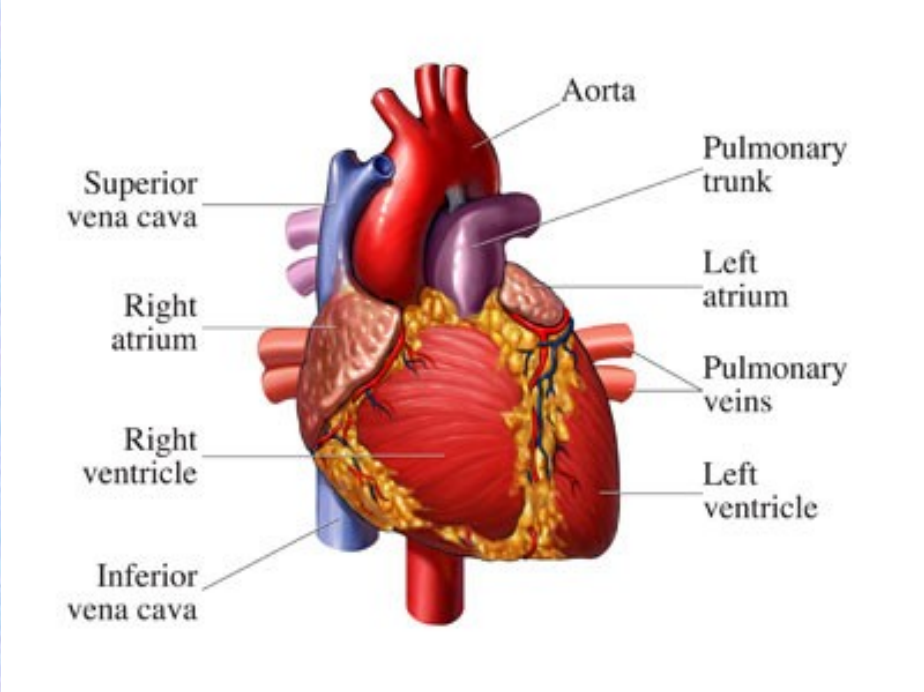
# EXAMINATION TECHNIQUES

# IN CARDIOLOGY



- **Non-invasive methods**

- **Invasive methods**

  - (by puncture needle or catheter)

# NON – INVASIVE METHODS

**Basic** – used together with examination of patients

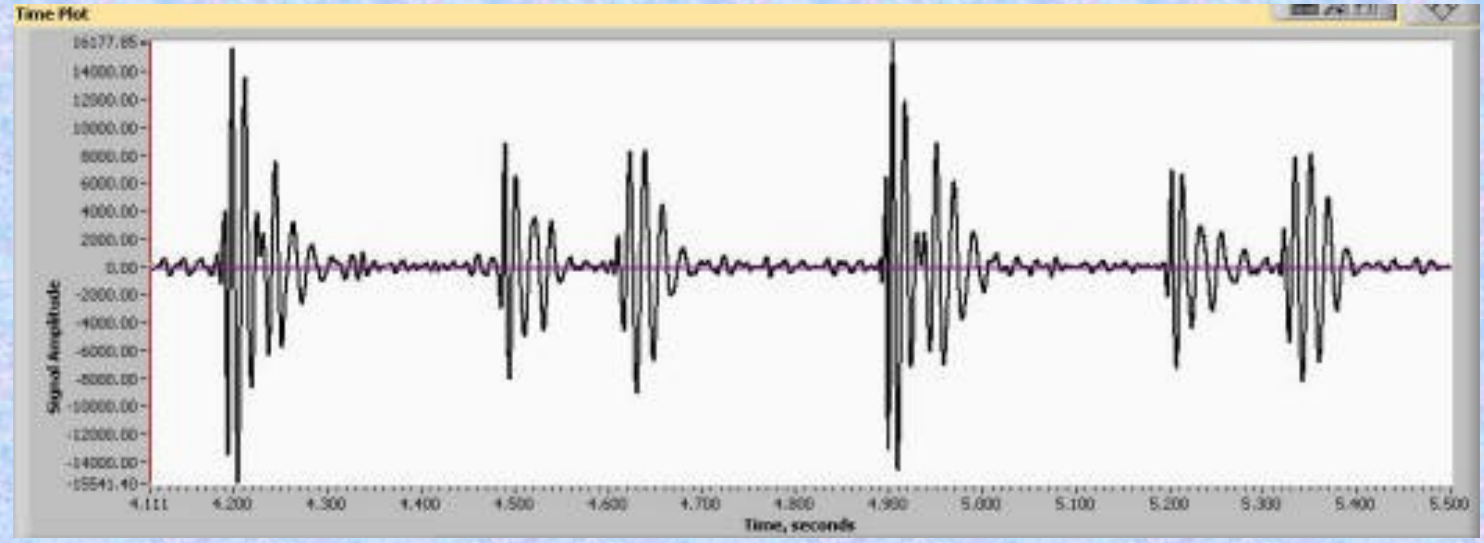

**Inspection**

**Percussion**

**Palpation**

**Auscultation**

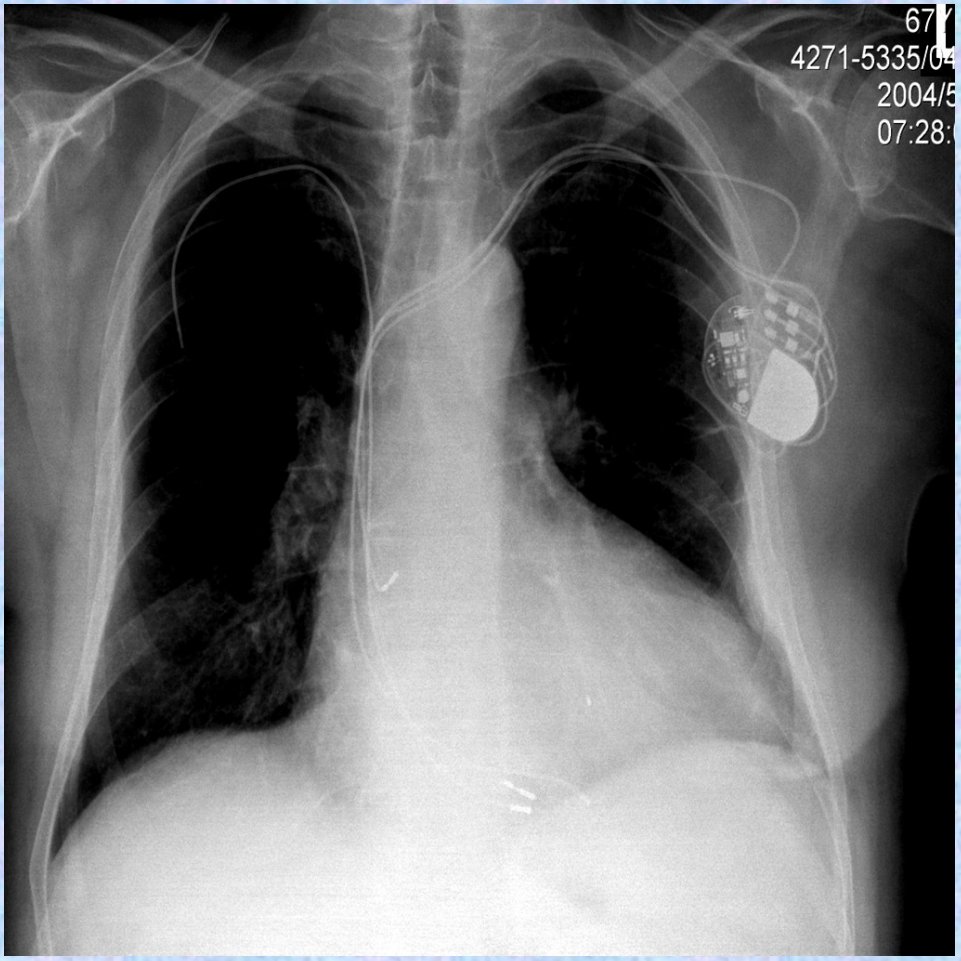
- **PHONOCARDIOGRAPHY**




S1 S2 S3 S1 S2 S3

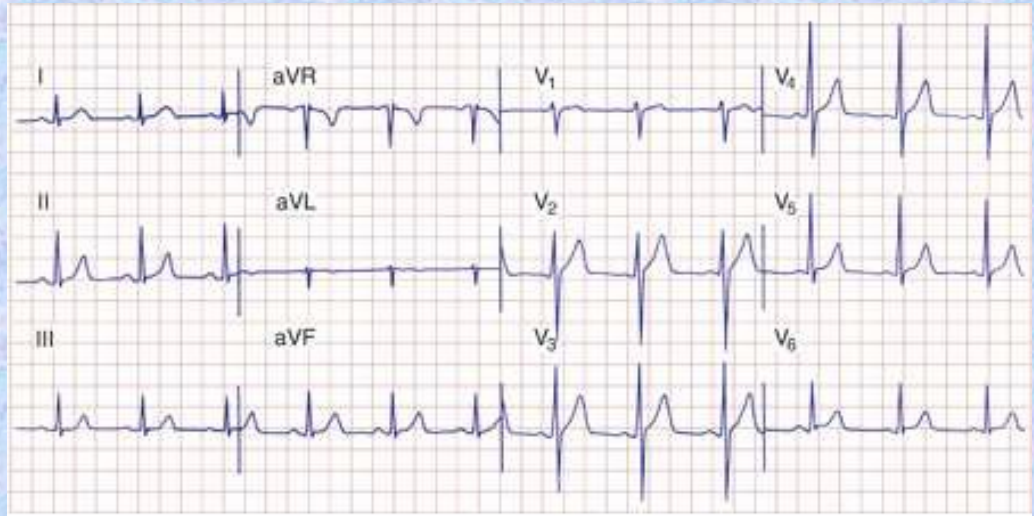
# X-ray

Chest x-ray provides useful information about cardiac size and shape, as well as the state of the pulmonary vasculature, and may identify noncardiac causes of the patient´s symptoms



# ELECTROCARDIOGRAPY

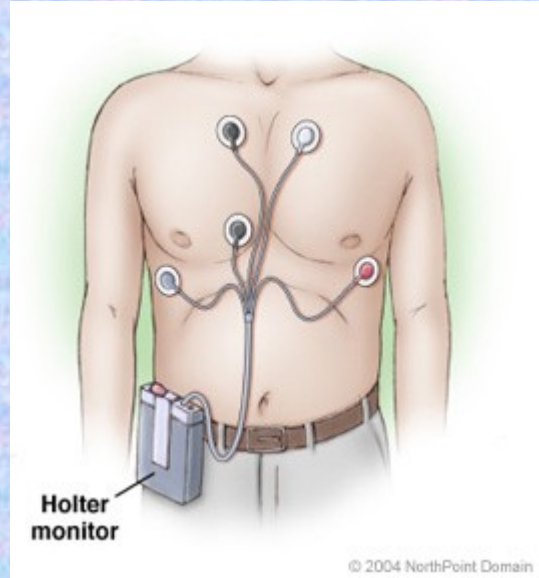
- A routine 12-lead ECG
- The major importance of the ECG is to assess cardiac rhythm and determine the presence of left ventricle hypertrophy or prior myocardial infarction or QRS width
- Normal ECG excludes left ventricle dysfunction




Source: Longo DL, Fauci AS, Kasper DL, Hauser SL, Jameson JL, Loscalzo J: *Harrison's Principles of Internal Medicine, 18th Edition*: www.accessmedicine.com

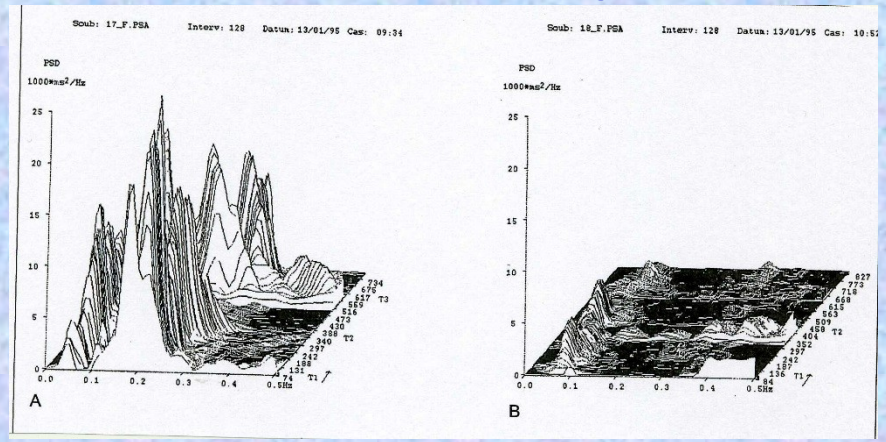
# ELECTROCARDIOGRAPY

- **HOLTER MONITORING**
- 24-hour ECG record




✓ ***estimation of heart rate variability***

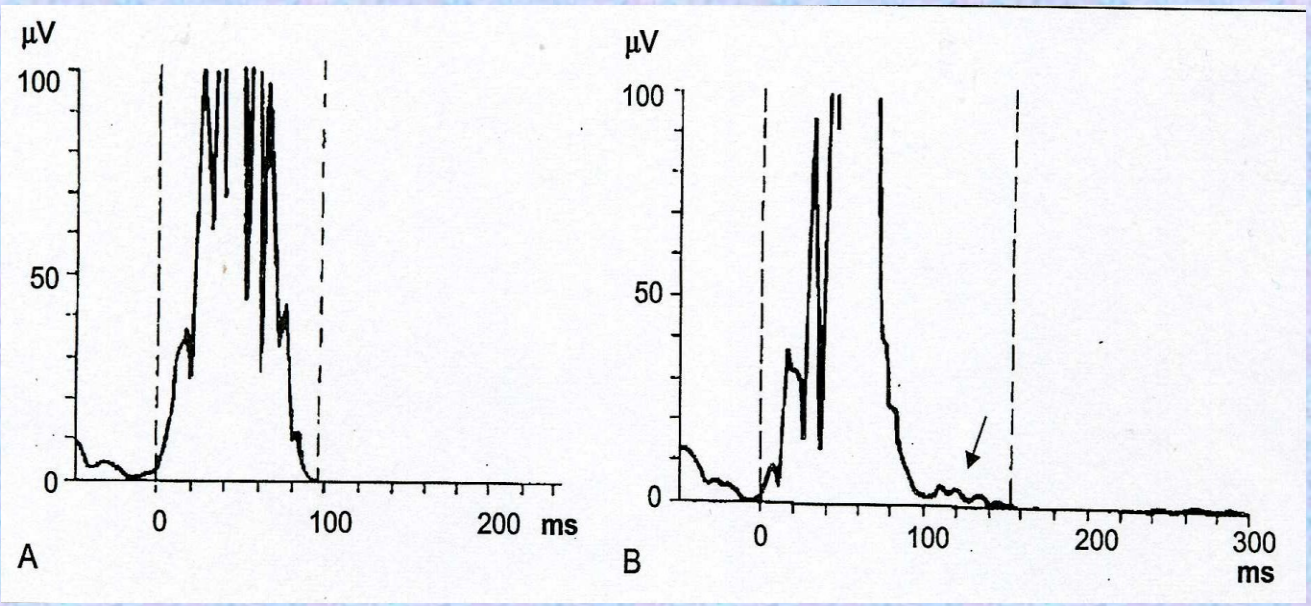
- time analysis
- spectral analysis



# ELECTROCARDIOGRAPY

- **HOLTER MONITORING**

✓ ***late potencials***



# Reveal - implantable recorder

**Patient Activator and Reveal® Plus ILR**


**Medtronic CareLink® Programmer**

- small device, without electrodes
- recorder of ECG during syncope
  - activation by patients
  - or autoactivation
- continuously monitoring 36 month, 42 min episodes at memory
- simple implantation, simple evaluation.

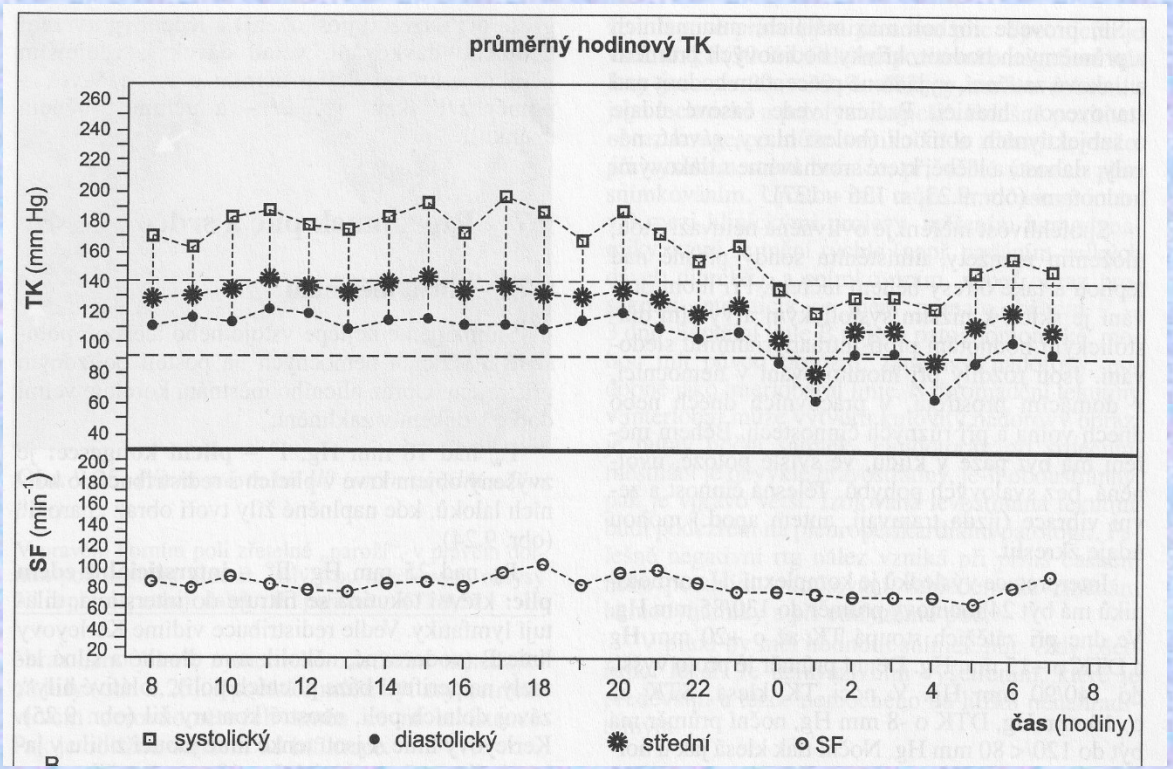
# BLOOD PRESSURE MEASUREMENT

AUSCULTATORY METHOD

OSCILOMETRIC METHOD

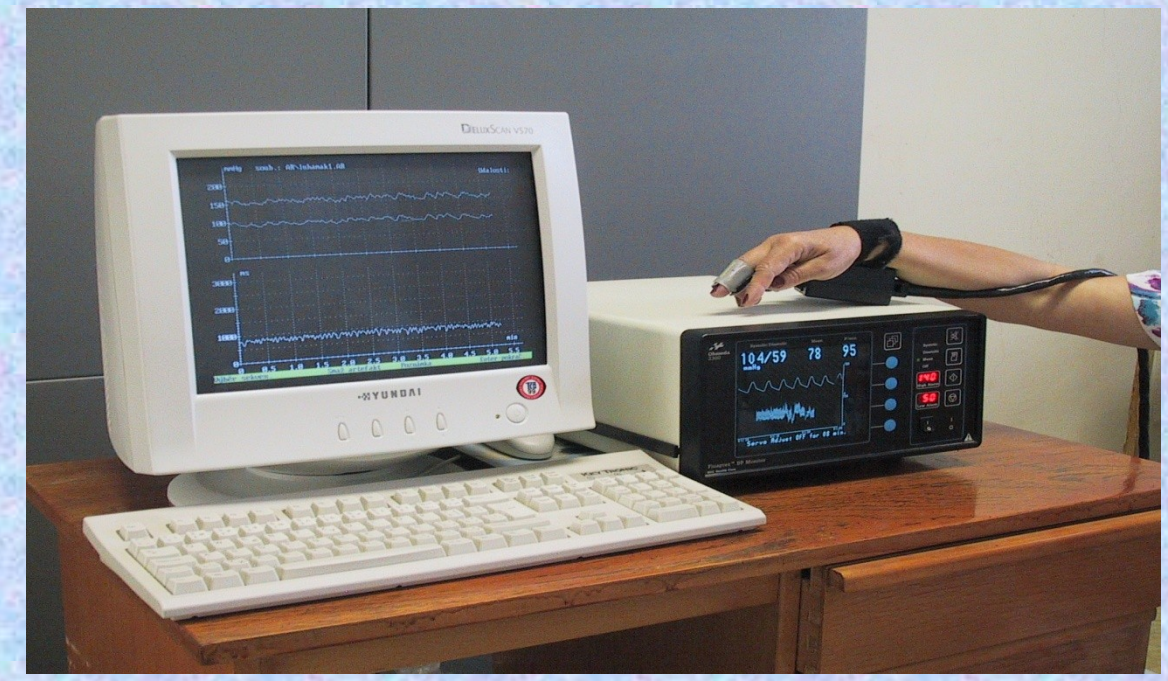
# BLOOD PRESSURE MEASUREMENT

- **AMBULATORY BLOOD PRESSURE MONITORING - ABPM**




# BLOOD PRESSURE MEASUREMENT

- continuously beat-to-beat measurement
- Peňáz principle - photopletysmography

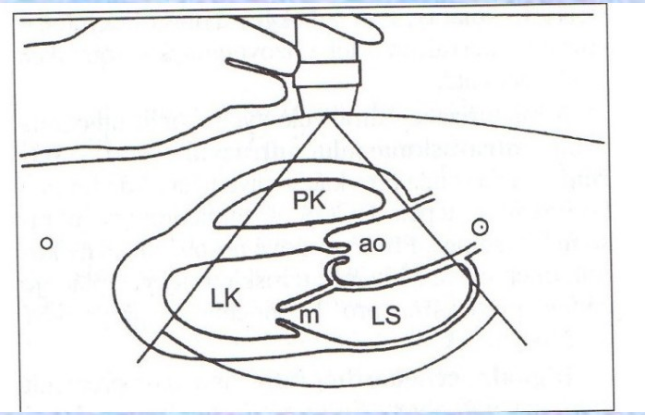


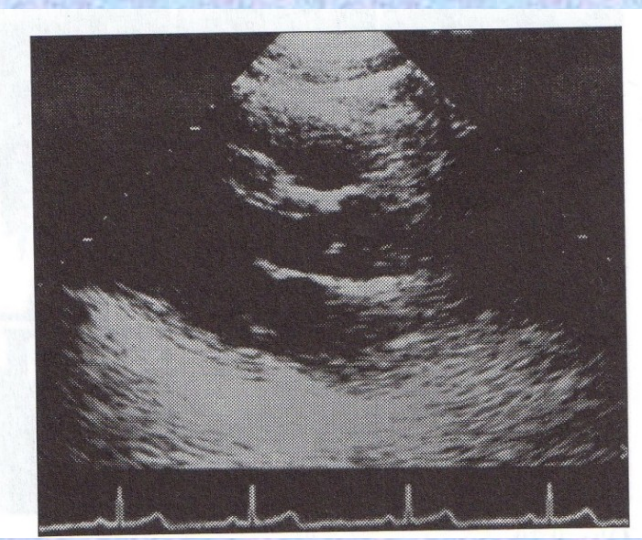
- We need than **pressure in the cuff corresponded to the pressure of the digital artery**
- **Method: photopletysmography**
- Recorded photoelectric plethysmogram
- The new term: **Transmural pressure** – Pt (the pressure across the wall of the artery)
- BP, Pc (pressure in cuff), Pt
- We estimated: **BP=Pc - - - Pt=0** - - - photoplethysmogram registered the highest amplitude of oscilation --- we measure the **MAP**
- Step by step increase of Pc, in the moment of the highest amplitude – **feed-back loop** started for obtained(keeping) the constant volume of the finger

# ECHOCARDIOGRAPHY

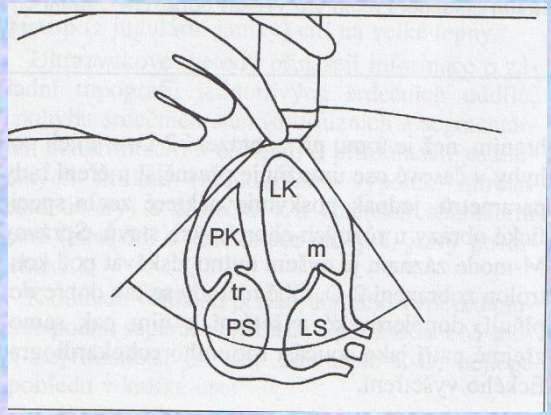
most widespread methods

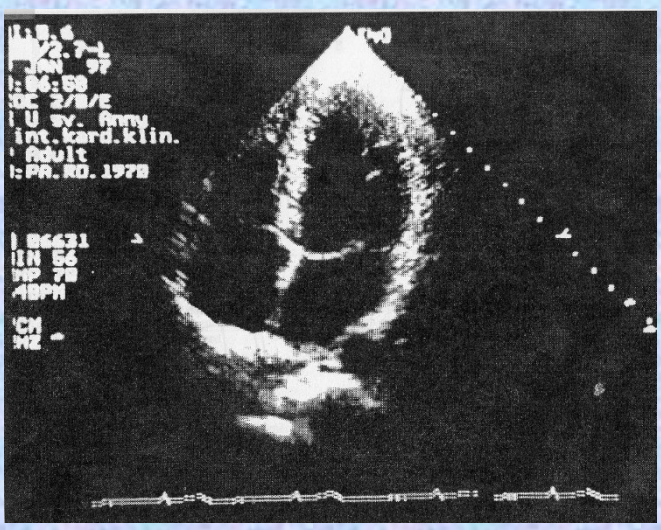
## PARASTERNAL LONG-AXIS VIEW



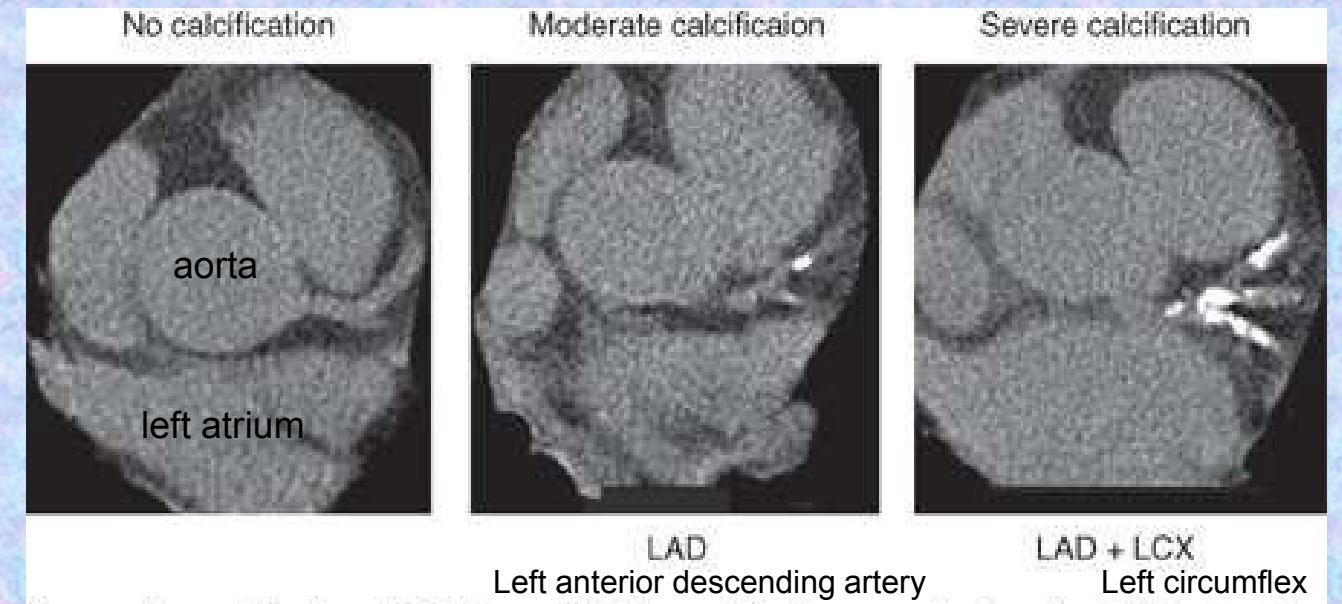
## APICAL VIEW



# COMPUTED TOMOGRAPHY

- CT is a fast, simple, noninvasive technique that provides images of the myocardium and great vessels;
- CT uses x-rays to create tomographic slices of objects-this is acomplished by rotating an x-ray bea around the object and measuring the trasmission of x-rays through the object at many angles,called projections

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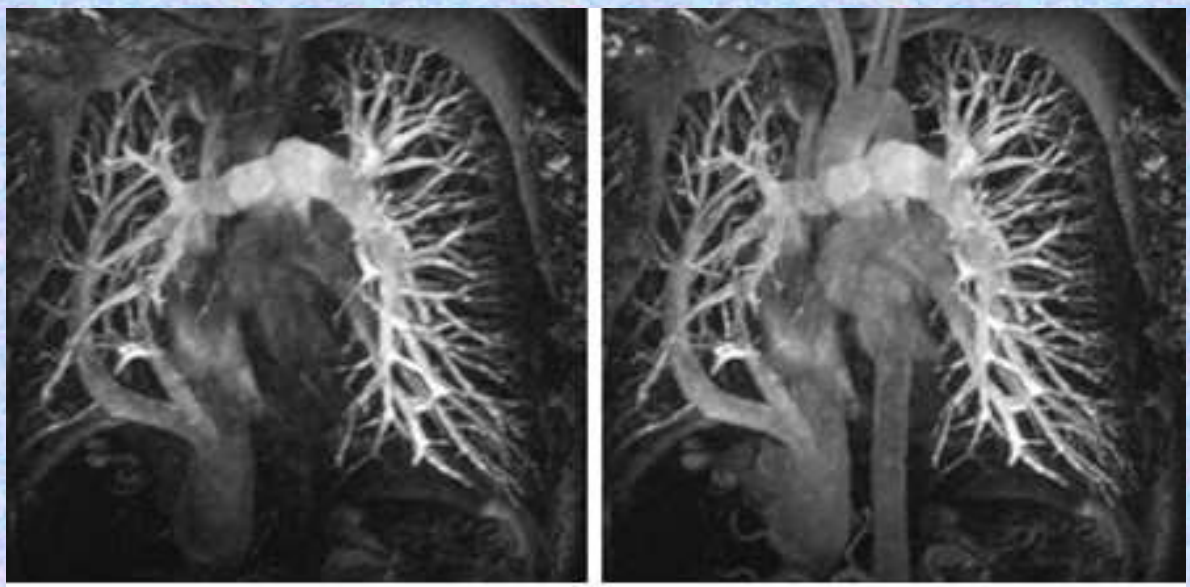
# MAGNETIC RESONANCE IMAGING

- Based on the magnetic properties of hydrogen nuclei
- Used to quantify accurately EF, ESV, EDV, cardiac mass
- Without the need for ionizing radiation



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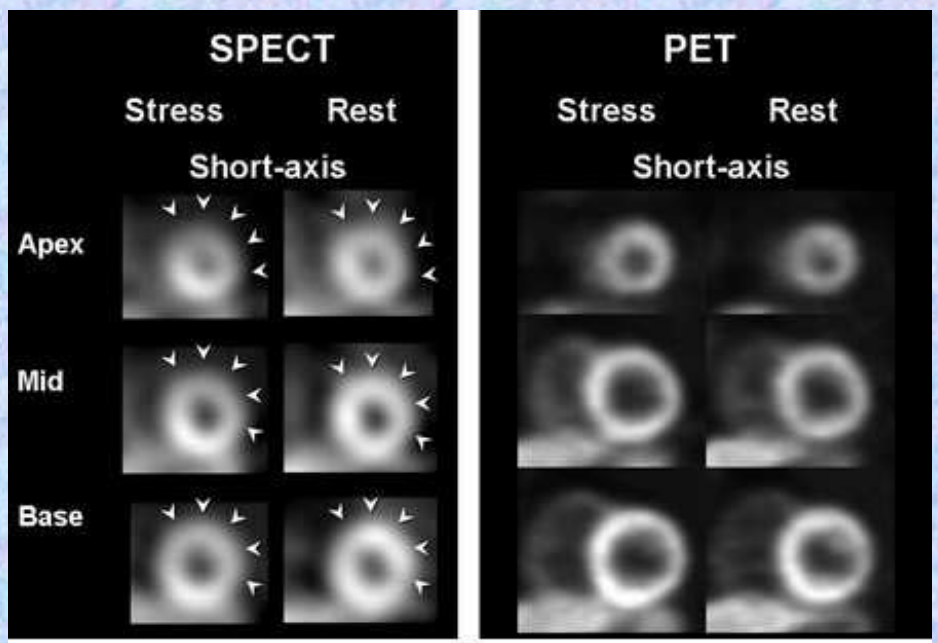
# NUCLEAR CARDIOLOGY

- Nuclear (or radionuclid) imaging requires intravenous administration of isotopes
- Single photon emission computed tomography SPECT and positron emission tomography PET

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# INVASIVE TECHNIQUES

- **CARDIAC CATHETERIZATION**
- ***Right heart catheterization*** – uses a balloon-tipped flotation catheter that is inserted into the femoral or jugular vein. Using fluoroscopic guidance, the catheter is advanced to the *right atrium* - *right ventricule* – *pulmonary artery* and pulmonary *wedge position* (as a surrogate for left atrial pressure = wedge pressure)

# INVASIVE TECHNIQUE

- **CARDIAC CATHETERIZATION**
- ***Left heart catheterization*** – with the aid of fluoroscopy, the catheter is guided to ascending *aorta* – across the aortic valve into *left ventricule* (inserted into a.femoralis,a.axillaris, a.brachialis)
- A needle-tipped catheter to puncture the atrial septum during right heart catheterization
- ***+ coronary angiography***

# INVASIVE TECHNIQUE

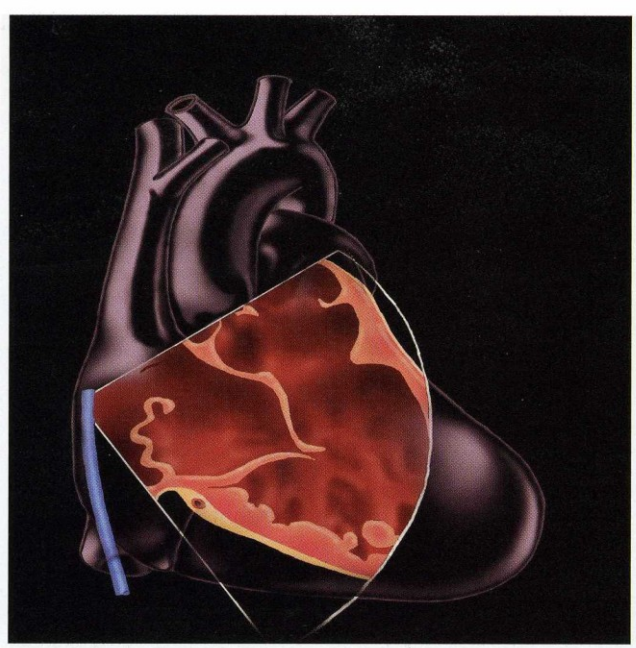
- How do we use cardiac catheterization?

✓ Pressure measurement
✓ Blood flow measurement
✓ Biopsy of tissue
✓ Blood samples for oxygen-saturation analysis to screen for intracardiac shunts
✓ Electric potentials measurement

# Intracardiac Echocardiography

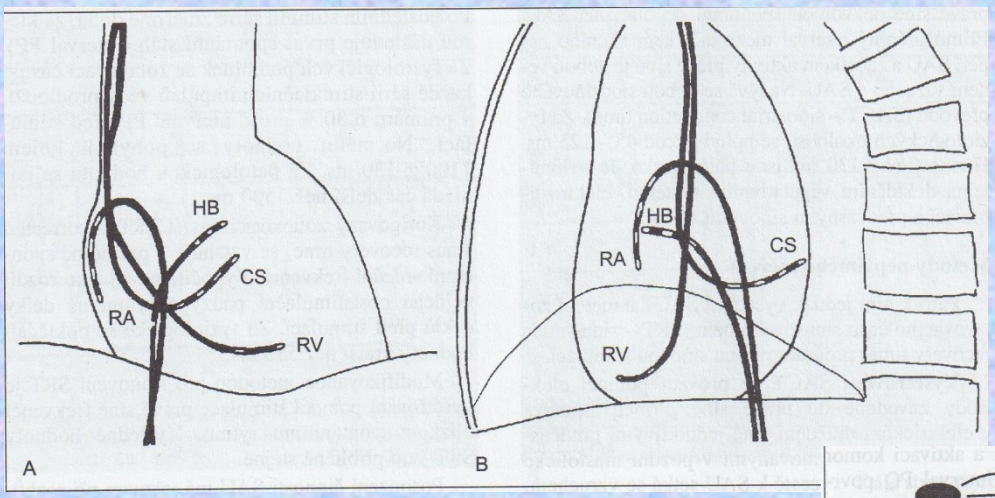
Is an intravascular ultrasound modality that provides diagnostic imaging of cardiac structures from within the heart.

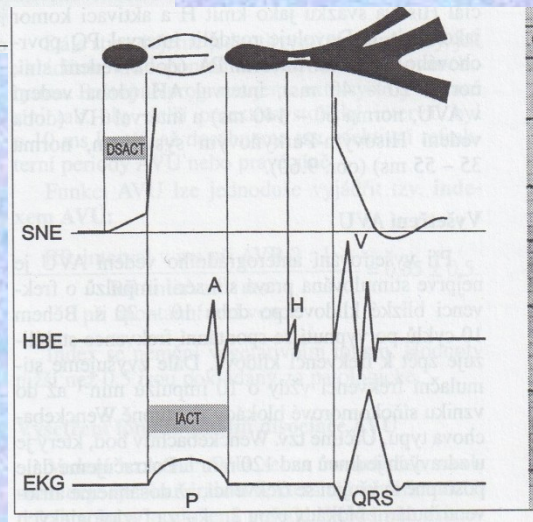
The first catheters used high frequency tranducers (20-40 MHz) containing a single ultrasound crystal that rapidly rotated at the end of catheter

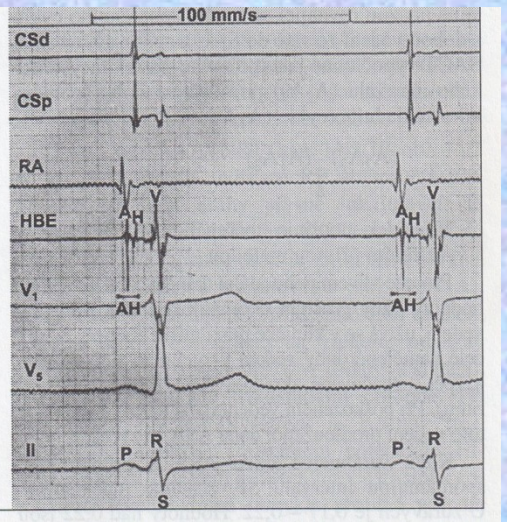


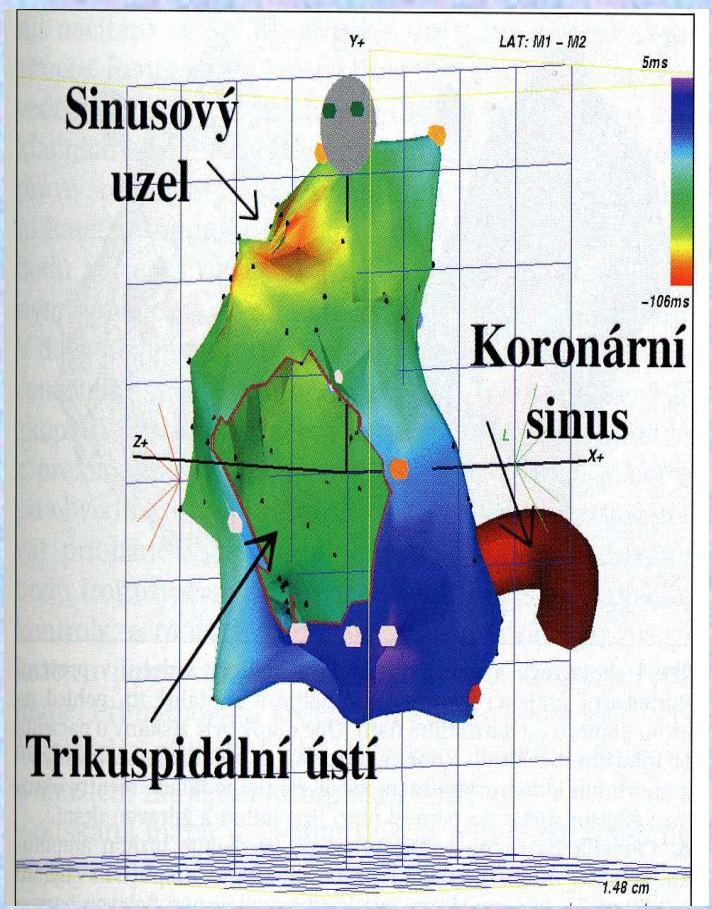
# INVASIVE TECHNIQUE

- **ELECTROPHYSIOLOGY EXAMINATION**

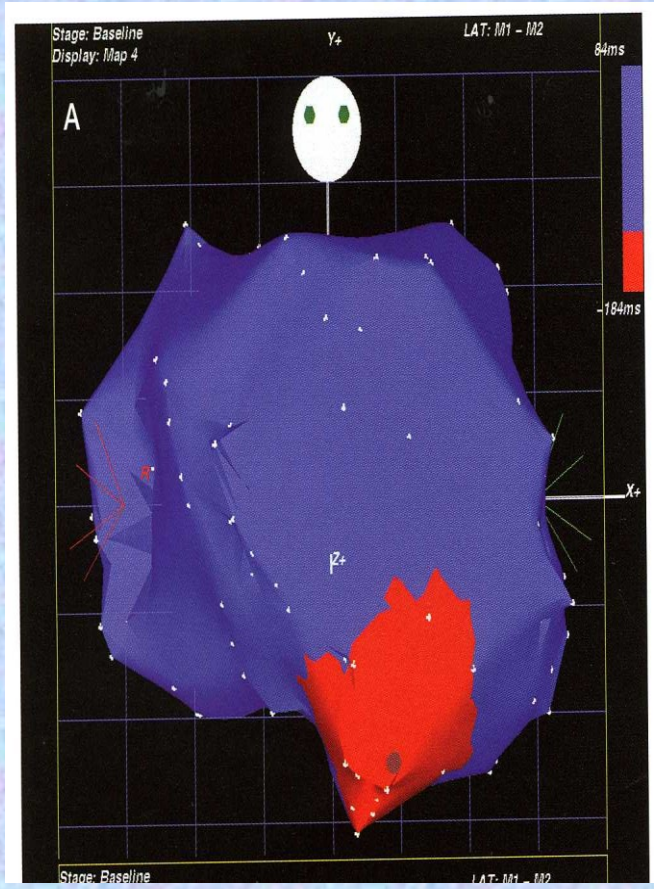


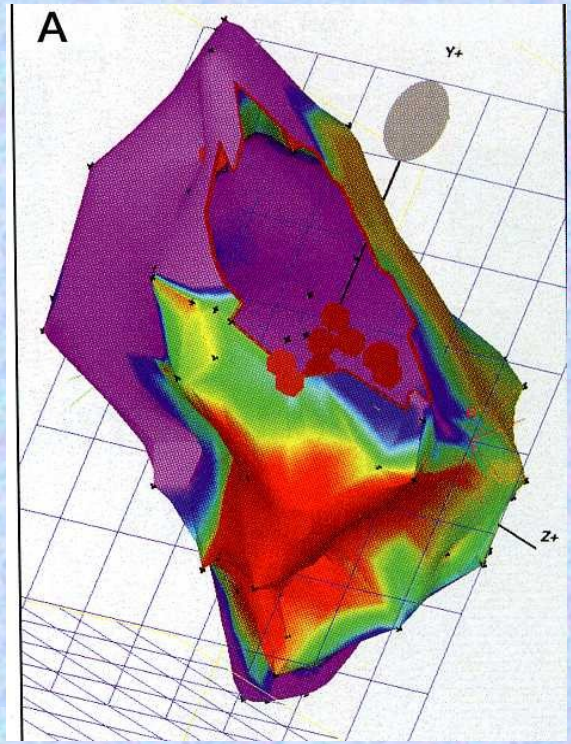





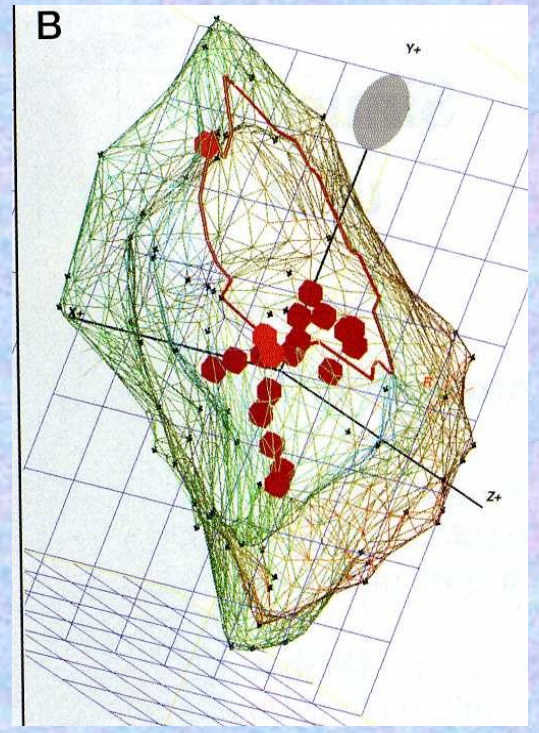

Activation map - Activation map of right atrium in left sloping projection - Sinus rhythm




Activation propagation map - propagation of left ventricular map




Voltage map – red color – places with a lower voltage, violet – healthy myocardium




Voltage map in network design – visibility of the catheter

- **THANK YOU FOR YOUR ATTENTION**