

Arytmie/Arrhythmias

**Martin Vokurka
2006**

Types of arrhythmias

I. *electrical events*

disturbance in origin of the impuls

disturbance in conduction

combined

II. *localization (clinical importance !)*

supraventricular (SV) – atrial, junctional

ventricular (V)

III. *resulting heart rate (effect on hemodynamics, ev. therapy)*

bradyarrhythmia

tachyarrhythmia

IV. *context of heart pathology*

primary

secondary

Electrical activity with contraction

Fast – *tachycardia*

Slow – *bradycardia*

Increased automaticity –

– *extrasystole*

(*ectopic premature beat, contraction*), ES

Escaped contraction

Electrical activity without adequate contraction

regular: *flutter*

irregular: *fibrillation*

Disorder of conductivity – *block*

A

1. degree: delay (all is conducted)

2. degree: partial blocking of conductance (not all is conducted)

3. degree: complete block (nothing is conducted)

B

„anatomical“ character of block – *branch blocks*

Used and recommended websites:

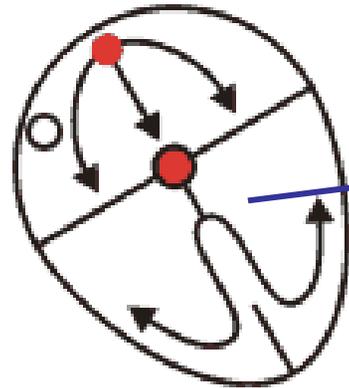
<http://www.cardionetics.com/docs/healthcr/ecg.htm>

<http://library.med.utah.edu/kw/ecg/>

<http://www.ecglibrary.com/>

<http://cardiology.ucsf.edu/ep/debris/ecg.htm>

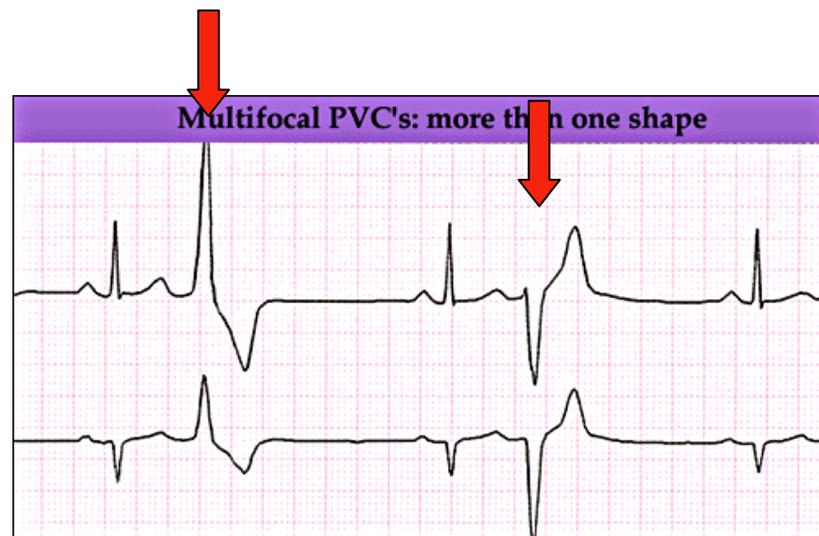
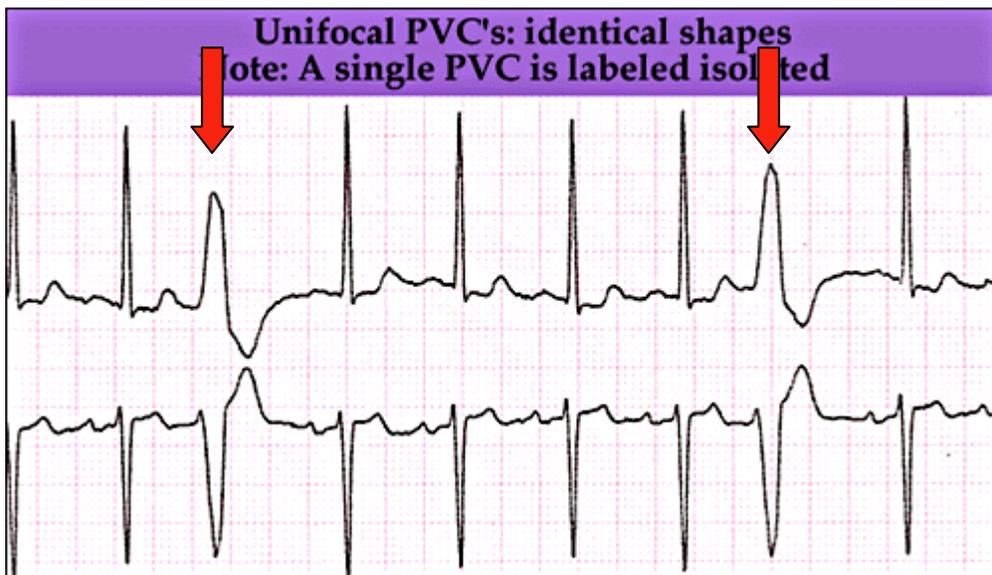
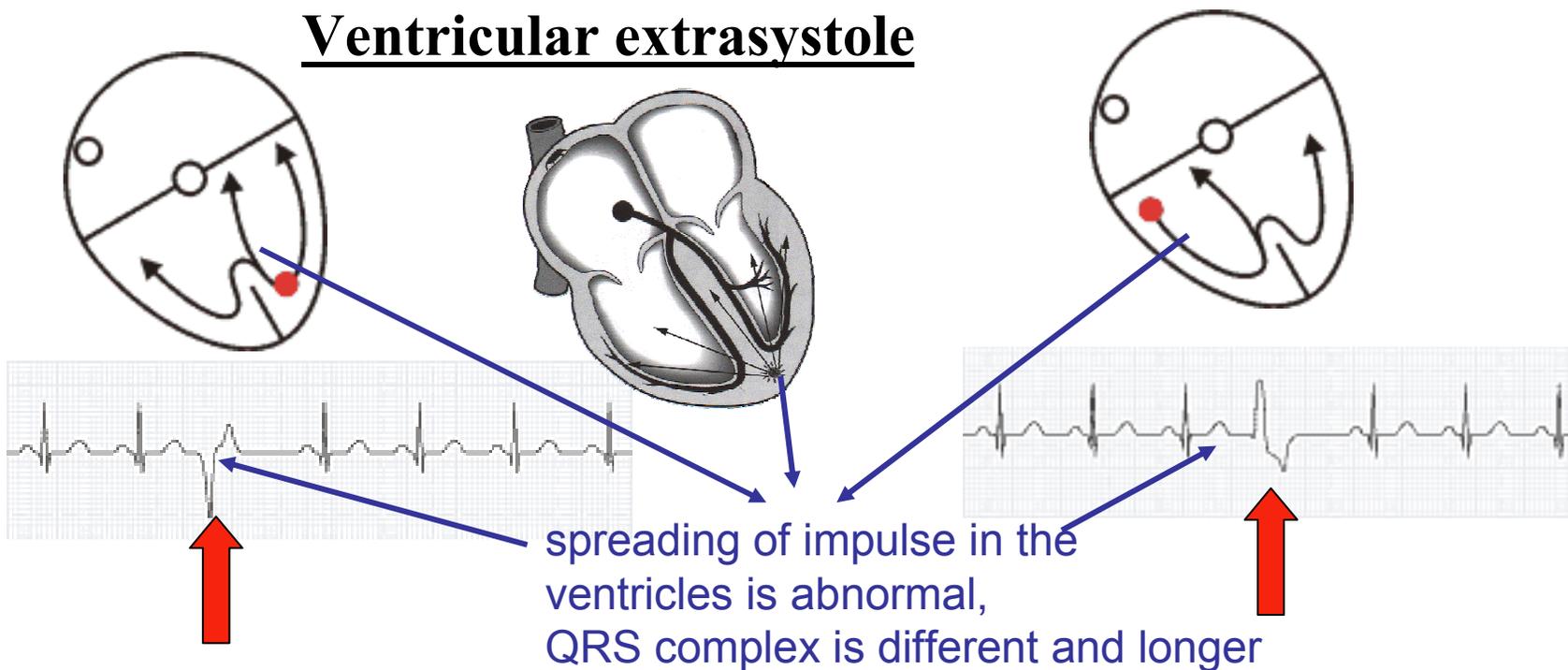
Atrial (supraventricular) extrasystole (SVES)



spreading of impulse in the ventricles is normal,
QRS complex is of normal shape/duration

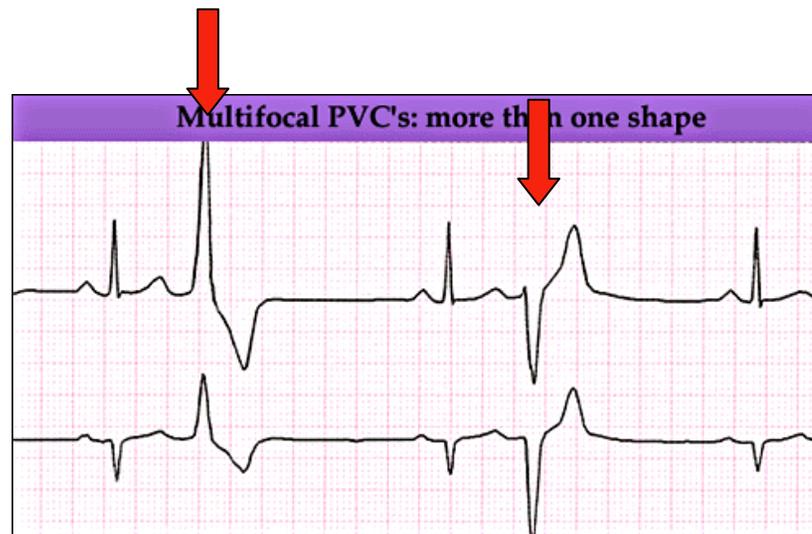


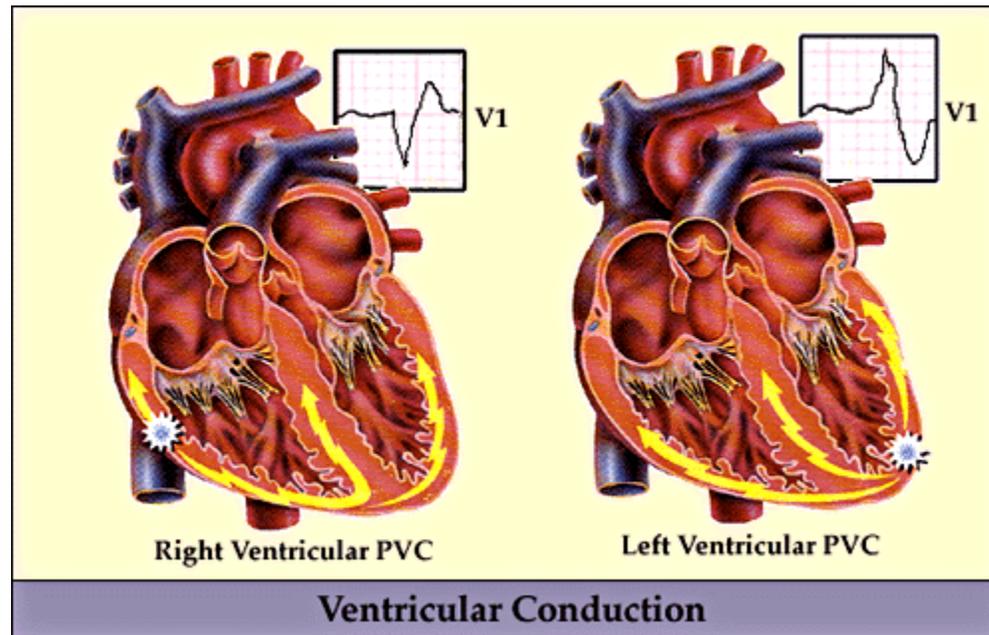
Ventricular extrasystole



spreading of impulse in the ventricles is abnormal, from two different ectopic centers, QRS complex is atypical, differs from the normal one, and the shapes of VES complexes are different

POLYTOPIC VENTRICULAR EXTRASYSTOLES



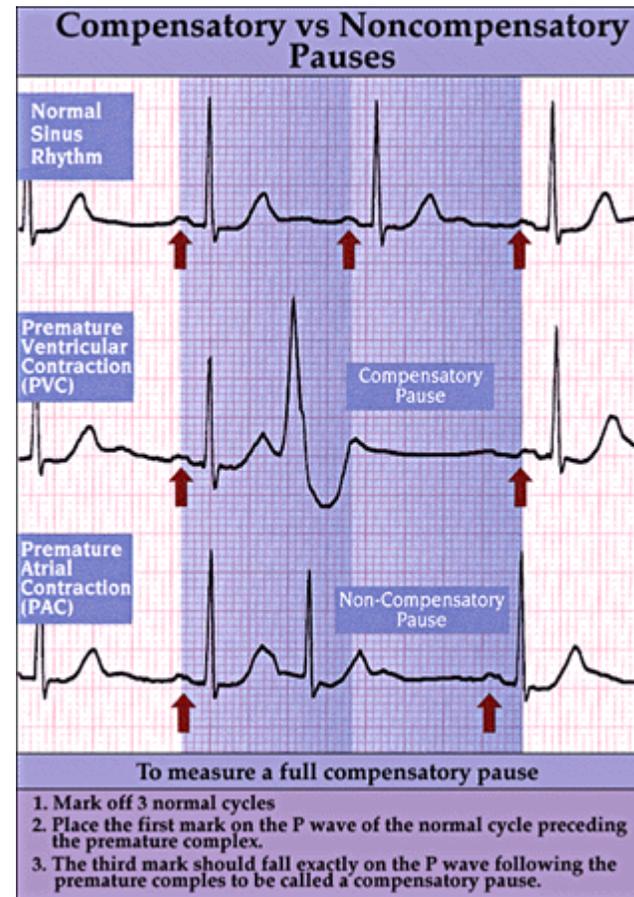


RV vs LV PVC's - Marquette-KH
Marquette Electronics Copyright 1996

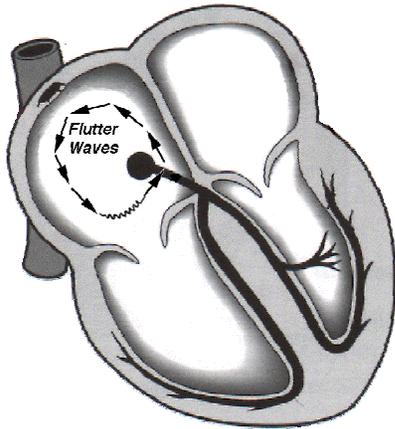
Compensatory pauses

in VES SA node cannot be discharged

in SVES the impulse in SA node is discharged by retrograde conduction



Atrial flutter

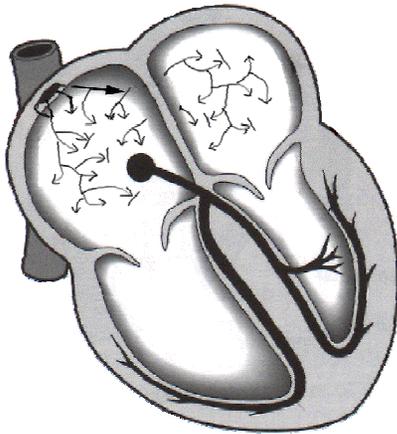


atrial activity: F waves
importance is the blockage of the AV
conduction

fast (unblocked) conduction would be
dangerous because of extreme tachycardia

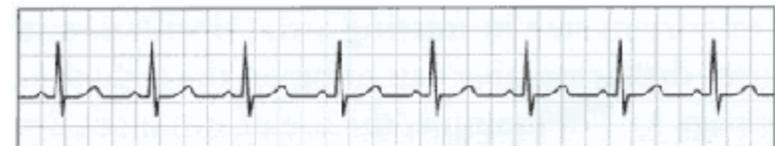
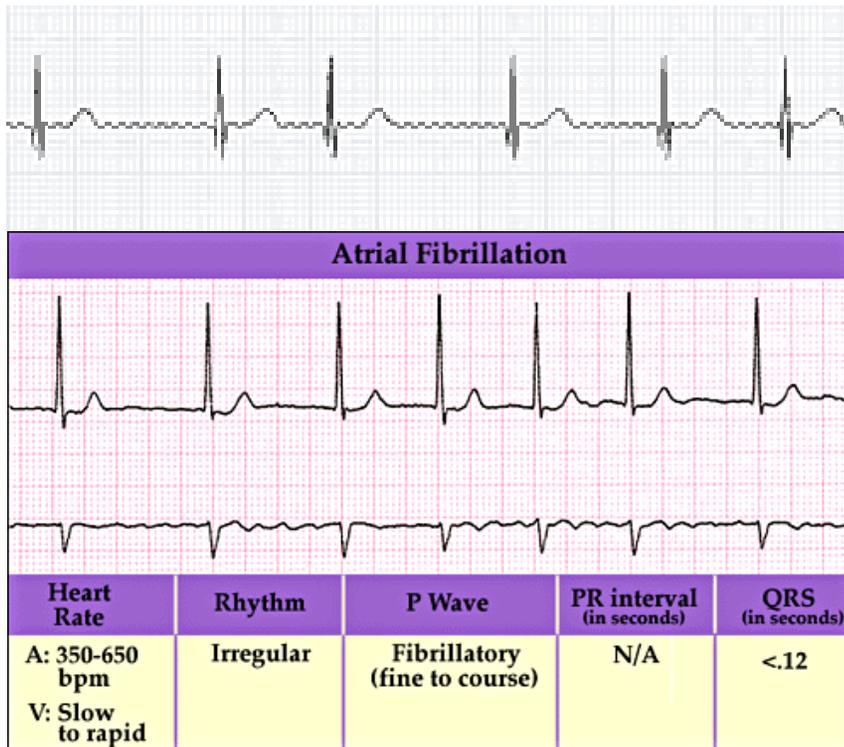
Atrial Flutter				
Heart Rate	Rhythm	P Wave	PR interval (in seconds)	QRS (in seconds)
A: 220-430 bpm V: <300 bpm	Regular or variable	Sawtoothed appearance	N/A	<.12

Atrial fibrillation



atrial activity: irregular *f* waves

AV conduction is absolutely irregular



ECG tracing of a normal heart rhythm.



In atrial fibrillation, the tracing shows tiny, irregular "fibrillation" waves between heartbeats. The rhythm is irregular and erratic.

SV tachycardia (SVT)

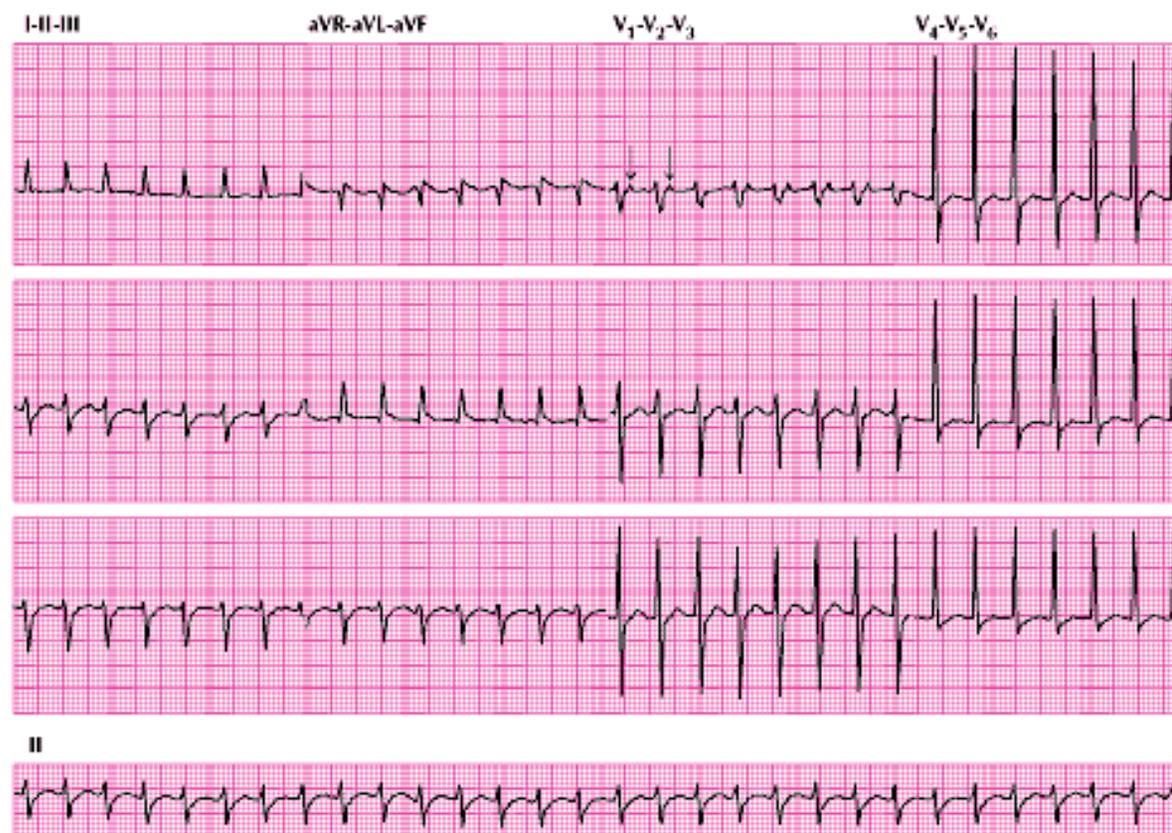


Figure 2. ECG shows supraventricular tachycardia in a 36-year-old woman with frequent episodes of sudden-onset, rapid, and regular heart rate. The ventricular rate is 183 bpm. Note the P waves at the end of the QRS complex (arrows in V₁). Symptoms persisted despite treat-

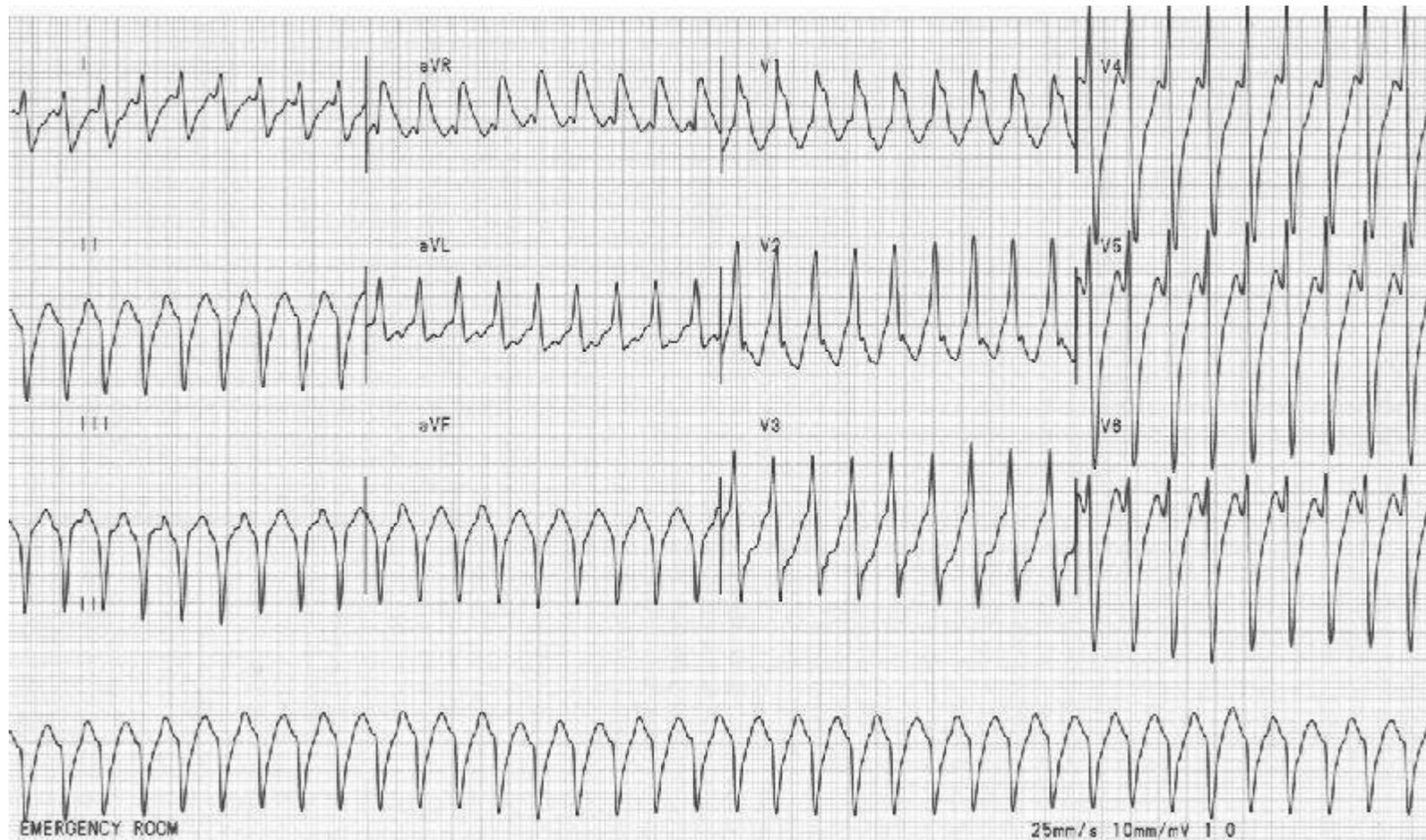
ment with oral verapamil and metoprolol, and the patient was referred for radiofrequency ablation. AV-node reentry tachycardia was diagnosed on electrophysiologic testing. The patient underwent successful ablation of the "slow pathway" with resolution of symptoms.

Importance of heart rate for the heart function:
duration of diastole

1. *filling of the ventricles (preload)* – decreased in high HR, increased in bradycardia
2. *cardiac output* – increased HR \times decrease of preload in high tachycardia, very slow HR decreases CO
3. *perfusion of myocardium* – high HR impaires perfusion
4. *blood pressure*
5. *contractility* – tachycardia increases contractility (calcium entry)
6. *oxygen and energy consumption* – increased in tachycardia

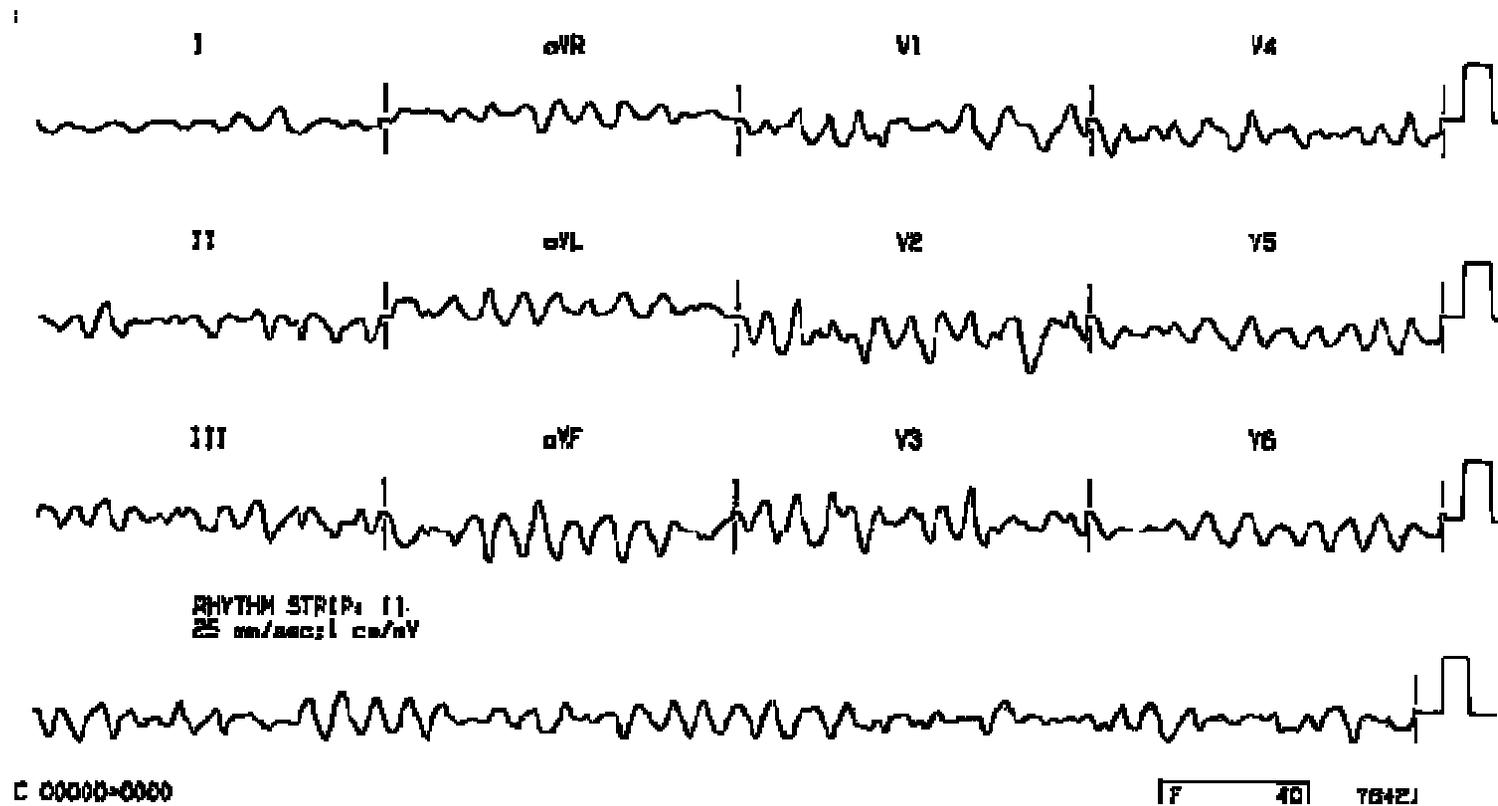
Ventricular tachycardia

abnormal, large QRS complex
monomorphic (the same shape) or polymorphic (varied shape)



Ventricular fibrillation (or flutter)

Acute situation, hemodynamic arrest –
0 cardiac output, 0 pulsation, coma,
resuscitation



AV block 2rd degree

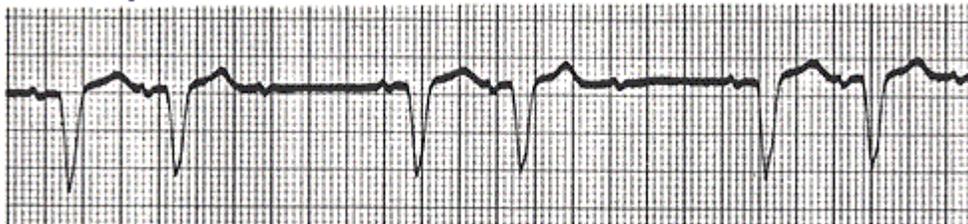


Lead V₁ "Classic Wenckebach"



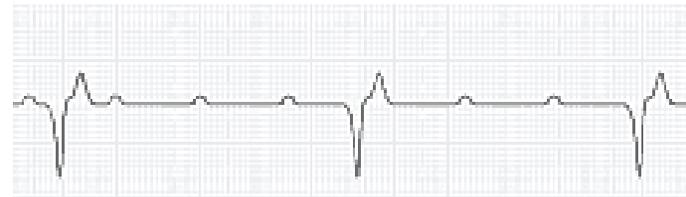
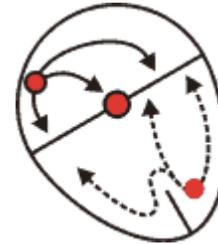
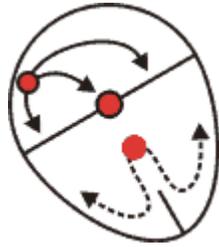
| 680 | 640 | 1180 | 680 |

Lead V₁

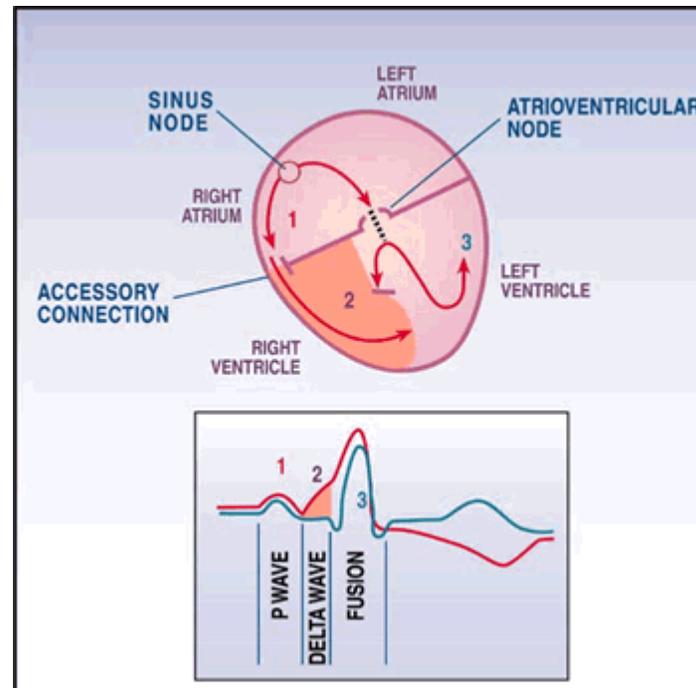


2nd degree AV block (type II) with LBBB

AV block 3rd degree



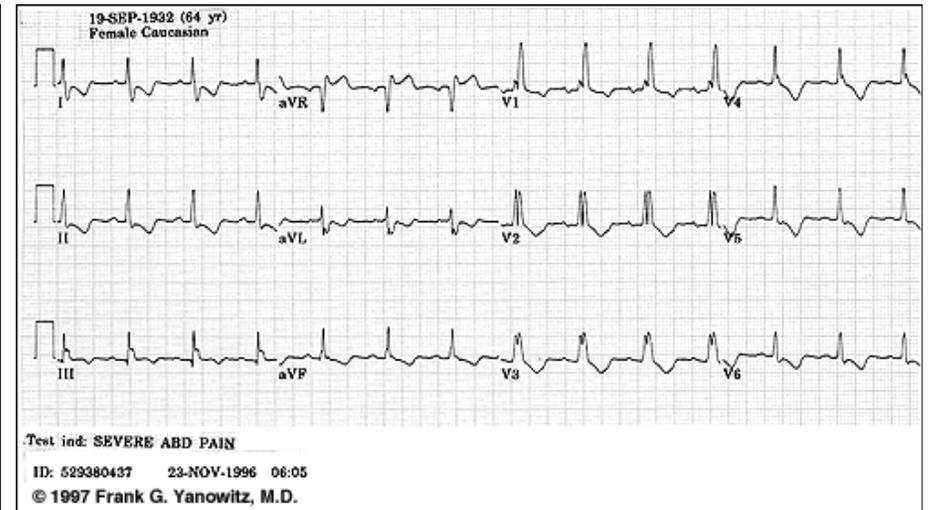
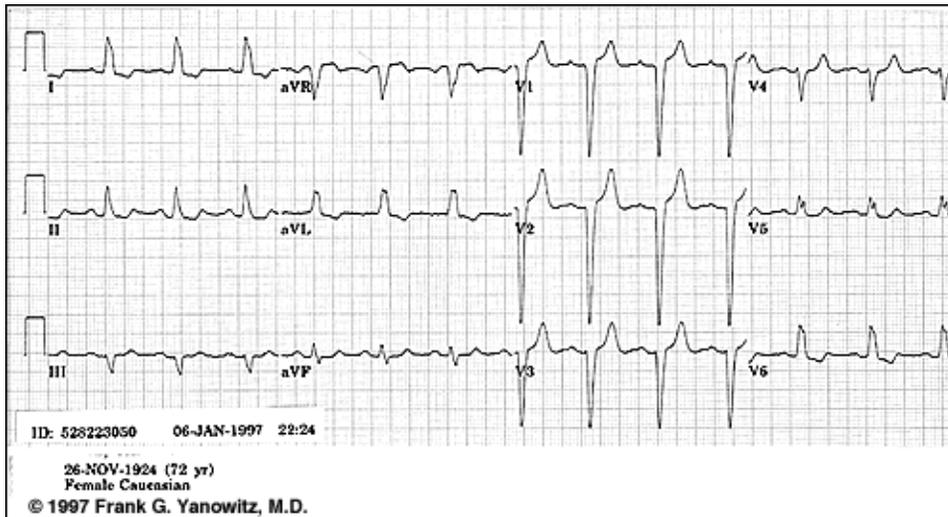
Preexcitation, WPW syndrome

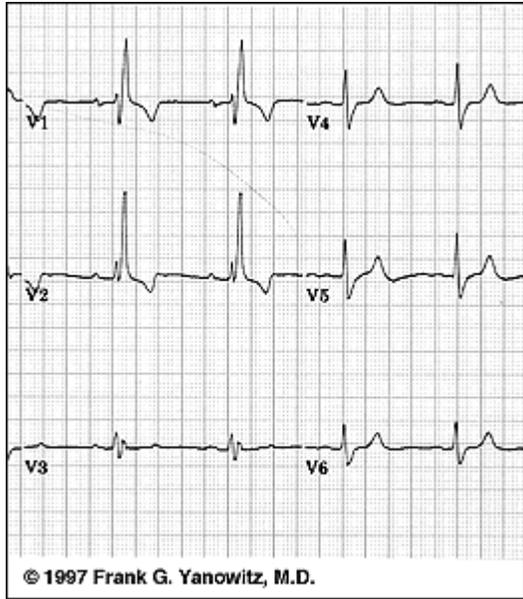


Bundle branch blocks (raménkové blokády)

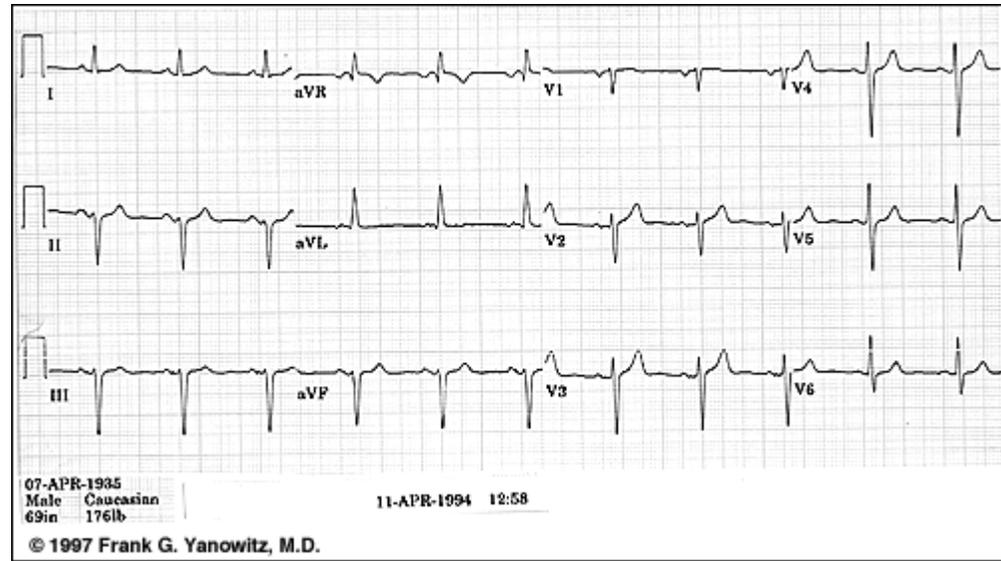
LBBB (left, levý)

RBBB (right, pravý)





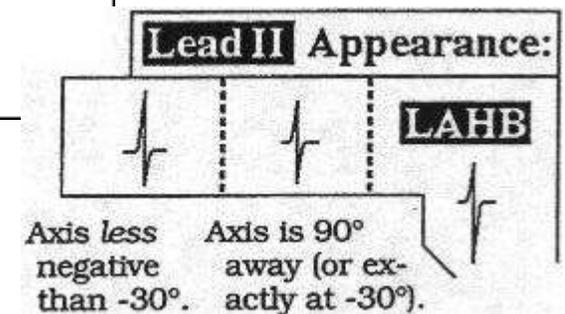
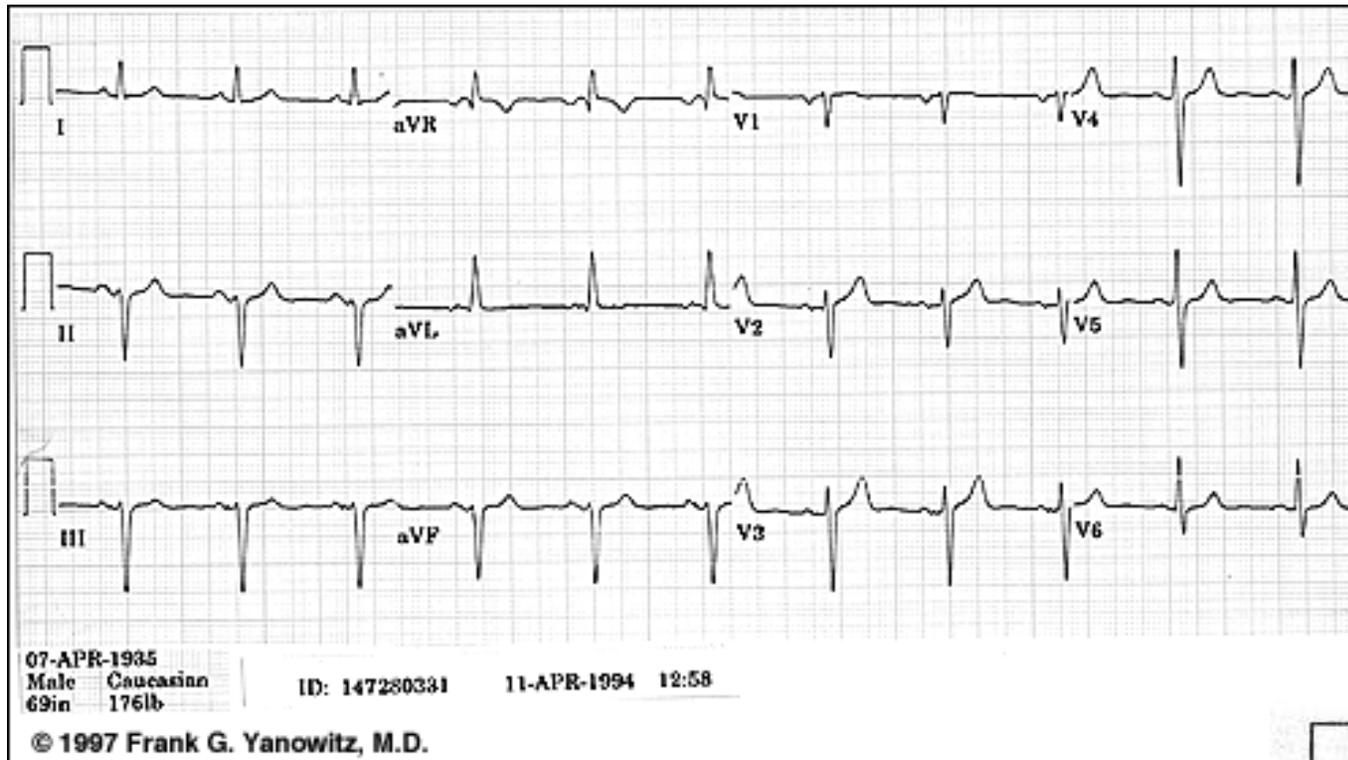
RBBB



LBBB

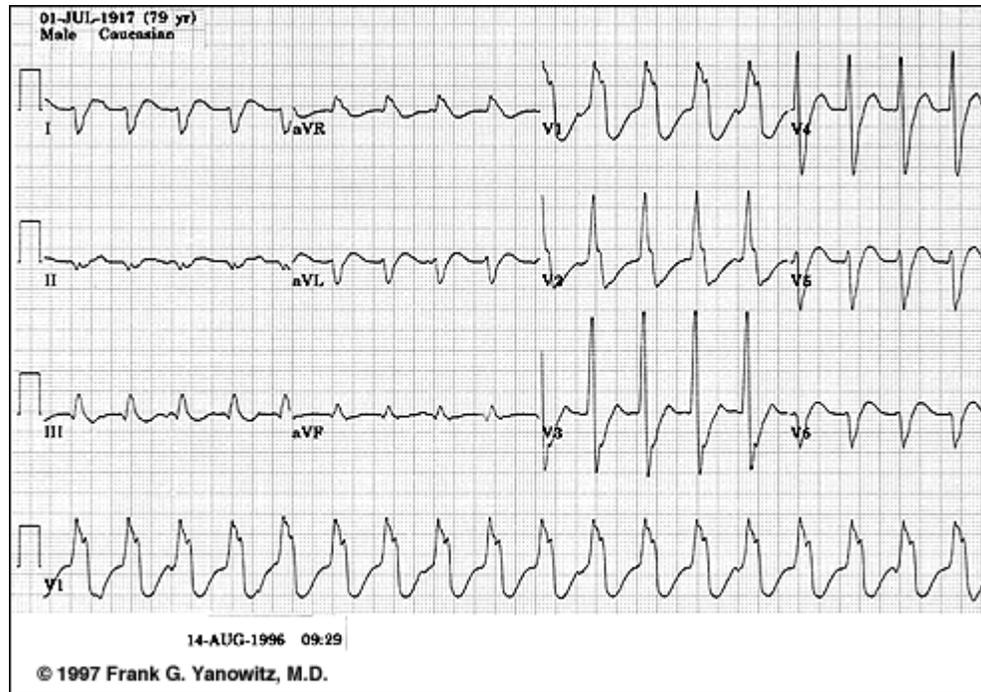
Left anterior fascicular block (LAHB)

In blockage of anterior fascicle the depolarization of upper and ventral part of LV is delayed which causes the vector of QRS to point to this area. The axis is thus more than -30° , usually -45° až -75° .





There are two types of 2nd degree AV Block.
In this example of Type I or Wenckebach
AV block there are 3 P waves for every 2 QRS's;
the PR interval increases until a P wave fails to conduct.
This is an example of "group beating".



Left Ventricular Tachycardia

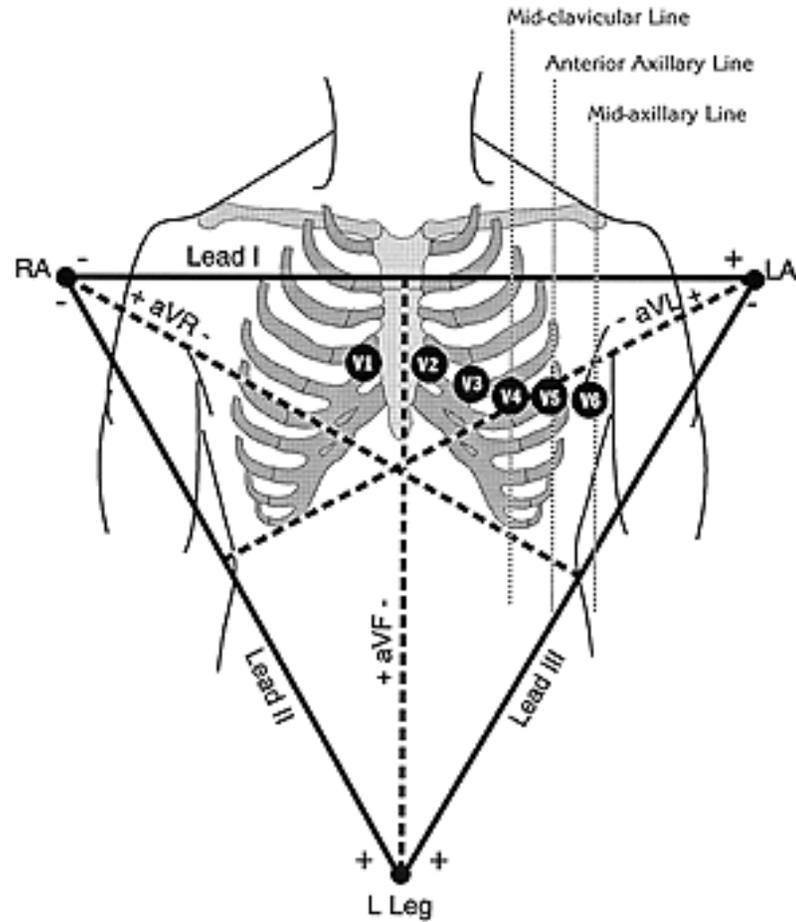
Frank G. Yanowitz, M.D. Copyright 1998

Several features confirm this wide QRS tachycardia to be ventricular in origin.

The morphology of the QRS in V1 has a distinct notch on the downstroke making it highly unlikely to be RBBB aberration.

The QRS is entirely negative in lead V6. The frontal plane QRS axis is +150.

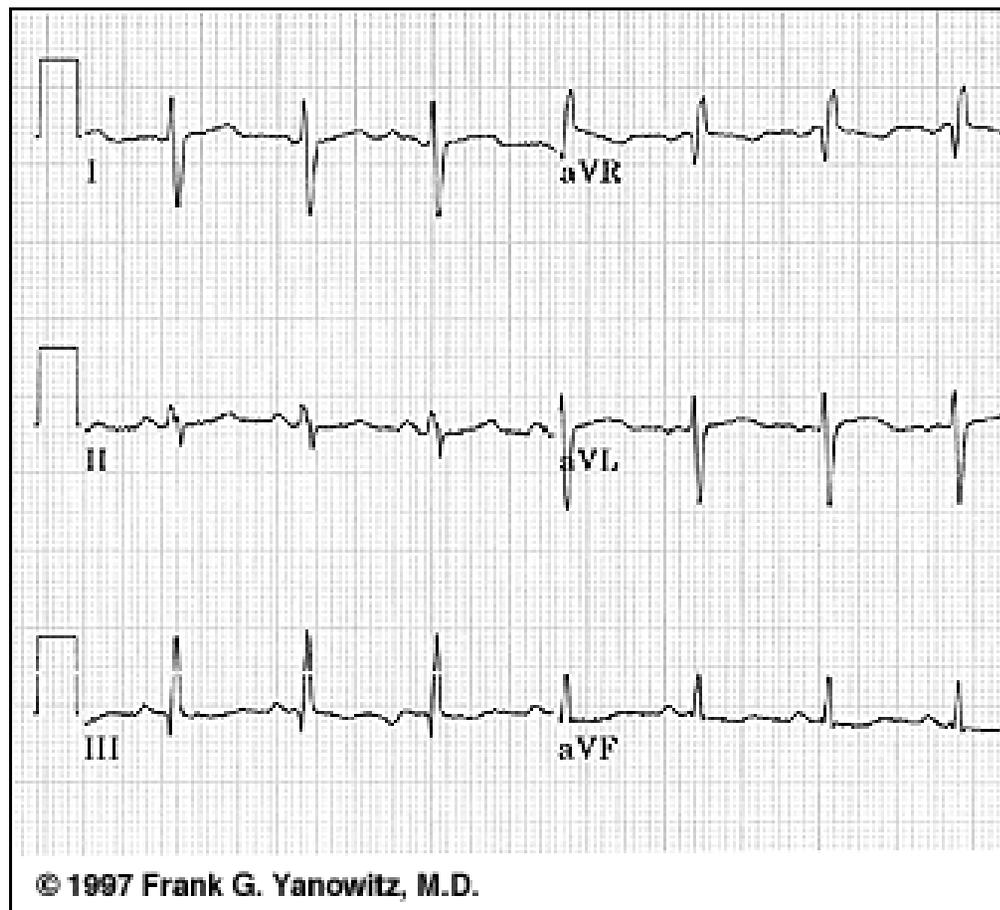
The direction of ventricular activation is from left to right and posterior to anterior, suggesting a left ventricular origin.



Frontal and Horizontal Plane Lead Diagram-KH

Frank G. Yanowitz, M.D.

Určete osu:



Frontal Plane QRS Axis = +150 degrees (RAD)-KH

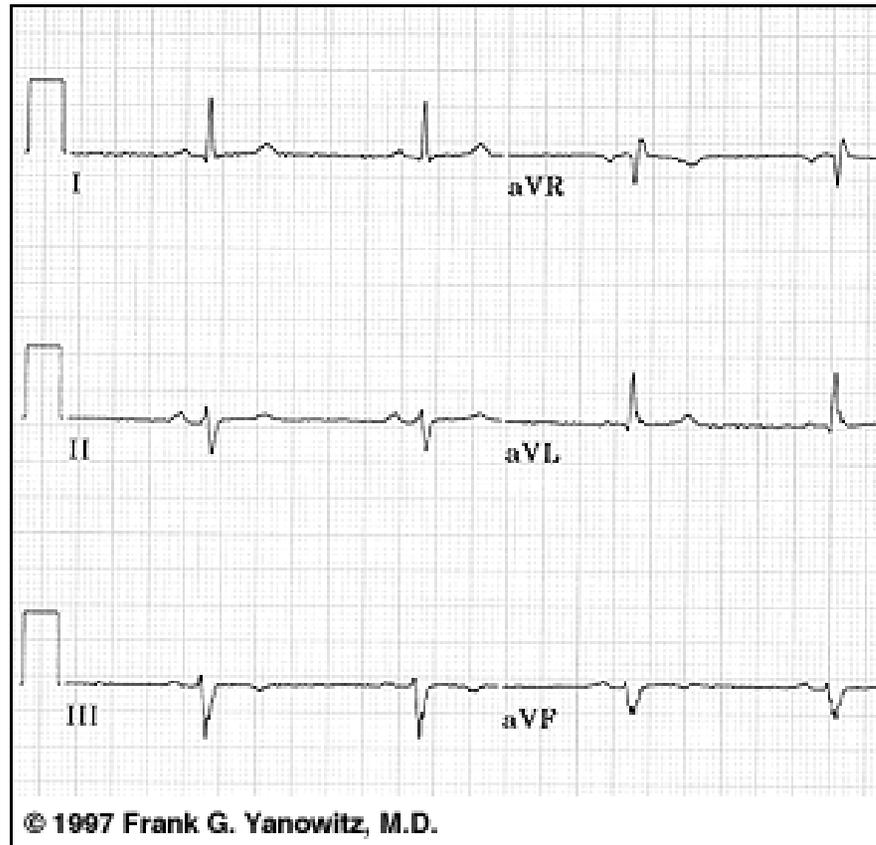
Frank G. Yanowitz, M.D.

This is an unusual right axis deviation (RAD).

Lead I is negative, which usually means RAD.

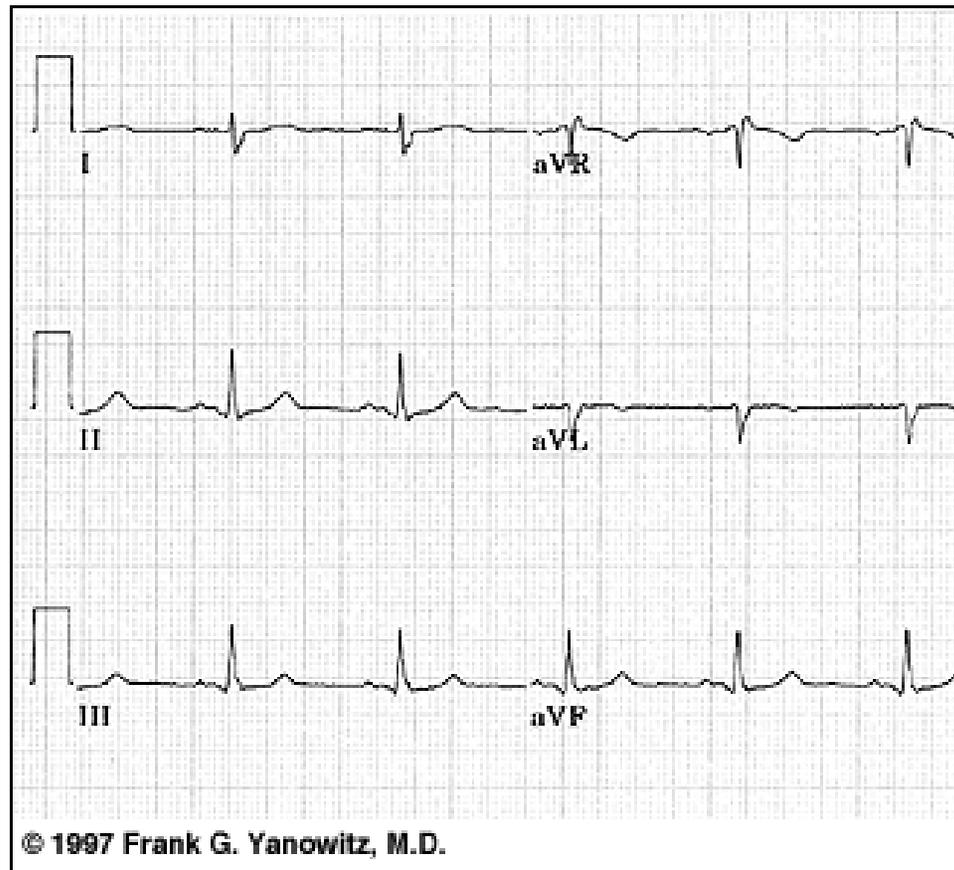
Lead II is the isoelectric lead, which almost always means -30 degrees; but in this example the axis is 180 degrees away from -30, or +150 degrees.

Určete osu:

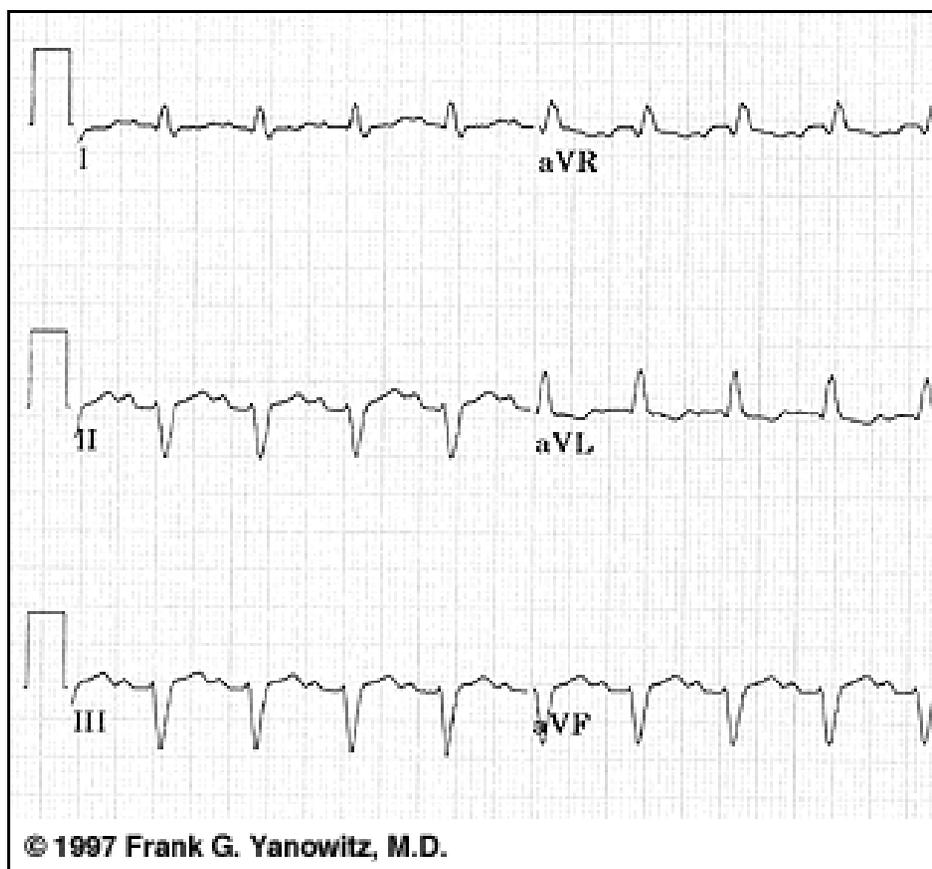


Frontal Plane QRS Axis = -45 degrees-KH
Frank G. Yanowitz, M.D.

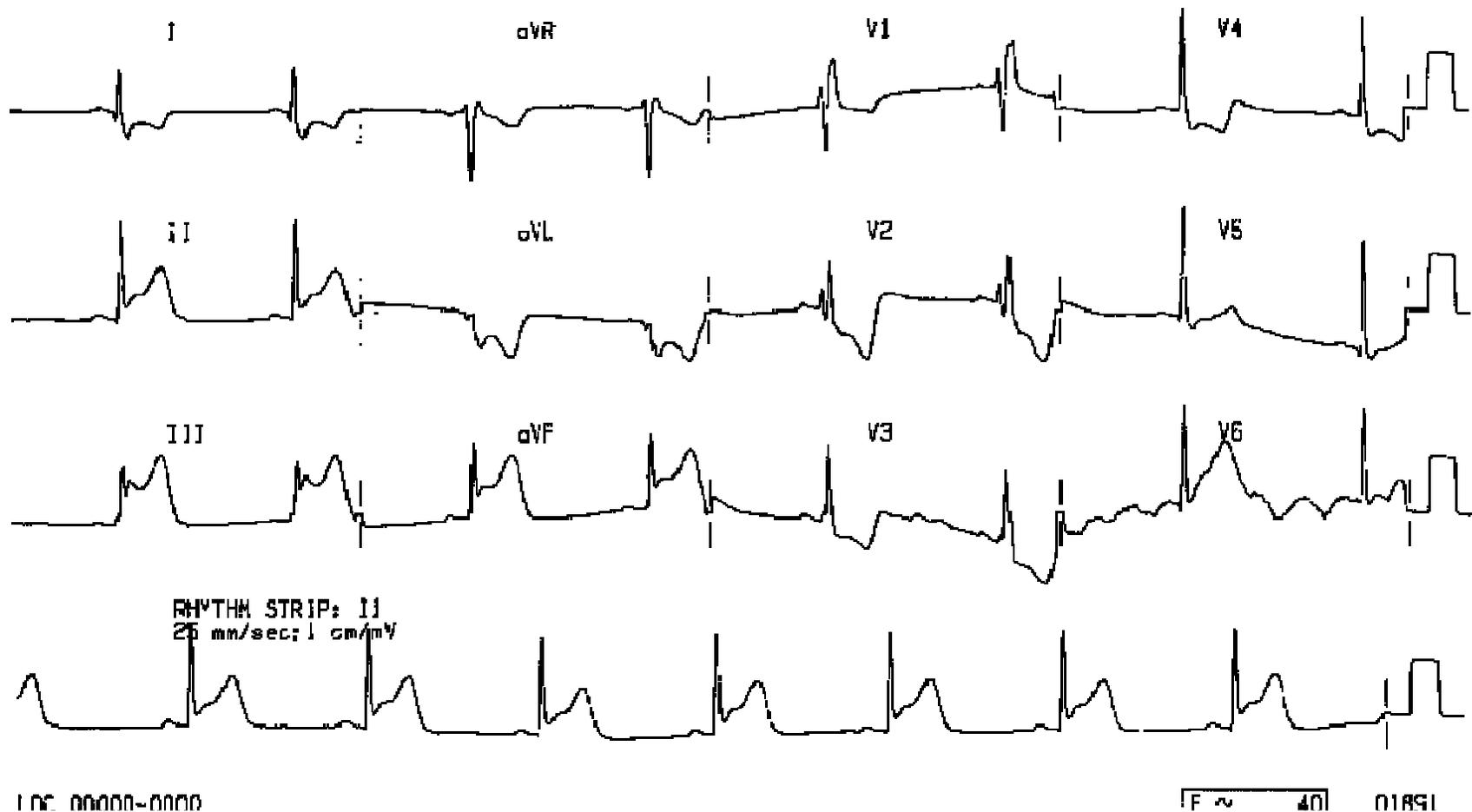
Určete osu:



Frontal Plane QRS Axis = 90 degrees-KH
Frank G. Yanowitz, M.D.



Frontal Plane QRS Axis = -75 degrees-KH
Frank G. Yanowitz, M.D.



Right Bundle Branch Block

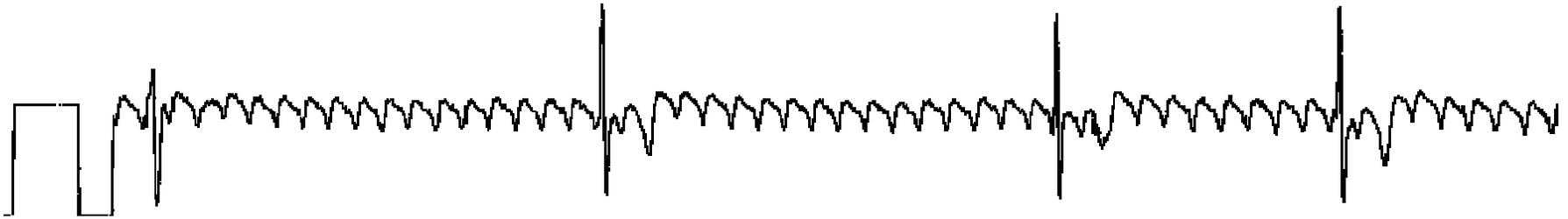
wide QRS, more than 120 ms (3 small squares)

secondary R wave in lead V1

other features include slurred S wave

in lateral leads and T wave changes in the septal leads

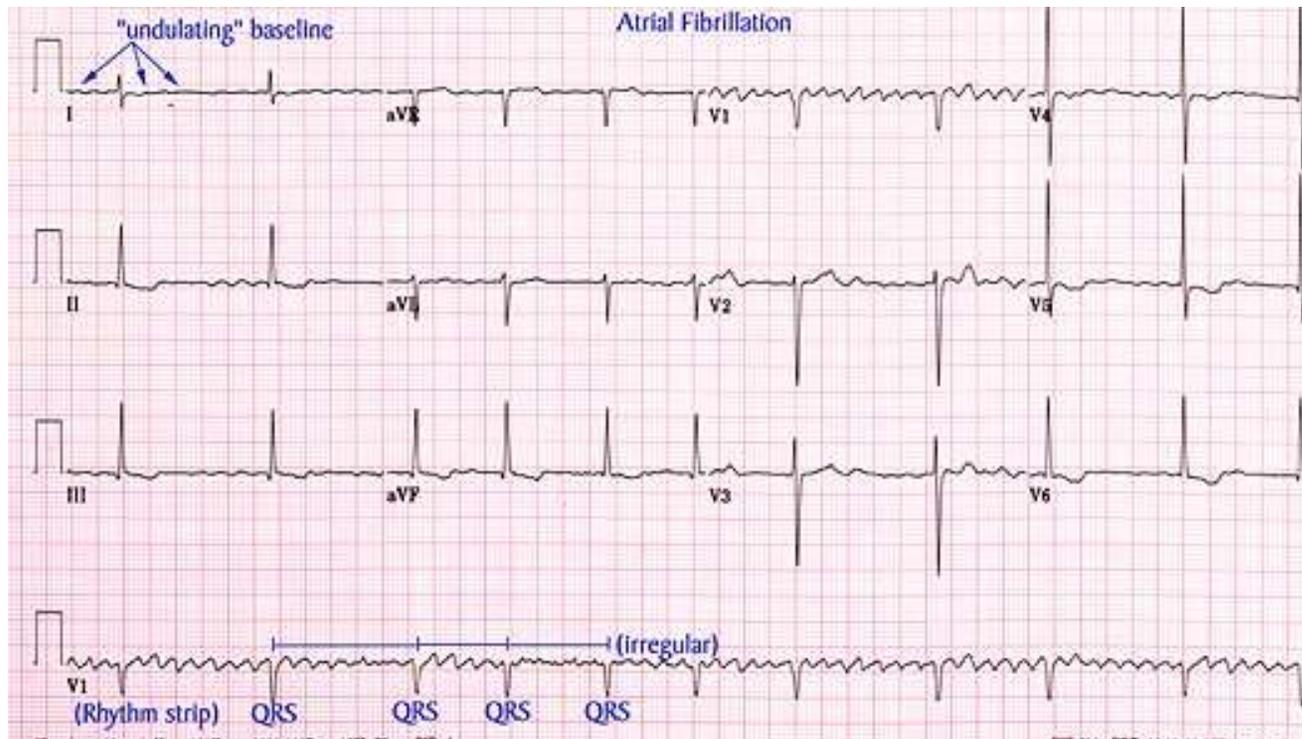
A 68 year old lady on digoxin complaining of lethargy.



Atrial flutter

A characteristic 'sawtooth' or 'picket-fence' waveform of an intra-atrial re-entry circuit usually at about 300 bpm.

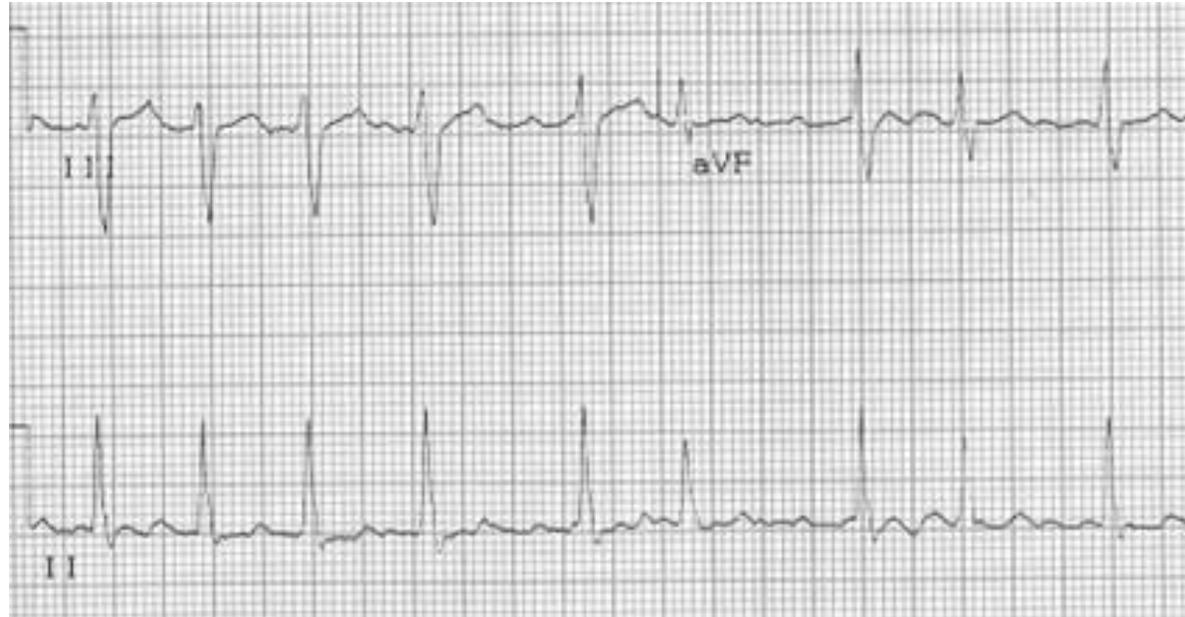
This lady was taking rather too much digoxin and has a very slow ventricular response.



Atrial fibrillation



Atrial flutter



Atrial fibrillation

<http://www.cacr.ca/news/2002/0210ritchie.htm>