VIA MEDICA

LETTER TO THE EDITOR

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Answer to Dr. Elsayed Z. Soliman, MD, MSc

Correlation of levels between PRS or PQ, ST segment and TP

Dear Dr Elsayed Z. Soliman,

Usually, the PR or PQ segment (end of P wave up to QRS complex onset), ST segment (from J point or the end of QRS up to the beginning of the T wave) and the TP segment (from the end of the T wave up to the P wave of the following cycle) are at the same level. Figure 1 shows a normal ECG and a line of dots pointing out the level of the three segments: PRs or PQ, ST and TP.

Dr Soliman wrote: "The point where P wave starts is the widely accepted isoelectric point".

Answer: We guess this is not so widely accepted. Many studies and Diagnostic ECG Systems adopt the PR or PQ segment as the isoelectric line [1–7].

Causes of downwardly convex elevation of ST segment

1. Vagotonia
2. Black race
3. Early repolarization variant
4. Juvenile pattern
5. Asthenic conditions
6. Hyperacute phase of infarction
7. Acute phase of pericarditis
8. Artifact caused by excessive inertia of the needle of the device
9. Saddle type in Brugada syndrome (type 2 or 3 patterns)

In 1982 Ginzton and Laks (Reference no. 2 of Dr Soliman's letter to the authors), examined the quantitative electrocardiographic differentiation of acute pericarditis (19p) from normal variant ST-T changes (20p). In this study, the authors conclude that an ST/T ratio ≥ 0.25 in lead V6 discriminated the ECGs of all patients with acute pericarditis from normal variants. The ST/T ratio was obtained by dividing the amplitude of the onset of the ST segment (J point) by the amplitude of the T wave in that lead. The ST/T ratio in lead V6 was calculated in two ways: using both the TP segment and the end of the PR segment as the baseline for measuring ST-segment and T-wave amplitudes. A flat or negative T-wave resulted in an ST/T ratio that could not be calculated for that lead.

Dr. Leonard Ginzton and Michael Laks wrote clearly: From the onset of the ST segment to the amplitude of the T wave. The authors do not measure from the beginning of P wave. The onset of the ST segment corresponds to J point. In this case (ERV) the beginning of P wave is located 1mm above the PR segment and TP segment (Fig. 2).

The PR segment end was used as the baseline for the ST-segment onset and T-wave maximal amplitude.

In this case (ERV) the beginning of P wave is located 1mm above PR segment and TP segment. In Figure 2 there is a PR-segment depression and upwardly concave ST-segment elevation typical of

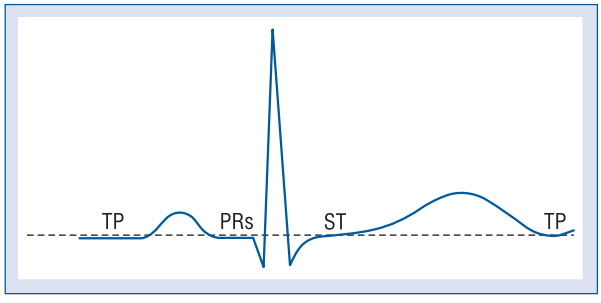

Figure 1. Normal ECG with dotted isoelectric line.

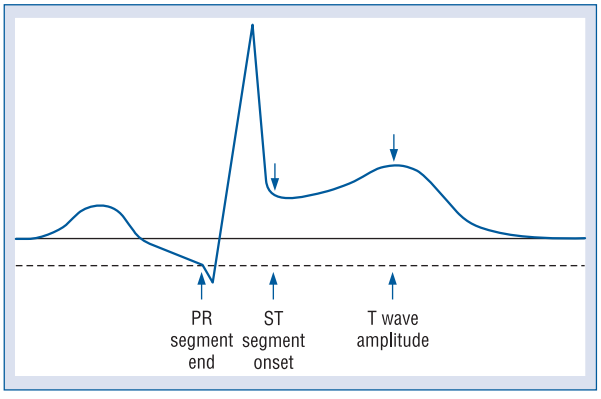

Figure 2. The locations of the electrocardiographic measurements for the PR segment, ST segment and T wave.

pericarditis. Diffuse ST segment elevation together with PR segment depression indicates pericarditis. PR segment depression in pericarditis is the atrial counterpart of ST elevation — ST elevation reflects inflammation of the ventricular subepicardial layer and PR segment depression reflects inflammation of the atrial subepicardial layer.

Note that the ST/T amplitude ratio is greater than 0.25 (the T wave is not tall). In early repolarization patterns, the T wave is usually tall, resulting in an ST/T amplitude ratio of ≤ 0.25.

Dr. Soliman wrote: "Traditionally", ST elevation in ERV is more manifest in mid-chest leads not V6.

Answer: Dr. Ginzton et al. wrote: "After analyzing various potential electrocardiographic criteria for differentiating acute pericarditis from normal variants, in this study population we conclude that an ST/T ratio in lead V6 ≥ 0.25 was the best discriminator between the ECGs of acute pericarditis and normal patients". The TS/T ratio in lead I, V4 and V5 also discriminated between acute pericarditis and normal patients, were slightly lower than those in V6. If lead V6 is not available because baseline artifact or chest bandages are present, an ST/T ratio ≥ 0.25 in any leads I, V4 or V5 is highly suggestive of acute pericarditis.

We think that Dr. Soliman should use the term: frequently and not traditionally, i.e. in 8% of cases of ERV ST segment elevation is observed in the right precordial leads [8]. Tracings somewhat mimicking Brugada syndrome are observed in 8% of athletes without a history of syncope or familial sudden death.

ST/T ratio in lead V6

Dr Soliman wrote: In Figure 3, the authors used two different baselines for the two ECGs in the Figure, which makes comparison un-acceptable.

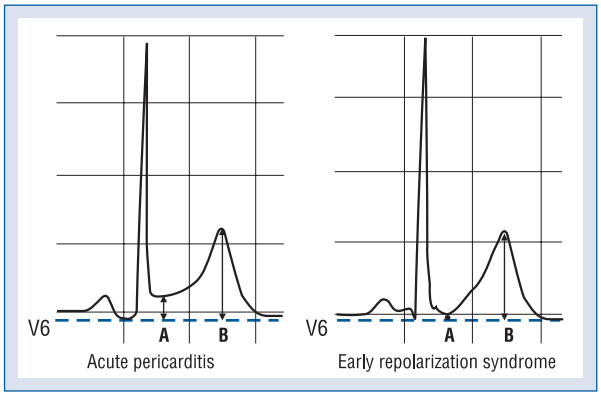

Figure 3. A quantitative electrocardiographic differentiation of acute pericarditis from ERV. (Figure 5 from the initial version oryginal article).

We agree with Dr. Soliman. The ST-segment deviation should be determined by drawing a line between subsequent PQ segments. There is an error in our Figure. The blue line is not properly drawn.

Finally, Dr Soliman wrote: "…TP line or a line extending from the start of P wave to the start of the P wave of the next beat (if TP line is not perfectly flat) is the widely accepted method of identifying the ECG baseline."

Answer: Indeed, I think that the isoelectric line must be determined by the voltage level at the beginning of the QRS complex (PQ segment). This intersection point is then taken as the termination point of the T wave.

Dr. Soliman, Thank you very much for the clever warning.

All the best!

Andrés Ricardo Pérez Riera, MD
Masters Degree in the Cardiology area
Chief of Electro-Vectorcardiography
Sector ABC's Medical School
ABC Foundation, Santo André
São Paulo, Brazil
e-mail: riera@uol.com.br

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