

Pulmonary embolism

!! The 3rd most common cardiovascular disease !!

According to autopsy only 30% correctly recognized
while

Mortality of recognized and treated PE is 8%
non-recognized and not treated 30%

40-50% patients with DVT have asymptomatic PE

!! Always consider possibility of



Definition

Obstruction of part of pulmonary arterial system by

- trombus
- fat
- air
- amniotic fluid



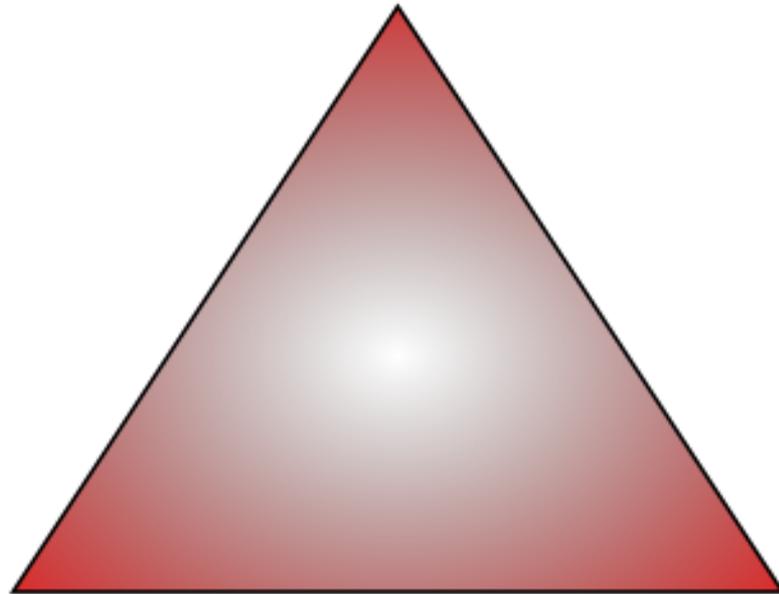
Source

- leg deep vein thrombosis (85%)
- pelvic vein
- renal vein
- vena cava inferior
- right heart
- importance of vena cava sup. is increasing
(central vein catheter, ICD, PM,....)



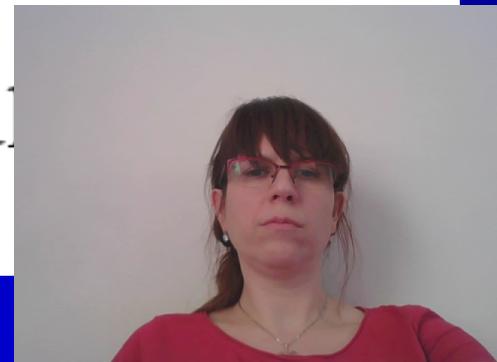
Risk factors - Virchow trias

Stasis of
blood flow



Endothelial
injury

Hypercoagulability



Risk factors

- **Congenital**
- **Acquired**
- **Predisposing**
- **Triggers**



Congenital thrombophile RF

- APC resistance - FV Leiden (homozyg.)
- def. AT III, prot. C, prot. S, Fbg.
- Von Willebrand (def. f VIII)
- MTHFR
- PT20210a
- fibrinolysis disorders



Acquired thrombophile RF

- immobilisation
- surgery
- Malignancy
- myeloproliferation
- hormone th., drugs (tamoxifen, leflunomid..)
- chronic heart failure, lung disease
- autoimmune dis.
- infections



Predisposing RF

- age
- obesity
- varices
- history of thrombosis/VTE
- anatomic abnormalities (May-Thurner, Paget-Schroetter)



Triggers

- travelling
- trauma
- venous catheters
- pregnancy
- e-thrombosis...



Pathophysiologic consequences

Extent

localization

status of cardiopulmonary system

Hemodynamically significant PE causes acute pulmonary hypertension → pressure elevation in right sided heart compartments → dilatation, acute Tri insuf → acute right heart failure, in case of massive PE also decrease of minute volume → systemic hypotension.

Irritation of „stretch“ receptors → hyperventilation
hypoxemia a hypocapnia



Symptomes of PE

acute X subacute (successive)

high-risk (shock, ↓TK) vs. not high-risk

Sudden death - cca 10%

Dyspnea at rest - almost in 95 % - abrupt onset, abruptly worsened

Chest pain - cca 50%, of any type

Hemoptysis - only in case of pulmonary infarction - cca 15%

Cough, syncope

Clinical - tachypnea and tachycardia
acute right heart failure
hypotension
cardiogenic shock



Investigations

- ECG
- X-ray (not specific)
- ECHO
- pulmonary arteriography
- spiral CT angiography
- pulmonary scintigraphy
- blood sample
- duplex sono of leg veins – exclusion of th



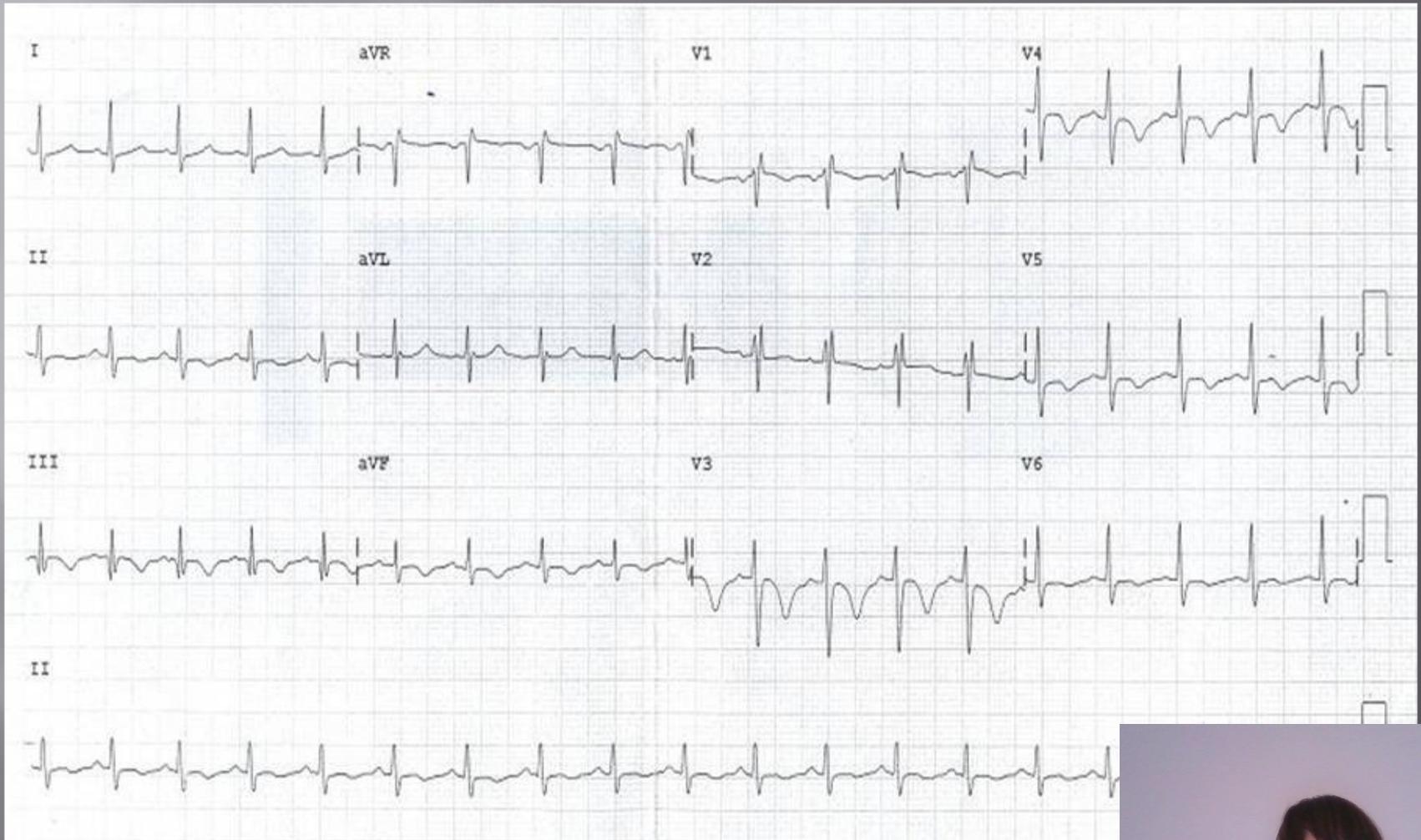
ECG

- S I
- Q III
- Neg.T v III, V1 – V4
- Tachycardia
- RBBB
- Right axis deviation
- P pulmonale in II, III

RV hypertrophy is not typical for



ECG



Pulmonary embolism

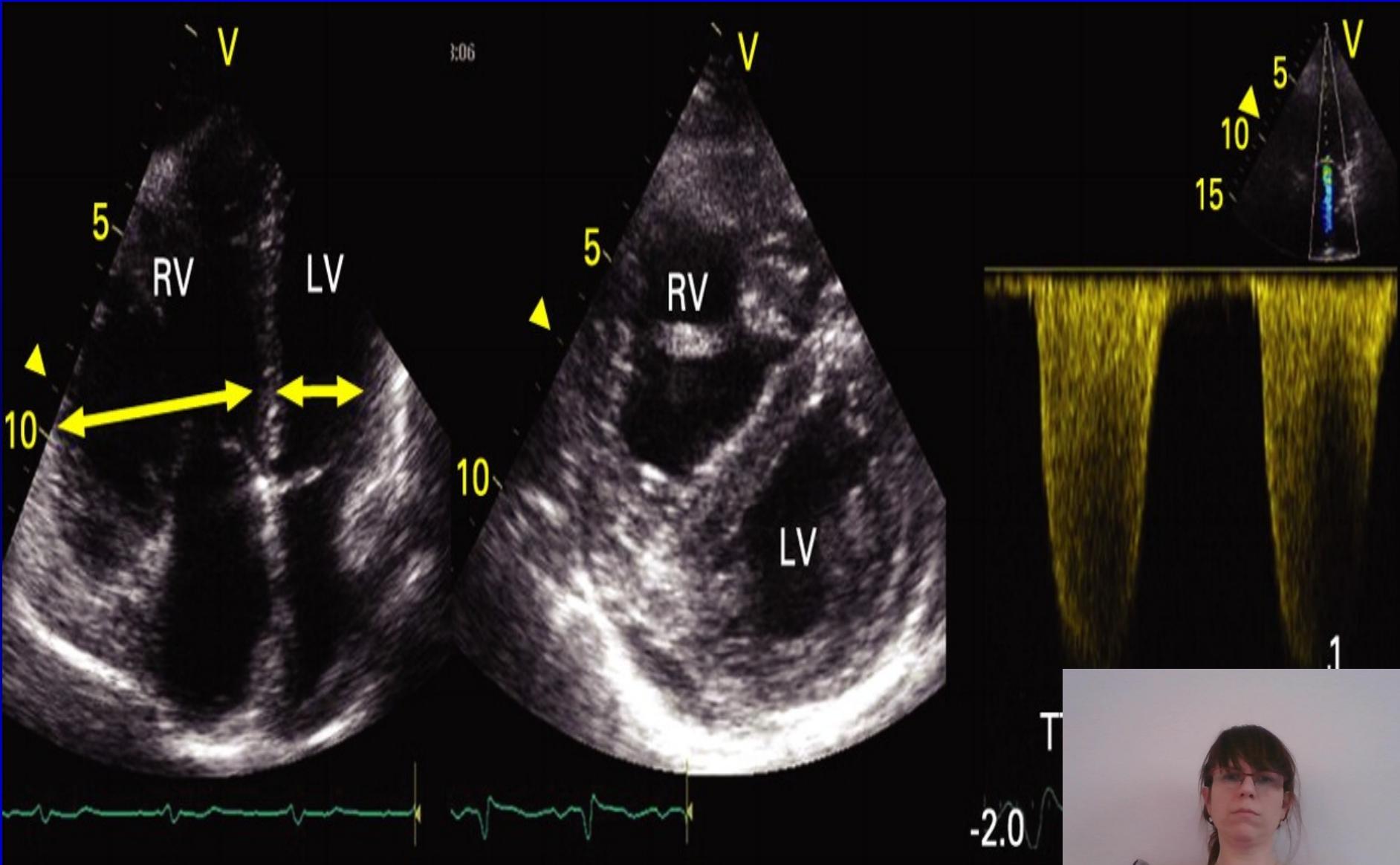


ECHO

- akinesia of the mid-free wall but normal motion of the apex
- RV dilatation
- D shape of left ventricular cavity during contraction
- doppler measurement of pulmonary flow
- tricuspidal regurgitation



ECHO



Laboratory

- DDimers
 - breakdown products of a blood clot
 - negative ELISA test excludes TE process
 - falsely positiv – infection, pregnancy, injury, recent surgery
- BNP
- TropT
- Astrup – hypoxemia, hypocapnia



CT AG

- CT pulmonary angiography
- high sensitivity and specificity
- limitations: allergy

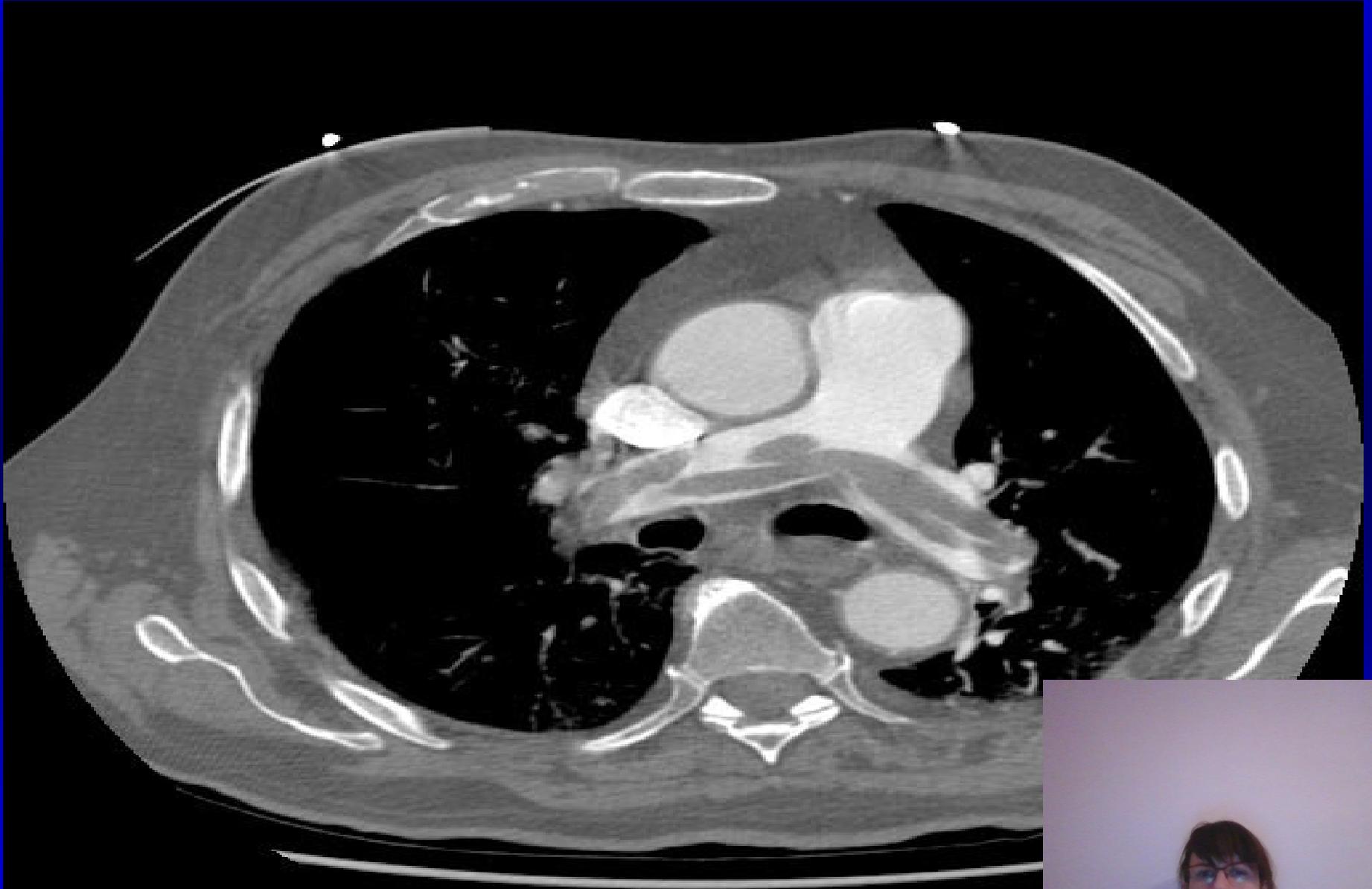
induced postcontrast nephropathy

small peripheral arteries

pregnant patients (better than S



CT AG



SPECT

- high sensitivity, low specificity ■ negative scan excludes PE
- combined ventilation-perfusion scan, in comparison with chest X-ray, integration with orientation CT

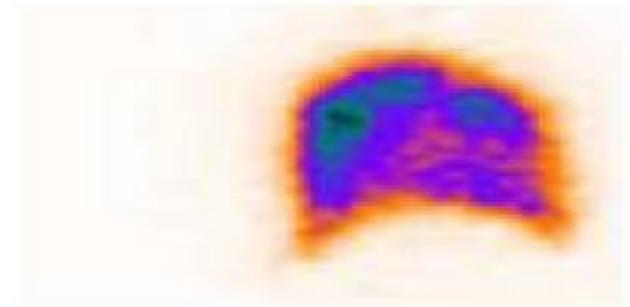
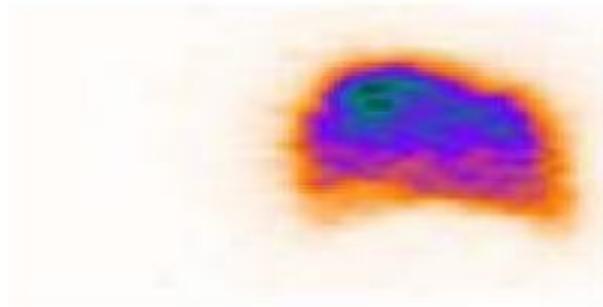


SPECT

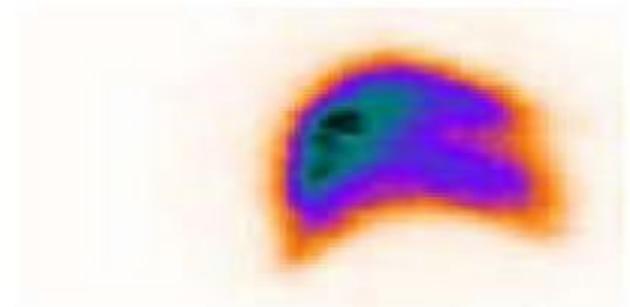
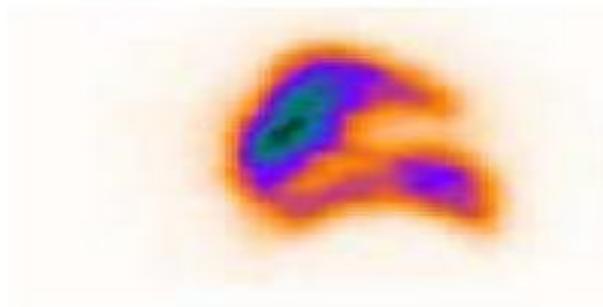
Initially

3 days later

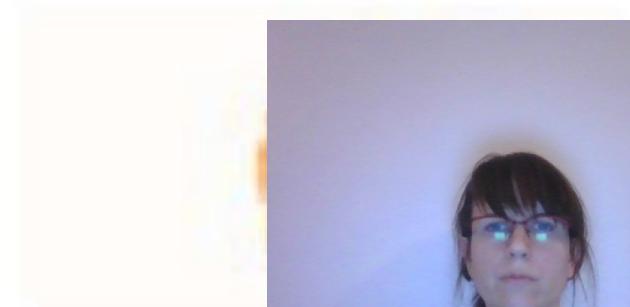
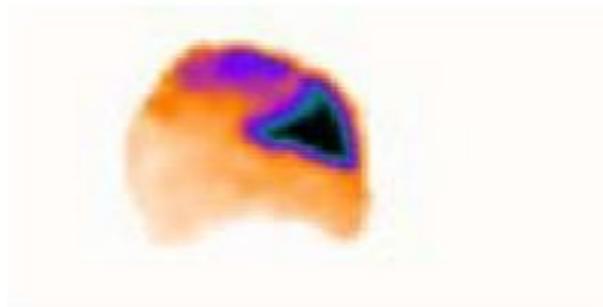
Ventilation



Perfusion



V/P_{quotient}



Therapy of PE

Opening of occluded pulmonary arteries

- **Thrombolysis** can be started up to 14 days since PE
 - **indication criteria: hypotension, cardiog. shock**
 - **symptoms of right heart failure**
 - **unsuccessful heparin therapy, increasing or recidivous**
KI – high risk of fatal bleeding
- **Anticoagulation** - full anticoag. dose
 - **UFH or LMWH**
 - **fondaparinux**
 - **warfarin**
 - **NOAC (dabigatran, rivaroxaban, apixab)**
- **Embolectomy** – only several dept. all over the world
- **Catheter therapy**



Prevention of TED (TEN)

Risk stratification before surgery

Physical prevention - early mobilization, venous gymnastic (dorsal and plantar ankle flexion), elastic stockings, bandages

Pharmacologic prevention - LMWH, fondaparinux

Caval filter

Email: Andrsova.Irena@fnbrno.cz

