

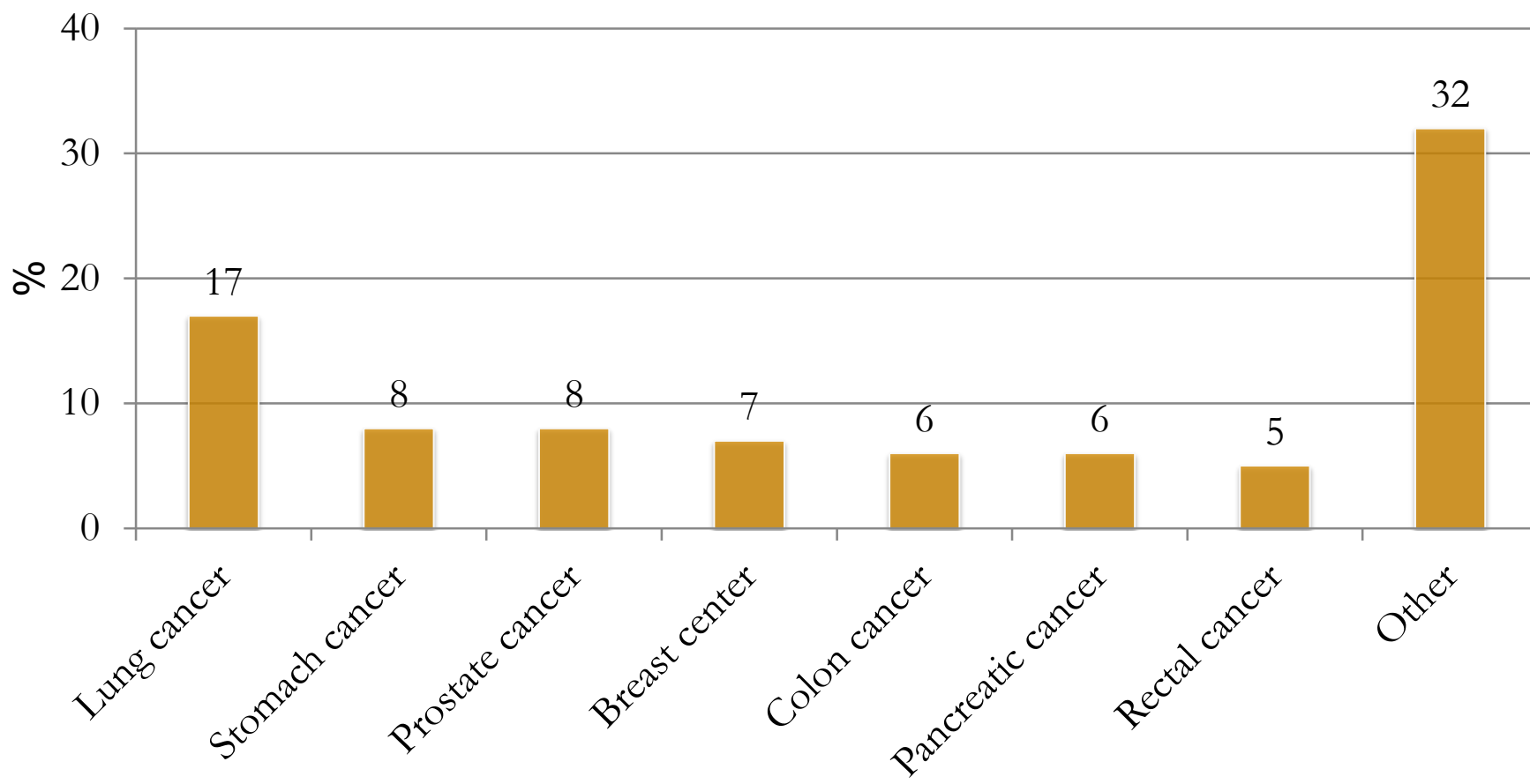
SPARING OF PERFUSION ACTIVE REGIONS DURING LUNG RADIOTHERAPY CAN IMPROVE PATIENTS QUALITY OF LIFE

Romualdas Griskevicius, Rita Steponaviciene, Saulius Cicenias, Jonas Venius.

MEDICAL PHYSICS IN THE BALTIC STATES 2017

13TH INTERNATIONAL CONFERENCE "MEDICAL PHYSICS IN THE BALTIC STATES 2017", 9-11TH OF NOVEMBER

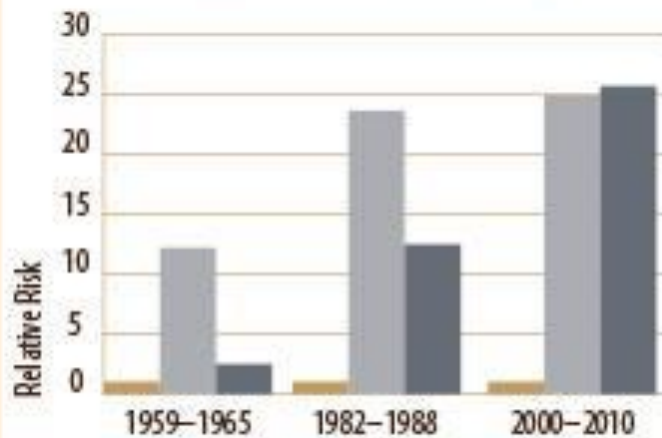
Death rate from cancer in Lithuania



LUNG CANCER RISK FOR SMOKERS

— COMPARED TO —

PEOPLE WHO NEVER SMOKED



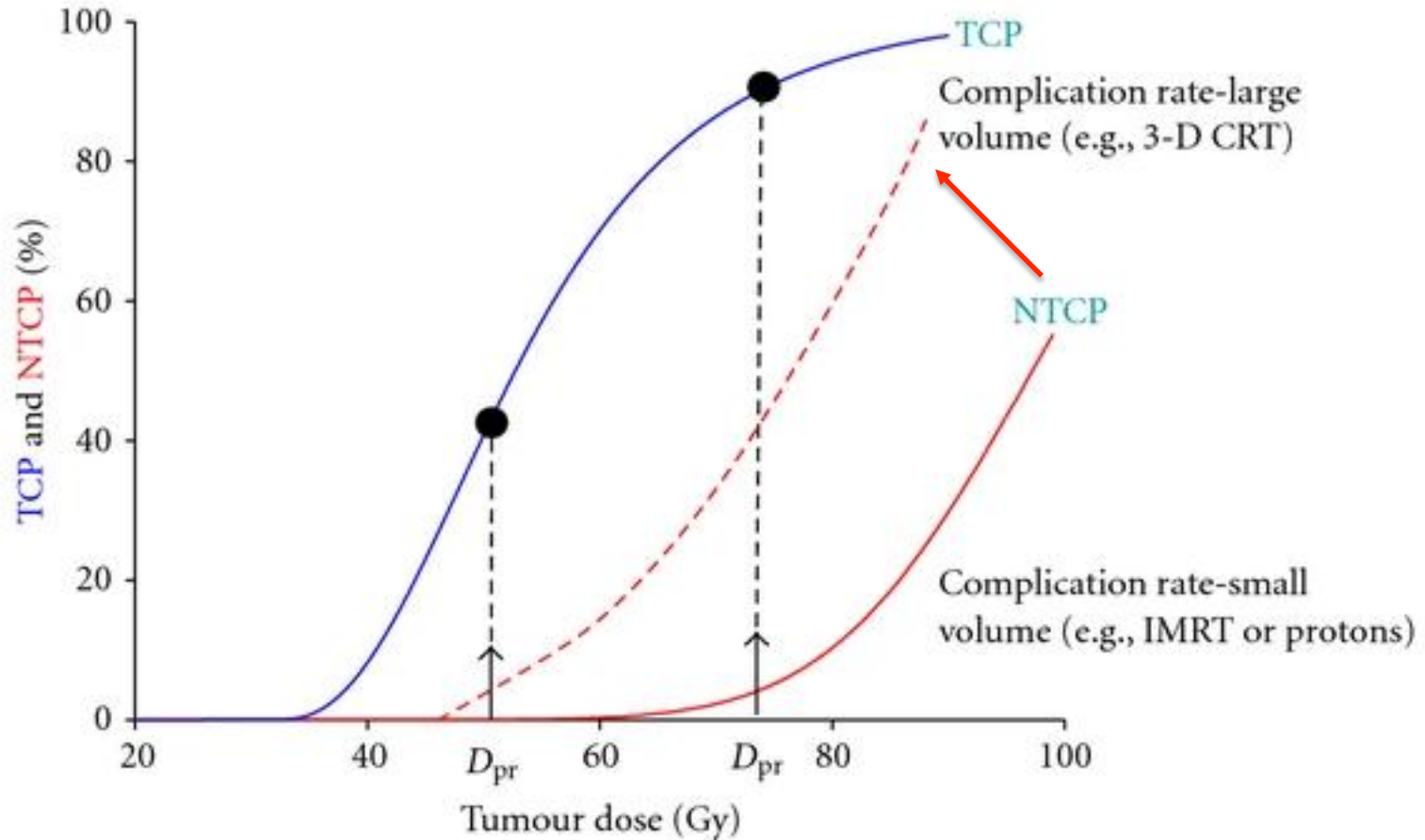
#LungCancerAwarenessMonth



NATIONAL
CANCER
INSTITUTE

The main methods for treating cancer are surgery, radiotherapy, chemotherapy and the combination of all these methods.





Increasing dose to tumour we will increase dose to normal tissue.

TCP - Tumor Control Probability, NTCP - Normal Tissue Complication Probability

Clinically significant symptomatic radiation pneumonitis (RP) occurs in % of patients irradiated for cancers:
 5–50% lung
 5–10% mediastinal lymphatics
 1–5% breast



Thorax: Lung

QUANTEC: ORGAN-SPECIFIC PAPER

RADIATION DOSE–VOLUME EFFECTS IN THE LUNG

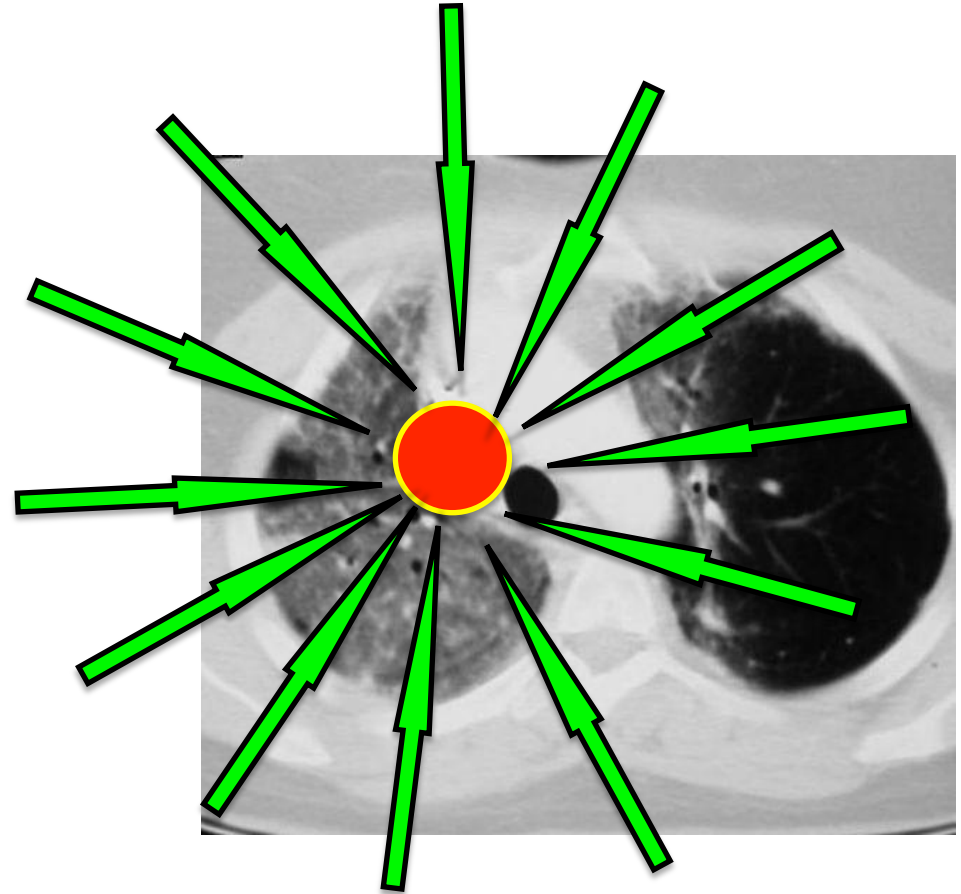
LAWRENCE B. MARKS, M.D.,* SOREN M. BENTZEN, D.Sc.,† JOSEPH O. DEASY, PH.D.,‡
 FENG-MING (SPRING) KONG, M.D., PH.D.,§ JEFFREY D. BRADLEY, M.D.,‡ IVAN S. VOGELIUS, PH.D.,†
 ISSAM EL NAQA, PH.D.,‡ JESSICA L. HUBBS, M.S.,* JOOS V. LEBESQUE, M.D., PH.D.,||
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COMPLICATIONS

What could be possible solutions?

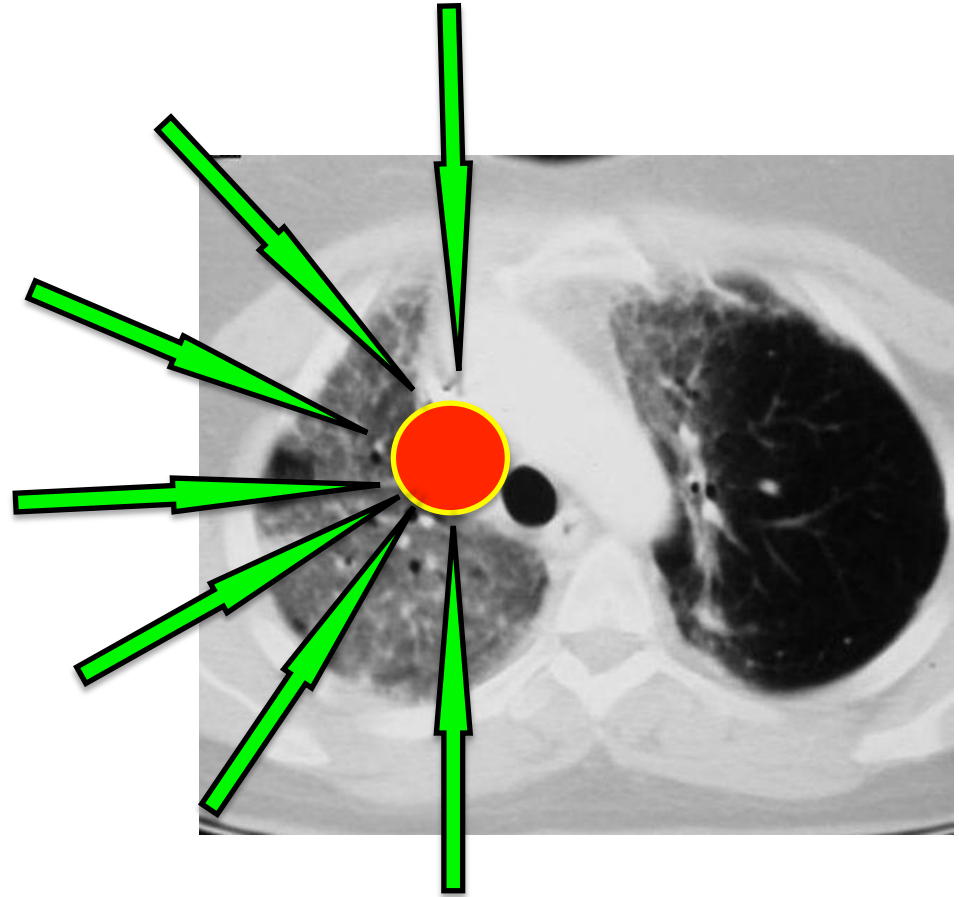
What could we sacrifice to spare lung function?



COMPLICATIONS

What could be possible solutions?

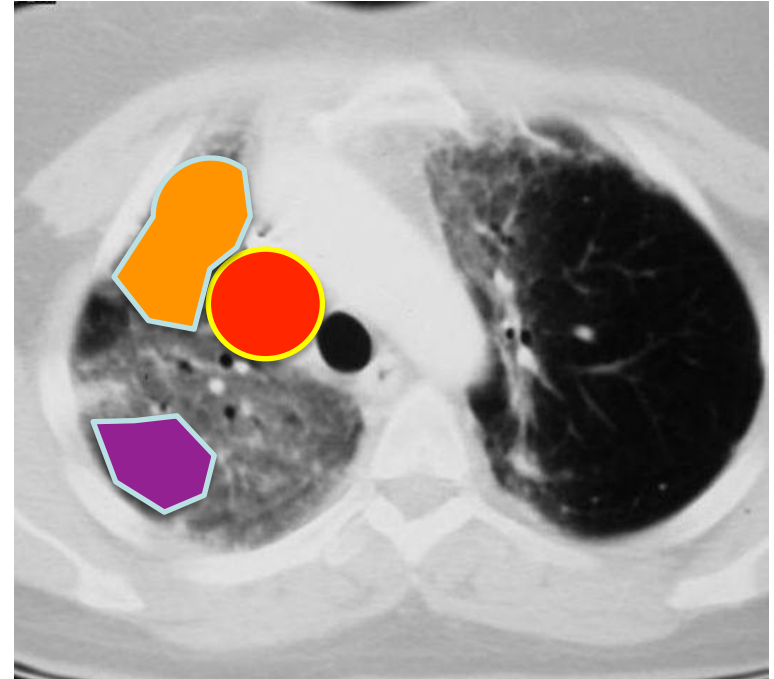
1. Spare „healthy“ lung ?



COMPLICATIONS

What could be possible solutions?

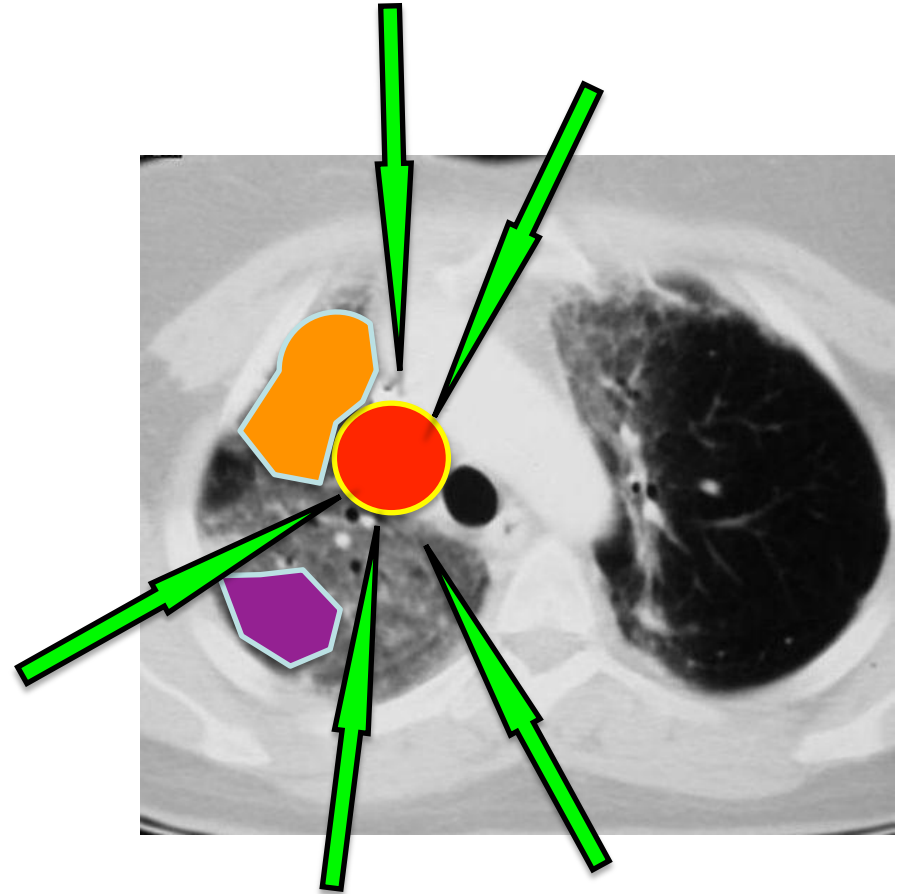
1. Spare „healthy“ lung ?
2. Get info about lung function.



COMPLICATIONS

What could be possible solutions?

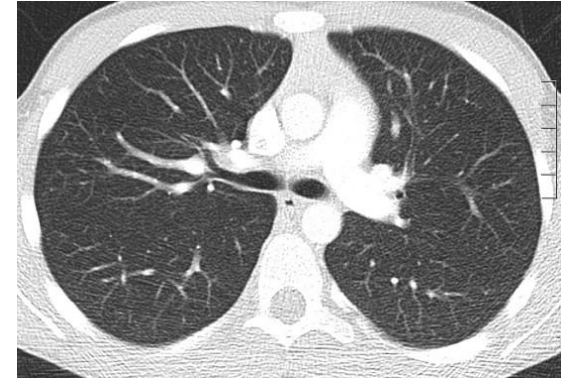
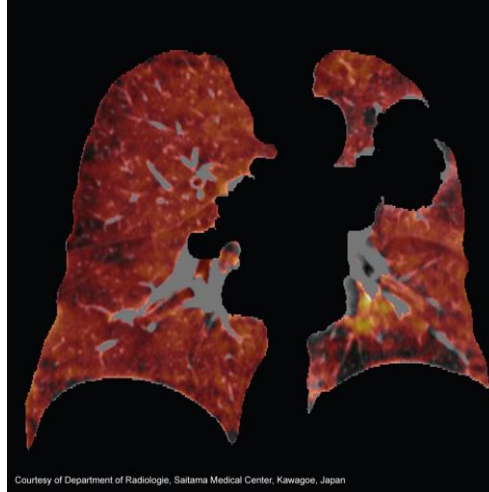
1. Spare „healthy“ lung ?
2. Get info about lung function.
3. Spare well functioning areas.



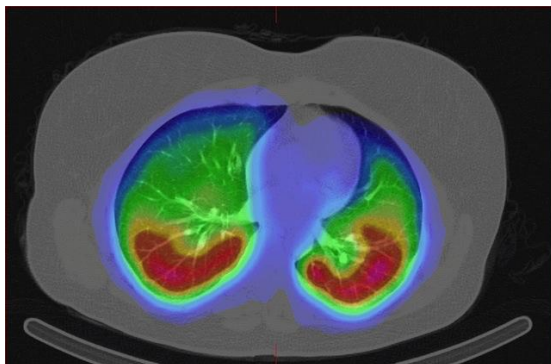
Lung ventilation, perfusion and diffusion parameters are not taken into account during dosimetric planning.



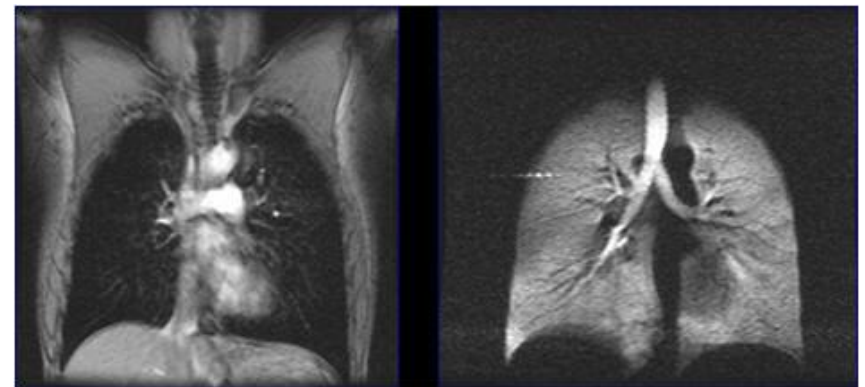
Lung CT:
Contrast-enhanced CT
Xenon CT
Dual energy CT



Lung SPECT/CT

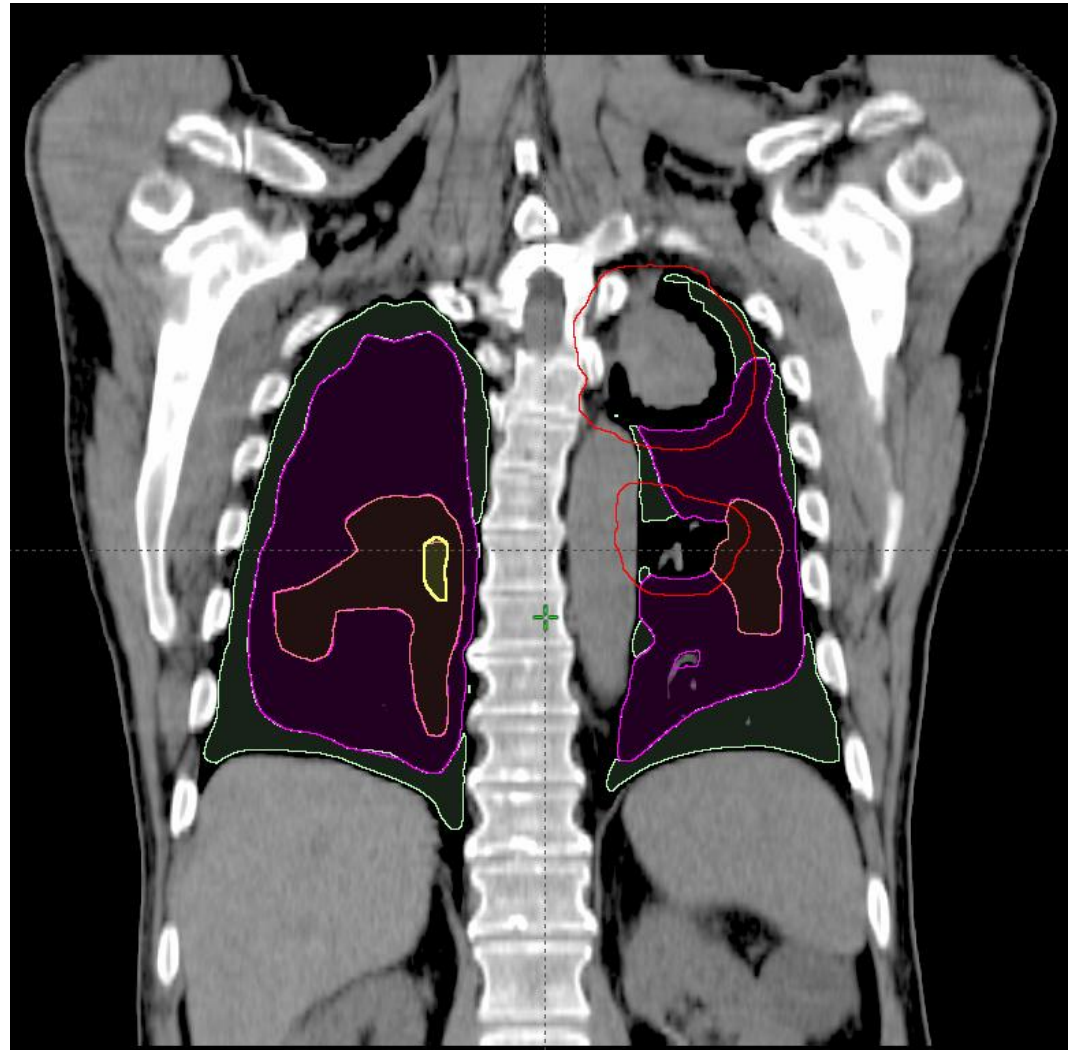


Lung MRI

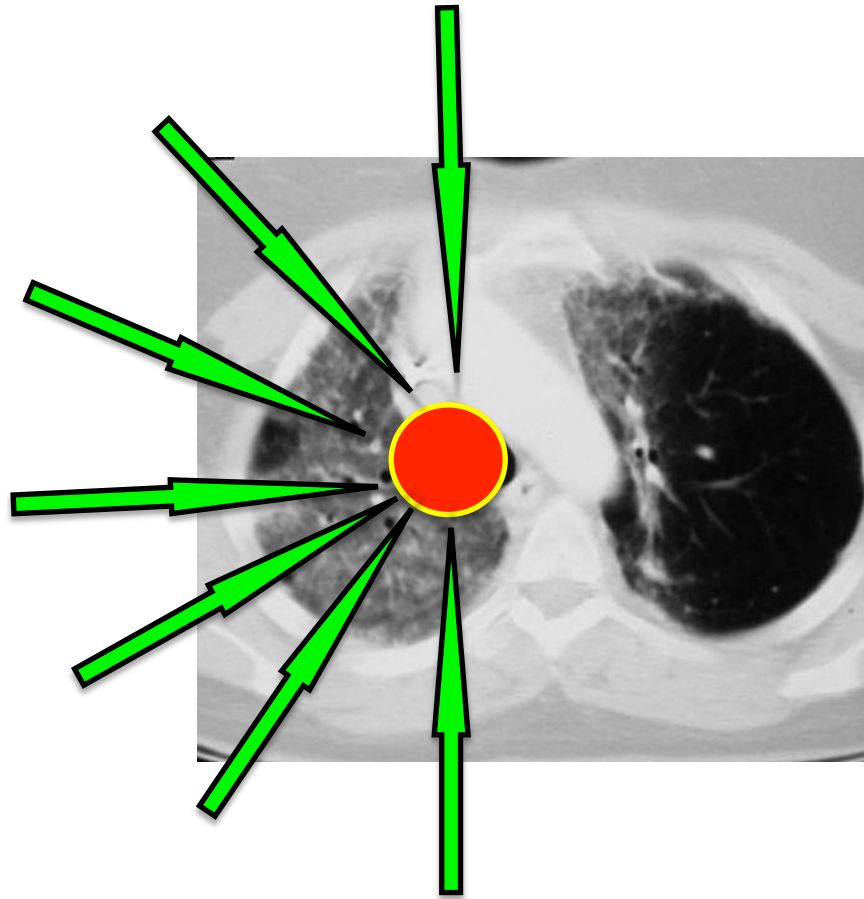


SPECT/CT

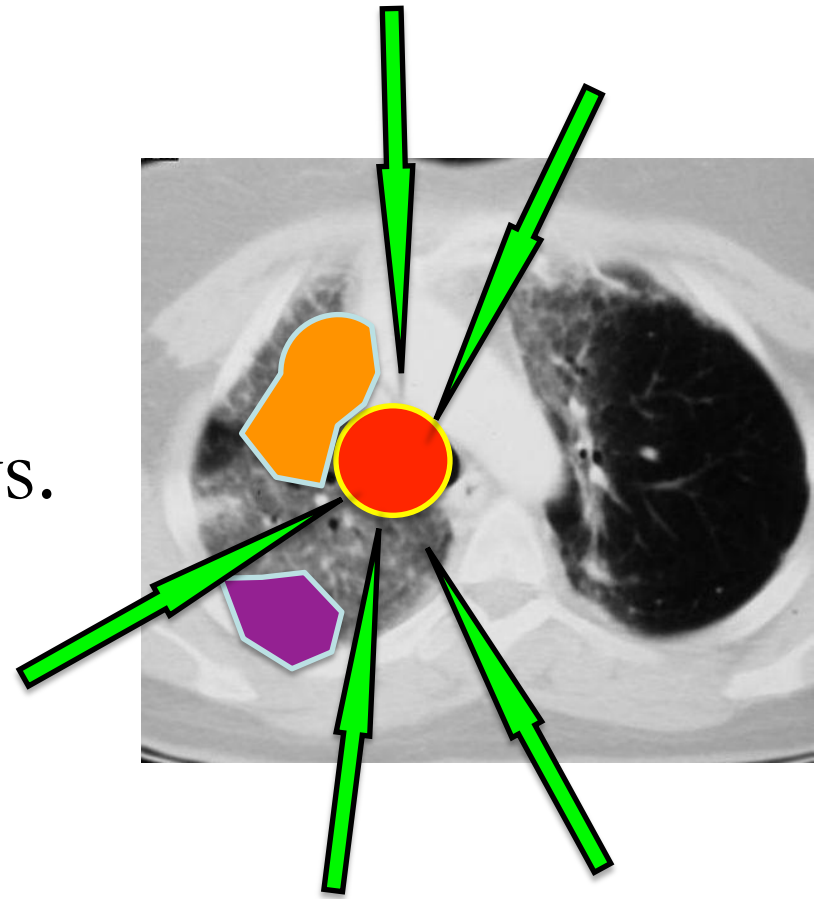
Lung perfusion
SPECT/CT was
performed during RT
to investigate for
possible pulmonary
embolism on a dual-
head SPECT/CT
camera.



RT plan comparison

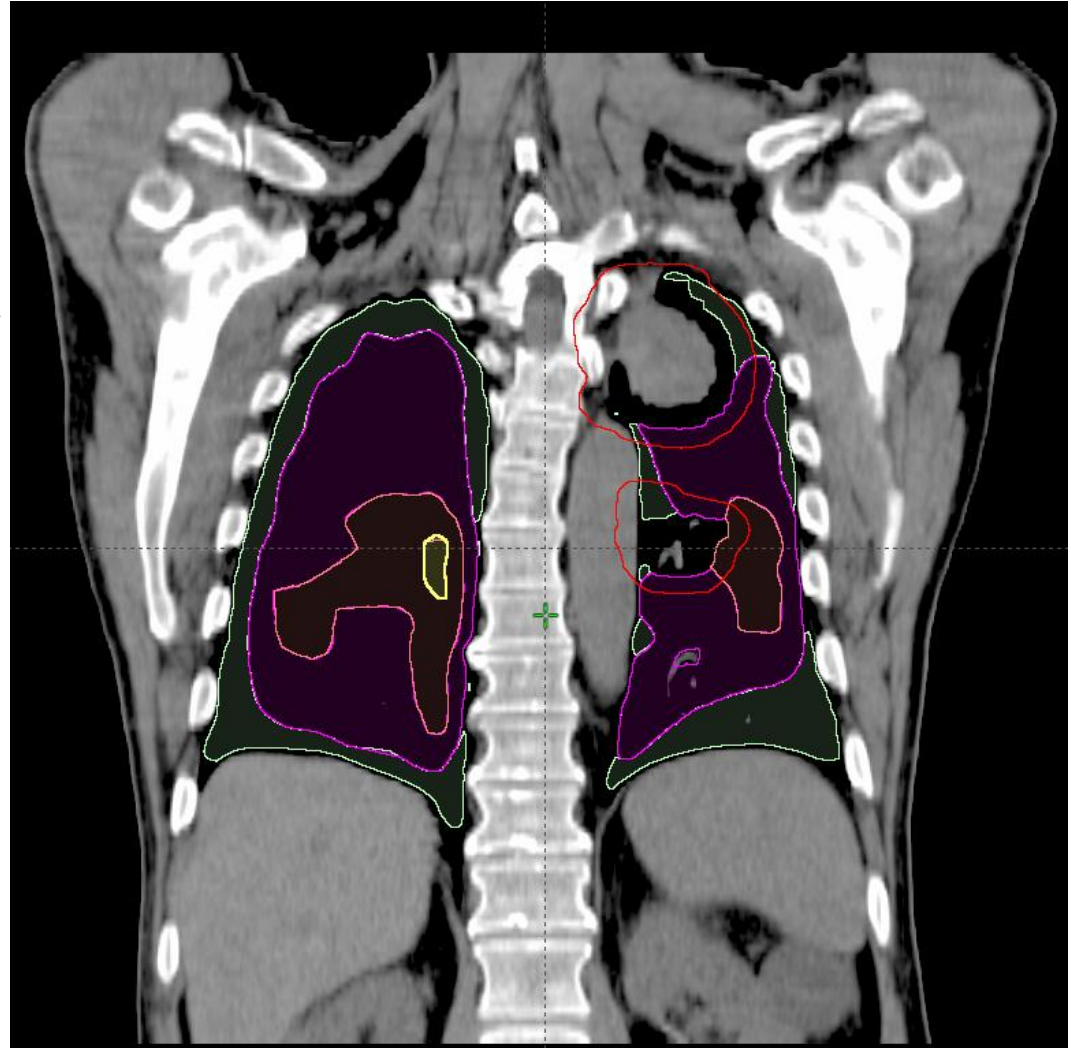


VS.



Functional segmentation (1)

Four threshold levels (0-25%, 25-50%, 50-75%, 75-100%) of maximum perfusion count were used to contour different perfusion zones of the lung



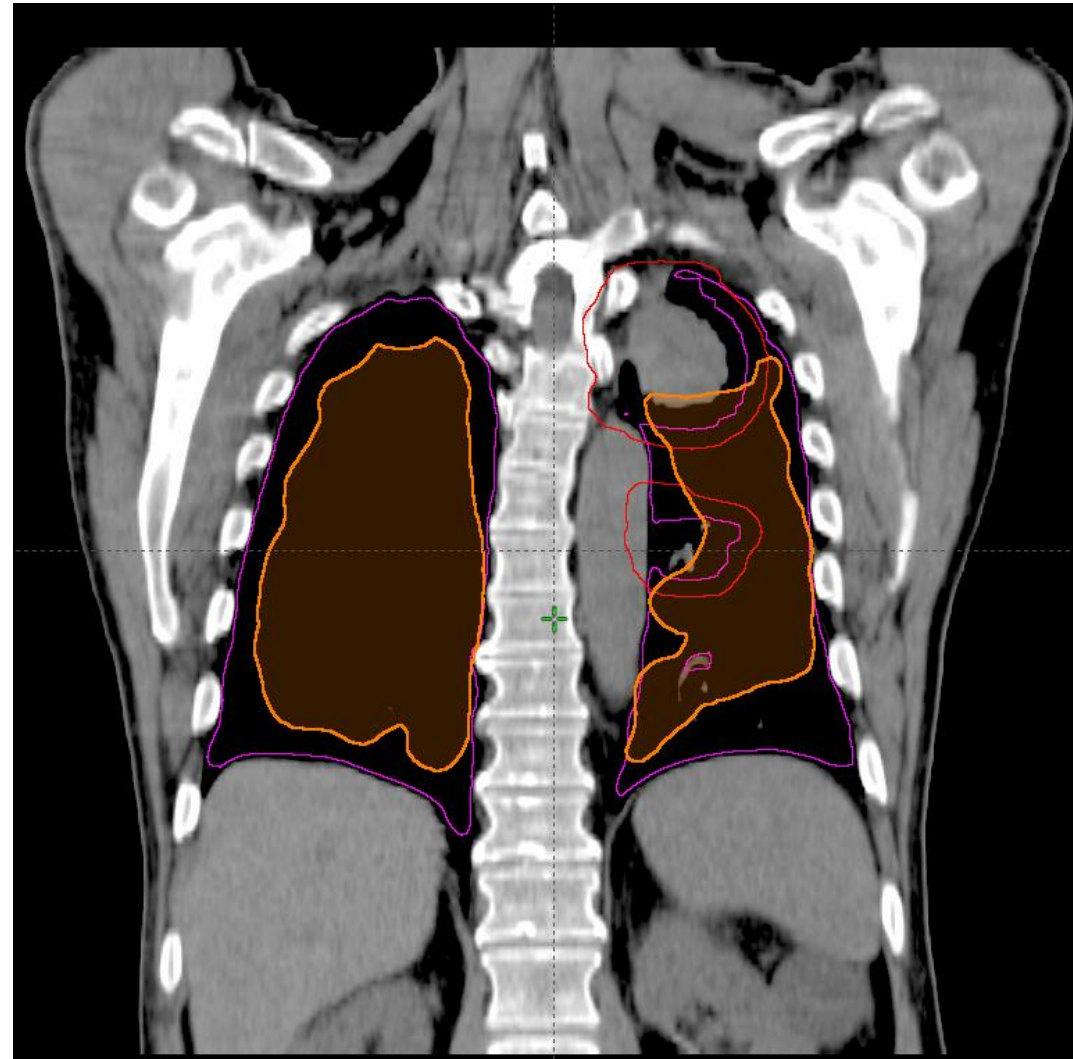
Functional segmentation (1)

STRUCTURE	REDUCTION (%)	VOLUME cc
SPECT 0-25%	2,8 %	2248
SPECT 25-50%	16,8 %	1293,35
SPECT 50-75%	39,8 %	399,85
SPECT 75-100%	91 %	36,6



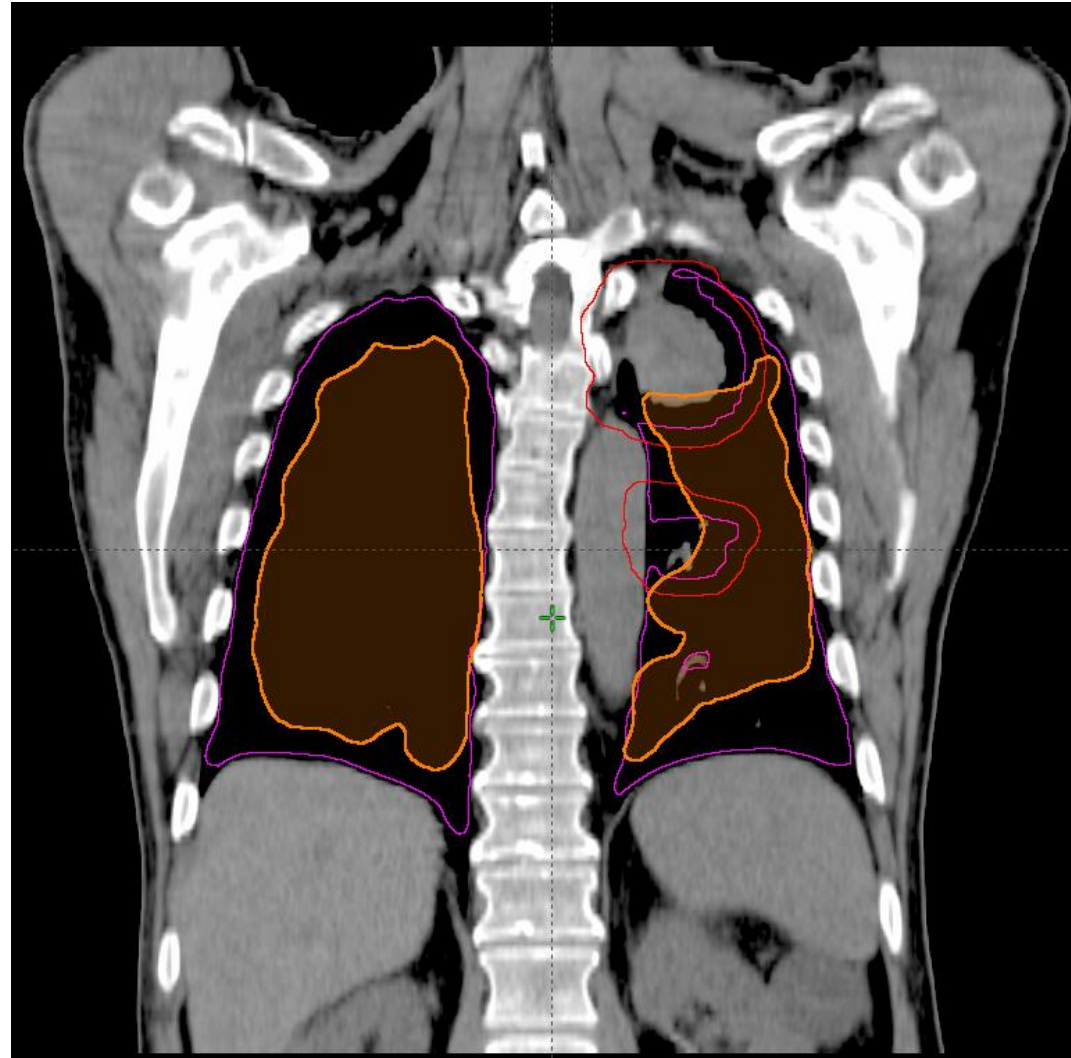
Functional segmentation (2)

One threshold level – perfusion more than 30% .



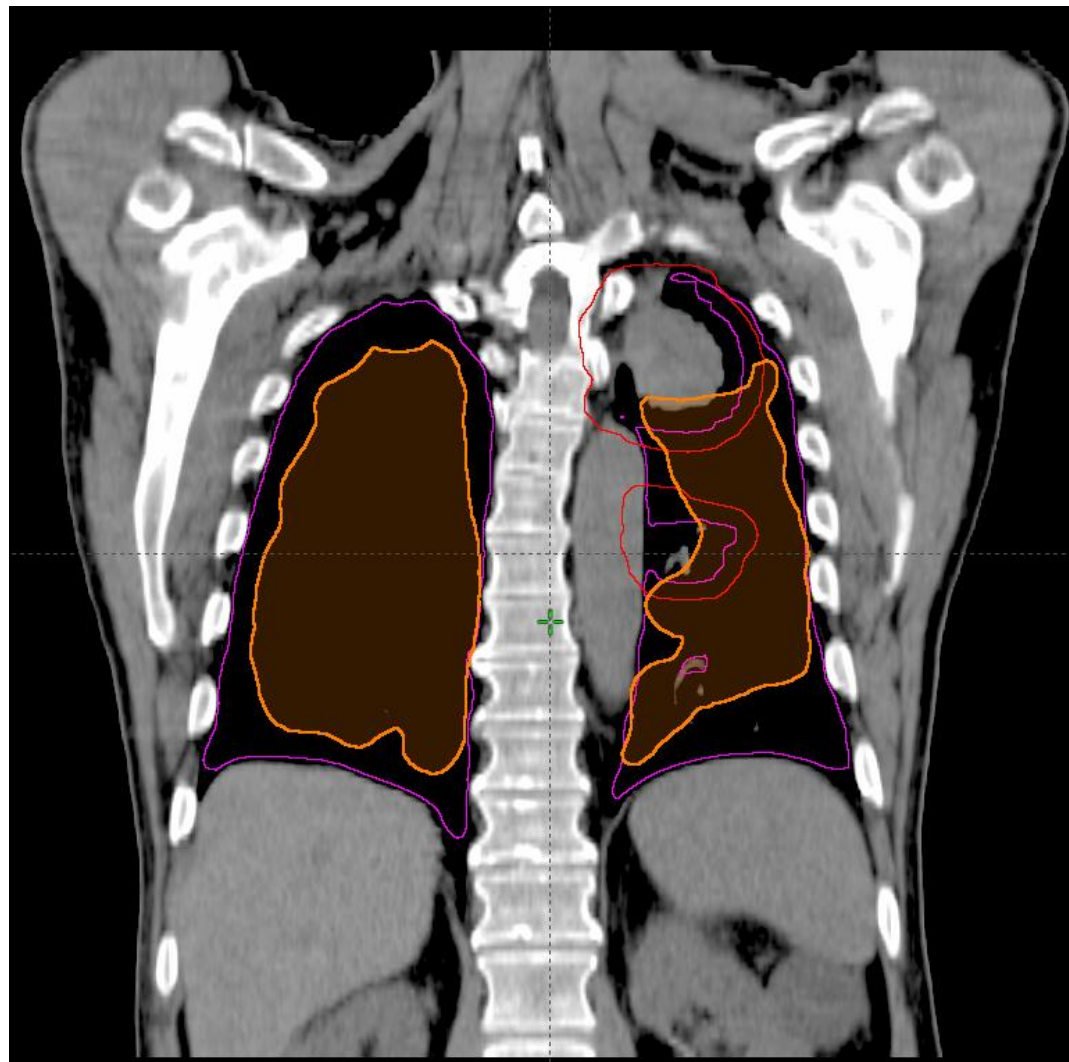
Functional segmentation (2)

Characteristic	Reduction (%)
MLD	11,4
V5Gy	19,1
V15Gy	23,0
V20Gy	16,5



Functional segmentation (2)

Characteristic	Reduction (%)
CI	2,25
HI	13,3



Conclusions

1. We can identify functioning areas of the lung which must be spared.
2. The implementation of additional structures and constraints without changing other planning parameters resulted in reduced doses.
3. Changes in conformity and homogeneity indices occurred after optimization slightly lowers plan quality, but lung sparing benefits in SPECT based plans.
4. Reduced dose to healthy and well-functioning lung tissue could lead to reduced RP manifestation and increased quality of life.

Thank You

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