrodes: near the shoulders and hips, for less muscle artifact
- Additional VR3 VR4 can be done
Normal HR

- Infants: 145 (90-180)
- 6 m: 145 (105-185)
- 1 y: 132 (105-170)
- 4 y: 108 (72-135)
- 14 y: 85 (60-120)

Rate of 80 bpm in adults typically not achieved until mid adolescence

Changes due to the gradual increase in vagal tone with aging

*Figure 1* Continuous age-dependent percentile curves of the heart rate for the total population.

*European Heart Journal (2001) 22, 702–711*
Rhythm

- **Normal sinus rhythm**
- Same criteria with adults
- (+)P II & (-) aVR same
  Normally P axis positive
- **Use aVF** if negative
  lower rhythm
Step II
PR QRS QT

- Shorter due to smaller cardiac size
- PR depends on age and heart rate
- Normal < 0.12 infants < 0.16 children < 0.20 sec older
- QRS narrower increases w age 0.04-0.08 sec

*European Heart Journal (2001) 22, 702–711*
QT interval and corrected QTc

$QTc = \frac{QT}{\sqrt{RR}}$

QTc is longer in the young.

Infants < 6 months QTc of < 490 msec
>6 months similar to adult < 440 ms

Error in correction due to high rate
Use ambulatory recordings
Slight differences between boys & girls

**Boys** (adolescence)
Higher amplitudes
slightly wider

**Girls** longer QTc 460
Step 3
QRS axis frontal

Use I & aVF

- 1 week-1 m: +110° (+30° - +180°)
- 1-3 month: + 70° (+10° - +125°)
- 3 m-3 y: + 60° (+10° - +110°)
- >3 y: +60° (+20° - +120°)
- adults: +50° (-30° - +105°)

Birth RV dominance
>3 y LV dominance

Pediatr Cardiol for Practitioners M. K. Park 5th Edit
Step 4
transverse axis- precordial leads

A) R/S ratio in V1 -V6

0-6 months: R dominant in right leads V1, V2, RV3 & deep S in left

6m-3y: R smaller in right leads larger in left & less deep S or RSR’

>3y R/S<1 in V1 V2, tall R in left leads small S LV dominance

B) T waves negative in V1 V2 RV3 after 7 days until adolescence 8y
10-15% juvenile T after 8y
Infant- 1st day

1) HR rhythm
2) PR QRS
3) Axis up to +180
4) R/S- Twaves
Infancy early childhood >6m -3y

1) HR -rhythm
2) PR QRS
3) Axis <+90
4) R/S- T waves

Normal Q waves in left leads

>6m pure R or RSR'
R;>R is abnormal
ECG >3 years

1) HR rhythm
2) PR QRS
3) Axis +90°-+125°
4) R/S-T waves
ECG 8-16 years

- R/S <1 adult type
- Taller R in left leads compared to adults
- Pos or negative T in $V_1$ - $V_4$
Common “normal” variations in ECG

1) Sinus arrhythmias- pauses <1.8s & junctional rhythm (vagal, athletes)
2) AV block 1 & 2\textsuperscript{nd} MI 10% of normal children
3) Ventricular or supraventricular extrasystole 20-30% of Holter recording
4) Early repolarization


Courtesy of Sotiris Nendios
Pathological ECGs
“Normal” ECG depends on age

Understanding the underlying pathophysiology and recognizing the normal pattern is important for all cardiologists emergency and acute care providers
Ευχαριστίες στην Υποδιευθύντρια Παιδοκαρδιολόγο ΩΚΚ κ Ρία Αποστολοπούλου για την πολύτιμη βοήθεια

Ευχαριστώ για την προσοχή σας