

Lungekreft

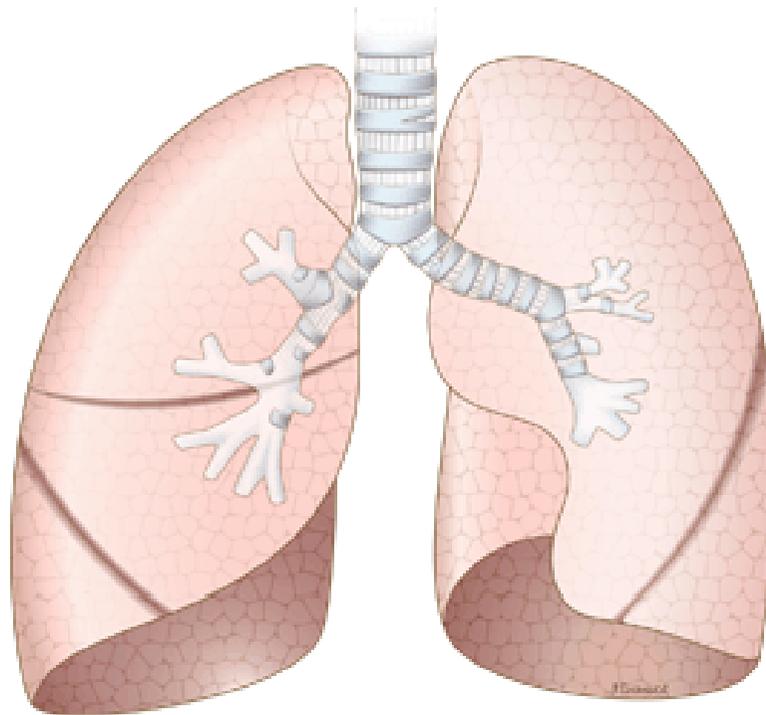


Odd Terje Brustugun

Radiumhospitalet

5. februar 2013

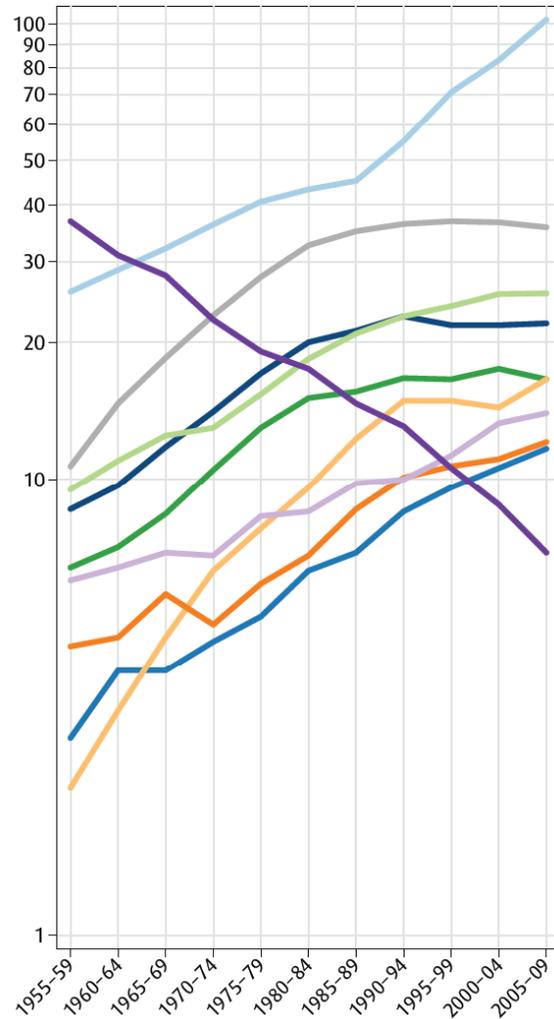
Epidemiologi



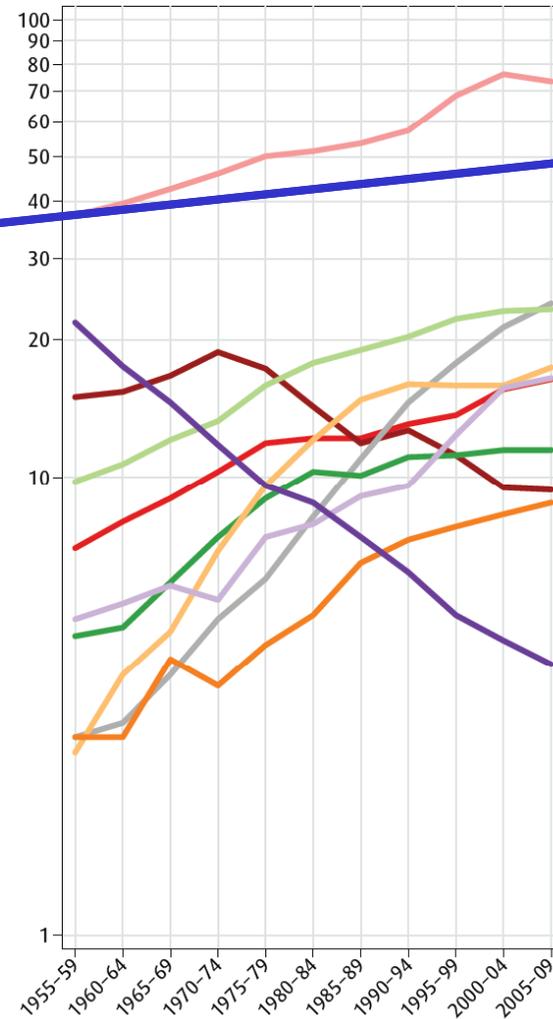
Incidence

- Prostate
- Breast
- Lung, trachea
- Melanoma of the skin
- Stomach
- Testis
- Corpus uteri
- Colon
- Non-Hodgkin lymphoma
- Bladder, ureter, urethra
- Cervix uteri
- Rectum, rectosigmoid, anus
- Central nervous system

MALES

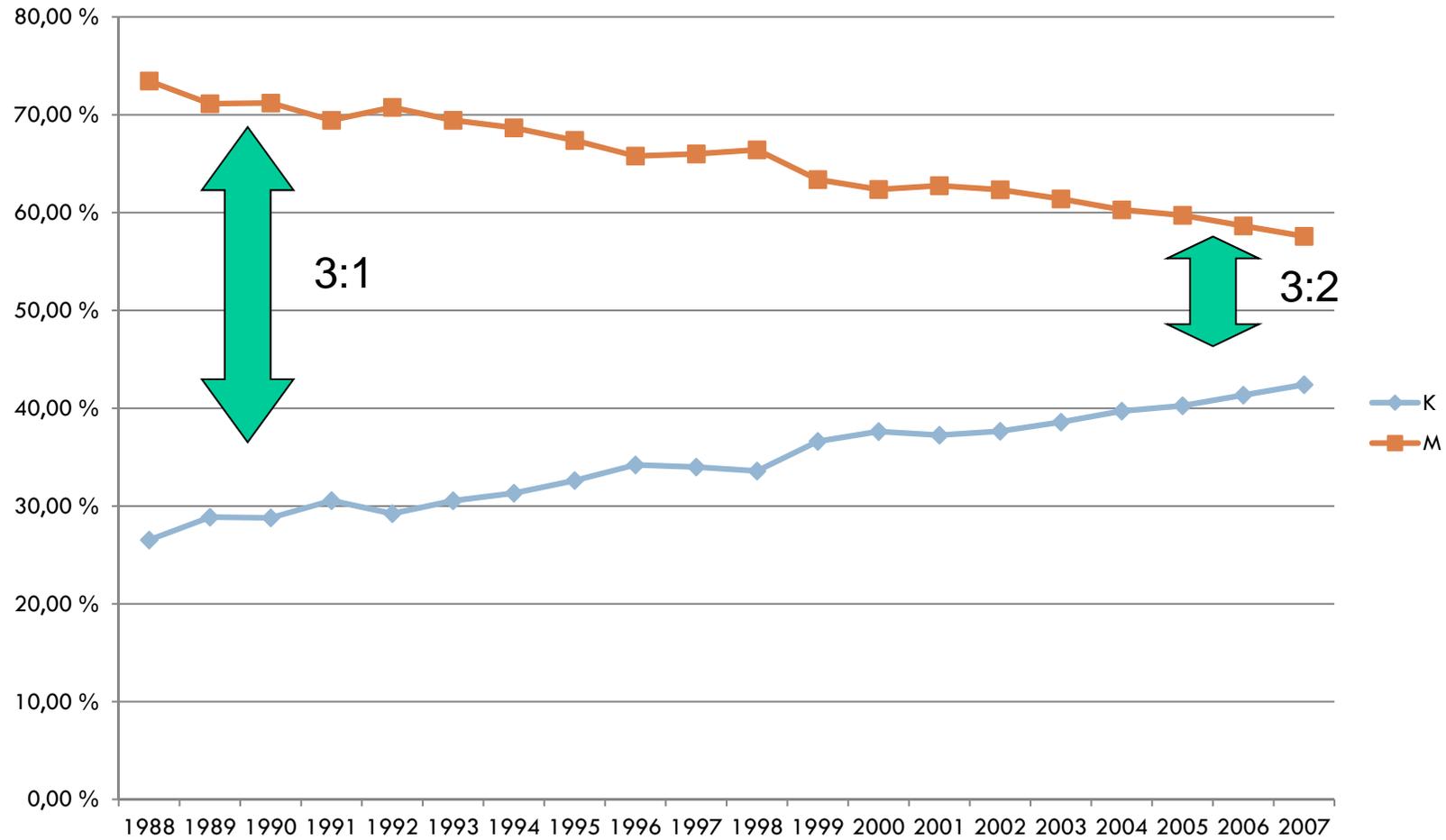


FEMALES

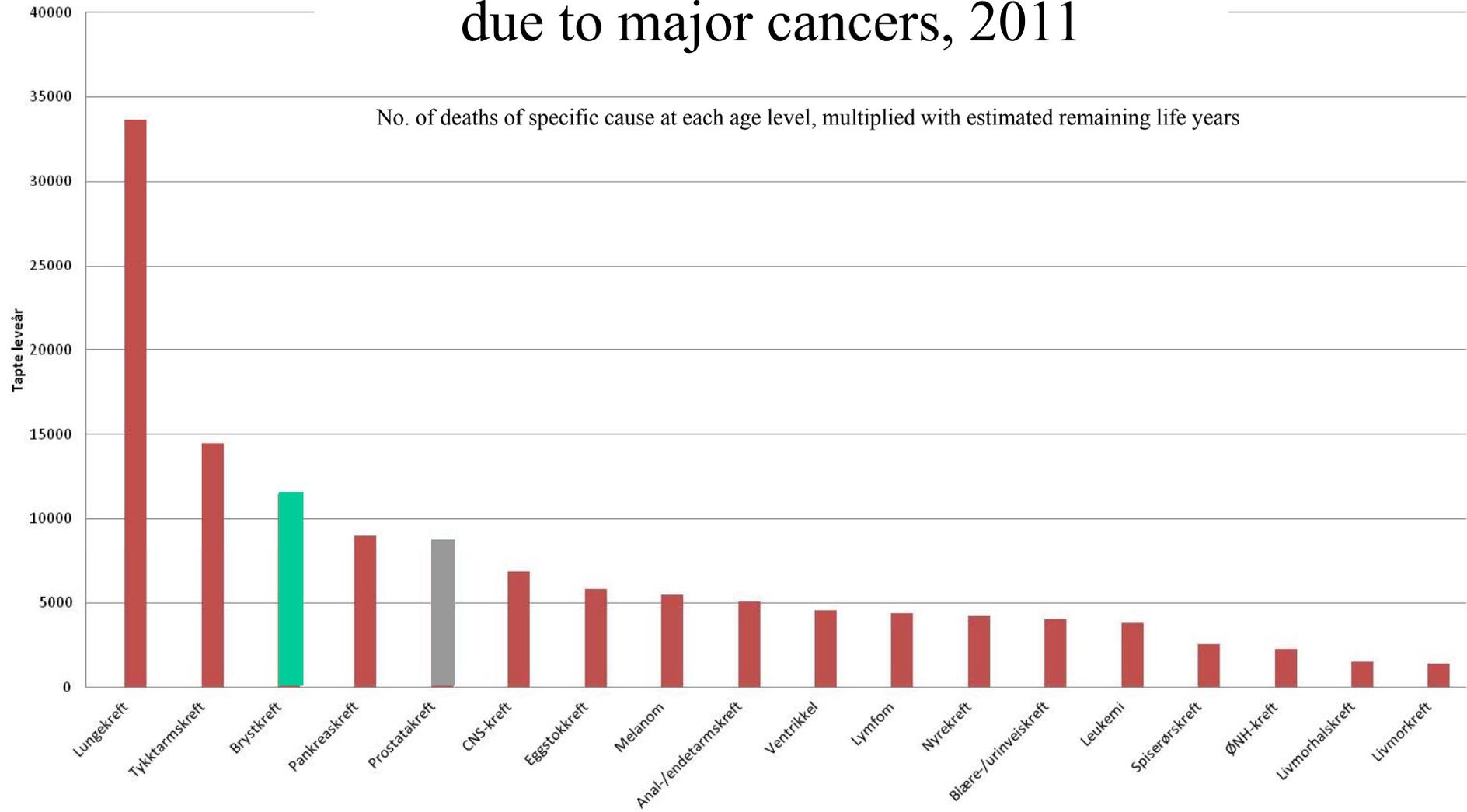


← 2. →

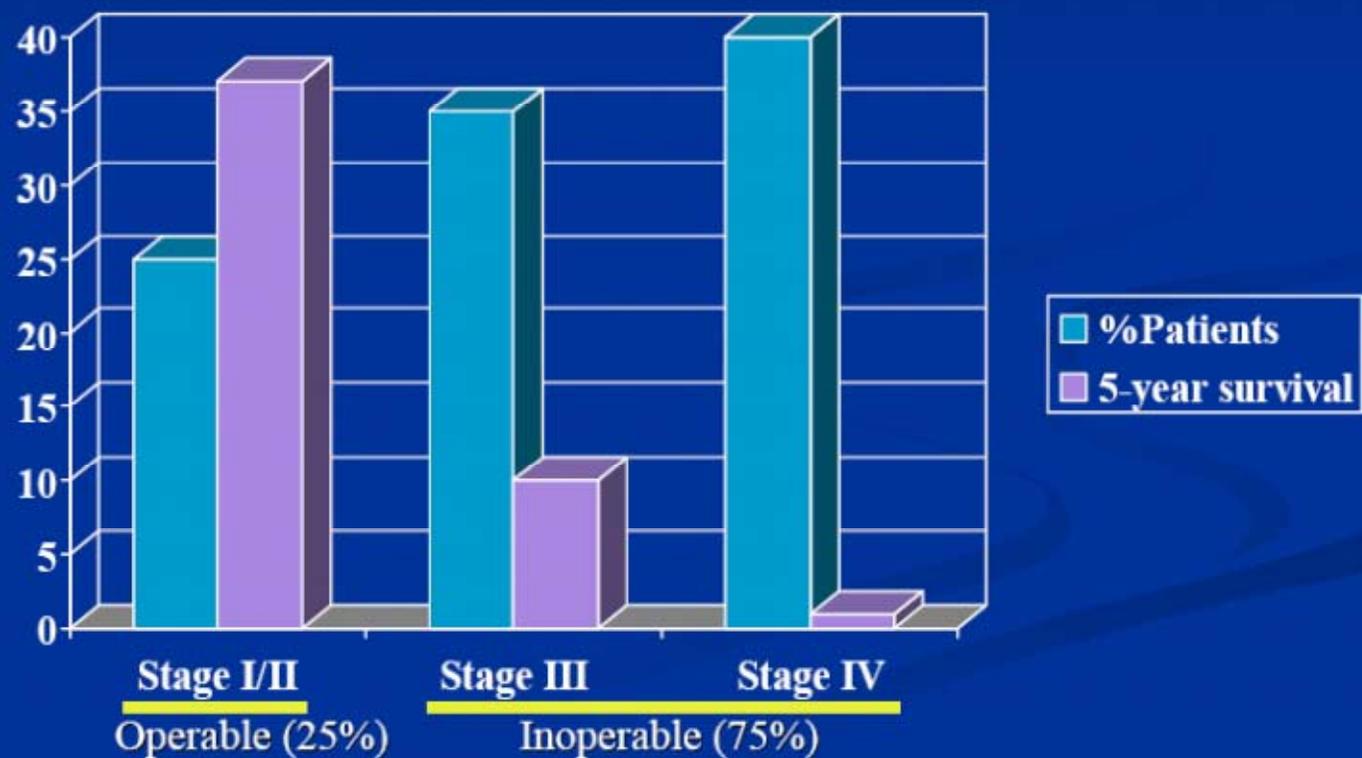
Kjønnsfordeling



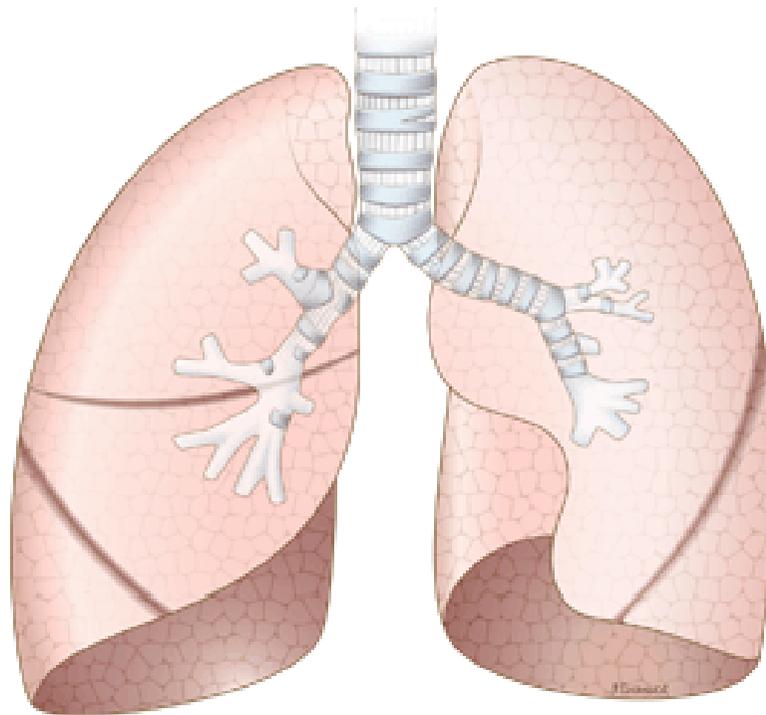
Years of life lost due to major cancers, 2011



Lungcancer overlevelse



Inndeling

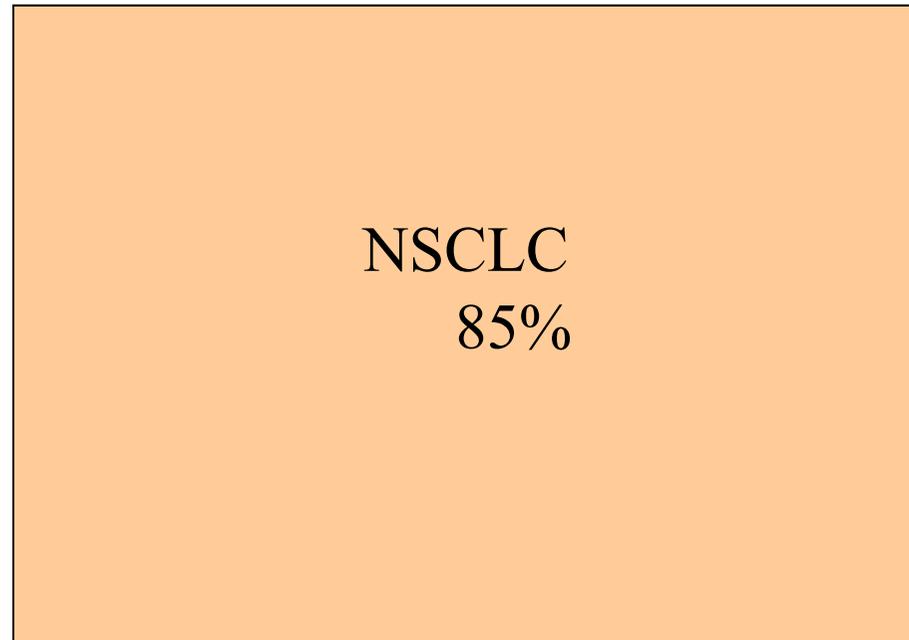


Vevstyper



2,8 x 15

1,5 x 15 x 2



8,5 x 2

3 x 10-13

2 x 25

2 x 30-35

Stadium (TNM-7)

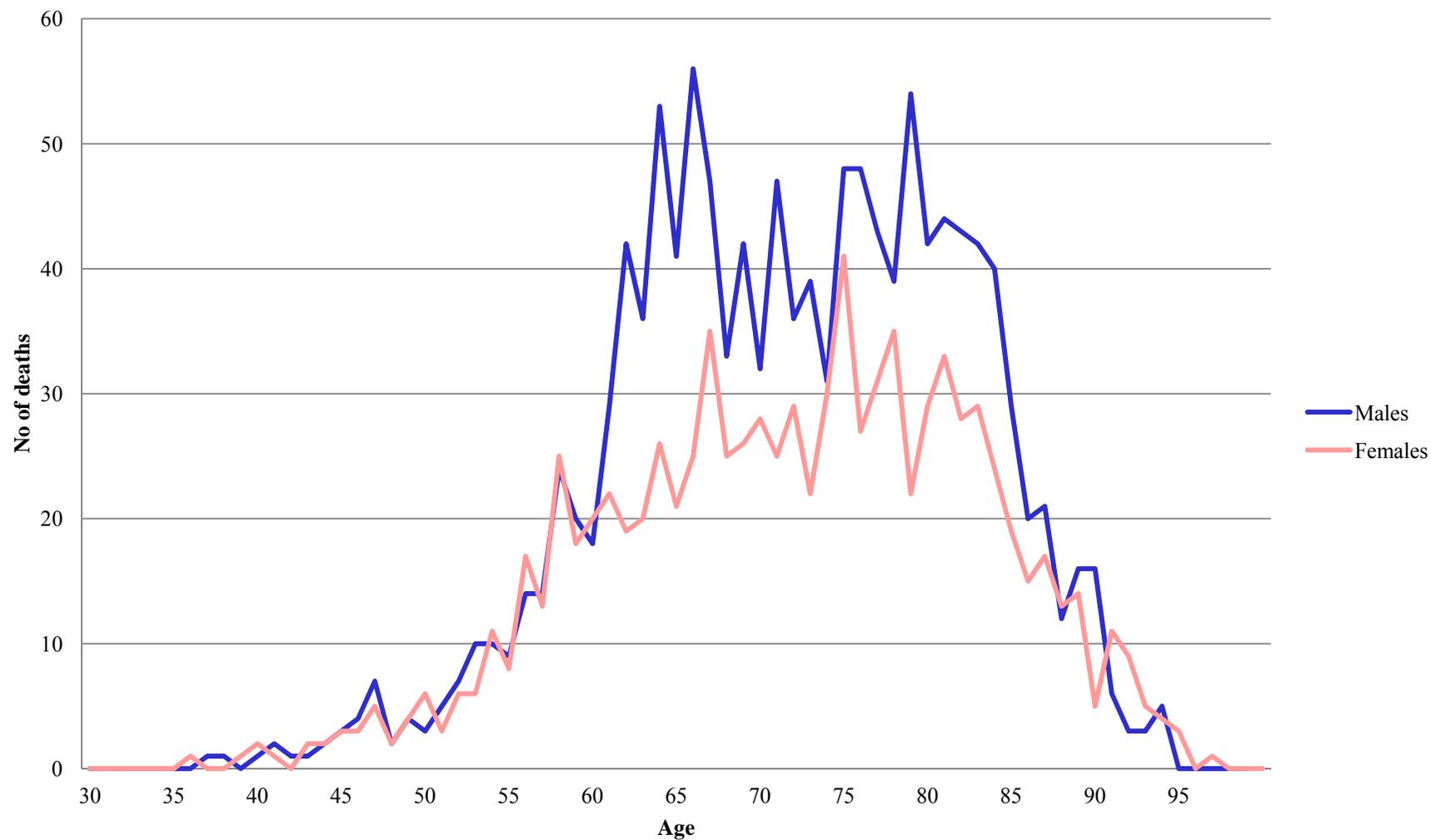
Stage grouping	T	N	M
Occult carcinoma	TX	N0	M0
Stage 0	Tis	N0	M0
Stage IA	T1a,b	N0	M0
Stage IB	T2a	N0	M0
Stage IIA	T2b	N0	M0
Stage IIB	T1a,b	N1	M0
	T2a	N1	M0
	T2b	N1	M0
Stage IIIA	T3	N0	M0
	T1a,b, T2a,b	N2	M0
	T3	N1, N2	M0
Stage IIIB	T4	N0, N1	M0
	T4	N2	M0
Stage IV	Any T	N3	M0
	Any T	Any N	M1

SCLC

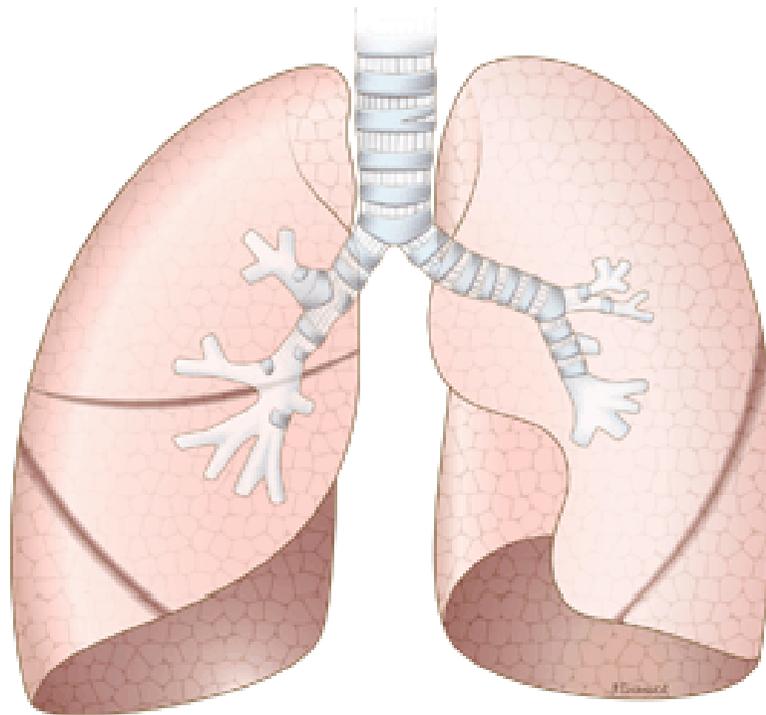
Begrenset sykdom

Utbredt sykdom

Aldersfordeling, ca pulm



Stråleterapi



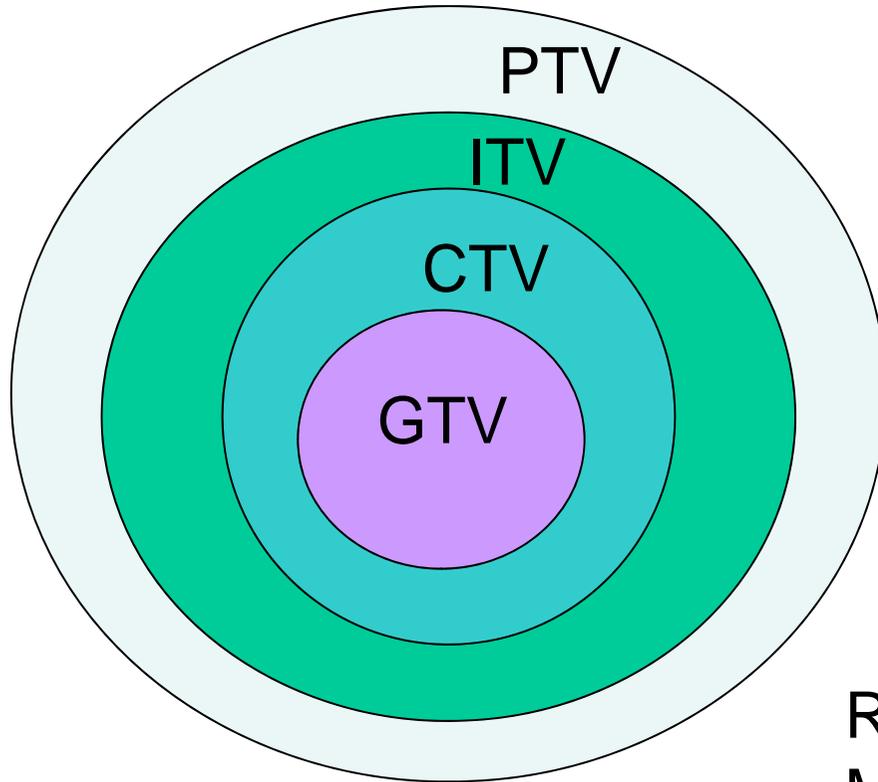
Strålebehandling

- Ca 60% av alle pasientene med lungecancer vil ha behov for strålebehandling (Tyldesley 2001)
 - SCLC 53%
 - NSCLC 64%

Husk

- Symptomlindring er poenget hos de fleste
 - Plager nå
 - Forventa plager
- Kort forventa levetid
 - Langvarig hospitalisering?
 - Det beste kan bli det godes fiende

CT doseplanlagt strålebehandling lungecancer



GTV: gross tumor volume
CTV: clinical target volume
ITV: internal target volume
PTV: planning target volume

Risikoorgan:

Medulla – 50Gy

Friskt lungevev – $V_{20} < 35\%$

Hjerte - $< 60\text{Gy}$ til $1/3$ av volumet

Costae - $< 50\text{ Gy?}$

Dybdedoser

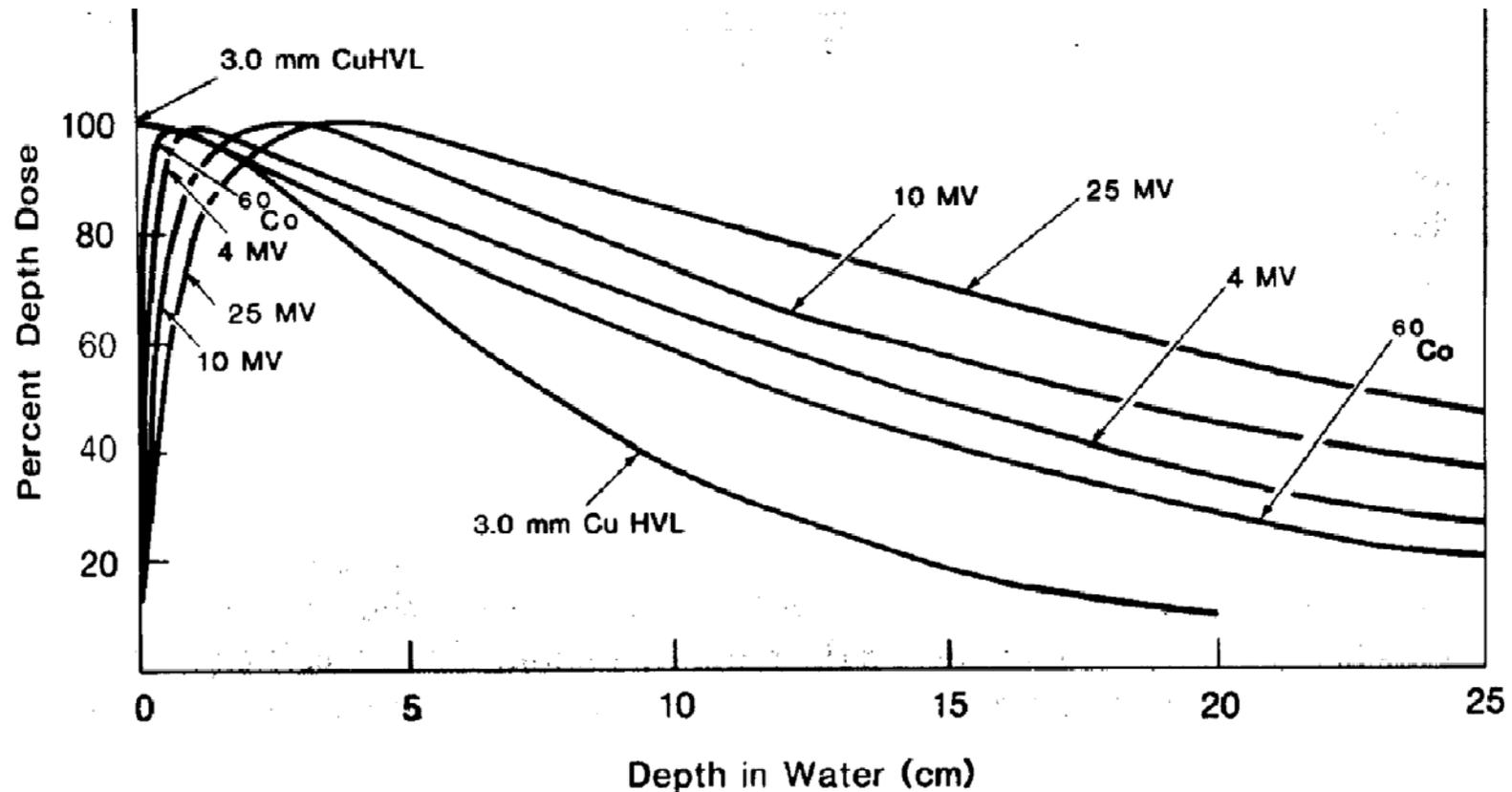
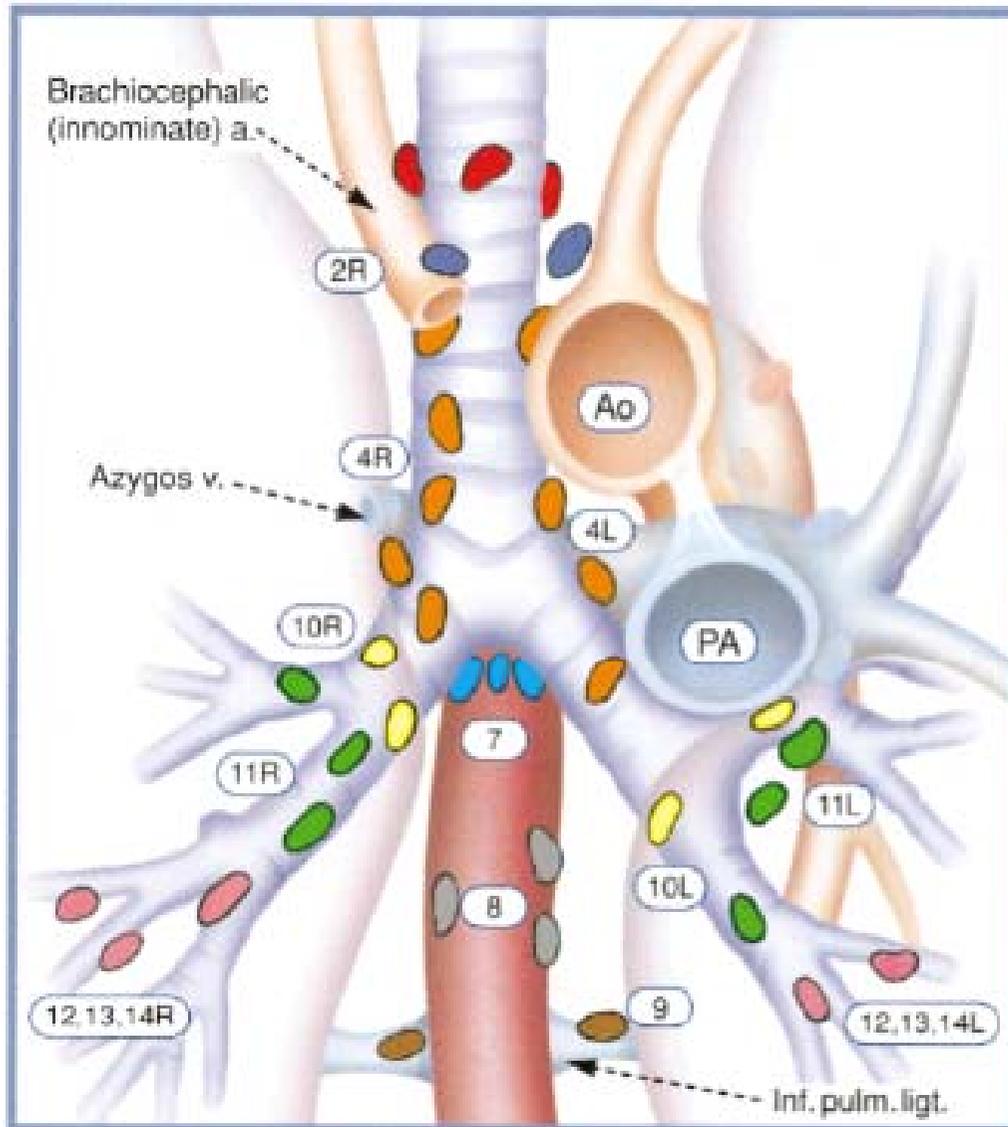


Figure 9.3. Central axis depth dose distribution for different quality photon beams. Field size, 10×10 cm; SSD = 100 cm for all beams except for 3.0 mm Cu HVL, SSD = 50 cm. Data are from Hospital Physicists' Association. Central axis depth dose data for use in radiotherapy. Br J Radiol 1978;(suppl 11); and the Appendix.

Glandelstasjoner



Superior Mediastinal Nodes

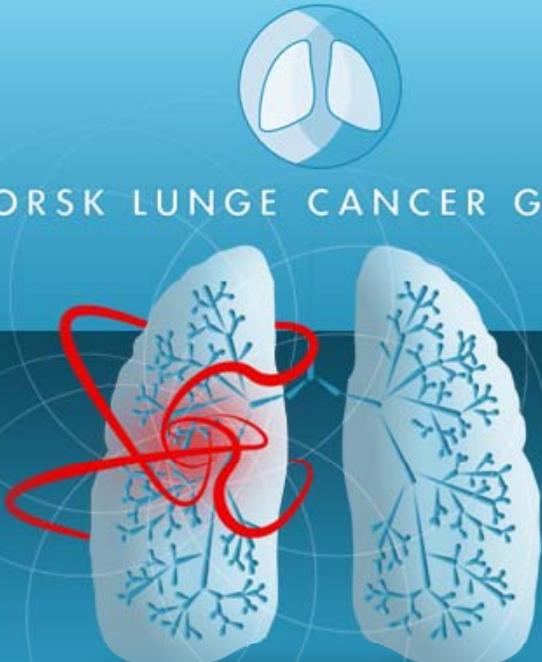
- 1 Highest Mediastinal
- 2 Upper Paratracheal
- 3 Pre-vascular and Retrotrachea
- 4 Lower Paratracheal (including Azygos Nodes)

N_2 = single digit, ipsilateral

N_3 = single digit, contralateral or supraclavicular

Aortic Nodes

- 5 Subaortic (A-P window)
- 6 Para-aortic (ascending aorta or phrenic)



NORSK LUNGE CANCER GRUPPE

Velkommen!

Hovedinnholdet på nettsidene til NLCG er handlingsprogrammet, men her ligger også annen nyttig informasjon for lungekreft-interesserte leger, pasienter, pårørende og andre. Ansvarlig for sidene er Styret i Norsk lungekreftgruppe (se link til høyre).

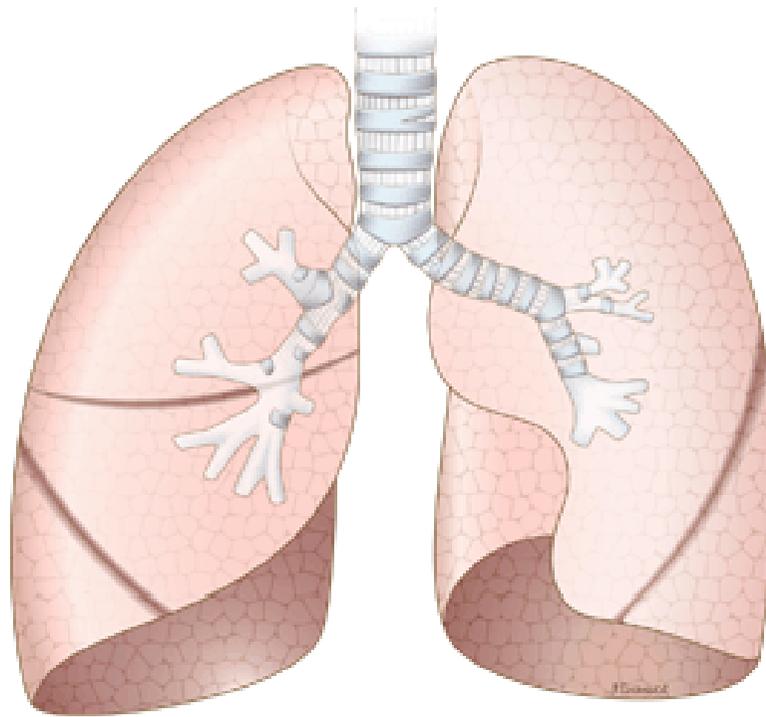
Vi håper internettssidene gir den informasjonen man forventer å finne, men forslag til endringer er selvsagt svært velkomne!

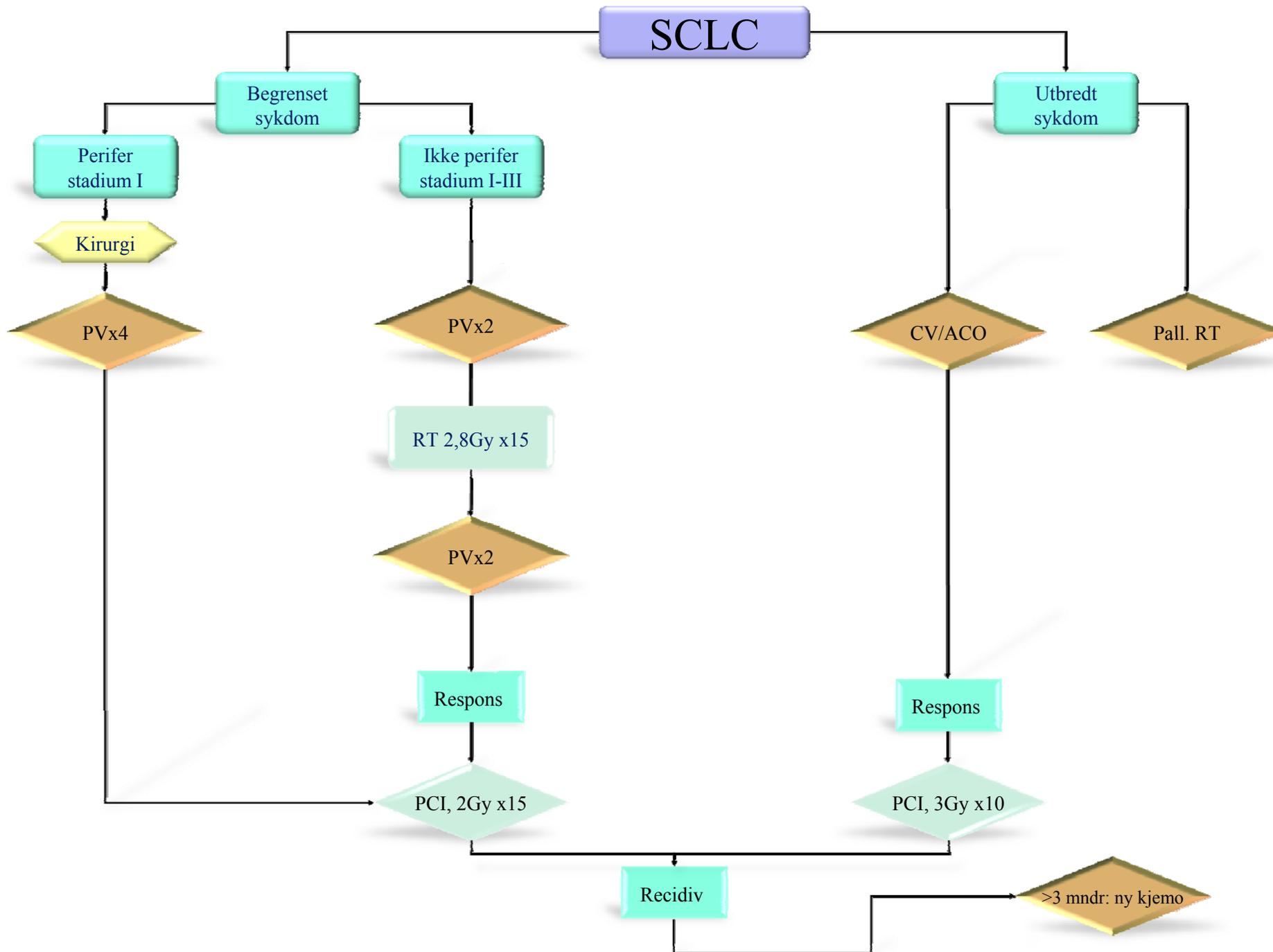
- Søk
- ▶ Forsiden
 - ▶ Retningslinjer for utredning og behandling av lungekreft
 - ▶ Retningslinjer for stråleterapi
 - ▶ Om NLCG
 - ▶ Organisasjon og kontaktinfo
 - ▶ Aktiviteter og referater
 - ▶ Publikasjoner
 - ▶ Studier ved enkelt-sykehus
 - ▶ Nyhetsbrev etc
 - ▶ Linker

Nyheter

- ETOP-kurset "2nd Residential workshop for young investigators in the field of thoracic malignancies" holdes 29.-31. august i Lugano, Sveits. Kurset anbefales varmt. Kursavgift og opphold dekkes av ETOP, der NLCG er medlem. Kun reisen må dekkes av deltageren, evt kan NLCG være behjelpelig med dette, etter søknad. Ta kontakt med et av [NLCG-styremedlemmene](#) for ytterligere informasjon. Påmeldingsfrist 28.2 (2.2.13)
- Godkjente [statutter](#) for NLCG er lagt ut (2.2.13)
- Oppdatert [info om kliniske studier](#) er lagt ut (2.2.13)
- [Referat fra styringsgruppemøtet 21.11.12](#) er nå lagt ut (2.2.13)
- JVBA-studien for NSCLC (2. linje) er nå lukket pga fulltallighet (15.1.13)
- CREST-studien for småcellet lungekreft, utbredt sykdom, er nå [lukket for inklusjon pga fulltallighet](#) (28.11.12)
- Overlege Hans Henrik Strøm mottok "BI Cancer Research Award" under Onkologisk forum. Les mer [her](#). (23.11.12)
- Programmet til årets [onkologisk forum](#) er lagt ut (16.10.12, oppdatert 24.10: inkludert styringsgruppemøtet onsdag kveld)
- Ny versjon av [Handlingsprogram for utredning og behandling av lungekreft](#) er

SCLC





WEB1000

Undersøkelse | Miniaturbilde | Visning | Rapport | Konferanse

42 296 1 25 75 1

Serie 1 Serie 2 cor 3/3

Serie 1 Serie 2 cor 3/3

150208

ACCES# 01128549

A80

046Y
F

R 1 7 4 L 1 7 4

Tilsendt us, CT thorax
W: 300, C: 40
MAG: 122%
7.0:1

P265

Sykehuset Buskerud

ACCES# 01128549

S1855

046Y
F

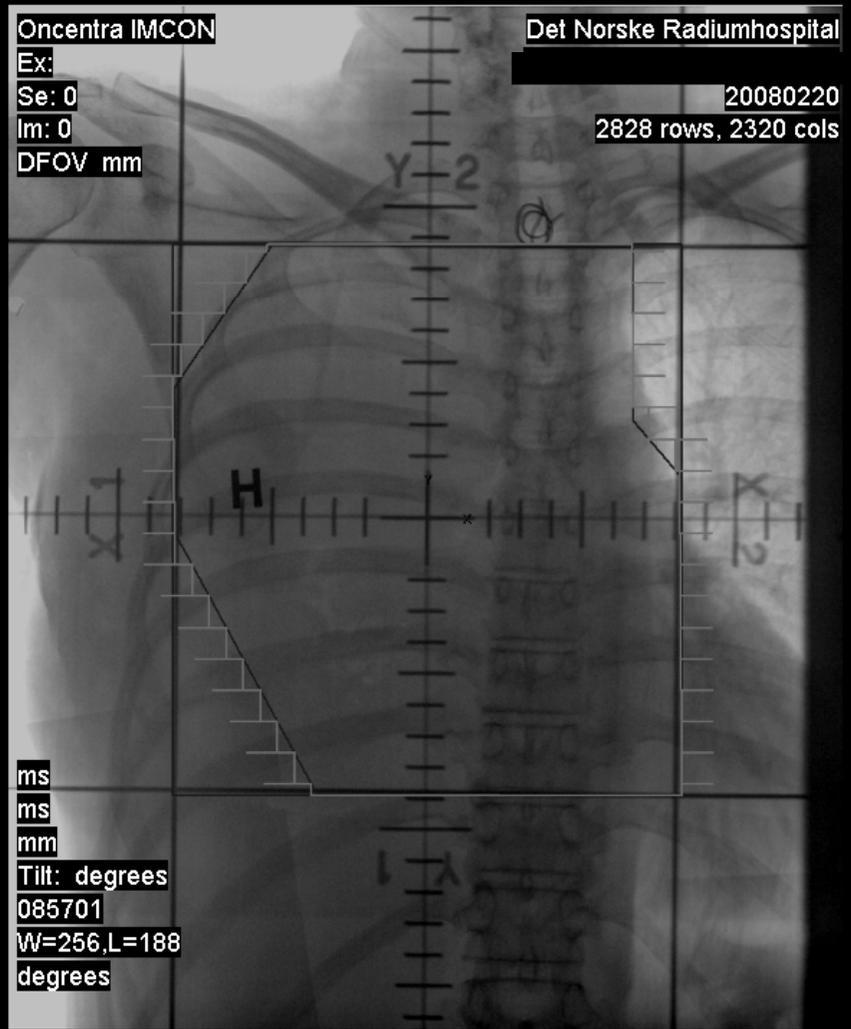
R 1 7 4 L 1 7 4

Tilsendt us, CT thorax
W: 350, C: 50
MAG: 122%
5.8:1

S1510

Sykehuset Buskerud

Viser bilder... Brukernavn : otr, Gruppe : unrestricted_team pasweb 00:06



WEB1000

Undersøkelse | Miniaturbilde | Visning | Rapport | Konferanse

1 46 117

1 39 89

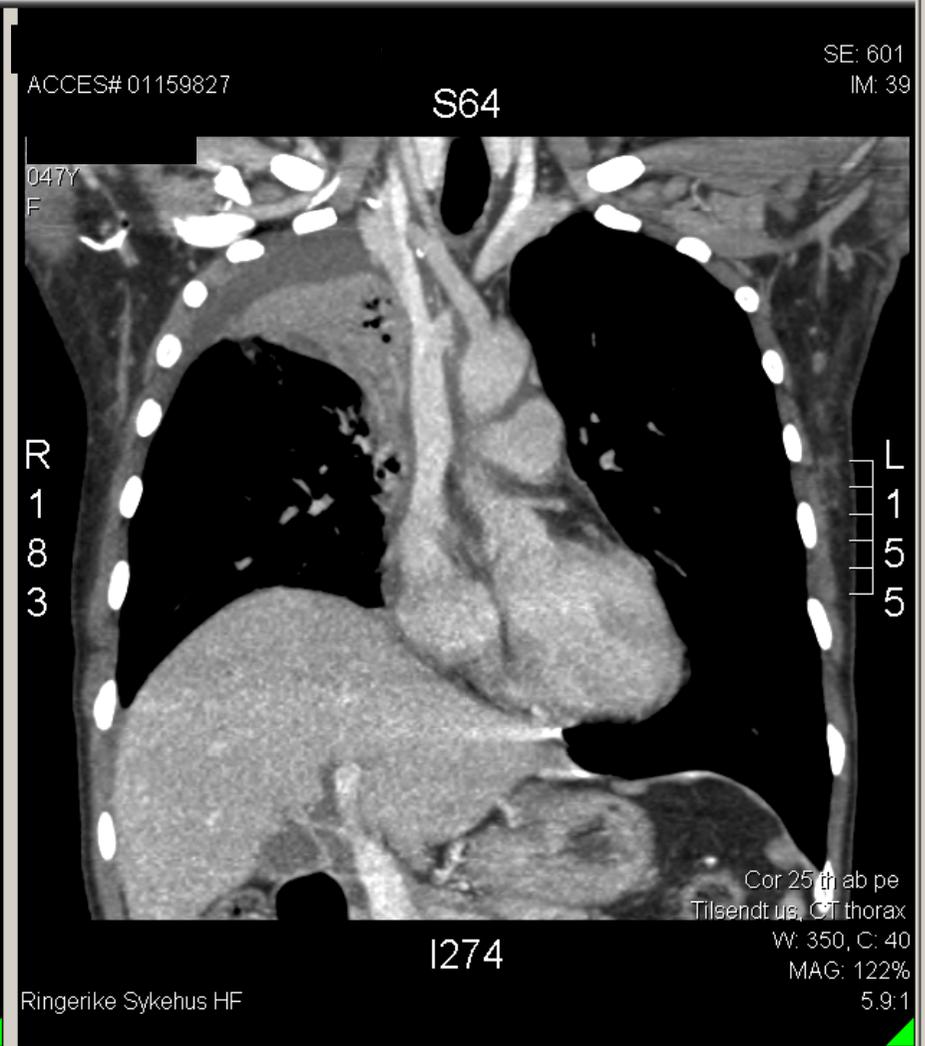
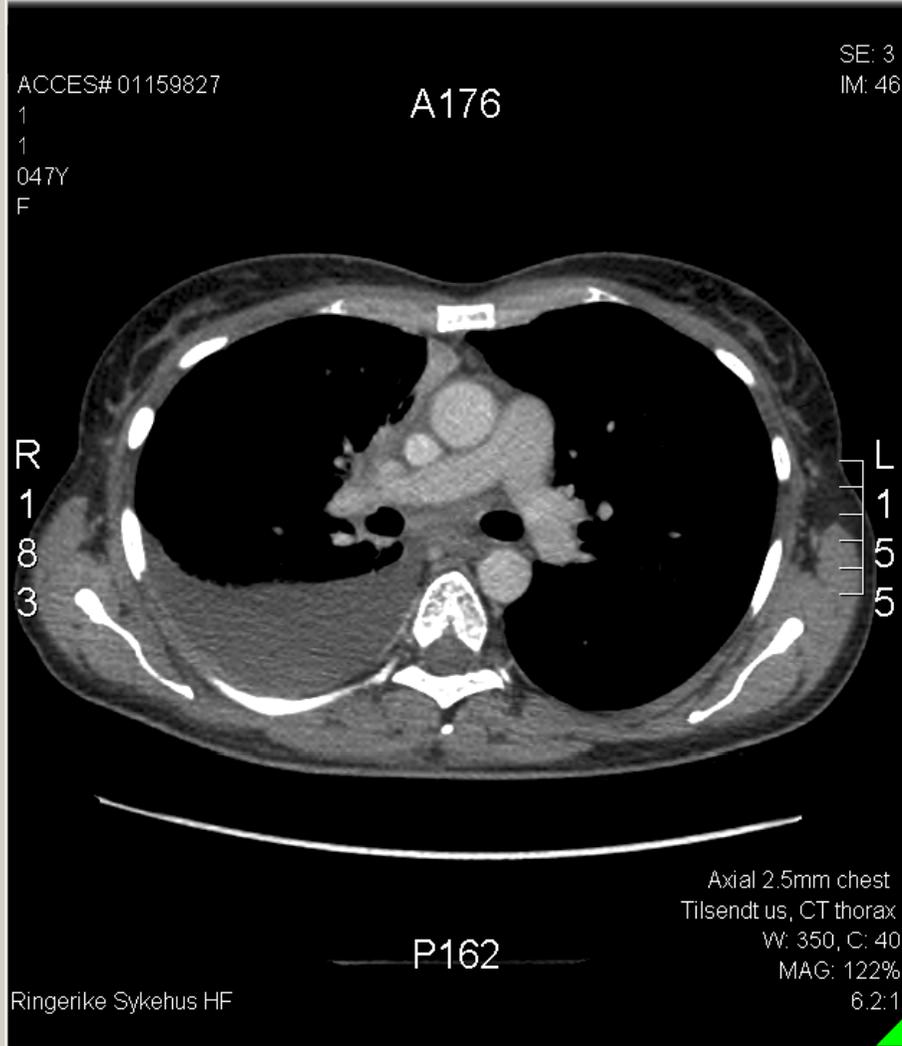
Serie 1 Axial 2.5mm chest HRCT 1.25 mm Cor

chest HRCT 1.25 mm Cor 25 th ab pe Dose Report

1

1

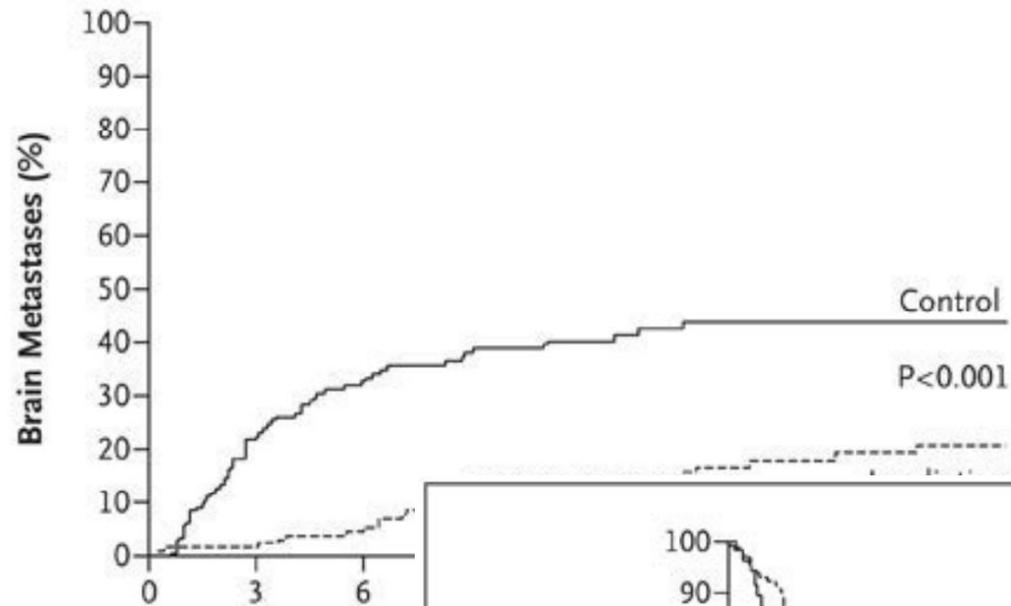
270508



Profylaktisk strålebehandling

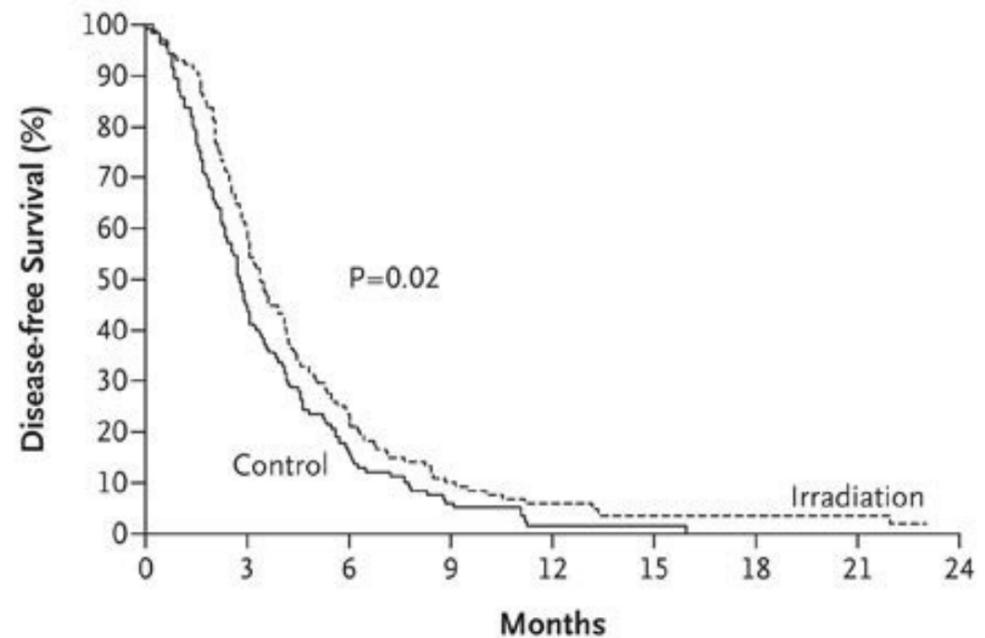
- SCLC begrenset sykdom i god remisjon
 - 2 Gy x15 mot total hjerne
 - innen 6 uker etter siste kjemo-kur
- SCLC utbredt sykdom med respons (kjemo)
 - 3 Gy x10 mot total hjerne
 - innen 6 uker etter siste kjemo-kur

PCI for SCLC-ED



No. at Risk

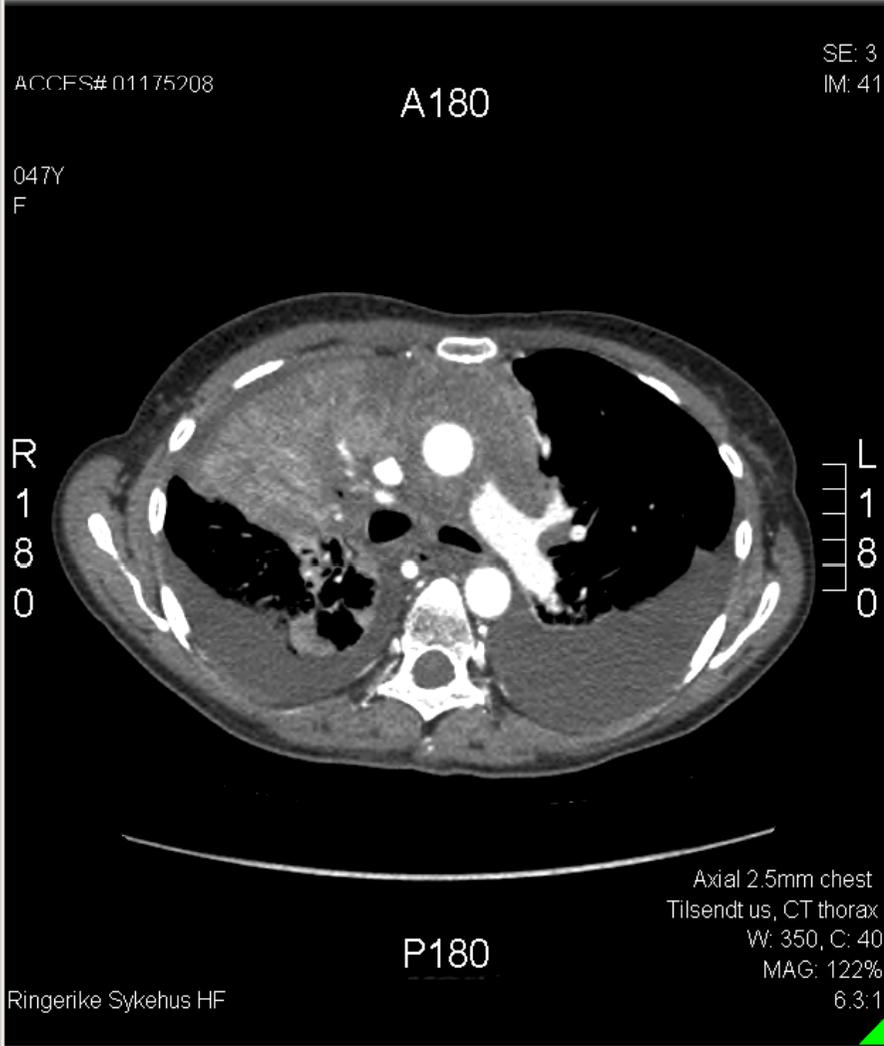
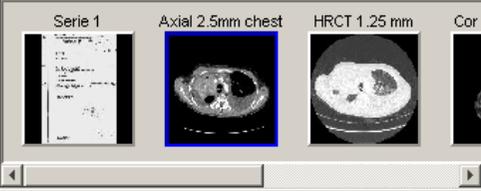
Control	143	94	48
Irradiation	143	119	66



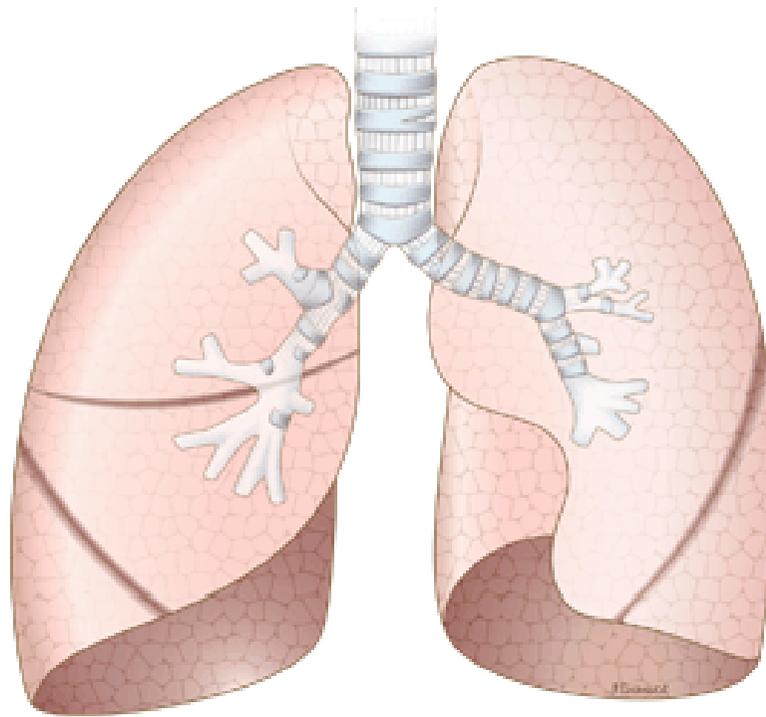
No. at Risk

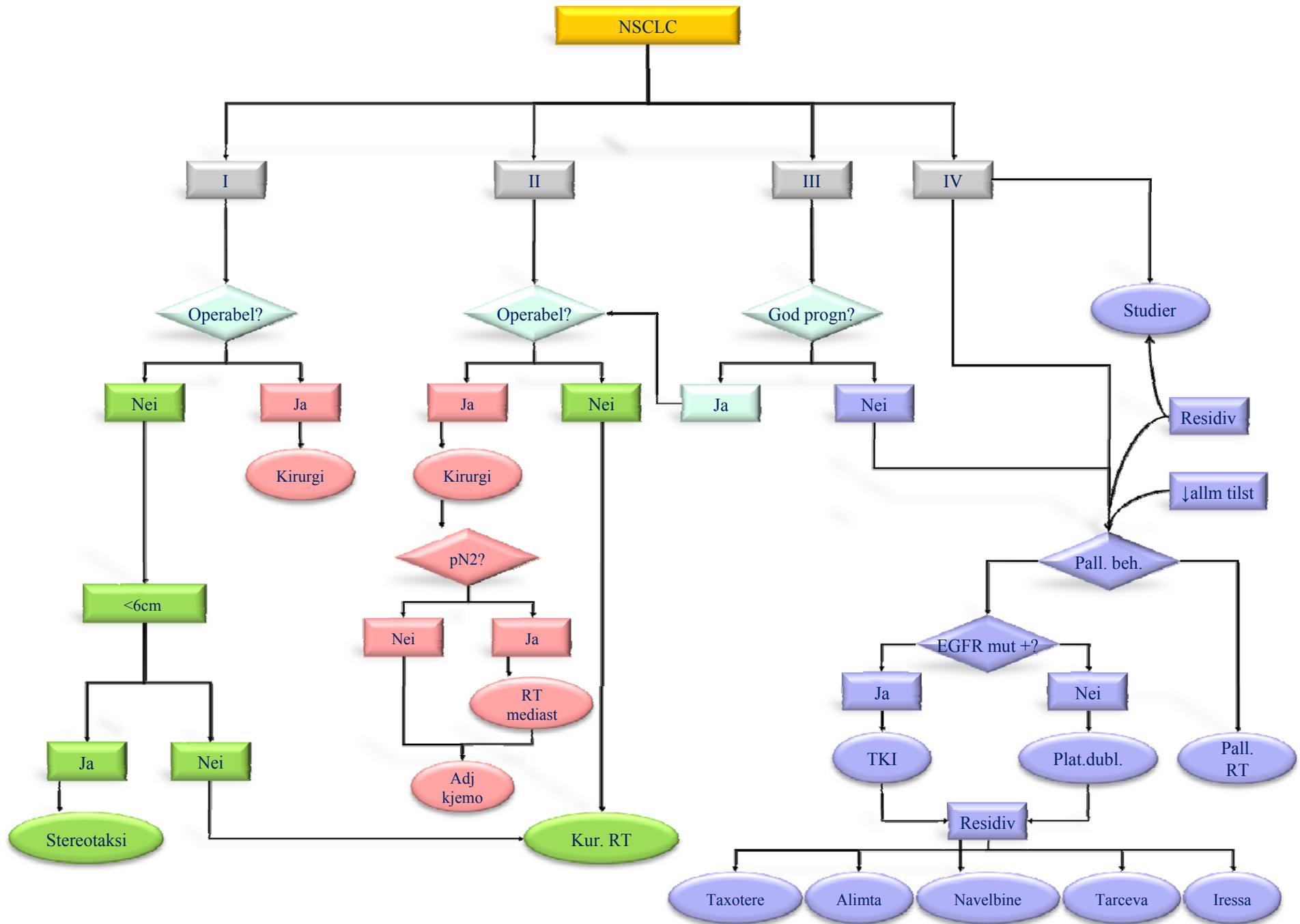
Control	143	62	20	8	1	1	0	0
Irradiation	143	79	30	13	6	3	3	2

230708



NSCLC





Kurativ strålebehandling NSCLC

Stadium I (T_1N_0 , $T_{2A}N_0$)

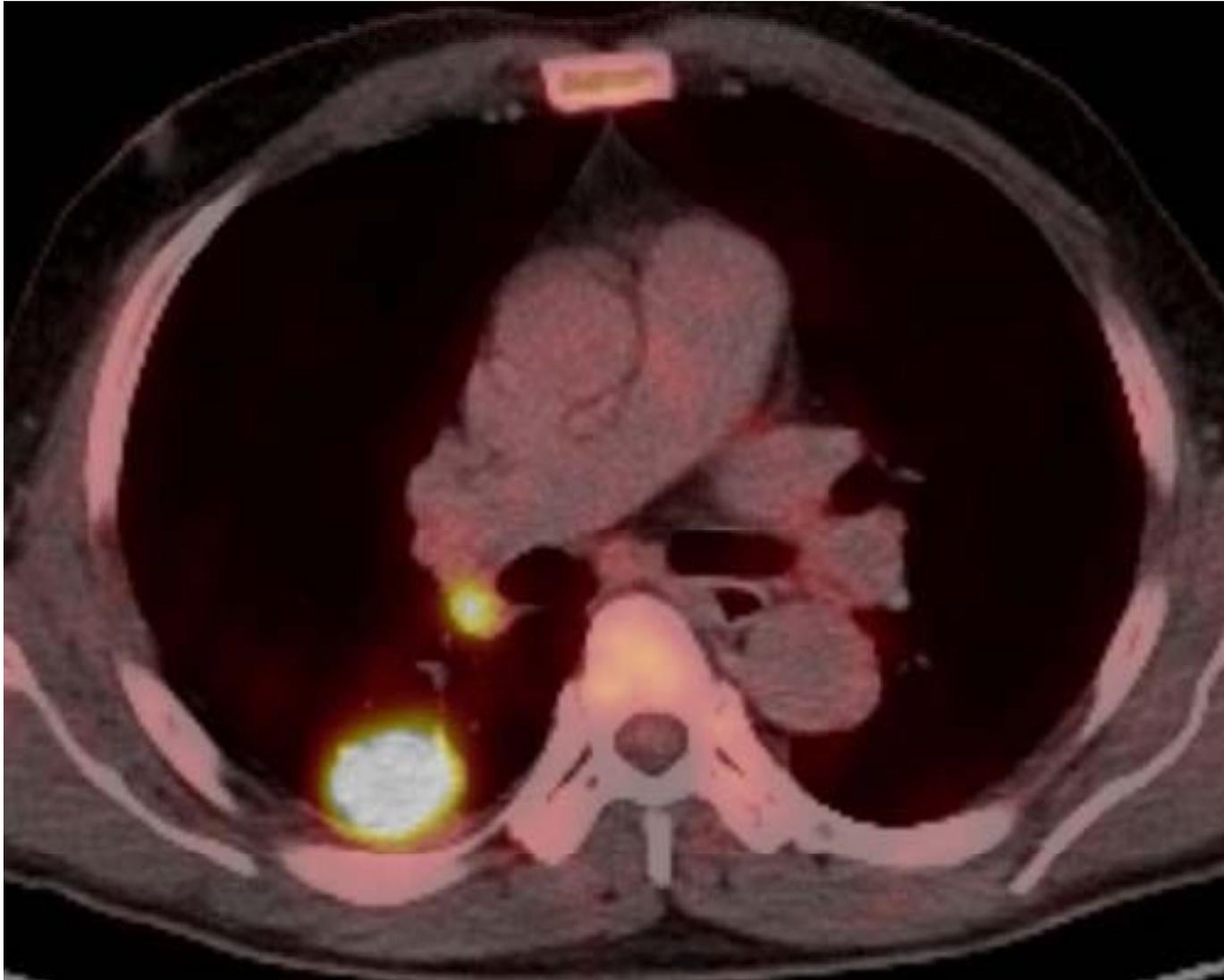
hvis ikke operabel

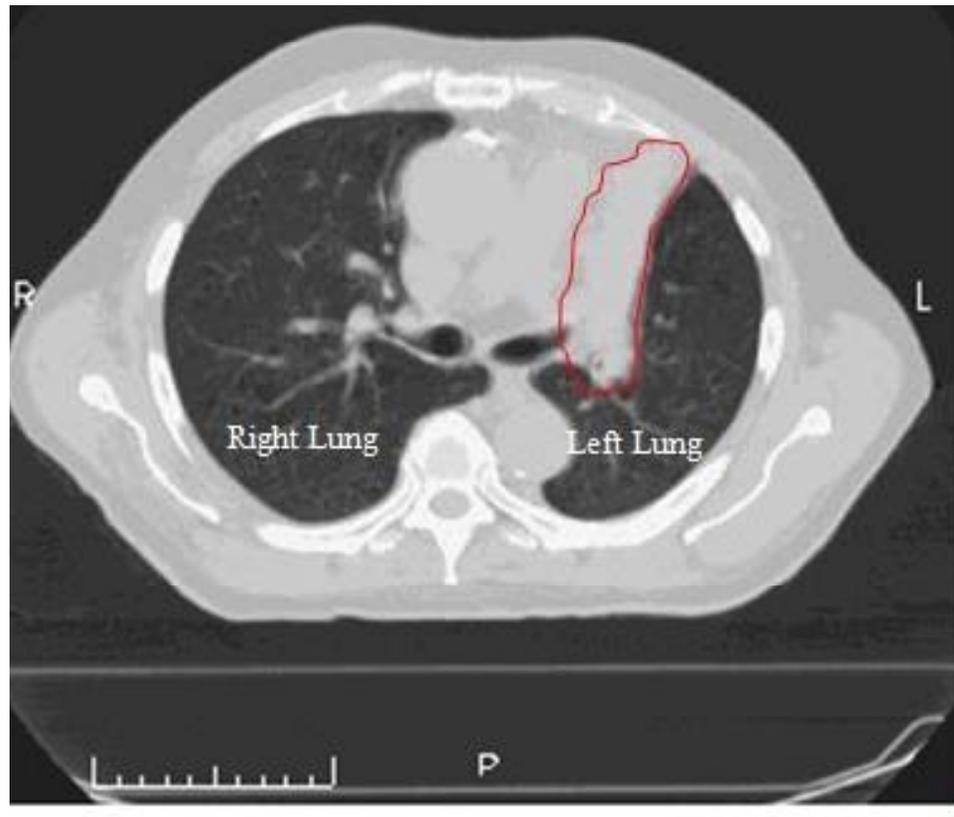
GTV = tumor (uten hilus/mediastinum)

Dosering: 2 Gy pr dagsfraksjon opp til 70 Gy

Ved perifer tumor $\emptyset < 5$ cm: 15 Gy x 3 stereotaktisk

PET/CT

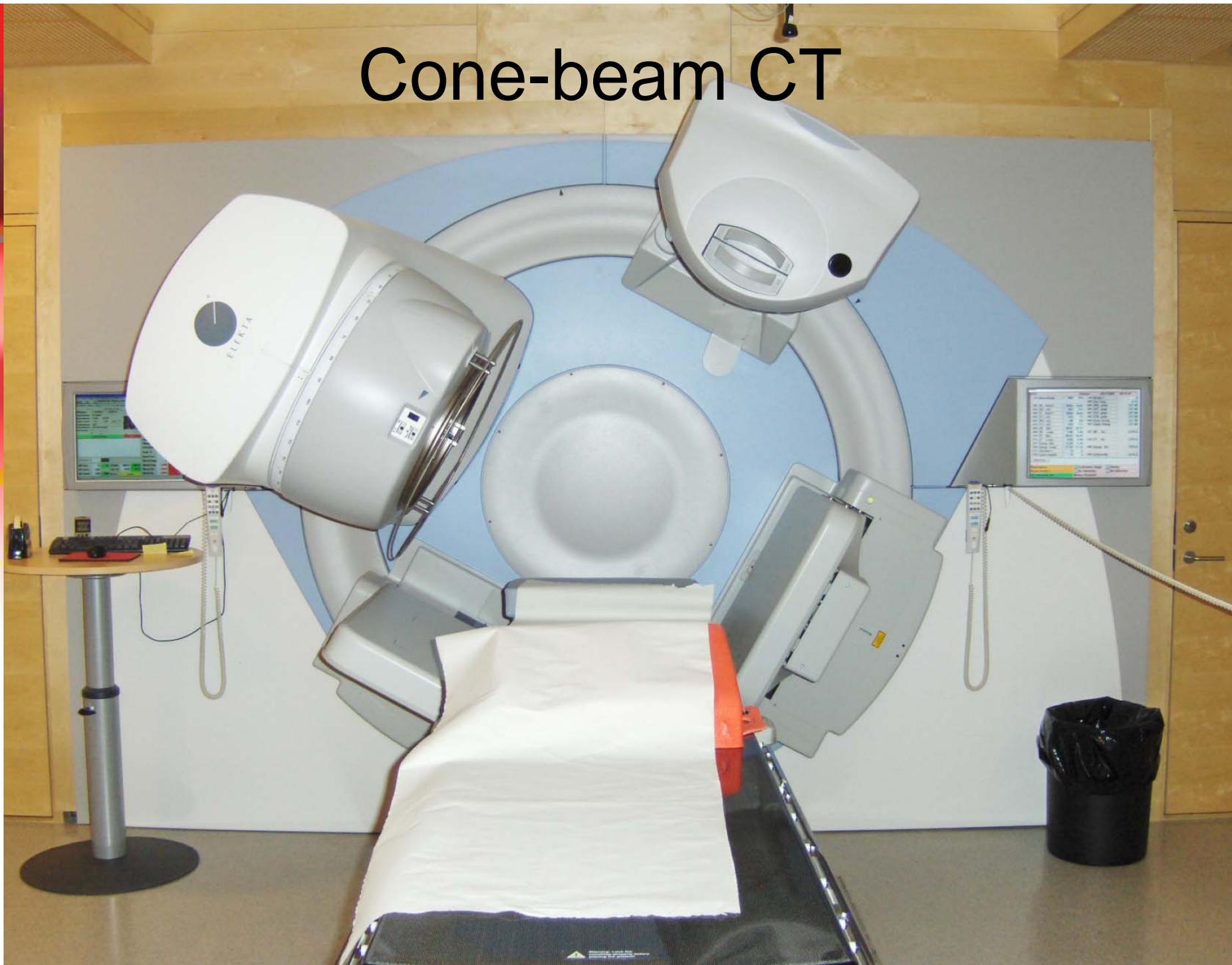


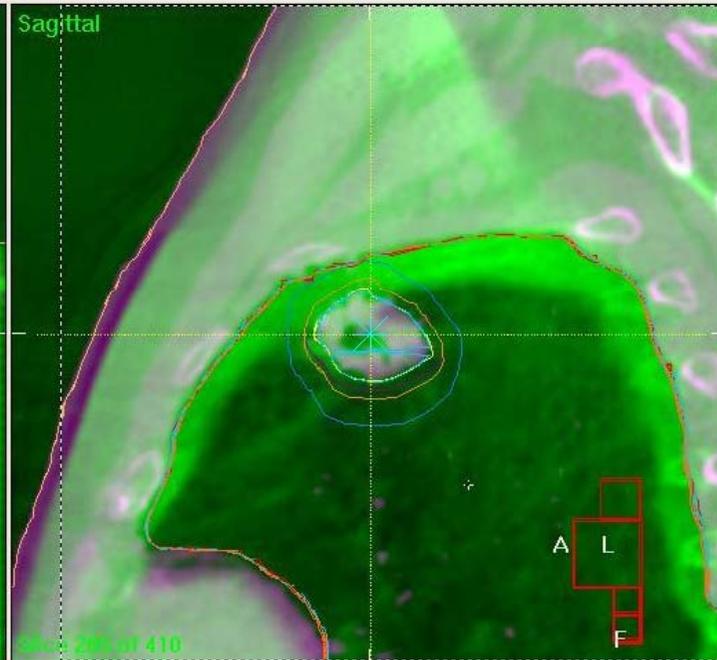
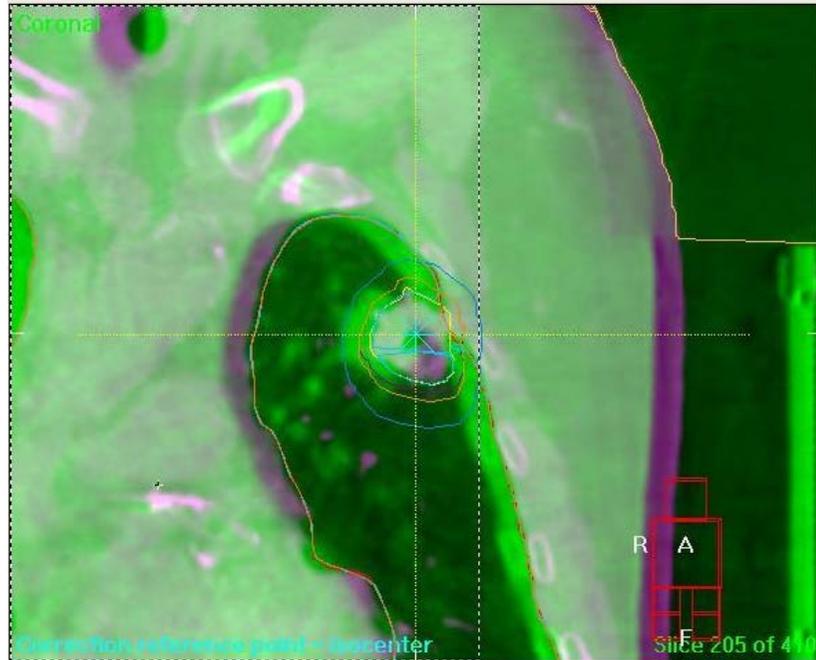


CT Scan

Figure 2. PET scan helps to differentiate tumor from the collapsed lung. This figure shows a comparison of CT and PET scans of a patient with lung cancer. Although it is difficult to outline the tumor from collapsed lung (red outlines both the tumor and the collapsed lung) on the CT scan, the intense area of FDG uptake in the PET scan clearly shows the location of active tumor, which is much brighter than the adjacent collapsed lung (blue).

Cone-beam CT





Image

Slice Averaging
none

Display Mode
Green-purple

GoTo..



Reference Preset

Cor Ref Point...

Scan

Alignment Clipboard

Structures ..

Alignment

Automatic Manual

Reset

Convert To Correction

Position Error

	Translation (cm)
X	0.00
Y	0.00
Z	0.00

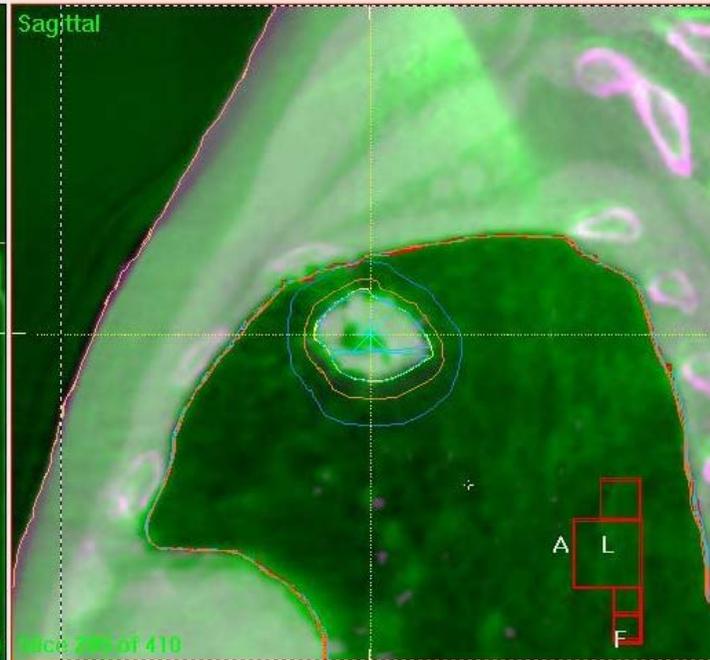
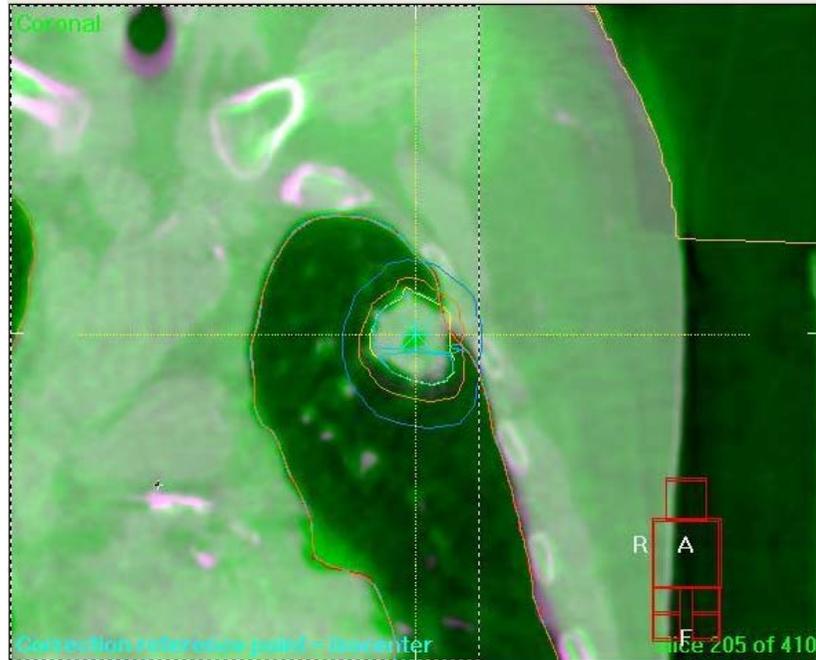
	Rotation (dg)
X	0.0
Y	0.0
Z	0.0

Table Correction (cm)

Lateral	-
Longitudinal	-
Vertical	-

Dismiss

Accept



Image

Slice Averaging
none

Display Mode
Green-purple

GoTo..

Reference Preset Cor Ref Point...

Scan

Alignment Clipboard

Structures ..

Alignment

Automatic Manual

Reset

Convert To Correction

Position Error

Translation (cm)	
X	0.00
Y	0.00
Z	0.00

Rotation (dg)

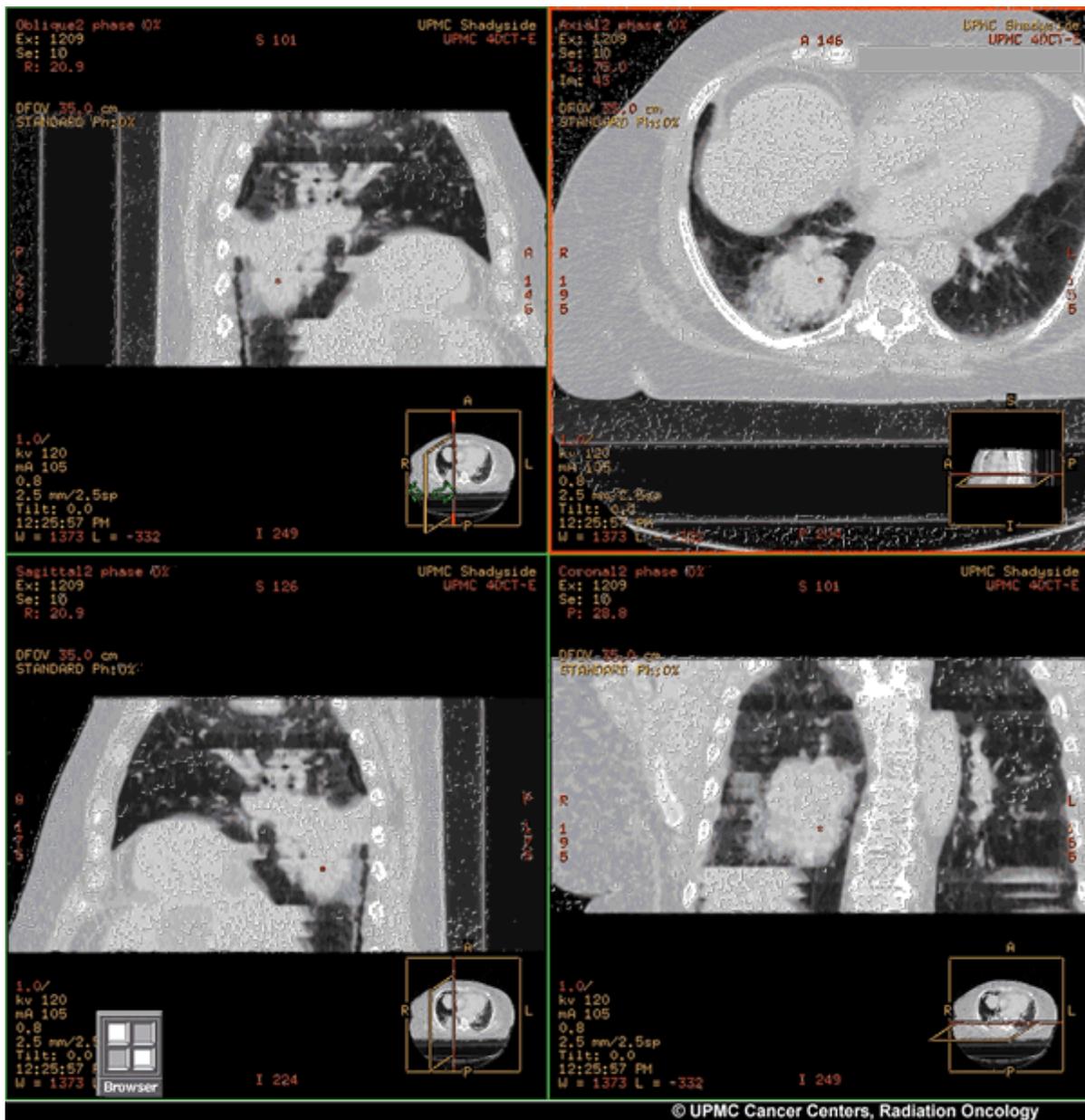
X	0.0
Y	0.0
Z	0.0

Table Correction (cm)

Lateral	-
Longitudinal	-
Vertical	-

Dismiss

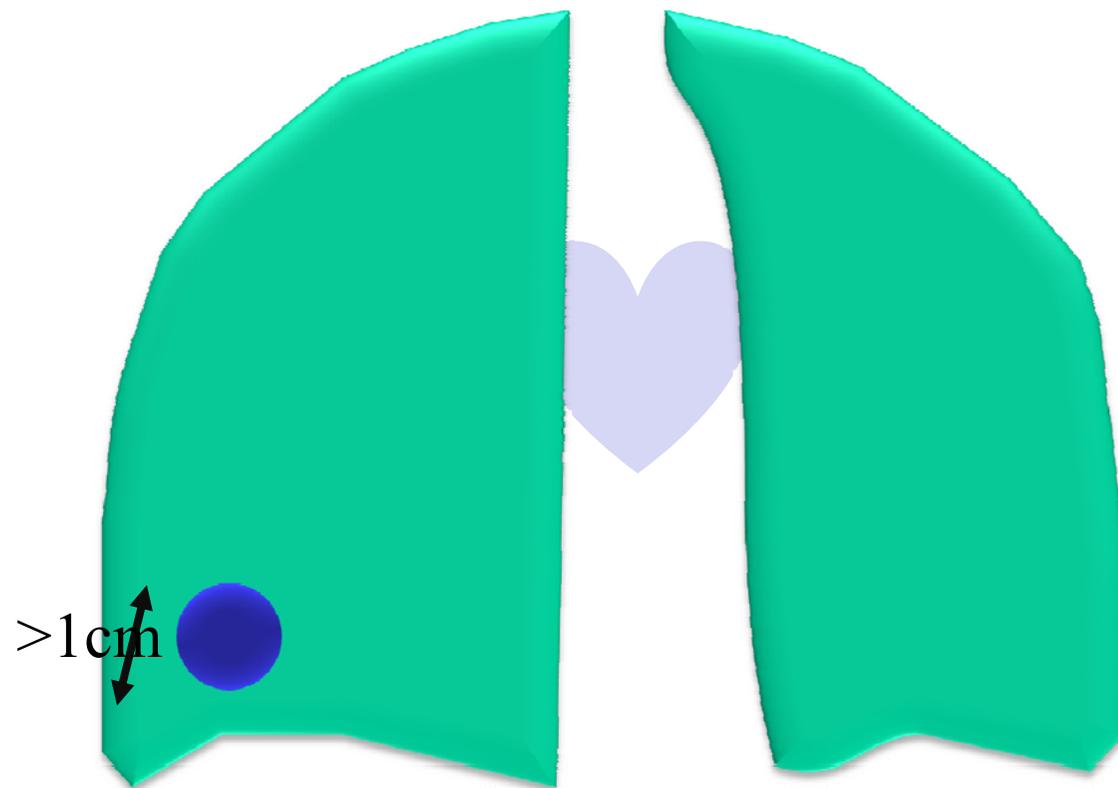
Accept



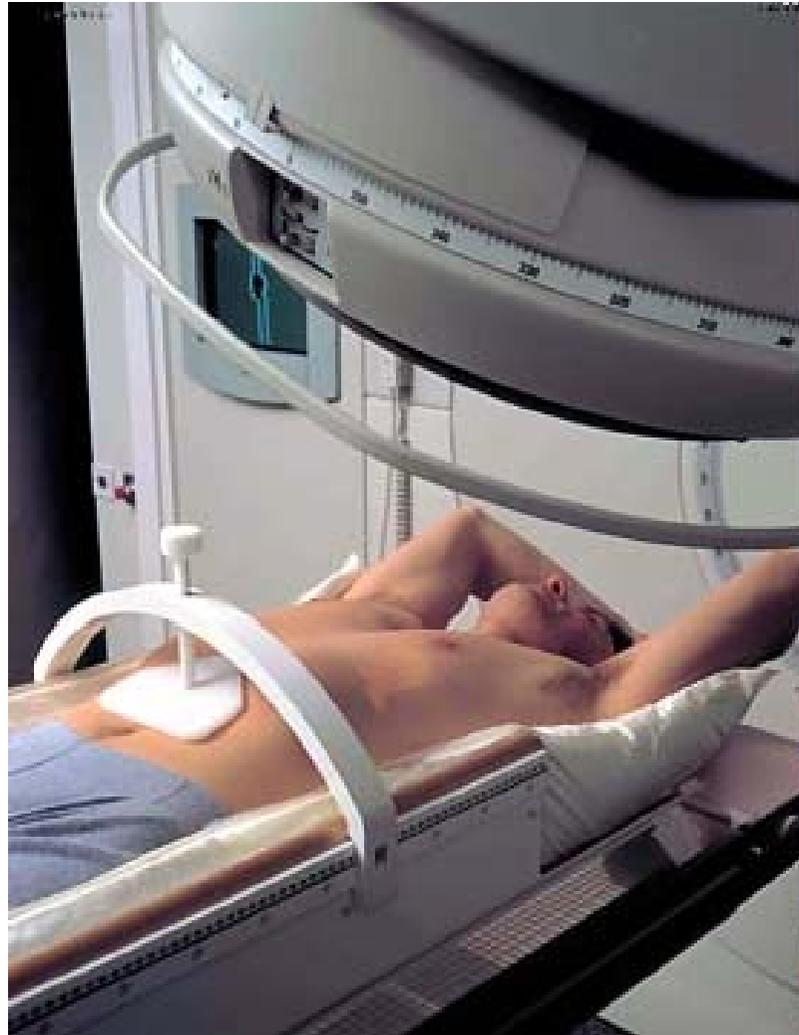
Fiksering



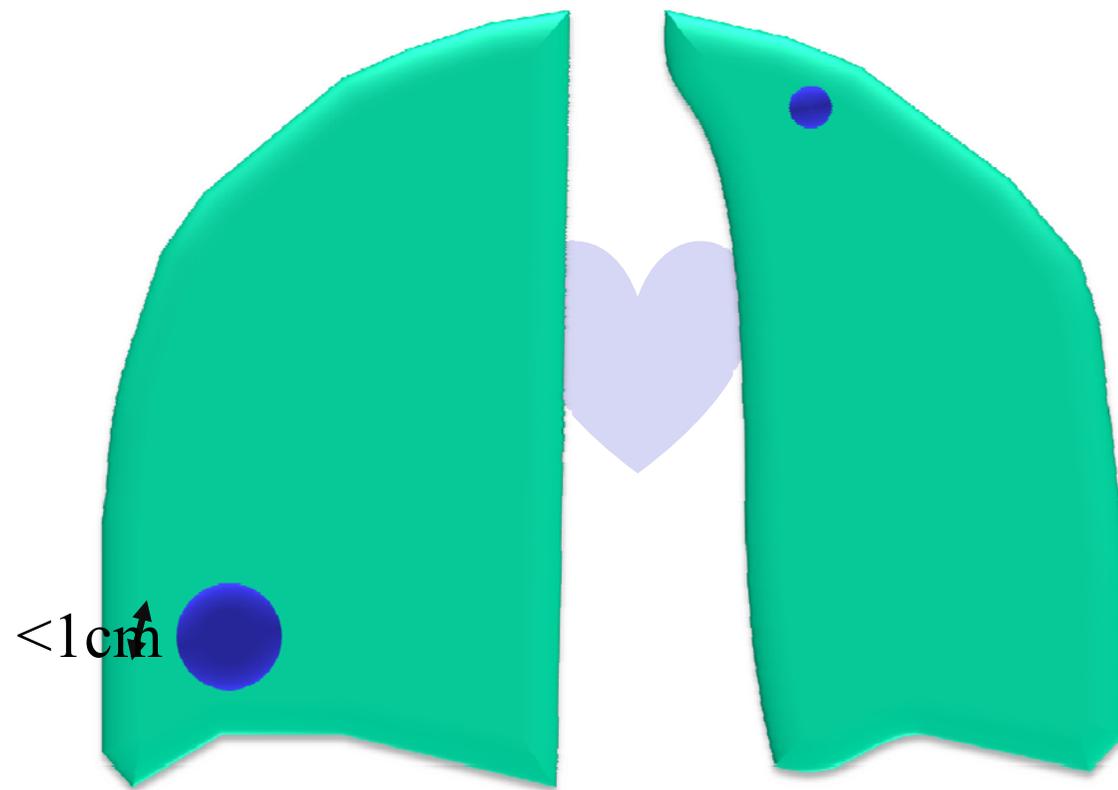
Lax-lådan (Ingmar Lax, Karolinska)



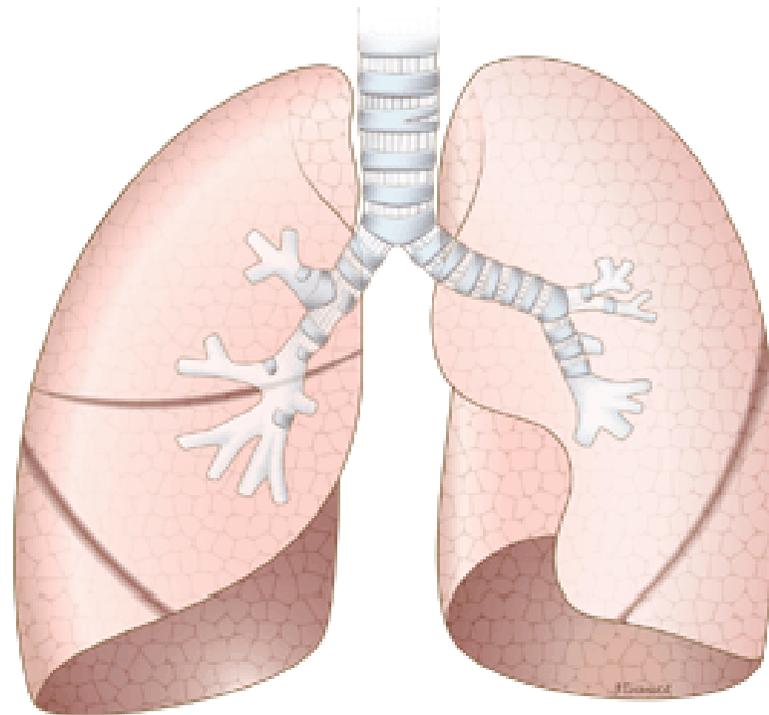
Fiksering



Lax-lådan (Ingmar Lax, Karolinska)

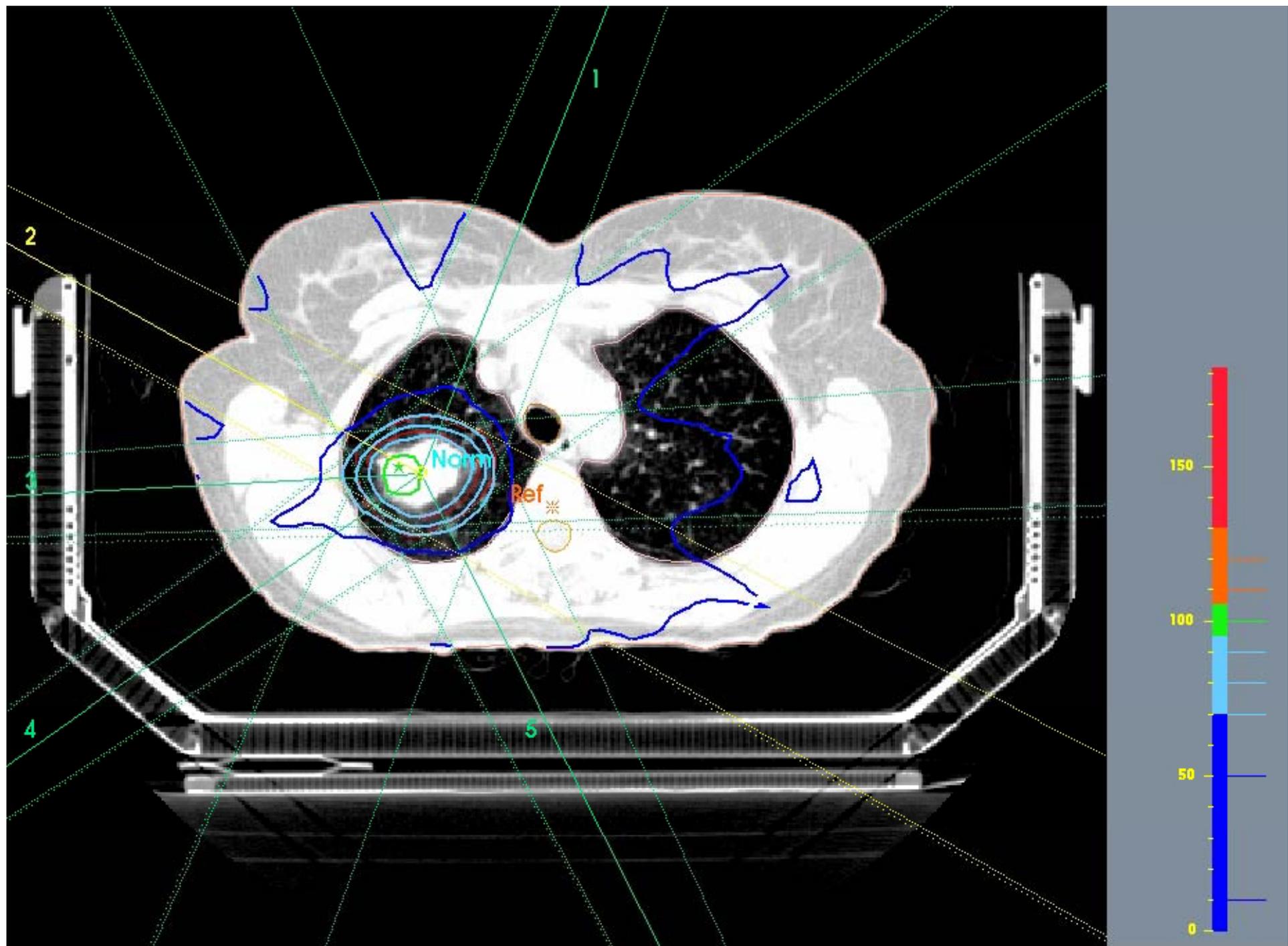


Stereotaksi

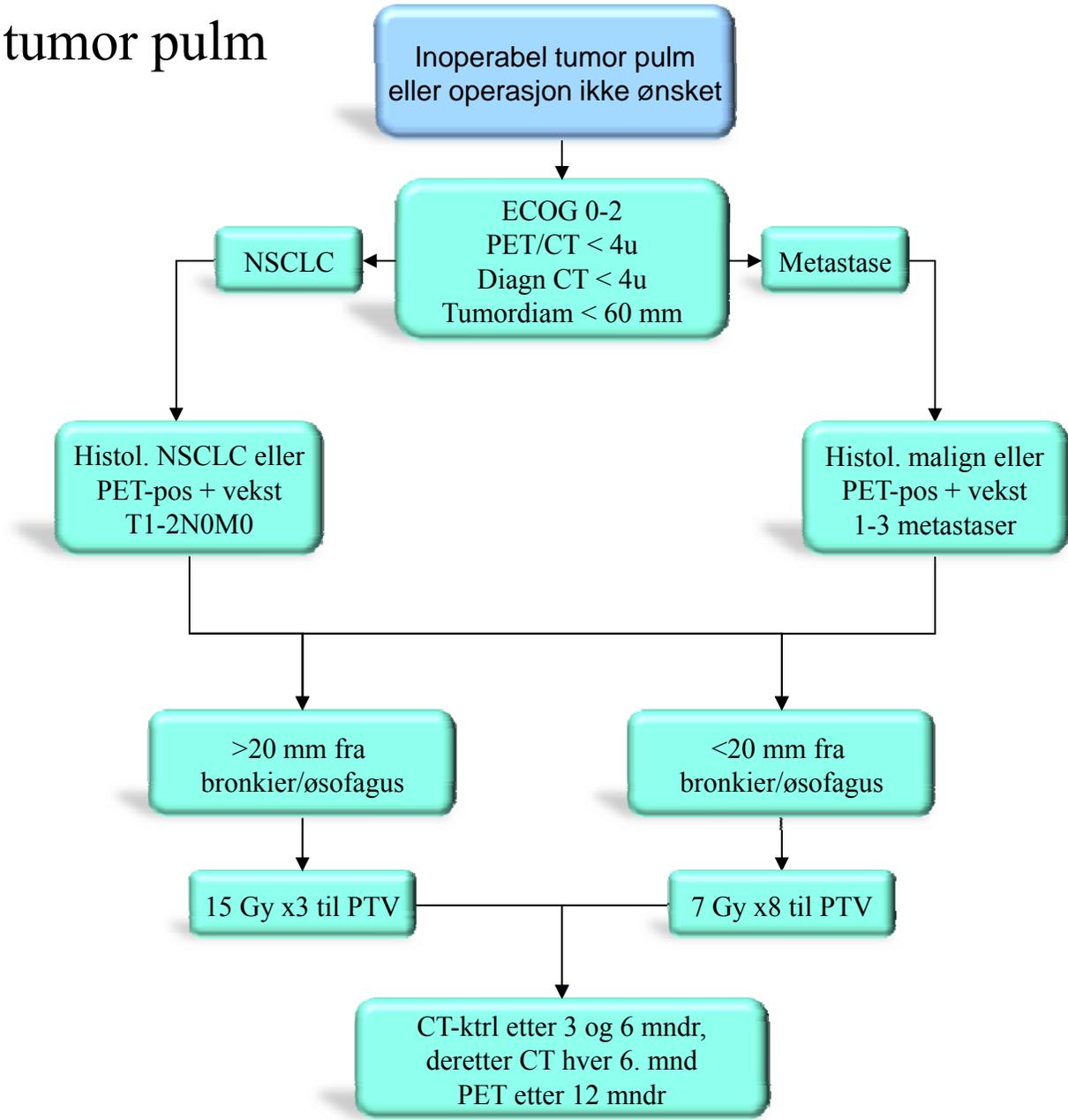


Dynamic Arc Therapy





Stereotaksi ved tumor pulm



Hvor høy er dosen egentlig?

Table 1. Biologically Effective Doses for Various Fractionated Radiation Regimens

Total Dose (Gy)	Dose/Fraction (Gy)	BED (Gy ₁₀) ^a
54	1.5	62.1
70.2	1.8	82.8
60	3.0	78.0
66	3.0	85.8
50	5.0	75.0
15	15	37.5 ^b
30	30	120.0 ^b

^a BED values were calculated assuming an α/β ratio of 10 Gy. ^b The calculated BED values may not be valid for a protocol involving only one fraction.

BED = biologically effective doses.

15 Gy x 3 tilsvarer (37,5 Gy x3) i 2-Gy's-fraksjoner = 112 Gy

Holger Hof, MD¹
Marc Muentert, MD¹
Dieter Oetzel, PhD¹
Angelika Hoess, MSc²
Juergen Debus, MD, PhD¹
Klaus Herfarth, MD¹

Stereotactic Single-Dose Radiotherapy (Radiosurgery) of Early Stage Non-small-Cell Lung Cancer (NSCLC)

¹ University of Heidelberg, Department of Radiation Oncology, Heidelberg, Germany.

² German Cancer Research Center, Department of Medical Physics, Heidelberg, Germany.

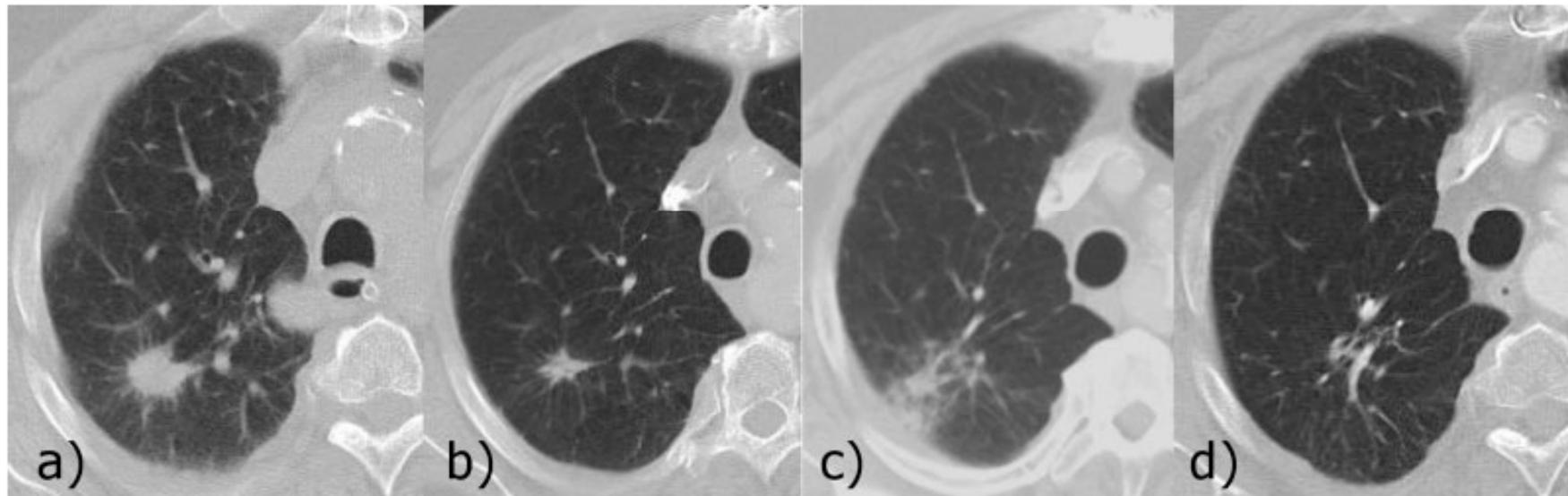
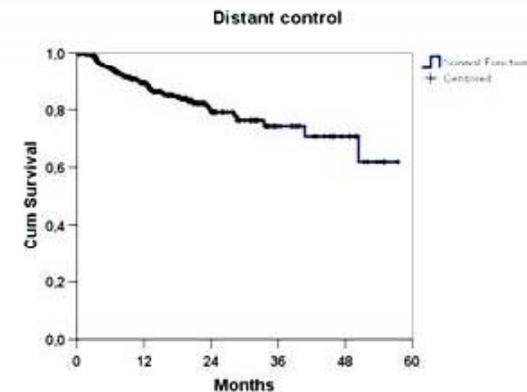
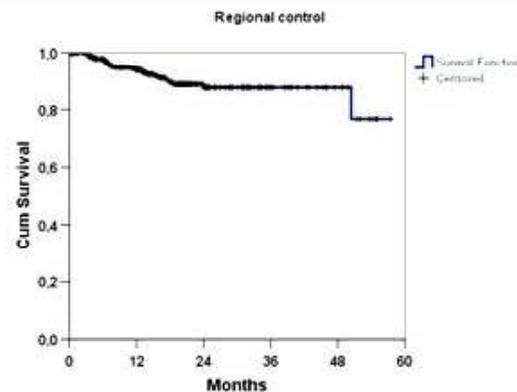
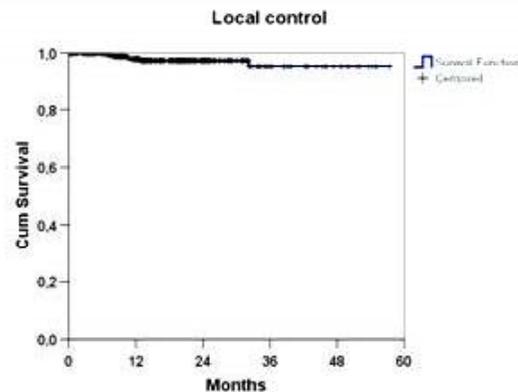


FIGURE 5. Development of a lung tumor after radiosurgery (based on computed tomography examinations). The initial tumor (a) shows significant reduction in size 6 weeks after treatment (b). Three months later, normal tissue reactions of the surrounding lung tissue are seen (c), which dissolve over the next months, leading to perifocal fibrotic changes without solid tumor rests 2 years after treatment (d).



N= 402 patients with single T1-T2 tumor
 Median follow-up 24 months (range 3-56 months)



Local Failure N=7 (1.7%)
 Median time to LF 10 months

Regional Failure N=26 (6.5%)
 Median time to RF 8 months

Distant Failure N=52 (12.9%)
 Median time to DF 8 months

Actuarial local failure:

- @1 year: 2.1%
- @2 years: 2.7%
- @3 years: 4.8%**

Actuarial regional failure:

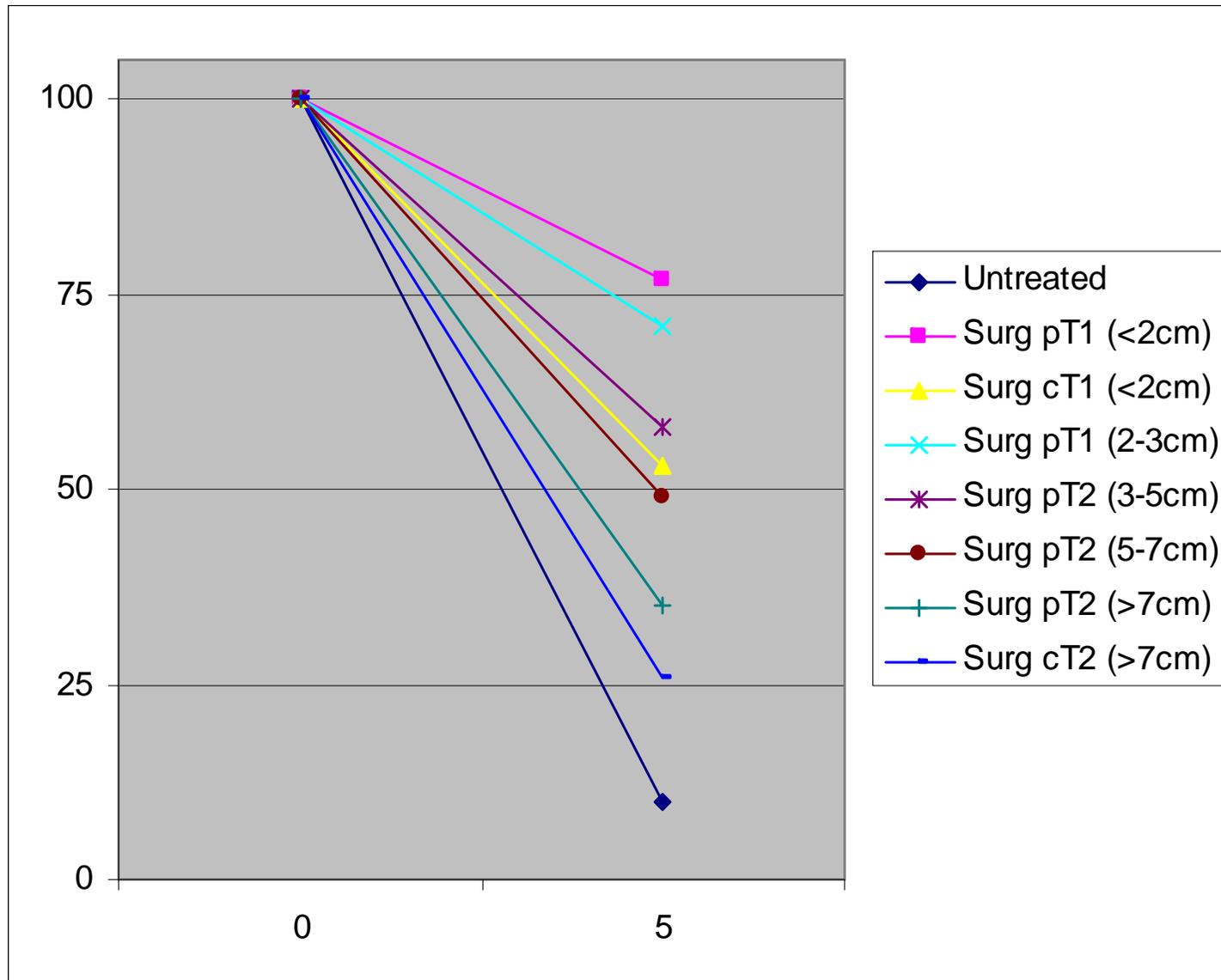
- @1 year: 5.7%
- @2 year: 12.0%
- @3 year: 12.0%**

Actuarial distant failure:

- @1 year: 11.1%
- @2 year: 21.2%
- @3 year: 25.9%**



5-års overlevelse etter kirurgi, ca pulm



Kurativ strålebehandling ISCLC

Stadium II

Hvis ikke operabel

GTV: tumor inkludert patologiske lymfeknuter

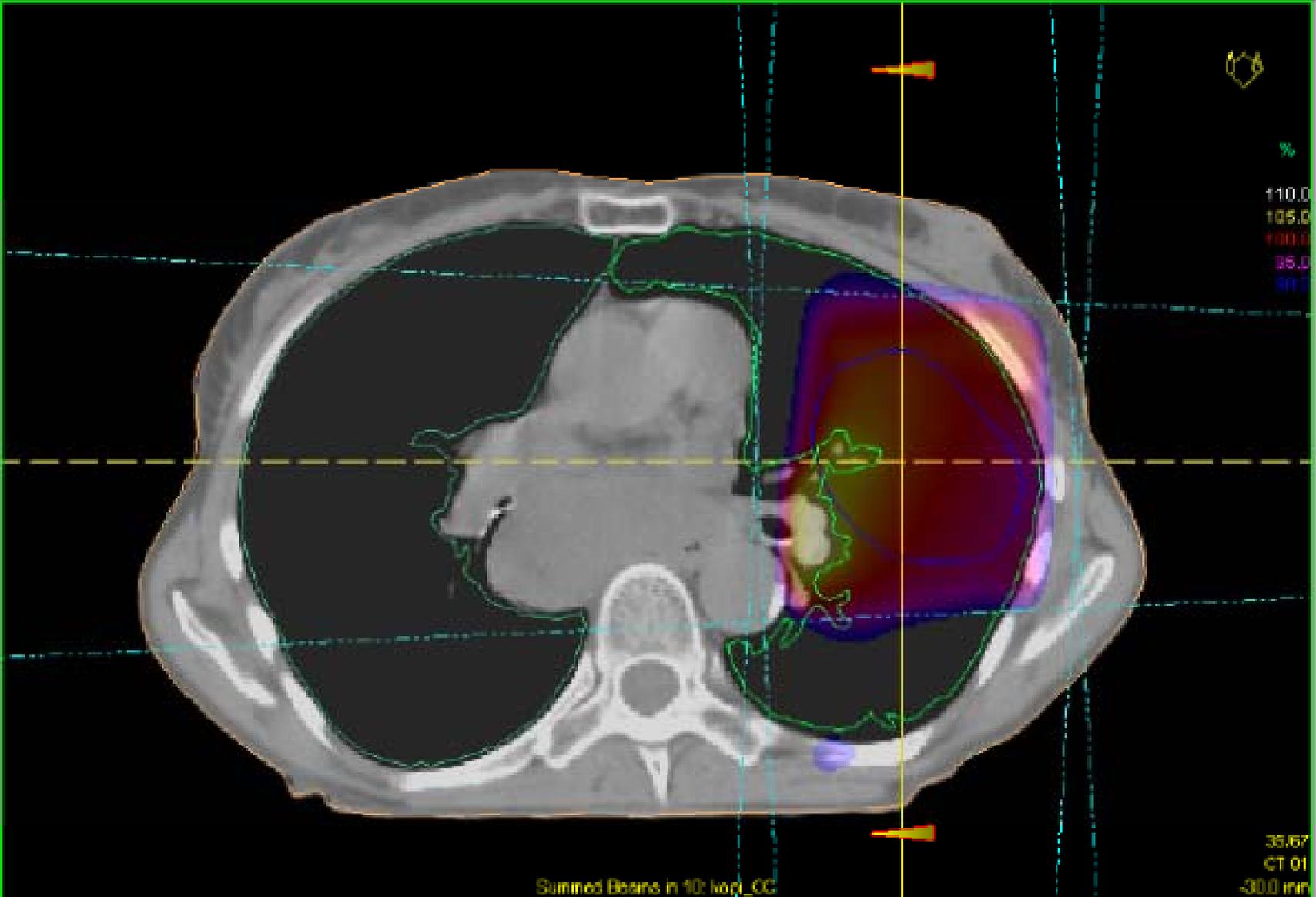
2 Gy pr dagsfraksjon opp til 70 Gy

Kurativ strålebehandling ISCLC

Stadium III A

God allmenntilstand

2Gy x30-35 + konkomitant PV-kur x2



Kurativ strålebehandling ISCLC

Postoperativ strålebehandling

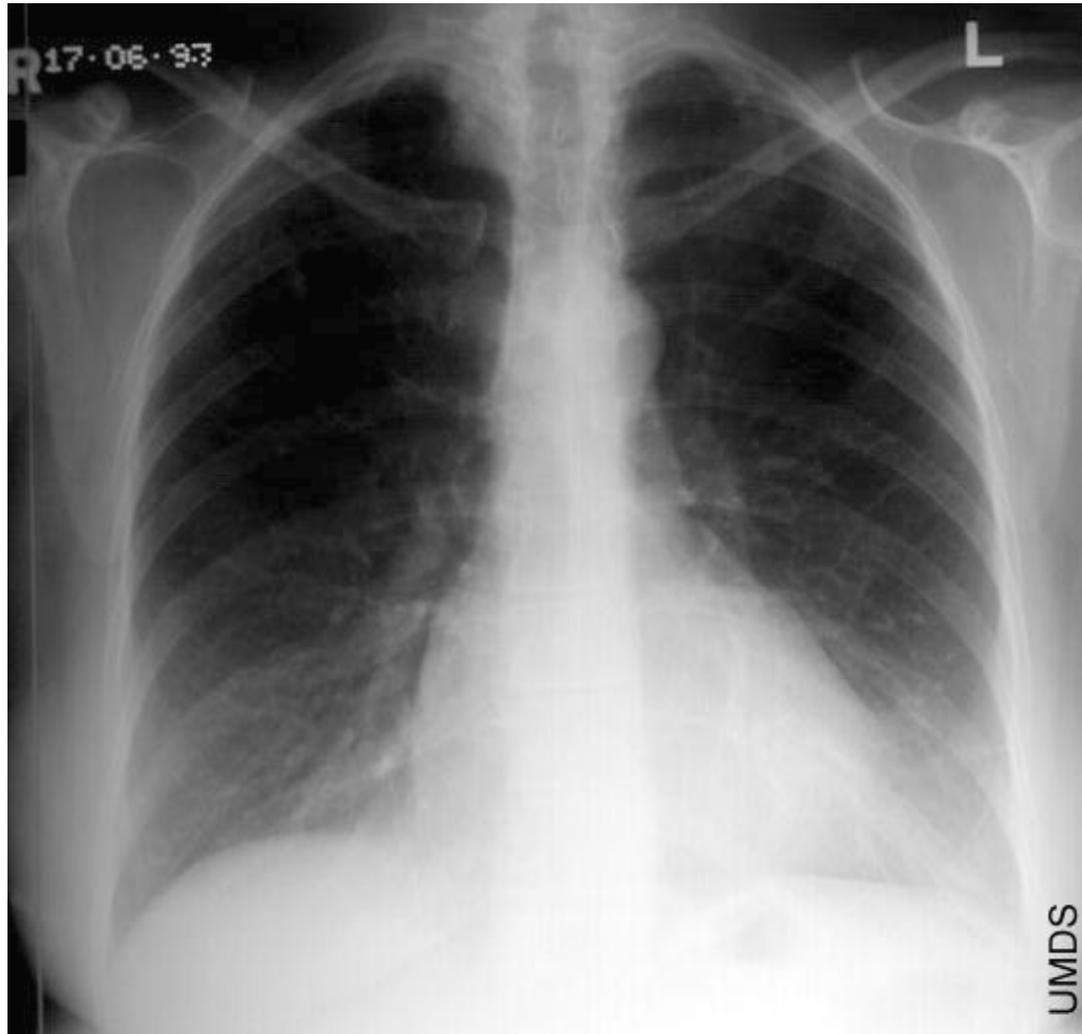
Ved N₂ sykdom, CT doseplan, 2 Gy x 30

Ved ufrie render, CT doseplan, 2 Gy x 25-30

Preoperativ strålebehandling

- Aktuelt ved primært inoperable Pancoast tumores (T3-4N0-1M0)
- 2 sykler med kjemoterapi, konkomitant med CT-doseplanlagt 2Gy x 25.
- Etter strålebehandlingen blir de vurdert på ny med tanke på operabilitet

Pancoasttumor i lunge



To år seinere



Fraksjonering (oppsummering)

- Kurativ:
 - 2 Gy x30-35 NSCLC
 - (medulladose ofte begrensende)
 - 2Gy x25 (pre- eller postoperativt)
 - 2,8 Gy x15 (42Gy) SCLC
- Palliativ:
 - 8,5 Gy x2
 - 3 Gy x10-13

Strålefibrose



Kurativ vs palliativ behandling

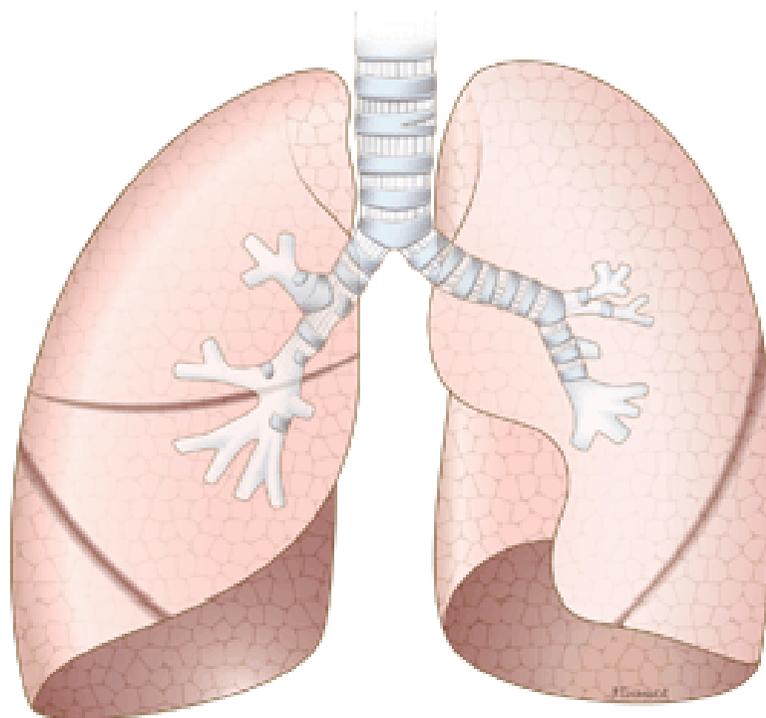


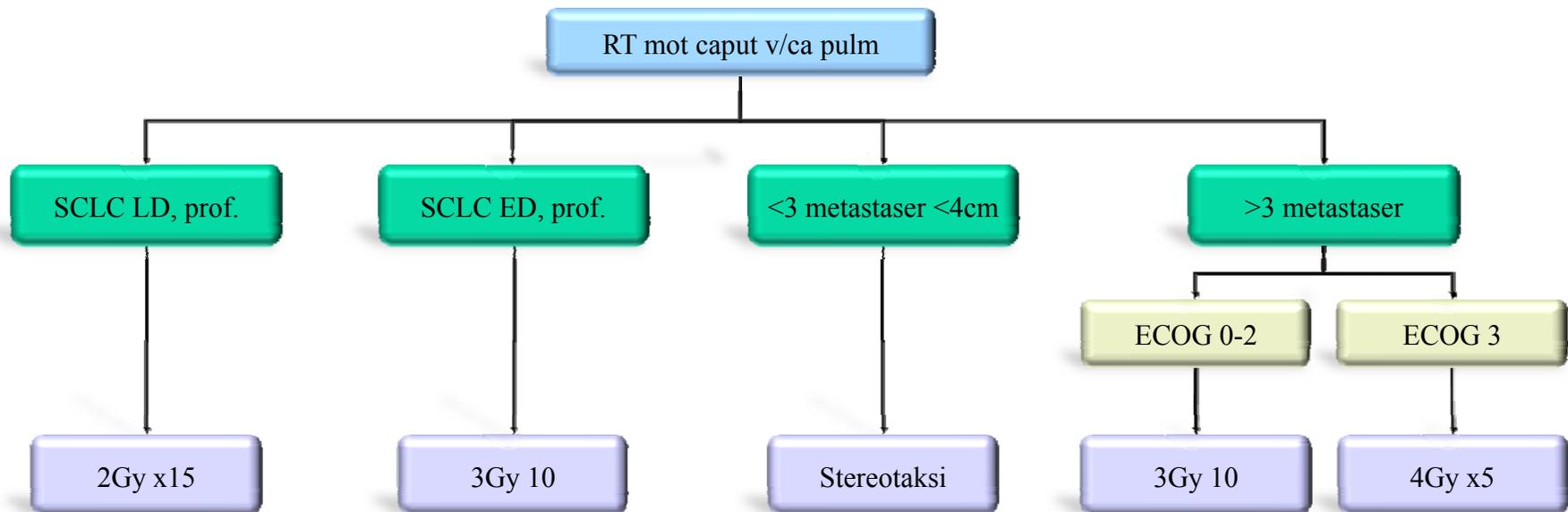
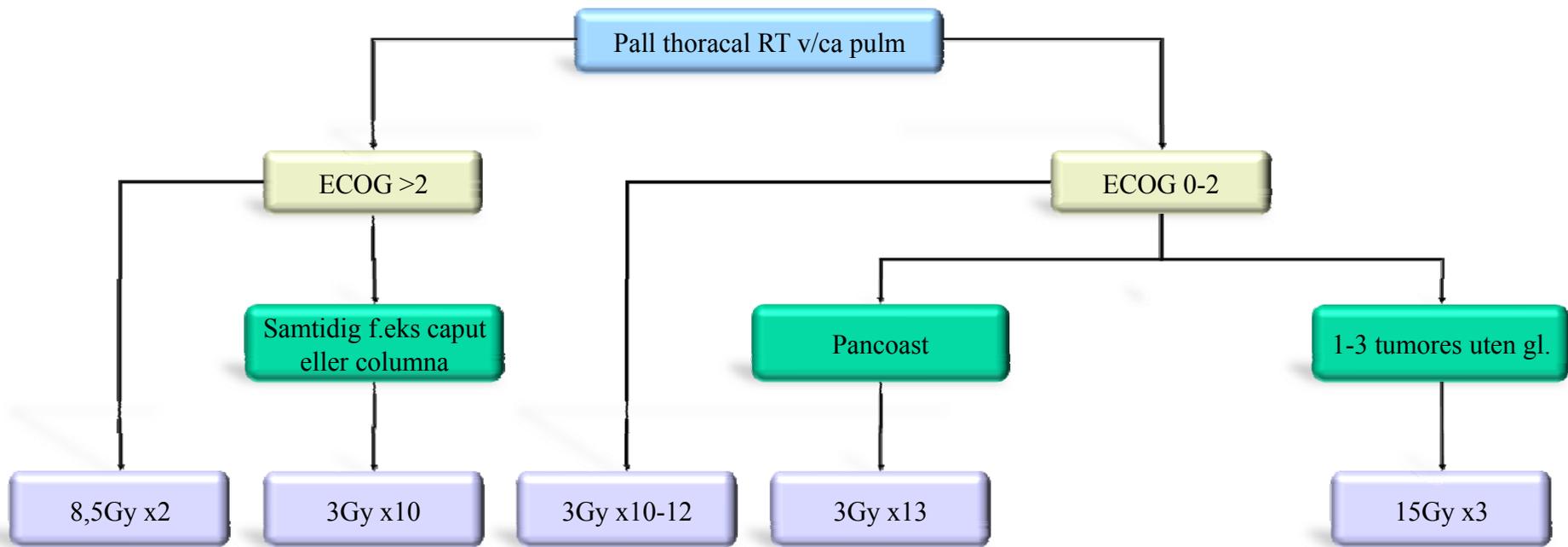
The Thinker, Rodin (1840-1917)

Prognostiske faktorer

- Annen alvorlig sykdom
 - hjerte-karsykdom (røykere!)
- Allmenntilstand (ECOG-status)
- Vekttap
 - >5-10% siste 3 mndr
- Tumorstørrelse (>9cm)

Palliasjon





Palliativ strålebehandling ved lungecancer

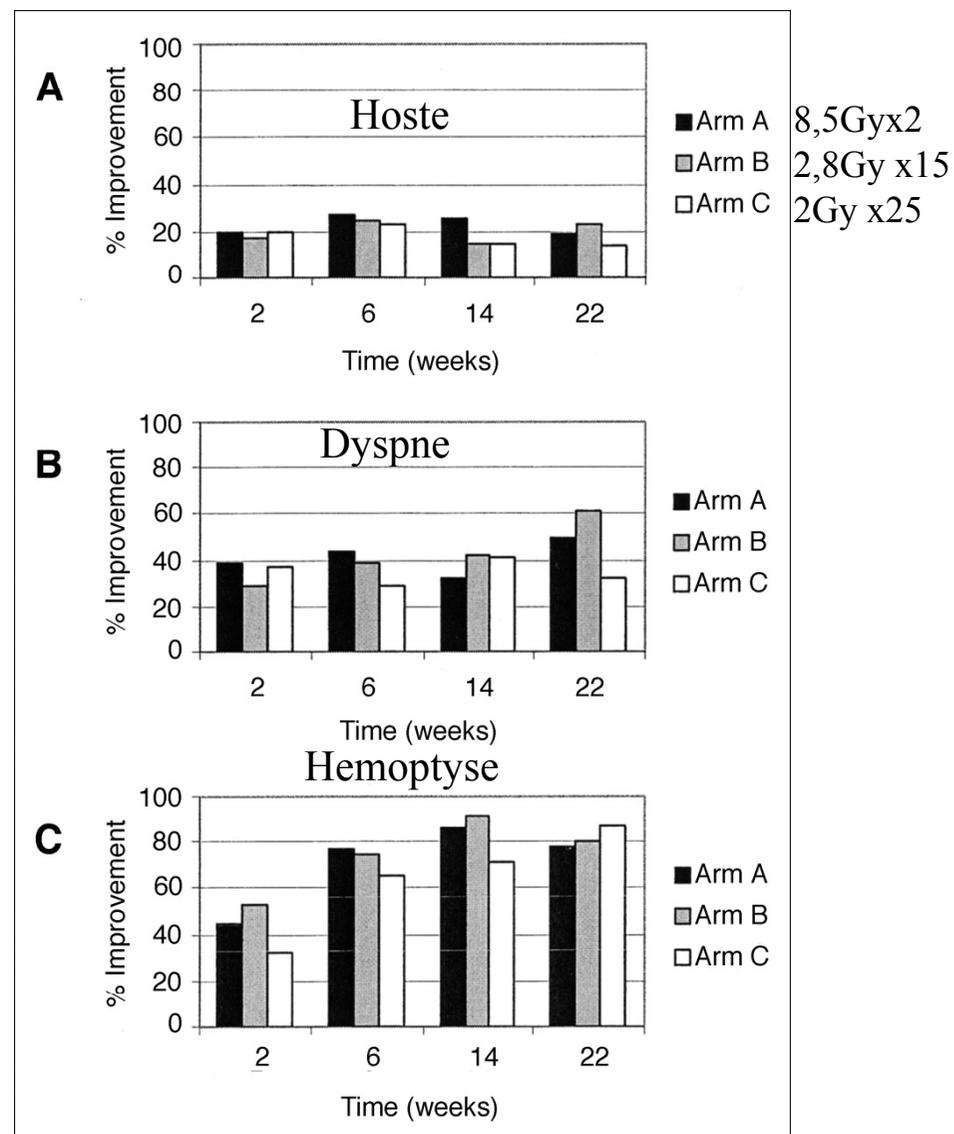
Torakal bestråling

- NSCLC
lokalavansert eller utbredt sykdom
- SCLC
ved residiv hvor kjemoterapi ikke er aktuelt

Palliativ RT ved lungecancer

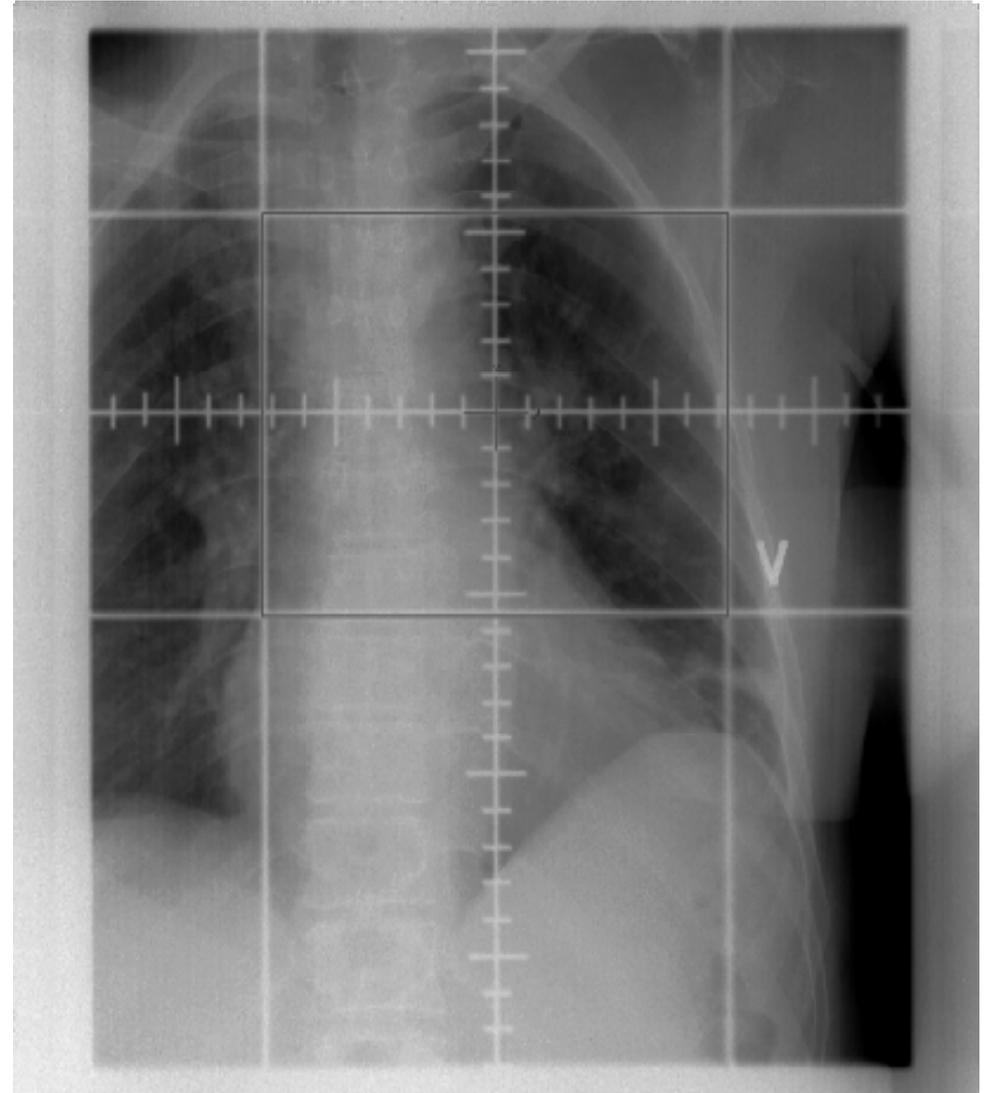
God symptomlindring

- Hoste
- Hemoptyse
- Smerter
- Dyspnoe
- VCSS
- Atelektase



Palliative lungefelt

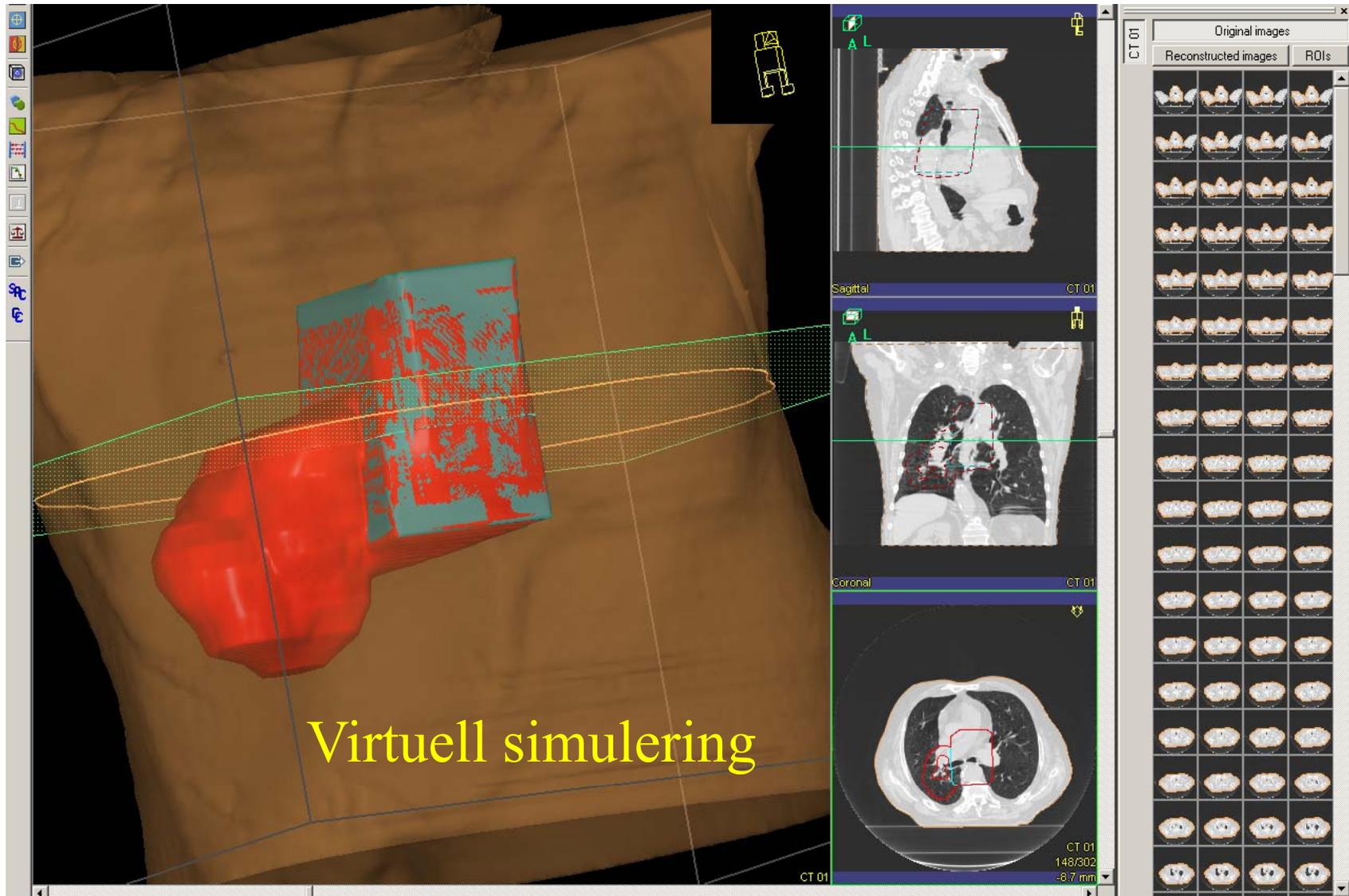
- Palliativ for de fleste
- 3 Gy x 10?
- 8,5 Gy x 2?
- Kort levetid!
- Mest mulig tid hjemme!



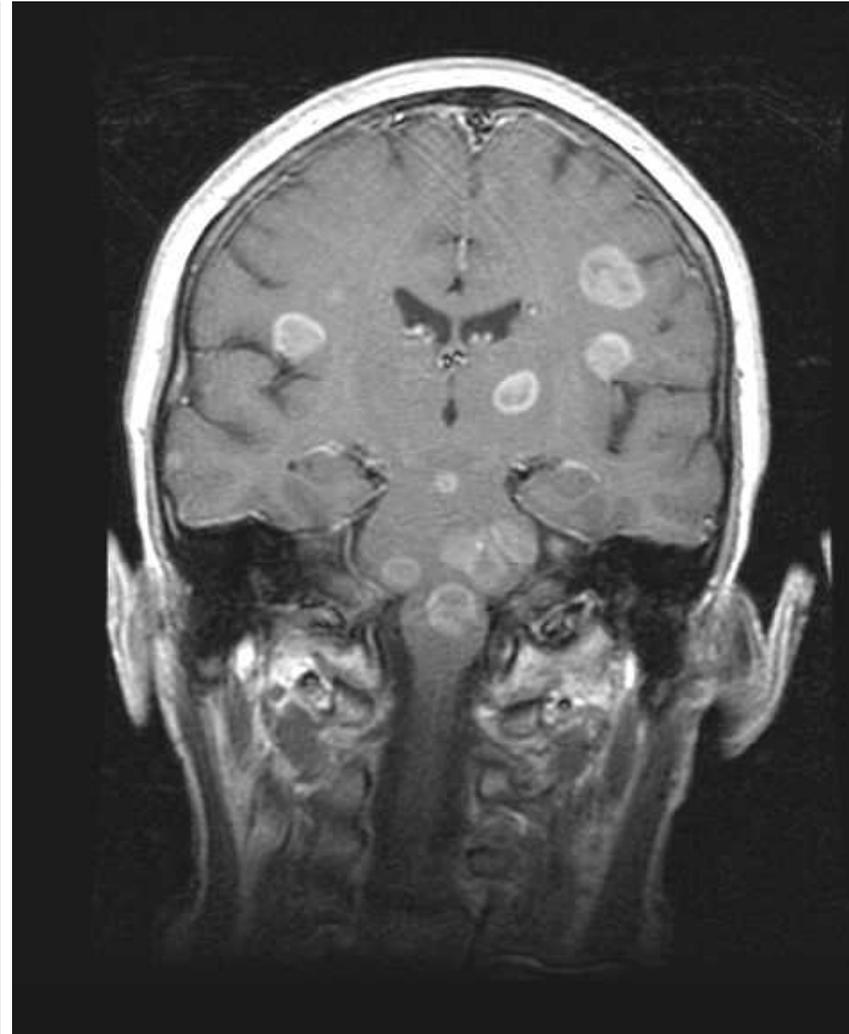
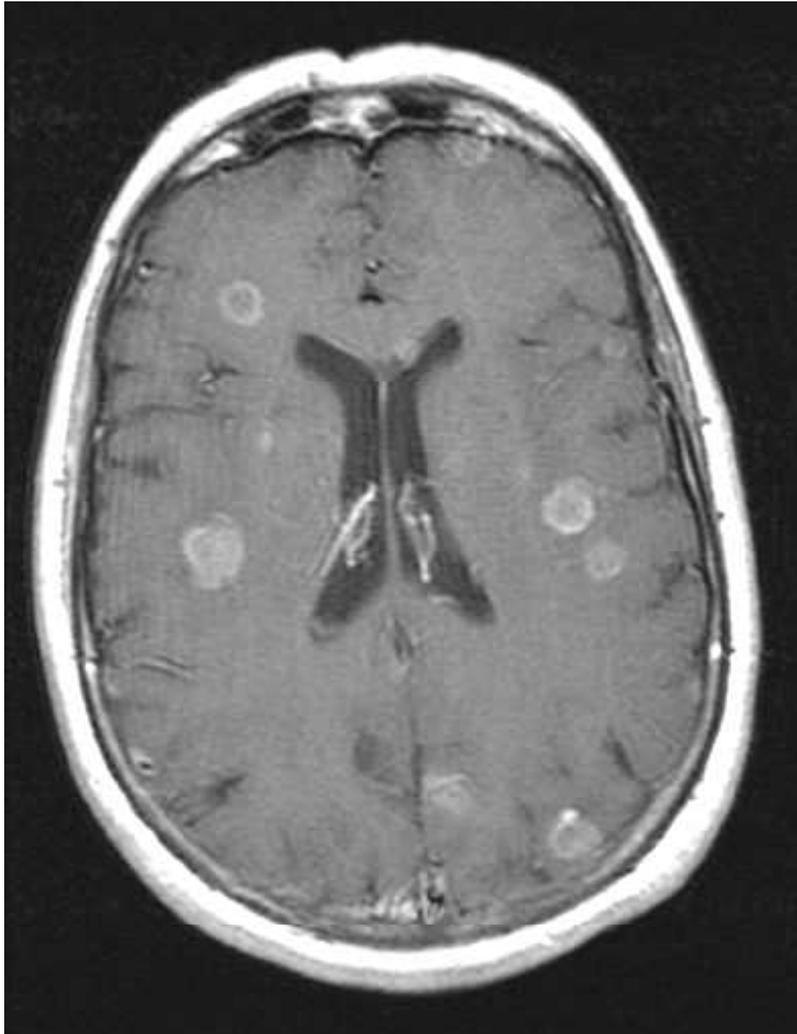
Palliativ strålebehandling ved lungecancer

- Målvolum
Symptomgivende deler av tumor
1,5-2 cm margin
+ mediastinum
- Maksimal feltstørrelse ca 200 cm²
- To motgående felt, forfra-bakfra.
- Direkte innstilling på simulator, evt virtuell simulering

Palliativt strålefelt

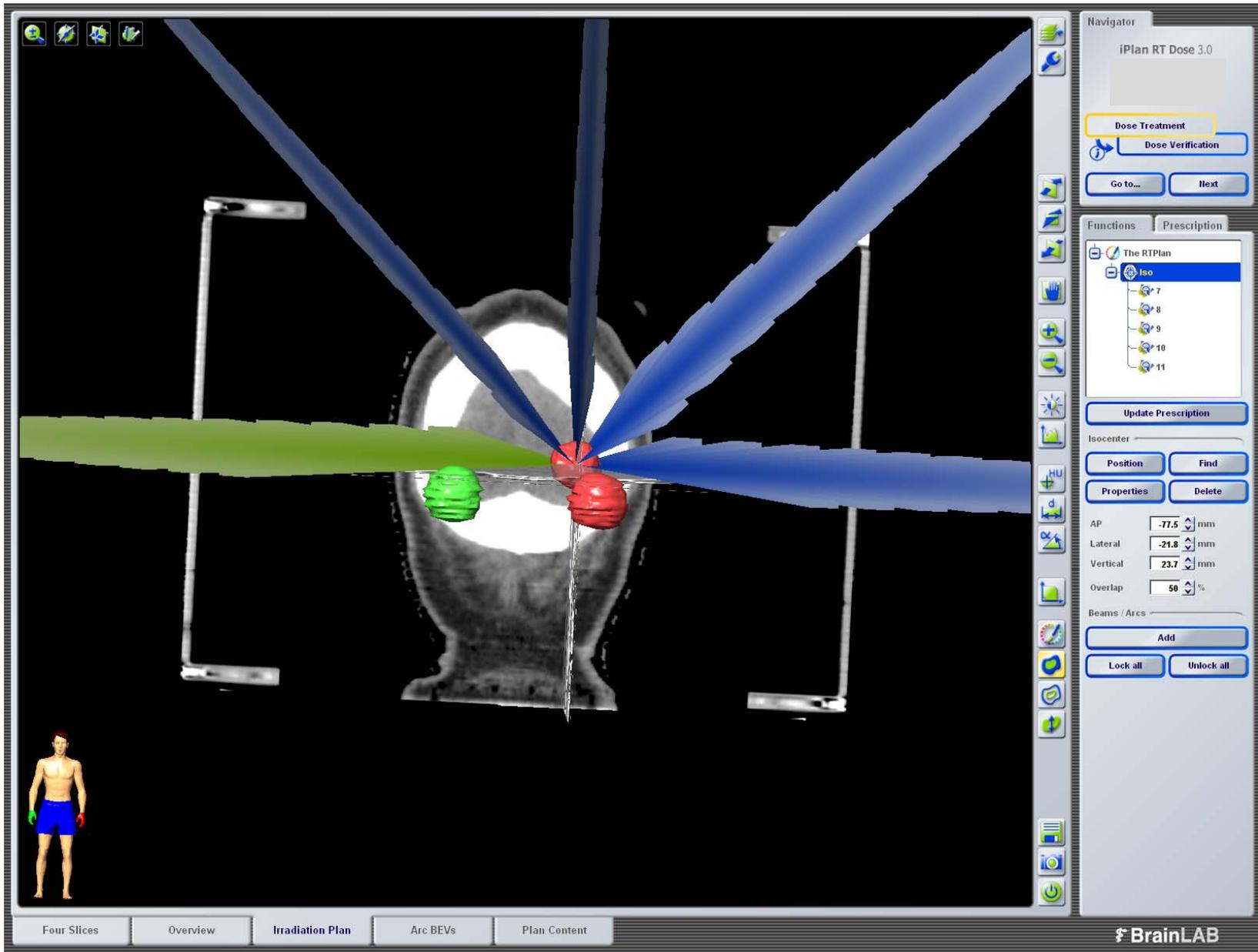


Hjernemetastaser



Hjernestereotaksi





Navigator

iPlan RT Dose 3.0

Dose Treatment

Dose Verification

Go to... Next

Functions Prescription

The RTPlan

- Iso
- 7
- 8
- 9
- 10
- 11

Update Prescription

Isocenter

Position Find

Properties Delete

AP -77.5 mm

Lateral -21.8 mm

Vertical 23.7 mm

Overlap 50 %

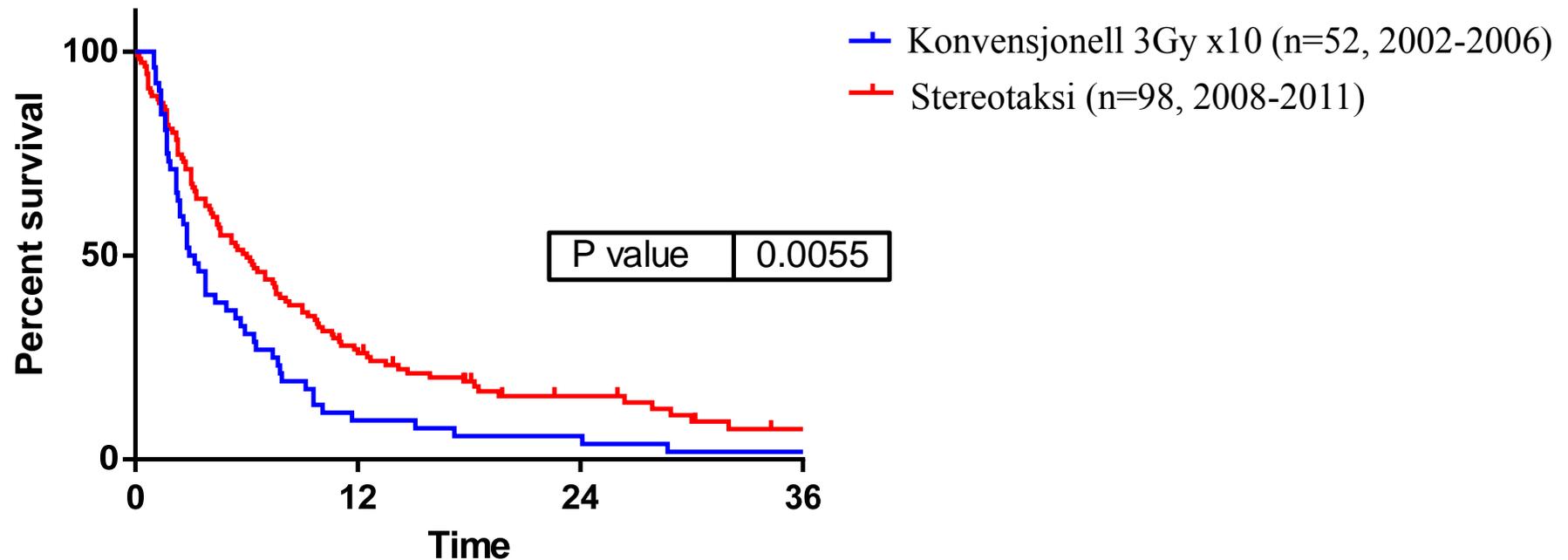
Beams / Arcs

Add

Lock all Unlock all

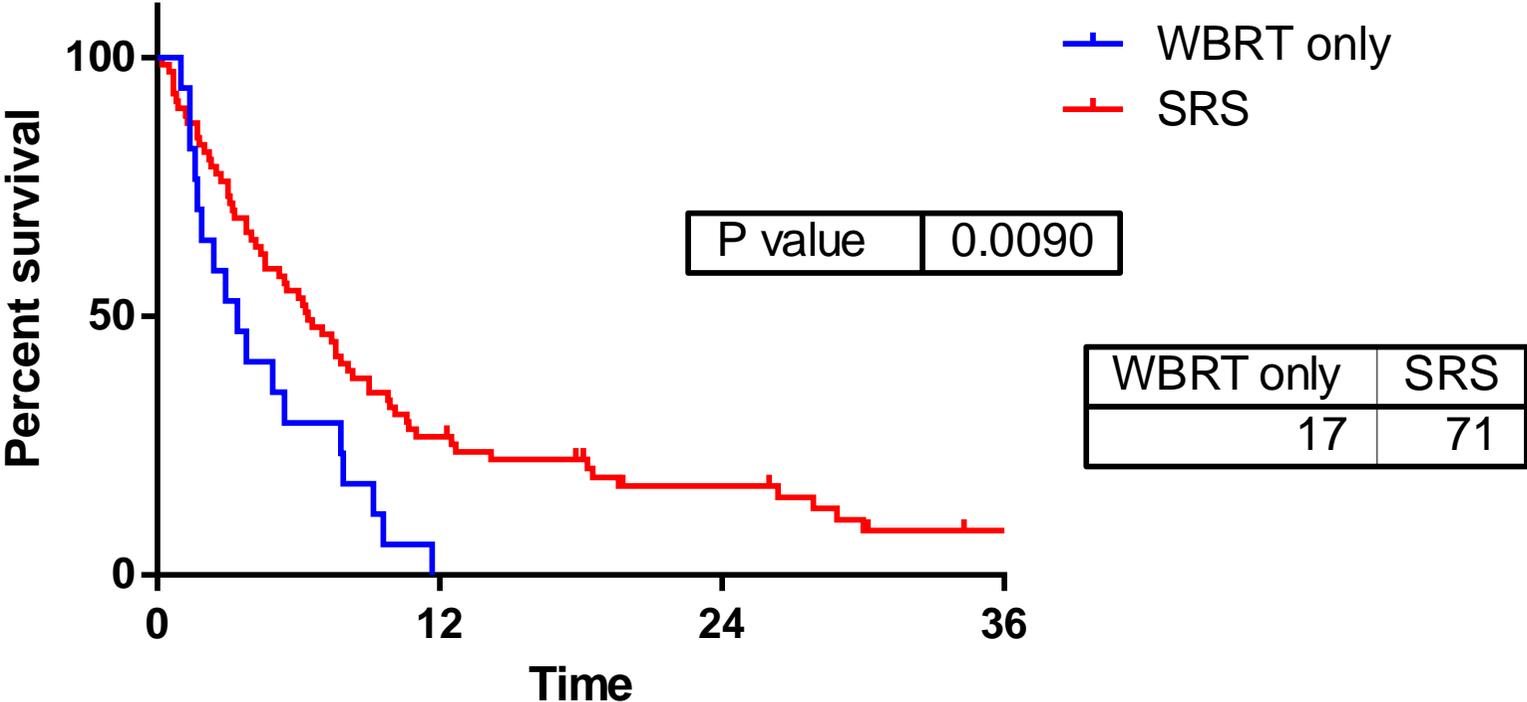
Stereotaksi vs helhjernebestråling ved 1-3 MR-verifiserte hjernemetastaser, ca pulm

WBRT vs SRS



Median survival	
WBRT only	3.050
SRS	6.000

WBRT vs SRS 1 met ot



Median survival	
WBRT only	3.400
SRS	6.400

Onkologisk akuttmedisin

- ofte lunge!

- Truende tverrsnitt
- Vena cava superior syndrom/Stokes krave

Konklusjon

- Ca 1700 lungekreftpasienter får strålebeh
- Palliasjon!
- Korte serier

- Mye komorbiditet
- Stereotaksi?

