ECHOCARDIOGRAPHIC EXAMINATIONS II.

COMPLICATIONS OF MYOCARDIAL INFARCTION
STRESS ECHOCARDIOGRAPHY
TEE

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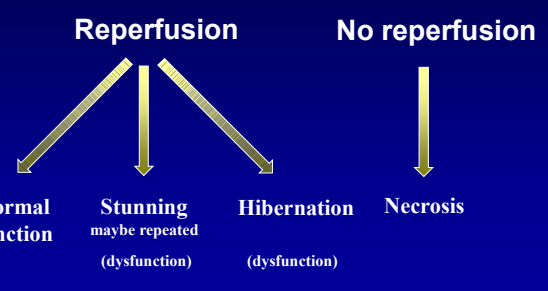
TÁMOP-4.1.1.C-13/1/KONV-2014-0001

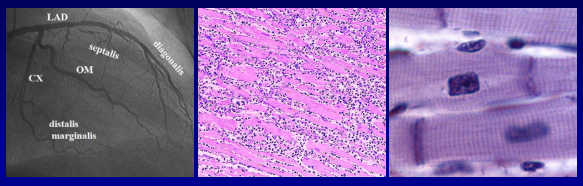
Sequence of events in myocardial ichaemia

1. Diastolic dysfunction
2. Systolic dysfunction:
   - wall motion abnormality
   - contractile dysfunction
   - impaired left ventricular function
3. ECG signs: ST depression, ST elevation
4. Chest pain

Possible outcomes in myocardial ischaemia



Methods for the characterization of myocardial circulation



Macrocirculation	Microcirculation	Membrane function
Coronarography	Contrast-echo	SPECT (Th, Tc)

http://en.wikipedia.org/wiki/Myocardial_infarction_diagnosis

Echocardiographic methods in the diagnosis of ischaemia

2D echo: myocardial infarction and its complications

Stress-echocardiography: provocation of wall motion abnormalities

Contrast-echo: better assessment of wall motion abnormalities and myocardial perfusion

Visualization of the coronary vessels: TEE, TTE (high frequency transducer)

Complications of myocardial infarction

Pericardial fluid
Aneurism - thrombus
Impaired left ventricular function
Chordal rupture (mitral valve)
Papillary muscle rupture
Postinfarct VSD
Mitral regurgitation
Ischaemic cardiomiopathy

Complications of myocardial infarction

Pericardial fluid

Stress-echocardiography

- **Stress test combined with ultrasound visualization**
- **Stress can be:** physical or pharmacological
- **Coronary artery disease causes wall motion abnormality**
- **Ischaemia can be provoked by:**
  vasodilators: adenosine, dipyridamole
  positive inotropic drugs: dobutamine
- **Wall motion score index (WMSI)**

Stress-echocardiography Main indications

- **Diagnose ischaemic heart disease (IHD)**
- **Estimate IHD prognosis**
- **Assess myocardial viability**
- **Assess preoperative risk**
- **Reveal underlying causes of dyspnoea of effort**
- **Localize ischaemic regions**
- **Diagnose diastolic heart failure**

Wall motion score (WMS)

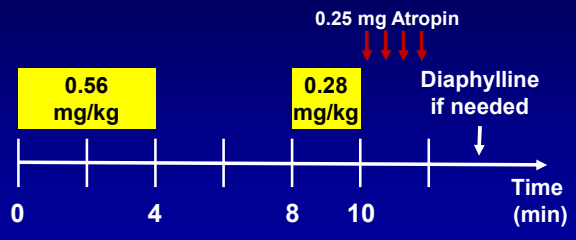
Hyperkinesis:	0
Normokinesis:	1
Hypokinesis:	2
Akinesis:	3
Dyskinesis:	4
Aneurysmatic wall motion:	5

Wall motion score index (WMSI)

$$\text{WMSI} = \frac{\text{WMS}}{\text{number of segments}}$$

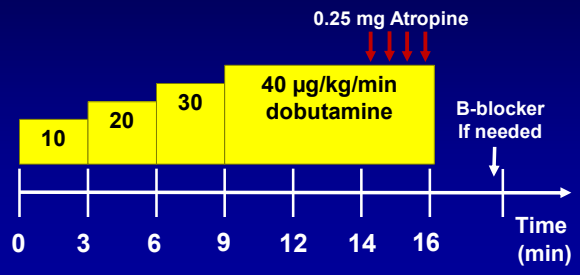
Diagnostic protocol - Dipyridamole

For the detection of ischaemia



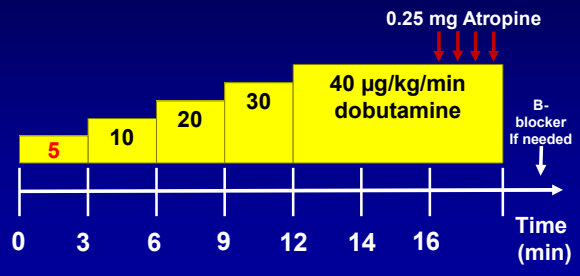
Diagnostic protocol - Dobutamine

For the detection of ischaemia



Diagnostic protocol - Dobutamine

For the detection of myocardial viability



Doppler myocardial imaging (DMI)

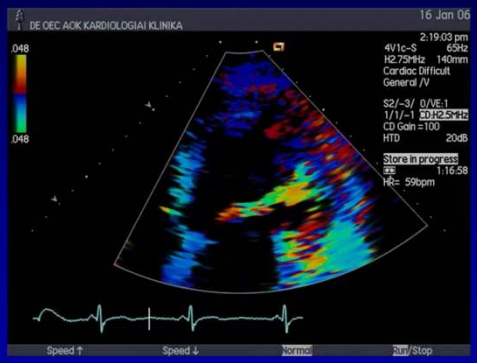
Detection of myocardial wall movements, it is suitable for the measurement of myocardial contraction and relaxation

Visualization of slow but high energy movements

Goal: analysis of local and global systolic and diastolic myocardial function

Doppler myocardial imaging (DMI) Main indications

- Assessment of global myocardial systolic and diastolic function in rest
- Estimation of increased left ventricular preload (mitral E / annular Ea ratio increased)
- Assessment of local ischeamia and viability (combined with dobutamine stress-echo)
- Optimization and follow-up of resynchronization therapy



Tissue Doppler Imaging

Pulsatile Doppler method

Contrast-echocardiography

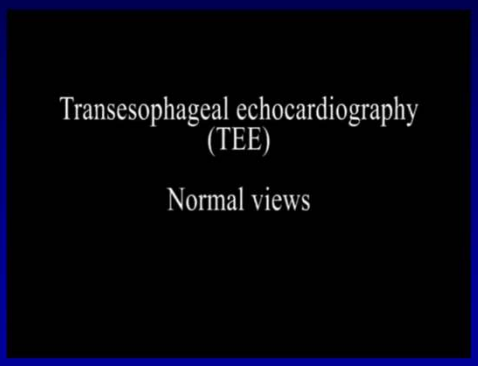
Left ventricular contrast-echo: more accurate measurement of left ventricular volumes and function due to better visualization of the endocardium

Myocardial contrast-echo: estimation of microvascular integrity (analysis of myocardial perfusion)

Important indications: visualization of shunts and wall motion disturbances, examination of no-reflow after thrombolysis, visualization of hibernated myocardium

Transoesophageal echocardiography

Semi-invasive method
Transducer is inserted in the oesophagus
Very good resolution, smaller penetration depth
Important indications:
- **Native/prosthetic valve/pacemaker endocarditis**
- **Cardioembolic diseases, thrombus**
- **Congenital vitium**
- **Aortic diseases (dissection, aneurysm)**
- **Arrhythmia, cardiac tumor**



Case presentation 1 - Atrial septal defect

Patient: 44-year-old woman

Family history: mother - AMI
father - hypertension

No complaints, atrial septal defect may be identified on routine TTE

Premedications: topical lidocaine spray
2.5mg dormicum i.v.

Case presentation 2 - Prosthetic valve endocarditis

Patient: 79-year-old man

History: hypertension, COPD
prosthetic aortic valve implantation in 2002

Complaints: fever (39-40°C), symptoms of bronchitis
increased CRP, PCT
positive hemoculture (achromobacter xylosoxidans, Gram-negative, aerob)

Premedications: topical lidocaine spray, 2.5mg dormicum i.v.

Case presentation 3 - Cardiac metastasis

Patient: 53-year-old woman

History: Hypertension
Surgical resection of malignant melanoma in 2009
Focal opacities on chest X-ray at the beginning of 2014
Brain metastatis on CT at the end of 2014

Complaints: weakness, dispnoe
TTE: left ventricle neoplasm?
TEE: visualisation of the tumor

Premedications: topical lidocaine spray, 2.5mg dormicum i.v.

Case presentation 4 - Left auricular thrombus

Patient: 56-year-old woman

History: hypertension, appendectomy, cholecystectomy

Complaints: irregular heartbeat (for 1 week)
atrial fibrillation on ECG

TEE to screen the left atrium for thrombi before cardioversion

Premedications: topical lidocaine spray, 2.5mg dormicum i.v.

Case presentation 5 - Aortic thrombus

Patient: 68-year-old woman

History: hypertension, renal artery stenosis (30-55%)
significant carotid stenosis on ultrasound

Preoperative assessment before carotid endarterectomy:
aortic arch/descending aorta mural thrombus?

Premedication: topical lidocaine spray, 2.5mg dormicum i.v.

Final exam test bank – Int-1.46

Early and late complications of acute myocardial infarction:

1) ventricular fibrillation

2) left ventricular aneurysm formation

3) cardiogenic shock

4) pericardial effusion

A) Answers 1, 2 and 3 are correct
B) Answers 1 and 3 are correct
C) Answers 2 and 4 are correct
D) Only answer 4 is correct
E) All of the answers are correct

Final exam test bank – Int-1.45

Diagnostic tests with the ability to detect asymptomatic angina pectoris (silent ischemia):

1) dobutamine stress echocardiogram

2) Holter ECG monitoring

3) exercise test

4) ABPM

A) Answers 1, 2 and 3 are correct

B) Answers 1 and 3 are correct

C) Answers 2 and 4 are correct

D) Only answer 4 is correct

E) All of the answers are correct

Final exam test bank – Int-1.114

Transesophageal echocardiography could be required before the cardioversion of atrial fibrillation because diagnosing left atrial thrombus with transesophageal echocardiography could make the cardioversion necessary to be postponed.

A) Both of them are correct, there is causal relationship between them

B) Both of them are correct, but there is no causal relationship between them

C) The first part is correct, the second one is wrong

D) The first part is wrong, the second one is correct

E) Both of them are incorrect

Final exam test bank – Int-1.168

The mechanical complication of myocardial infarct, except:

A) papillary muscle rupture

B) rupture of a free ventricular wall

C) ventricular tachycardia

D) rupture of the interventricular septum