

Hoe werkt radiotherapie en hoe zit het met MRI en protonen?

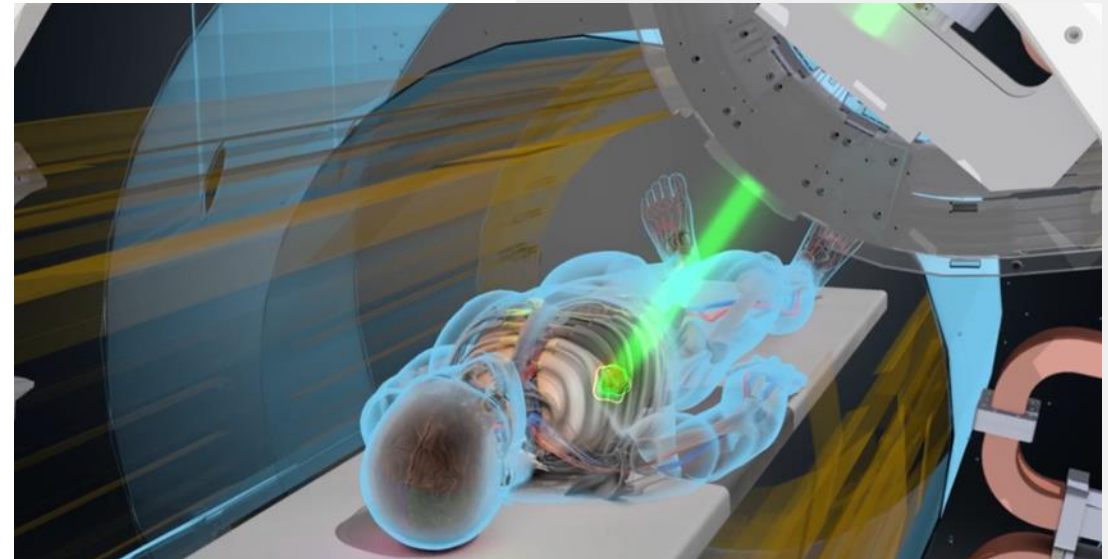
Heike Peulen radiotherapeut, MD PhD
Longkanker symposium 7-2-2025

**Gedreven
door het
leven.**

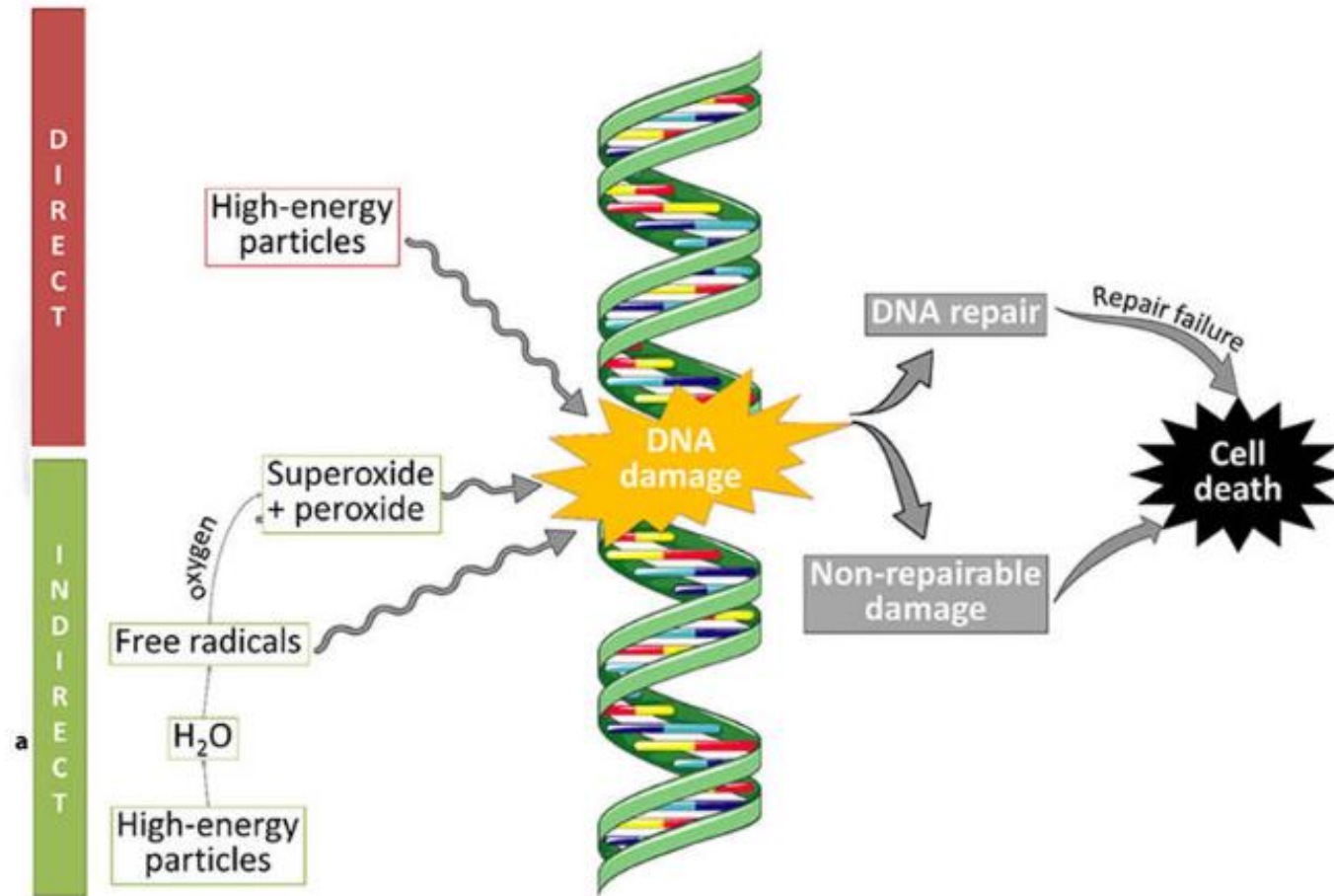
Inhoud



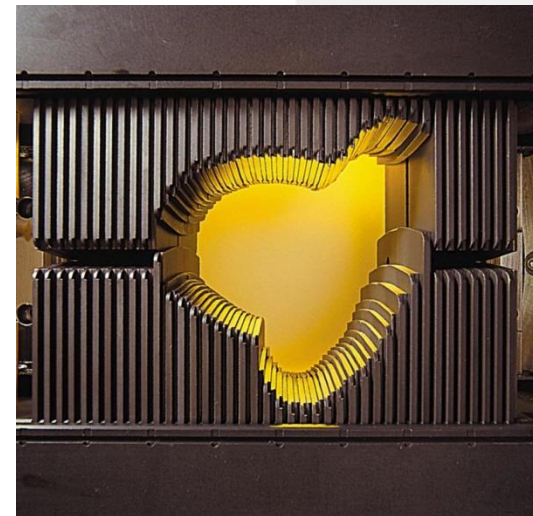
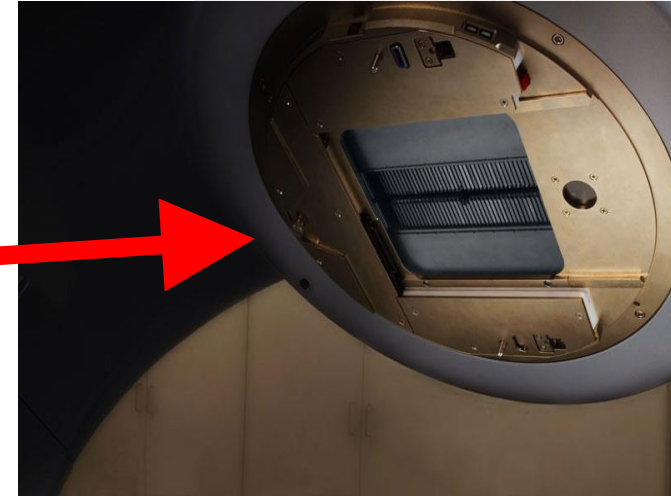
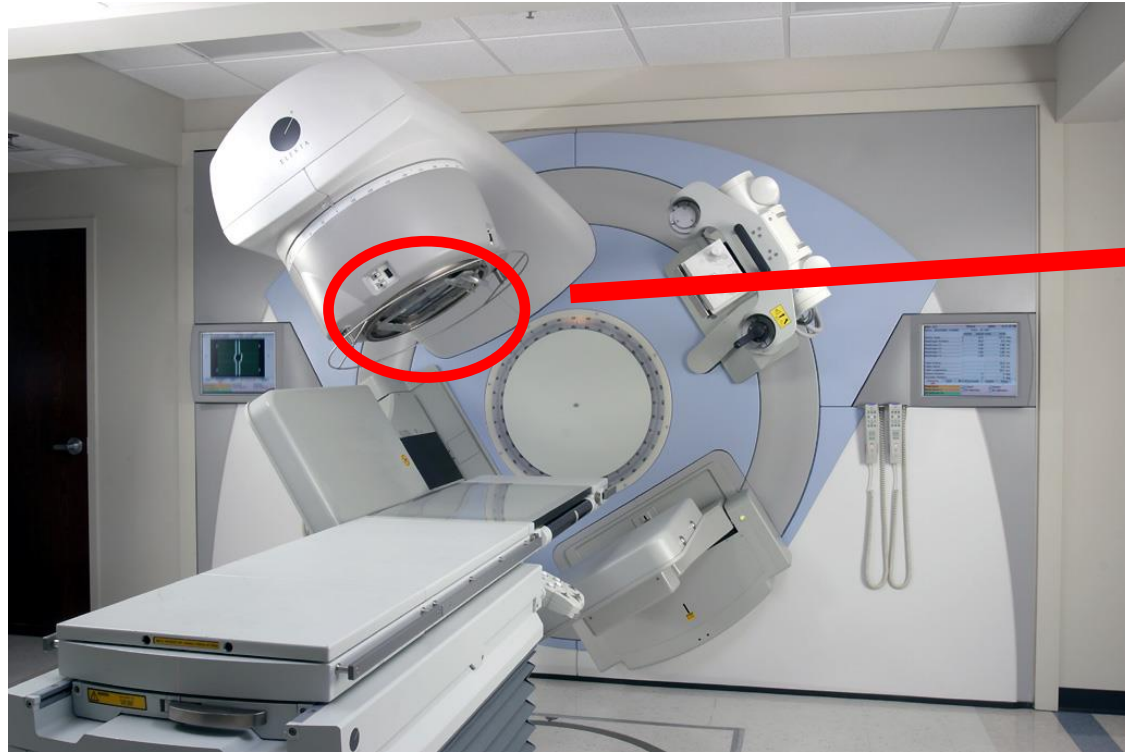
- Wat is bestraling
 - Hoe werkt het
 - Behandeling
- Nieuwe ontwikkelingen
 - MRI gestuurde bestraling
 - Protonen



Hoe werkt radiotherapie?



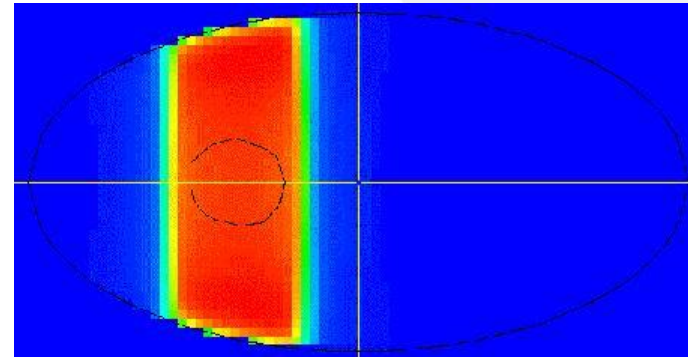
Lineaire versneller = bestralingstoestel



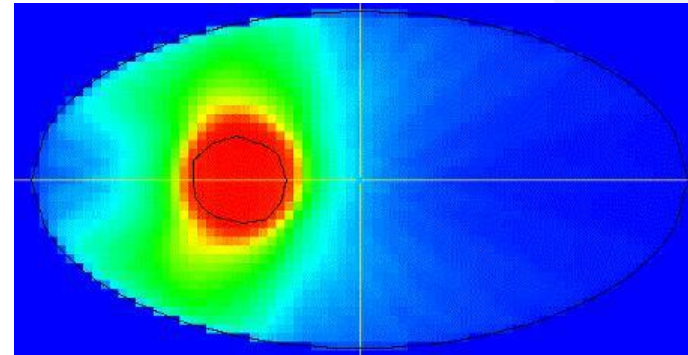


Bestralingsplan vroeger en nu: minder dosis op gezond weefsel

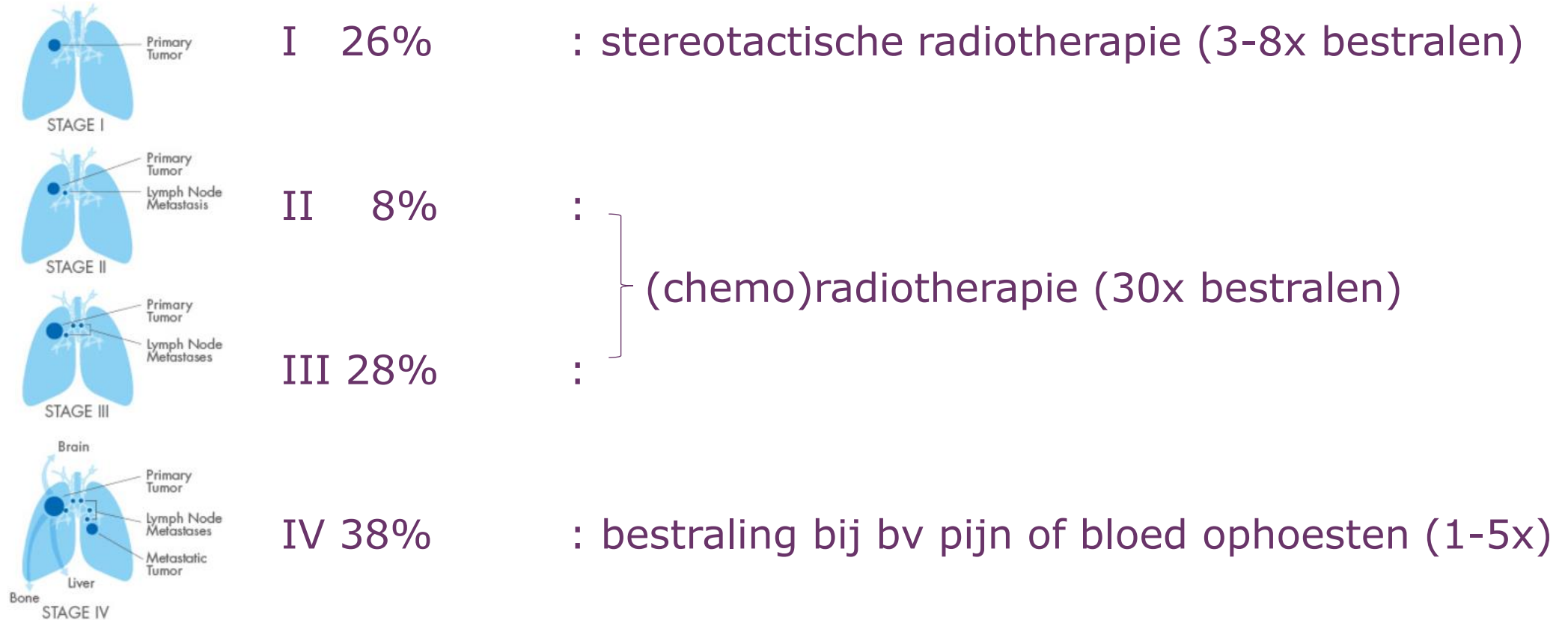
conventionele
radiotherapie
("AP-PA")



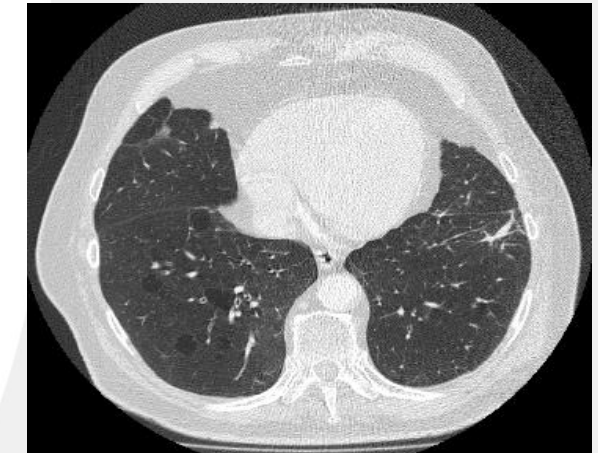
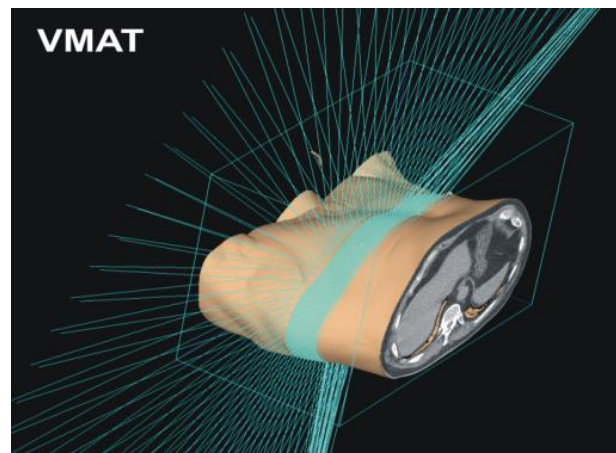
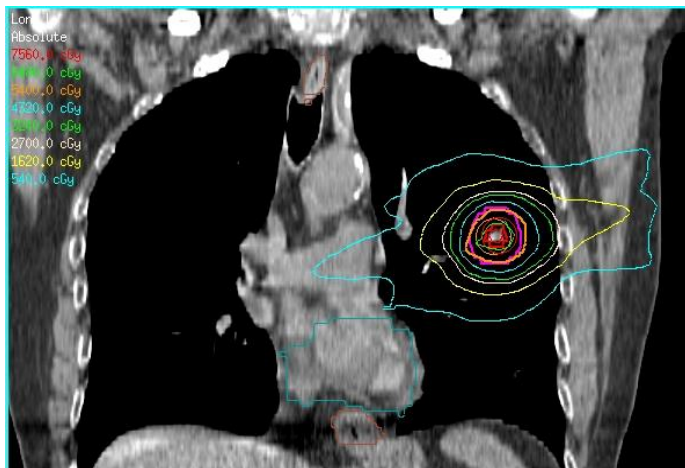
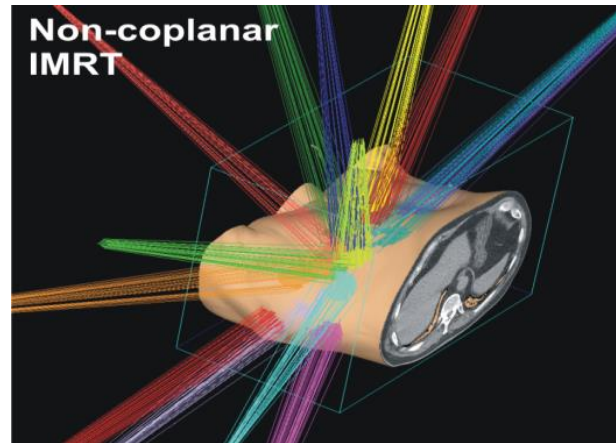
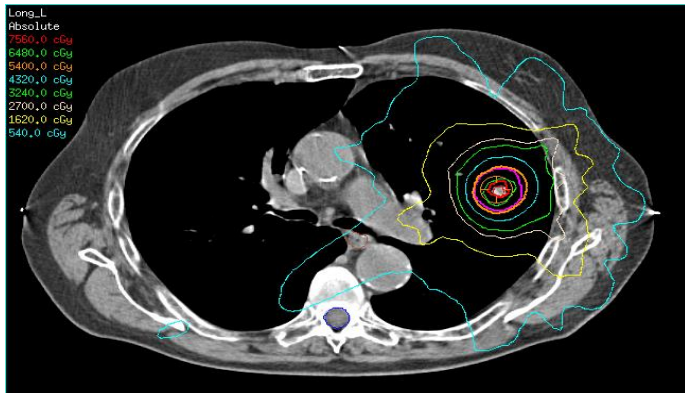
conformatie
therapie
(3D of IMRT)



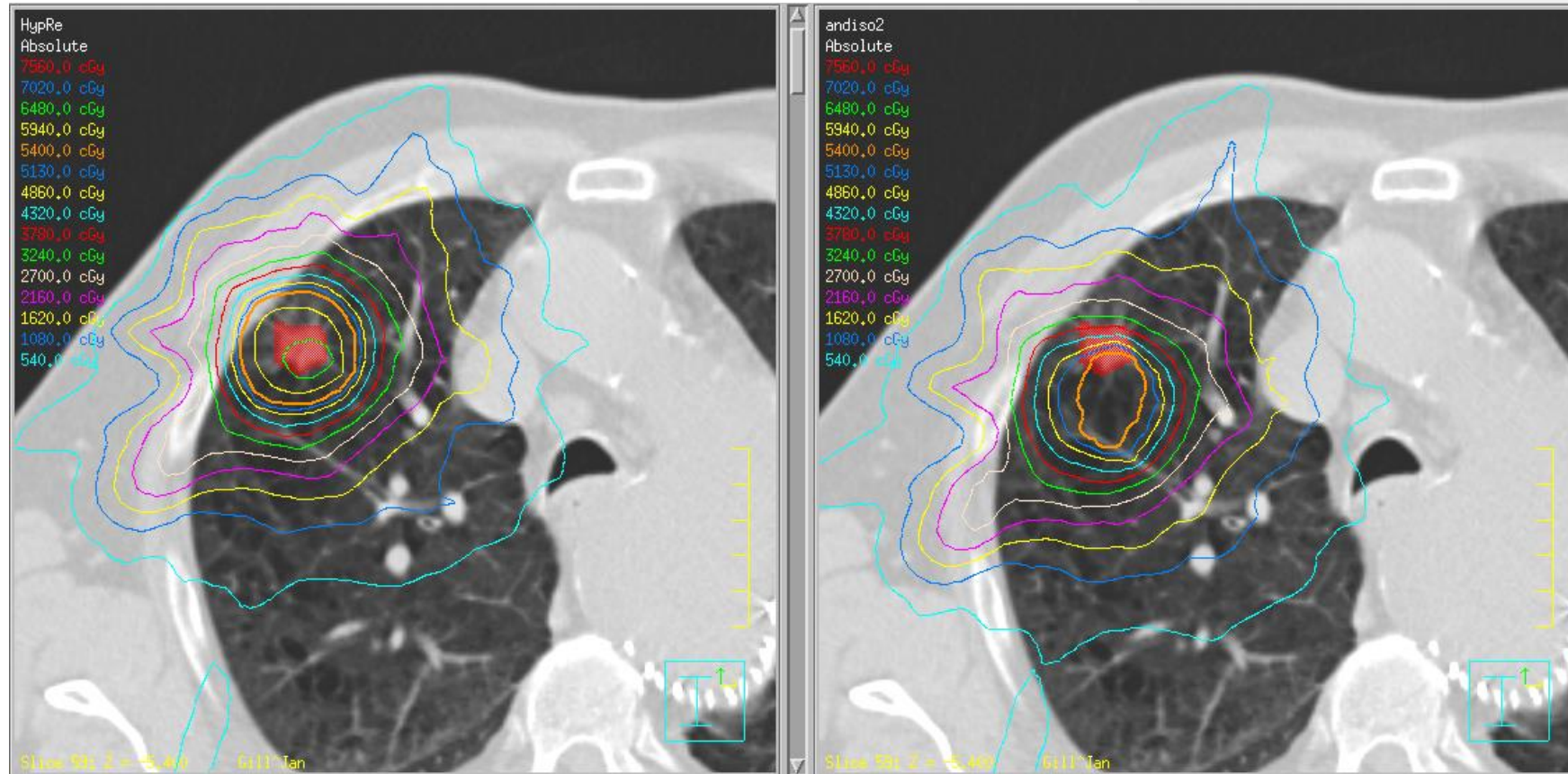
Radiotherapie per ziekte stadium



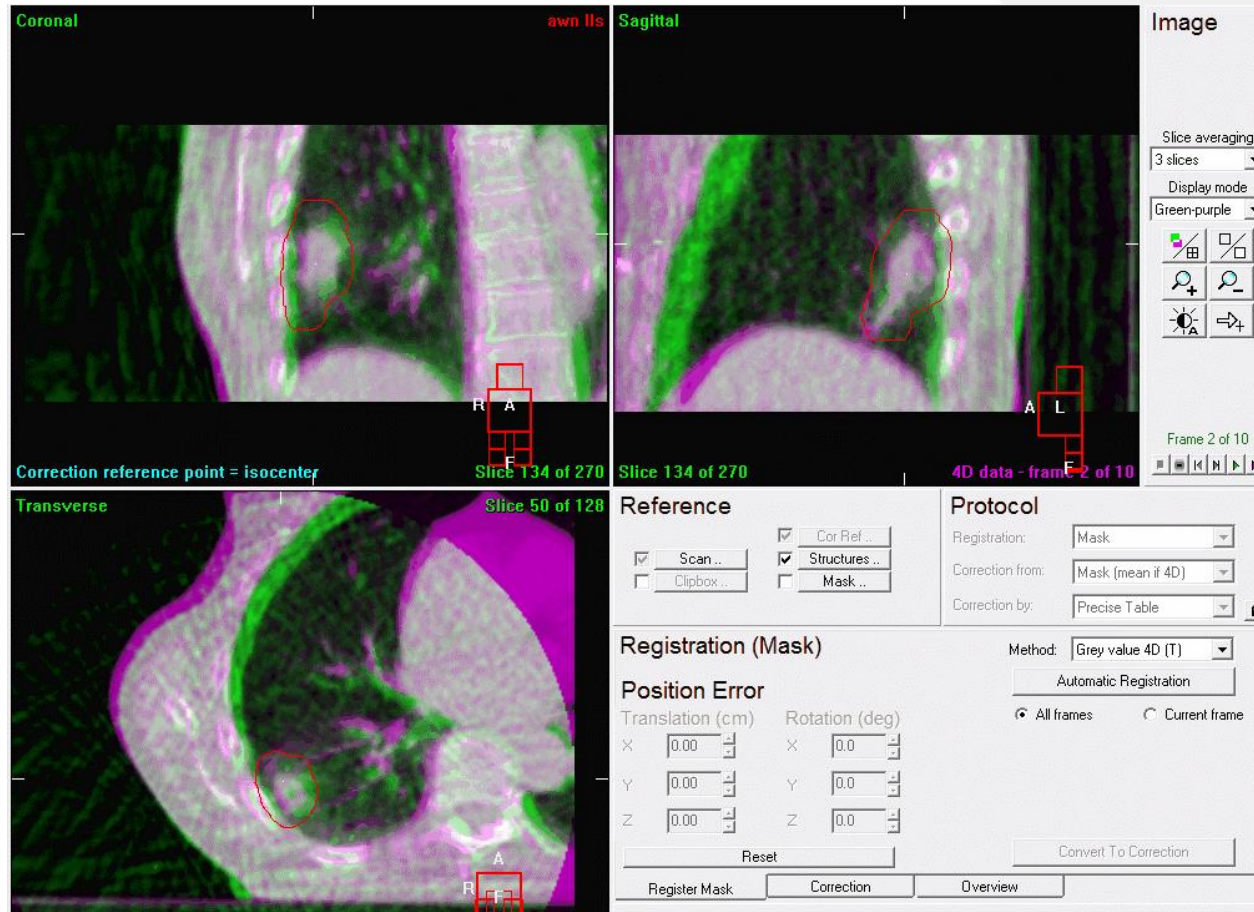
Stereotactische bestraling: hoge lokale controle en weinig bijwerkingen



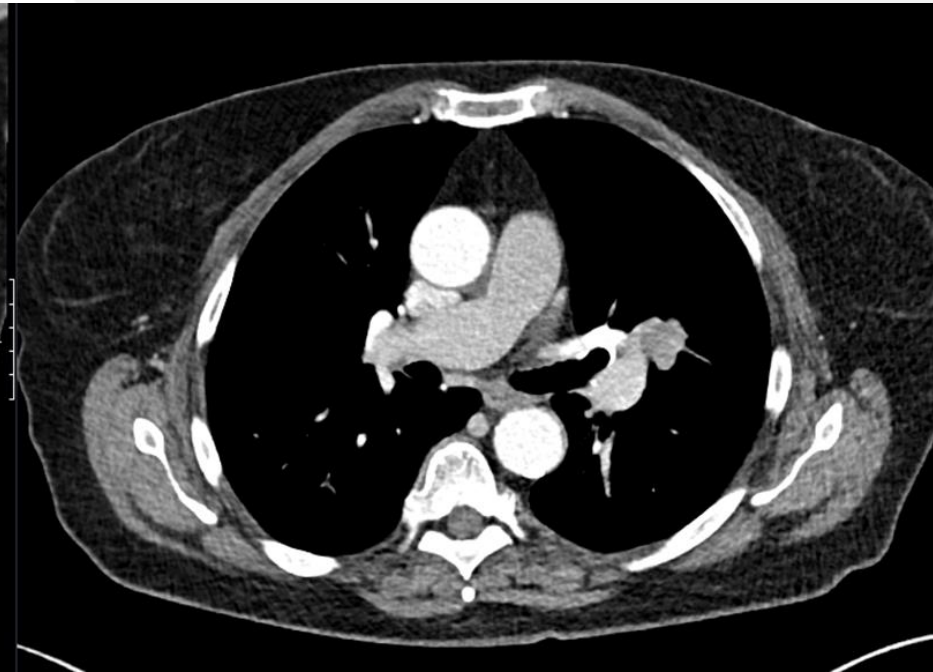
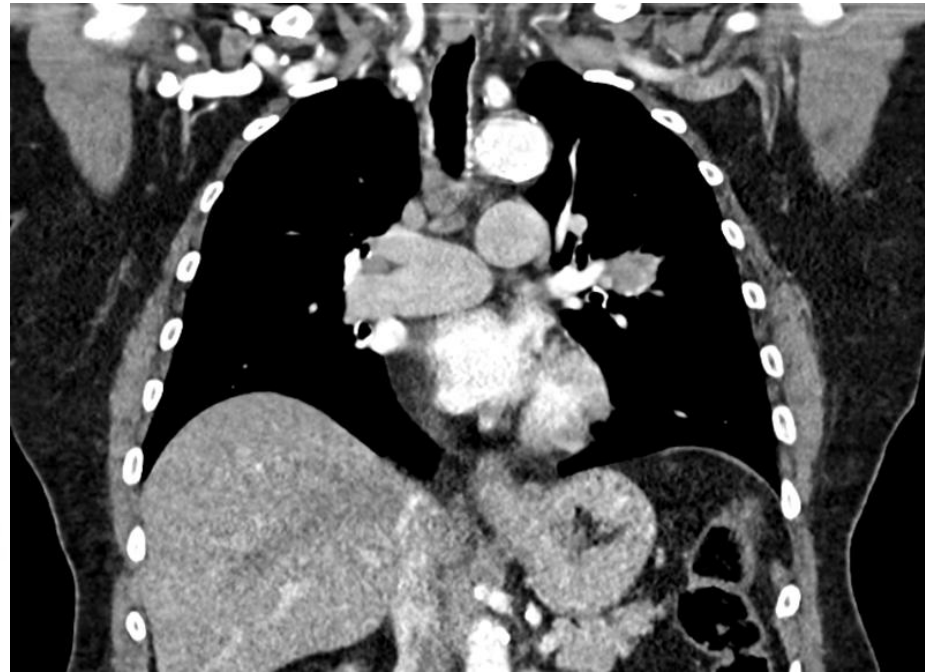
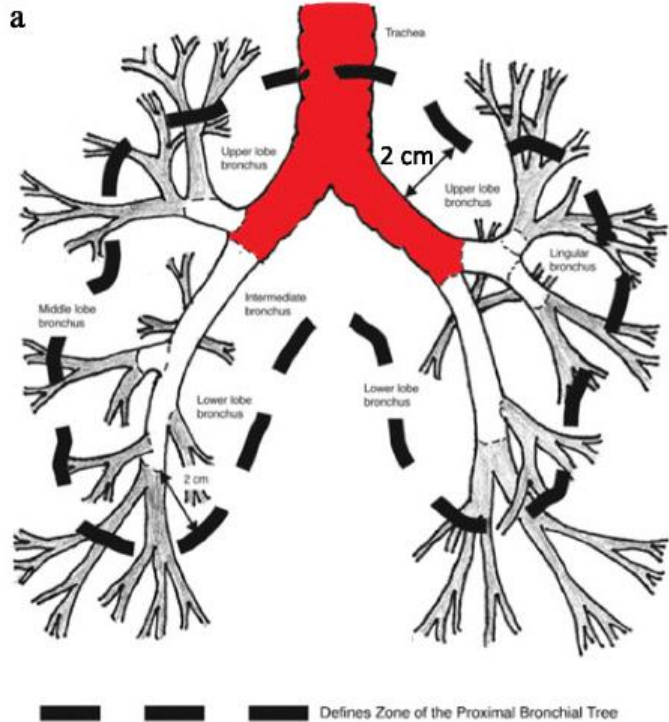
Waarom beeldgestuurde radiotherapie?



Standaard bestraling: CT scan vooraf aan elke behandeling

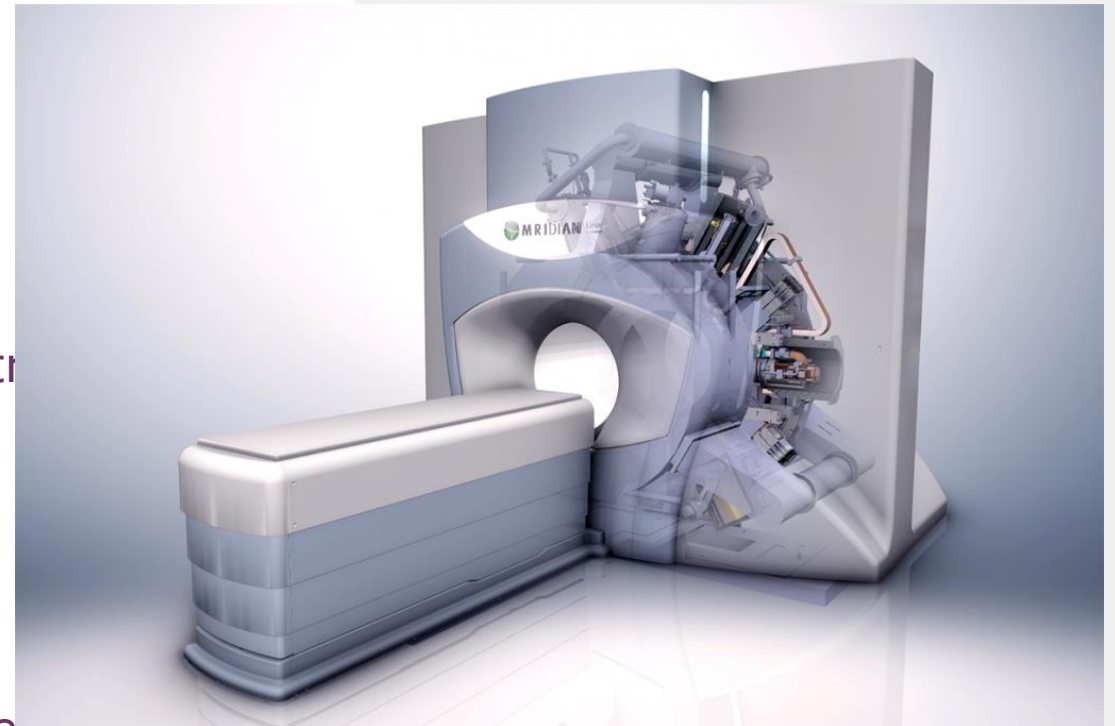


Meer kans op bijwerkingen indien tumor naast luchtpijp of hart



Wat is een MR-Linac?

- Linac = Lineaire versneller
→ Bestralingstoestel
- Beeldgestuurde radiotherapie met MRI
- Nauwkeurig
 - beeldkwaliteit is beter
 - dagelijkse plan aanpassing (adaptieve bestraling)
 - gated bestraling (vastgehouden adem)
- Voordeel
 - Beter tumordekking
 - Beter sparen van omliggend gezond weefsel



Patiënt helpt mee met efficiënte bestraling (gating)



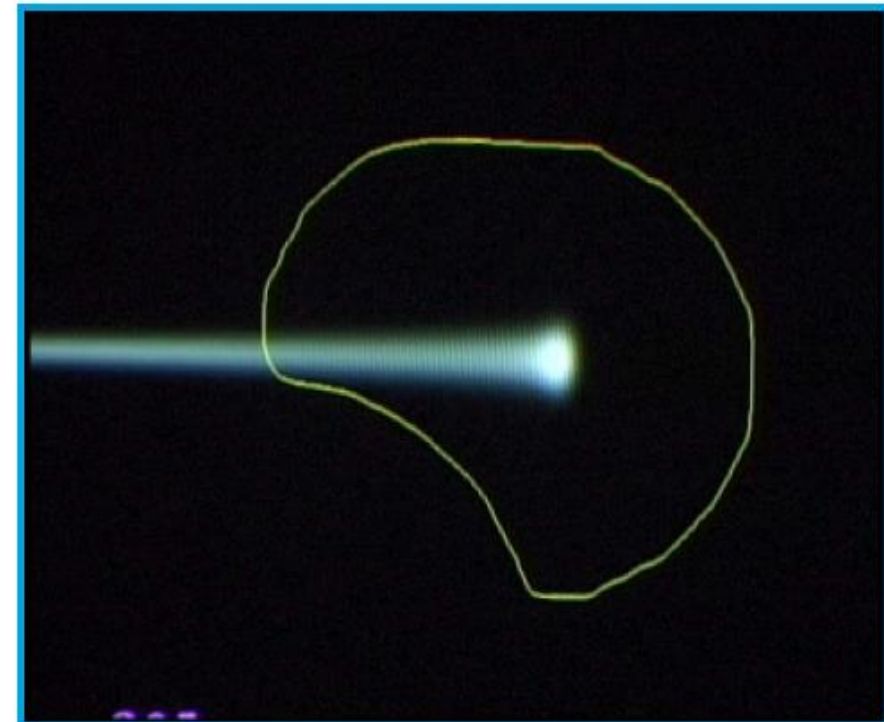
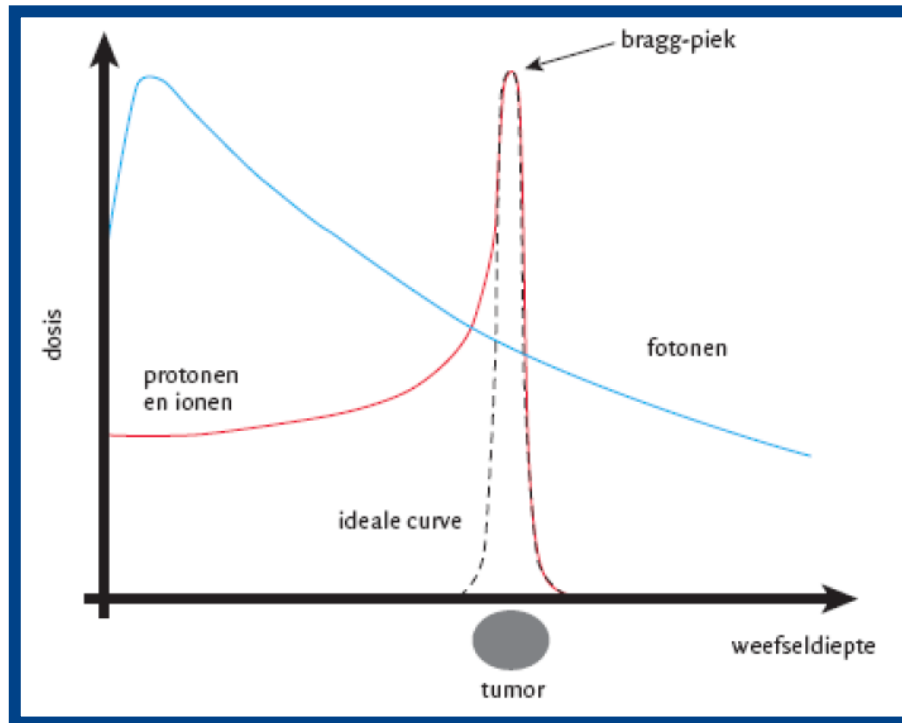
Grote tumor beweging



Gating: bestraling alleen bij ingehouden adem



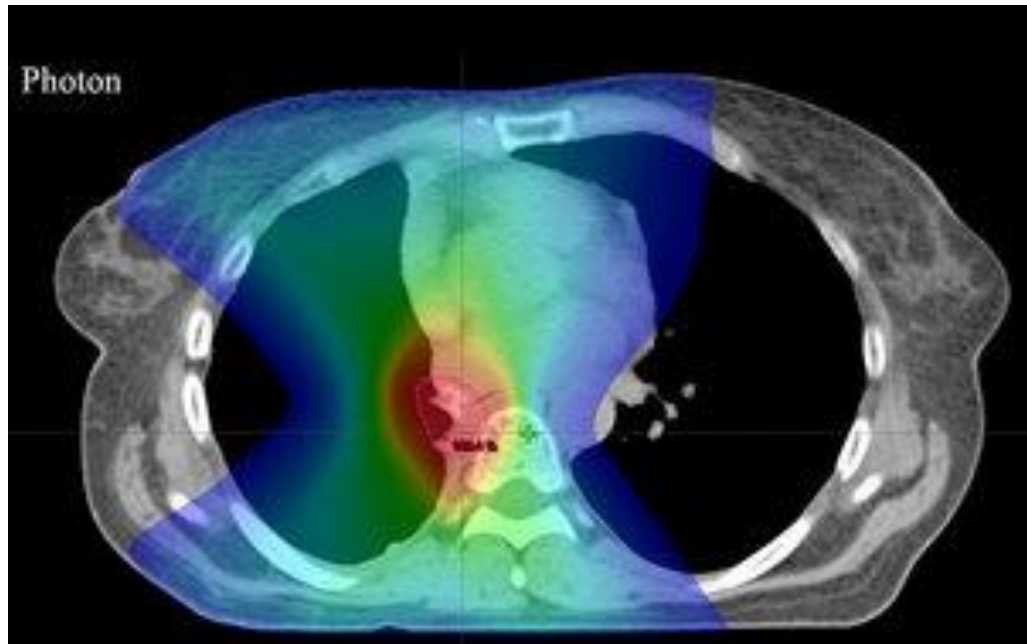
Protonen bij longkanker



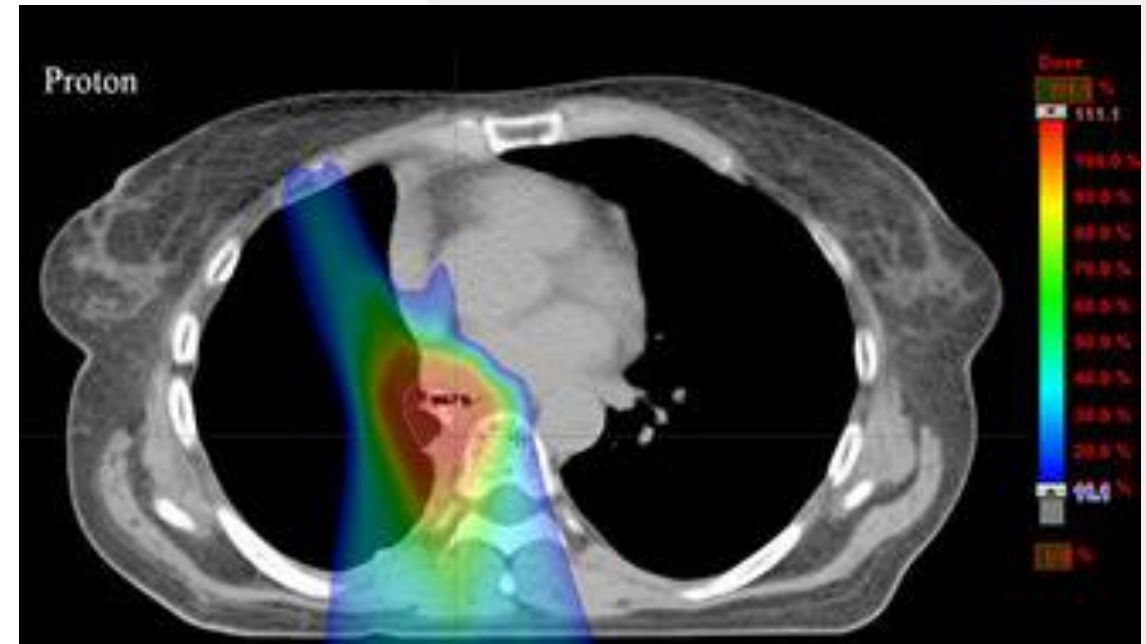
Verskil fotonen en protonen



Fotonen



Protonen



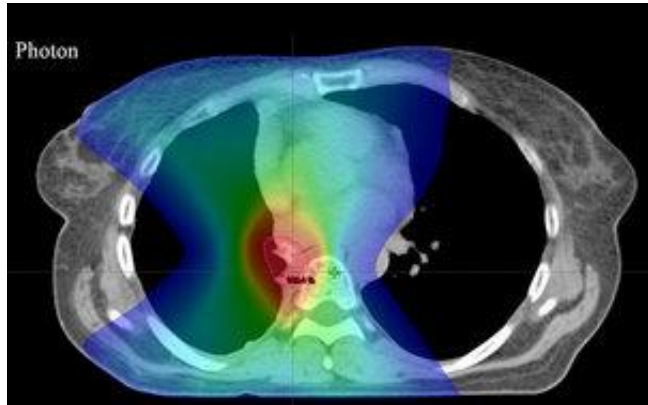
Courtesy of dr. J. van Loon Maastrro Clinic

Adapted from Diwanji et al. Trans Lung Canc Res 2007

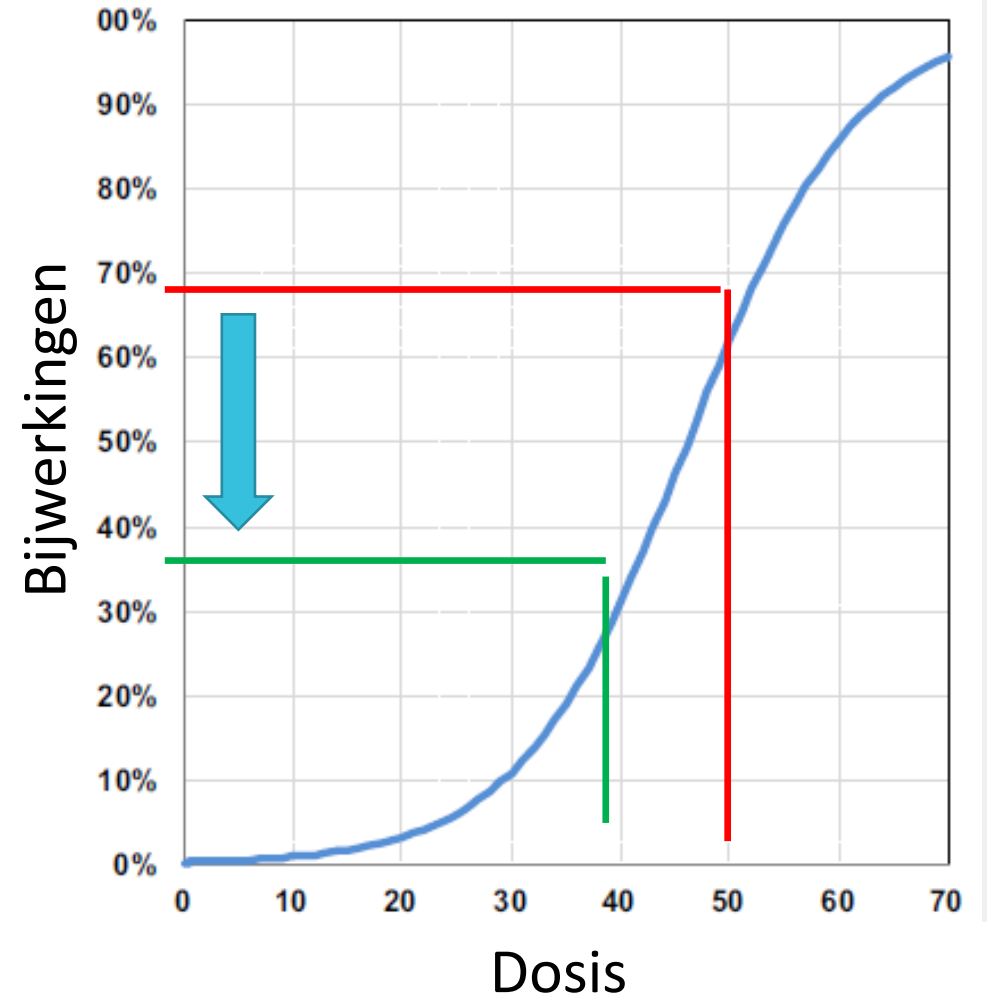
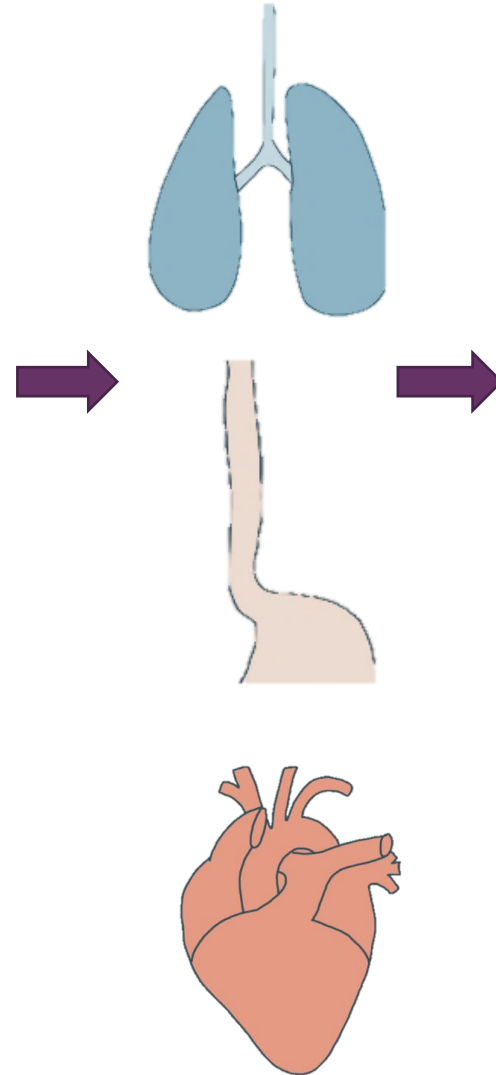
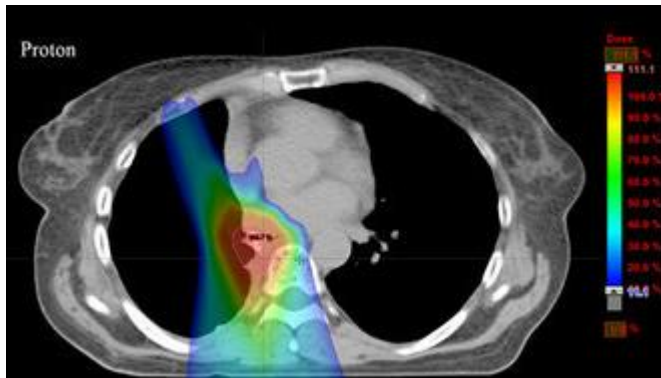
Model based werken: voorspellen van bijwerkingen obv predictie modellen



Fotonen



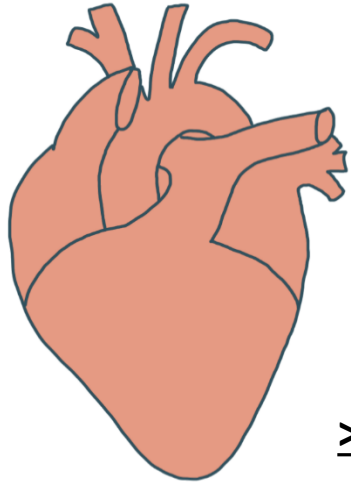
Protonen



Courtesy of J. van Loon Maastrou



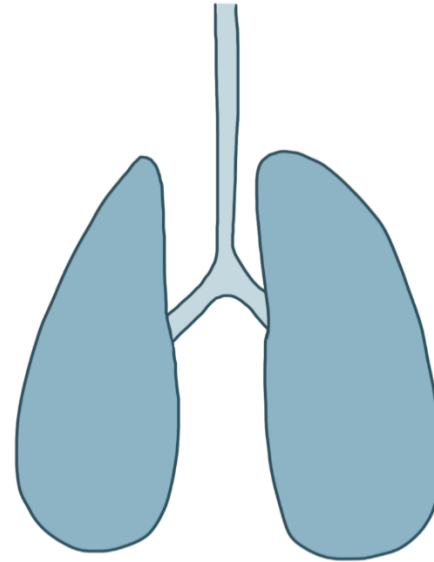
Graad 5 toxiciteit: Mortaliteit



>2%

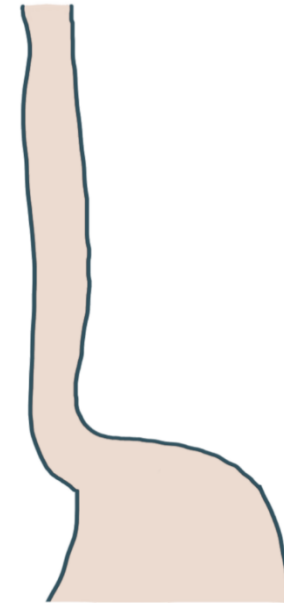
Model parameters:
Mean Heart Dose
Tumorvolume (incl klieren)

Graad 2 toxiciteit: pneumonitis and oesofagitis



>10%

Model parameters:
Mean Lung Dose
Roken
Pulmonale comorbiditeit
Tumor locatie
Leeftijd
Sequentiele chemoradiatie



Model parameters:
Mean Esophagus Dose
Overall treatment time



Take home message

- Radiotherapie: steeds nauwkeuriger waardoor minder bijwerkingen
- MRI gestuurde radiotherapie
 - Dagelijks adaptieve herplanning: aanpassing bestralingsplan op variatie tumor en omliggende organen, waardoor betere tumor dekking en beter sparen van gezond weefsel
 - Gated bestraling (ingehouden adem)
 - Vroeg stadium longkanker: stereotactische radiotherapie bij centrale tumoren en grote tumorbeweging (met name onderkwabben)
- Protonen radiotherapie
 - Minder dosis in omliggend weefsel: met name hart, maar ook longen en slokdarm waardoor beter sparen gezond weefsel.
 - In Nederland: “model based”
 - Gevorderde stadia longkanker: (chemo) radiotherapie

Vragen?

