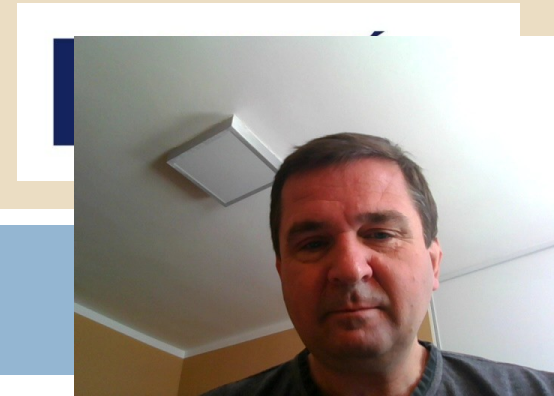


ECG – ALL YOU WANTED TO KNOW, BUT YOU WERE AFRAID TO ASK !

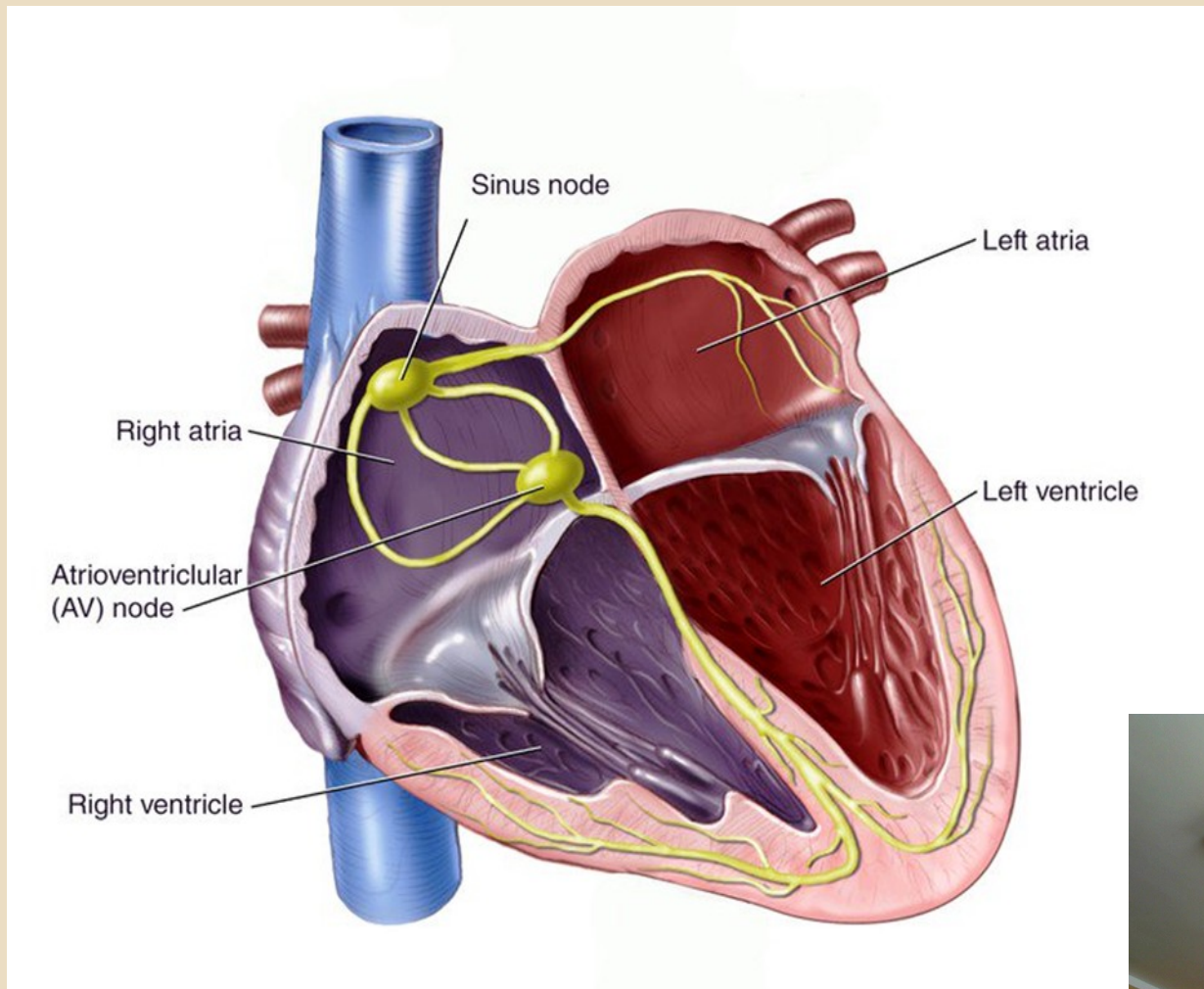
L.Křivan

Interní kardiologická klinika FN Brno

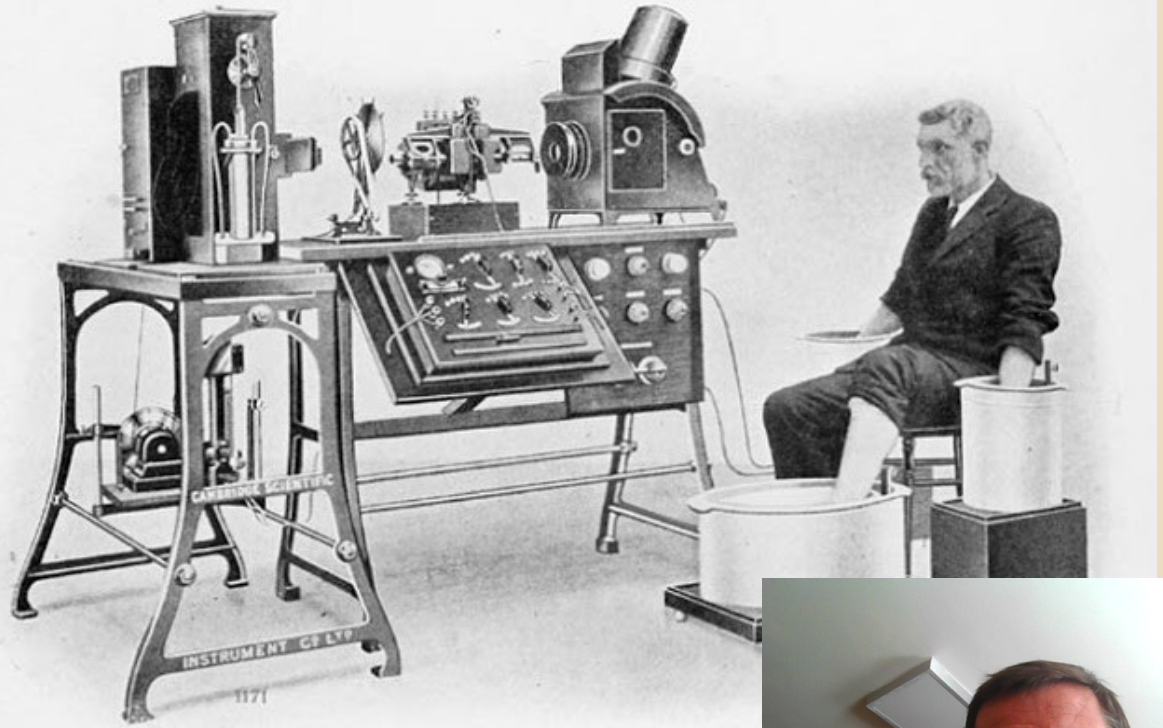
MUNI
FACULTY
OF MEDICINE



Nodes responsible for cardiac rhythm



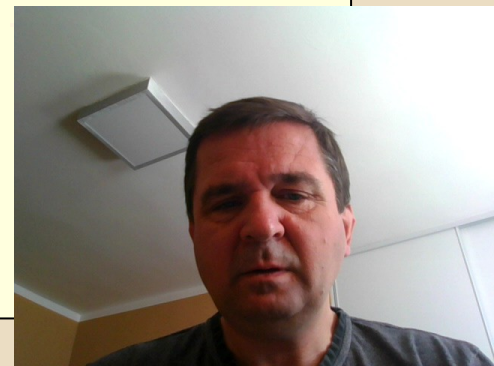
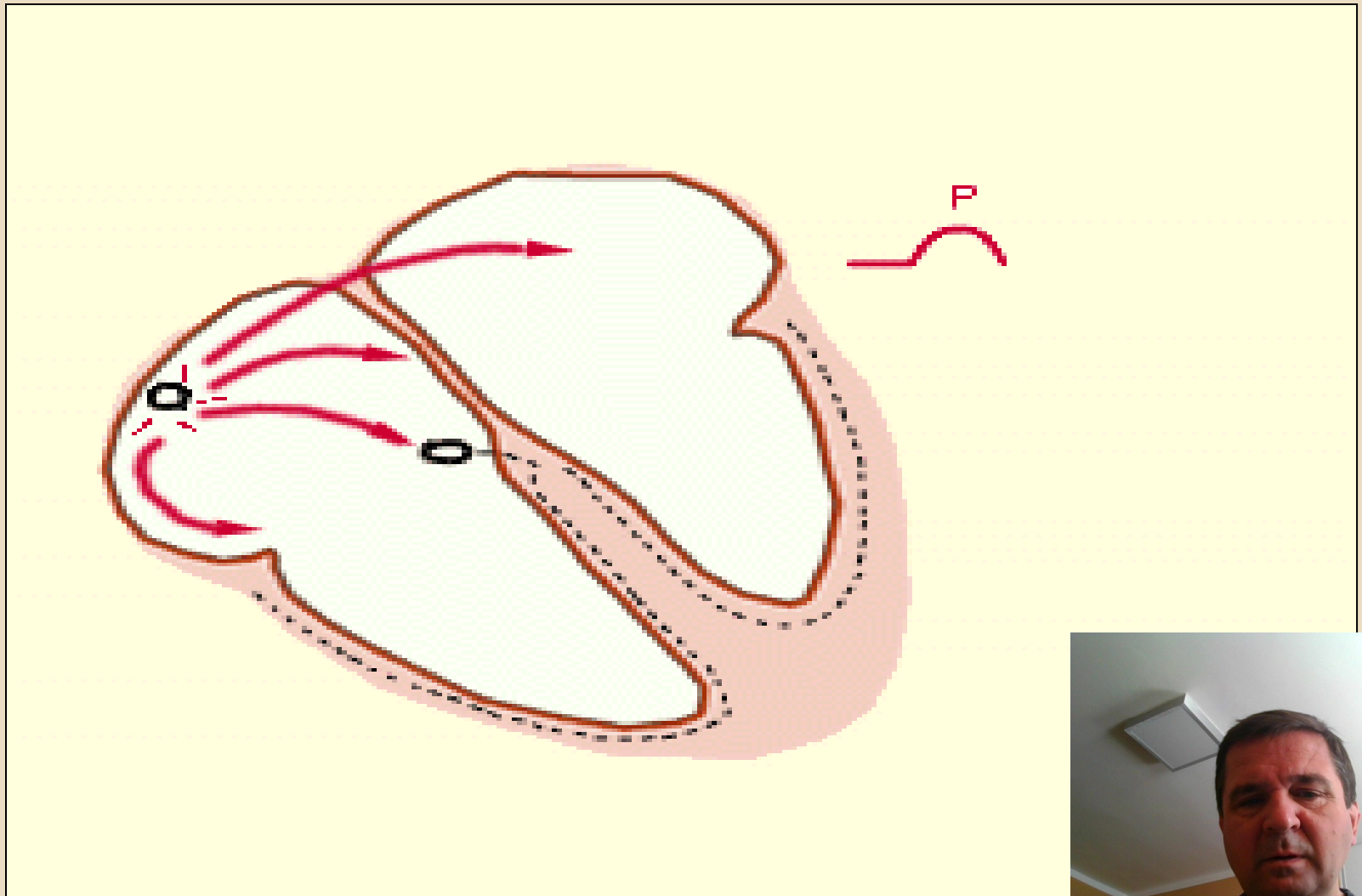
Electrical cardiac activity can be recorded



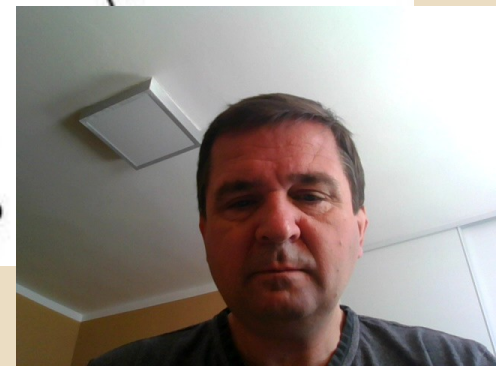
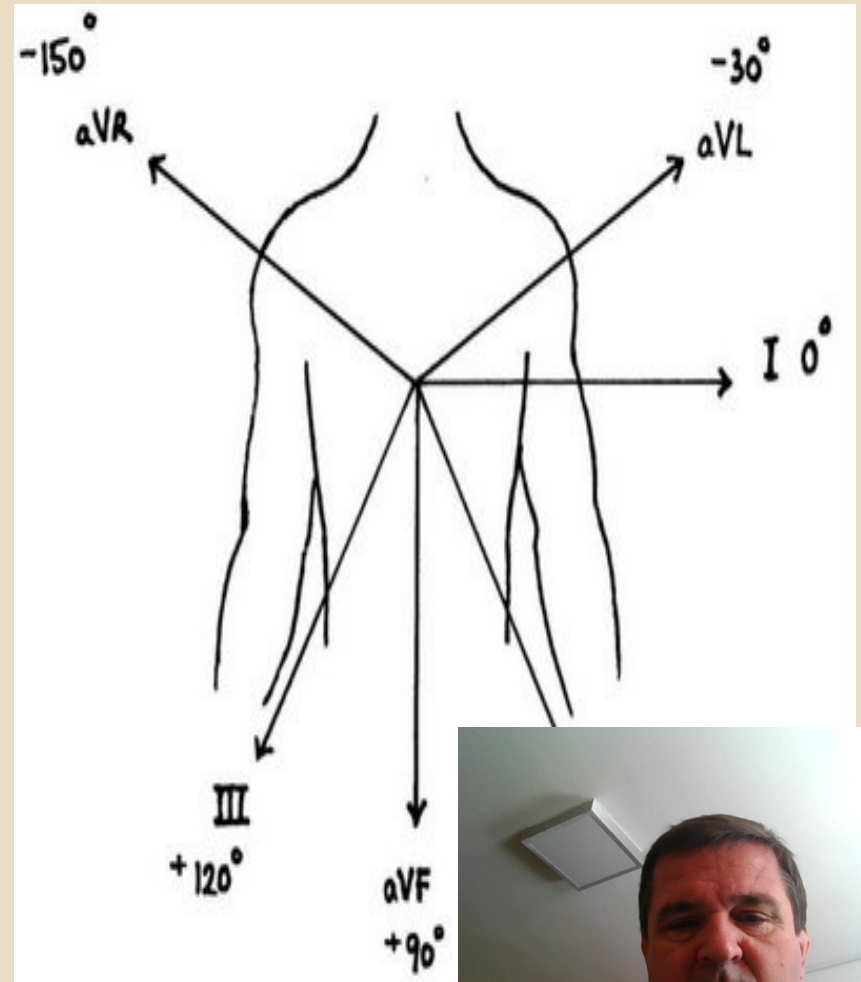
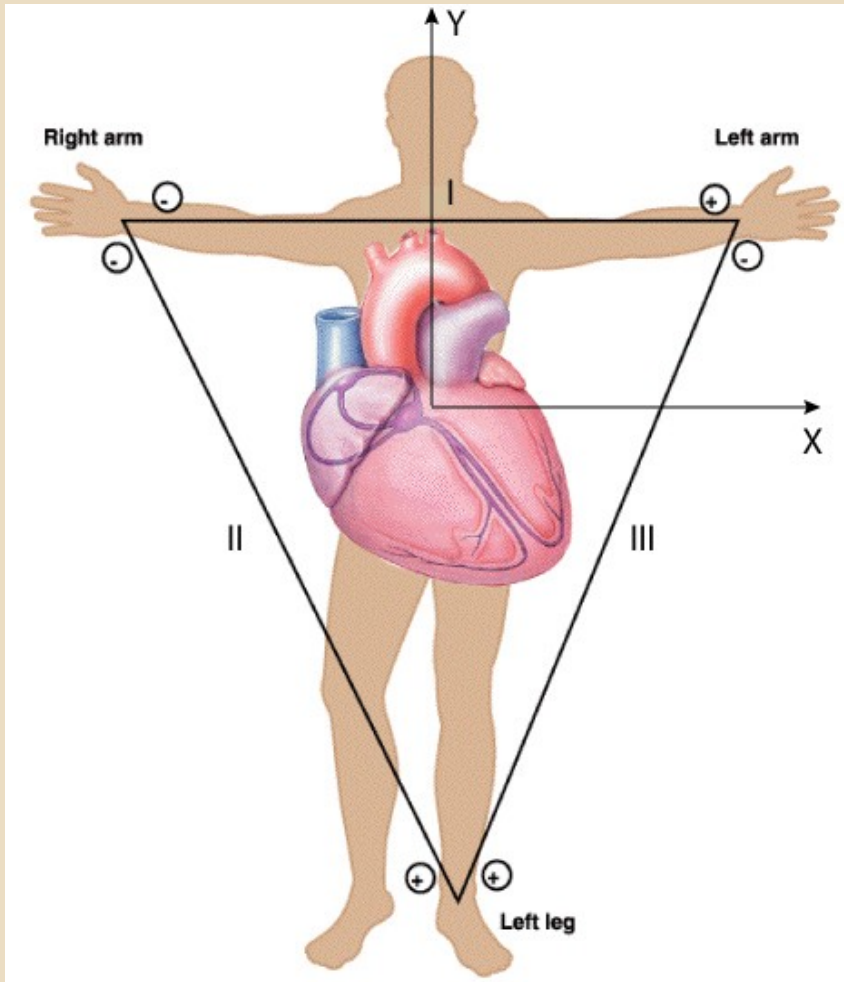
PHOTOGRAPH OF A COMPLETE ELECTROCARDIOGRAPH, SHOWING THE MANNER ATTACHED TO THE PATIENT, IN THIS CASE THE HANDS AND ONE FOOT IN CONTACT WITH A SALINE SOLUTION



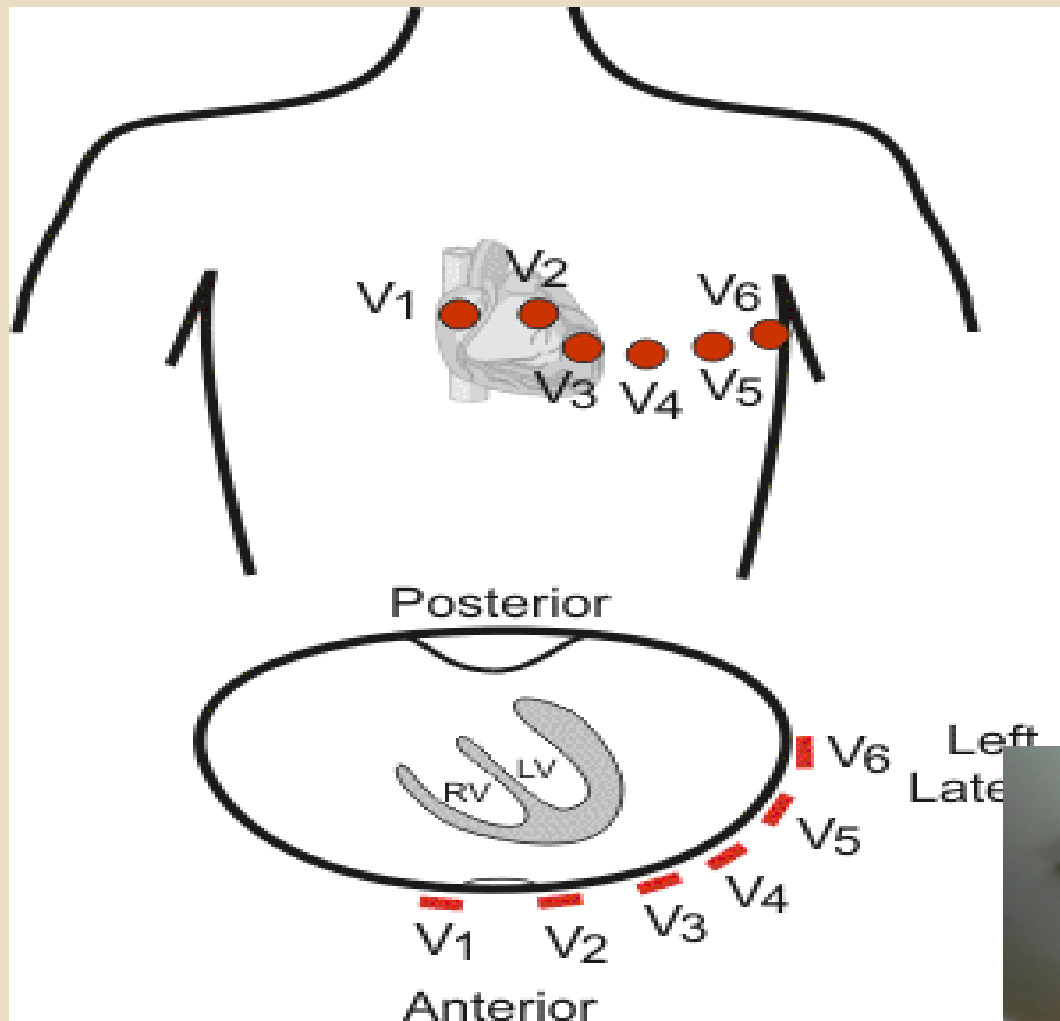
ECG (Willem Einthoven 1893)



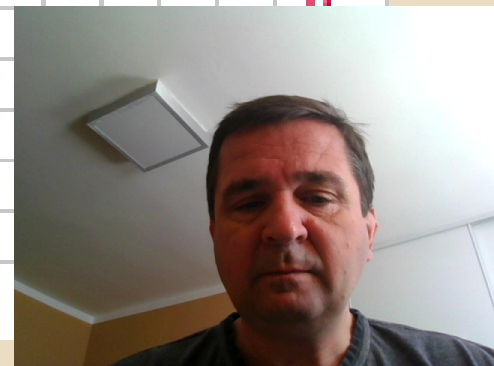
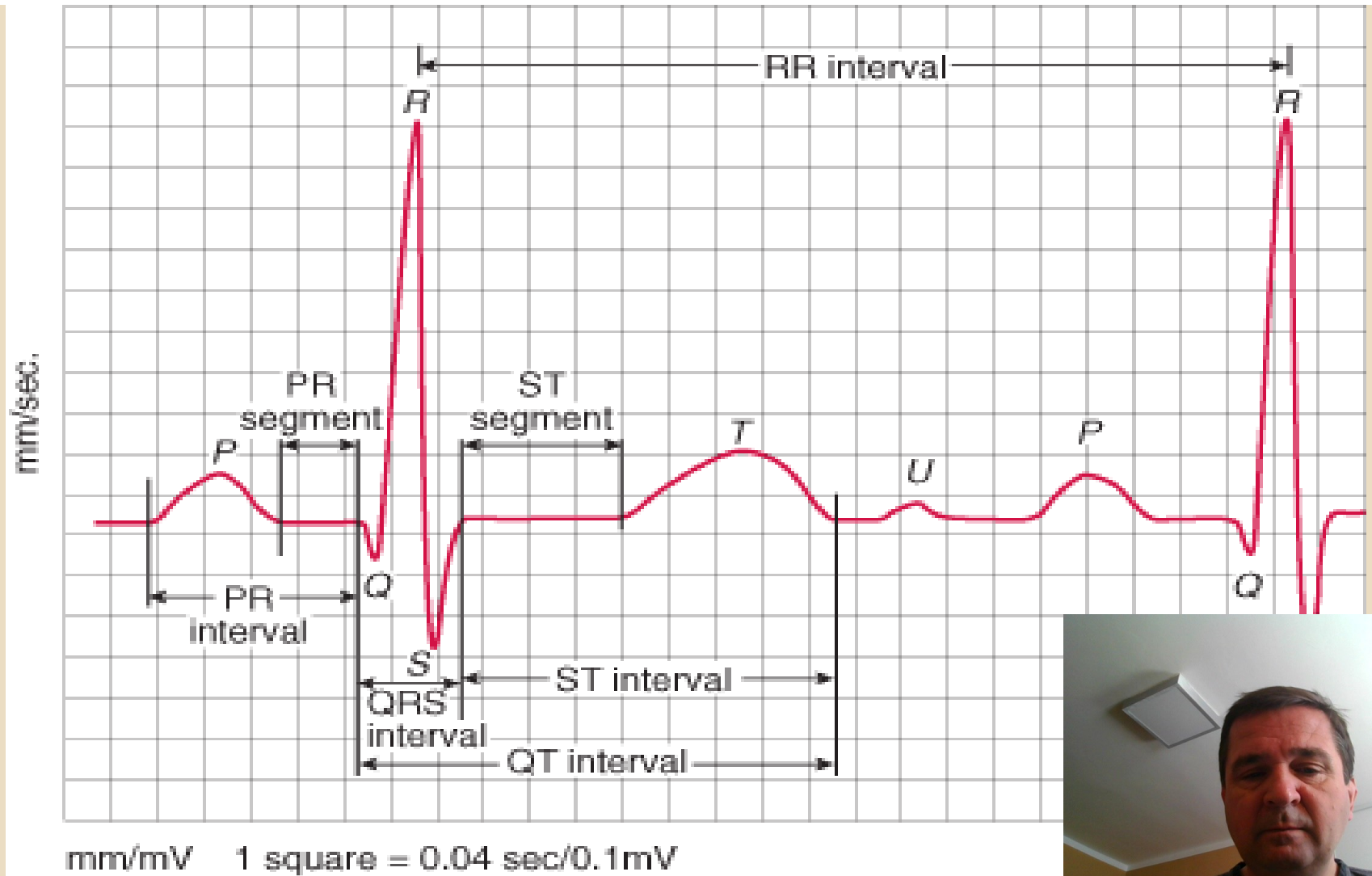
ECG – limb leads



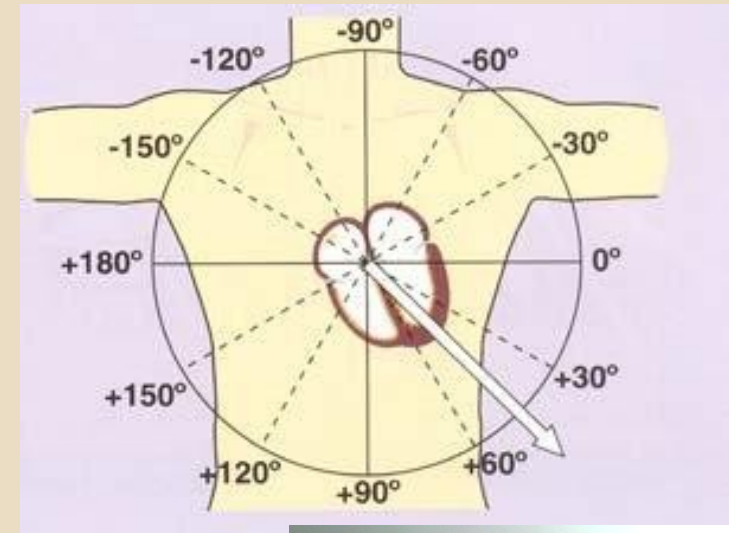
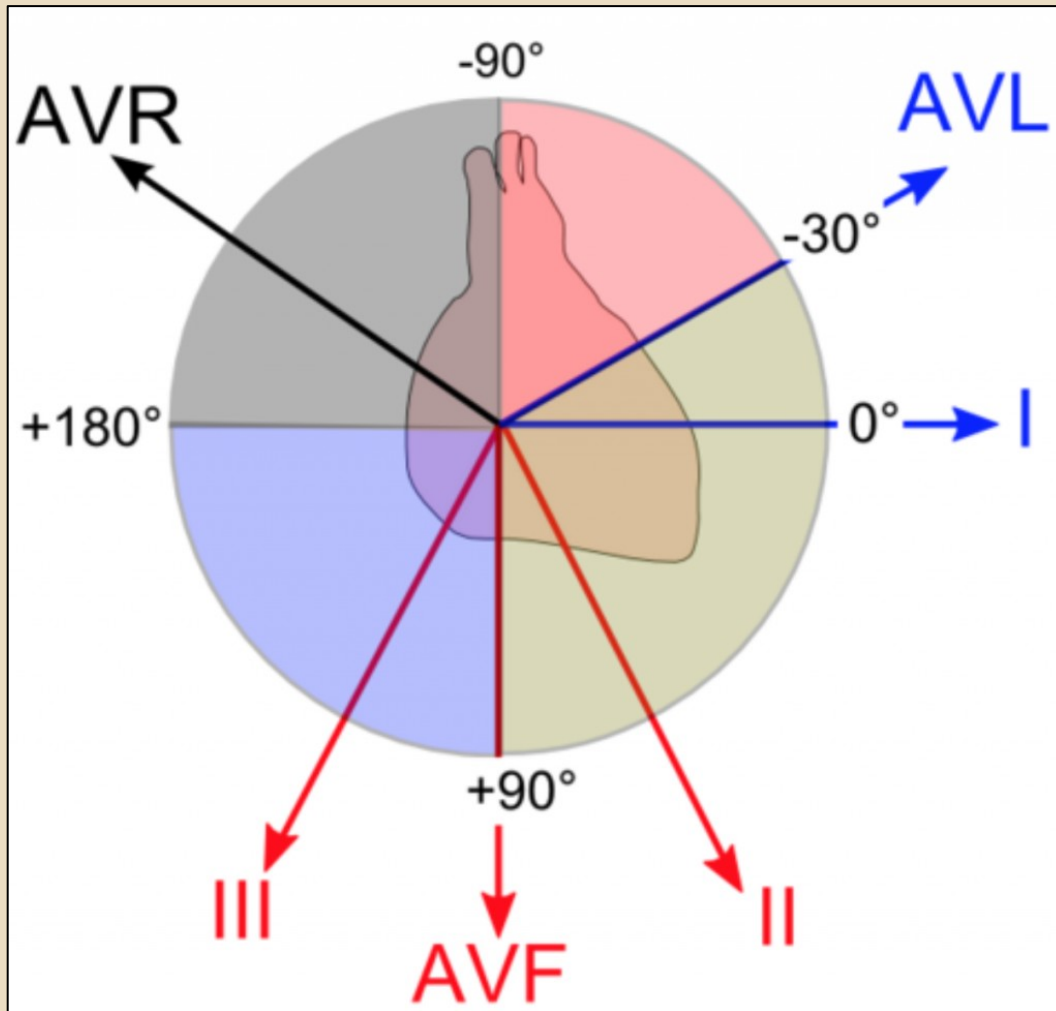
ECG- precordial leads



ECG – intervals (**PQ** < 0.2s, **QRS** < 0.1s, **QTc** < 0.44s)



Electrical axis of the heart



Conduction disorders

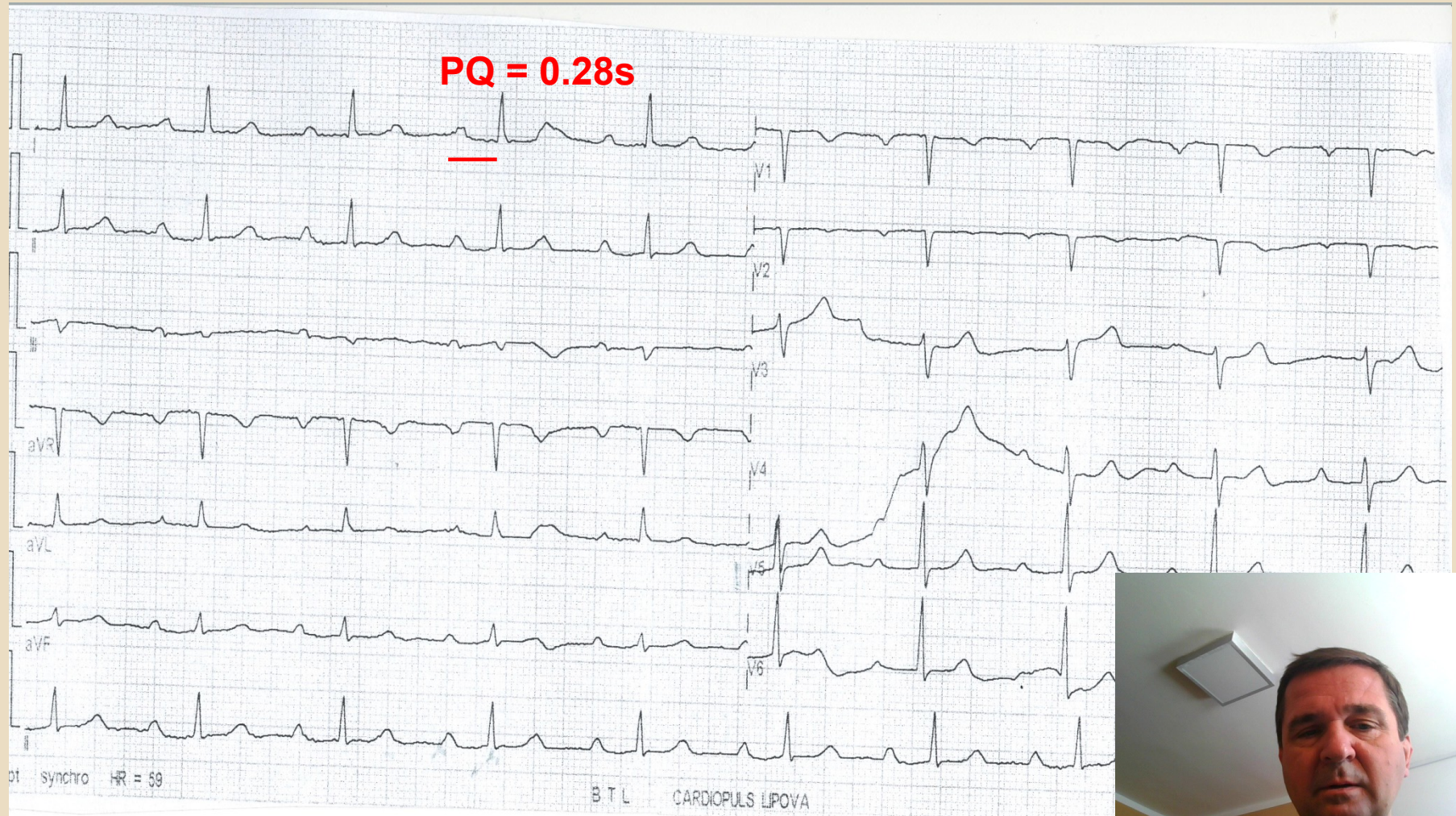
AVB (I.st, II.nd, III.rd)

RBBB

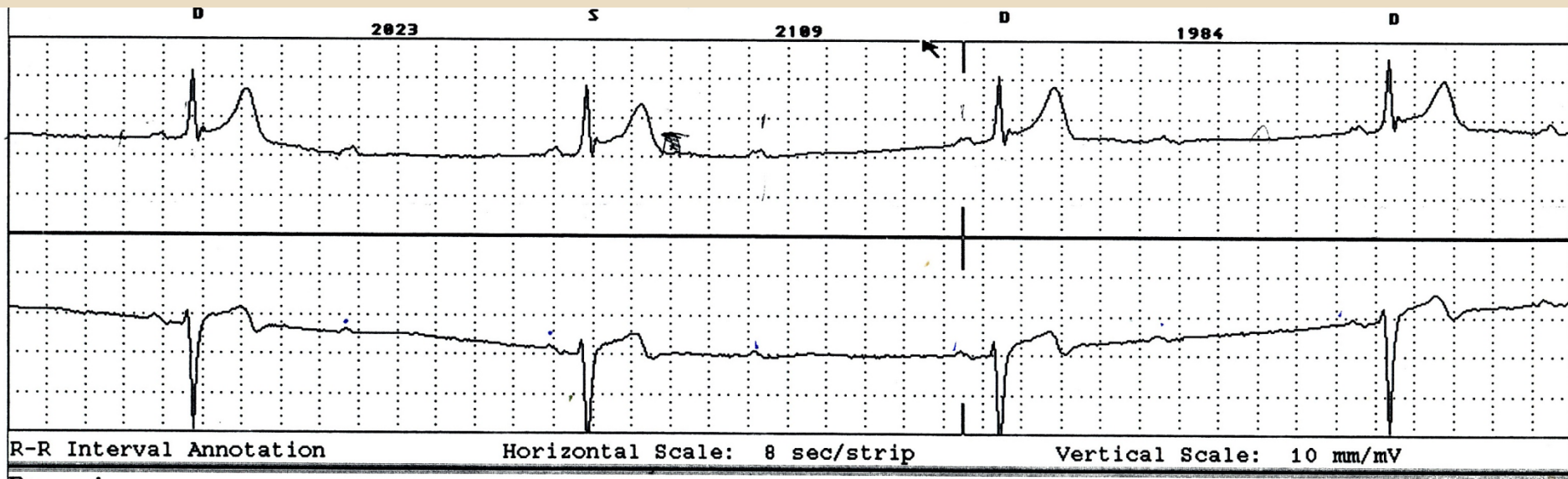
LBBB



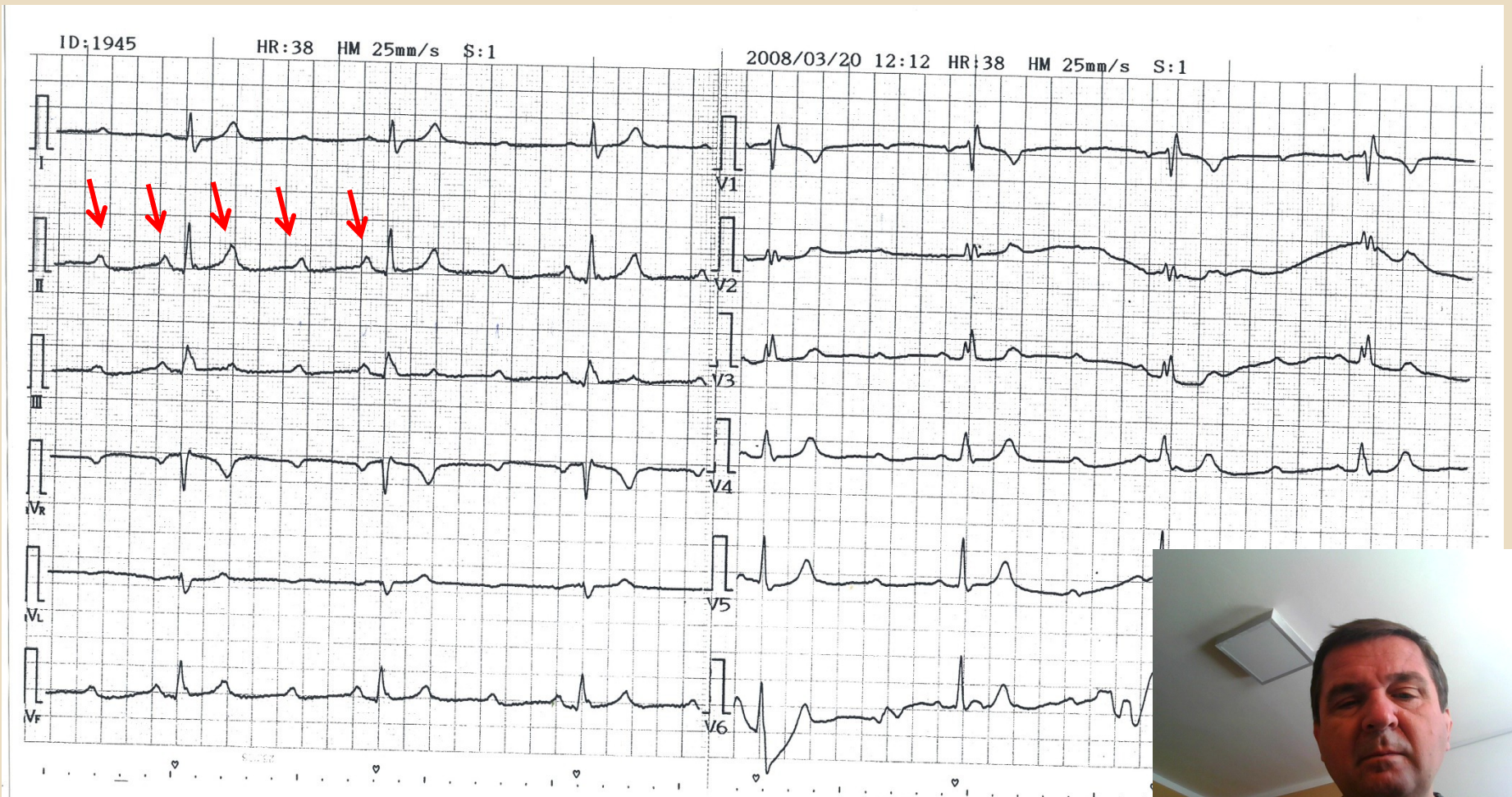
AVB I.st degree (PQ > 0,2s)



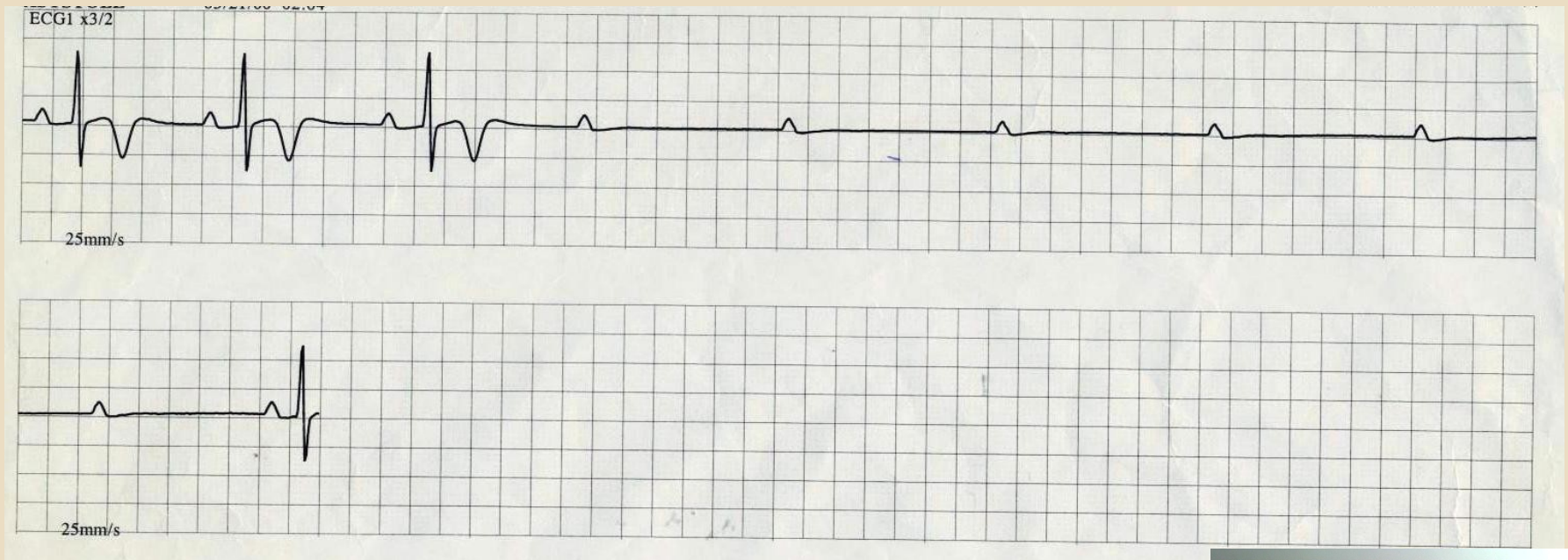
AVB II.nd degree (2/1)



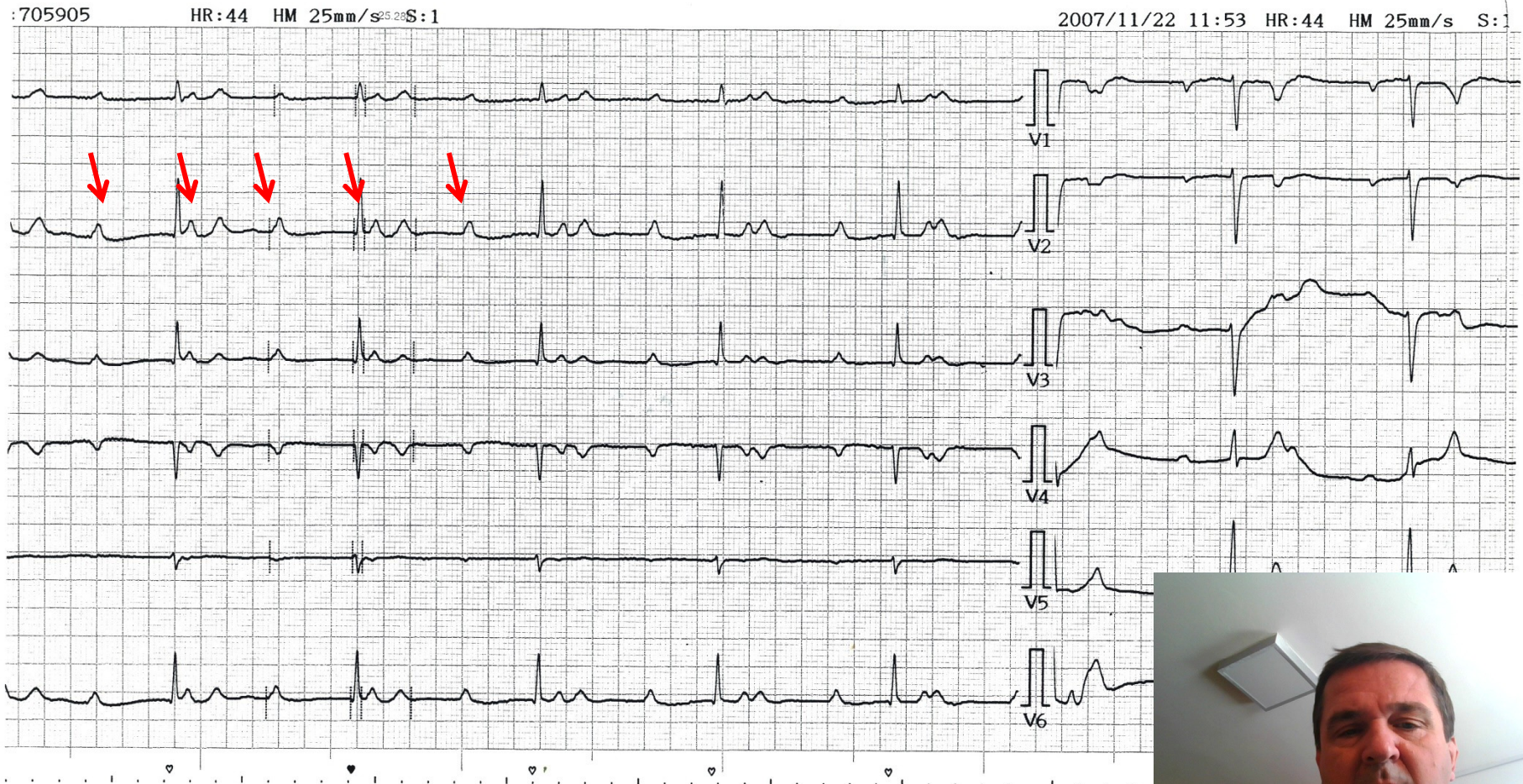
AVB II.nd degree (Mobitz 3/1)



AVB III.rd degree (no secondary, tertiary autom. centre)



AVB III.rd degree (escape rhythm from AV junction)

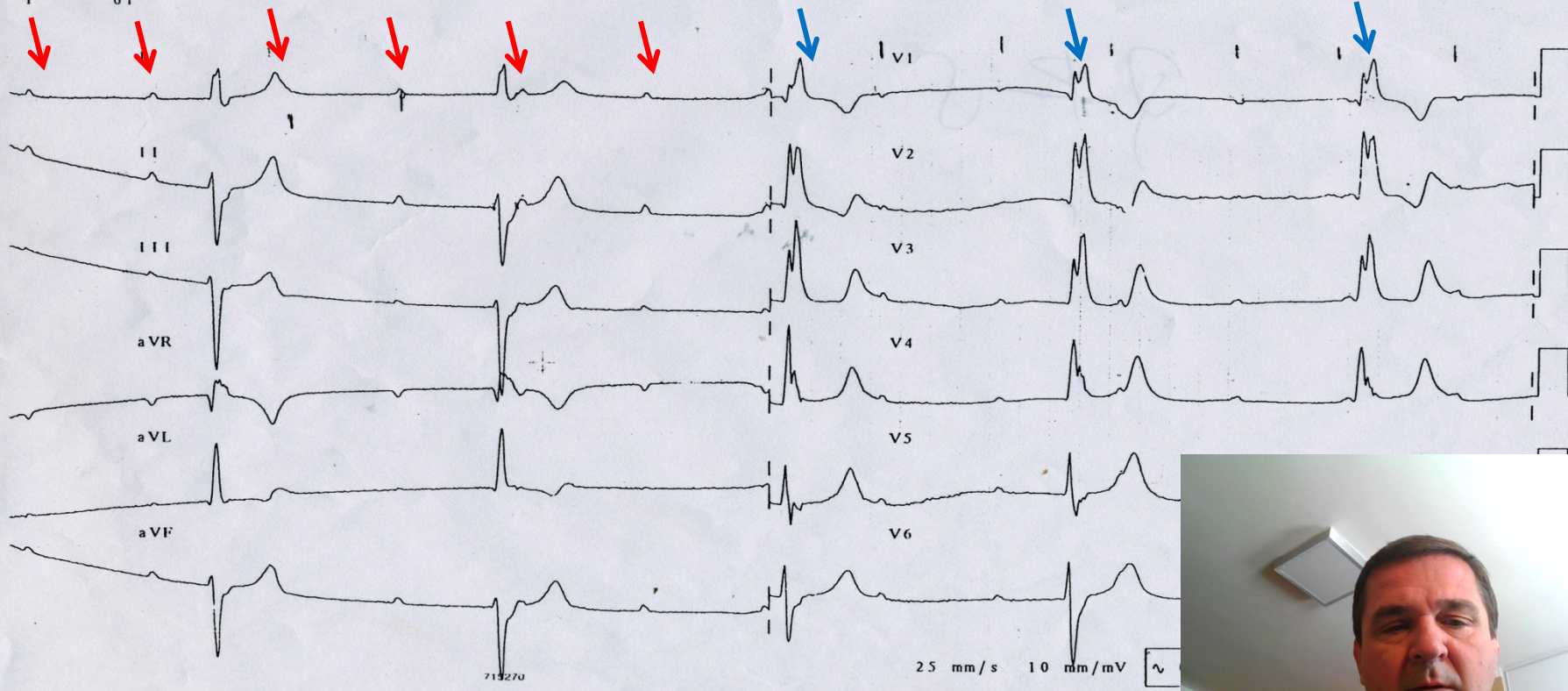


AVB III.rd degree (escape ventricular rhythm)

Rate 32
PR 0
QRSD 166
QT 728
QTc 531

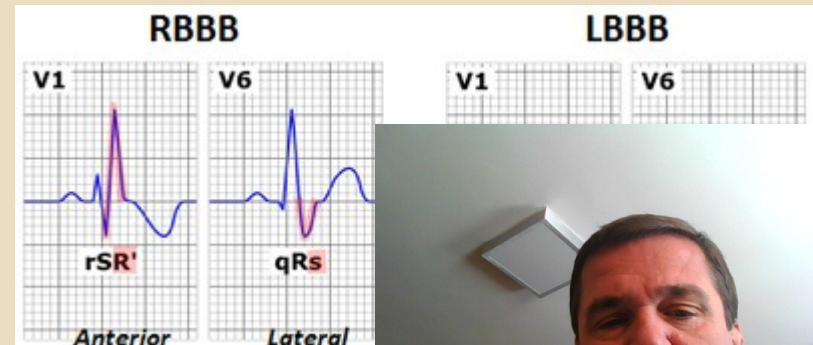
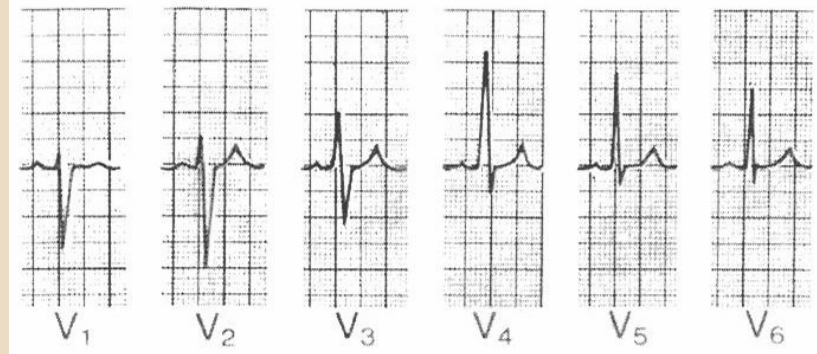
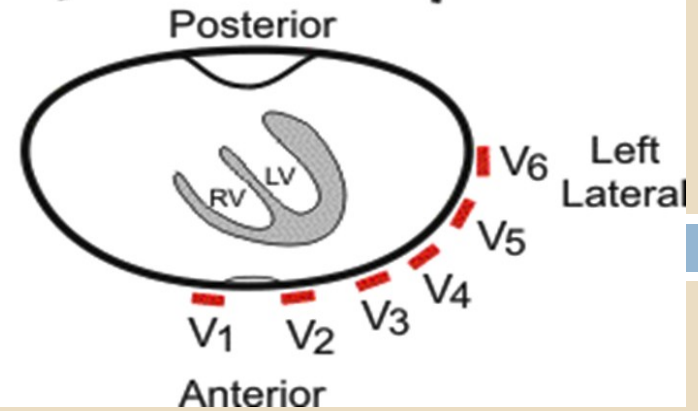
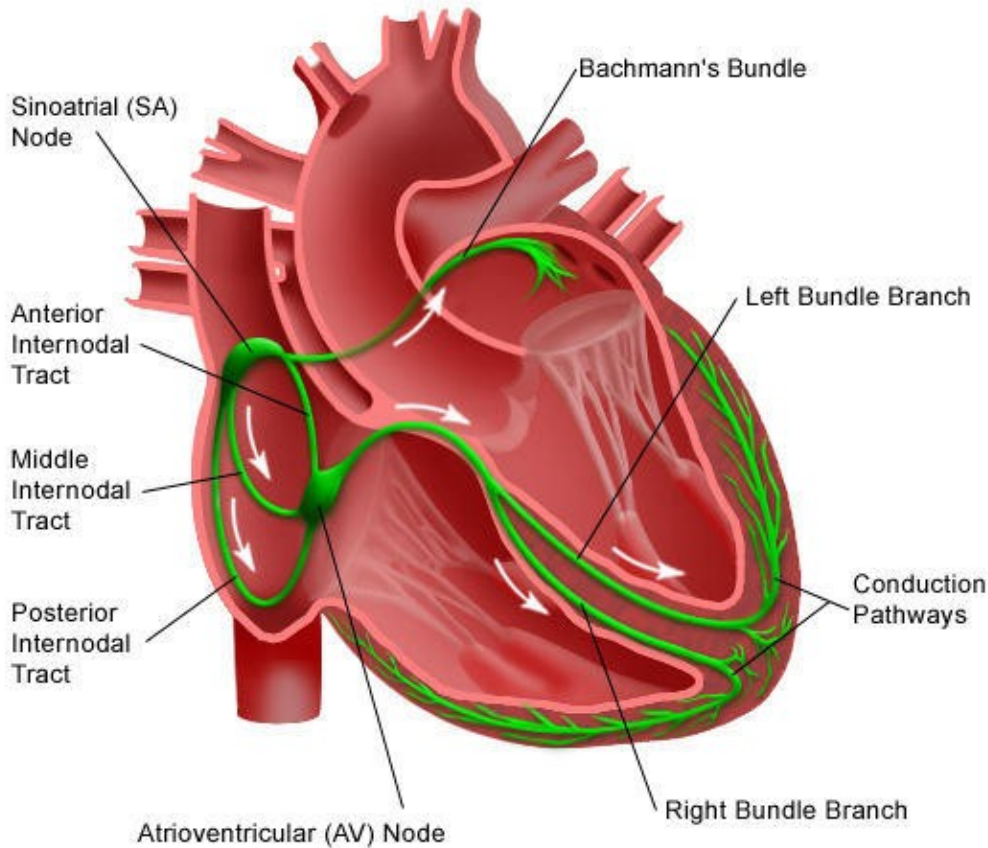
--Axis--

P
QRS -74
T 61

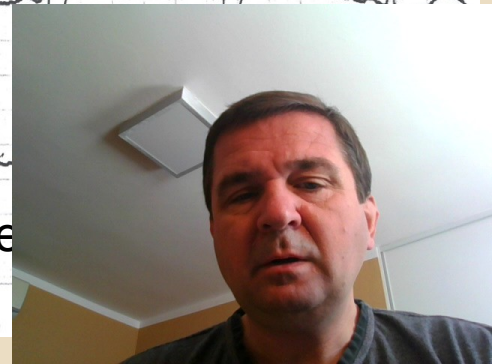
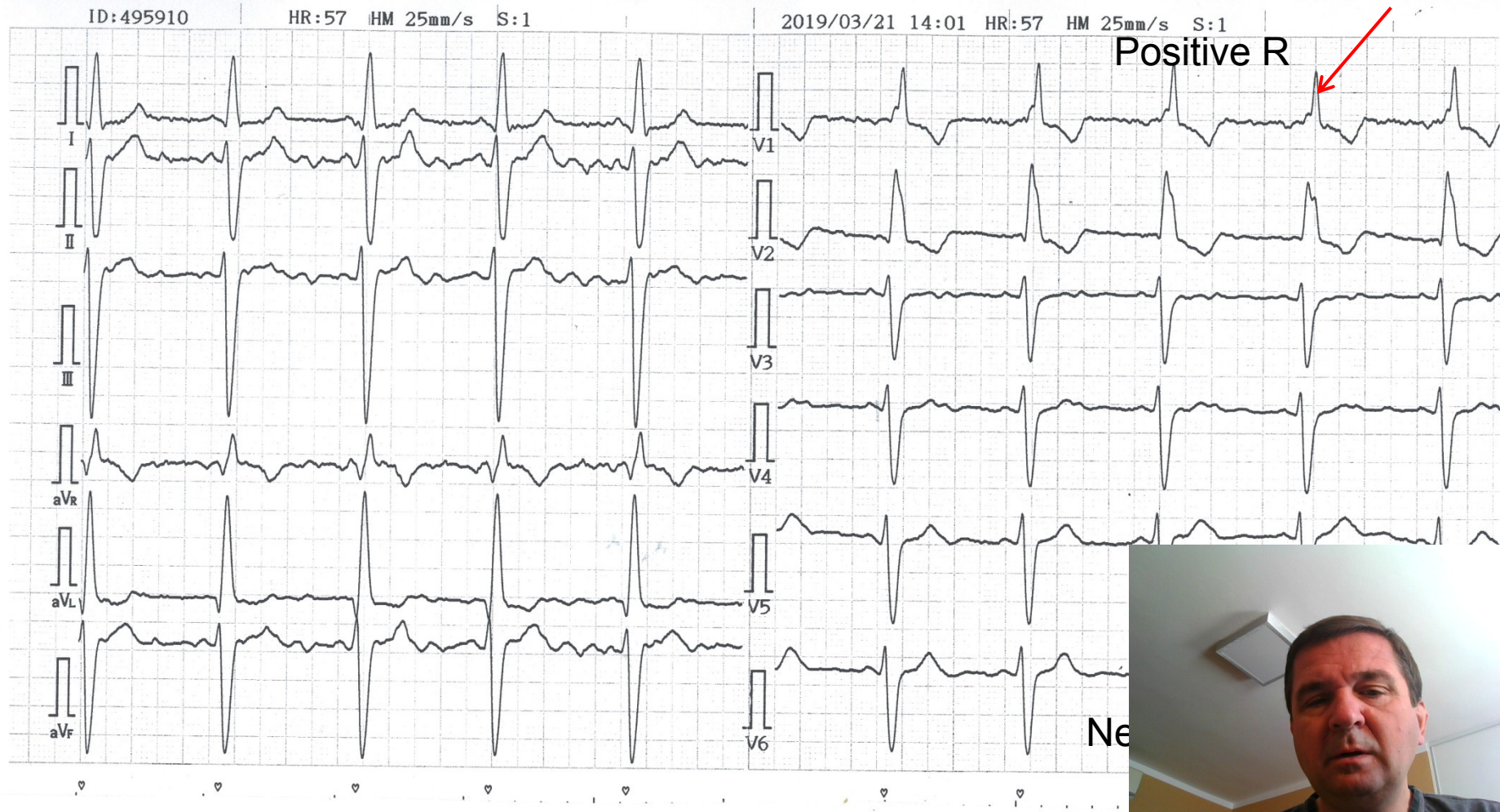


Bundle branch block

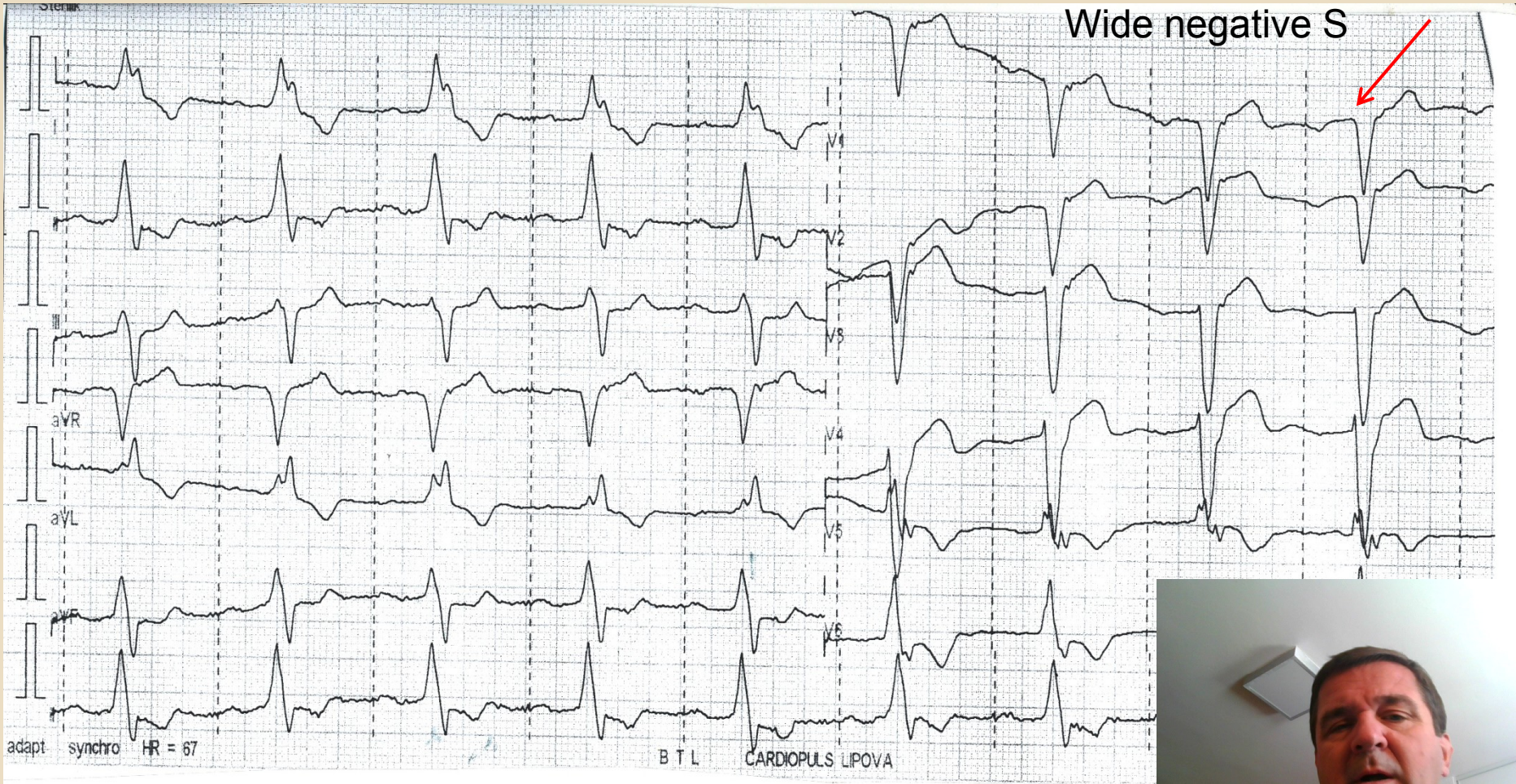
Electrical System of the Heart



Right bundle branch block - RBBB



Left bundle branch block - LBBB



Wide positive



Supraventricular arrhythmias

Premature atrial contraction

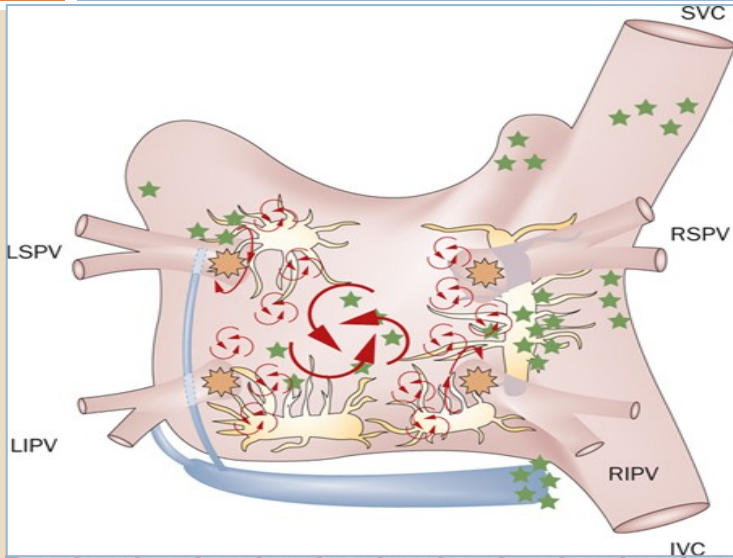
Atrial fibrillation

Atrial flutter

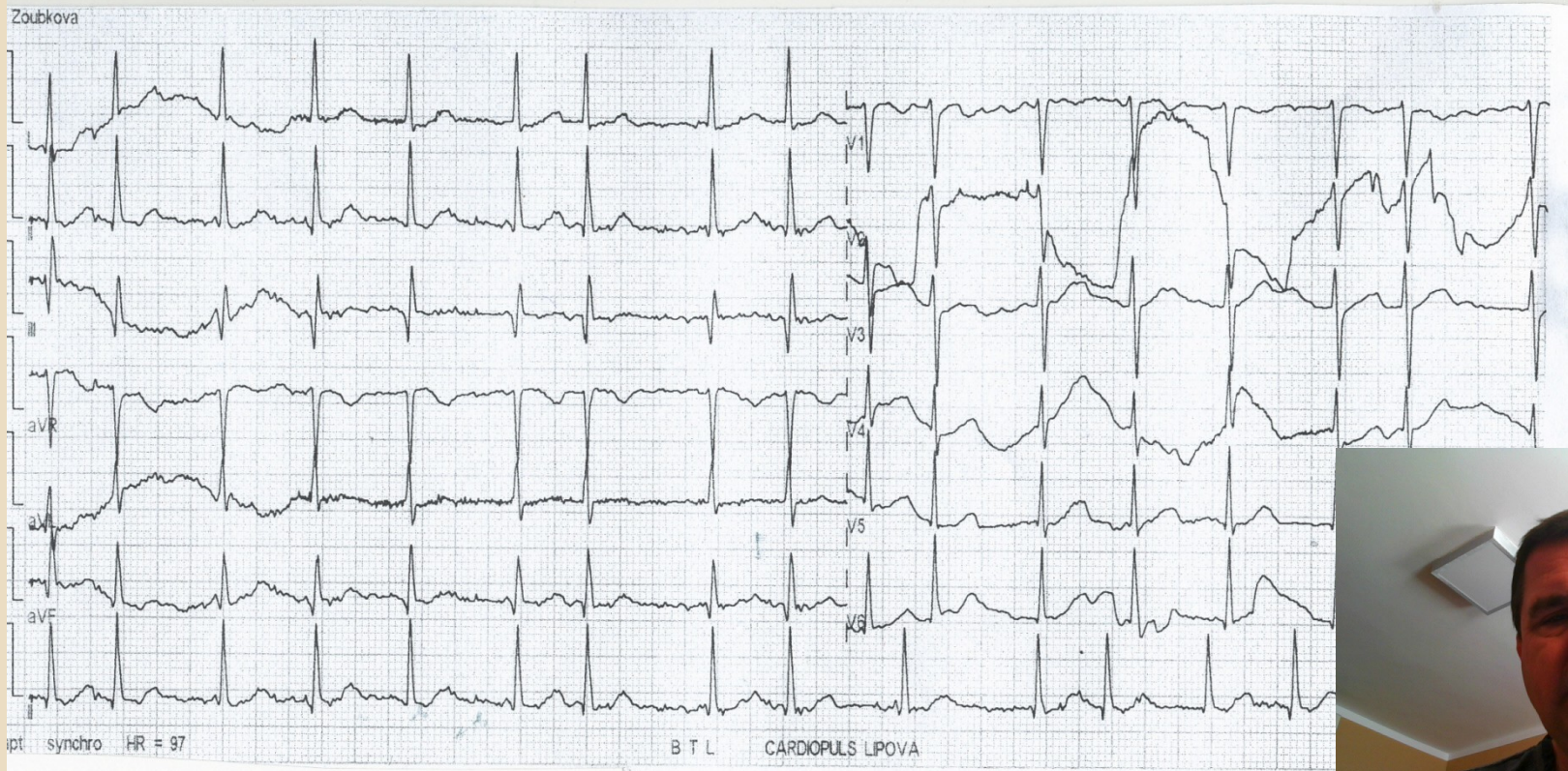
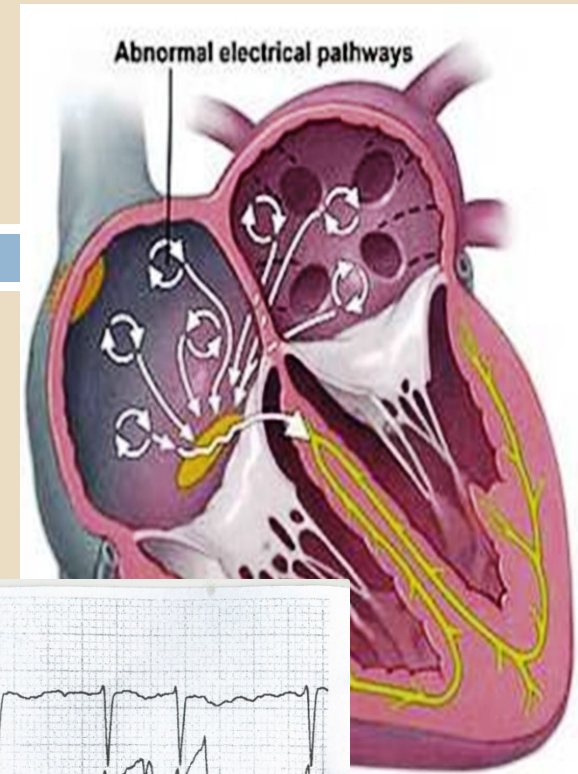
AVNRT

AVRT (WPW)

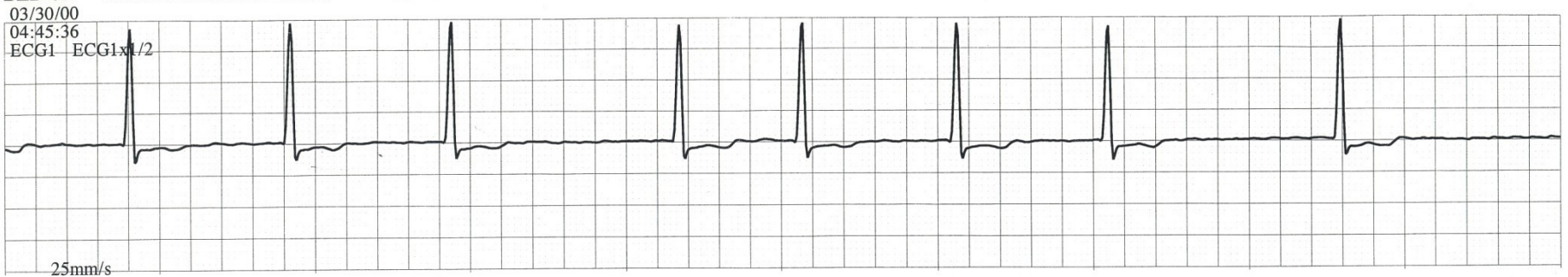
Premature atrial contraction (PAC)



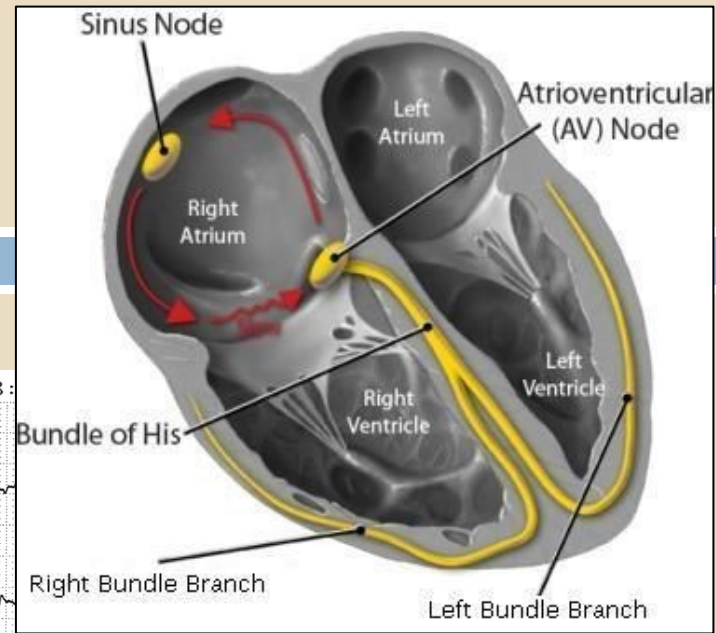
Atrial fibrillation (AF)



Atrial fibrillation + slow ventricular response



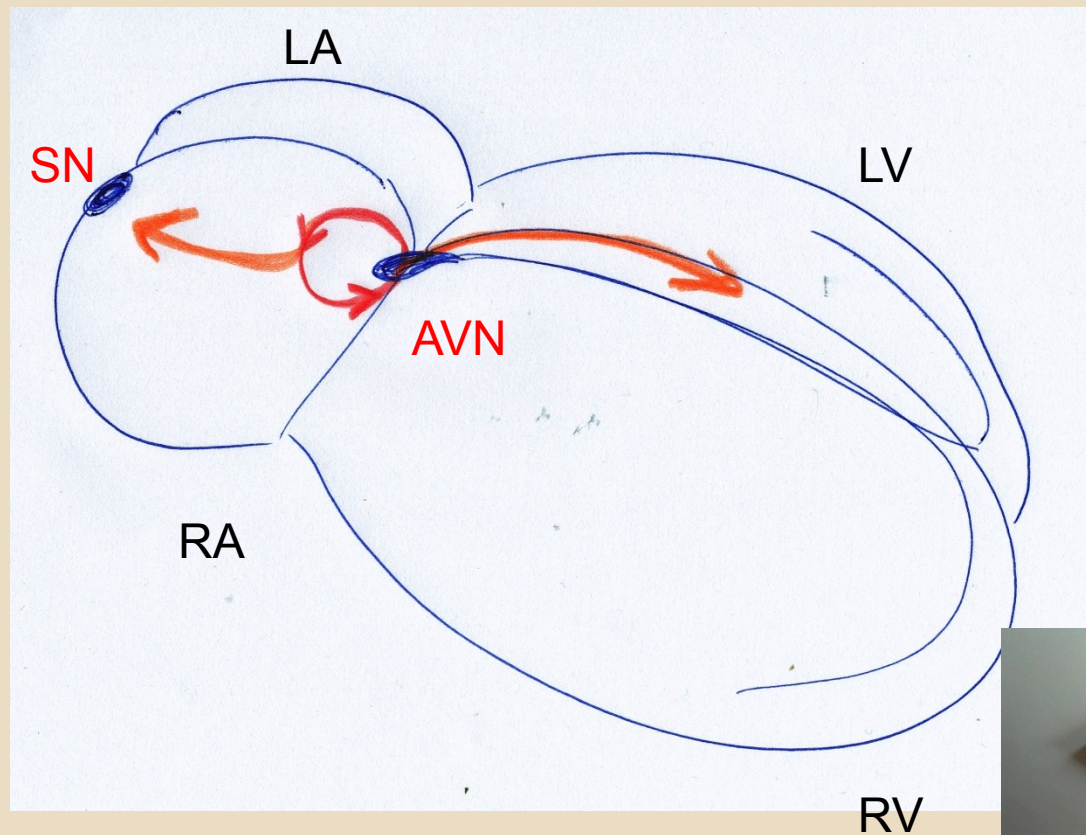
Atrial flutter



saw tooth pattern II, III, aVF



AVNRT (Atrio Ventricular Nodal Reentry Tachycardia)

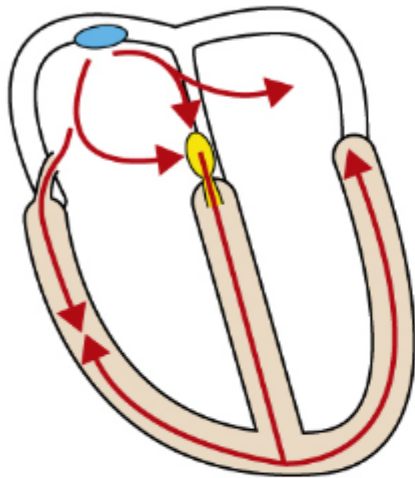


AVNRT (Atrio Ventricular Nodal Reentry Tachycardia)



Accessory pathway

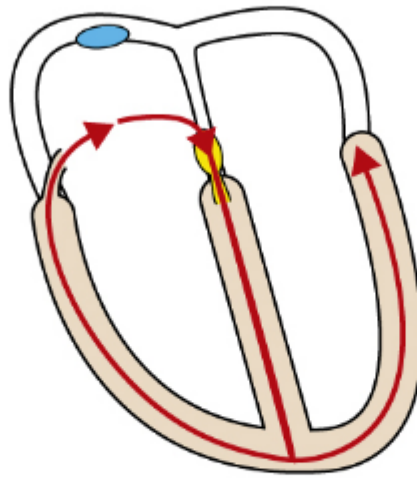
Pre-excitation



- Short PR interval
- In this case the PR segment cannot be seen.

Orthodromic AVRT

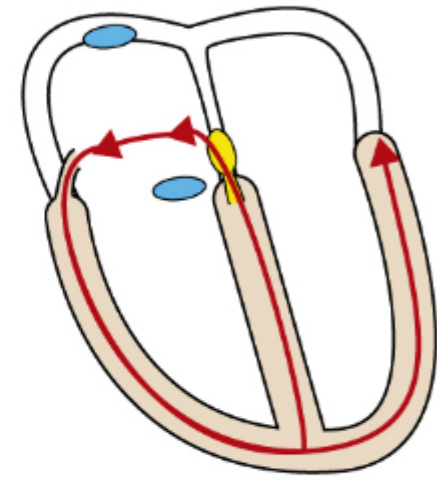
Antegrade conduction through atrioventricular node



- Normal QRS duration
- No delta wave
- Retrograde P-wave after QRS

Antidromic AVRT

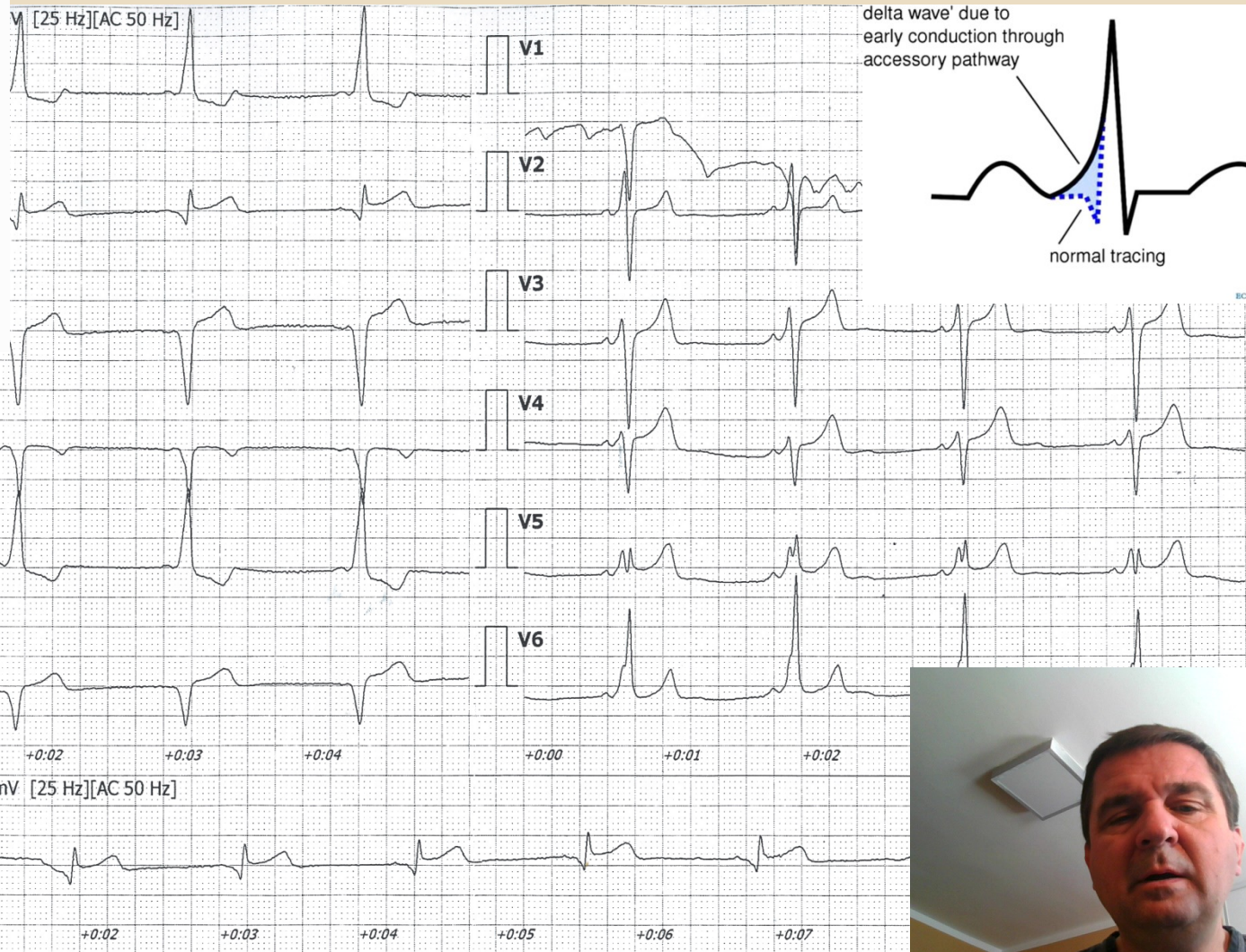
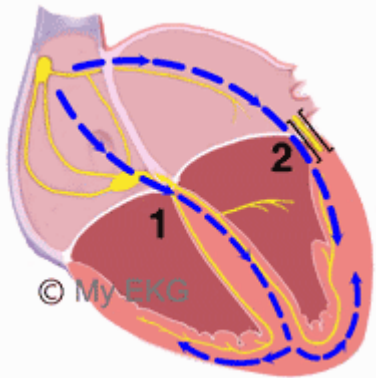
Retrograde conduction through atrioventricular node



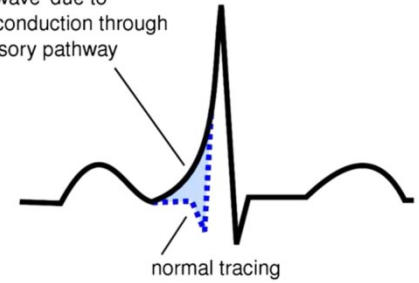
- Wide QRS
- P-wave before QRS
- If P-wave occurs just before QRS



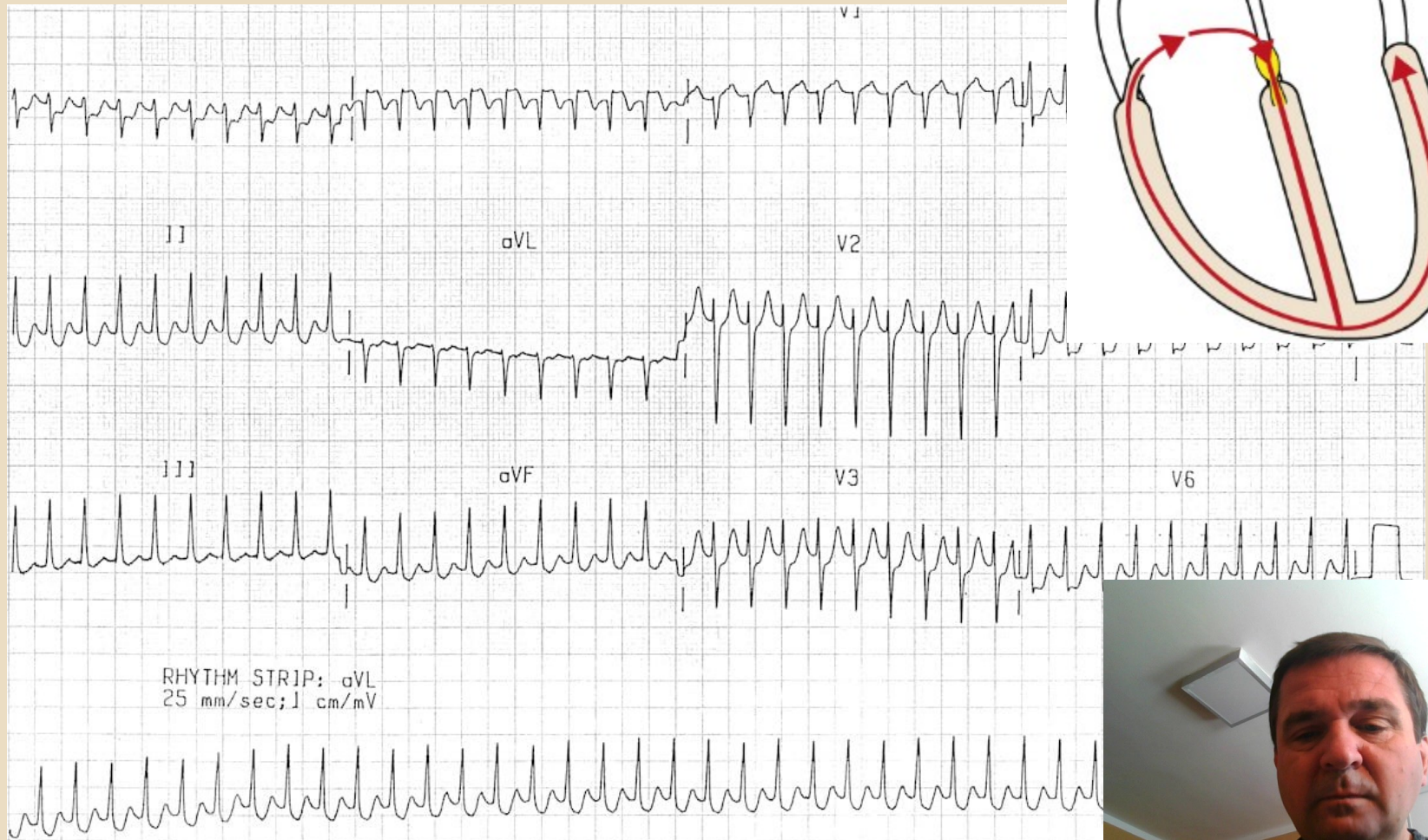
Preexcitation – delta wave



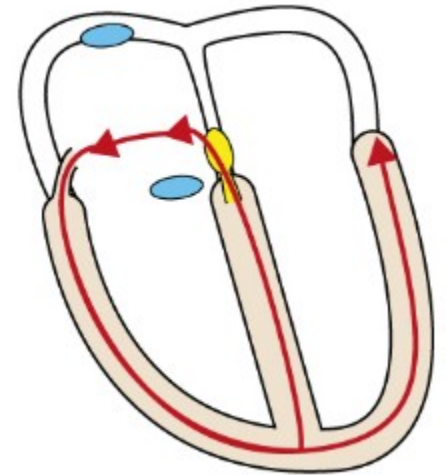
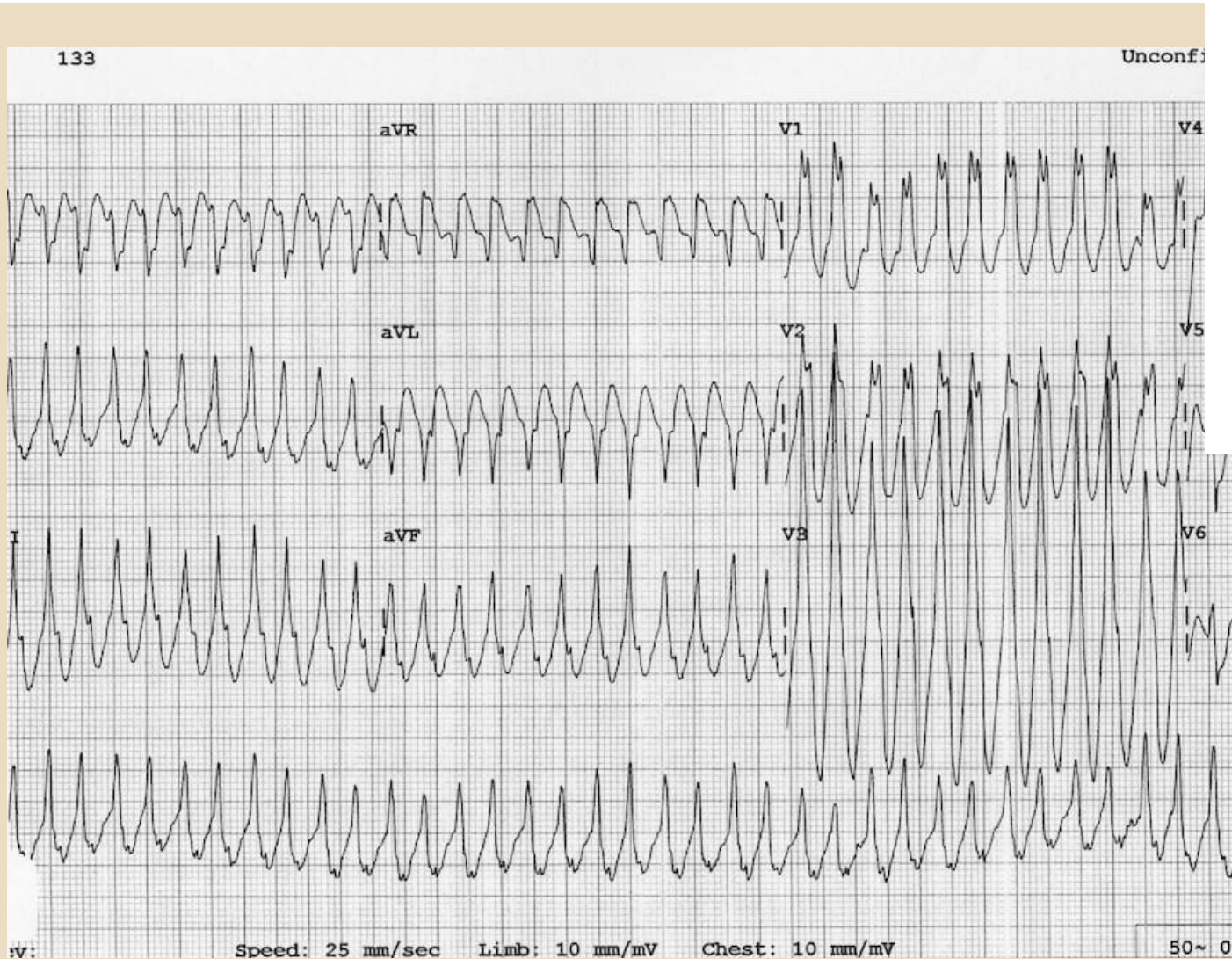
delta wave' due to early conduction through accessory pathway



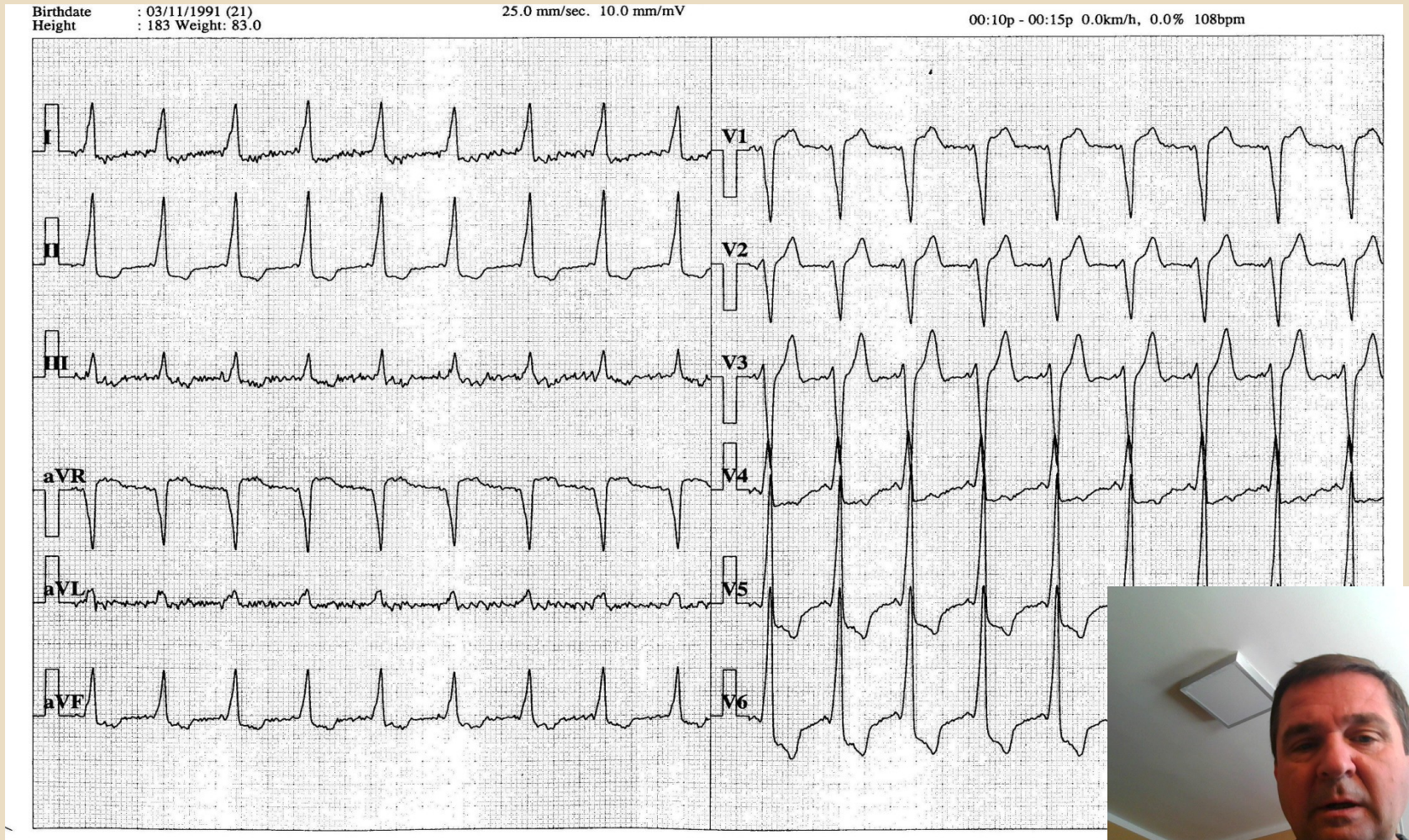
AVRT (Atrio Ventricular Reentry Tachycardia) ORTHO



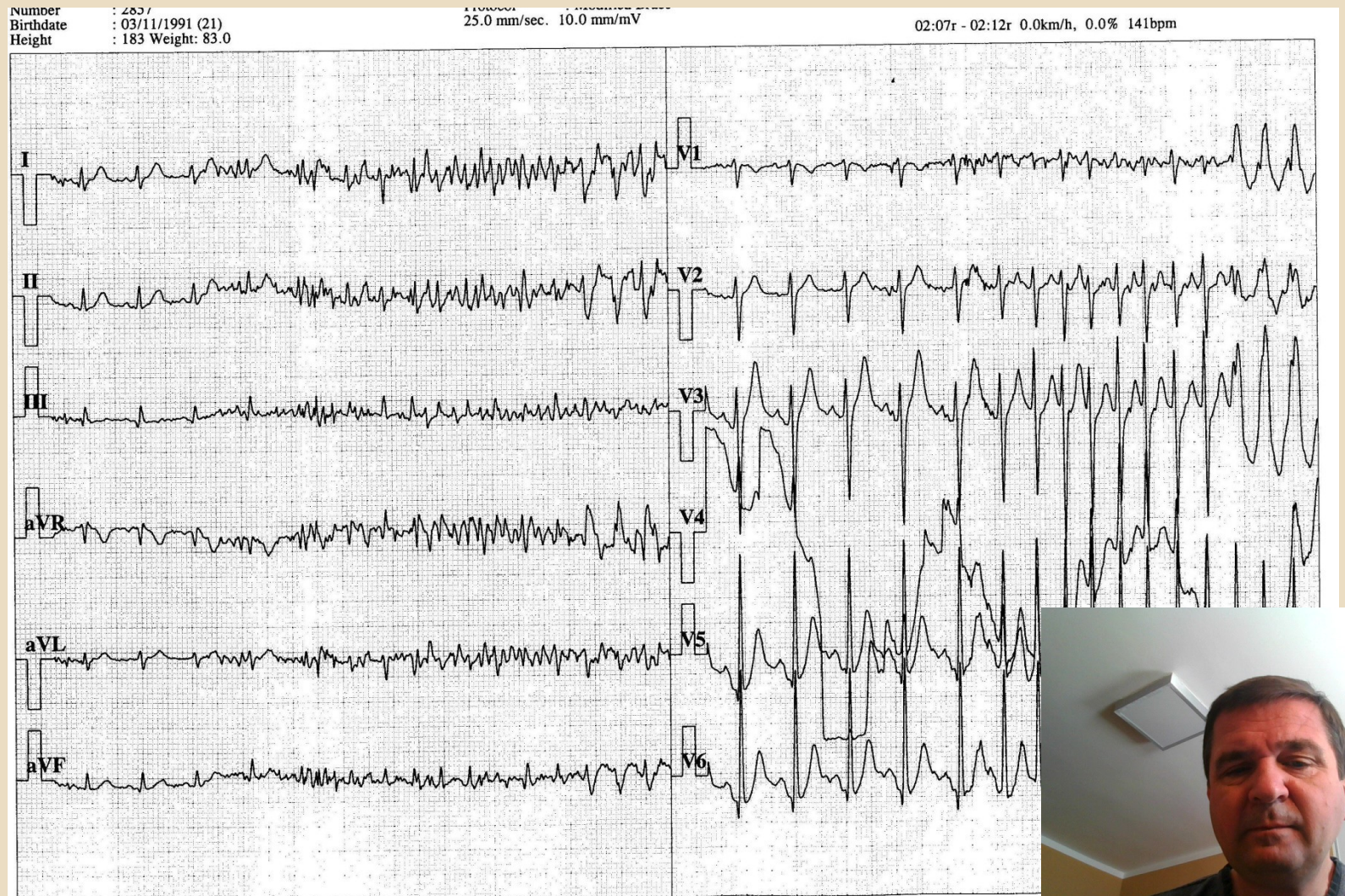
AVRT (Atrio Ventricular Reentry Tachycardia) ANTI



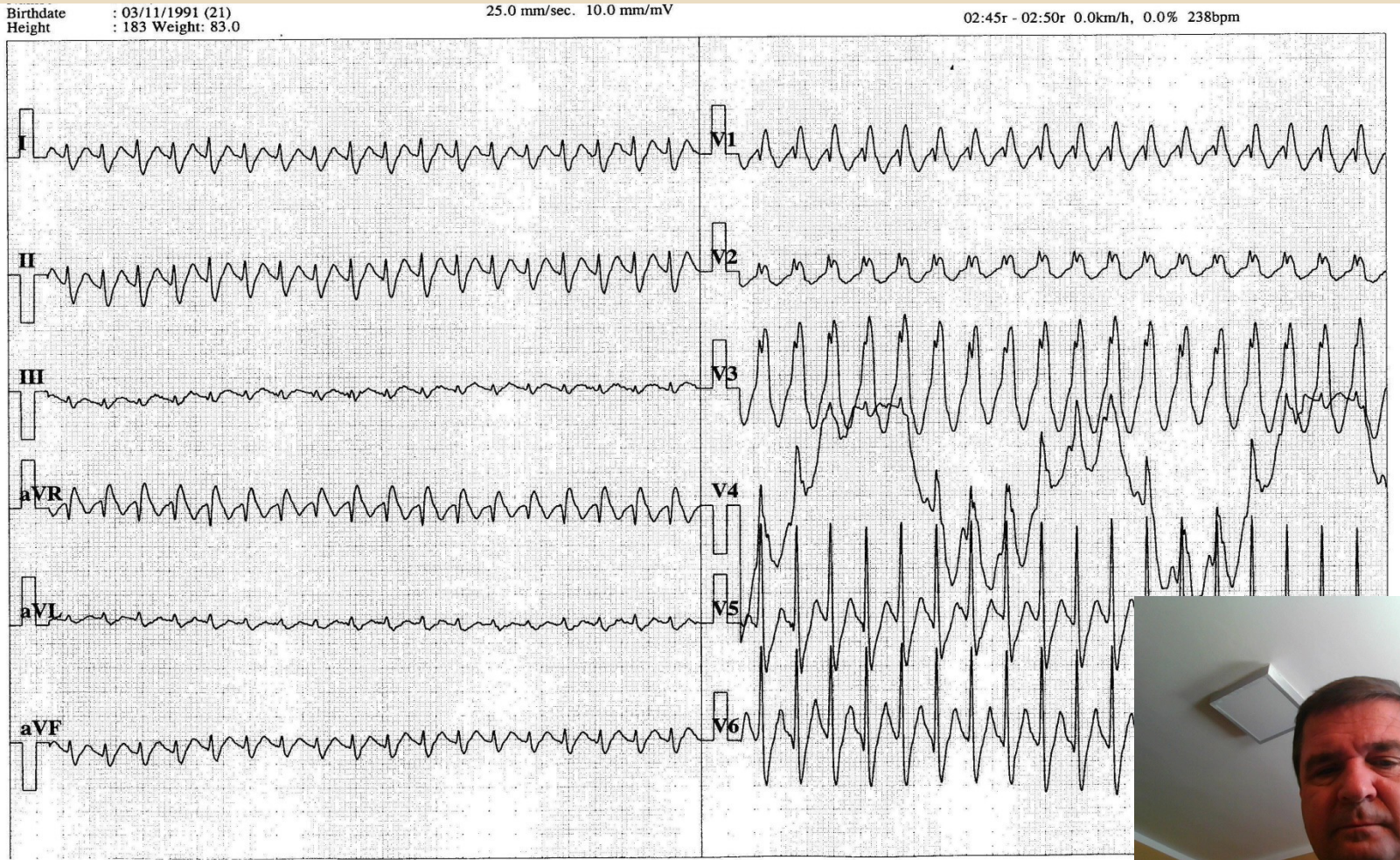
Delta wave prior to treadmill test



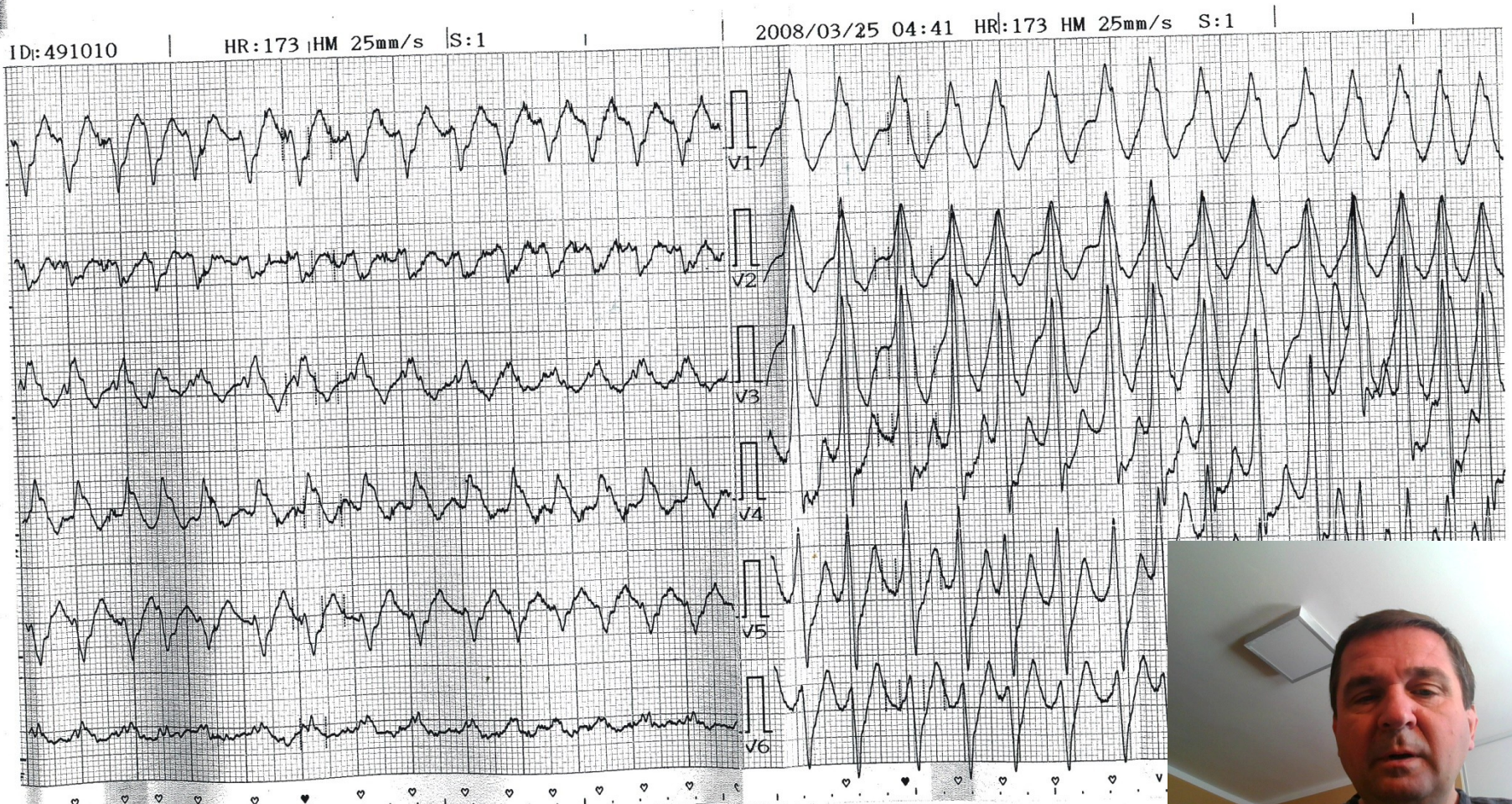
Orthodromic tachycardia (AVRT) with RBBB



Orthodromic tachycardia (AVRT) with RBBB



Atrial fibrillation + accessory pathway



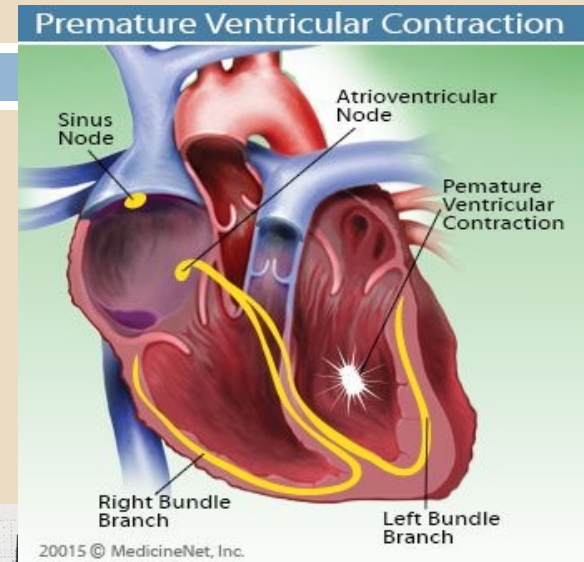
Ventricular arrhythmias

Premature ventricular contraction (PVC)

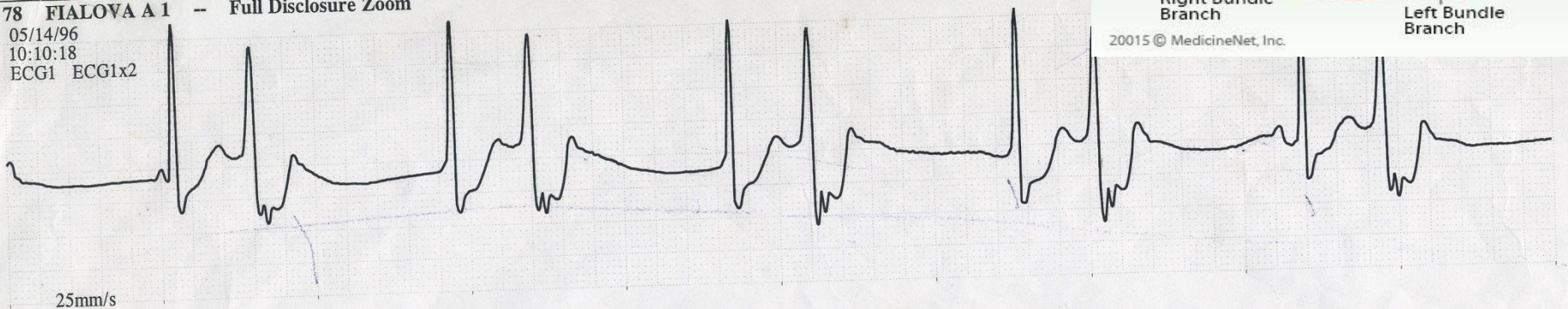
Ventricular tachycardia

Ventricular fibrillation

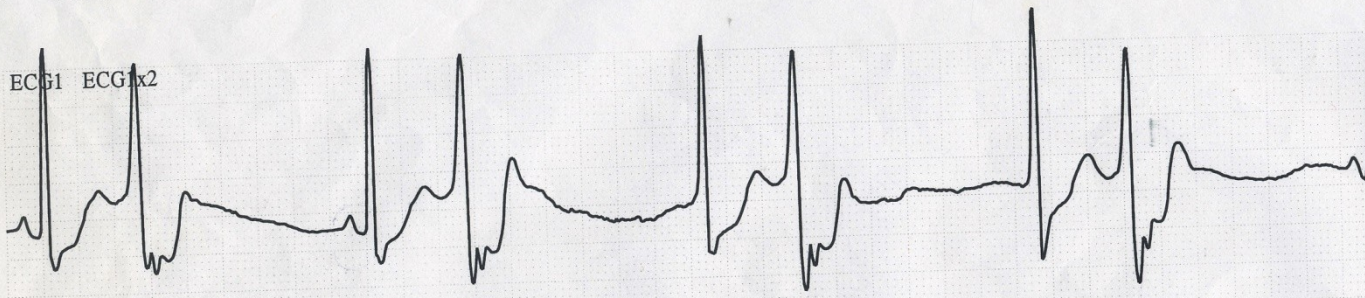
PVC (Premature ventricular contractions - bigeminy)



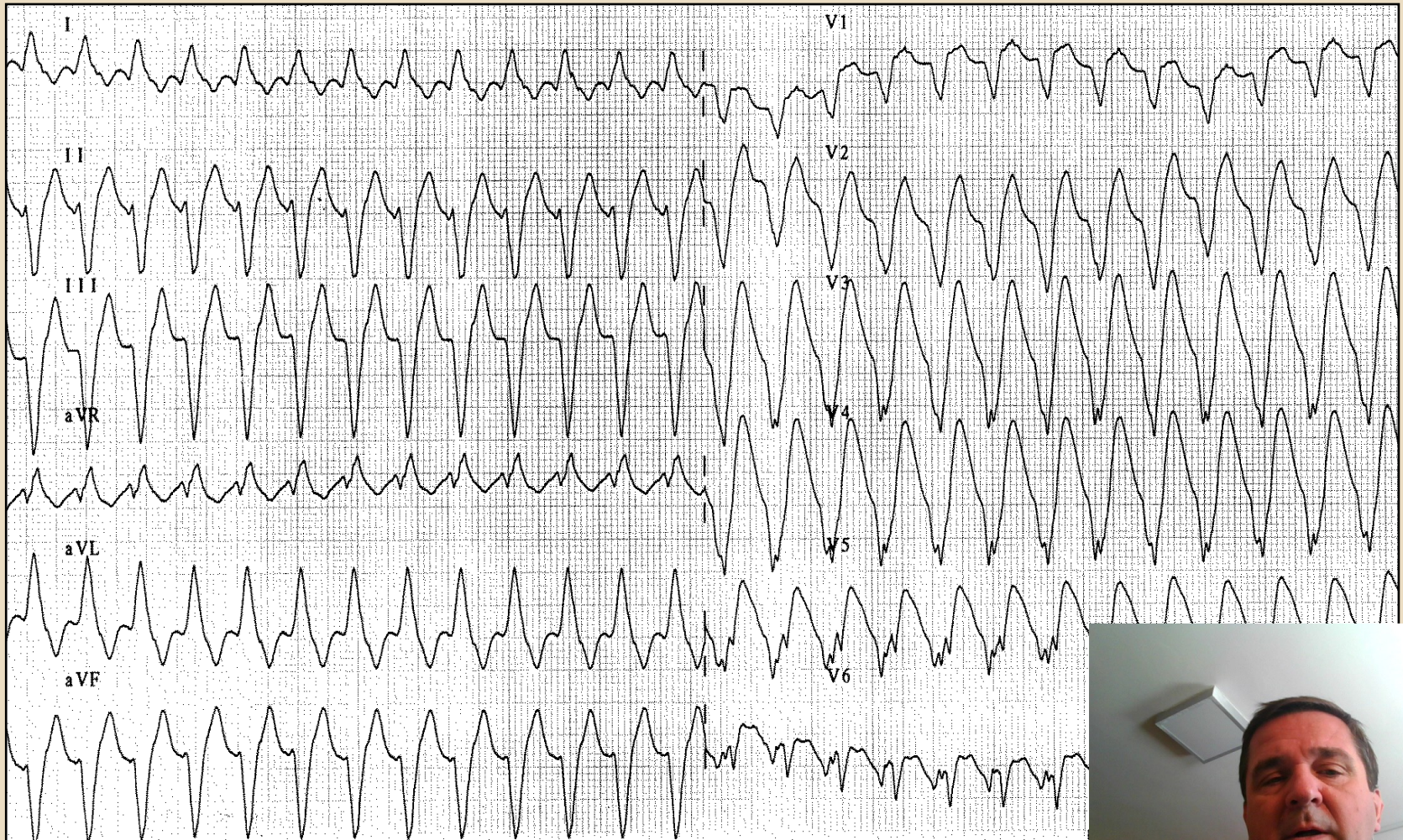
78 FIALOVA A 1 -- Full Disclosure Zoom
05/14/96
10:10:18
ECG1 ECG1x2



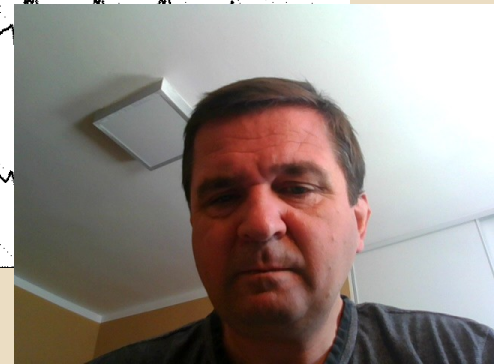
ECG1 ECG1x2



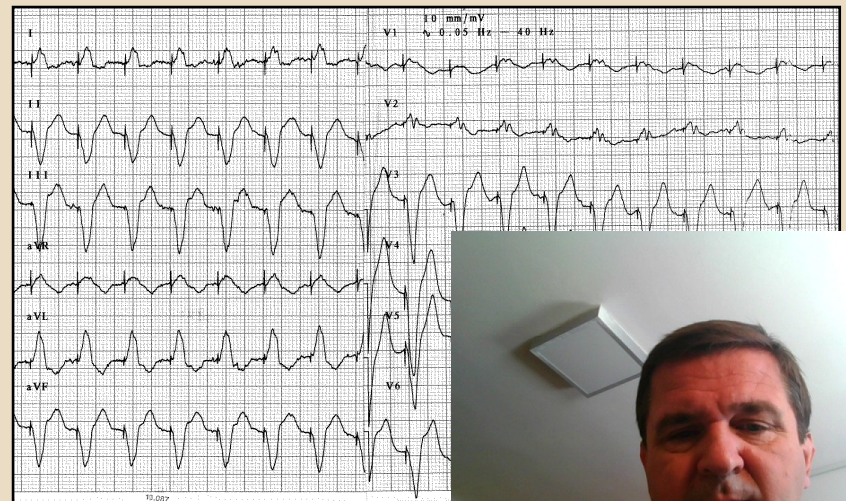
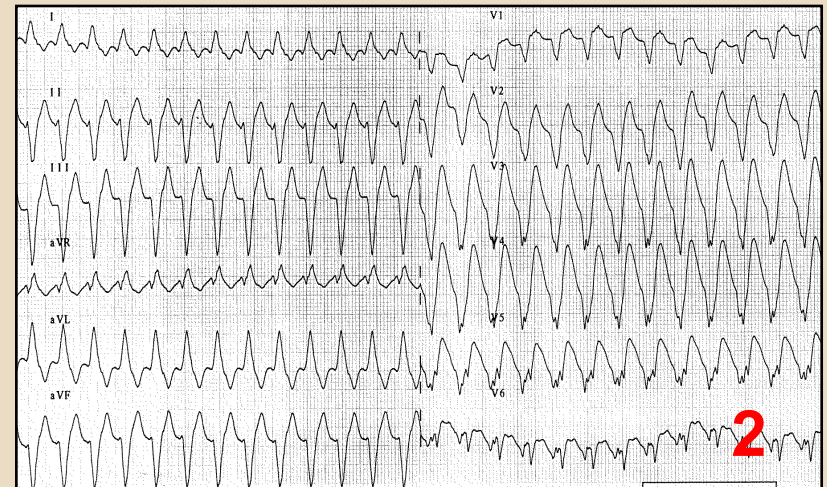
VT LBBB – like



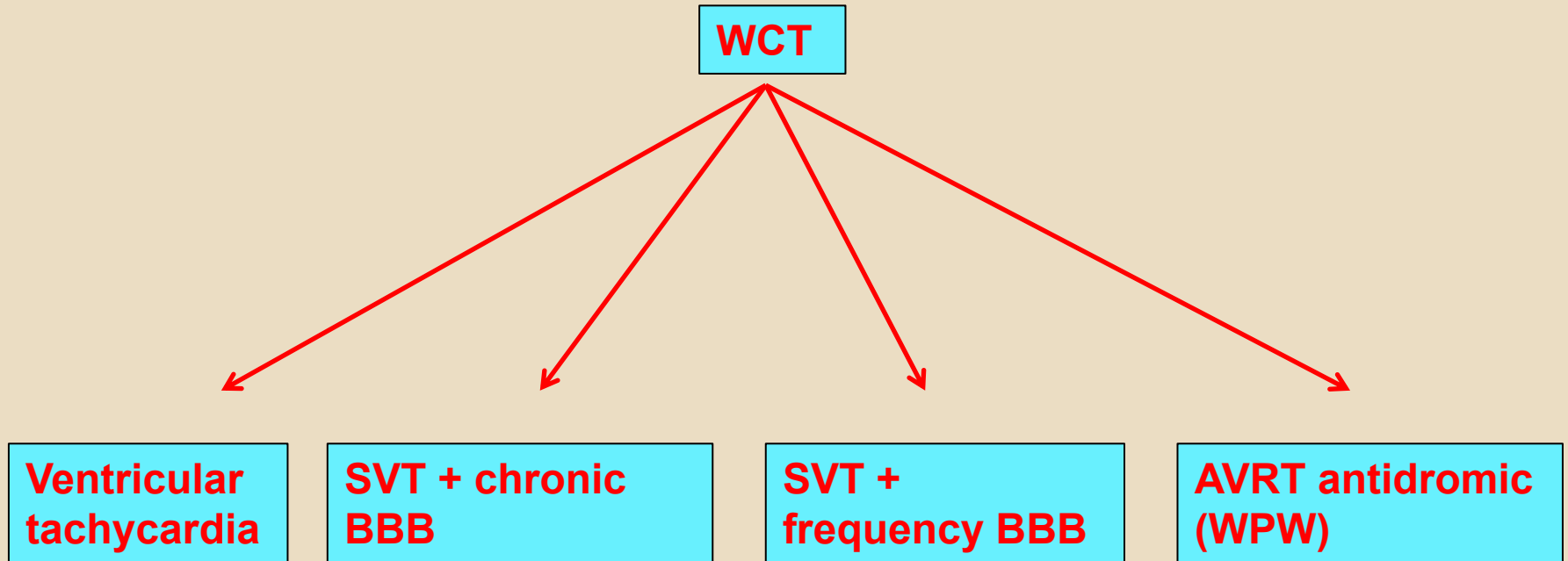
VT RBBB – like



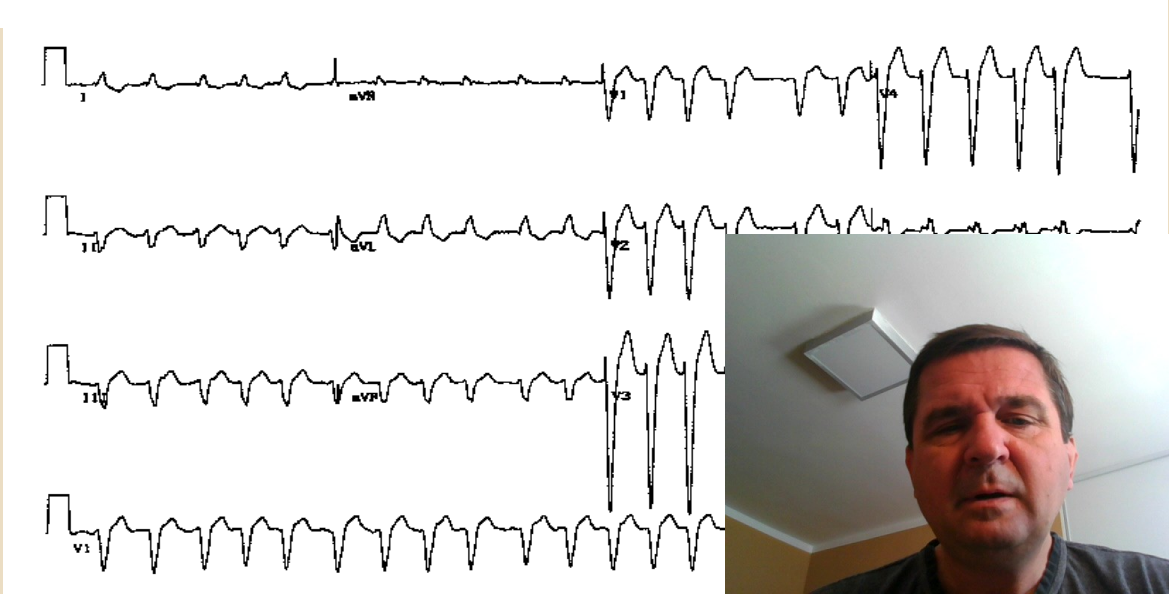
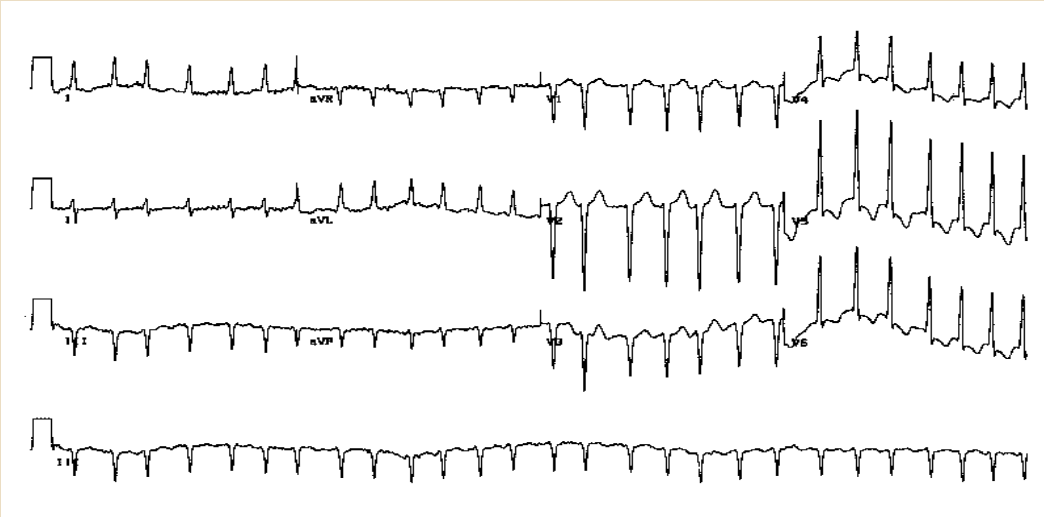
Differential diagnosis of wide complex tachycardia



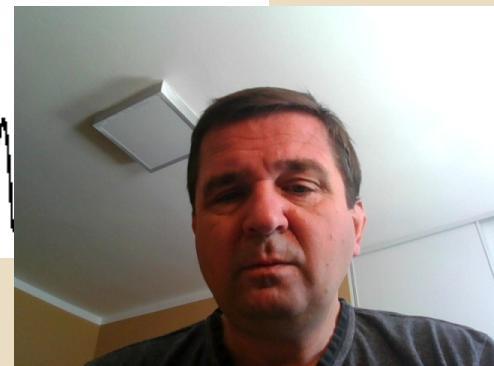
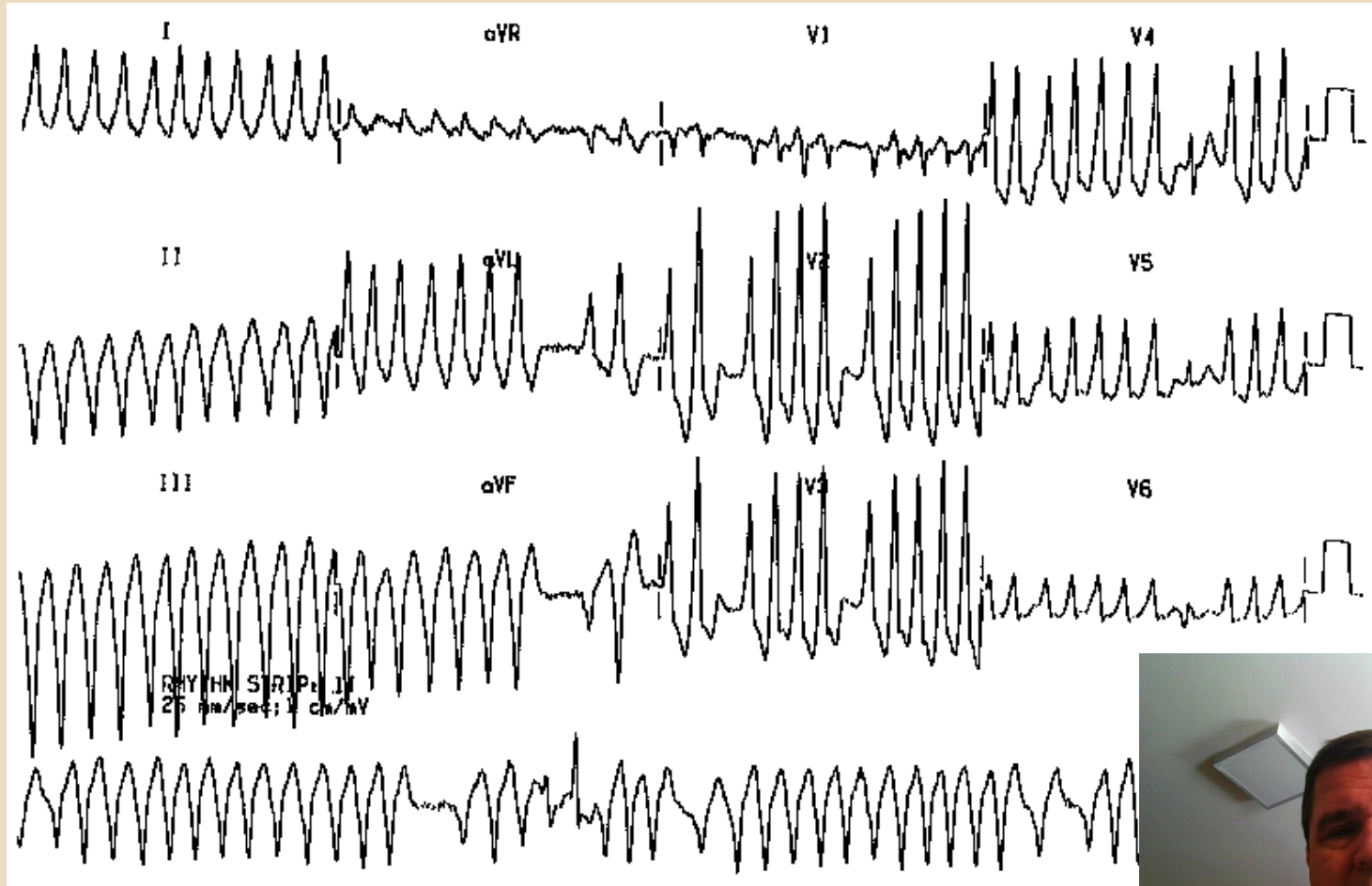
Wide complex tachycardia (WCT)



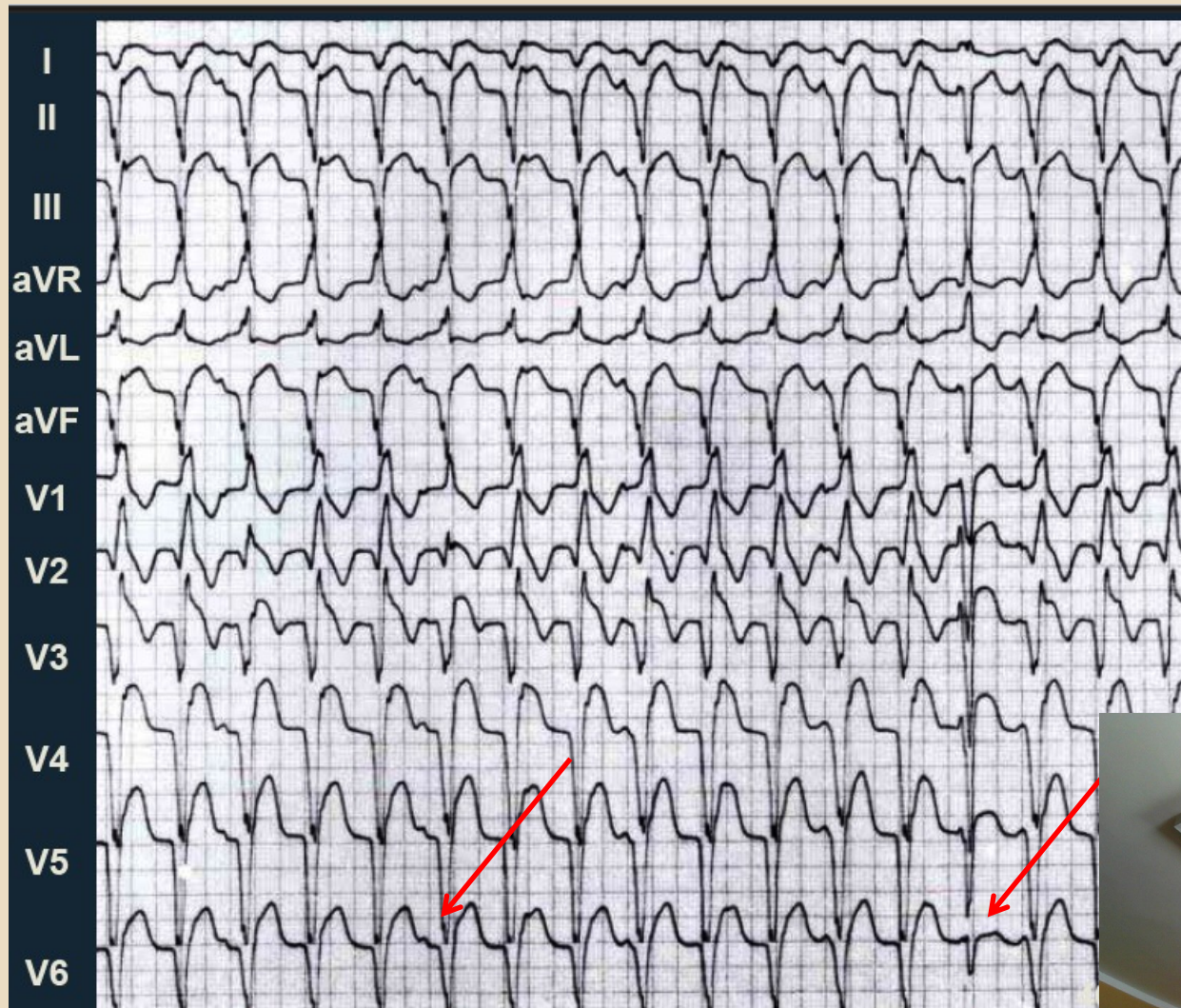
AF with frequency BBB



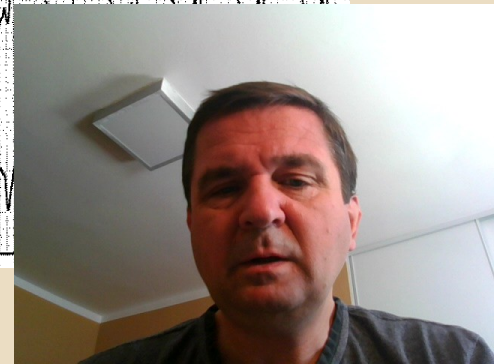
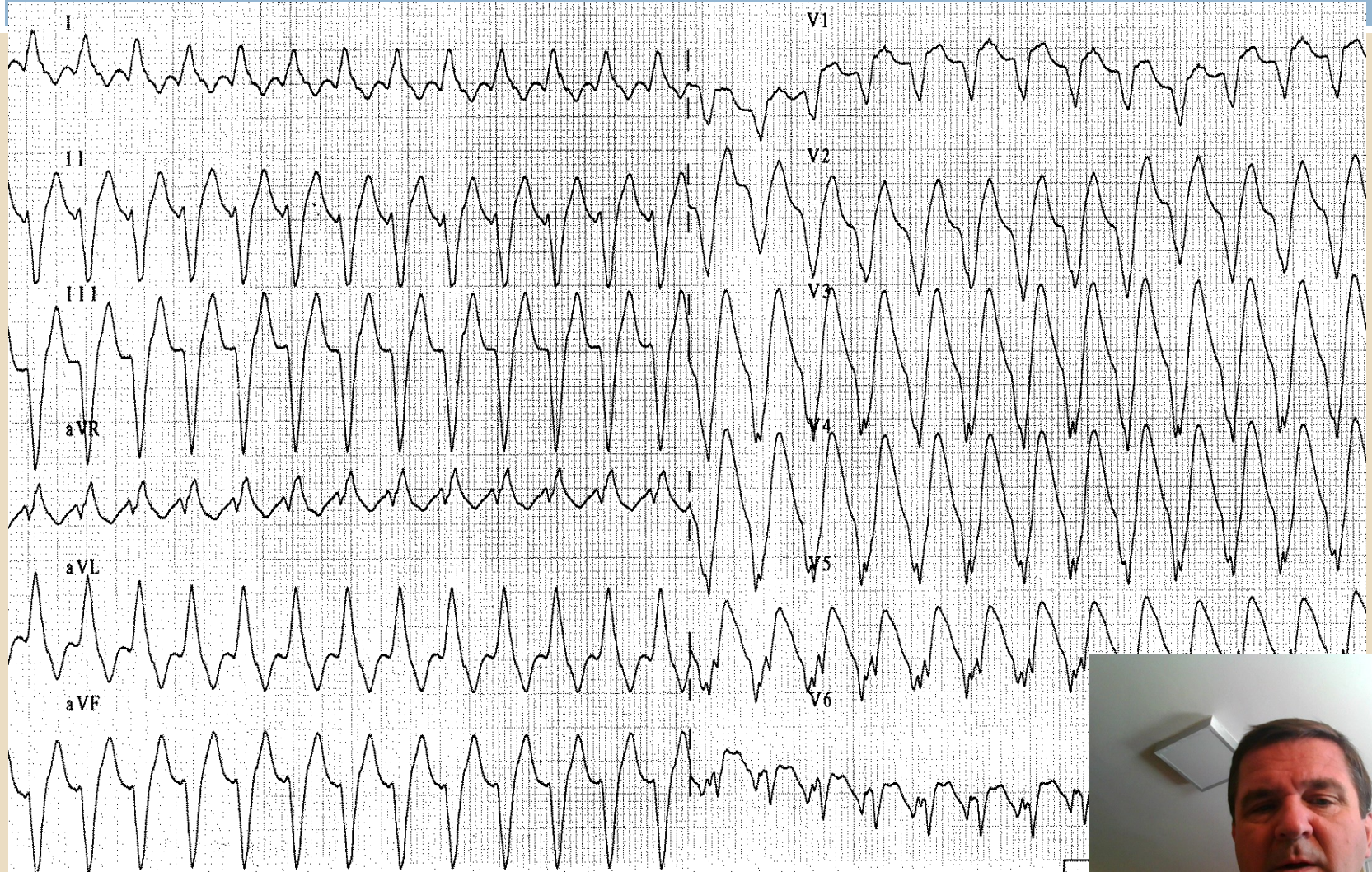
AF + accessory pathway



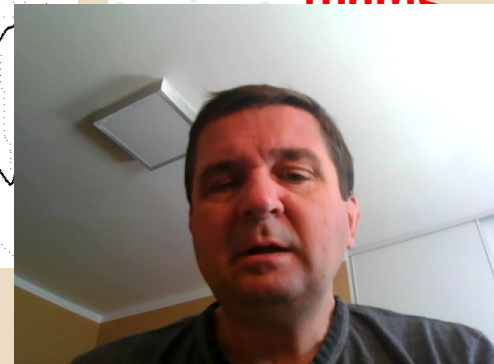
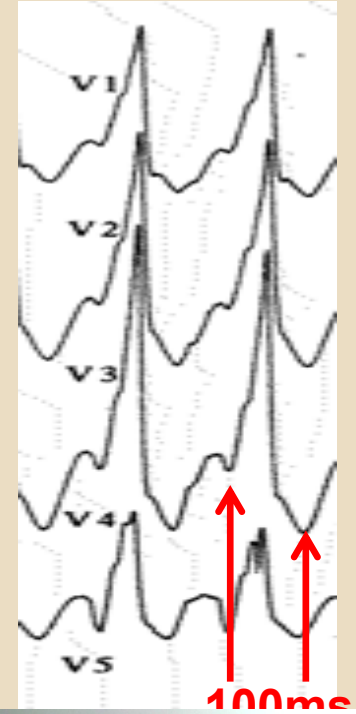
VT RBBB – like, VA dissociation and fusion beat



Identical QRS orientation in precordial leads

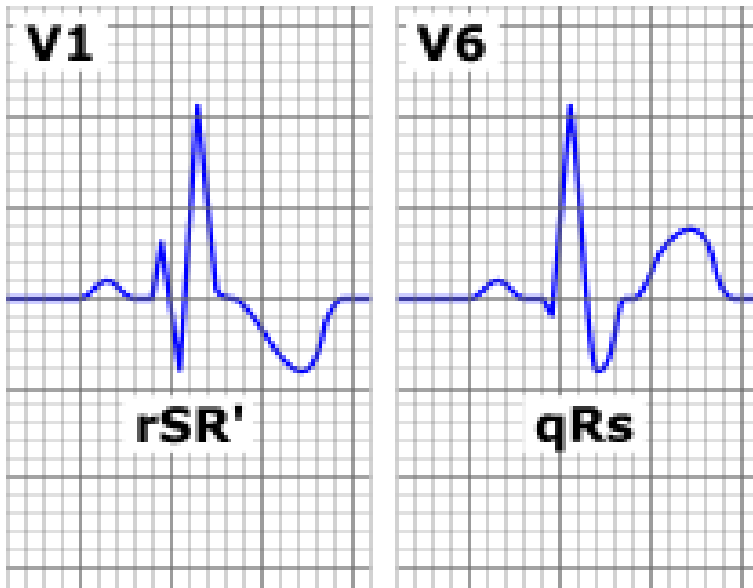


RS duration > 100ms

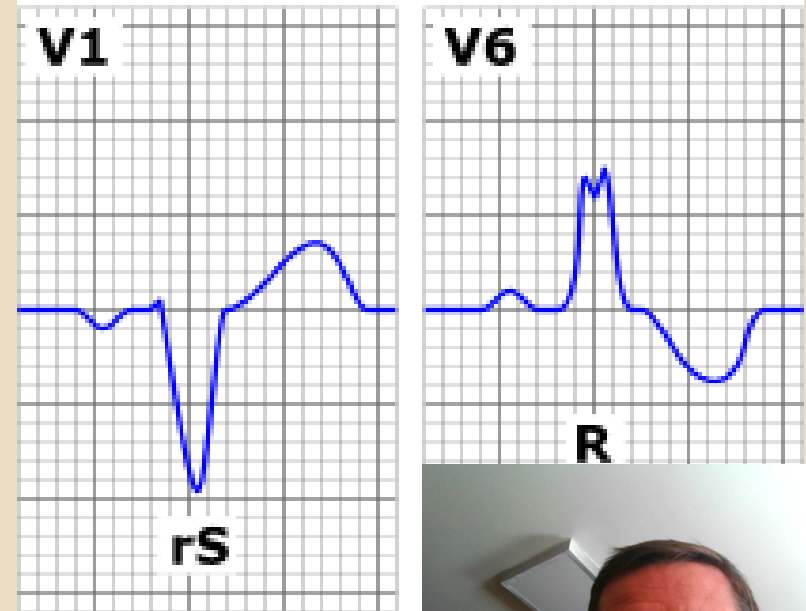


Absence of typical BBB pattern

Right bundle branch block characteristics



Left bundle branch block characteristics



Ventricular fibrillation (VF terminated by ICD shock)

BED-006 KAKOS IMP 3 -- Full Disclosure Zoom

03/07/98 23:30 (1)

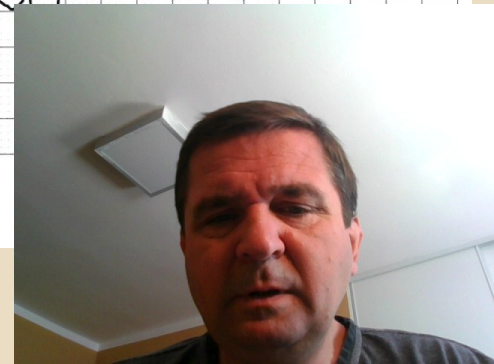
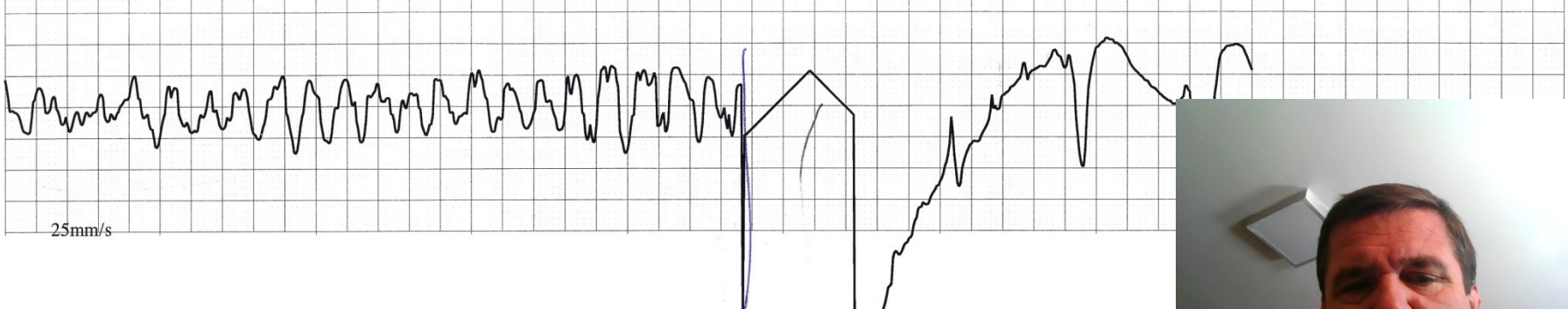
03/07/98

23:25:36

ECG1 ECG1x1



ECG1 ECG1x1



Ischaemia

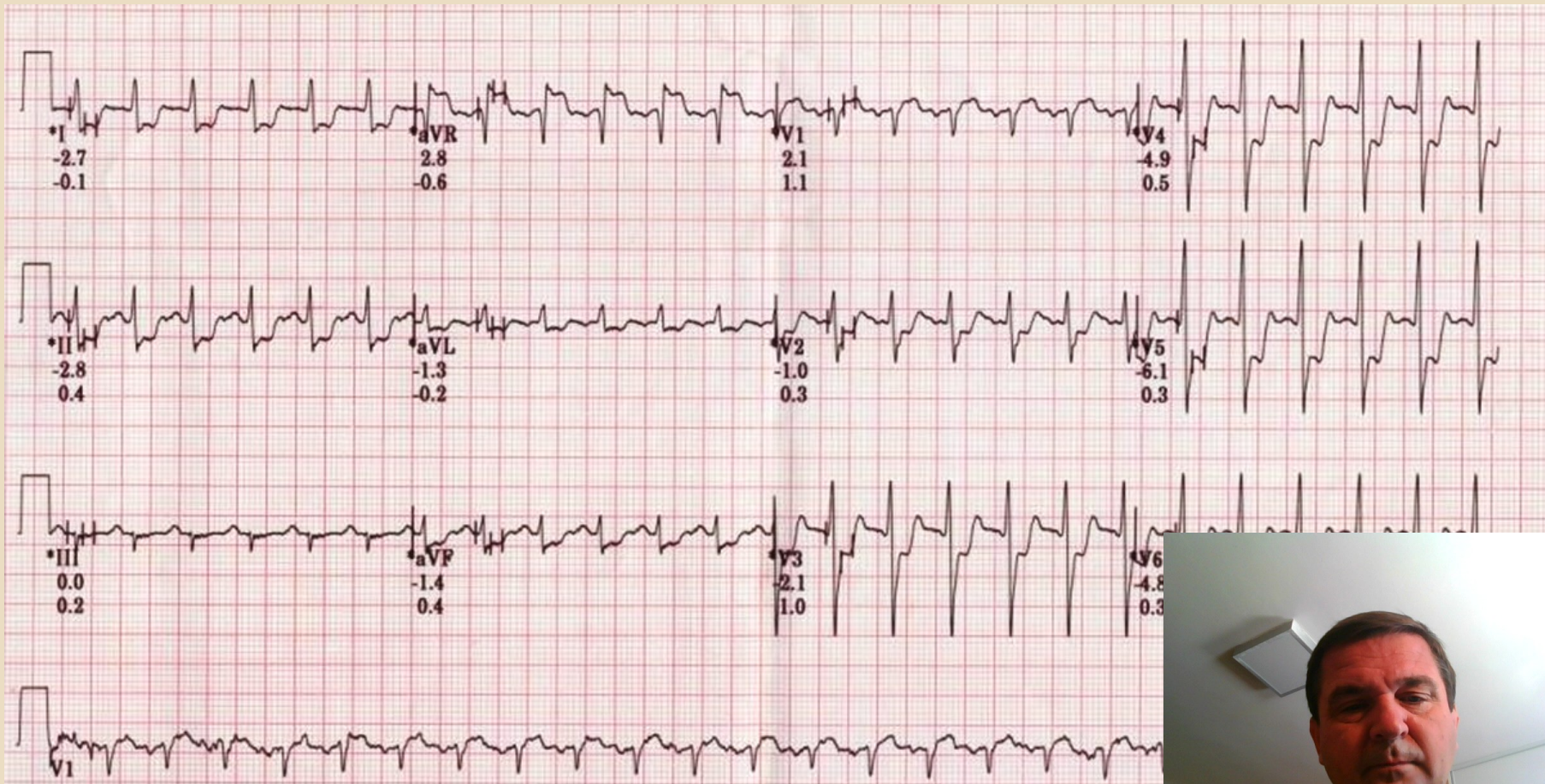
Subendocardial – angina pectoris

STE Myocardial Infarction

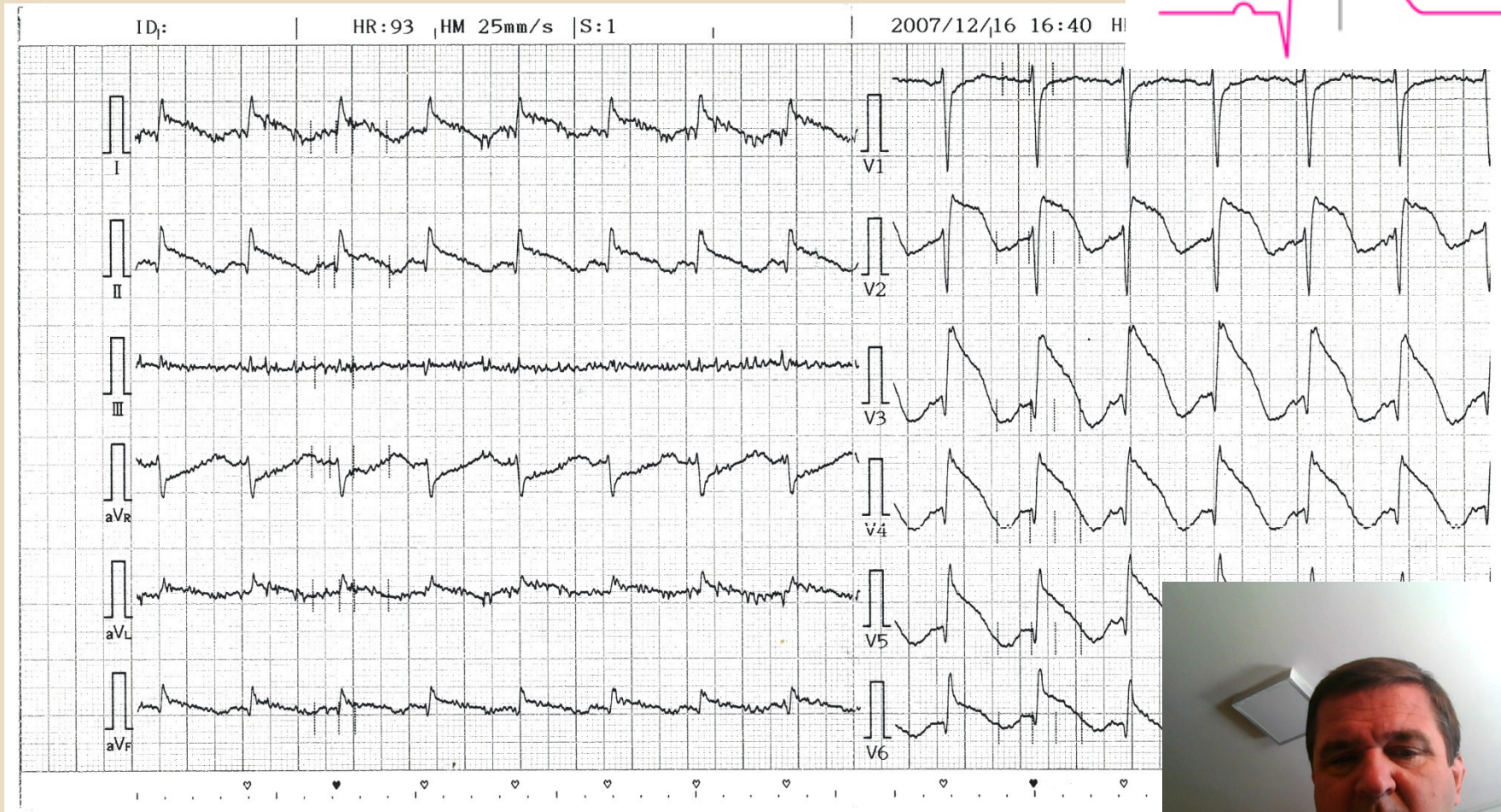
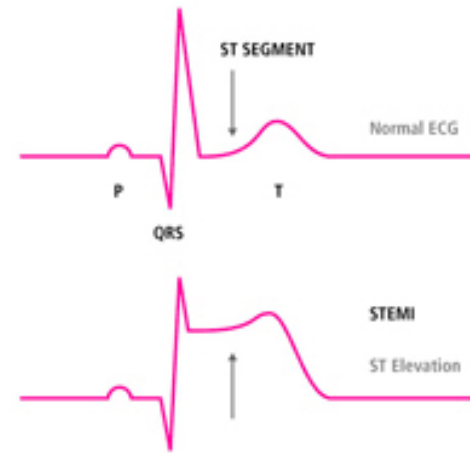
Post MI changes



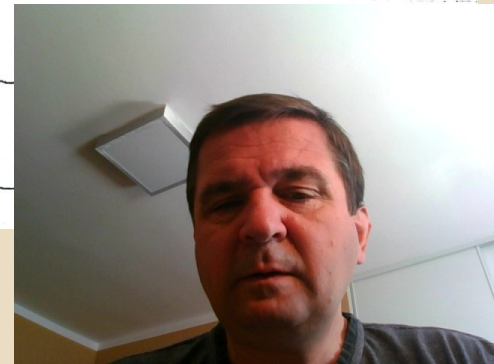
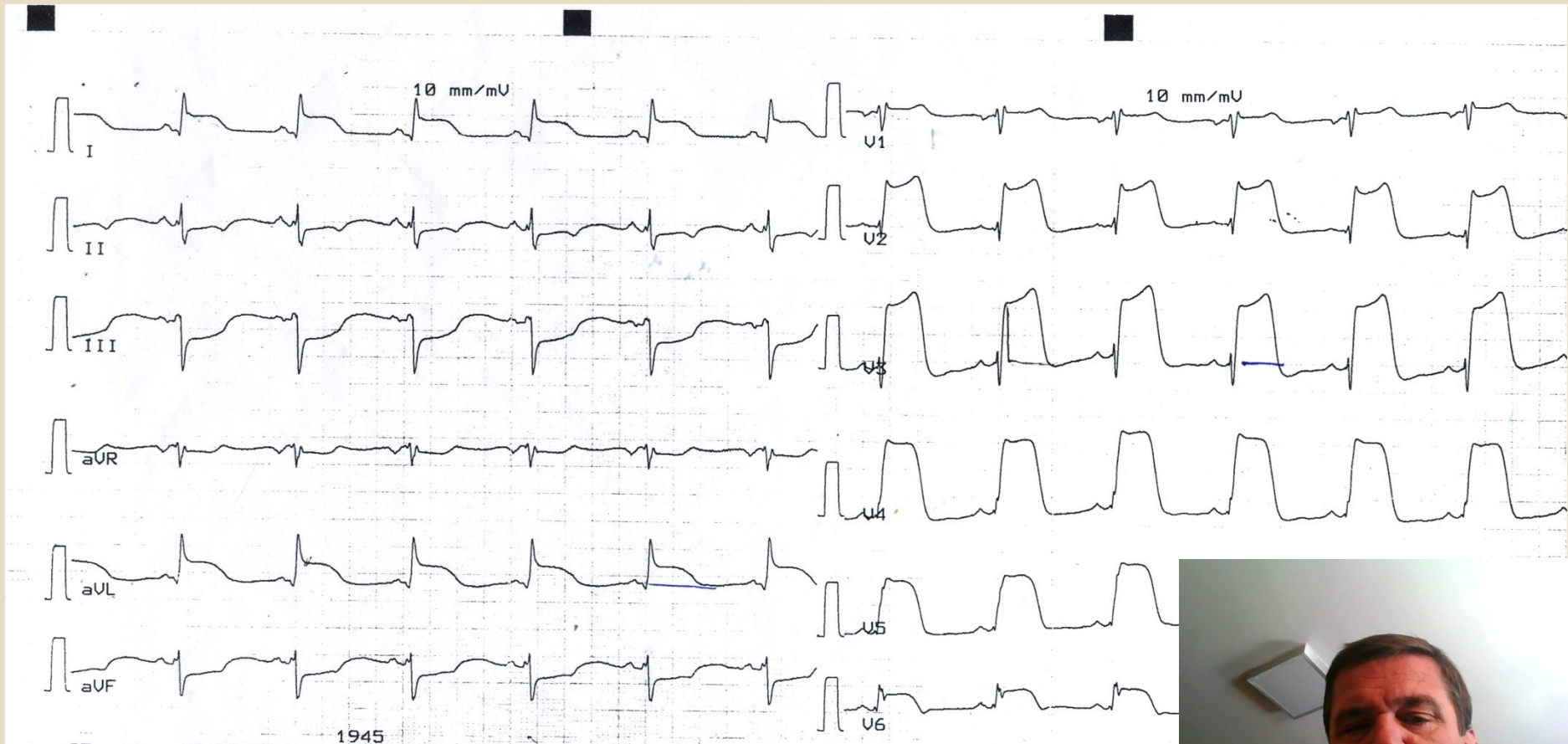
ST depressions during treadmill test



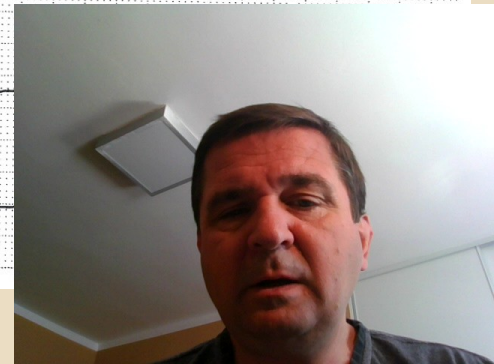
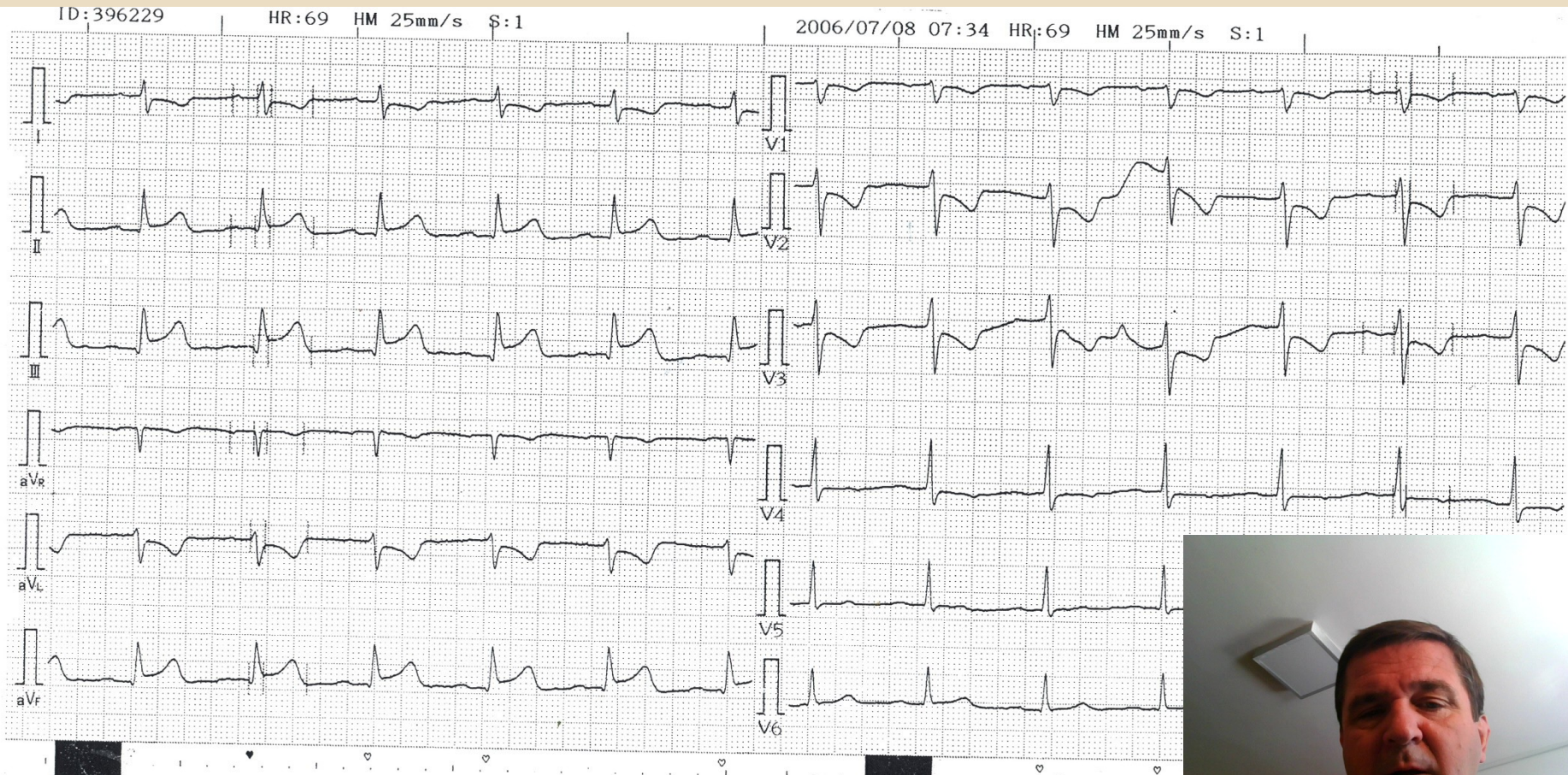
STEMI in left main artery occlusion



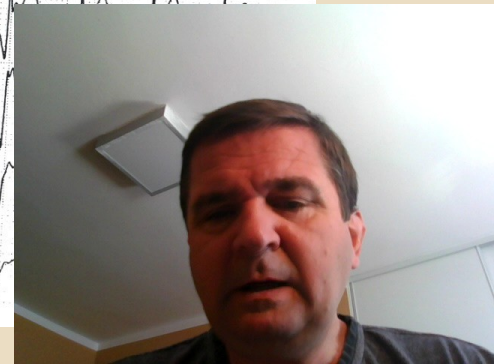
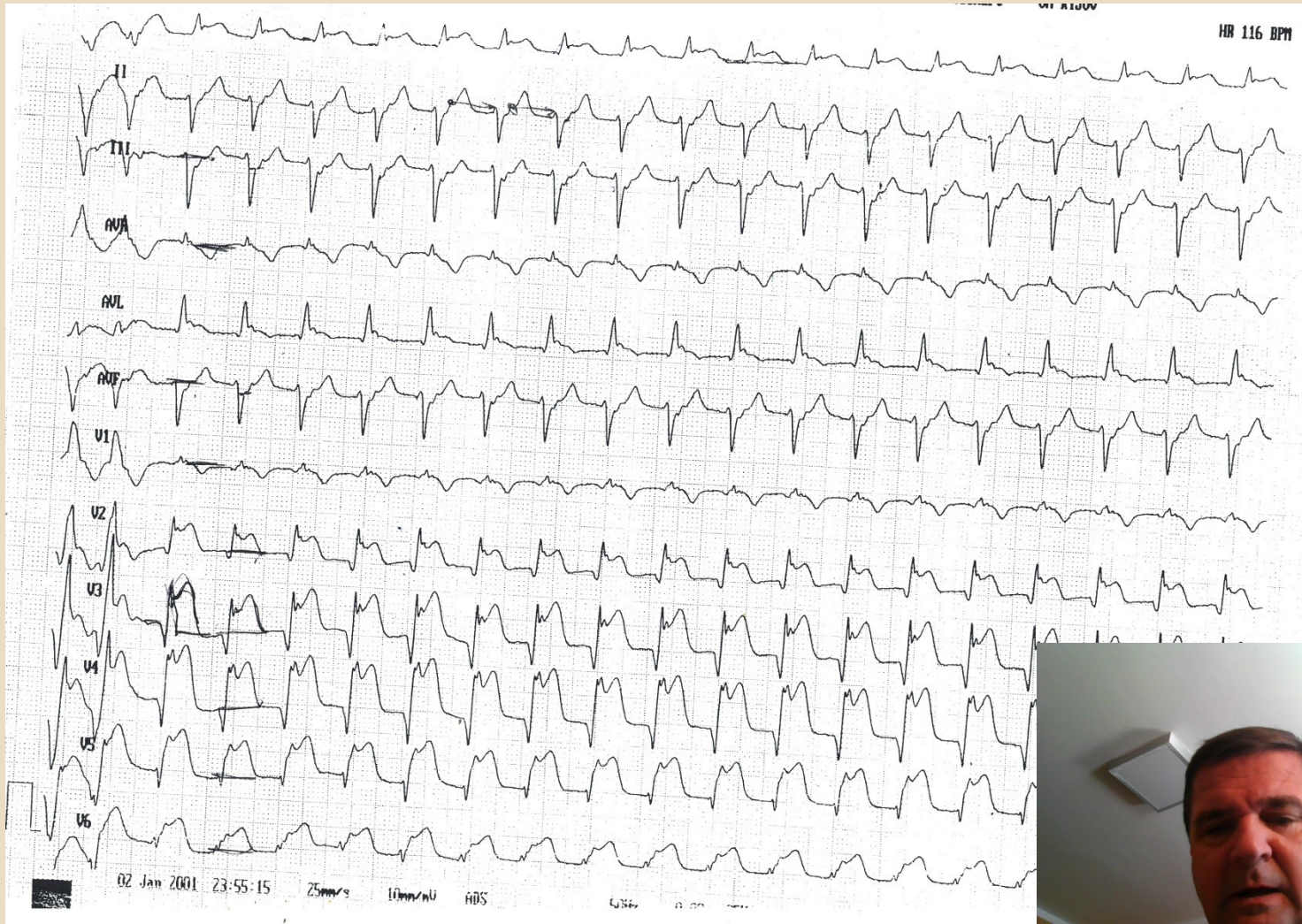
STEMI in left anterior descending artery occlusion



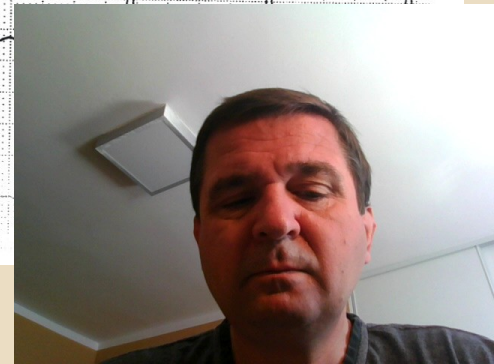
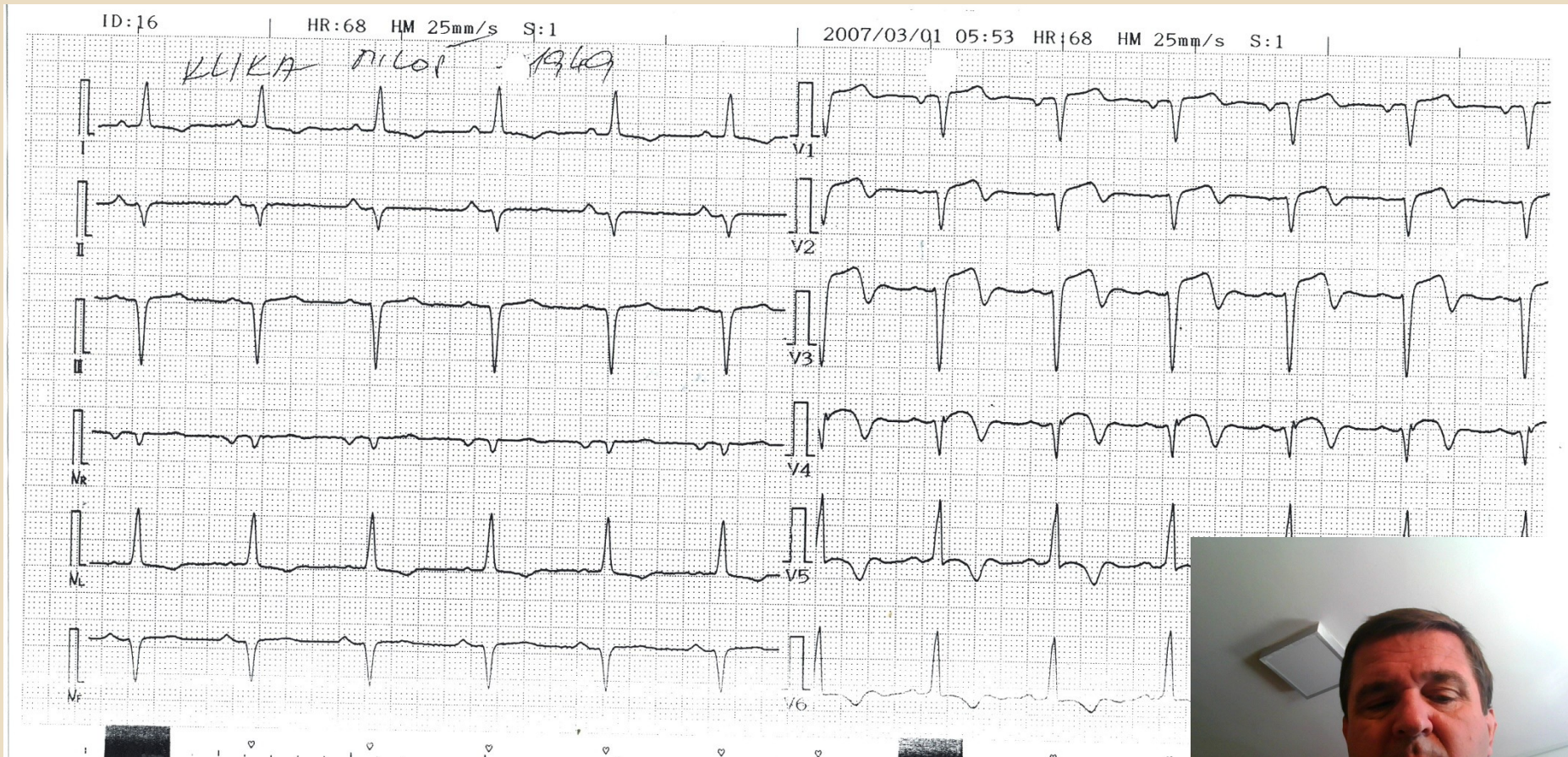
STEMI inferior wall



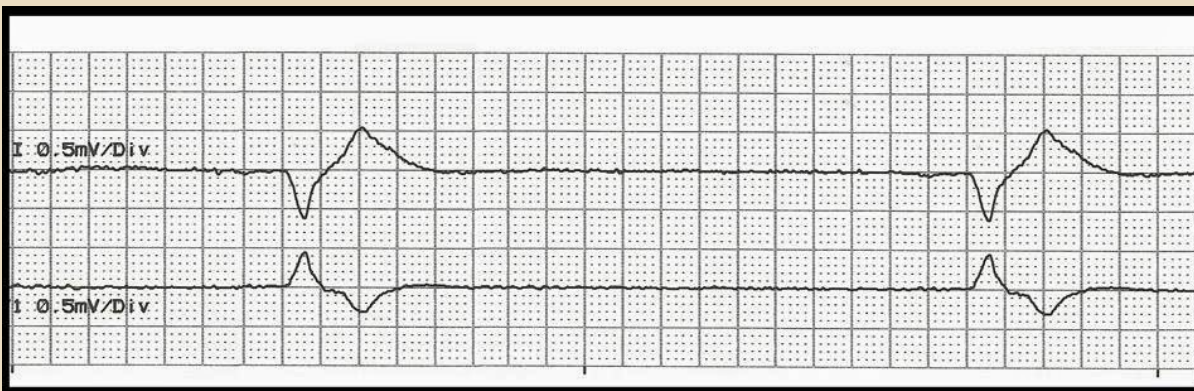
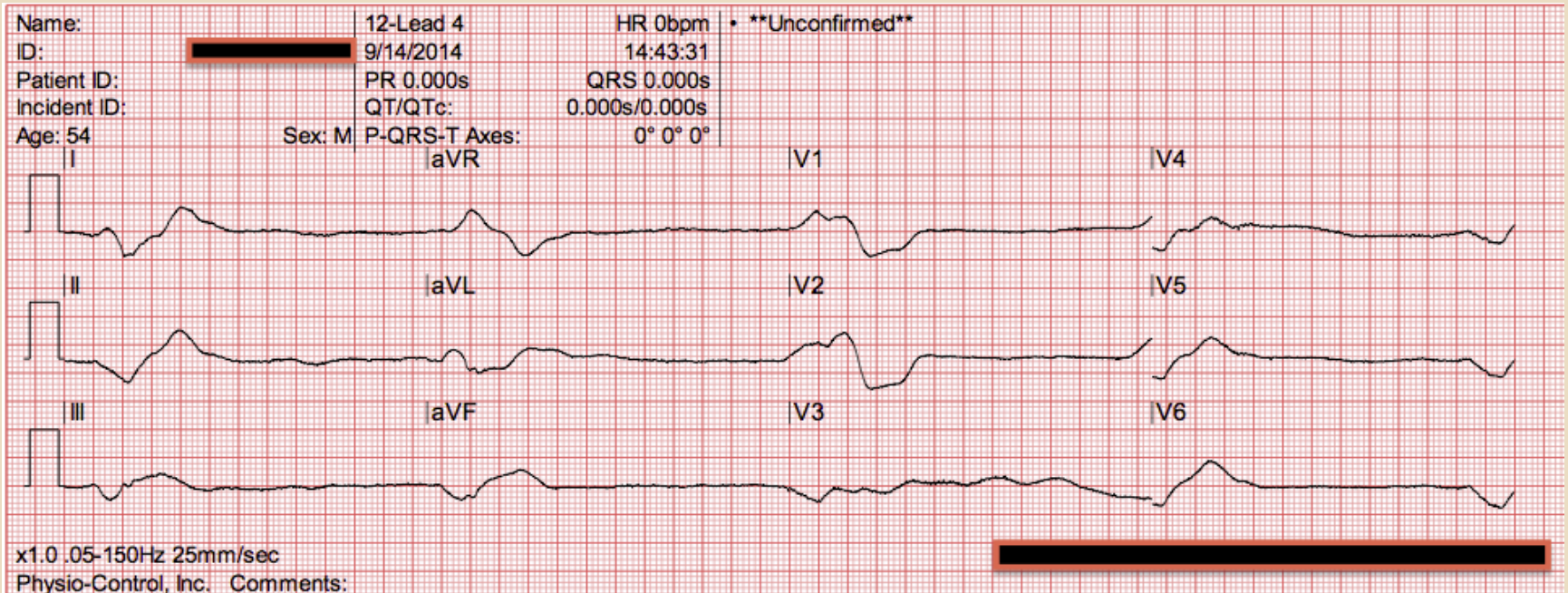
STEMI anterior wall (AE)



Post STEMI with forming aneurysm of ant. wall



Terminal rhythm - Electro mechanic dissociation



Ionic channel disorders

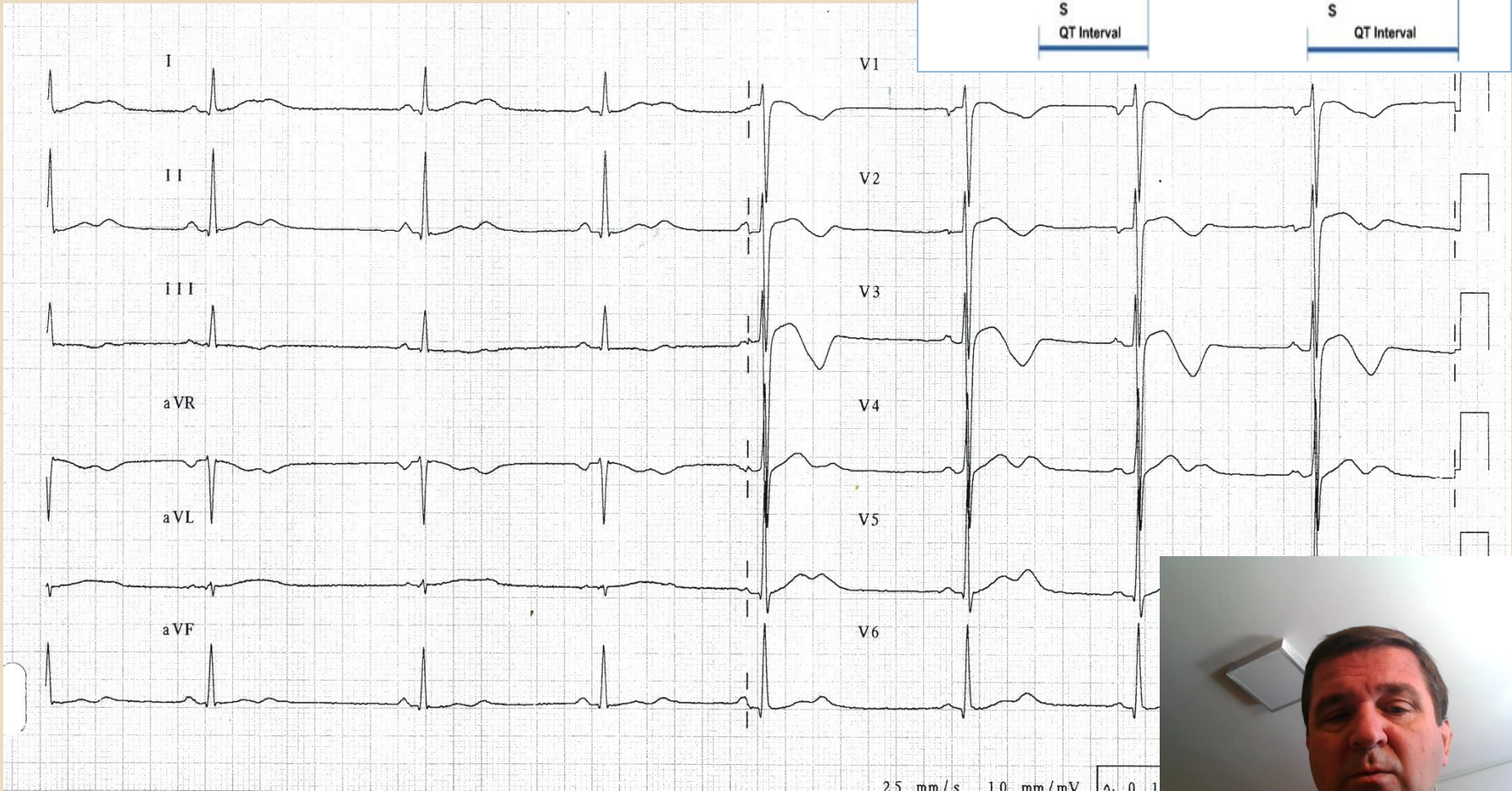
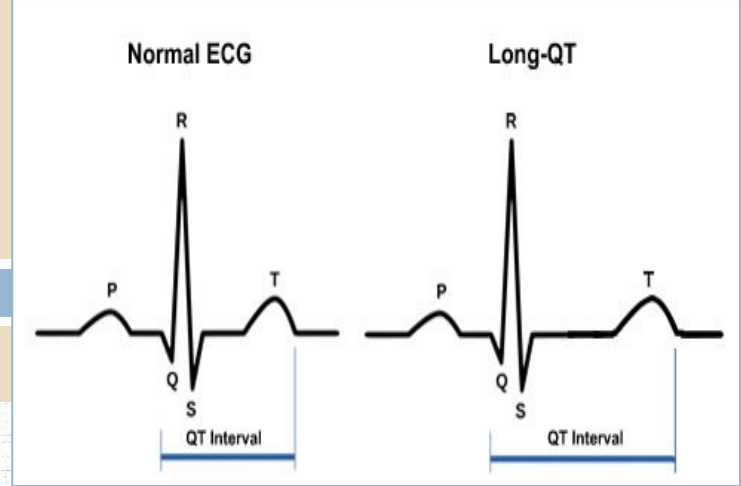
LQT syndrome

Brugada syndrome

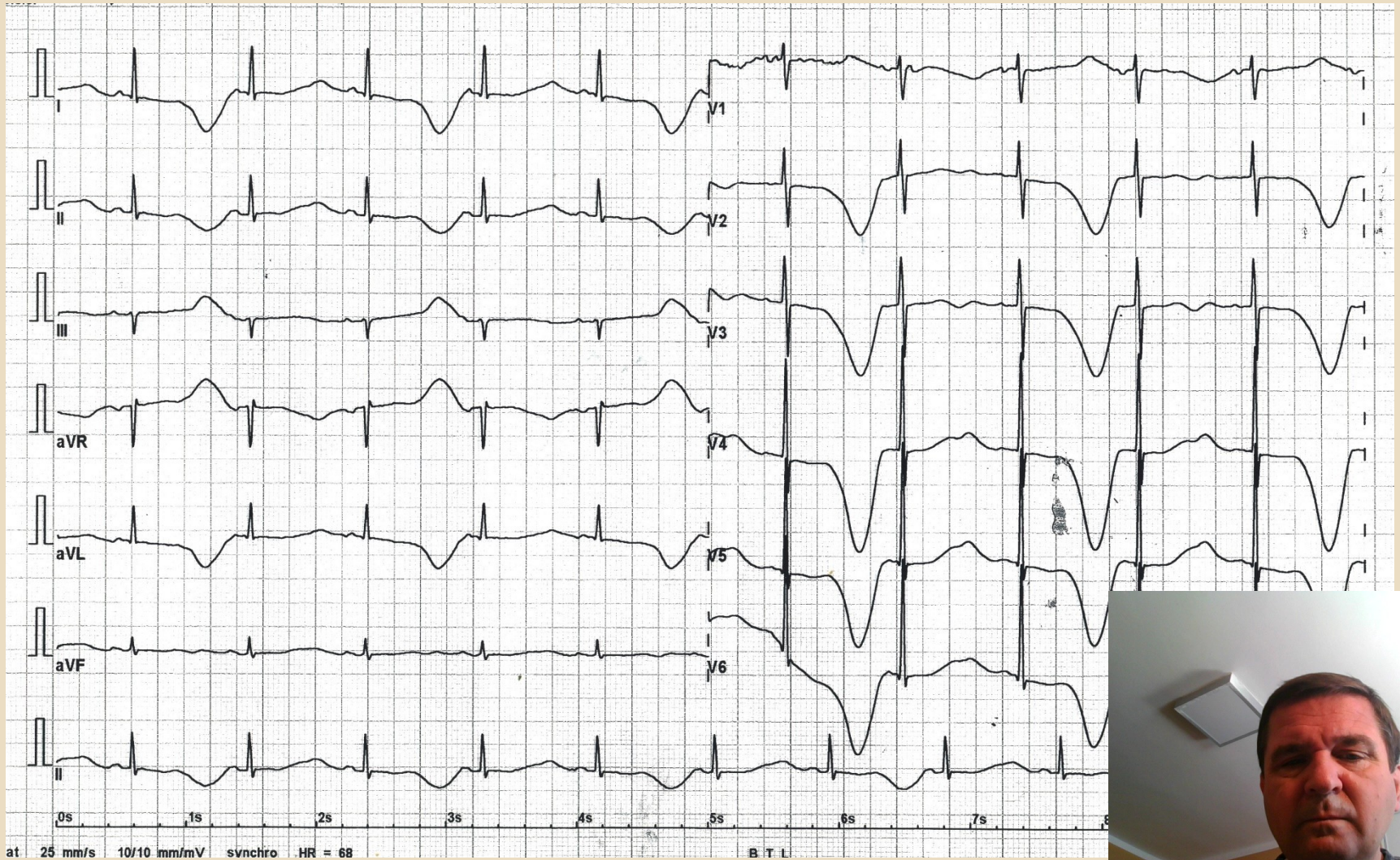
Catecholaminergic polymorphic VT



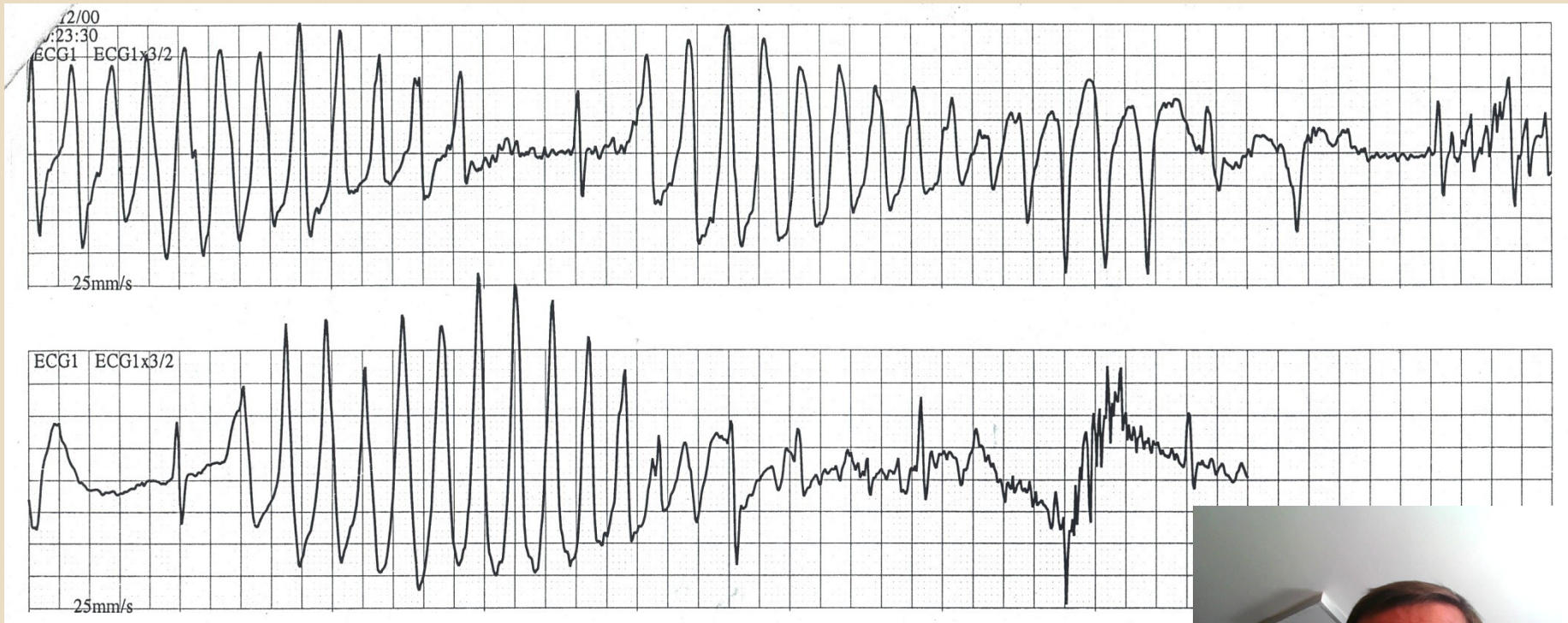
LQT syndrome



LQT syndrome + TWA

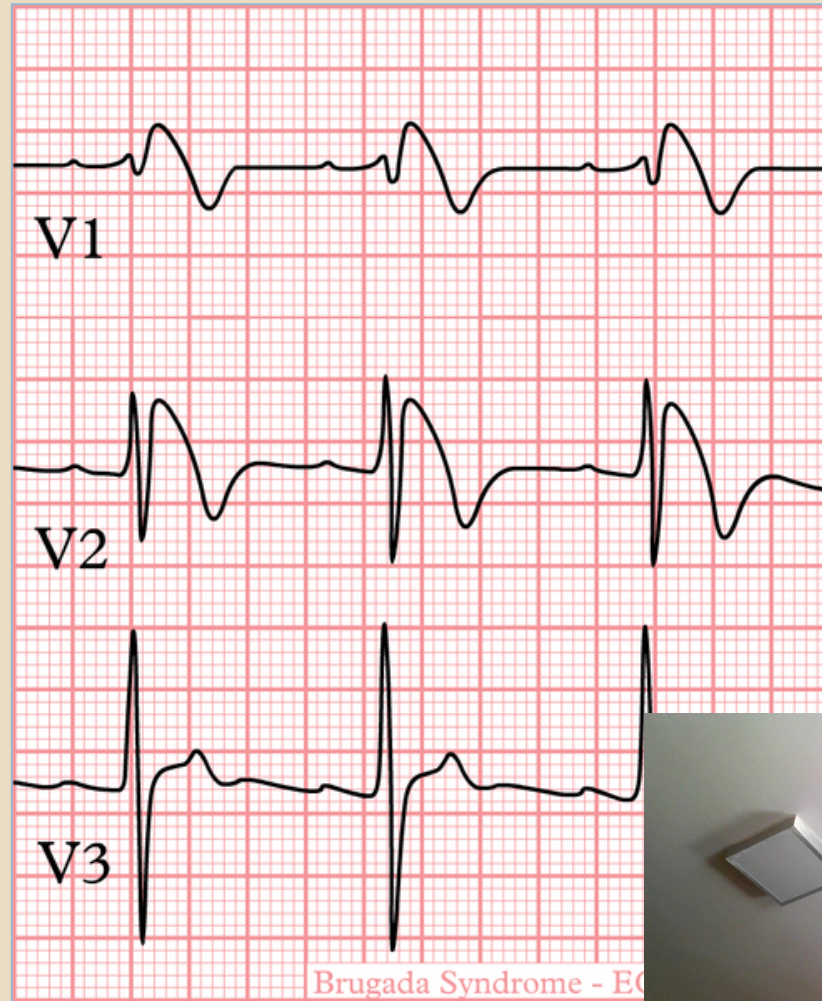


VF TdP type (Torsades de pointes)



Brugada syndrome

Autosomal hereditary disorder of genes responsible for Na and Ca channels.

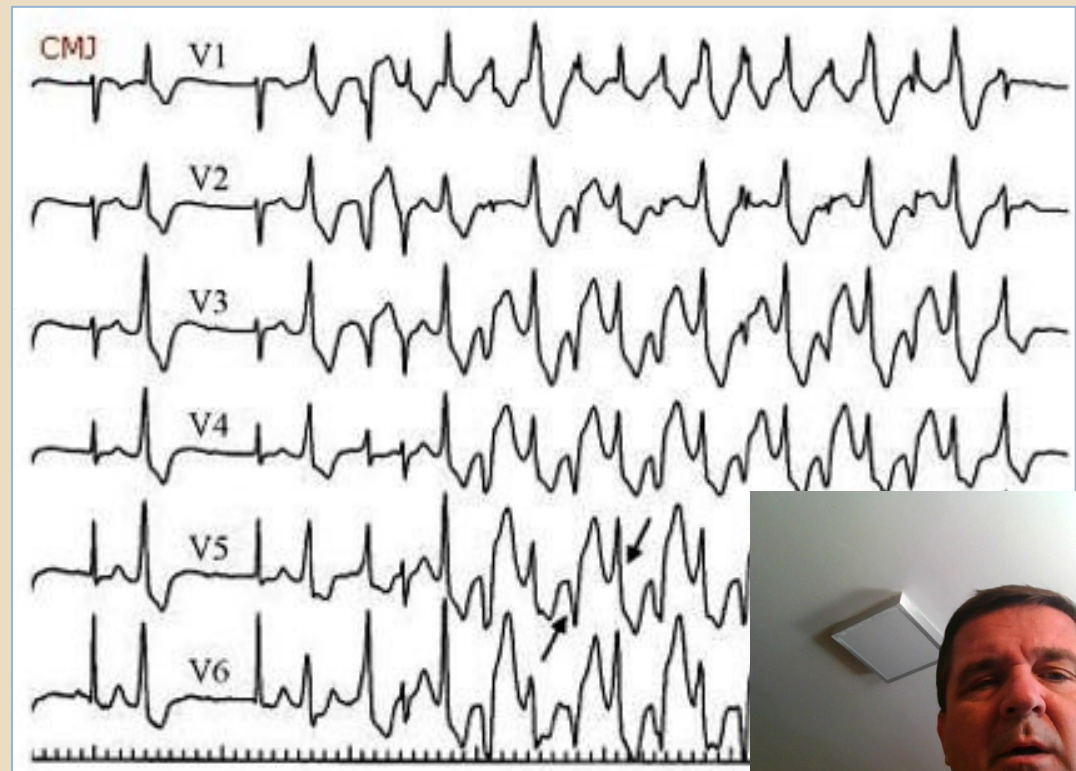


Brugada P., Am Coll Cardiol 1992

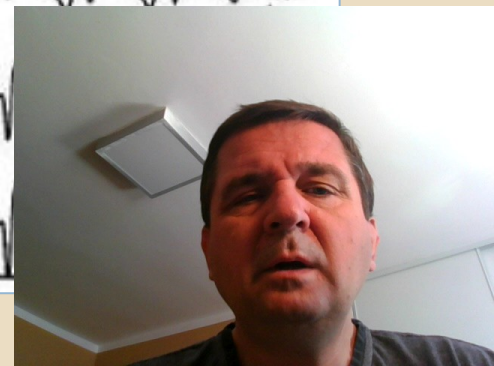


CPVT – Catecholaminergic polymorphic VT

Mutation of cardiac proteins of Ca exchange. Malignant arrhythmias during exercise



Bytešník., et al. Cor Vasa 2011;53(Suppl 1)



Pacing

Anti – bradycardia pacing

Anti – tachycardia pacing

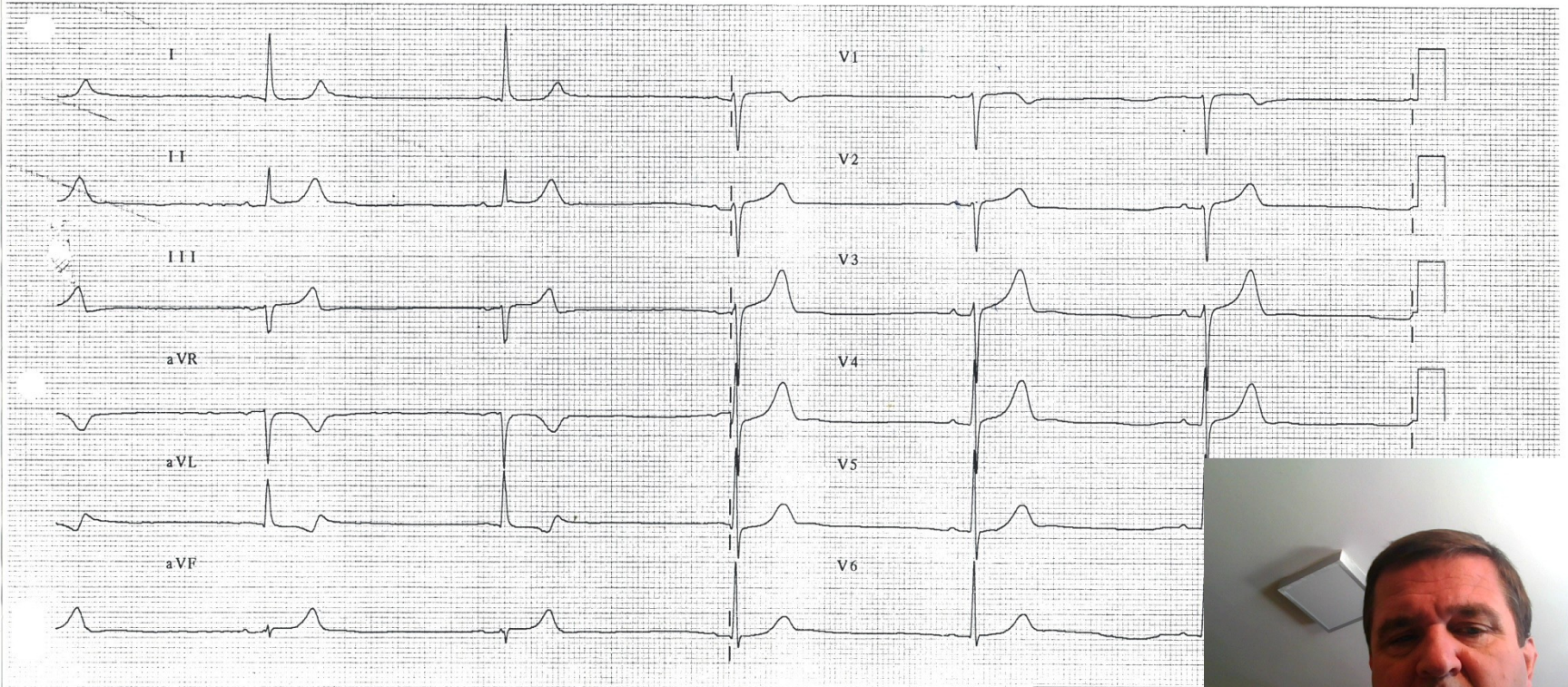
Resynchronization pacing



Sinus bradycardia

Rate 34
PR 169
QRSD 94
QT 574
QTc 432

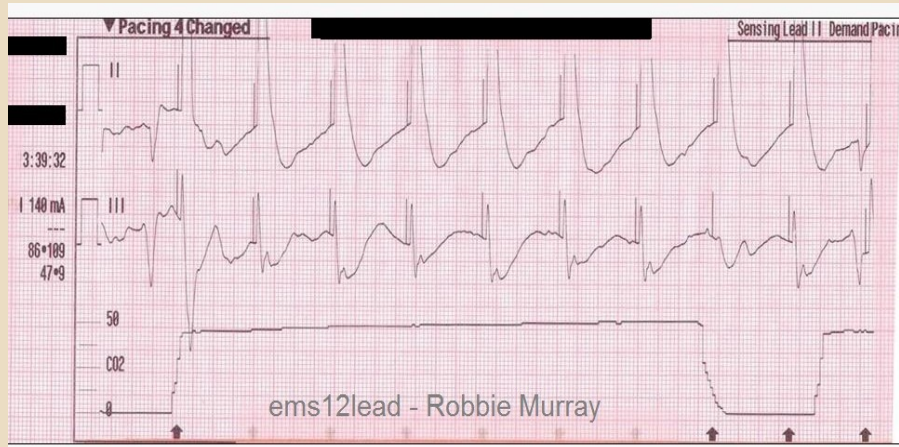
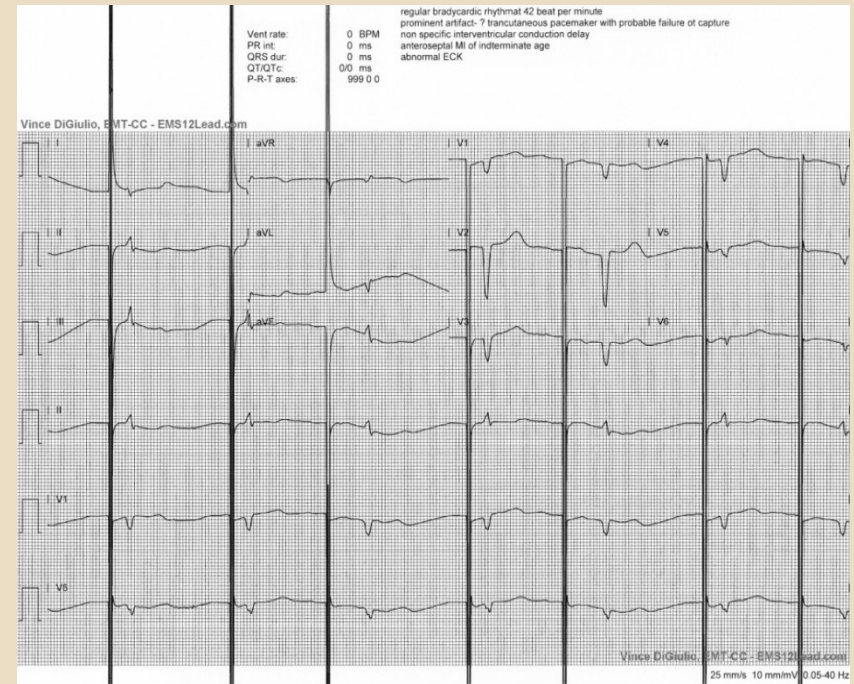
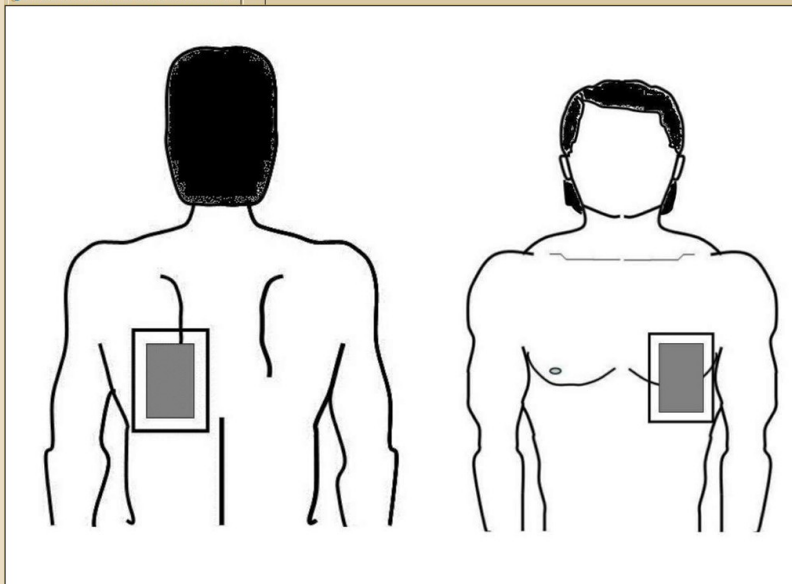
--Axis--
P -7
QRS 3
T 67



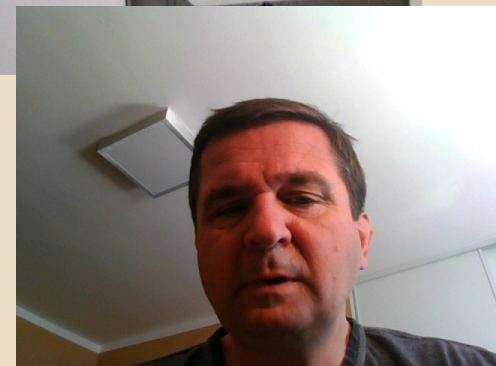
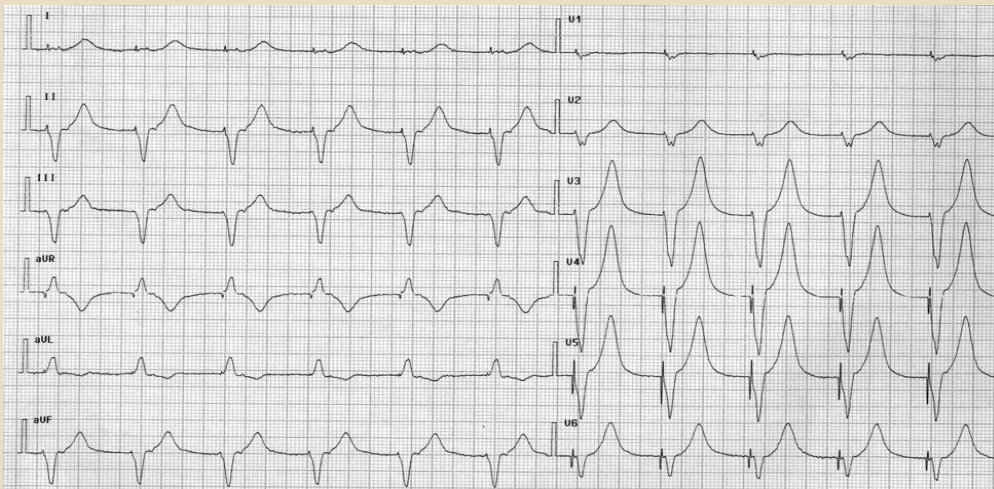
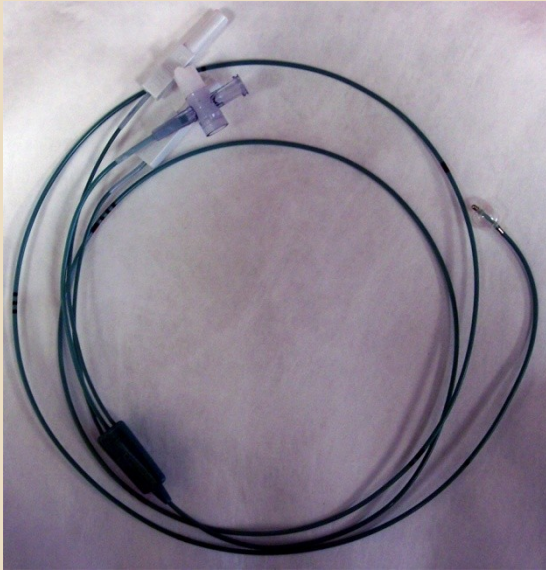
Operator: mw



External pacing



Temporary transvenous pacing



Transvenous pacing from 1958

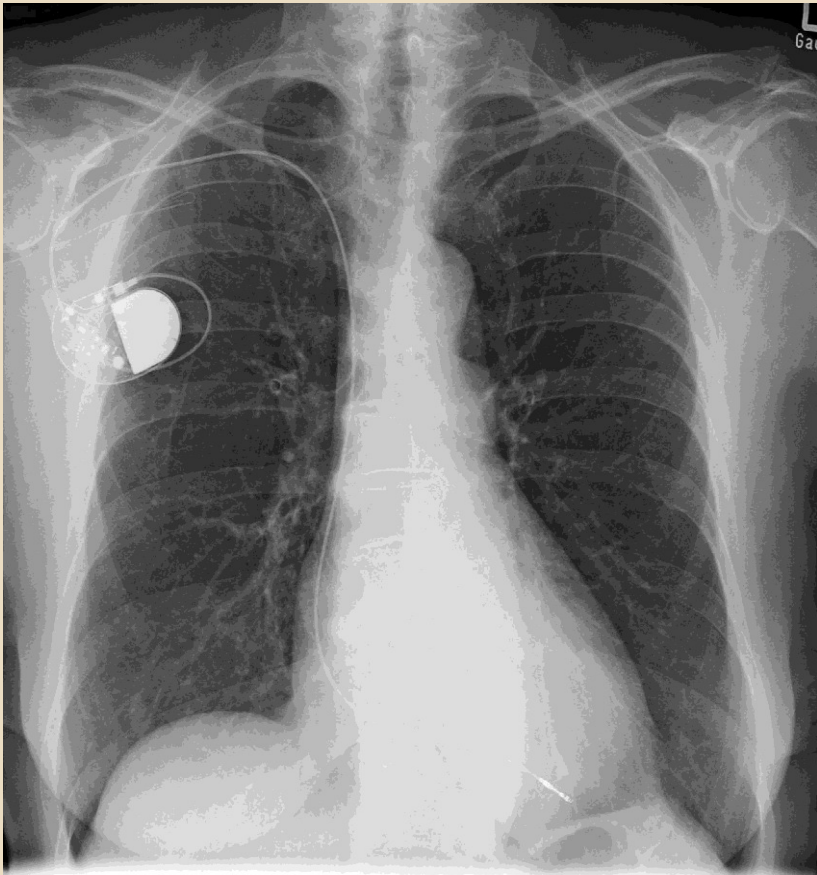
Elmqvist + Senning 8.10.1958



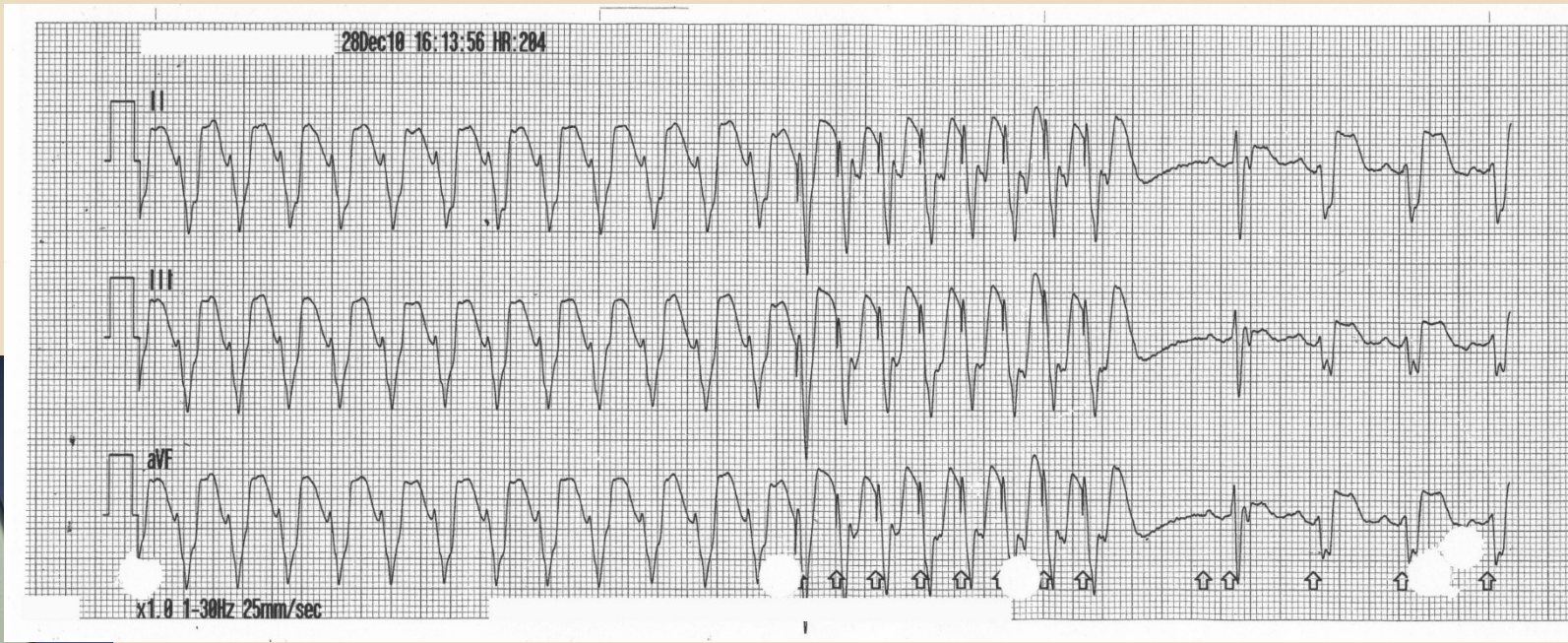
Arne Larsson 1915 - 2001



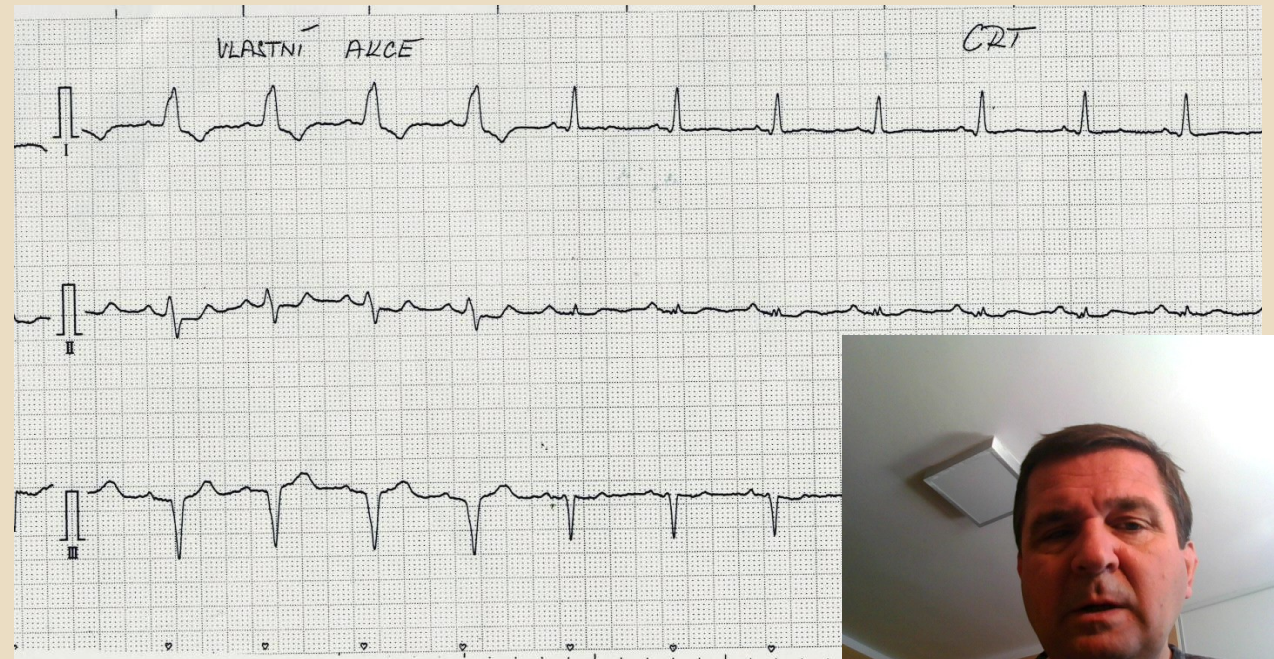
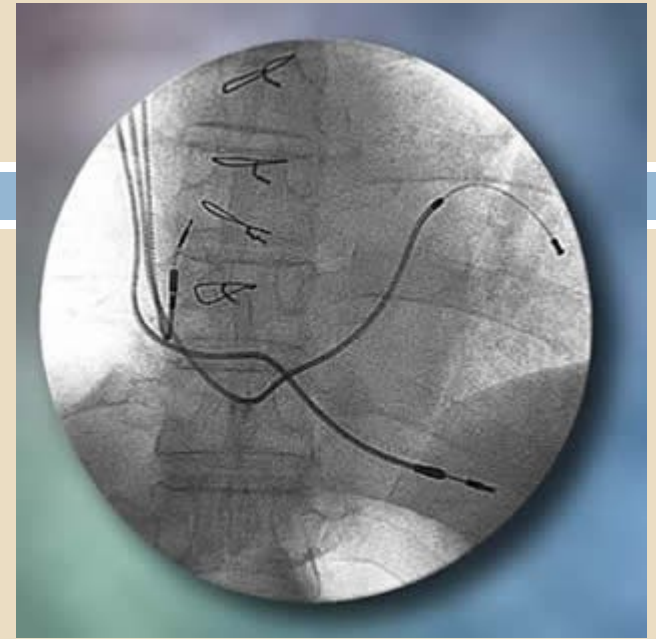
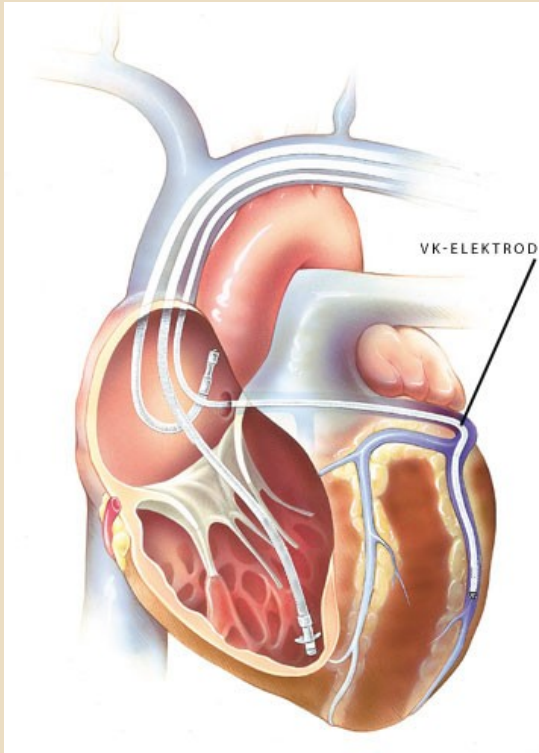
Single and dual chambre PM



Antitachycardia pacing in ICD



Resynchronization therapy





FN BRNO

