ECG in modern medicine:

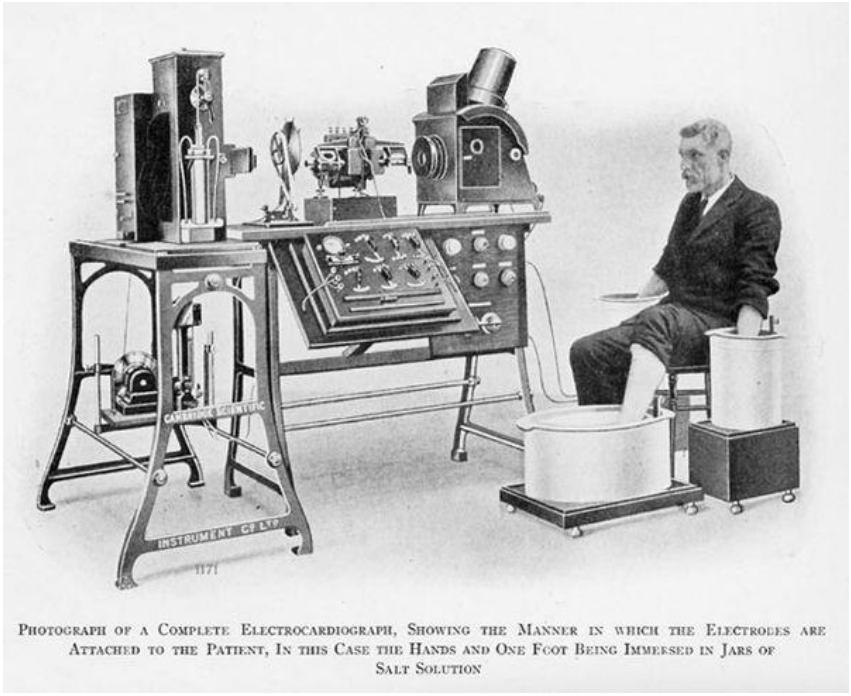
“Yesterday”
or
“Forever young”?

Valentin A. Kokorin, MD PhD, Assoc. prof.
Hospital therapy №1 department
Pirogov Russian National Research Medical University
Moscow, Russia

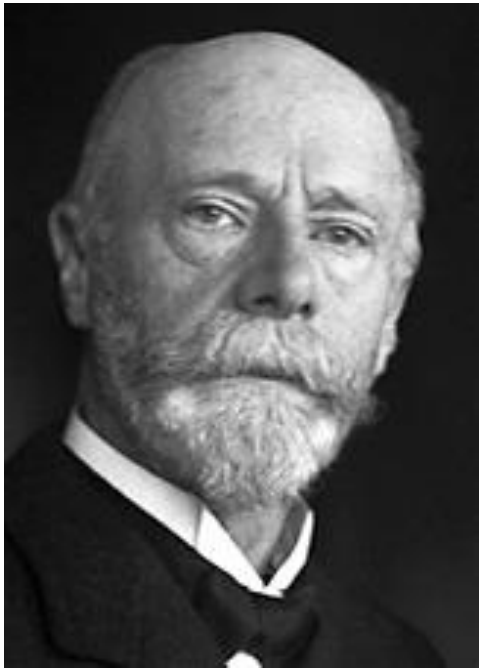
European school of internal medicine
Riga, 28 January, 2015

ECG: anamnesis vitae

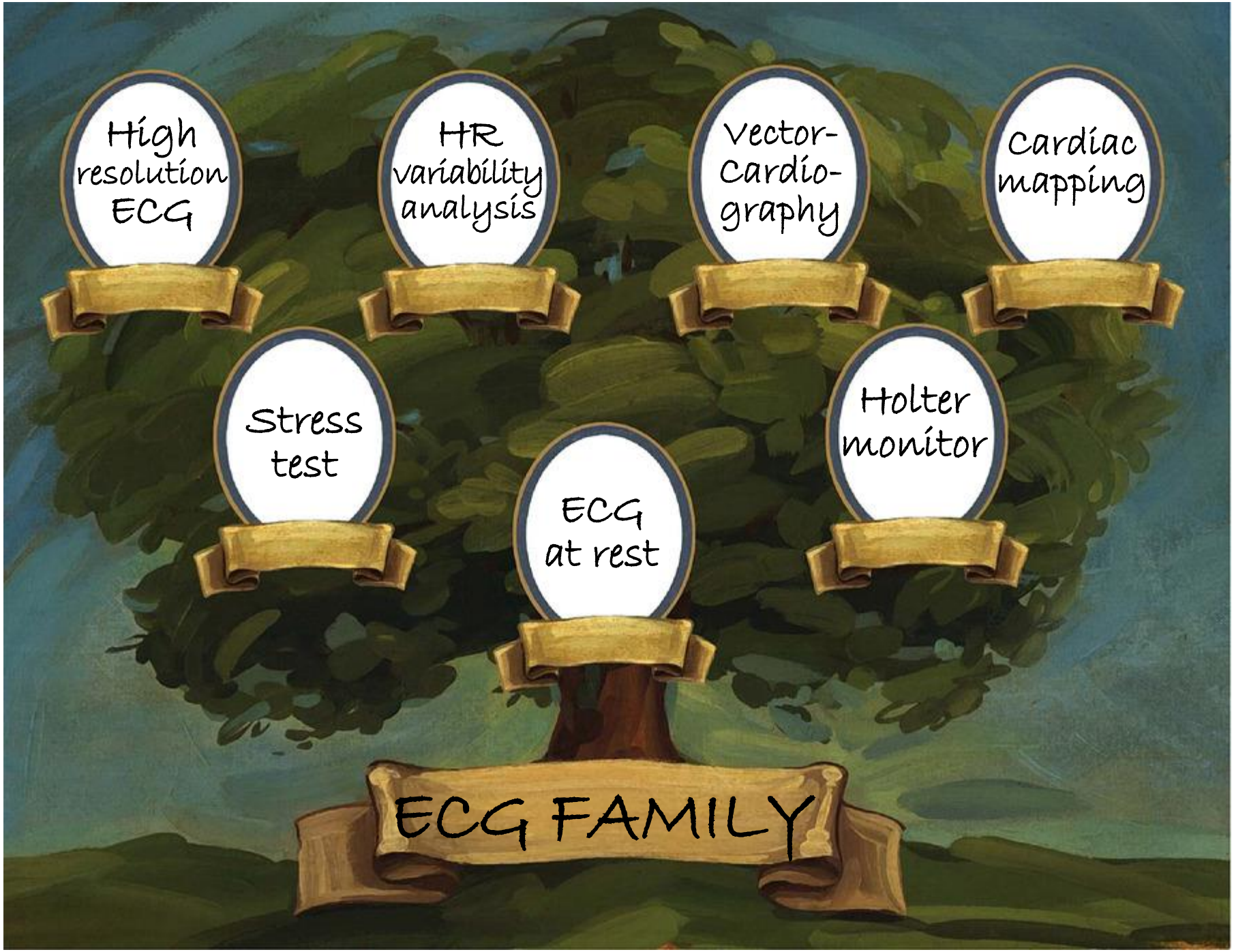
Augustus Waller



Photograph of a Complete Electrocardiograph, Showing the Manner in which the Electrodes are Attached to the Patient, In this Case the Hands and One Foot Being Immersed in Jars of Salt Solution



Willem Einthoven

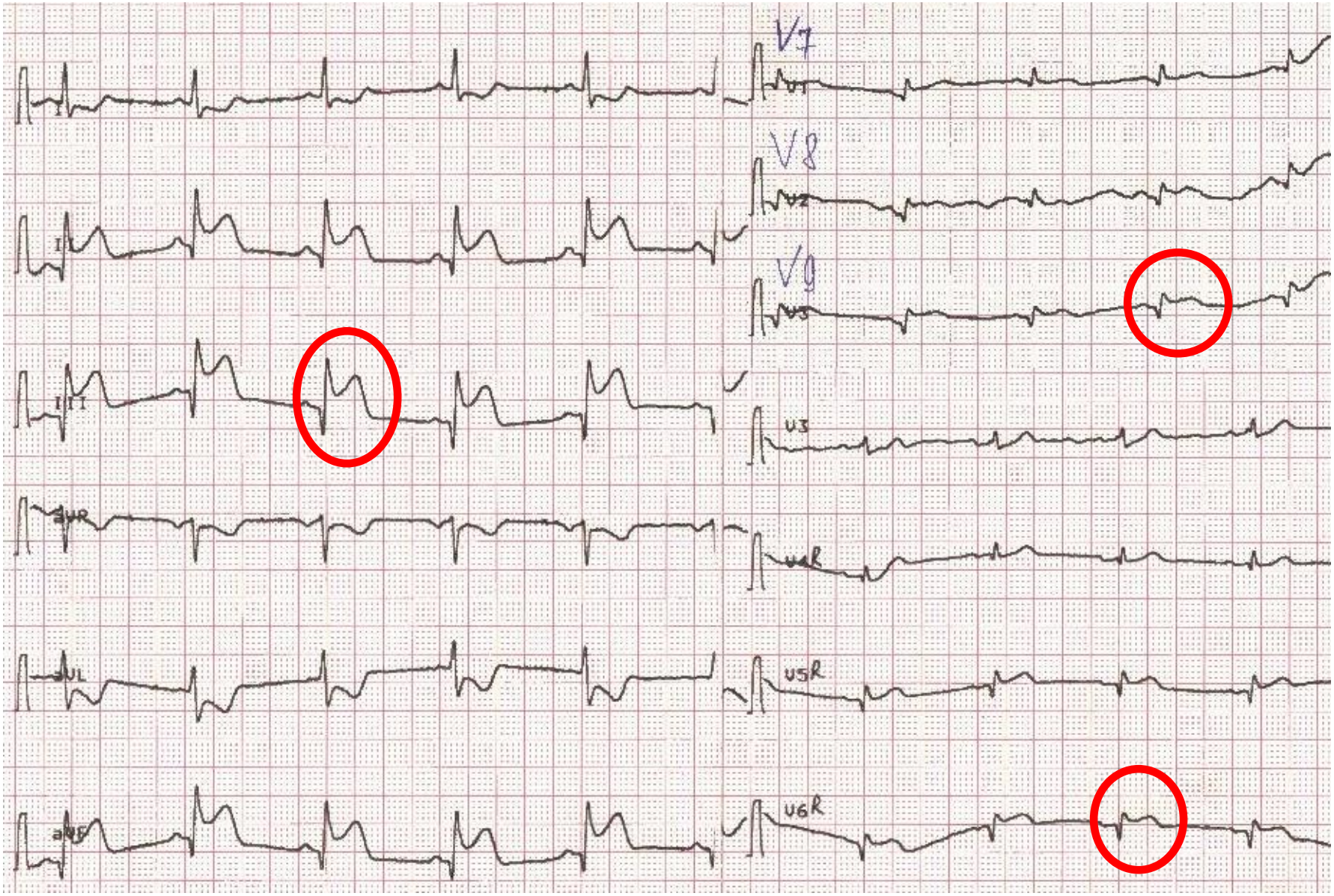

High resolution ECG
HR variability analysis
Vector-cardio-graphy
Cardiac mapping
Stress test
ECG at rest
Holter monitor
ECG FAMILY

1. Normal ECG
2. Posterior STEMI
3. Anterior wall ischemia
4. WPW syndrome

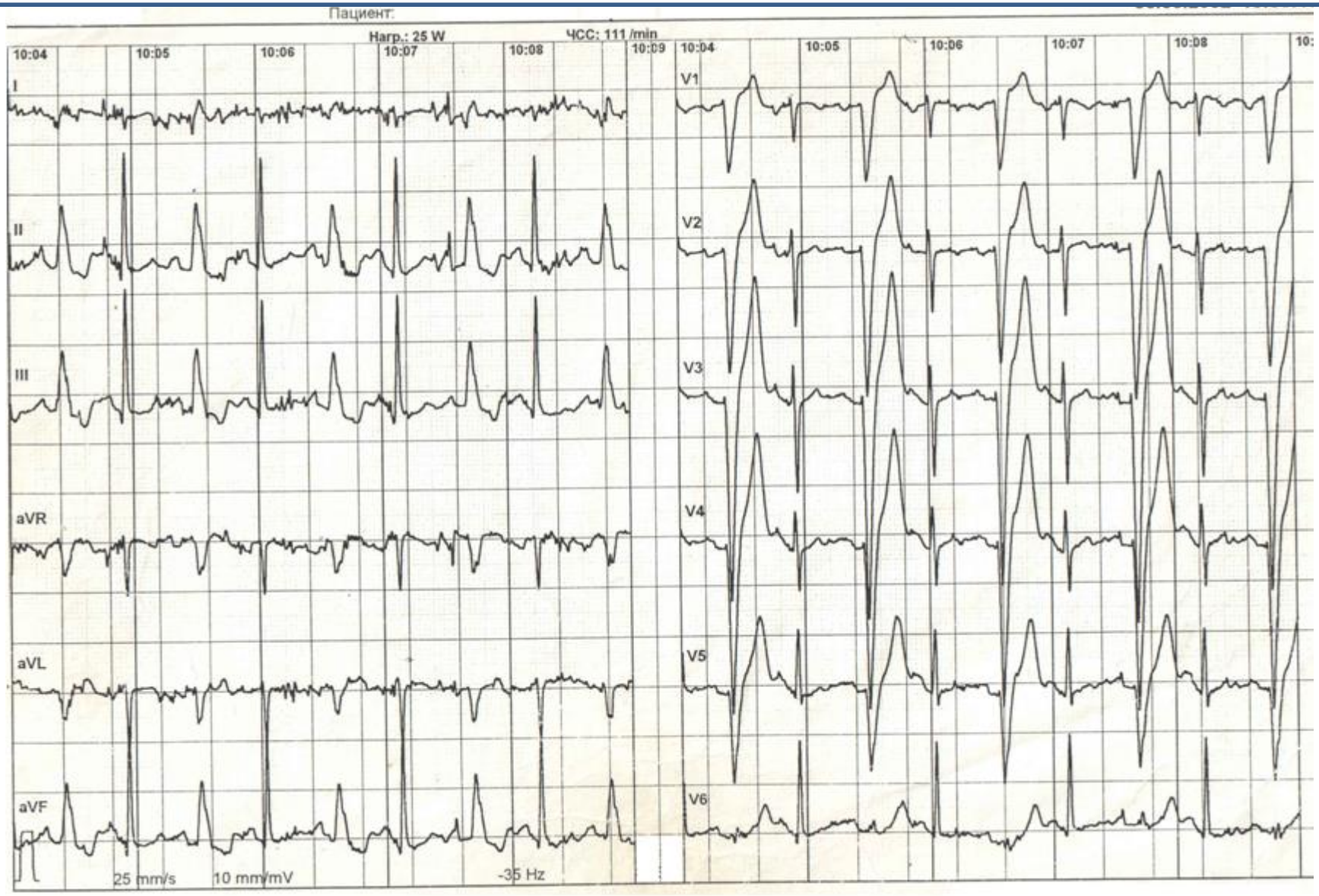
Localization of myocardial infarction

Localization	Main changes	Reciprocal changes
LV anterior wall	V_1-V_4	II, III, AVF
LV inferior wall	II, III, AVF	I, AVL, V_1-V_4
LV posterior wall	V_7-V_9	High R wave and ST depression in V_1-V_2
LV lateral wall	I, AVL, V_5-V_6	-
LV high lateral wall	AVL, V_3^2- V_6^2	-
Right ventricle	V_{3R}-V_{6R}	V_2, AVF
Atria	PQ segment depression or elevation, P wave changes	-

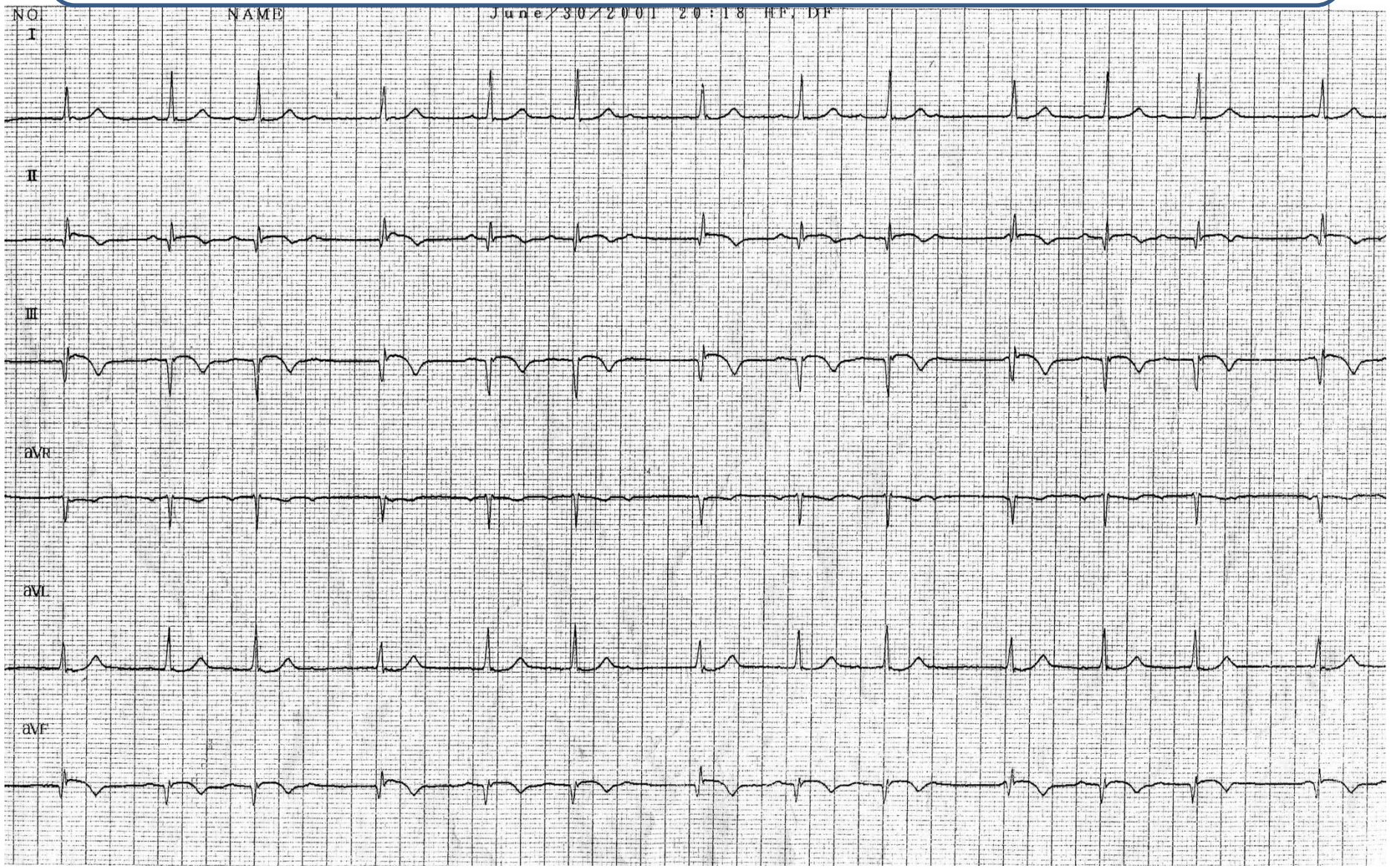
Inferior & posterior MI with RV involvement



1. **Transient LBBB**
2. Ventricular extrasystoles
3. Supraventricular extrasystoles
4. Transient WPW syndrome



1. Atrial fibrillation
2. Sinoatrial block
3. AV-block with escape beats
4. Supraventricular extrasystoles



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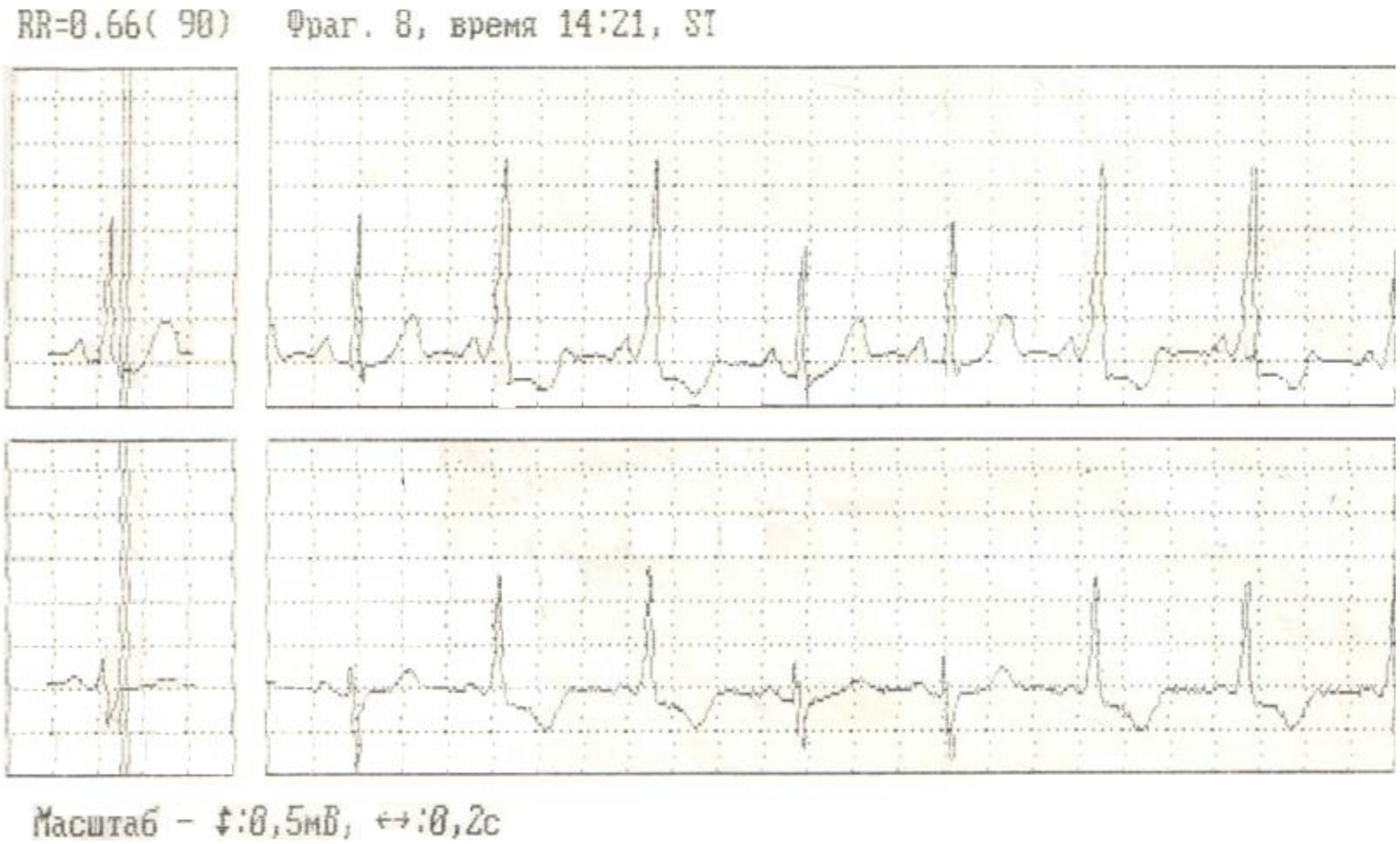


Ventricular pre-excitation syndromes

- Wolf-Parkinson-White (WPW) syndrome (phenomenon) – short PQ interval (< 120 ms), appearance of delta wave, wide, deformed QRS complex (> 120 ms), secondary changes of ST segment and T wave;
- Lown–Ganong–Levine syndrome (LGL) - short PQ interval (< 110 ms) with normal QRS complex, absence of delta wave and without ST segment and T wave changes;
- Mahaim type – normal duration of PQ interval with presence of delta wave

1. Atrial pacing
2. Dual chamber pacing
3. Ventricular pacing
4. Multi chamber pacing

Artificial pacemakers

- One chamber (atrial or ventricular), dual chamber, multi chamber (biventricular)
- Temporary or permanent
- The most common regimens of pacing:

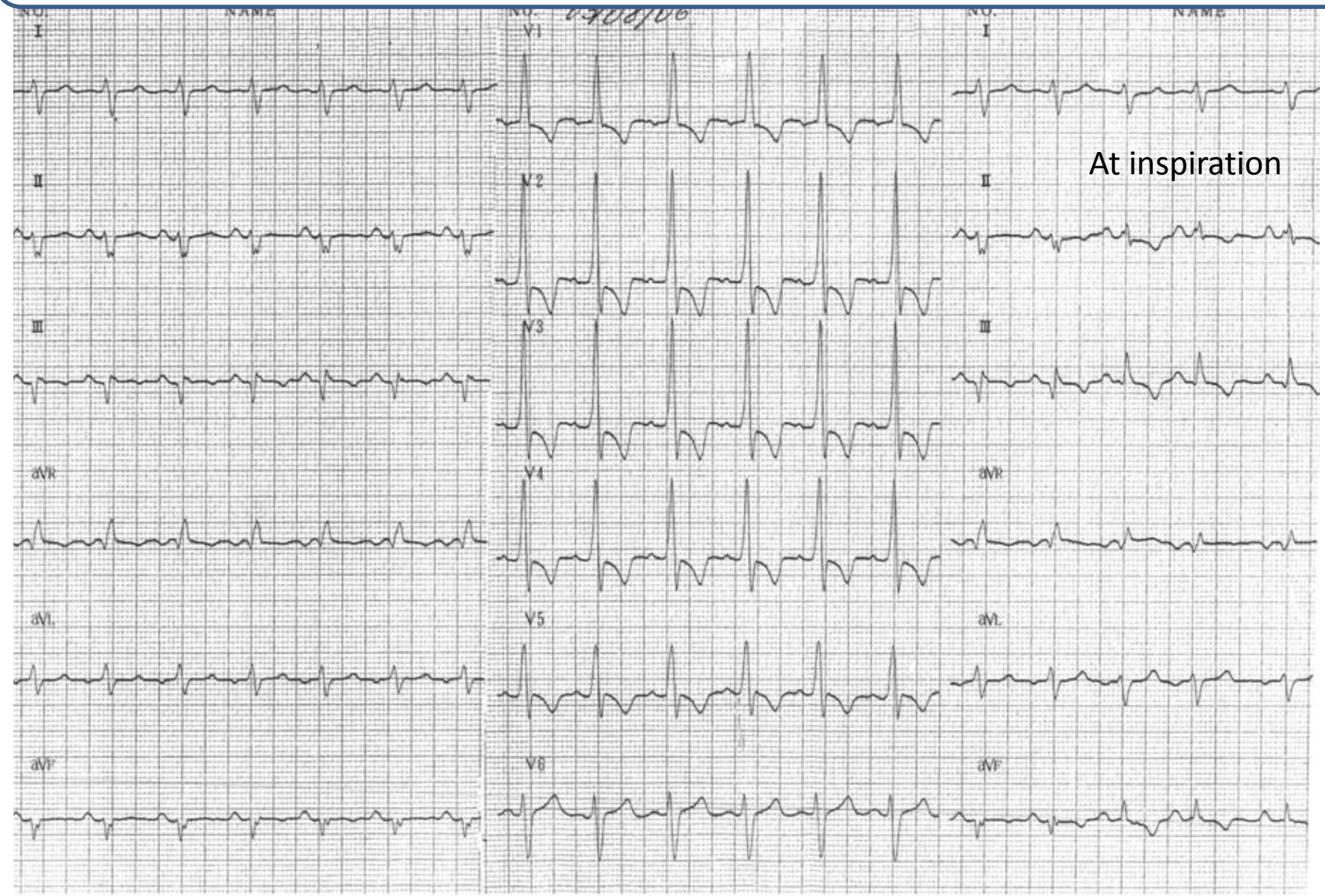
  VVI — one chamber ventricular pacing on demand;

  VVIR — the same but with rate adaptation;

  AAI — one chamber atrial pacing on demand;

  DDD — dual chambers atrial-ventricular biocontrolled pacing
- *Cardiac resynchronizing therapy* (CRT) – in patient with heart failure and signs of dyssynchrony on Echo

1. Inferior STEMI
2. WPW syndrome
3. Cor pulmonale
4. Dextrocardia



Acute cor pulmonale

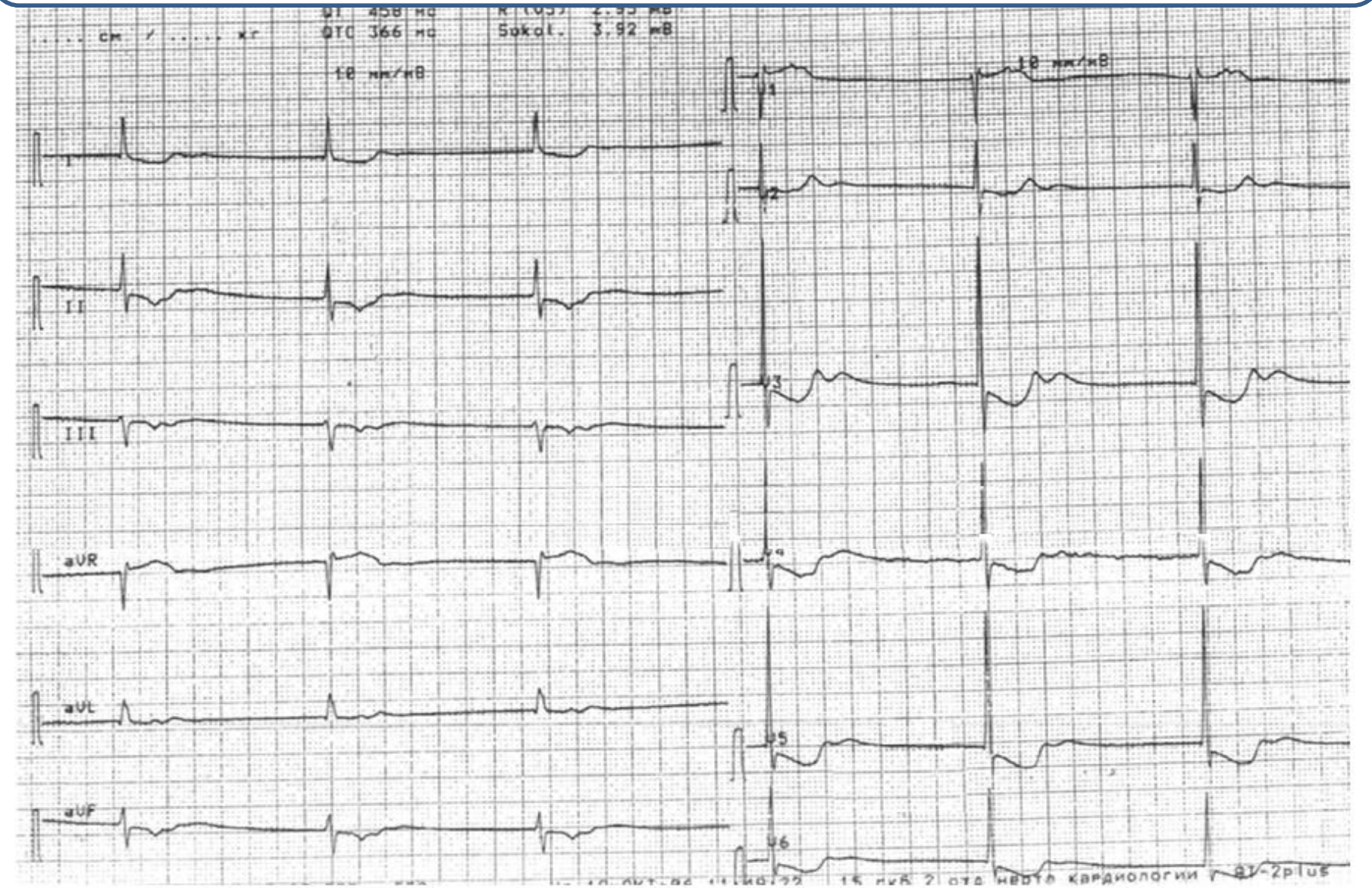
Main reasons:

- Pulmonary embolism (*not only thrombotic origin!*)
- Pneumothorax
- Status asthmaticus
- Massive pneumonia
- ARDS

ECG findings:

- ✓ P-pulmonale
- ✓ Right bundle branch block
- ✓ Deep S wave in V_5-V_6
- ✓ T wave inversion in right chest leads
- ✓ McGinn-White syndrome (deep S wave in lead I, Q wave and negative T wave in III lead – $Q_{III}S_IT_{III}$)

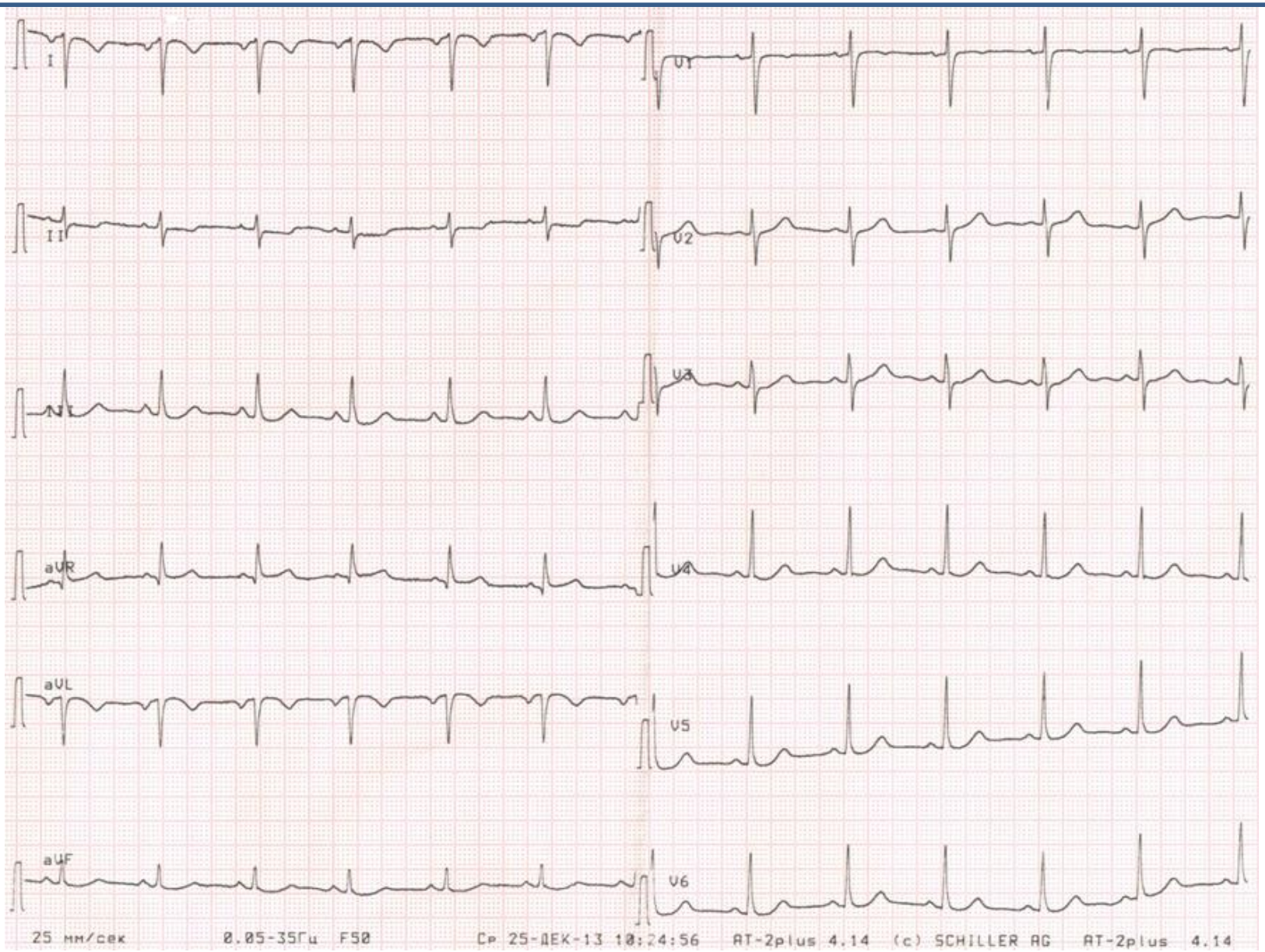
1. Sinus bradycardia
2. Hypopotassemia
3. Anterior and lateral wall ischemia
4. AV block



Hypopotassemia

- ***Etiology:*** vomiting, diarrhea, usage of digoxin, diuretics, laxative medications, B_{12} vitamin or folic acid, high dosage of insulin, primary hyperaldosteronism, hyperglycemia, family periodic paralysis
- ***ECG findings:*** trough-shaped ST-segment depression, T wave flattening or inversion, QT interval prolongation, U wave appearance

1. Lateral MI
2. Incorrect electrodes' placement
3. Dextrocardia
4. Kind of normal ECG



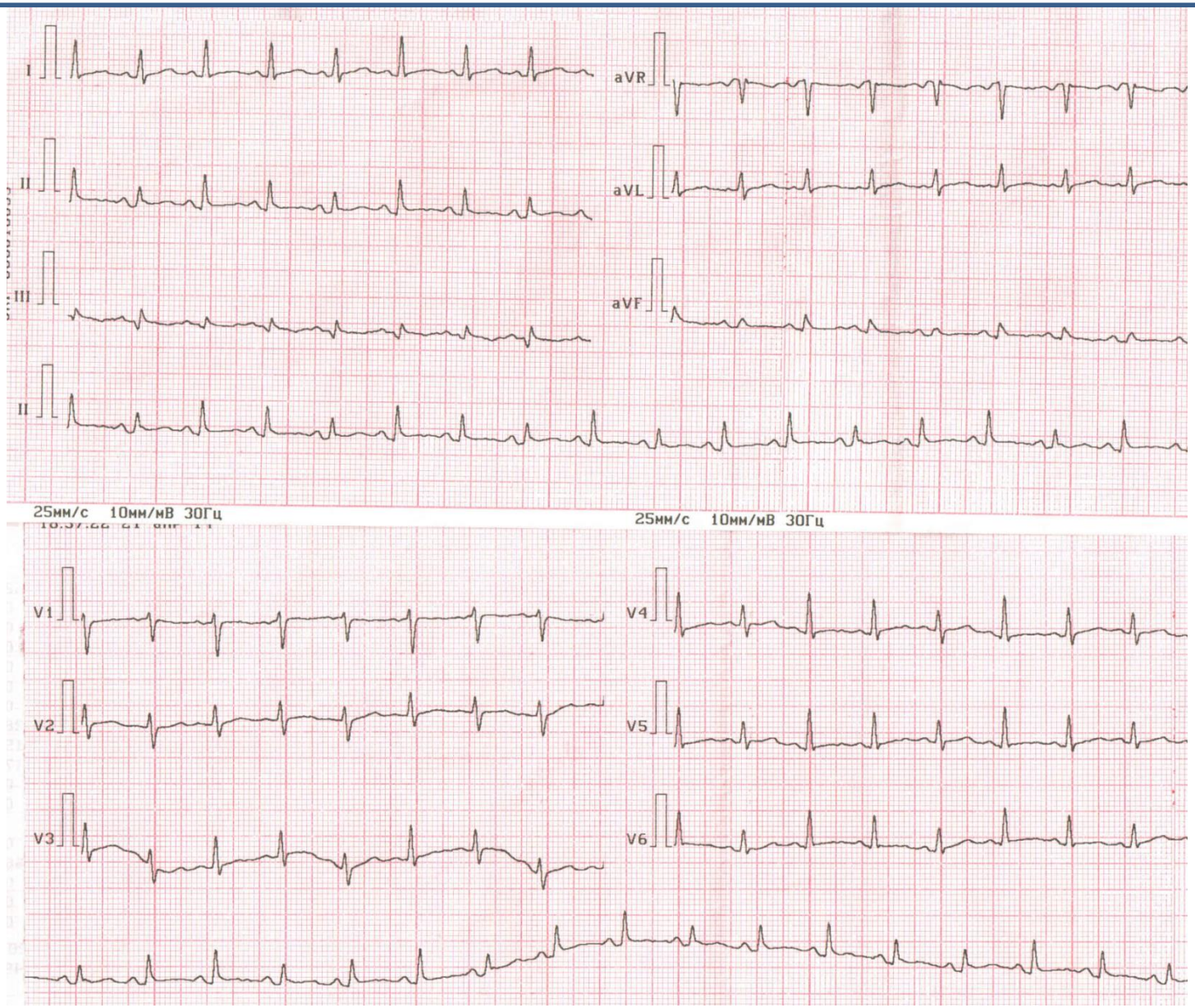
1. **Early repolarization syndrome**
2. **Brugada syndrome**
3. **Inferior-lateral STEMI**
4. **Pericarditis**

Early repolarization syndrome

ERS identifying in 1-9% of the general population, more often in men, leading sedentary lifestyle, athletes and black race, in patients with connective tissue dysplasia.

- Notch on the downsloping portion of QRS complex (J wave)
- ST-segment elevation with upward concavity
- Asymmetric high amplitude T waves
- U waves appearance
- Regression of changes at physical activity.

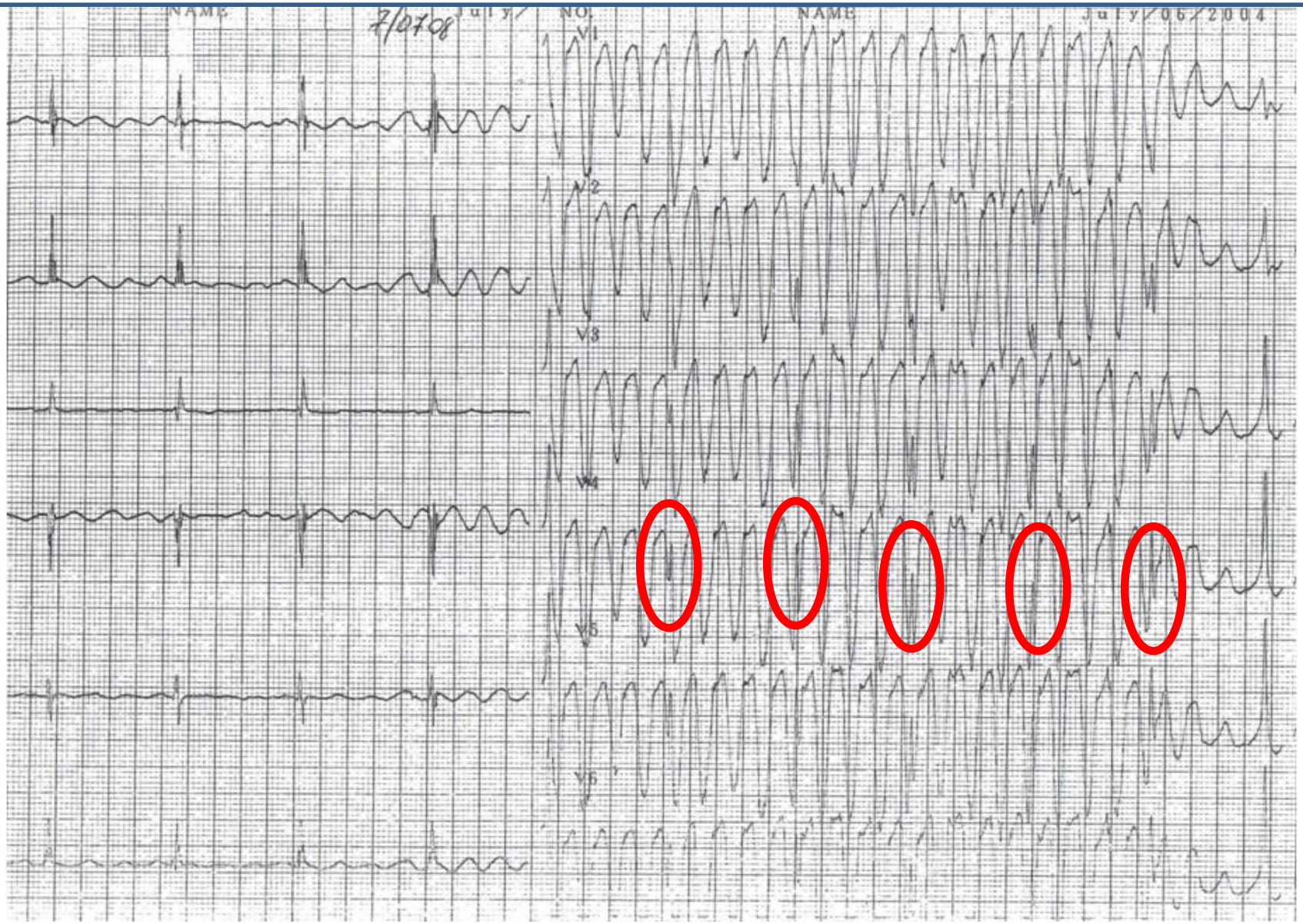
1. Pulmonary embolism
2. Pericardial effusion
3. Non-STEMI
4. Transient WPW syndrome



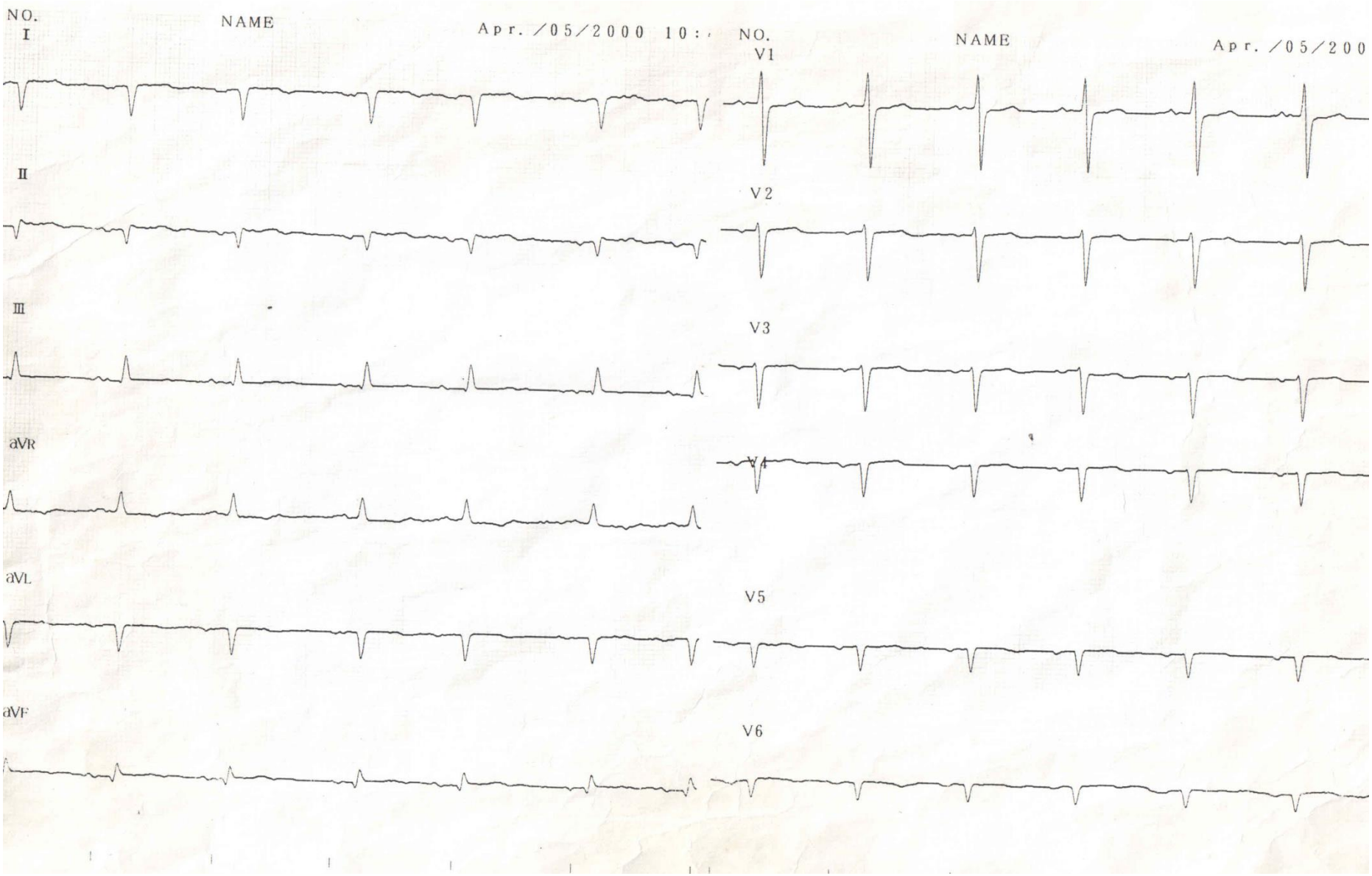
ECG findings in pericarditis

- Sinus tachycardia
- Concordant ST segment elevation in multiple leads, usually without reciprocal changes
- PQ interval depression
- Alternation of QRS complexes
- Low amplitude of QRS complexes in case of effusion
- Absence of pathological Q wave

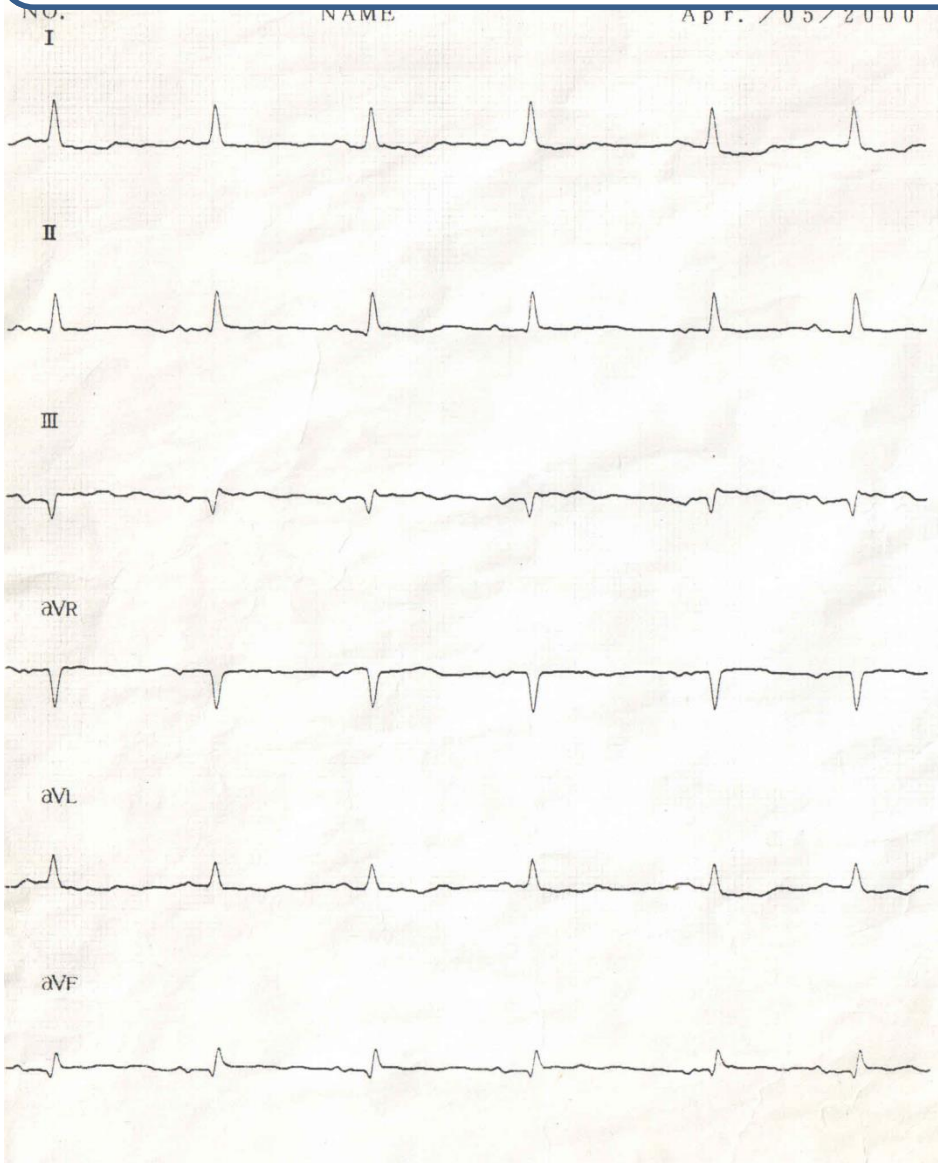
1. Atrial flutter
2. Ventricular tachycardia
3. Atrial fibrillation
4. **Normal sinus rhythm**

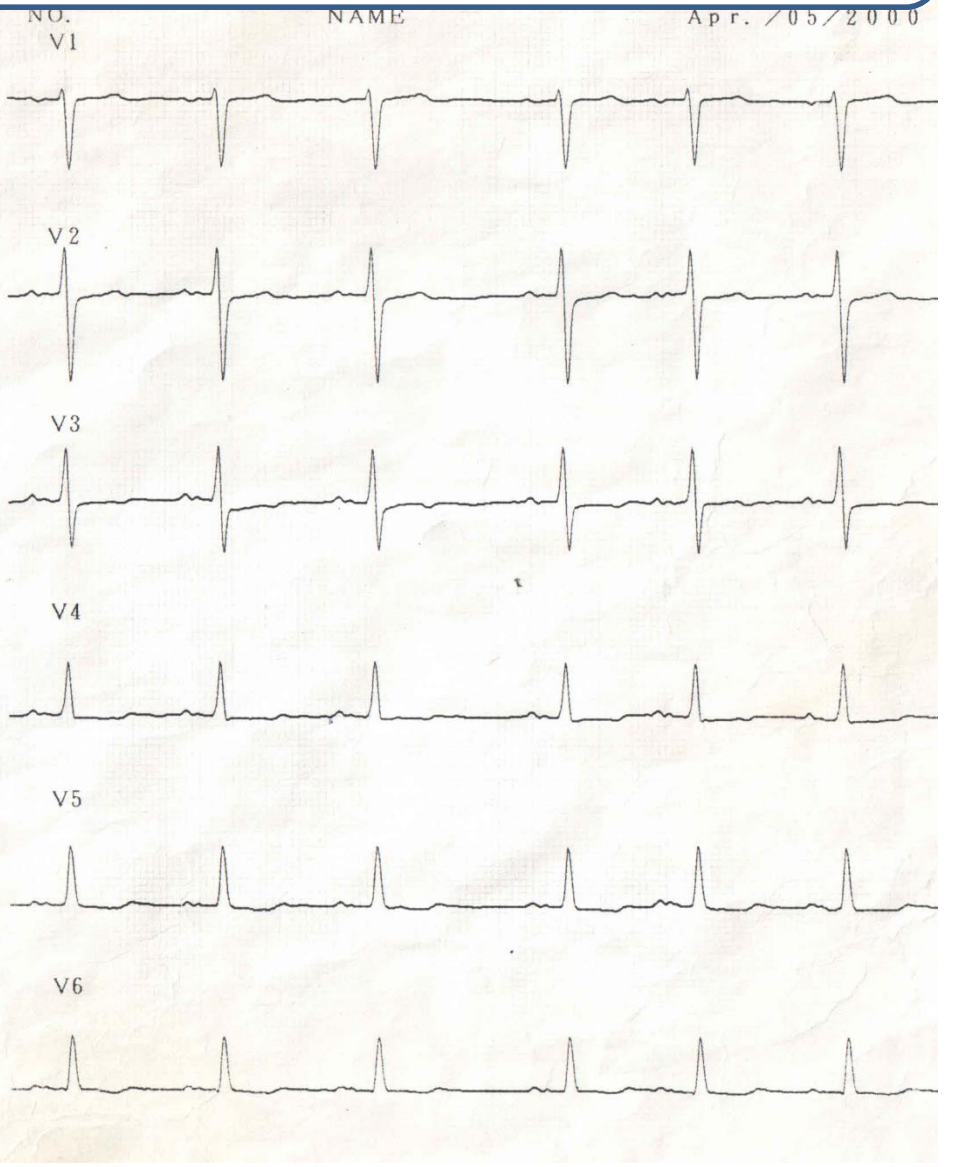


45 years old man admitted to the hospital with paroxysm of atrial fibrillation; sinus rhythm was restored in ambulance



1. Inferior MI
2. Incorrect electrodes' placement
3. Kind of normal ECG
4. Something else



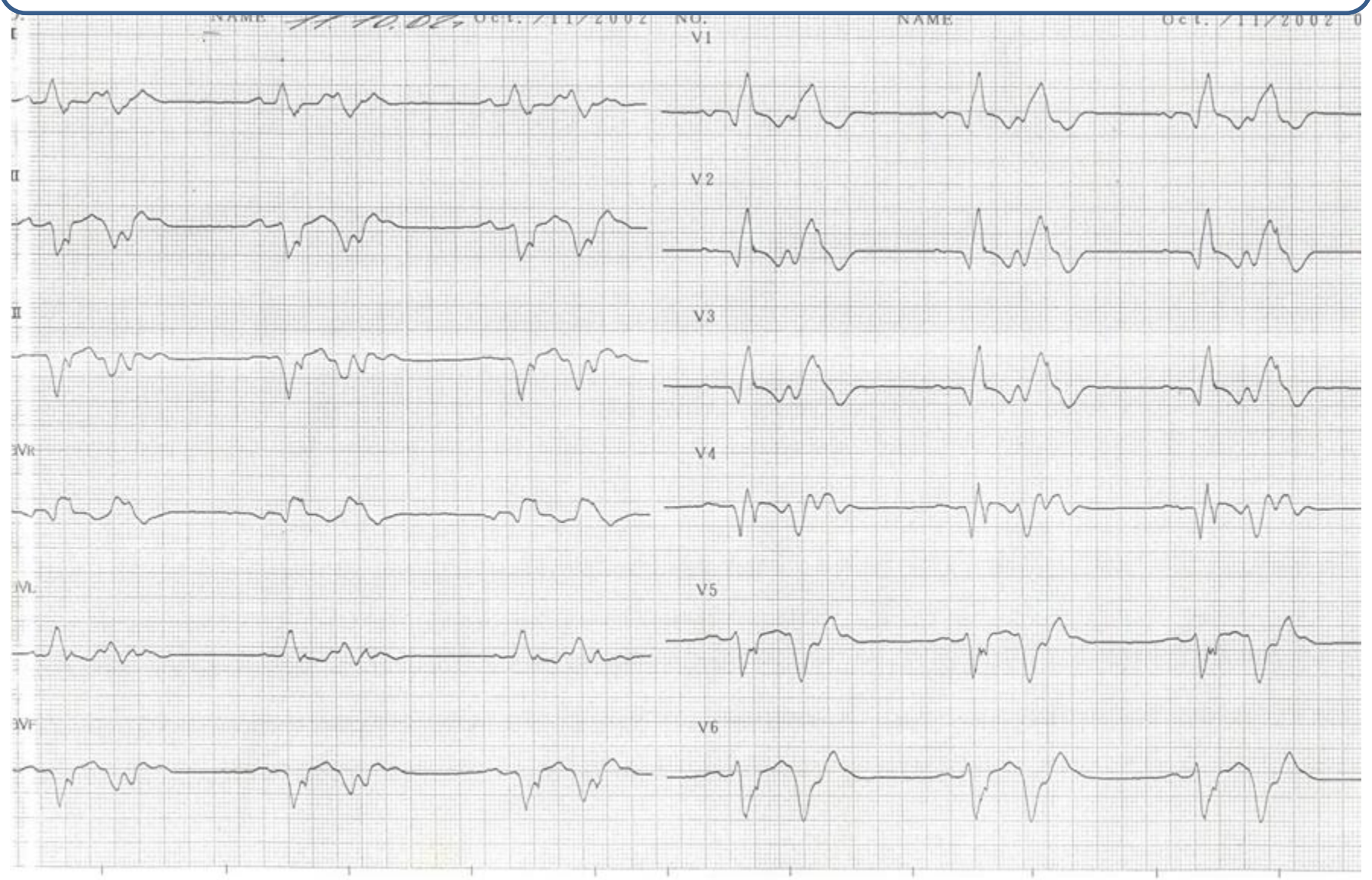


Dextrocardia

- Low voltage of QRS complexes
- Absence of enlargement of R wave in chest leads, with rS type configuration
- Non-specific changes in apical leads

A. Dextrocardia with situs inversus viscerum
B. Isolated dextrocardia (without situs inversus viscerum)
C. Dextroposition of the heart

1. Ventricular bigeminy
2. Old anterior MI
3. RBBB
4. p-mitrale



6 steps of proper ECG interpretation

- ✓ Validation of ECG recording (electrodes, voltage, speed)
- ✓ Analysis of rhythm and conduction (source, regularity, rate)
- ✓ Evaluation of electrical axis position
- ✓ Estimation of intervals and waves (PQ, QRS, ST, T, QT)
- ✓ Additional waves (Δ, J, U) and complexes (premature beats)
- ✓ Conclusion

XIV European Congress of Internal Medicine
(Moscow, 14-16 October 2015)

ECIM 2015 in Moscow

Some figures:

- Website opening and start of registration – May 2014
- Abstract submission deadline – 31 May 2015
- End of early registration – 14 August 2015
- Early registration fee for YI – 100 E
- YI half-day – on October, 16

Unique possibility to discover Russia!

What is “double-blind, placebo-controlled clinical trial”?

Two surgeons examining ECG in a company of traumatologist... ☺