Nuclear medicine diagnostics in diseases of the respiratory system

Diagnostic methods:

- lung perfusion scintigraphy
- lung ventilation scintigraphy

Lung perfusion scintigraphy

Radiopharmaceutical:

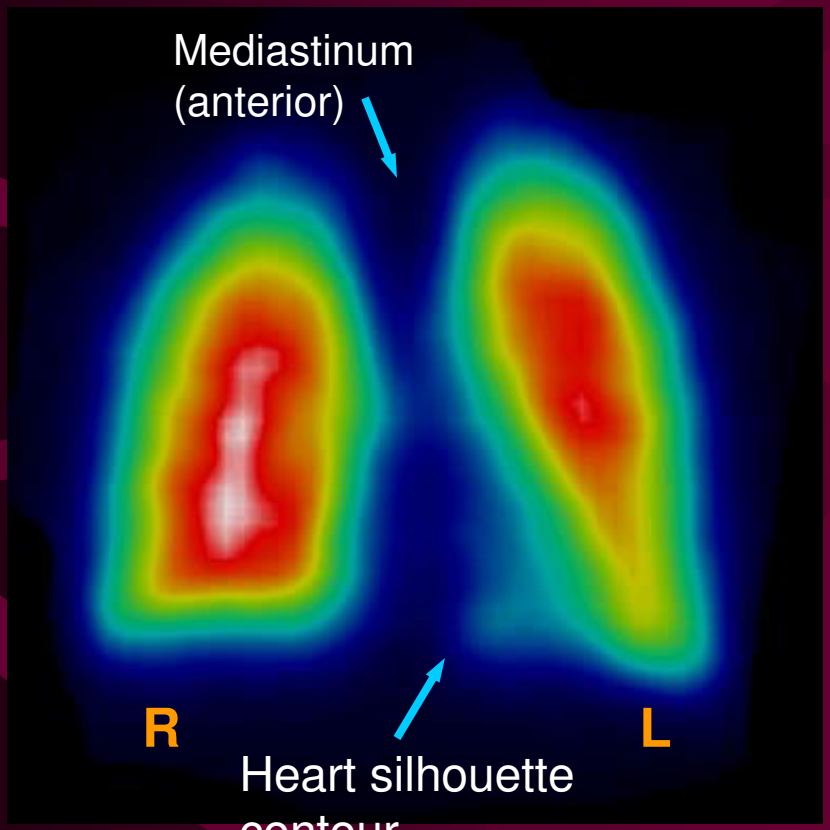
^{99m}Tc-microspheres (small albumin spheres of 15-30 micrometers in diameter, comparable to diameters of capillary arteries in lungs , being trapped in those arteries)

Clinical applications:

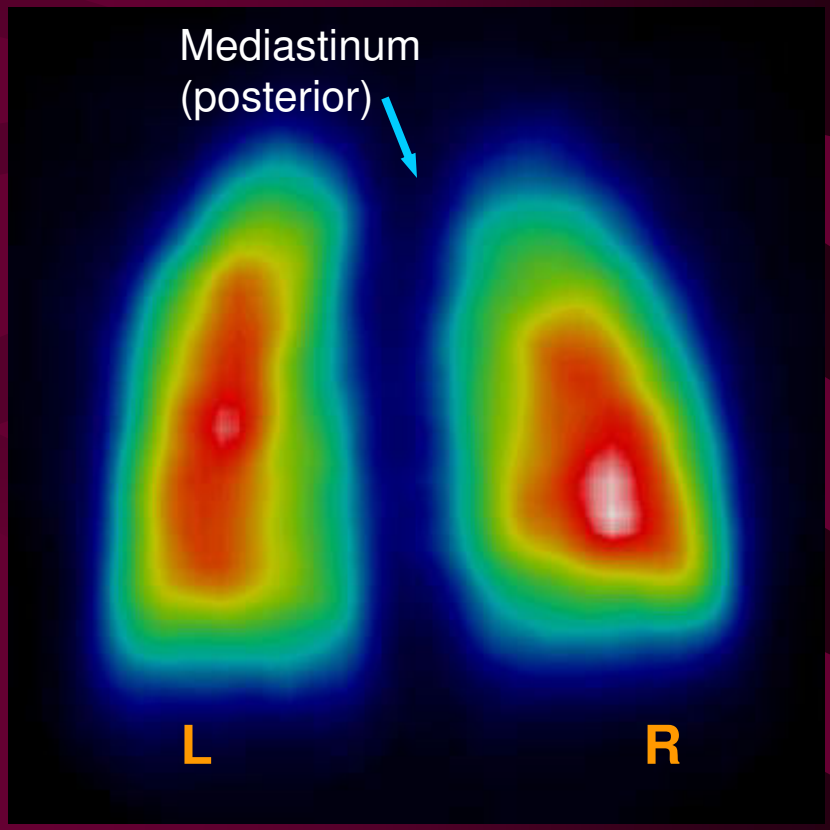
1. **Suspected pulmonary embolism**
2. Neoplasms of the lungs
3. Congenital malformation of lungs and pulmonary vessels

Normal lung perfusion scintigrams

Ant. projection

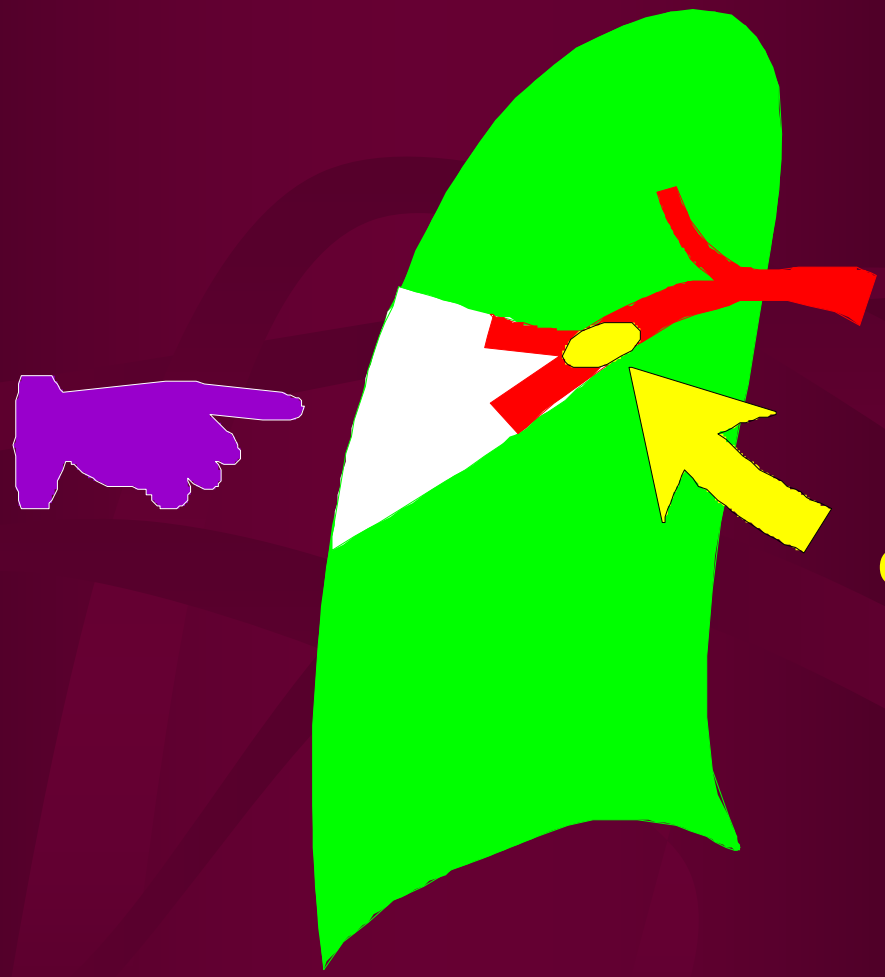


Post. projection



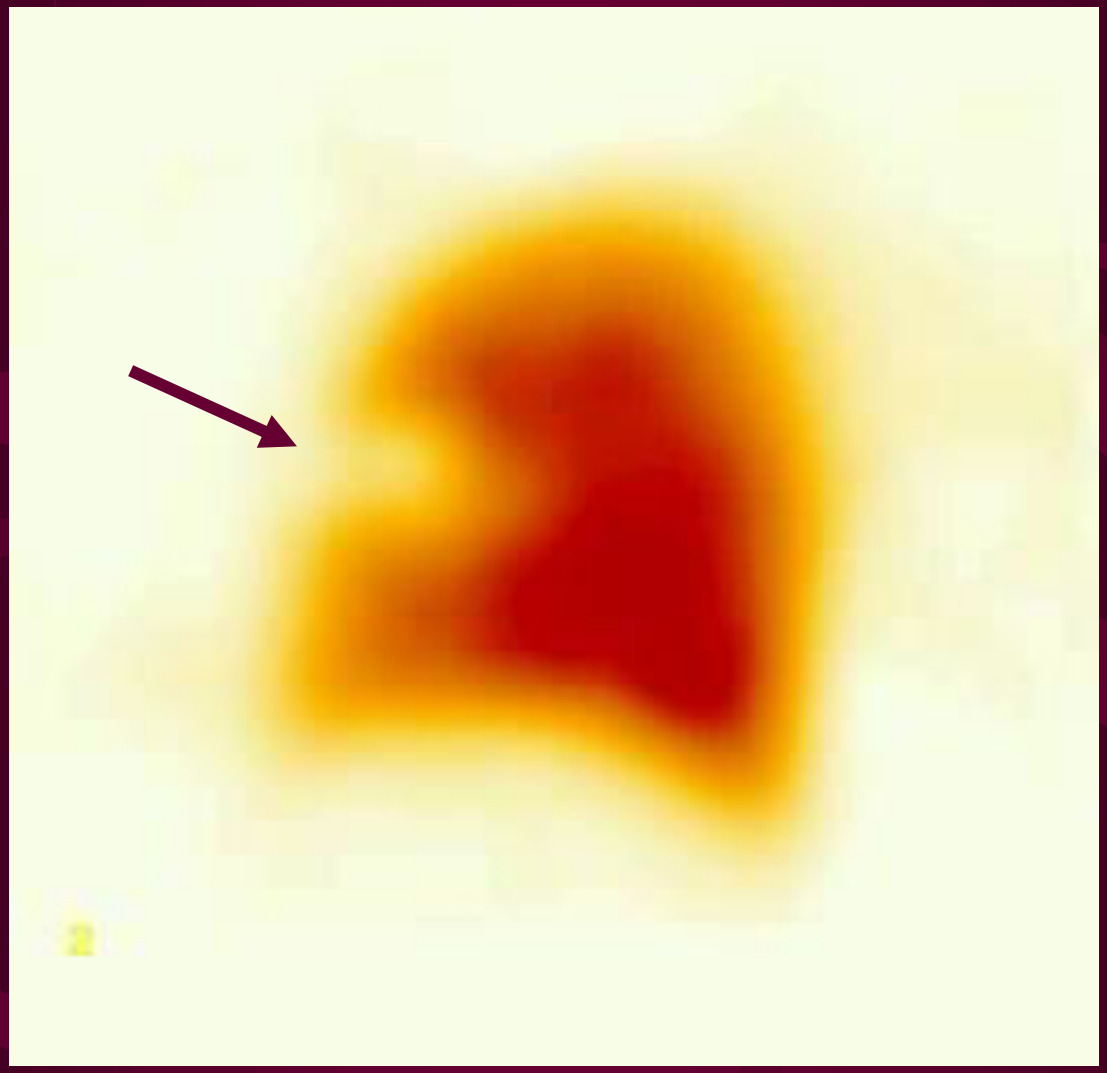
Pulmonary embolism is a blockage of the main artery of the lung or one of its branches by a substance that has travelled from elsewhere in the body through the bloodstream

Segmental perfusion defect



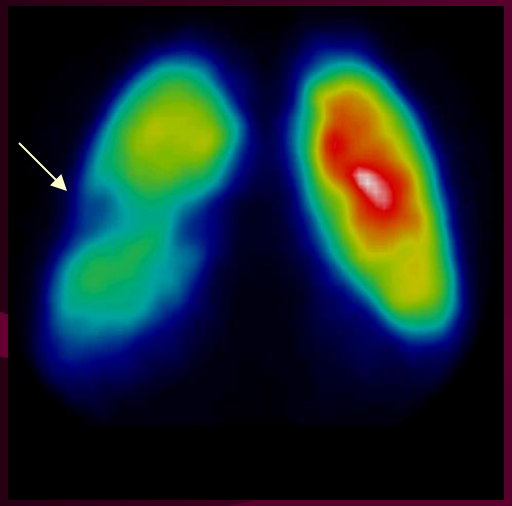
embolism

Pulmonary embolism

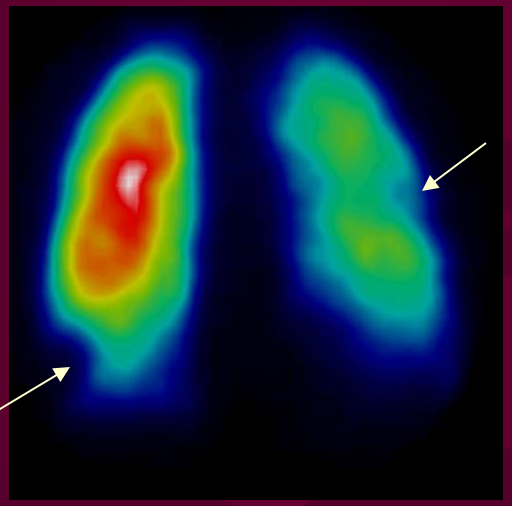


Lung perfusion scintigraphy – pulmonary embolism

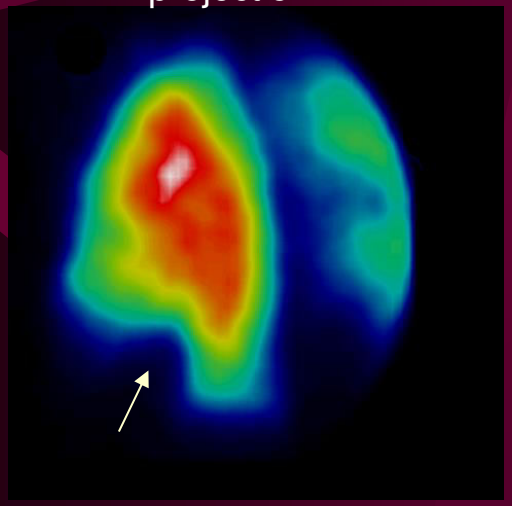
Posterior projection



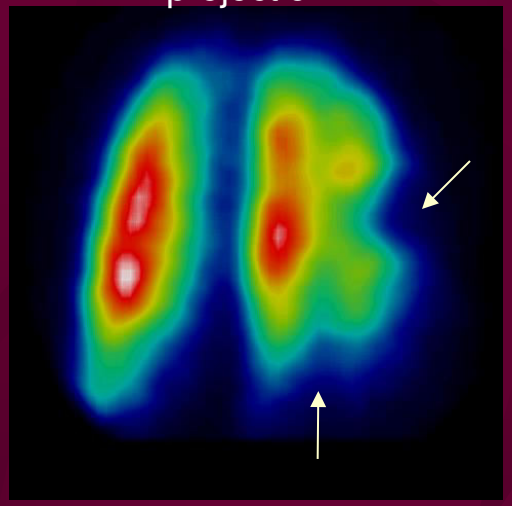
Anterior projection

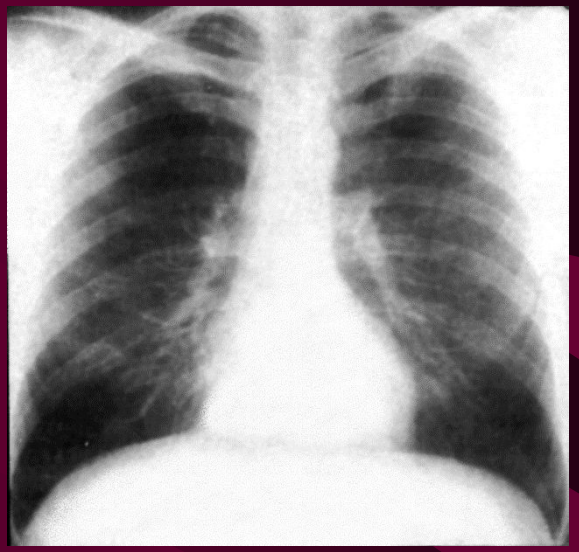


Posterior left oblique projection



Posterior right oblique projection

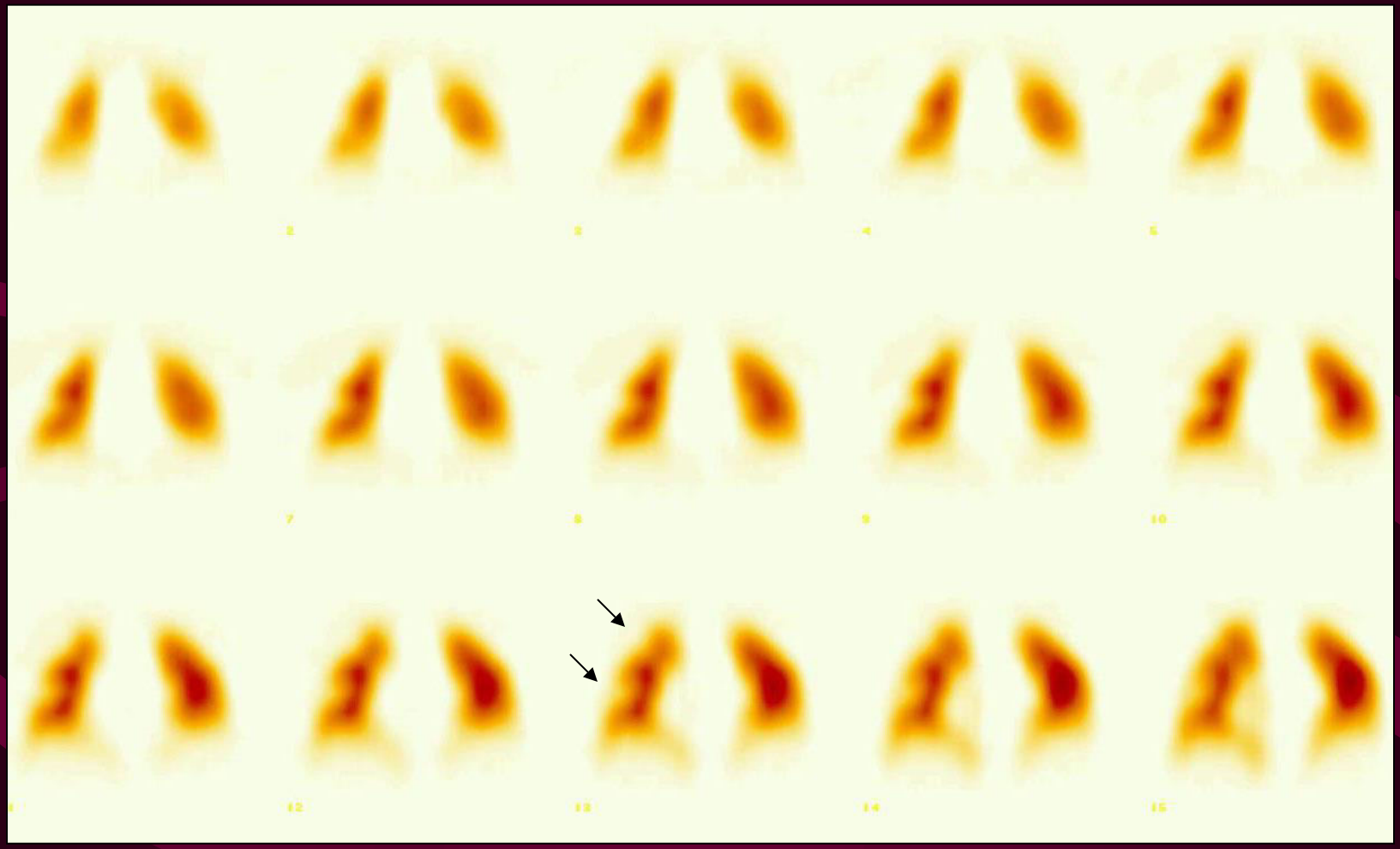




X-rays

Segmental perfusion defect put together with a normal chest X-ray indicate a presence of a pulmonary embolism

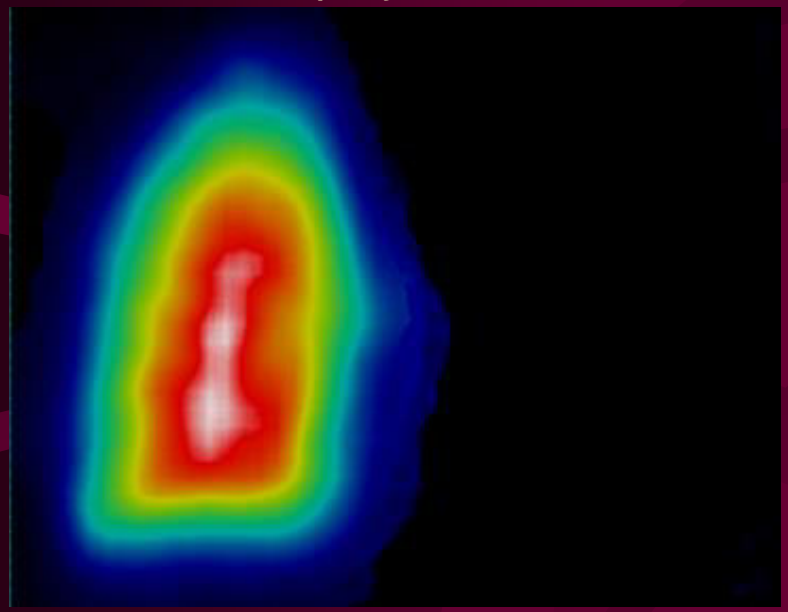
Lung perfusion tomographic (SPECT) scintigraphy
(coronal slices)



Pulmonary embolism

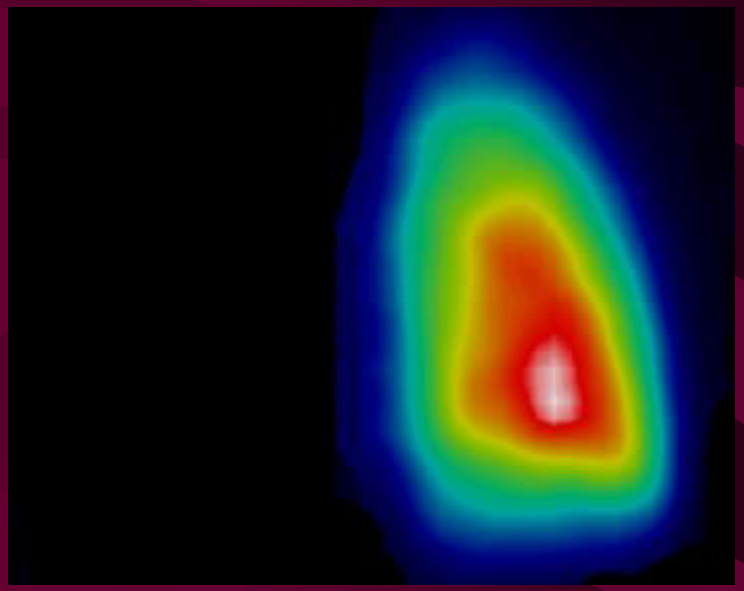
Tumor (Ca) in the left lung hilus

Anterior projection



R L

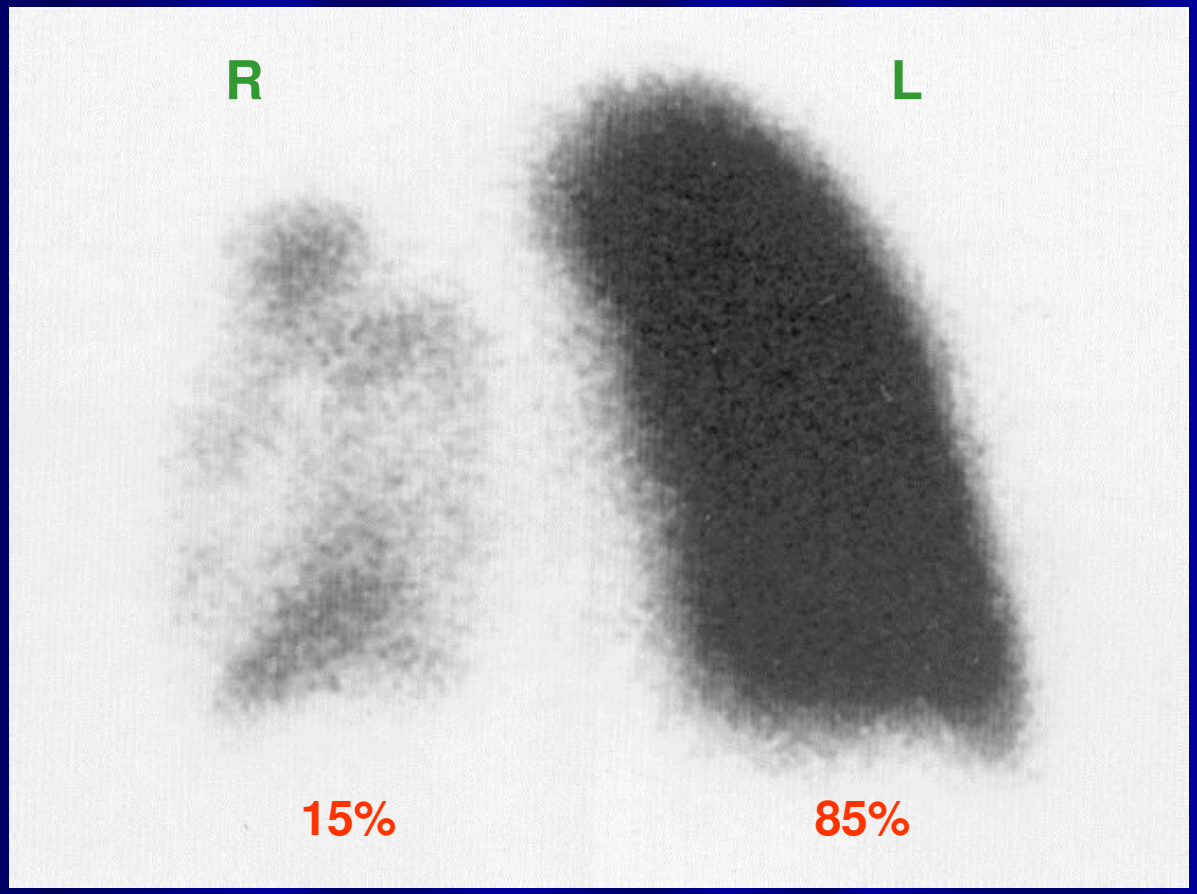
Posterior projection



L R

Lung perfusion scintigraphy

Prognosis of respiratory sufficiency after planned resection of the right lung



FEV_1 – forced expiratory volume in 1 sec.

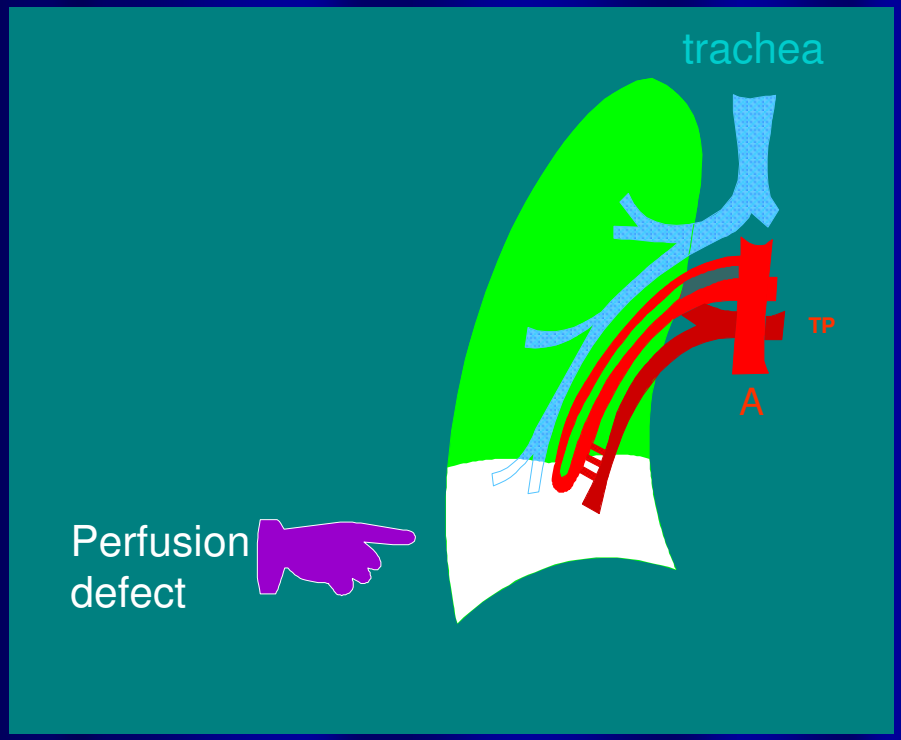
A share of the right lung in pulmonary function equals 15%, so a planned resection will reduce a total function of the lungs from 1.5 to about 1.3 .

FEV_1 *before surgery* = 1.5 l

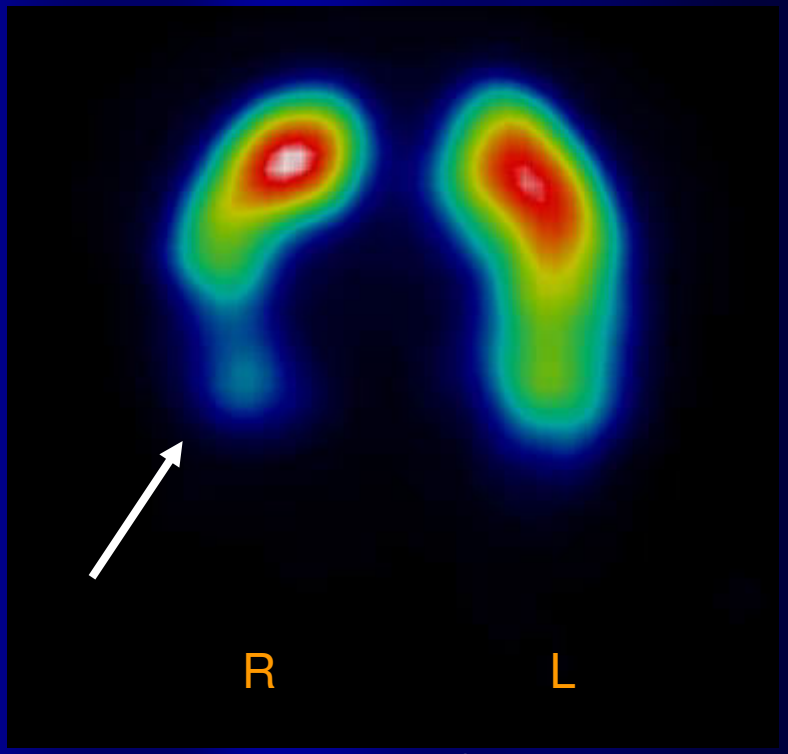
FEV_1 *prognosis after planned surgery* = 1.3 l

Right lung hypoplasia

Sequestration of the right lung



Anterior projection



A **pulmonary sequestration** is a medical condition where a piece of tissue that develops into lung tissue is not attached to the pulmonary arterial blood supply (intrapulmonary sequestration drains via pulmonary veins, extra pulmonary sequestration drains to the IVC) and does not communicate with the other lung tissue

Lung ventilation scintigraphy

A study not very common because of technical problems (a patient should breath in a closed circuit with a radioactive gas)

Radiopharmaceuticals:

Radioactive aerosols (^{99m}Tc-DTPA, ^{99m}Tc-colloid).

Radioactive noble gases (^{133}Xe, ^{81}Kr).

Clinical applications:

1. Suspected pulmonary embolism (as an investigation supplementary to the perfusion imaging).
2. Obturatory diseases of the respiratory system.

Lung perfusion (a) and ventillation (b) scintigraphy

Pulmonary embolism

a

b