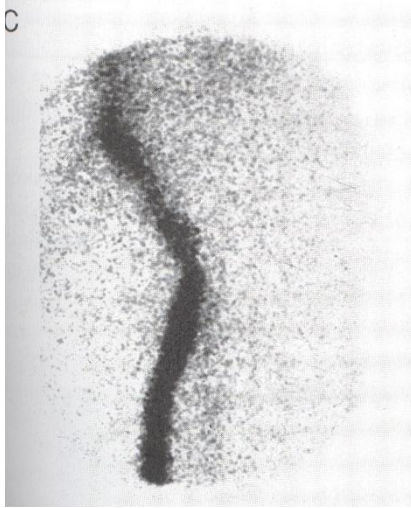
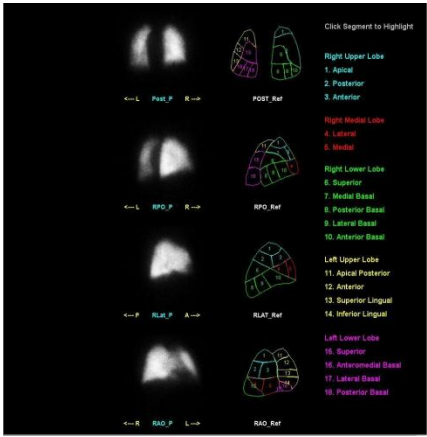
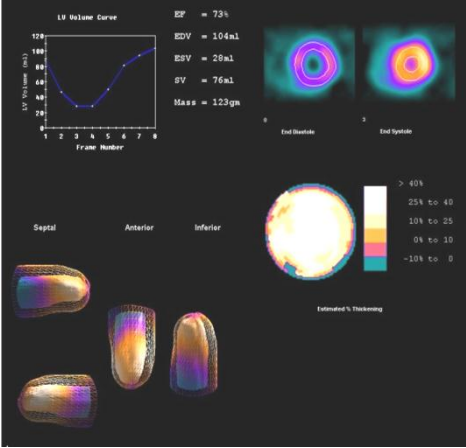


IMAGING OF HEART, LUNGS AND VESSELS



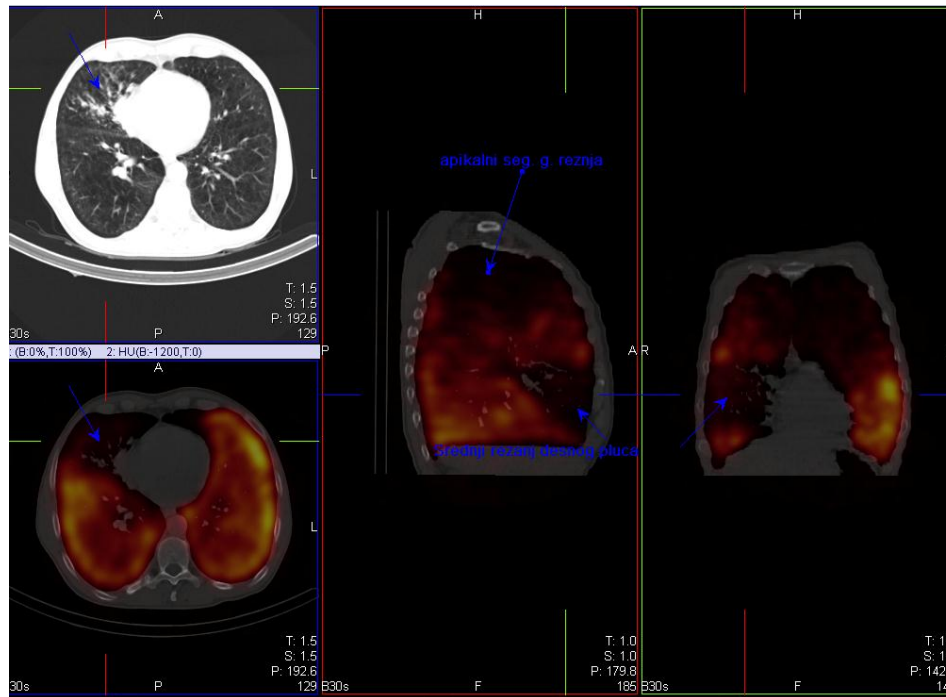
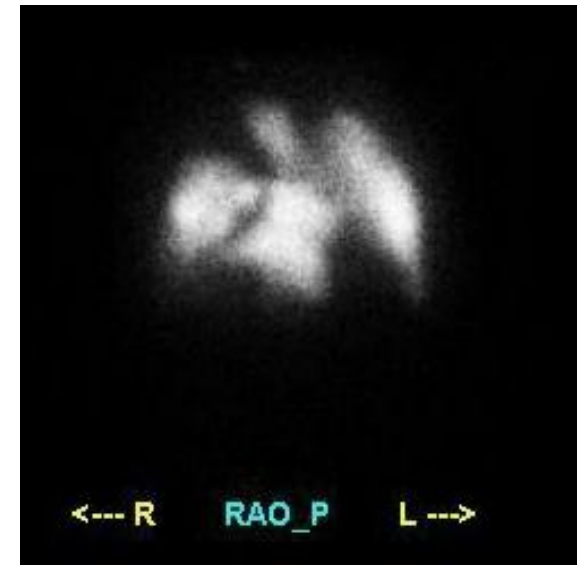
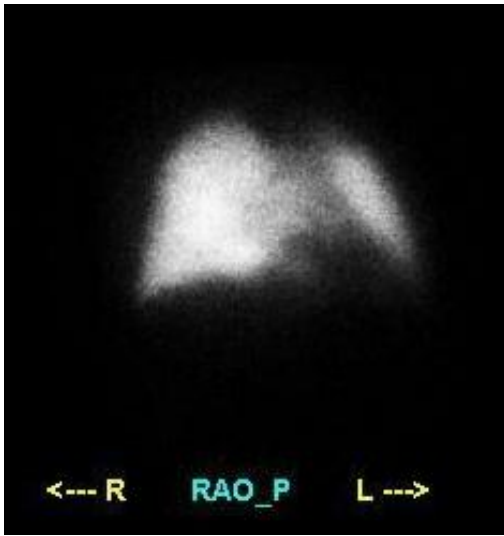
My Shunt Composite Image

Assoc. prof. A. Punda, MD., PhD.

Assoc. prof. V. Marković, MD., PhD.

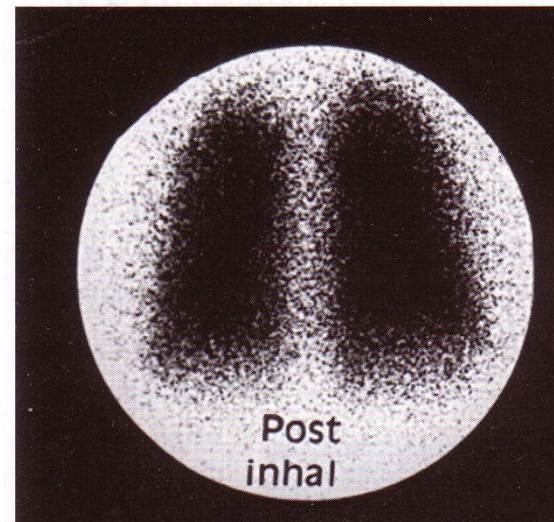
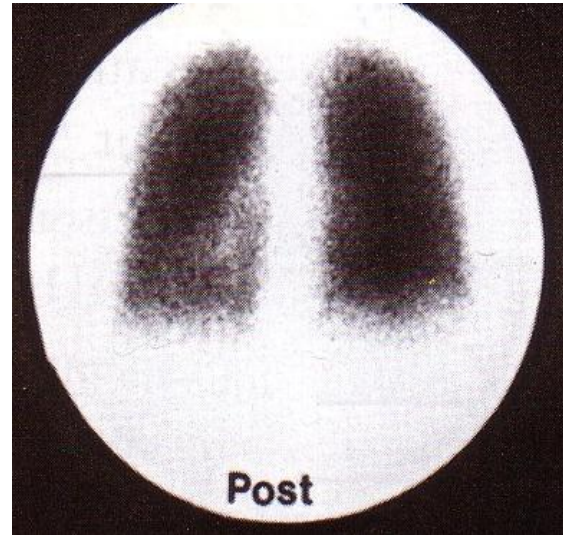
S. Gračan, MD., nucl. med. spec.

Pulmology



Lung scintigraphy

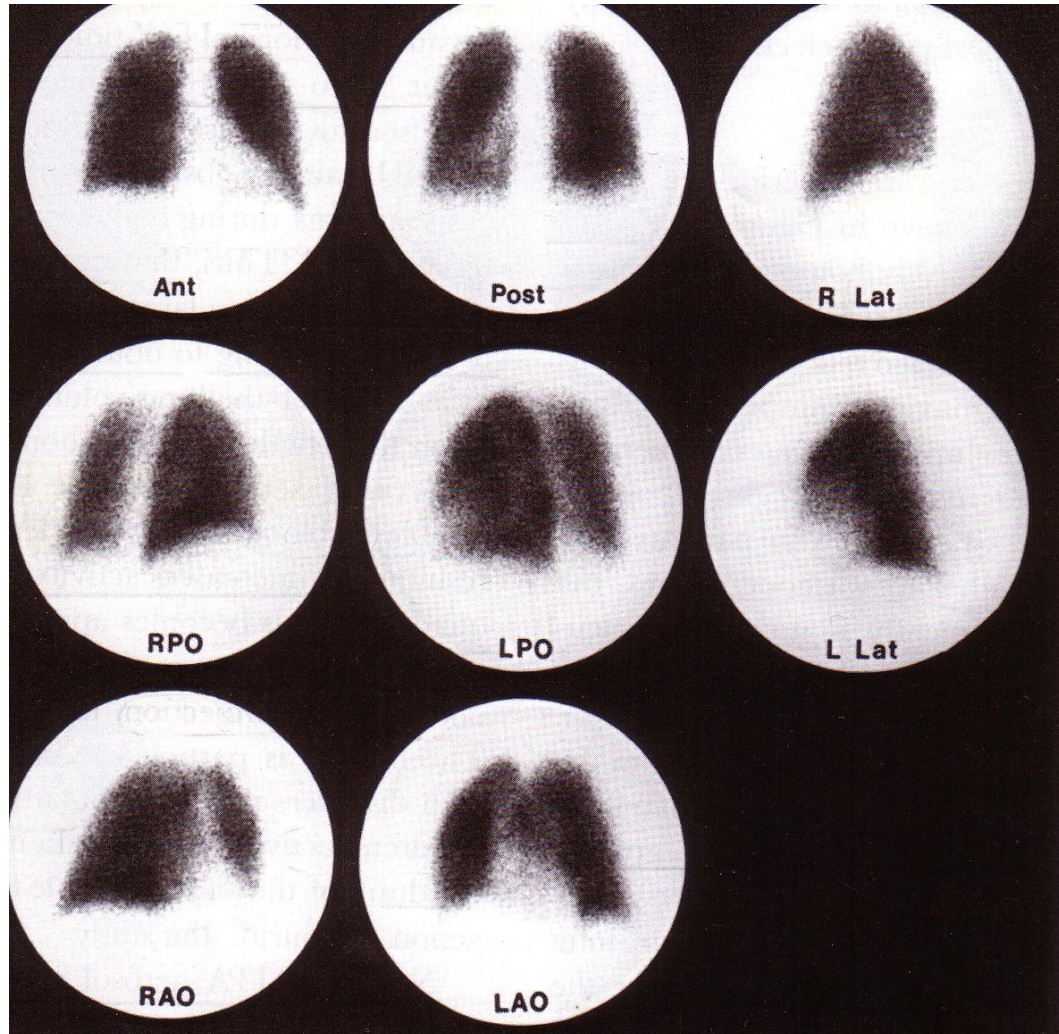
- Perfusion scintigraphy: labeled particles embedded in the capillary net
- Ventilation scintigraphy: inhalation of the radioactive gasses and aerosoles



Perfusion lung scintigraphy

- Tc-99m – labeled albumin macroaggregates (MAA)
- Tc-99m – labeled human albumin microspheres (HAM)
- Particle size 20-40 μm , usual dosage is consisted from 200 000 to 700 000 particals
- Dosage: 111-185 MBq (3-5 mCi)

NORMAL PERFUSION SCINITIGRAMS



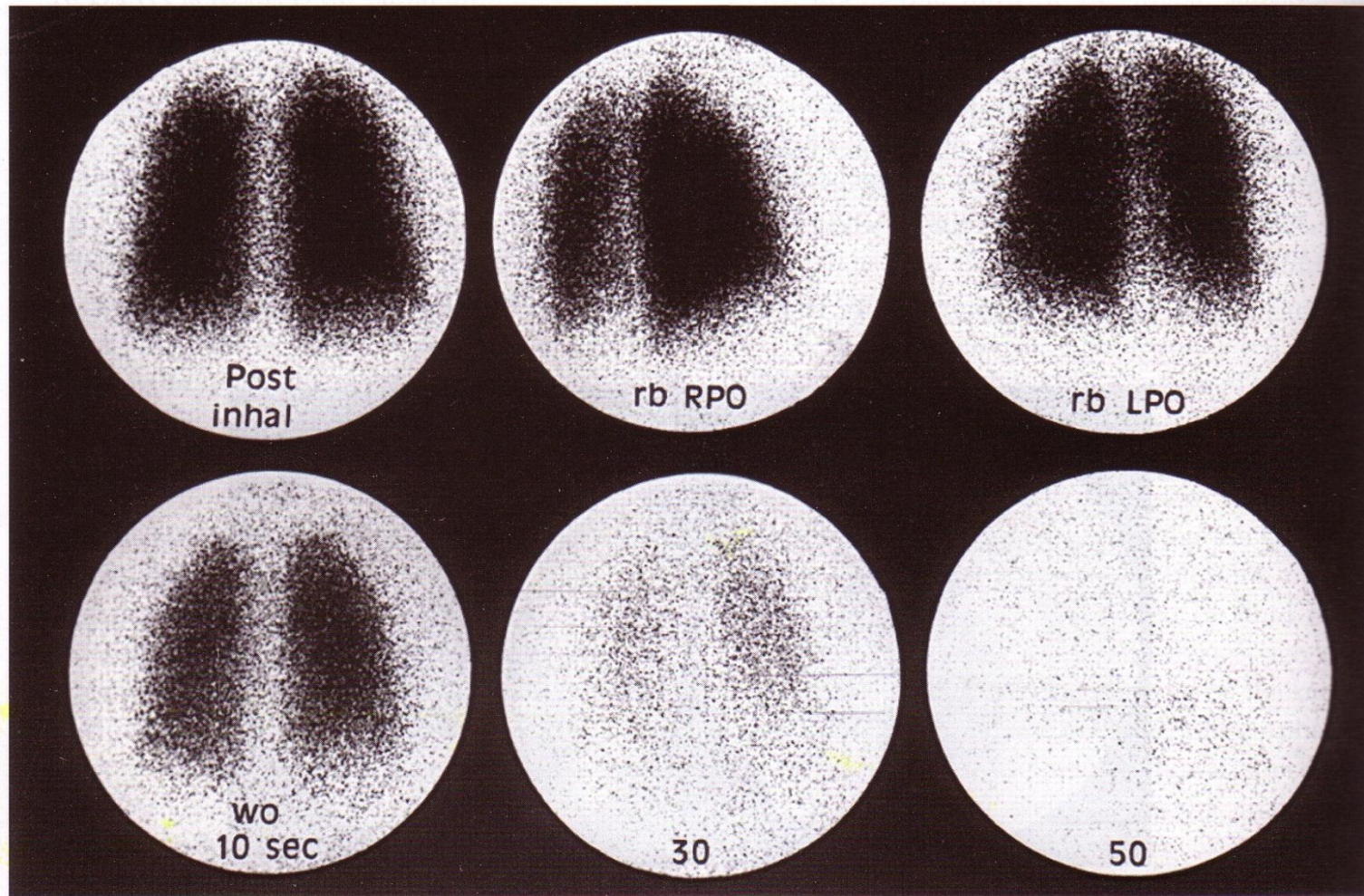
Ventilation lung scintigraphy

- **Xe-133:** $E_{\gamma} = 81$ keV-a, $T_{1/2f} = 5,2$ days, $T_{1/2b} = 30$ sec., activity (dosage) = 10-20 mCi
- **Cr-81m:** $E_{\gamma} = 190$ keV-a, $T_{1/2f} = 13$ sec., $T_{1/2b} = 30$ sec, from rubidium 81/krypton-81m generator ($T_{1/2} = 4,6$ hours); activity (dosage) = 10 mCi
- **Xe-127:** $E_{\gamma} = 172, 203$ and 375 keV-a, $T_{1/2f} = 36$ days, $T_{1/2b} = 30$ sec., activity (dosage) = 10 mCi

Methods for the ventilation lung scintigraphy

- **Xe-133** – inhalation of 370-740 MBq (10-20 mCi)
- Posterior projection – three phases:
 - first phase (first-breath or wash-in)
 - equilibrium phase – two images of 90 sec (breathing the mixture of air and Xe-133)
 - third phase (wash – out) – breathing just air; few images of 45 seconds

NORMAL VENTILATION LUNG SCAN WITH Xe-133



Aerosols – inhalation scintigraphy

- Tc-99m – DTPA
- Tc-99m – carbon particles – “TEHNEGASON”
- Imaging of ventilation distribution during inhalation phase (inhalation scintigraphy). Particals are captured in the bronchoalveolar mucose long enough ($T_{1/2} > 60$ min.) for multiple projection imaging before diffusing through the pulmonary epithelium to the pulmonary capillaries

Aerosole studies

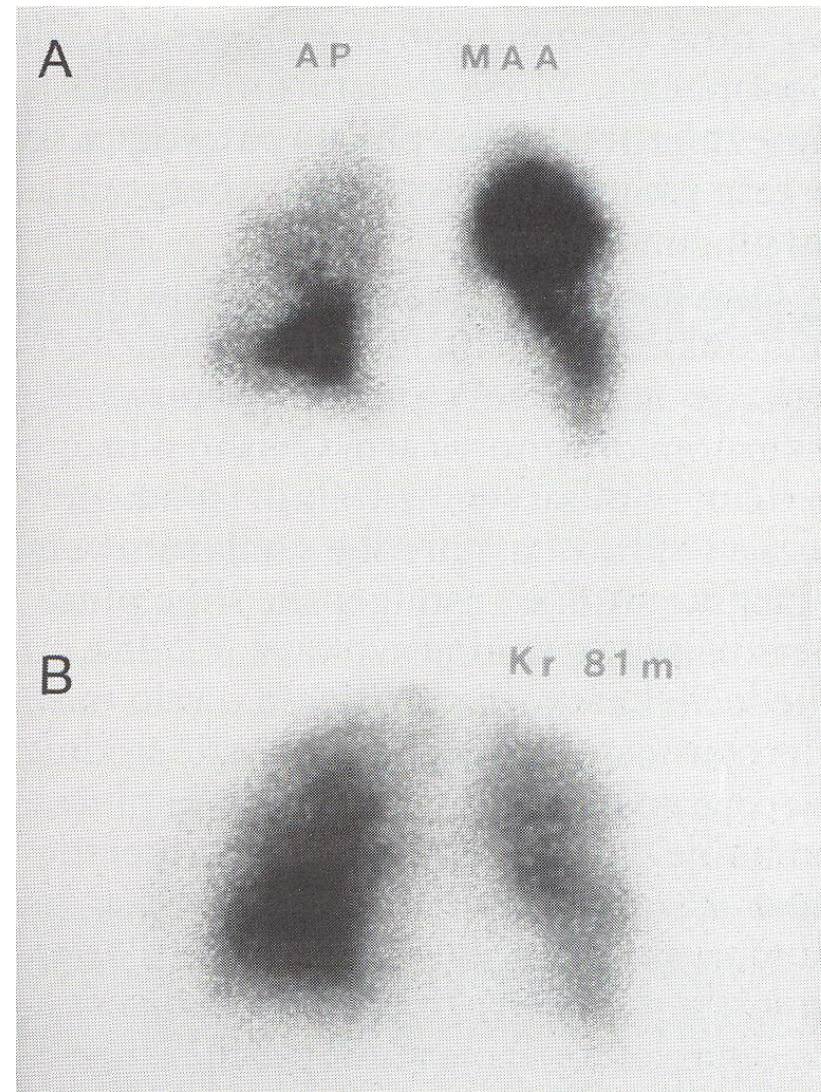
- Breath in for several minutes thorough the mask conected to the nebulizer
- Nebulizer 1480-1850 MBq (40-50 mCi)
- Tc-99m – DTPA, 5-10 % radioactivity reaches the lung
- Imaging: 6 projections, same as lung for perfusion scintigraphy

Lung perfusion scintigraphy

- Tc-99m – MAA
- six projections

Finding interpretation

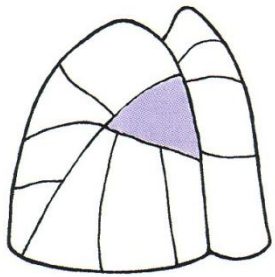
1. perfusion/ventilation scintigraphy mismatch (V/Q-MISMATCH)
2. Perfusion defect – insignificant ventilation defect
3. perfusion/ventilation match (V/Q-MATCH) non-embolic lung diseases



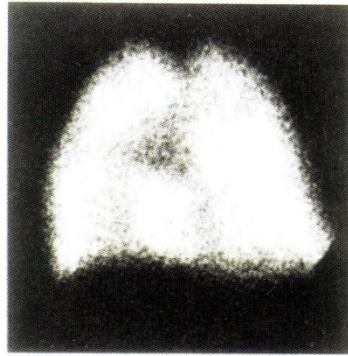
Pulmonary emboly. A. Perfusion scintigram, anterior image, showing perfusion defect in lower right lung lobe, B. Normal ventilation scintigram

Lung perfusion scintigraphy

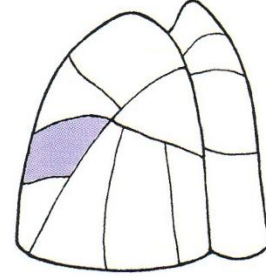
- Normal findings
- Very low probability for pulmonary emboli
- Low probability for pulmonary emboli
- Medium probability for pulmonary emboli
- High probability for pulmonary emboli
- Specificity 90%
- Sensitivity 50%



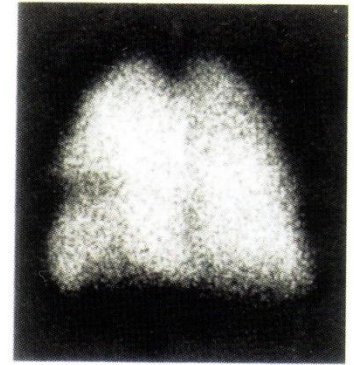
LEFT



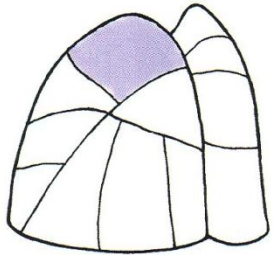
L. POSTERIOR OBLIQUE



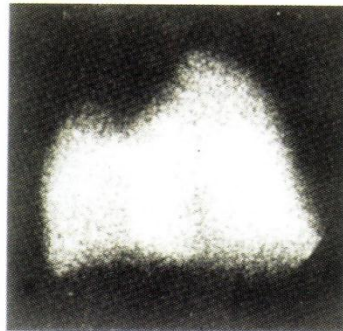
LEFT



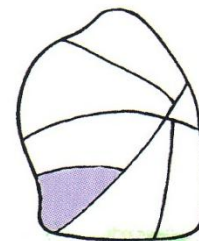
L. POSTERIOR OBLIQUE



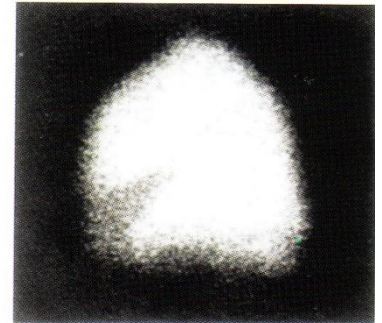
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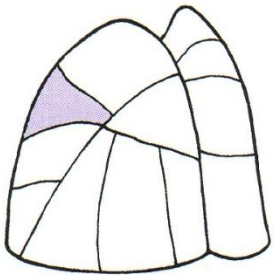
L. POSTERIOR OBLIQUE



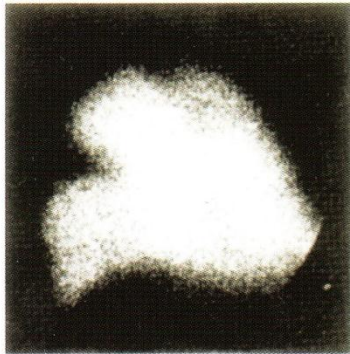
ANTERIOR



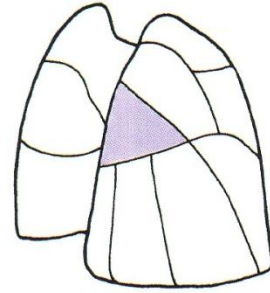
L. LATERAL



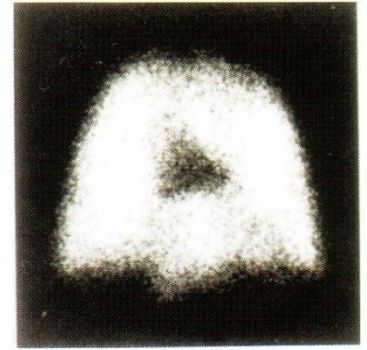
LEFT



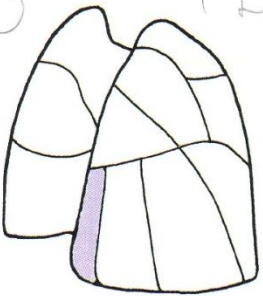
L. POSTERIOR OBLIQUE



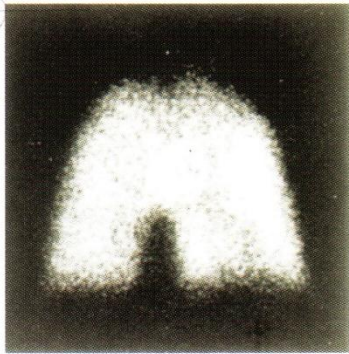
LEFT



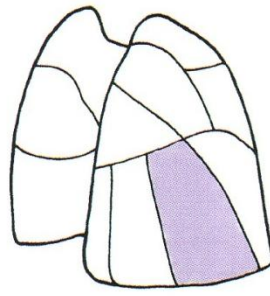
R. POSTERIOR OBLIQUE



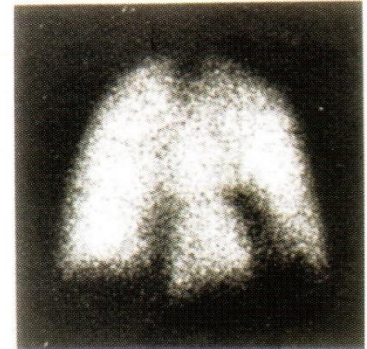
LEFT



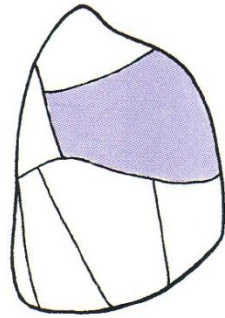
R. POSTERIOR OBLIQUE



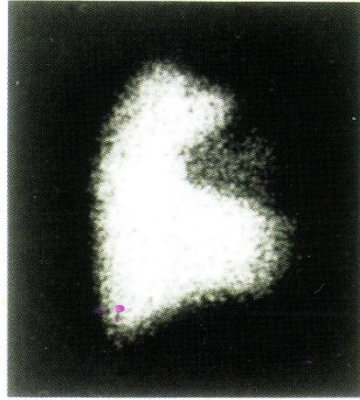
LEFT



R. POSTERIOR OBLIQUE

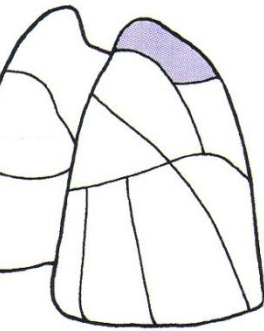


POSTERIOR

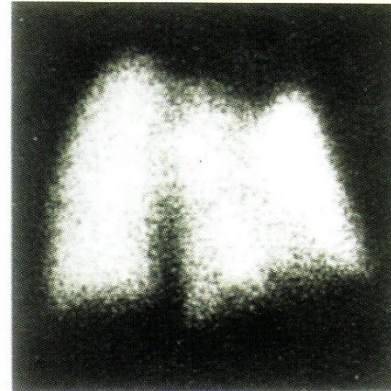


ANTERIOR

R. LATERAL



LEFT

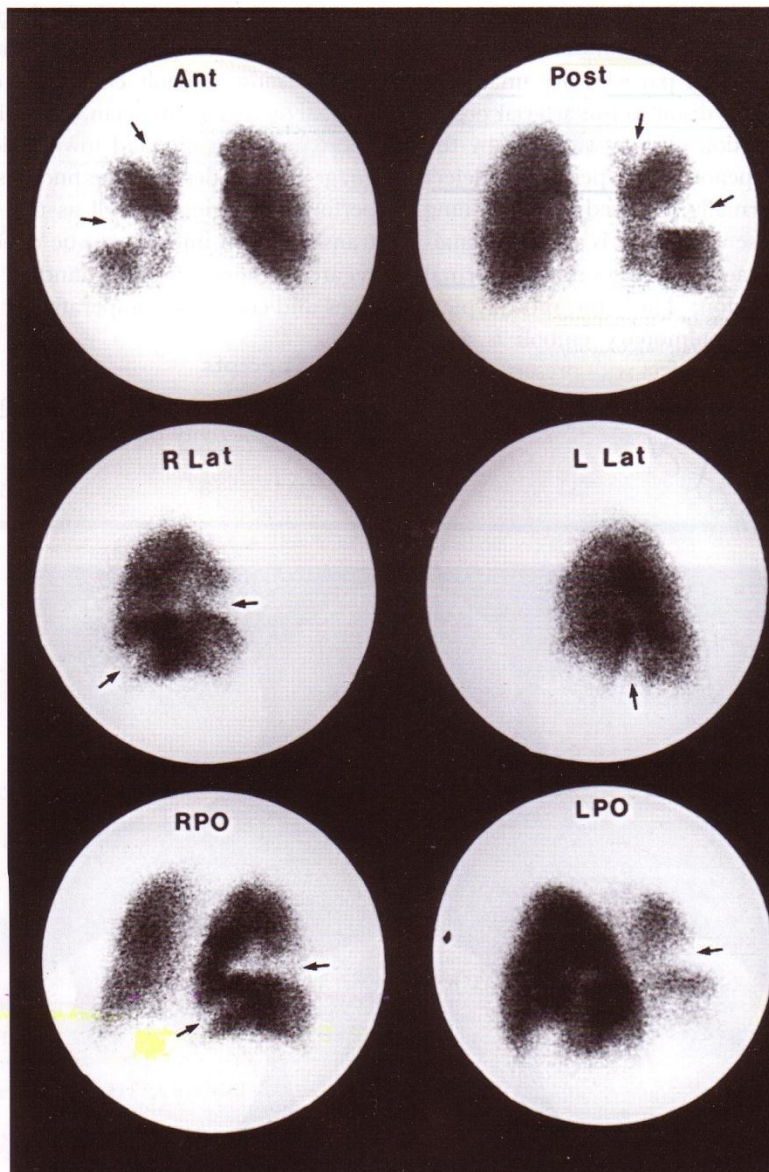


RIGHT

R. POSTERIOR OBLIQUE

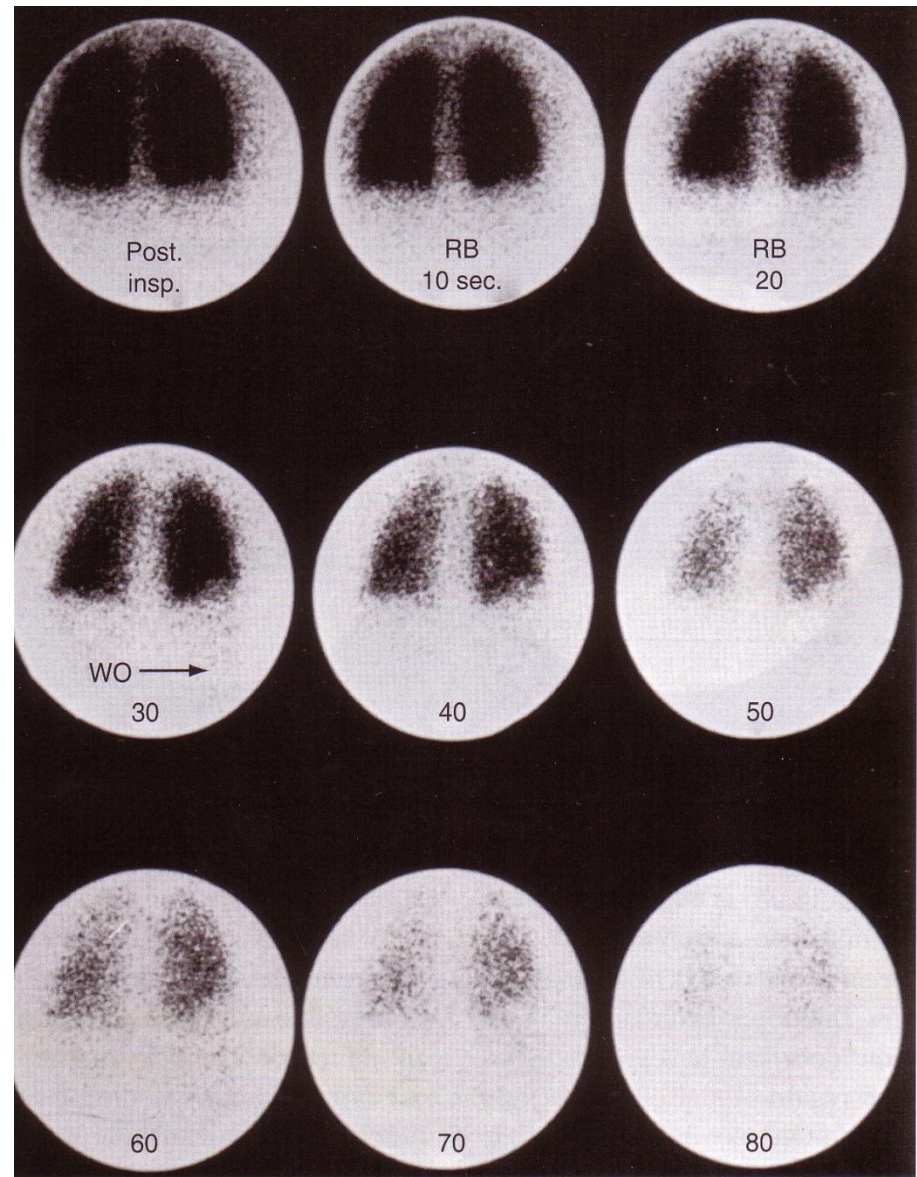
Multiple perfusion

defects

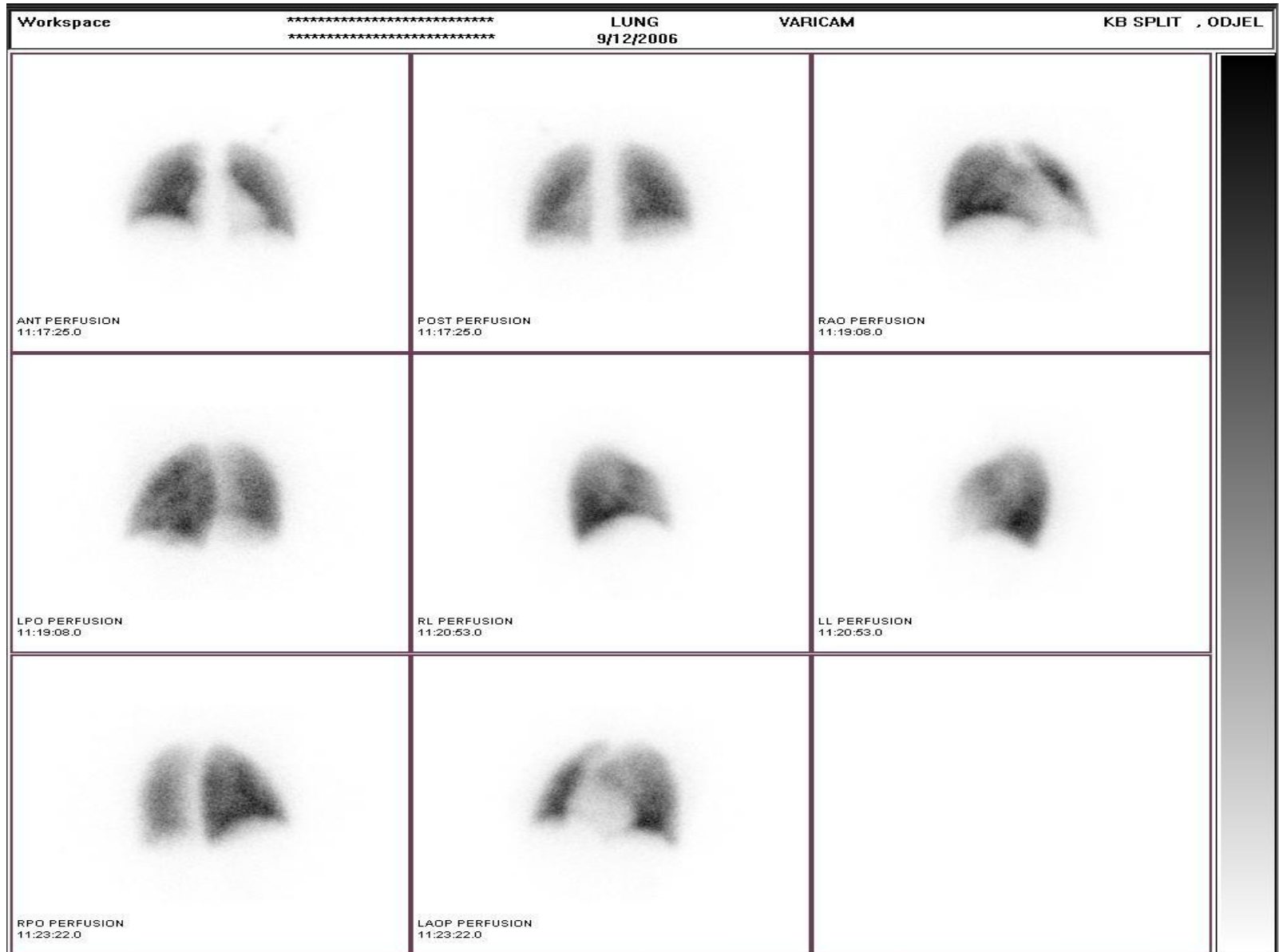


Normal ventilation scintigraphy

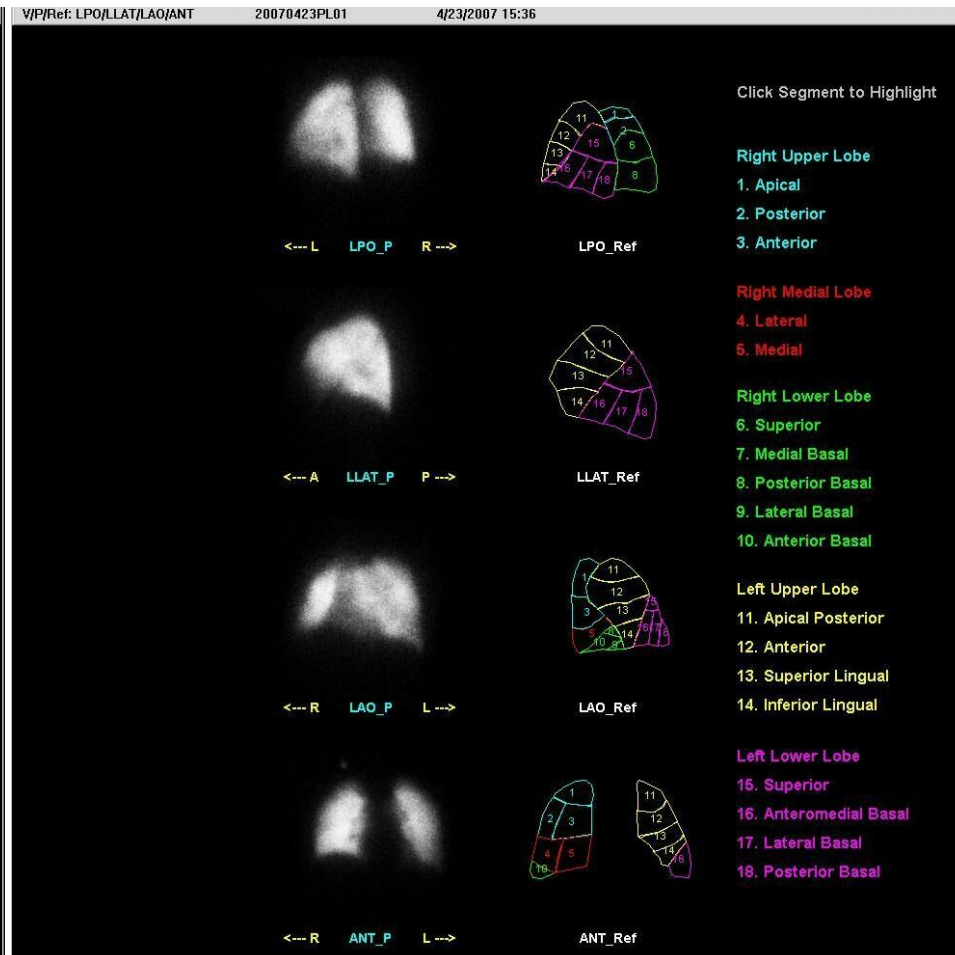
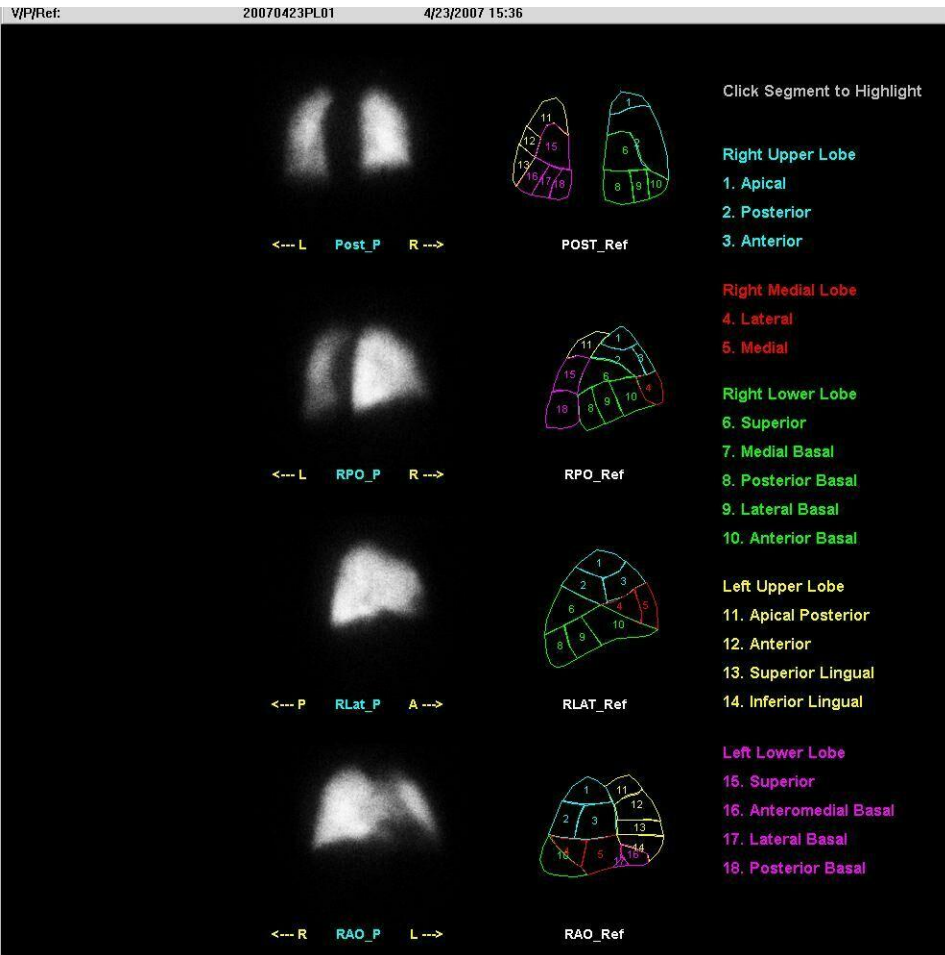
with X-131



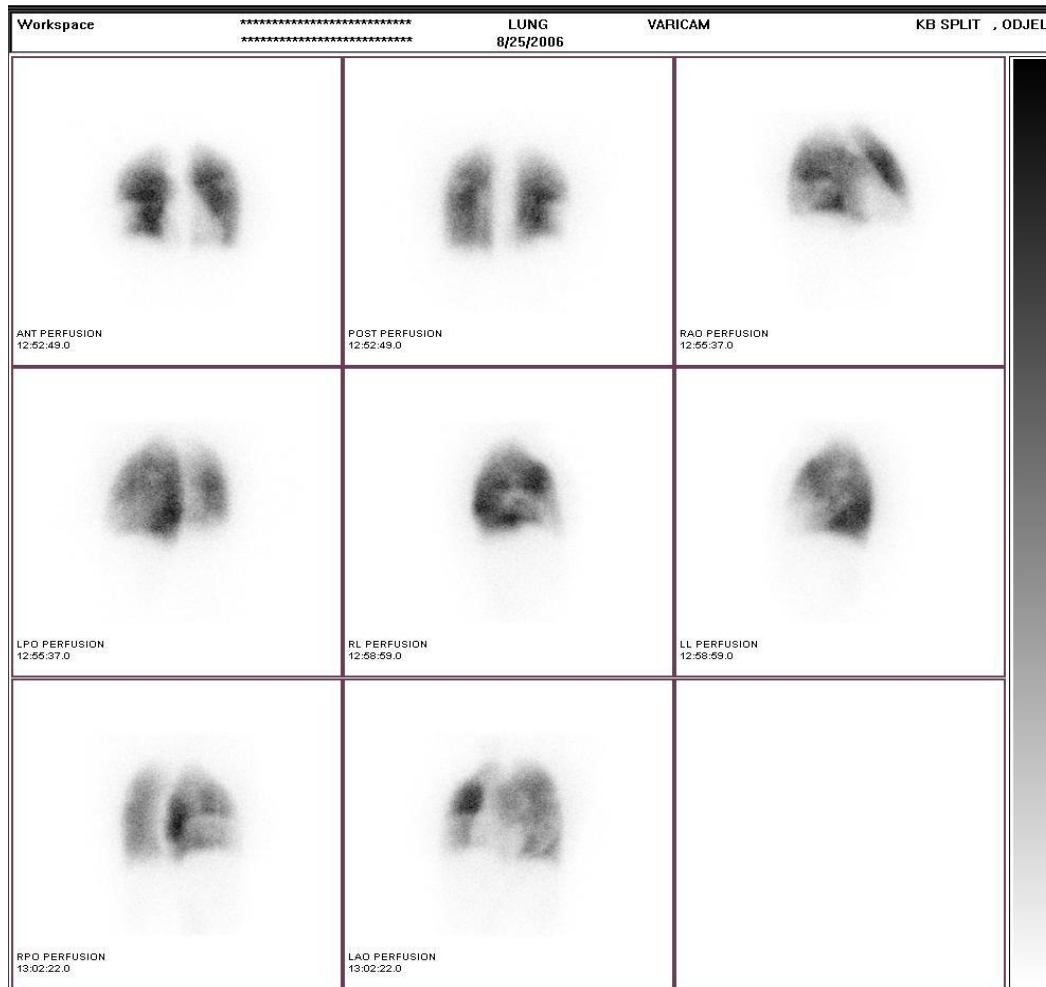
Normal lung perfusion scintigraphy



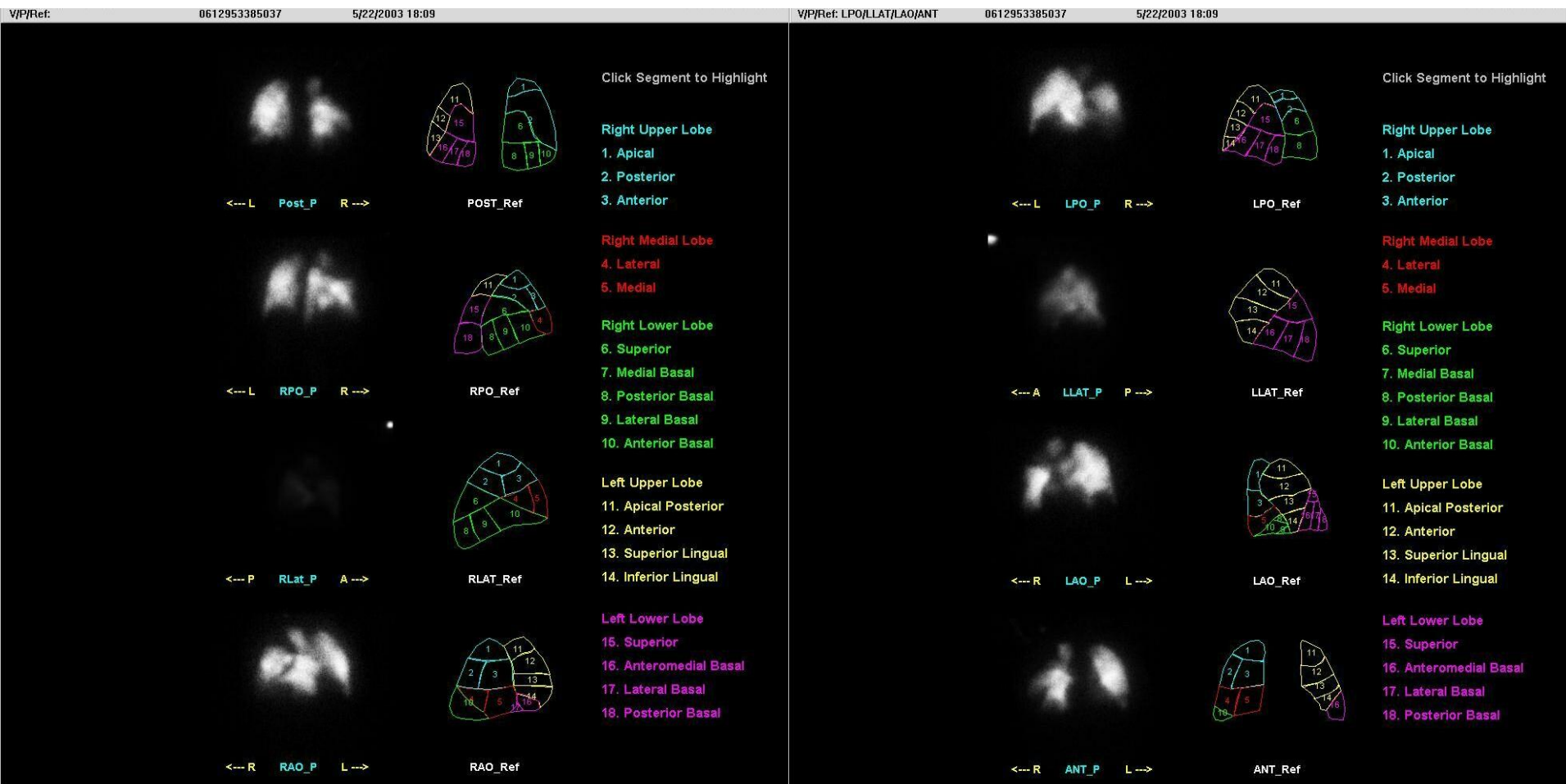
Normal lung perfusion scintigraphy



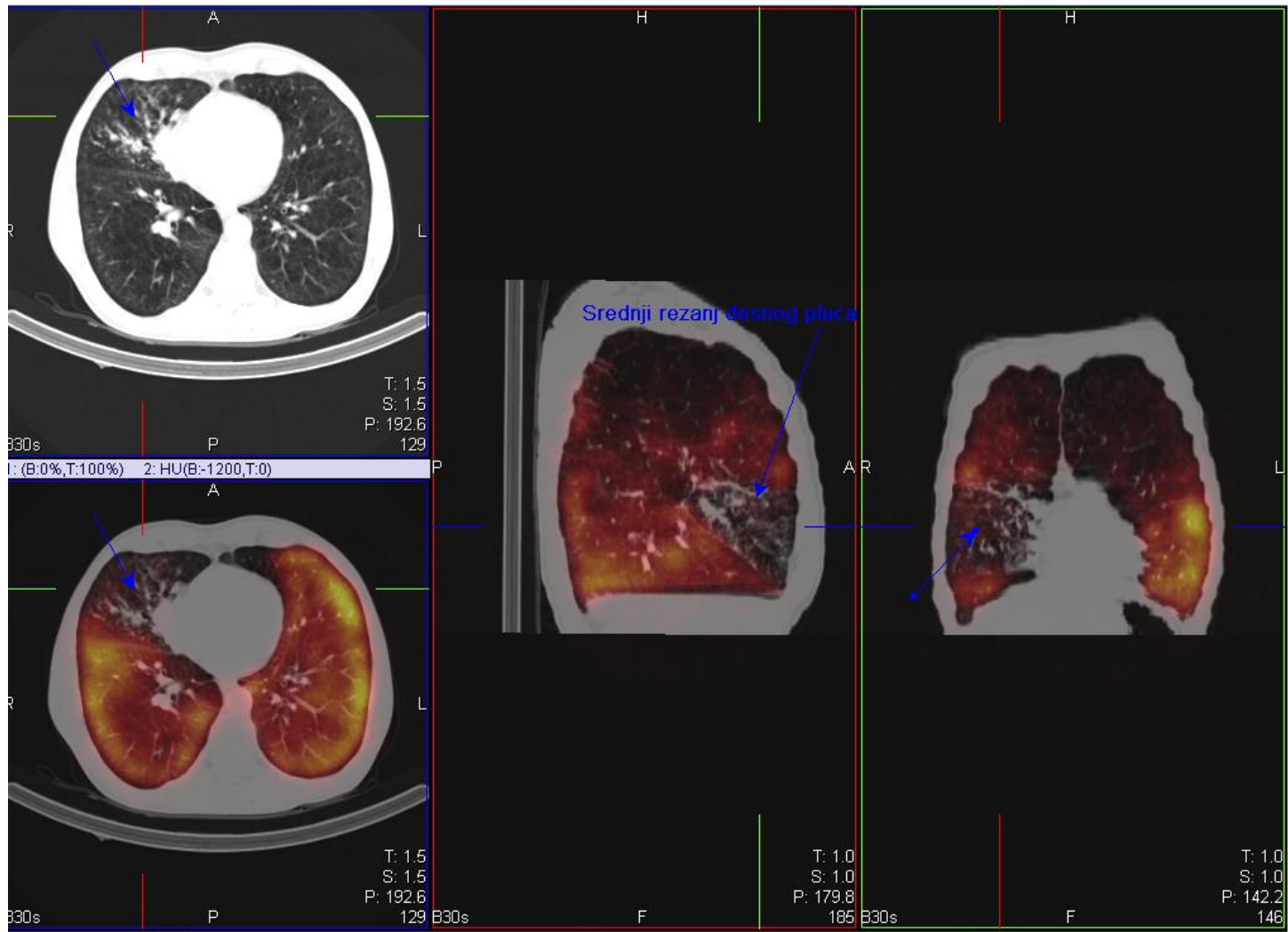
Perfusion defect in the lateral basal segment of the right lower lobe



Perfusion defects in the right superior lobe (posterior and anterior segment) and in the part of basal segments in both lower lung lobes



Perfusion lung scintigraphy – SPECT/CT



Perfusion defect in the right middle lobe

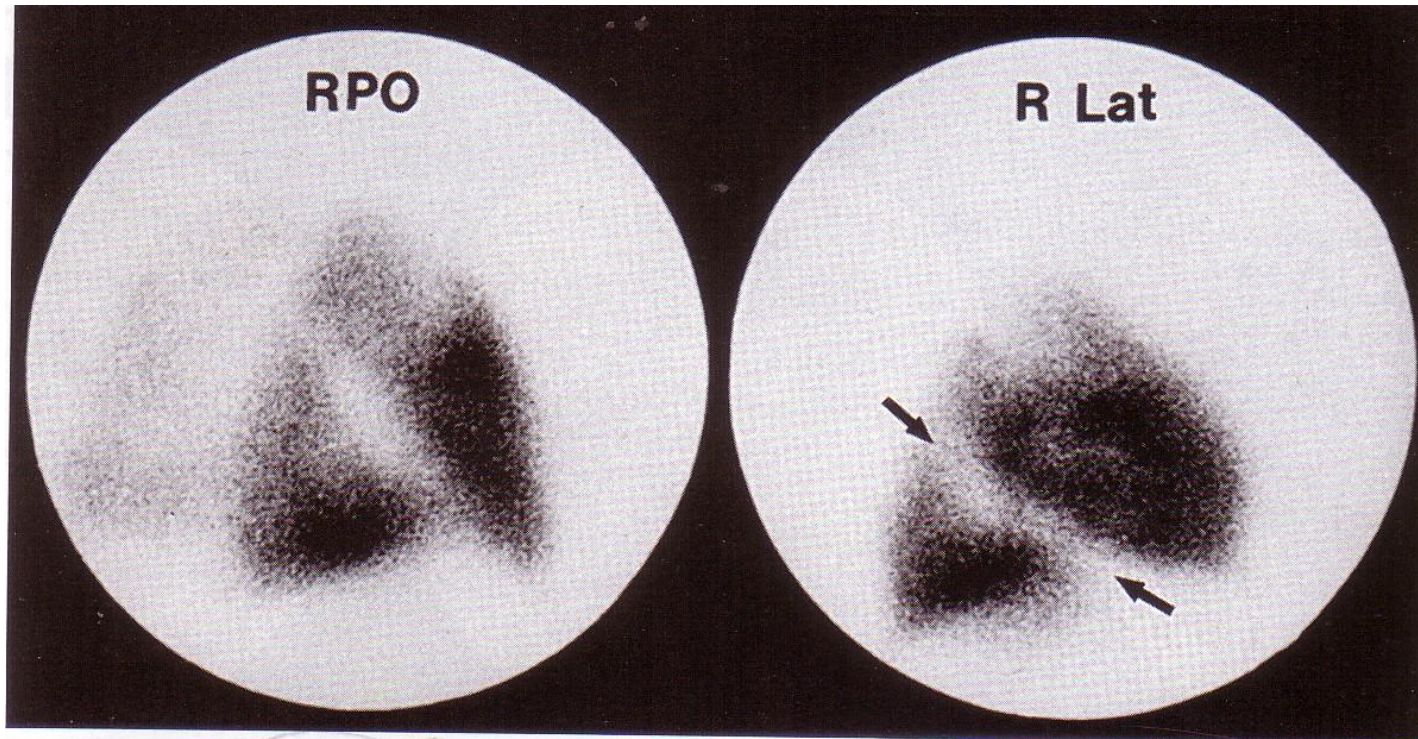
Perfusion lung scintigraphy – SPECT/CT



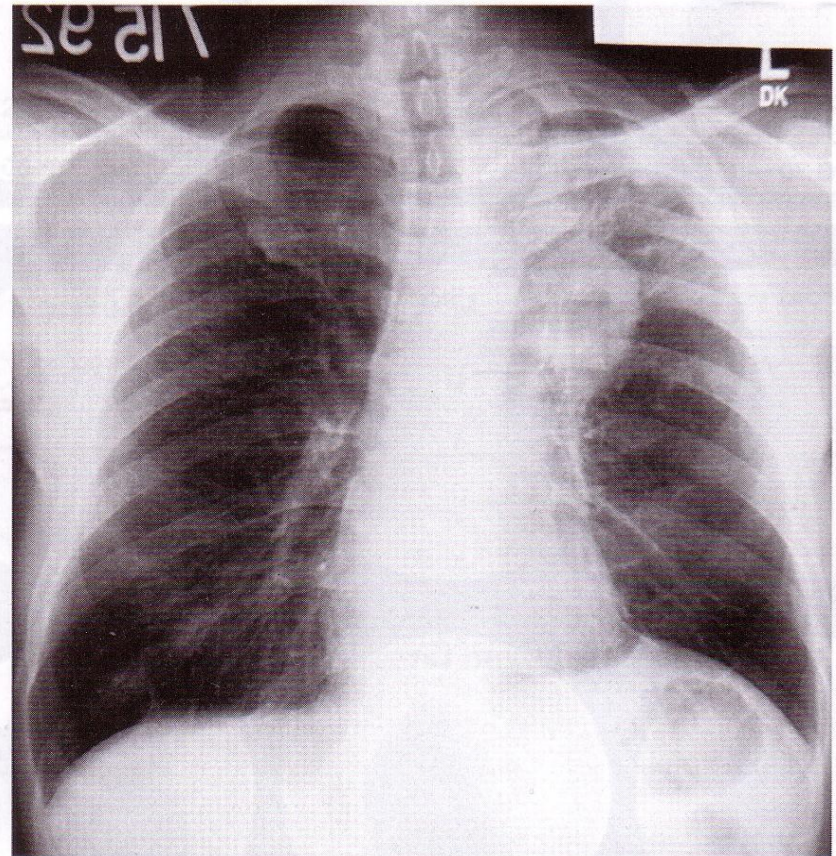
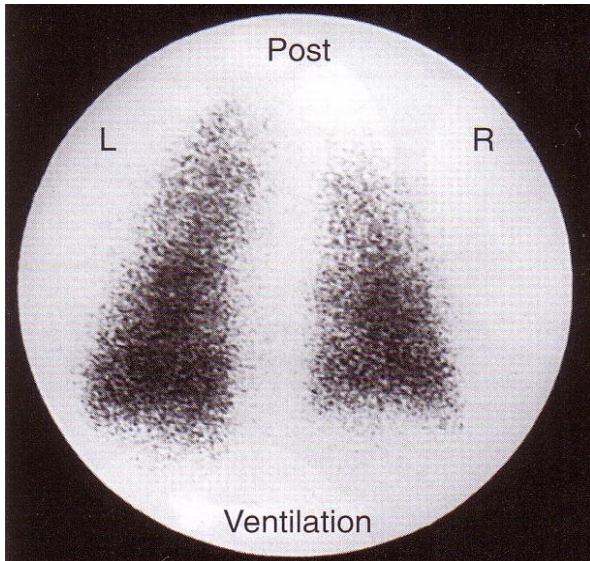
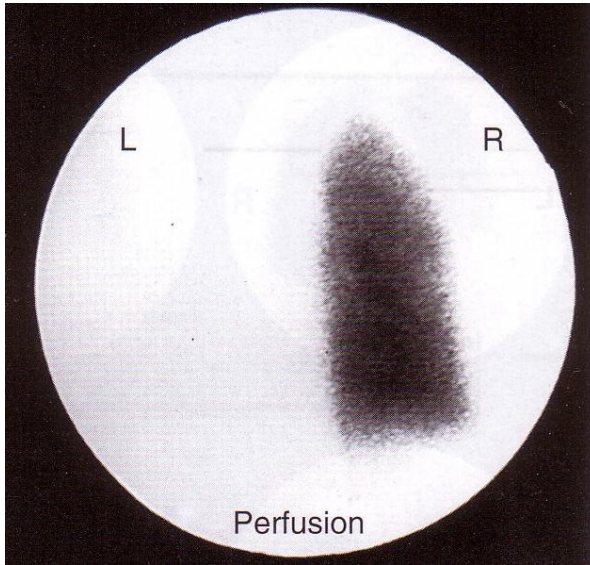
Perfusion defects in the apical segment of the right superior lobe and in the right middle lobe

FISSURE SIGN

- Linear perfusion defect in the area of the right large fissure (fissura obliqua) because of the liquid in the fissure (pleural effusion in heart decmopensation)



Lung carcinoma



The end