

TOGA lentesymposium

***Technische snufjes en gadgets:
de weg naar adaptieve radiotherapie***

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Radiotherapie-Oncologie

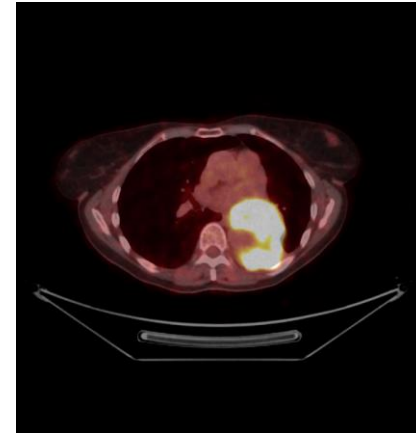
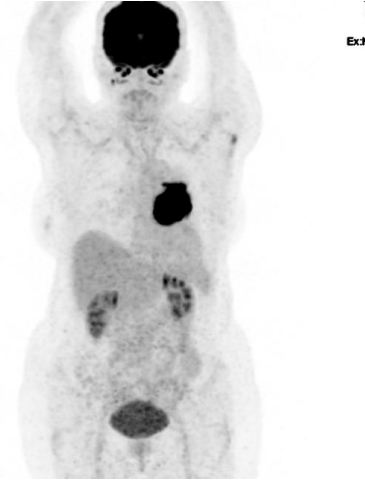
Iridium Netwerk, Antwerpen

TOGA symposium Maart 2022



Casus

- 73-jarige patiënte ♀
- Actief roker
- Oncologische problematiek:
 - 12/2020: Nieuwe diagnose limited disease SCLC links hilair, cT4N0M0 (stadium IIIA)
 - 4/1/2021 - 18/2/2021: concomitante chemoradiotherapie
 - RT: 33 x 2 Gy
 - Chemo: cisplatinum/etoposide 4 cycli
 - Start RT vanaf cyclus II



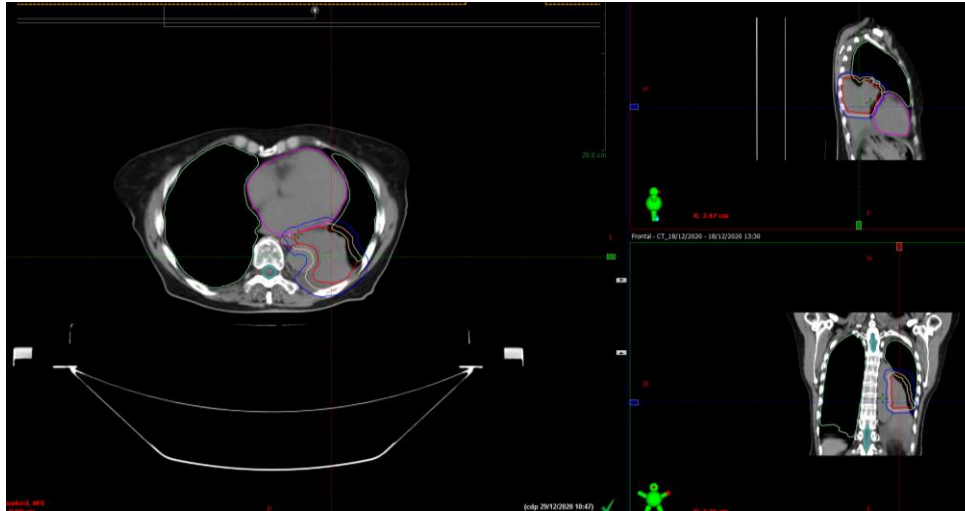
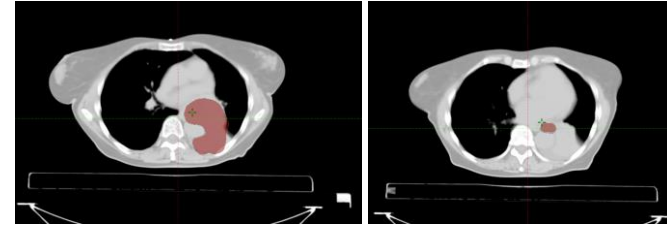
Radiotherapie - planning

- 3D conformele radiotherapie
- Simulatie:
 - Positionering: comfortabel + reproduceerbaar (thoraxsteun)
 - CT scan in bestralingshouding (volledige longen)
 - 4D CT



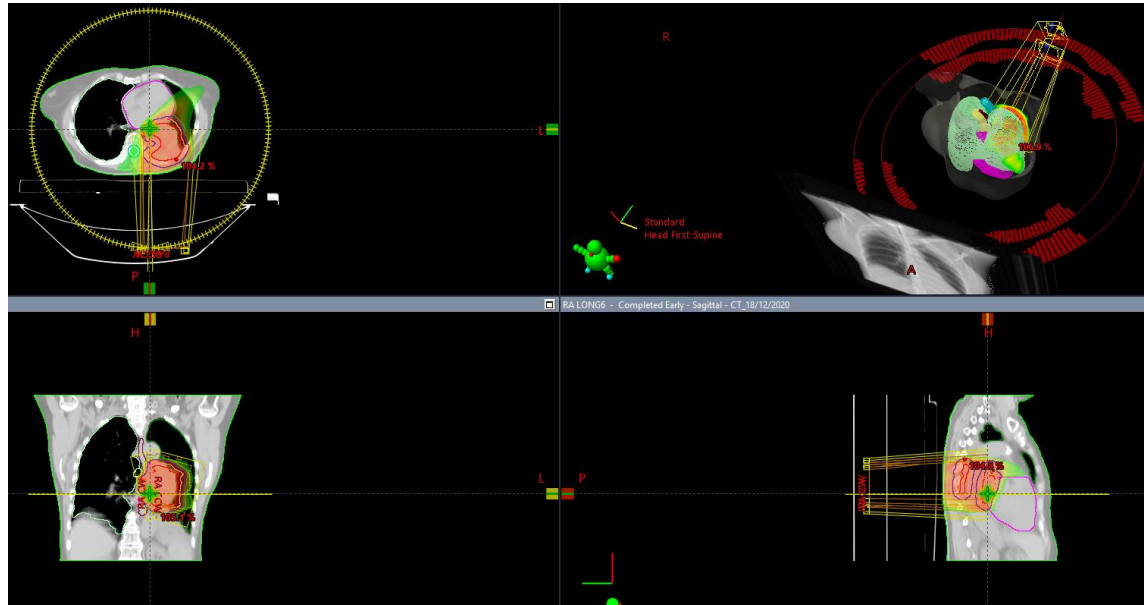
Radiotherapie - planning

- 3D conformele radiotherapie
 - Delineatie doelvolume en risico-organen
 - Tumor links hilair – N0
 - Fusie met PET -> DD tumor - atelectase
 - Marge voor microscopische ziekte – planningonzekerheid



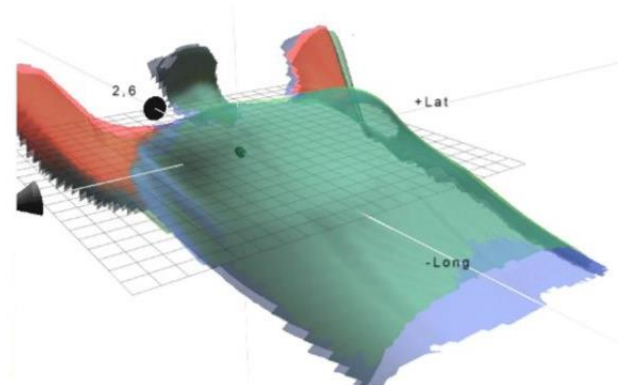
Radiotherapie - planning

- RT planning:
 - 66 Gy thv PTV volume met maximaal sparen van OAR
 - Rotationale arc therapie



Radiotherapie - uitvoering

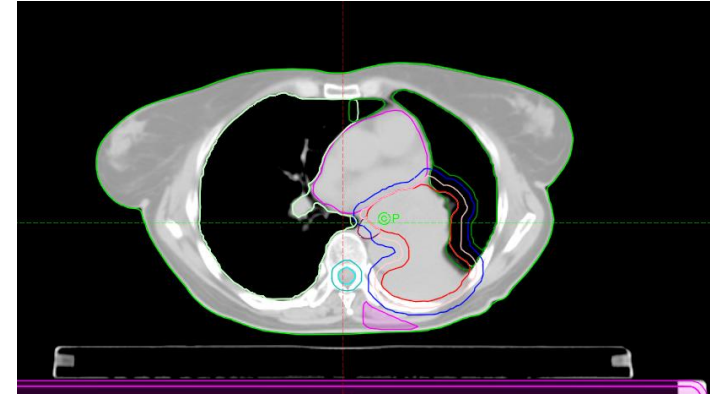
- 33 fracties – dagelijks – 5x/week
- Positionering – patient set up
 - Surface guided radiotherapie (SGRT)
 - Geen tatoeage of huidmarkeringen bij simulatie
 - Oppervlakte scanning
 - Monitoring van patiënt tijdens behandeling



Radiotherapie - uitvoering

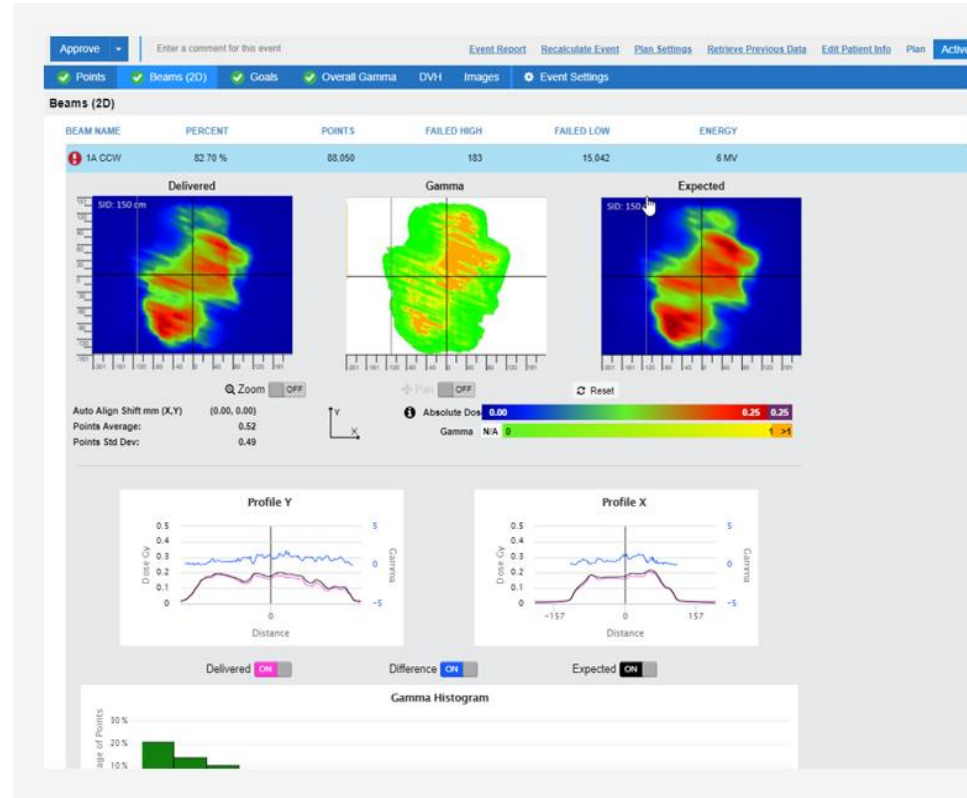
- Verificatie positie
 - Cone beam CT
 - Dagelijkse monitoring anatomie
 - Voordien: bony match met kv beelden
 - Beeldgeleide 'Image guided radiotherapie'
 - Verificatie en zo nodig 3D verschuiving (6D)
 - Interfractionele anatomische veranderingen

- Fractie 6/66
 - Afname atelectase op CBCT
 - SCLC met concomitante chemotherapie



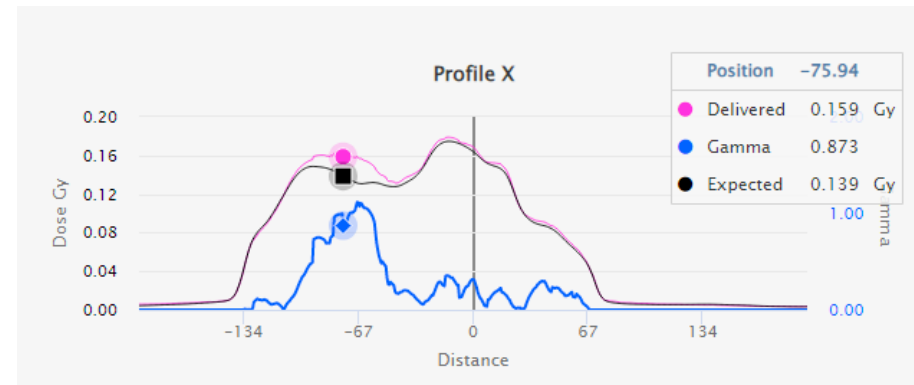
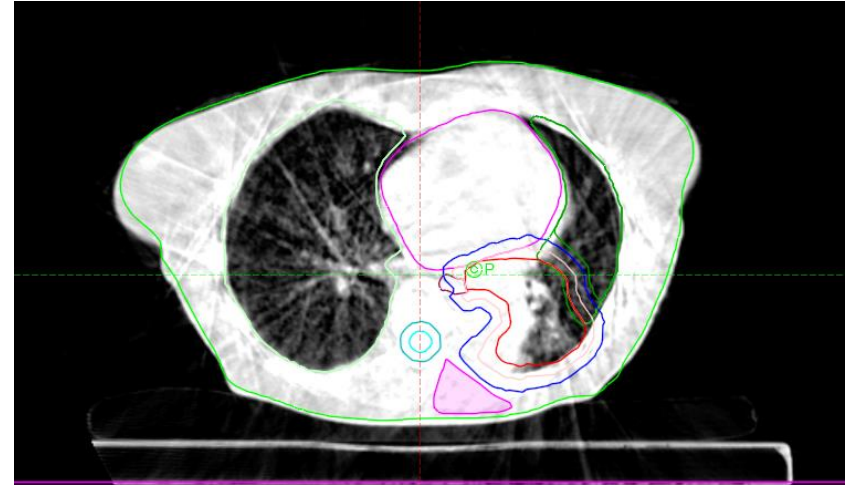
Radiotherapie - kwaliteitsverificatie

- Quality assurance systeem
 - Transit dosimetrie
 - Gegeven dosis vergelijken met geplande dosis
 - Verificatie
 - Matching
 - Shift risico-organen:
 - vb ontstaan pleuravocht – afname atelectase
 - Shift doelvolumen: vb afname tumor



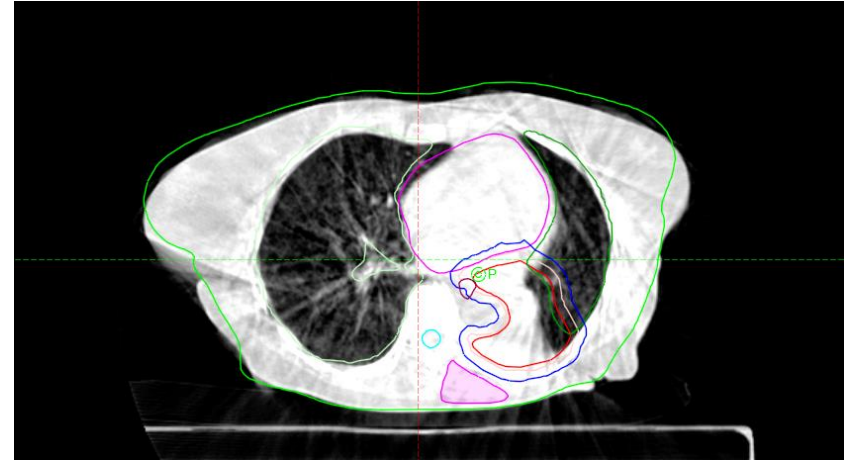
Adaptieve radiotherapie

- Cone beam CT
 - Afname tumor
 - Afname atelectase
- Perfraction QA
 - Foutmelding
 - Toename van gezonde longdosis
- Oplossing
 - Herevaluatie simulatie + herplanning



Adaptieve radiotherapie

- Fractie 25/33
 - Verdere afname tumor en atelectase
 - QA systeem ok
 - Matching tumor ok
 - Besloten tot verderzetten zonder herplanning



Besluit

- Meest voorkomende veranderingen
 - Atelectase
 - Pleuravocht
 - Tumor groei of afname
- Adaptieve radiotherapie in Iridium
 - Hoog conformele 3D rotationele arc therapie (VMAT)
 - Beeldvorming gestuurde radiotherapie (CBCT)
 - Surface geleide positionering en monitoring
 - QA dosimetrie voor kwaliteitsverificatie (Perfraction)
-> aanpassen RT plan obv beeldvorming/dosimetrie
- Effect op toxiciteit?
- Effect op lokale controle?

Literatuur - adaptieve radiotherapie

Radiotherapy
&Oncology

ORIGINAL ARTICLE | VOLUME 168, P234-240, MARCH 01, 2022

Survival benefits for non-small cell lung cancer patients treated with adaptive radiotherapy

Ditte Sloth Møller ¹ • Christina Maria Lutz ¹ • Azza Ahmed Khalil • ... Ane Appelt • Marianne Marquard Knap ² • Lone Hoffmann ² • Show all authors • Show footnotes

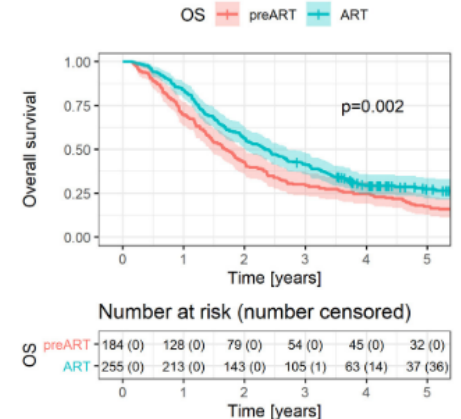
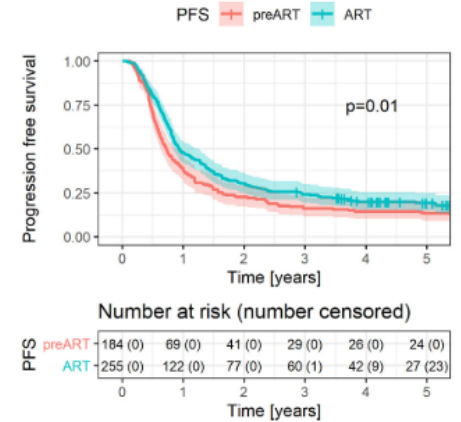
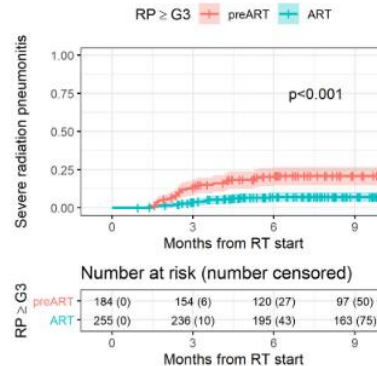
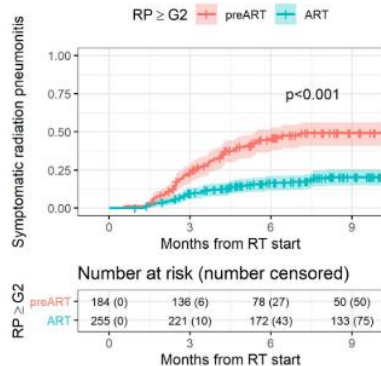
Open Access • Published: February 01, 2022 • DOI: <https://doi.org/10.1016/j.radonc.2022.01.039>

- Retrospective study - Denmark
- 472 patients (184 pre-ART – 255 ART)
- NSCLC treated with CRT
- Persistent changes -> adapted plan

Literatuur - adaptieve radiotherapie

Results:

- Decrease in PTV volume with ART : median 456 to 270 cc
- Decrease in mean lung and heart dose
- Decrease in radiation pneumonitis rates: severe RP from 21% to 7%
- Increase in PFS at 2y: 22% to 30% (p=0.01)
- Increase in OS at 2y: 43% to 56%
- Multivariate analysis: OS/DFS impact of GTV volume and ART



Literatuur - adaptieve radiotherapie

- Treatment adaptation to large anatomical changes leads to higher precision RT
 - Lower toxicity rates
 - Higher efficacy
- Limited bias from contributing factors
 - No adjuvant immunotherapy in both pre- and ART patients
 - IMRT 85% vs 100%

Bedankt!



