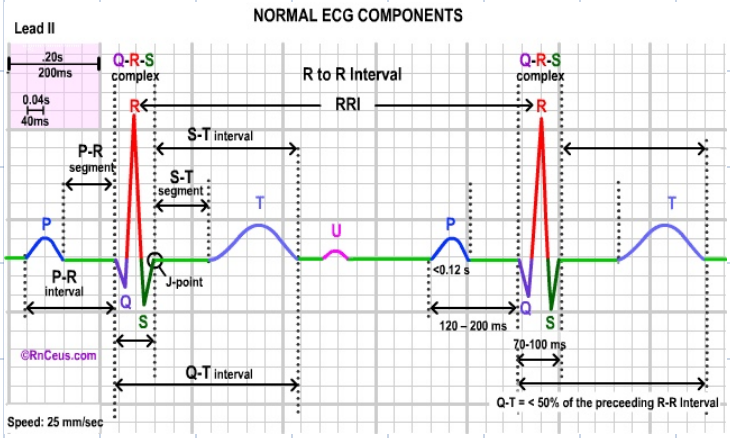
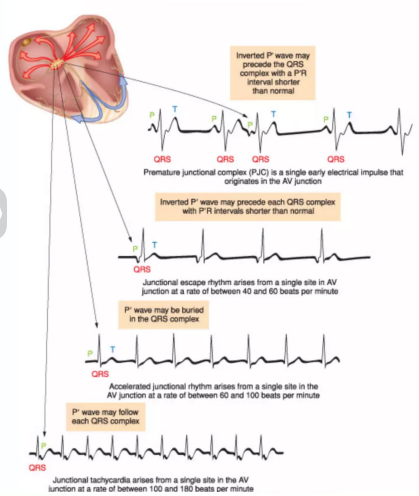
DR. ELDA
Rahardini
dreldarahardini.com

Gelombang P

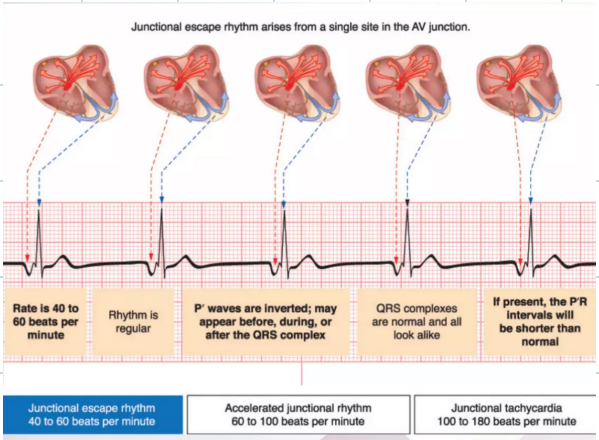


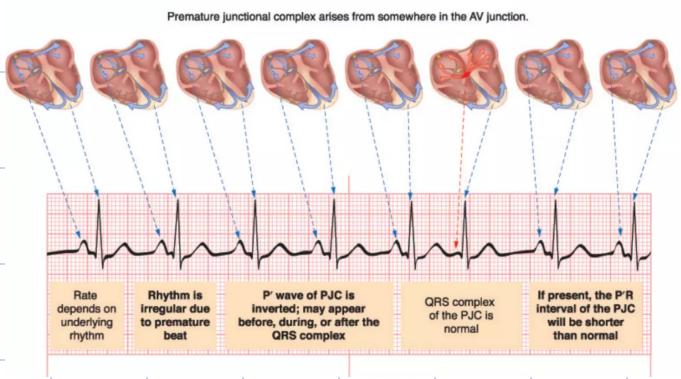
- Pada sinus Rythm : a. gel. P pada sadapan inferior (II, III, aVF) salah satu harus positif (pacemaker di SA nodes)
  b. gel. P akan selalu diikuti QRS kecuali pada
  - av blok gr II
  - av blok gr III
  - atrial flutter
  - atrial fibrillation

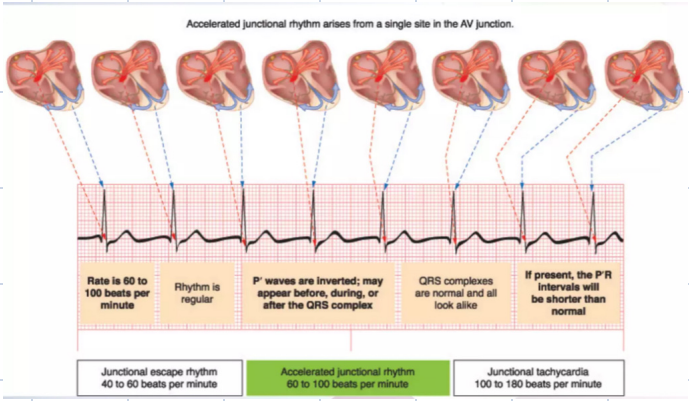
- Pada irama Junctional : arah perjalanan depolarisasi atrium dari bawah ke atas (Pace maker di AV nodes)

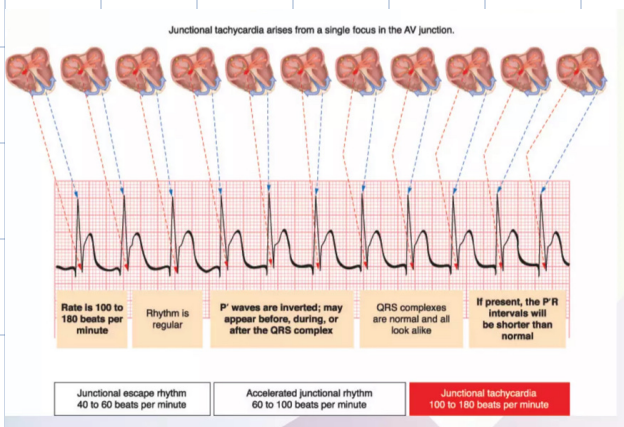


Kriteria :
- Narrow QRS
- Regular Ventricle Rythm
- P wave inverted : before / after / burried in QRS wave
- Rate between 40-60 bpm









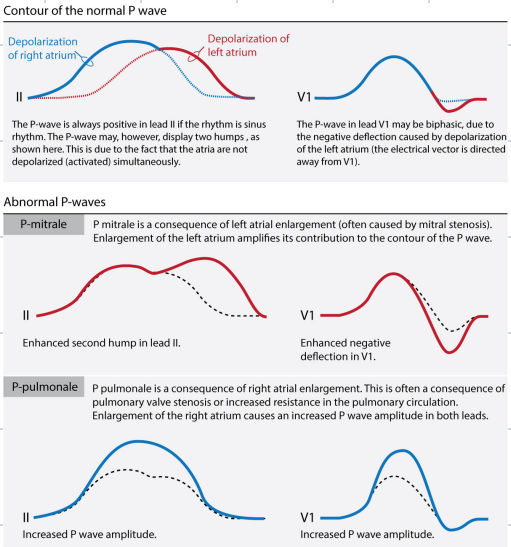
Atrial enlargement

enlargement → hypertrophy / dilation

DR. ELDA Rahardini
dreldarahardini.com

Left atrial enlargement → P mitrale
- Lead II 2nd hump bigger
- lead V_1 ada defleksi negatif pd. P

Right atrial enlargement → P pulmonale
- Lead II 1st hump bigger
- lead V_1 Peaked P wave



	II	V1
Normal		
RAE		
LAE		
RAE + LAE		

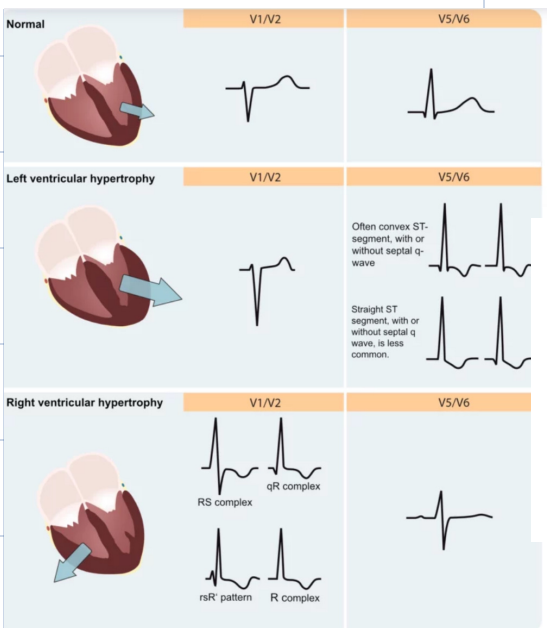
dari Prof LKD
* Pmitral tidak akan terlihat jika sudah ada atrial fibrilasi
atrium membesar

LVH & RVH

Ventricle hypertrophy evident in chest leads (V_1, V_2, V_5, V_6)

LVH ~ large R waves in left sided leads (V_5, V_6, I, aVL)
S waves in right sided leads (V_1 & V_2)

RVH ~ large R waves in V_1, V_2
deeper S waves in V_5, V_6



enlargement (dilation / hypertrophy)
EKG ga' bs bedain

Dilation ~ karena Volume Overload (Diastolic)
contoh: valvular regurgitation

Hypertrophy ~ karena Pressure Over load (Systolic)
karena ↑resistensi CO/hypertension stenosis

Left Ventricle Hypertrophy

The most common cause : aortic stenosis
aortic regurgitation
hypertention
cardiomyopathy
coarctation aorta

ST-T segment in hypertrophy

Significant hypertrophy → abnormal depolarisation dari myocardium ventrikel.
(mismatch antara kontraksi & kondaksi)
↓
Secondary ST-T changes (elevasi/depresi)
↓
Negative QRS → positive ST-T segmen etc

ECG criteria (index) for LVH

Table 1: Common electrocardiography criteria for the diagnosis of left ventricular hypertrophy [8–10]

Cornell voltage criteria	SV3 + RaVL ≥ 2.8 mV (28 mm) in men SV3 + RaVL ≥ 2.0 mV (20 mm) in women
Cornell product criteria	SV3 + RaVL (+8 in women a) x QRS duration ≥ 2,440 mm × ms
Sokolow-Lyon voltage criteria	SV1 + RV5 or RV6 ≥ 3.5 mV (35 mm) b or RaVL ≥ 1.1 mV (11 mm)
Romhilt-Estes (point score system)	(a score ≥ 5 is diagnostic of LVH, a score of 4 is "probable" LVH) Voltage criteria (3 points): Any S or R in limb leads ≥ 20 mm SV1, SV2, RV5, or RV6 ≥ 30 mm ST-T wave changes of LVH (3 points, 1 point on digitalis) Left atrial abnormality (3 points): Terminal component of the P wave in V1 ≥ 1 mm and ≥ 40 ms Left axis deviation (2 points): QRS axis of −30 degrees or more negative Prolonged QRS duration (1 point): ≥ 90 ms Delayed intrinsicoid deflection time (1 point): ≥ 50 ms in V5 or V6

→ sensitivitas 42%, spesifisitas 95%.

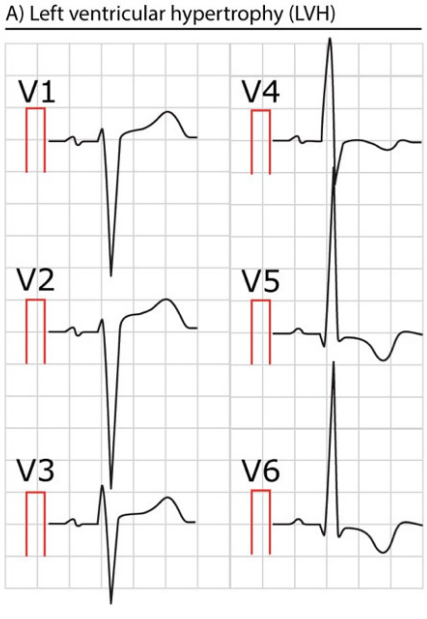
→ the best index! sensitivitas 51%, spesifisitas 95%

→ Sokolow-Lyon paling sering dipakai
Sensitivitas 20%. spesifisitas >85%

→ Romhilt este
sensitivitas 60%
4 points → LVH probable
5 points → LVH likely

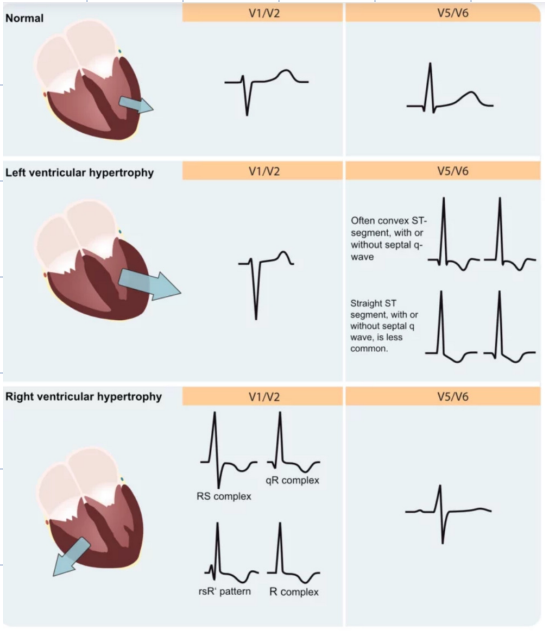
DR. ELDA
Rahardini
dreldarahardini.com

ECG changes in LVH



- Gelombang R yg besar di lead kiri (V5,V6, I, aVL) & gel. S yg dalam di lead V1,2,V3
- Secondary ST-T changes di lead kiri : Depresi 1 point
  - dulu disebut strain pattern
    - downsloping ST segment
    - T inversi (asymm)
- Secondary ST-T changes di lead kanan : ST segmen elevasi di lead V1 & V2
- Durasi QRS prolong : karena masa myocard ↑↑ atau karena myocard fibrosis.
  Komplek QRS bertakik.
- P mitral ~ Left atrial enlargement
- Left axis deviation
- QT prolongation

Right Ventricle Hypertrophy



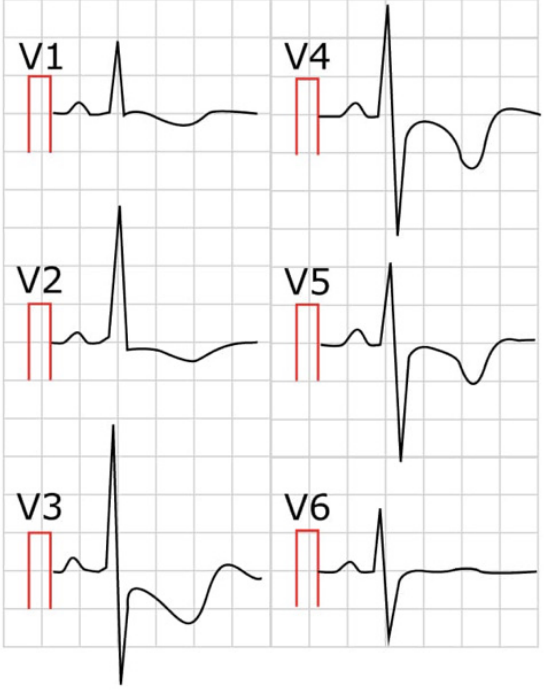
karena myocard LV lebih besar drpd RV → jadi moderate RVH may not alter ECG

Etiologi : Lung disease (↑ Pulmonary vasc. resistance)
Pulmonary hypertension
Mitral stenosis
Pulmonary embolism
Congenital heart dx

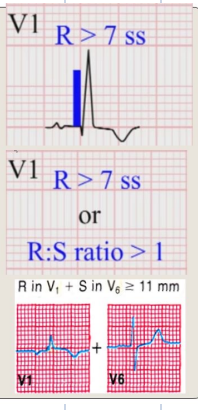
Diagnostic criteria :
- Right axis deviation +110°/more
- dominant R wave di V_1 (>7mm / R/s ratio >1)
- dominant S wave di V_5/V_6 (>7mm / R/s ratio <1)
- durasi QRS < 120 ms

Supporting criteria :
> RAE
> RV strain : ST depresi/T inversi di lead precordial kanan (V_{1-4}) dan lead inferior (II, III, aVF)
> $S_1S_2S_3$ pattern : RAD dg dominan S wave di lead I, II & III
> deep S wave lead lateral (I, aVL, V_5-V_6)

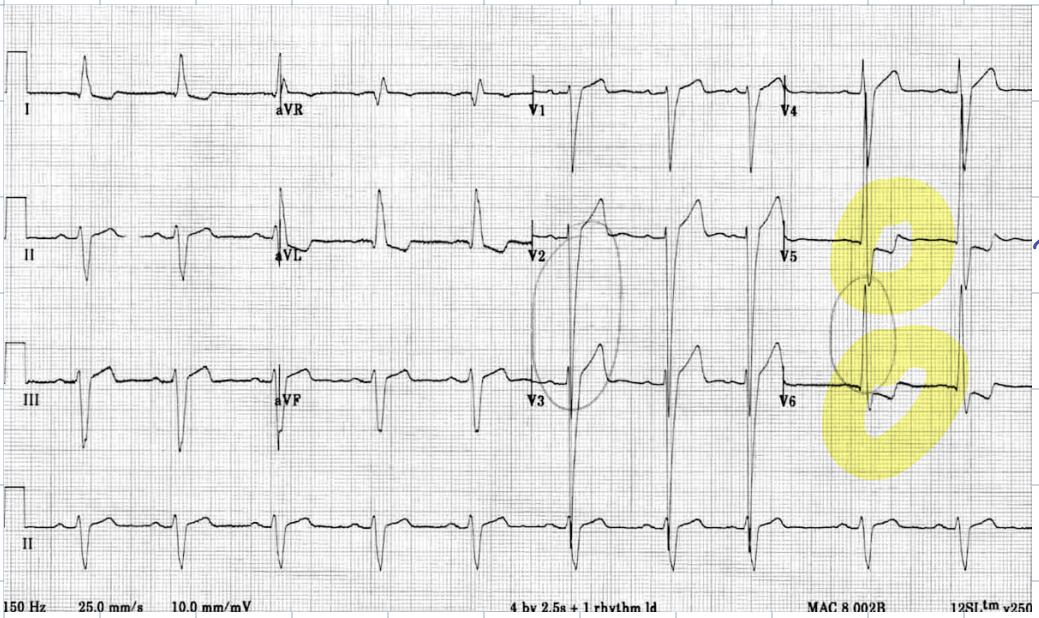
B) Right ventricular hypertrophy (RVH)



"EKG Voltage Criteria for RVH":
- An R wave in lead **V1** higher than 7 small squares in amplitude
(or)
- If the R wave in lead **V1** is higher in amplitude than the S wave (R:S ratio > 1)
(or)
- R wave in lead **V1** + S wave in lead **V6** > 11 mm

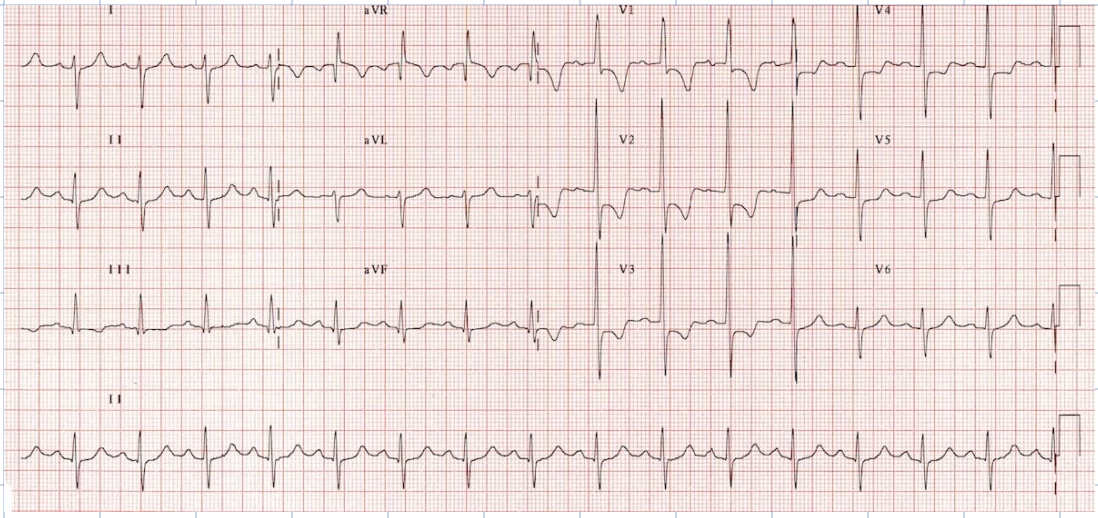


DR. ELDA
Rahardini
dreldarahardini.com



Left ventricular hypertrophy (LVH):

Markedly increased LV voltages: huge precordial R and S waves that overlap with the adjacent leads (SV2 + RV6 >> 35 mm).
R-wave peak time > 50 ms in V5-6 with associated QRS broadening.
LV strain pattern with ST depression and T-wave inversions in I, aVL and V5-6.
ST elevation in V1-3.
Prominent U waves in V1-3.
Left axis deviation.



Typical appearance of RVH:

Right axis deviation (+150 degrees).
Dominant R wave in V1 (> 7 mm tall; R/S ratio > 1)
Dominant S wave in V6 (> 7 mm deep; R/S ratio < 1).
Right ventricular strain pattern with ST depression and T-wave inversion in V1-4.