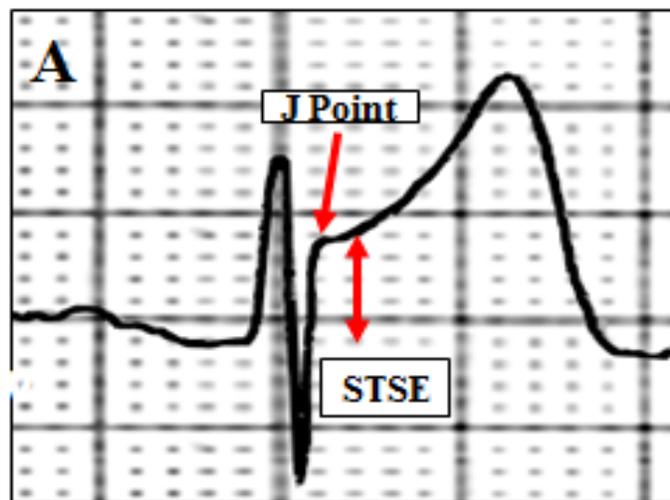
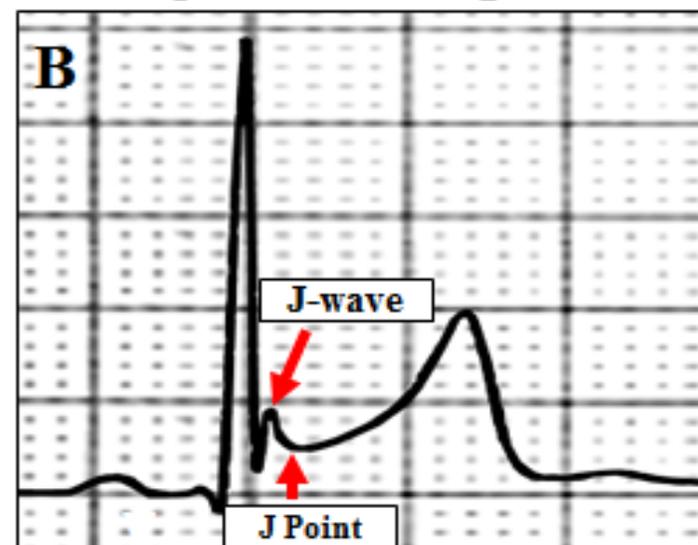


A and B - Classical definition of early repolarization pattern: ST segment elevation

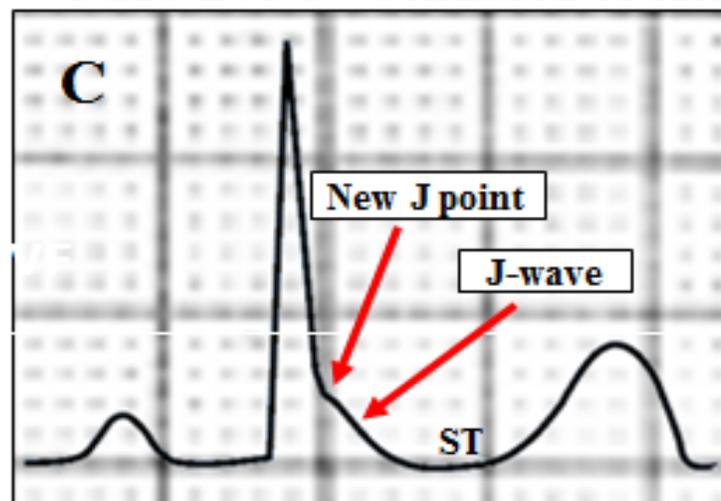


Without J-wave and STSE

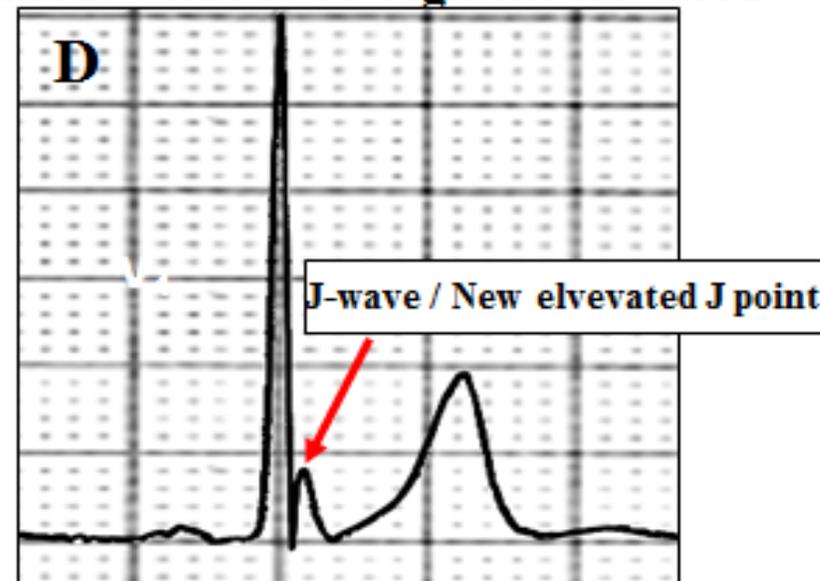


With J-wave and STSE

C and D: New definition of early repolarization: without ST segment elevation

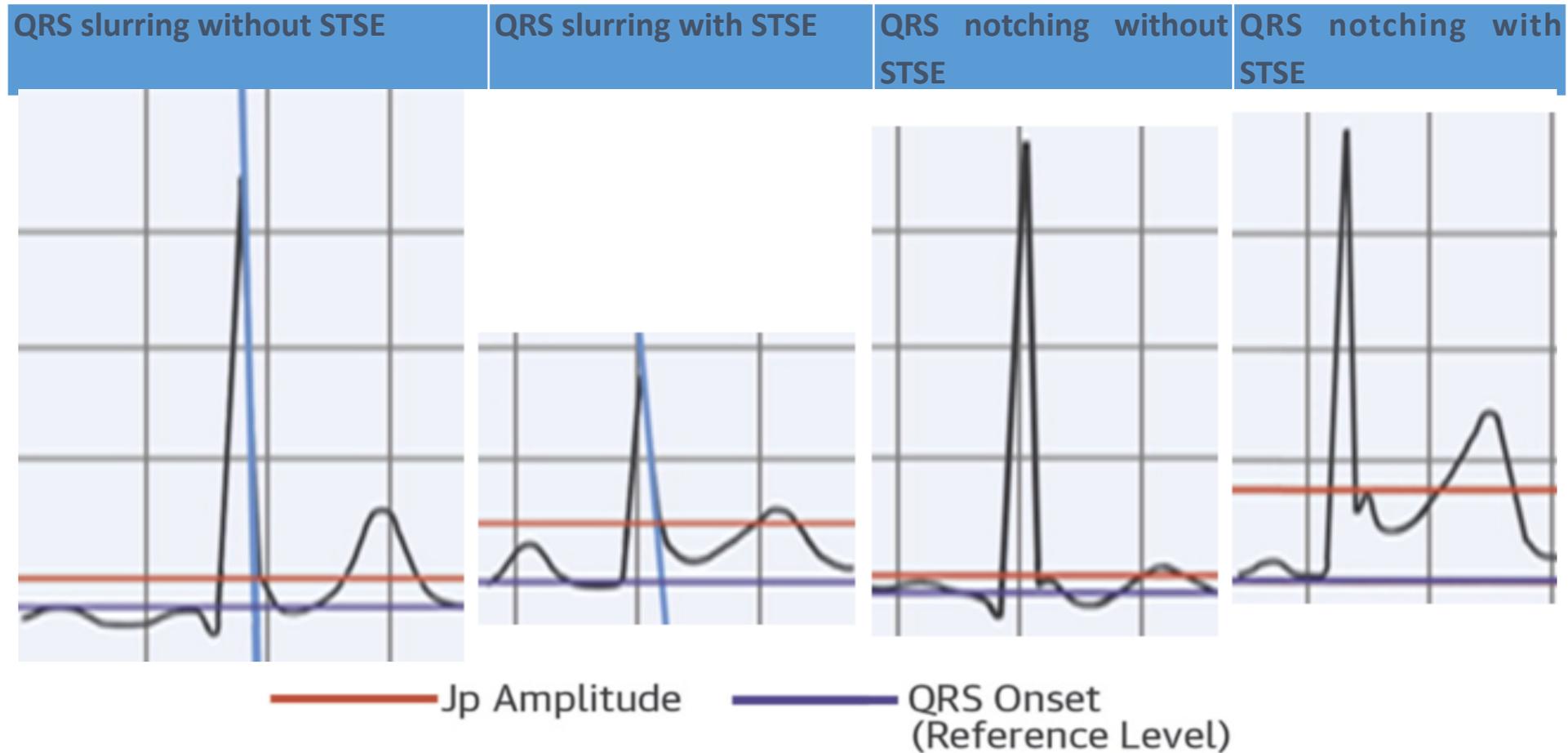


J-wave after P point without STSE



J-wave or new elevated J point without STSE

The new definition of ERP requires the peak of an end-QRS notch and/or the onset of an end-QRS slur as a measure, denoted J_p , to be determined when an interpretation of early repolarization is being considered. One condition for early repolarization to be present is $J_p \geq 0.1$ mV, while ST-SE is not a required criterion.



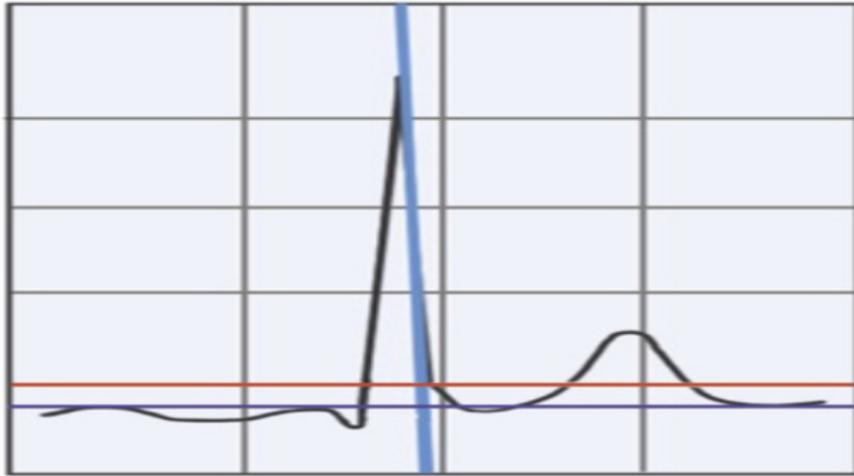
The upper salmon line indicates the notch or slur amplitude, J peak (J_p), while the lower purple line indicates the baseline used as a reference with respect to which amplitudes should be measured. The blue lines indicate tangents to the initial component of the R-wave downslope. All of these waveforms are illustrations of the early repolarization pattern. (Macfarlane 2015)

Early repolarization pattern new consensus definition (**Macfarlane 2015**)

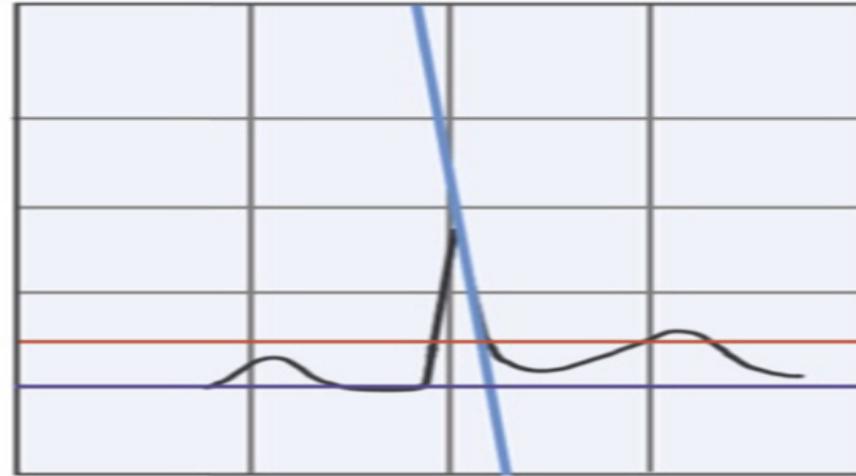
The new definition of ERP requires the peak of an end-QRS notch and/or the onset of an end-QRS slur as a measure, denoted J_p , to be determined when an interpretation of early repolarization is being considered. One condition for early repolarization to be present is $J_p \geq 0.1$ mV, while ST-segment elevation is not a required criterion.

In the figure of next slide we see the upper salmon line indicates the notch or slur amplitude, J_p , while the lower purple line indicates the baseline used as a reference with respect to which amplitudes should be measured. The blue lines indicate tangents to the initial component of the R-wave downslope. All of these waveforms are illustrations of the early repolarization pattern.

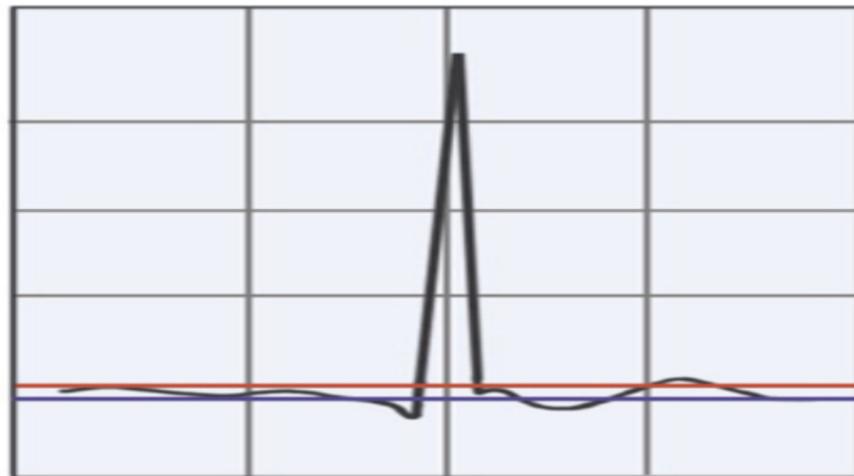
QRS Slurring Without ST Elevation



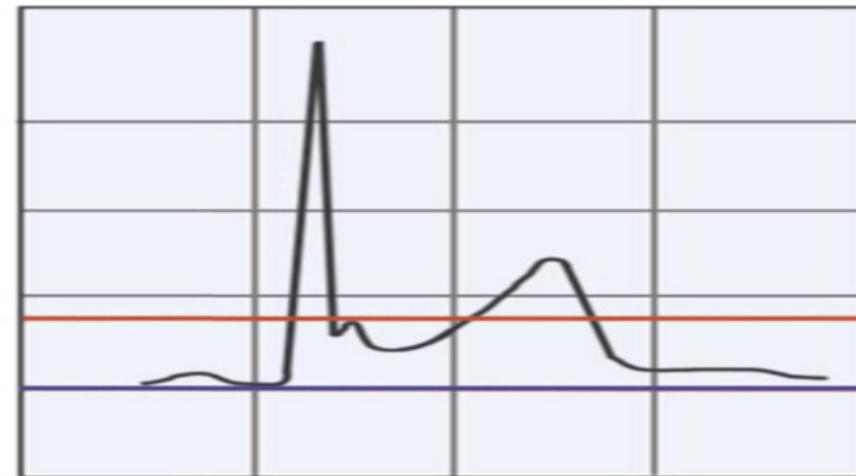
QRS Slurring With ST Elevation



QRS Notching Without ST Elevation

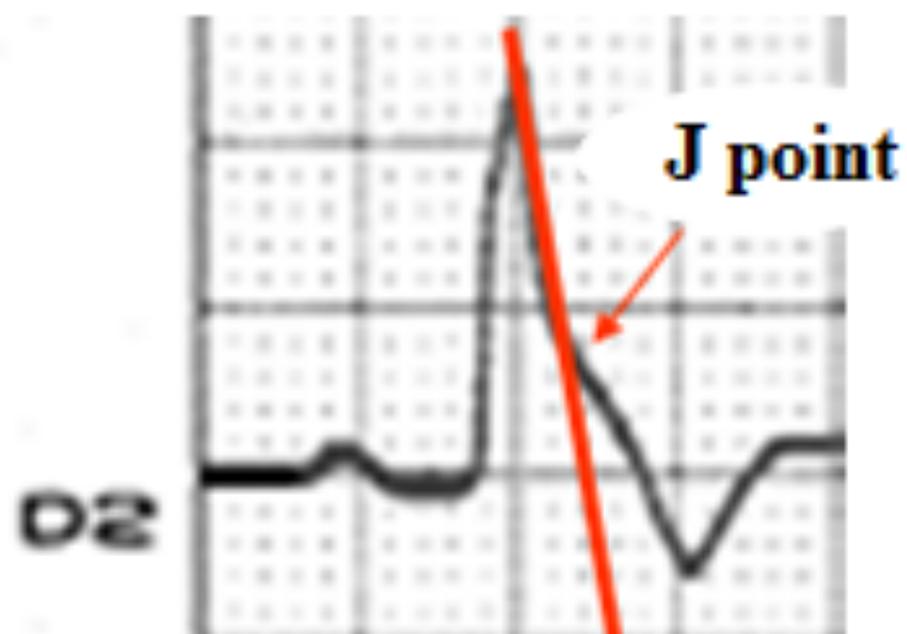
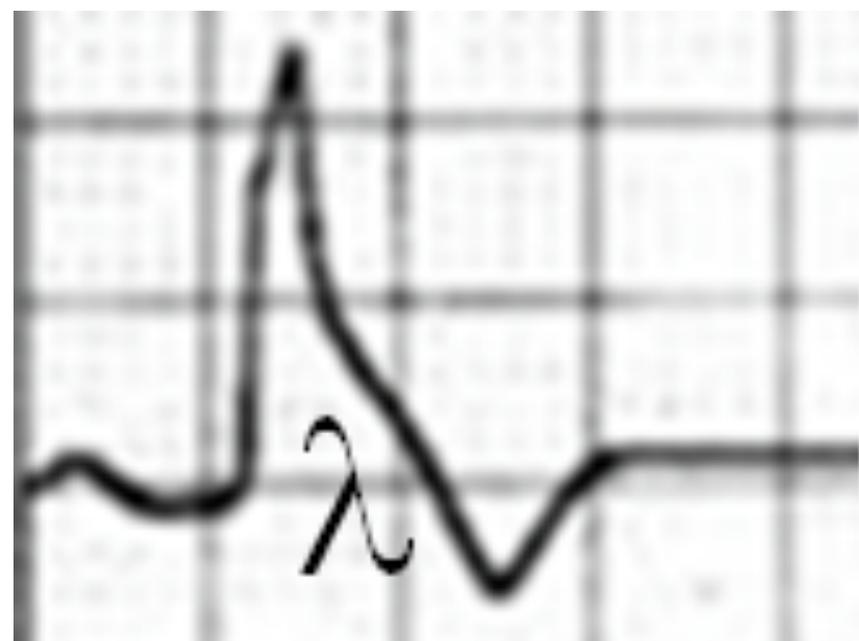


QRS Notching With ST Elevation



— Jp Amplitude

— QRS Onset (Reference Level)



Tangent line

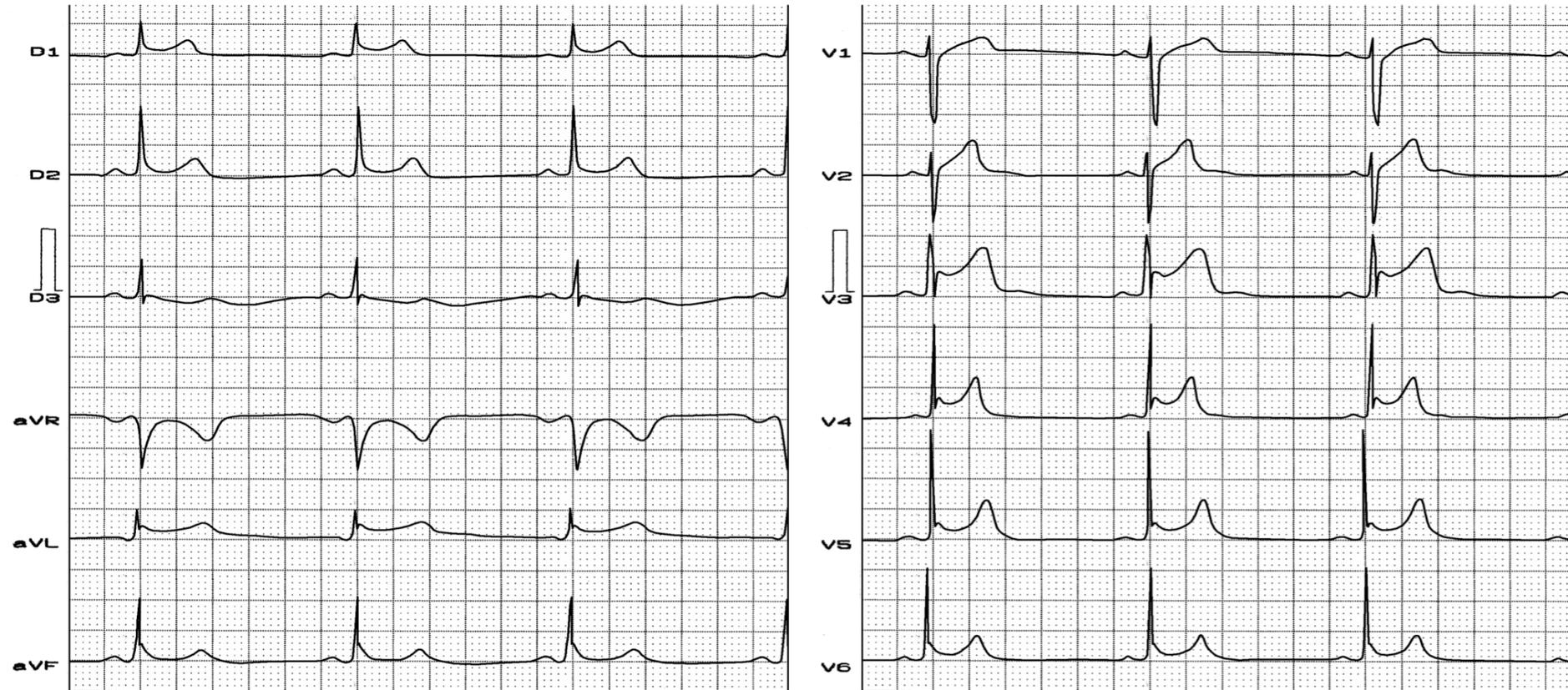
Name: DAS
Height: 1.91 m

Age: 24y
Biotype: Athletic

Sex: Male
Profession: professional basketball player

Race: Black

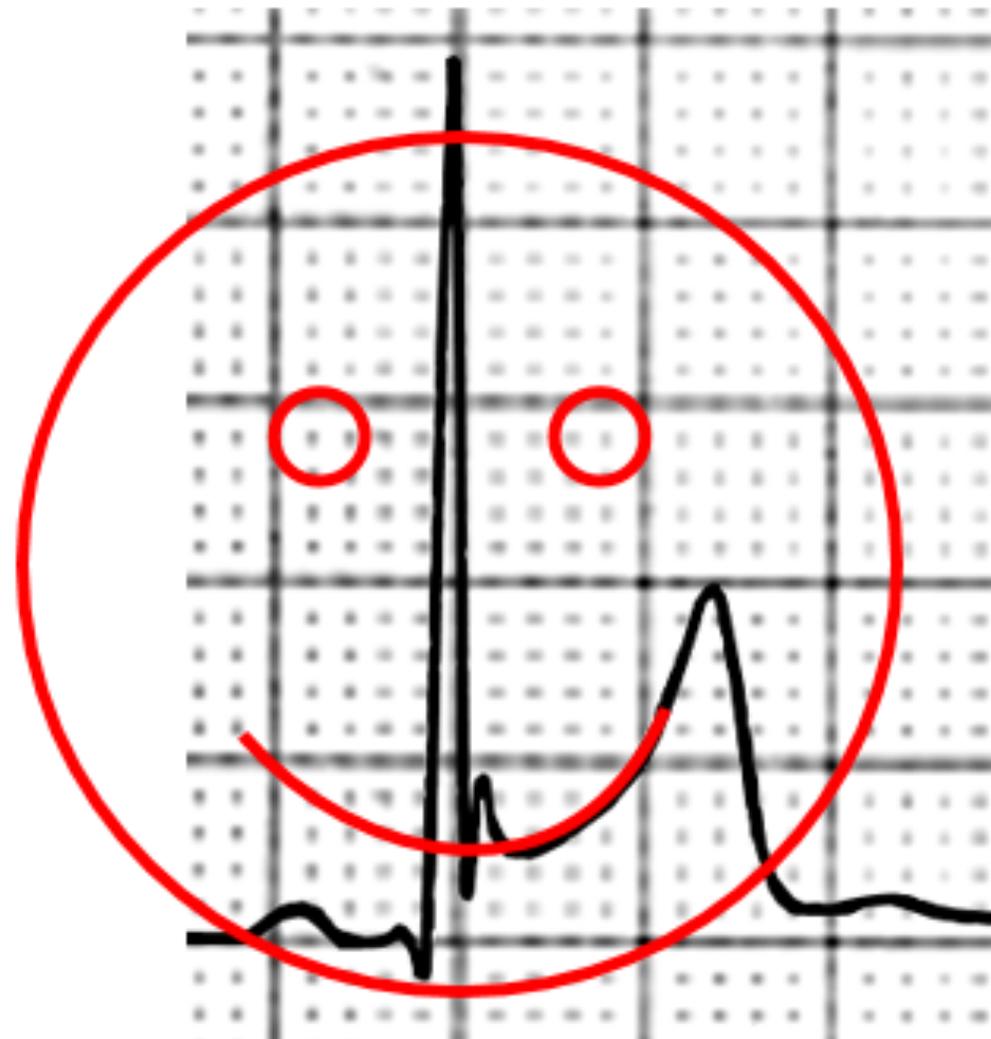
Weight: 82 kg



ECG diagnosis: sinus bradycardia, (HR 50 bpm). J point and ST segment with elevation > 4 mm in precordial leads from V_3 - V_5 of superior concavity. Notch or slurring of terminal portion of the QRS complex (J point). ST segment elevation > 4 mm in precordial leads V_3 , V_4 and V_5 .

Conclusion: sinus bradycardia, early repolarization syndrome.

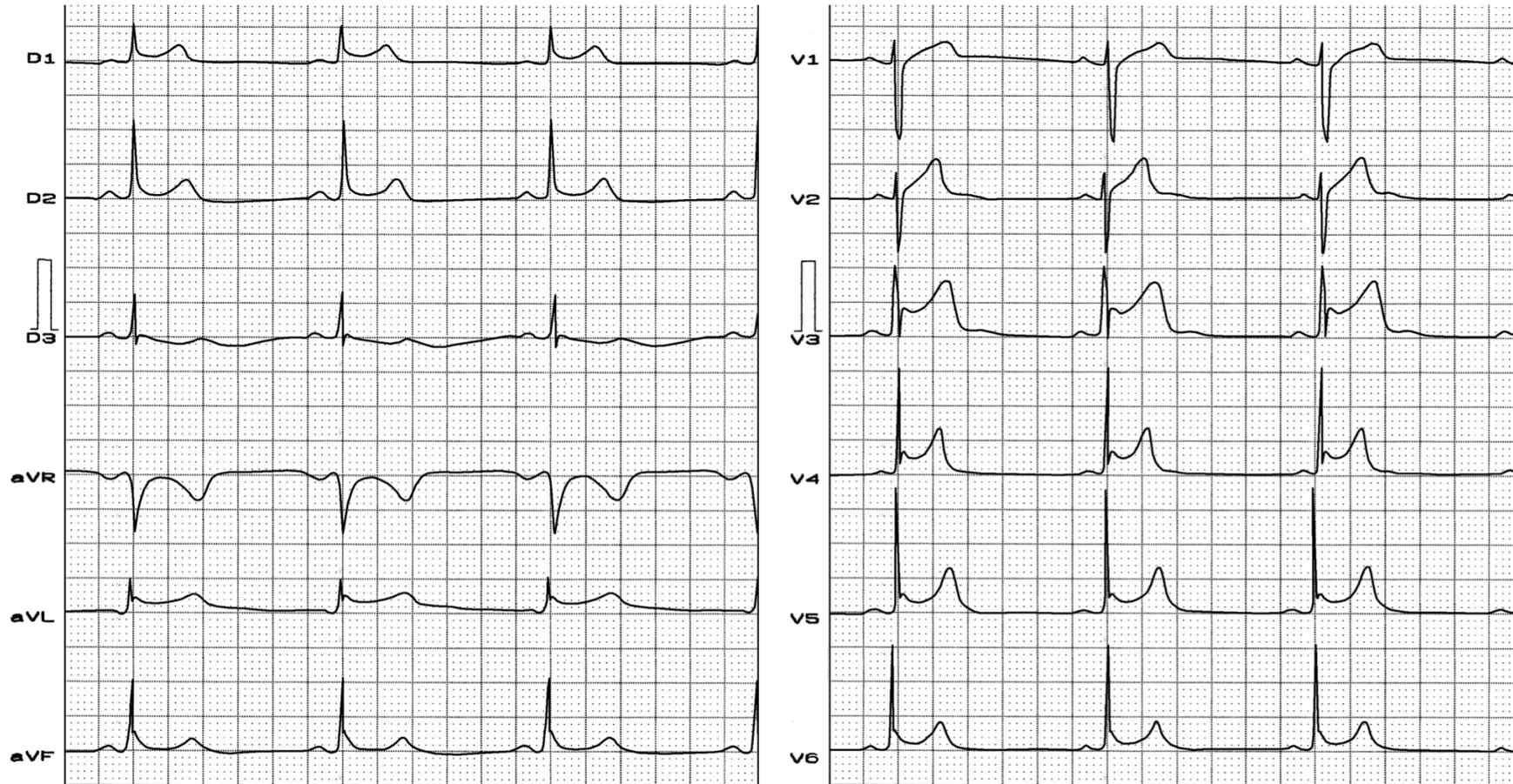
Typical ECG of early repolarization syndrome in an athlete with bradycardia.



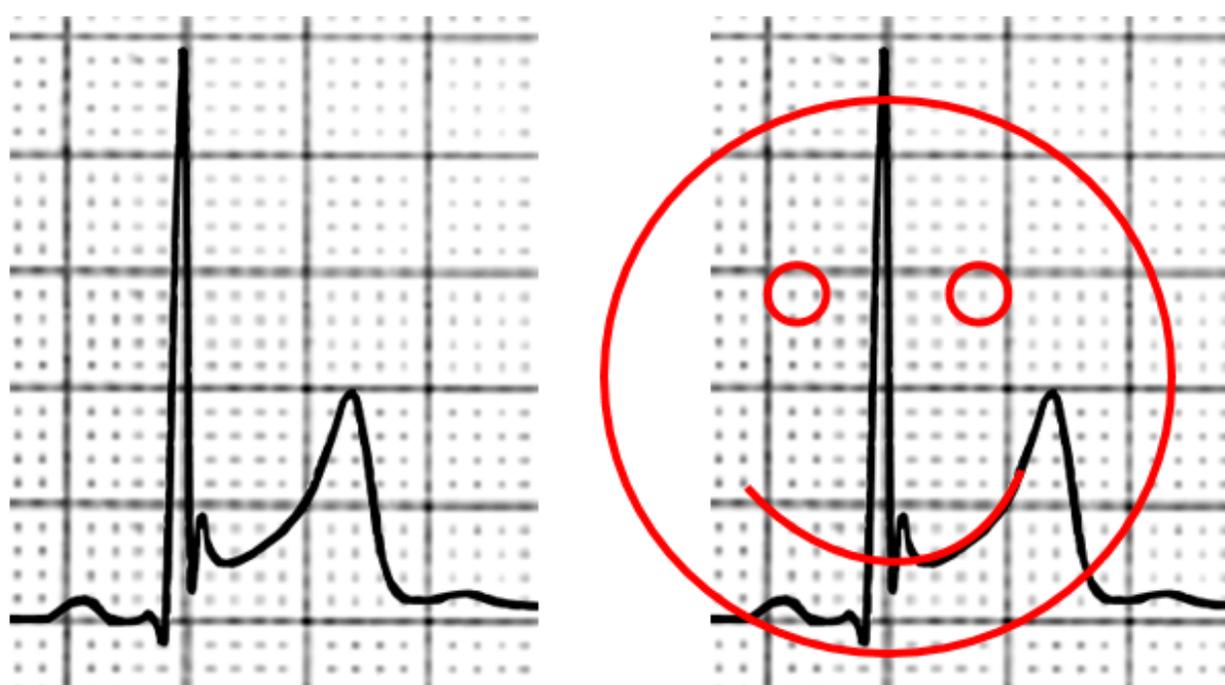
A figura mostra na derivação V4 o segmento ST de "concaidade superior", seguida de onda T positiva ampla que lembra um "rosto sorridente".

Early repolarization pattern ECG-VCG

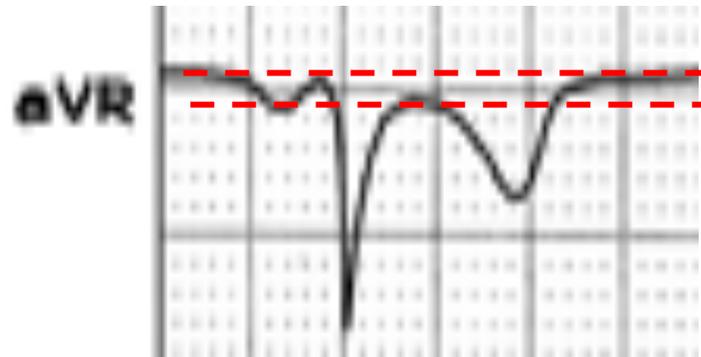
Male, 16 years old, mulatto, professional soccer player



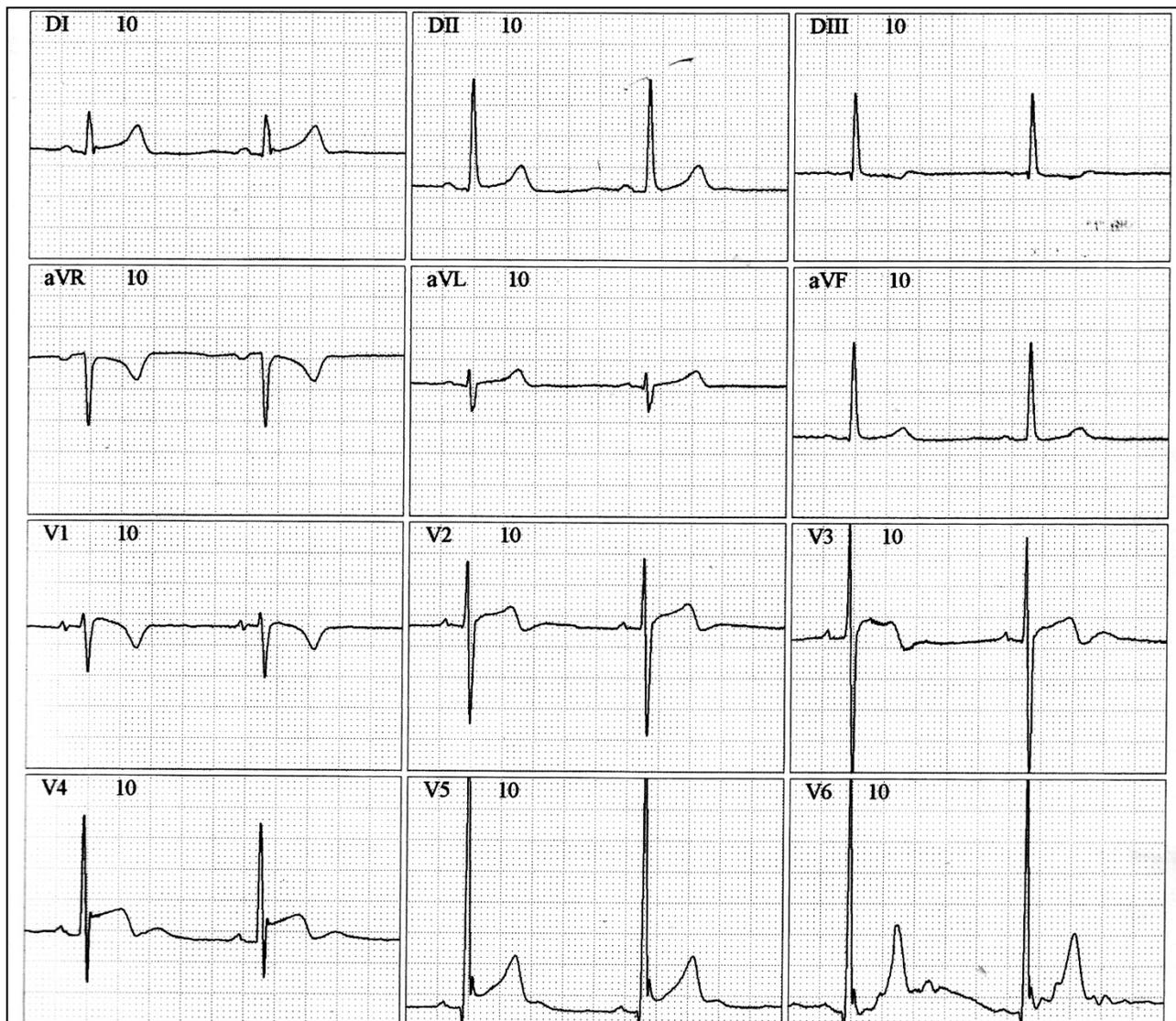
Electrocardiographic diagnosis: typical ECG pattern of benign early repolarization: sinus bradycardia, P, QRS and T directed to the same place, ST segment elevation concave to the top from V2 to V5 followed by tall pseudo symmetrical T waves concordant with precedent polarity of QRS complexes. Absence of mirror image or reciprocal changes (with exception of aVR).



The figure shows V4 precordial lead with STSE concave to the top followed by large positive T wave that resembles a "smiling face".



Mirror image or reciprocal changes only in aVR lead



Clinical Diagnosis: Professional soccer player athlete's heart._

Name: VLAS **Gender:** M

Age: 16yo. **Ethnic group:** Mulatto

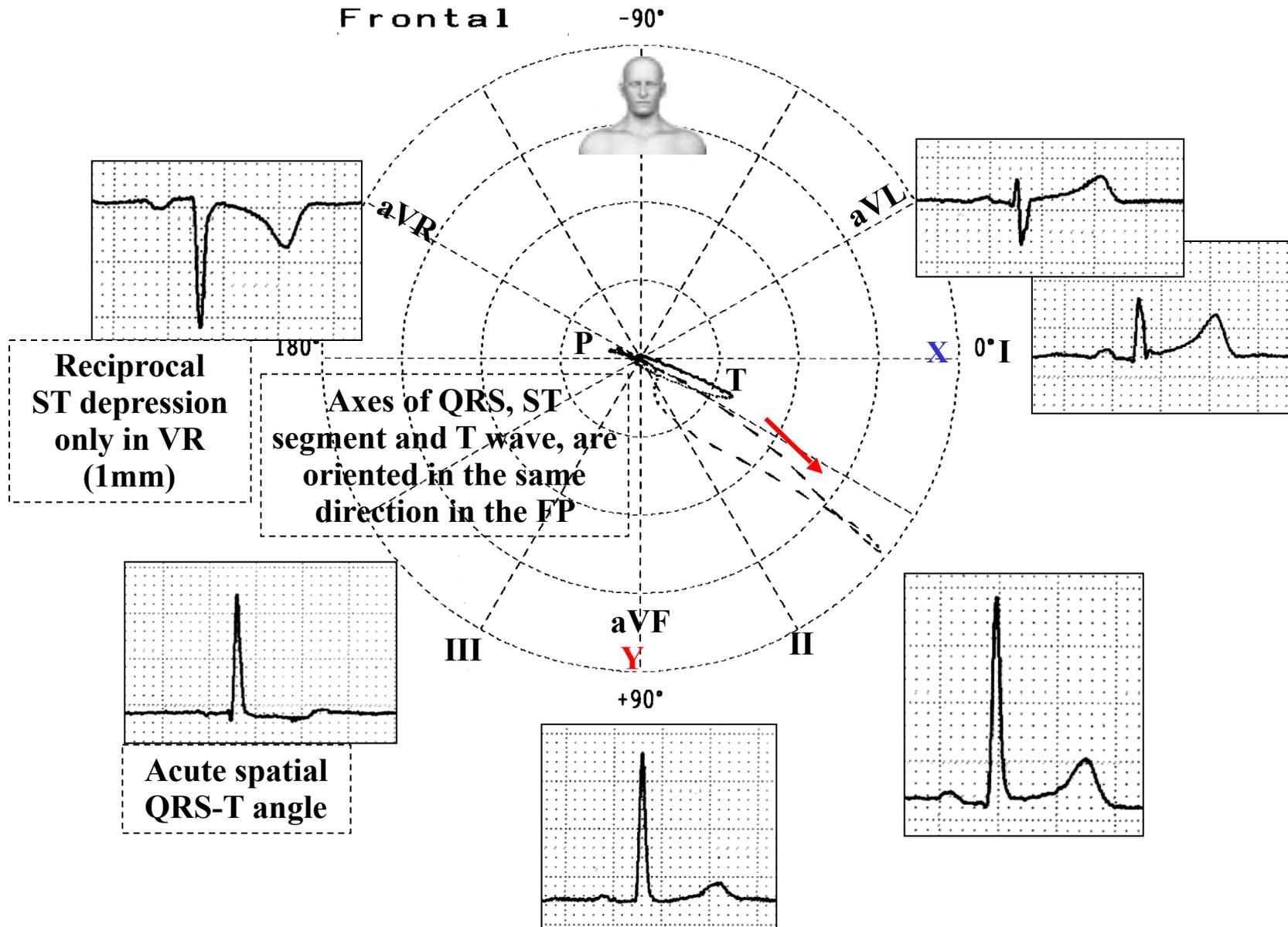
Weight: 65Kg **Height:** 1,73

Biotype: Normoline **Date:** 04/11/2008

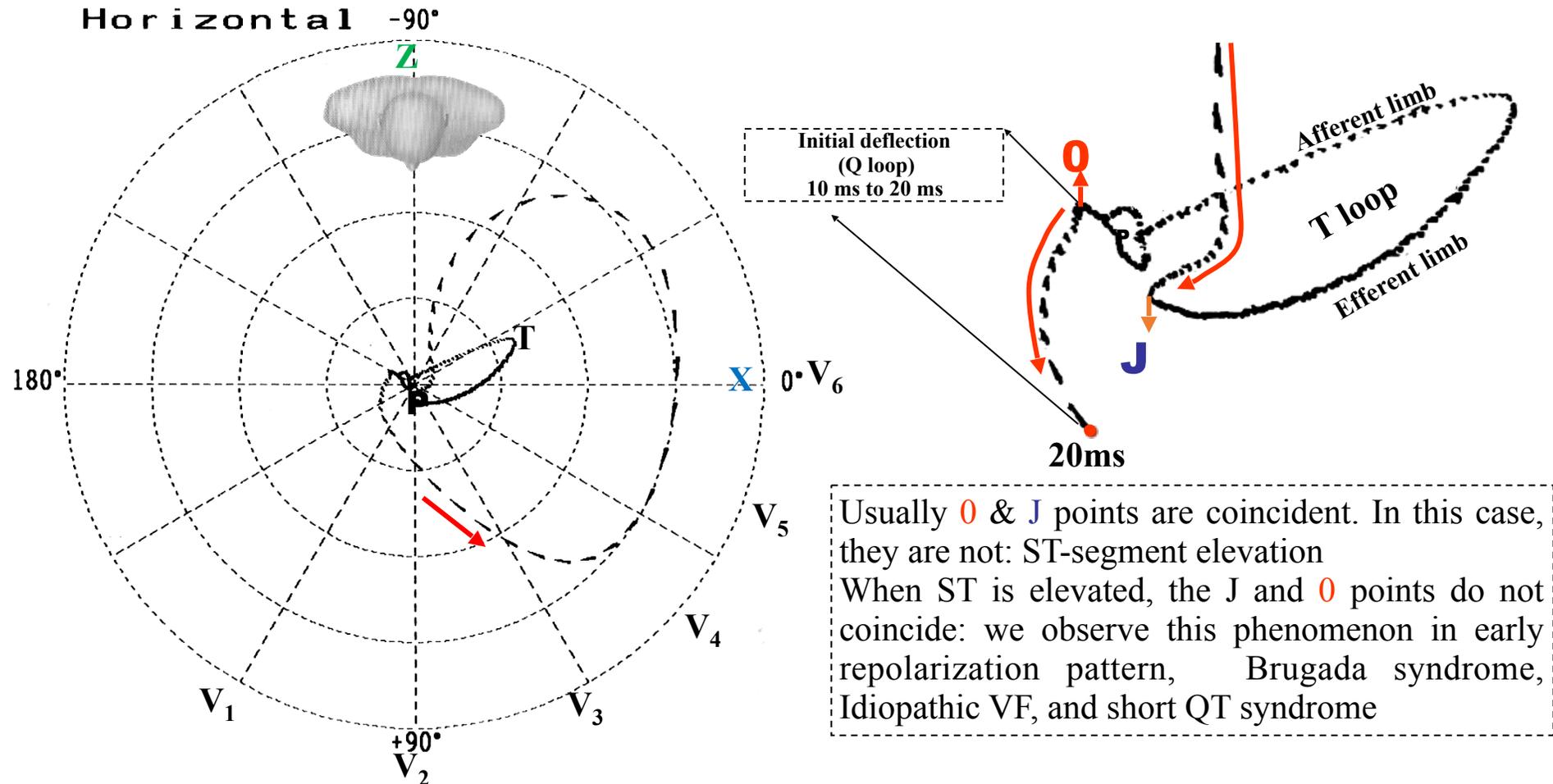
ECG diagnosis:

- **_HR:** 53 bpm: Predominant sinus bradycardia is observed in early repolarization pattern. ERV is seen in individuals with high vagal tone, such as athlete's heart. QRS duration of 90 ms.
- QRS axis +40°
- At least two adjacent precordial leads show ST segment elevation, with values ≥ 1 mm (2mm). Notching, irregular or slurring contour of the terminal QRS complex (J point).
- Relatively deep but narrow q waves may appear in the left precordial leads
- Positive Sokolow index. High QRS voltage is more frequent in male athletes, but its correlation with left ventricular hypertrophy is low (**our case**). This young man is a professional soccer player.
- Prominent J wave and ST-segment elevation, concave to the top, predominantly in left precordial leads, ending in a positive large T wave from V2 to V4 or V5.
- Prominent U waves are observed because sinus bradycardia is present.

ECG/VCG frontal plane correlation



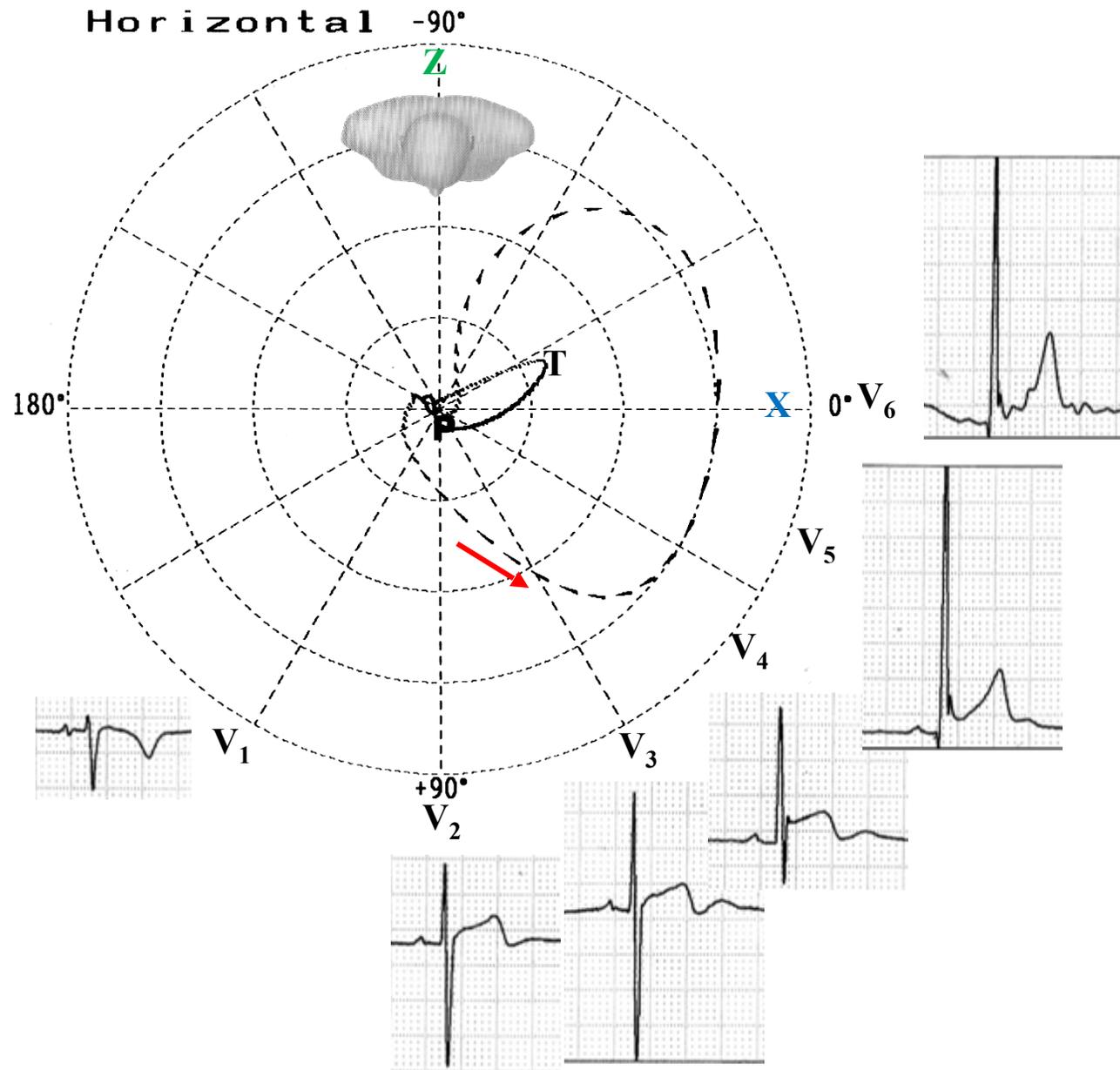
VCG horizontal plane correlation



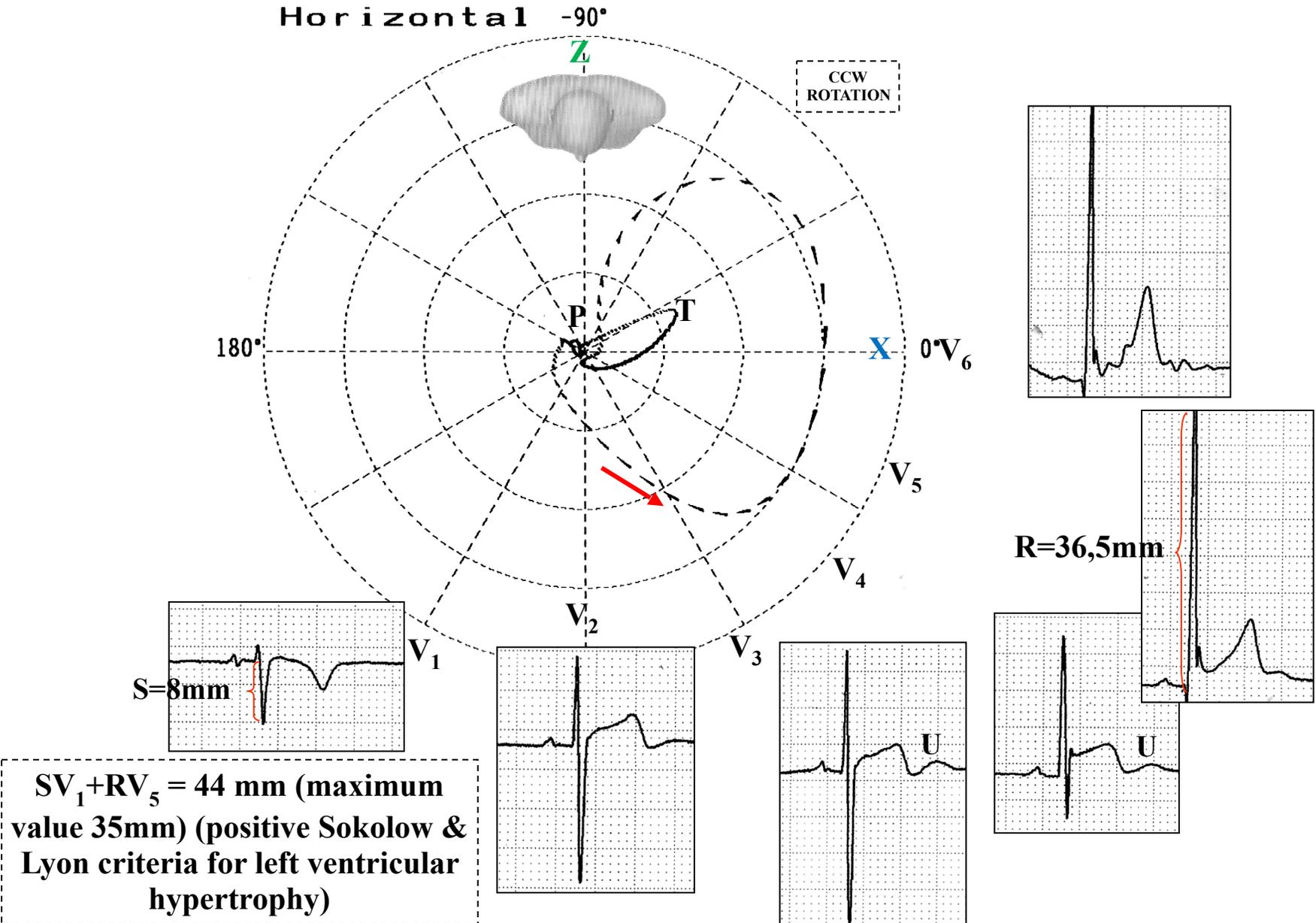
O point: it corresponds to the end of biatrial chamber activation, QRS loop onset (because PR segment does not exist, it is only a point) and the end of ventricular repolarization (T loop).

J point: in vectorcardiography, it corresponds to 3 elements: end of ventricular depolarization (QRS complex); beginning of repolarization (ST segment) when it does not present depression or elevation, and T wave onset.

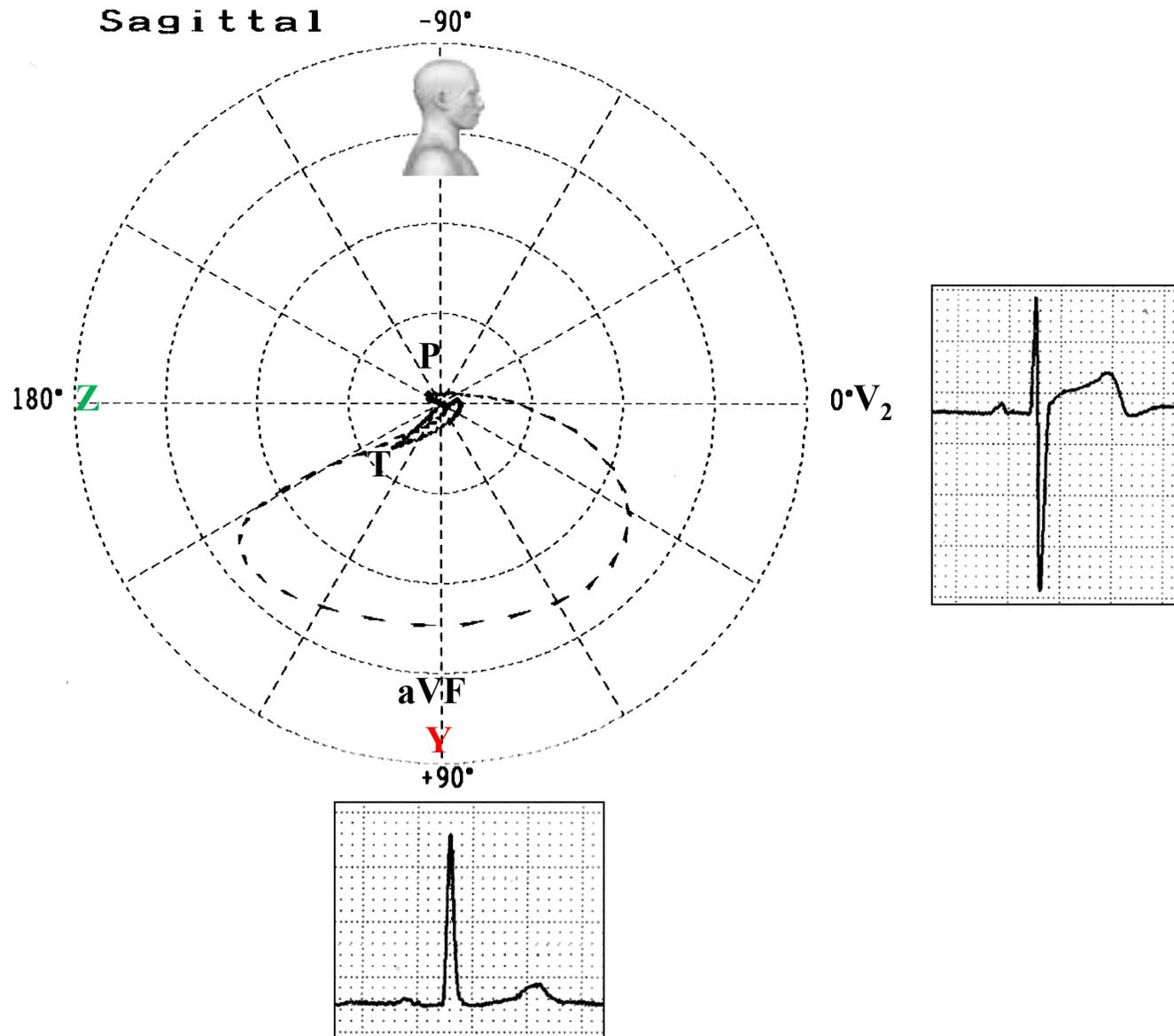
ECG/VCG correlation on horizontal plane



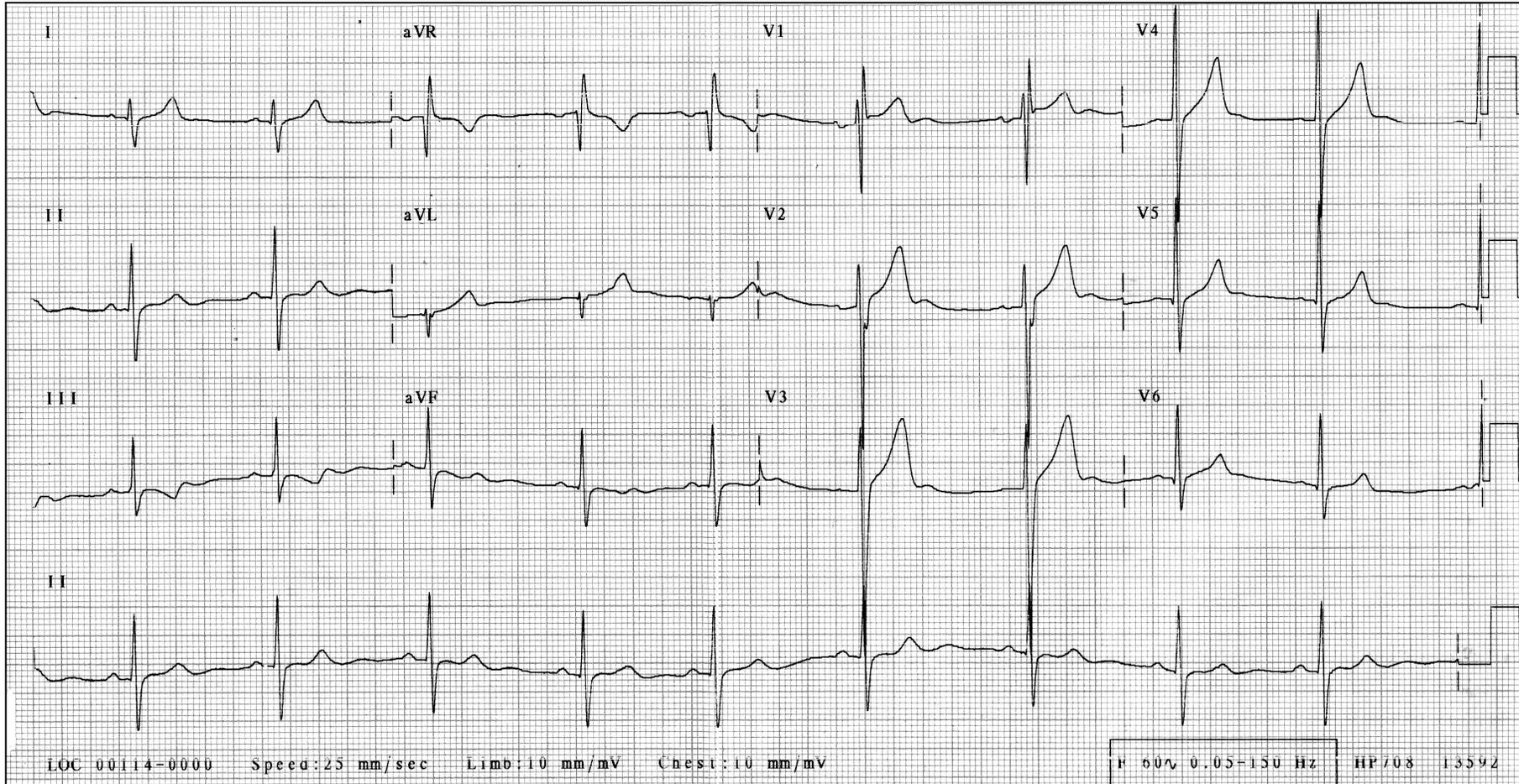
ECG/VCG horizontal plane correlation



ECG/VCG right sagittal plane correlation



Name: ASF; **Sex:** Male; **Age:** 18 yo.; **Race:** Afro-Descendent; **Weight:** 97 Kg; **Height:** 1,93 m; **Biotype:** Asthenic; **Date:** 07/30/2008; **Professional soccer player:** forward



Clinical Diagnosis: Familiar hypertension (BP: 150x105mmHg). Recent diagnosis.

ECG diagnosis: HR: 58bpm, P axis: 66bpm, PR interval: 168ms, QRSd: 97 ms, QRS axis: +128°, QT: 406ms, QTc: 399ms, T axis: +5°.

Which is the diagnosis ?

ECG/VCG horizontal plane correlation

