Current and Emerging Treatment Landscape of Lung Cancer II: Radiation Oncology Perspective

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Overview of the role of Radiation Oncology in lung cancer

- Make a decision: Curative vs Palliative

- Curative
  - Early stage unresectable (Stage I-II NSCLC)
  - Locally-advanced unresectable NSCLC
  - Post op NSCLC
  - Limited-stage SCLC
  - Oligo-categories (oligometastatic and oligoprogressive)

- Palliative principles
  - Improve symptoms, prevention of symptoms (i.e. fractures or obstruction), and/or durable local control
  - Often the most difficult of decisions we make
    - Treat vs not treat; what to treat; dose/fractionation; coordination with systemic therapy
    - Brain mets – few vs multiple

Radiation Oncology Tools (current and upcoming)

- **Photons (alphabet soup!):**
  - Linear Accelerator – traditional linac; CT-based Halcyon; MRI-based Unity or ViewRay; PET-based Reflexxion
  - Intensity-modulated RT (IMRT); Volumetric modulated arc therapy (VMAT); Image-guided RT (IGRT); 3 dimensional conformal (3DCRT); hypofractionated RT (i.e. 6-20 fractions); stereotactic RT; radiosurgery (1 fraction)
  - Special equipment – 6 DoF couches; Hypersight (near diagnostic CT quality images); camera-based body surface imaging (for breath hold delivery)

- **Protons**
  - Passive scattering (older systems; most have been upgraded)(similar to 3DCRT)
  - Pencil-beam scanning (also called intensity-modulated proton therapy or IMPT)
  - Volumetric arc proton therapy (not yet FDA approved)
  - FLASH therapy – currently research only
- **Brachytherapy** – not used much in lung cancer setting

Any images of technology are supposed to be instructive only

-There are multiple vendors of these technologies

-Selected images are examples, not intended to favor one or the other

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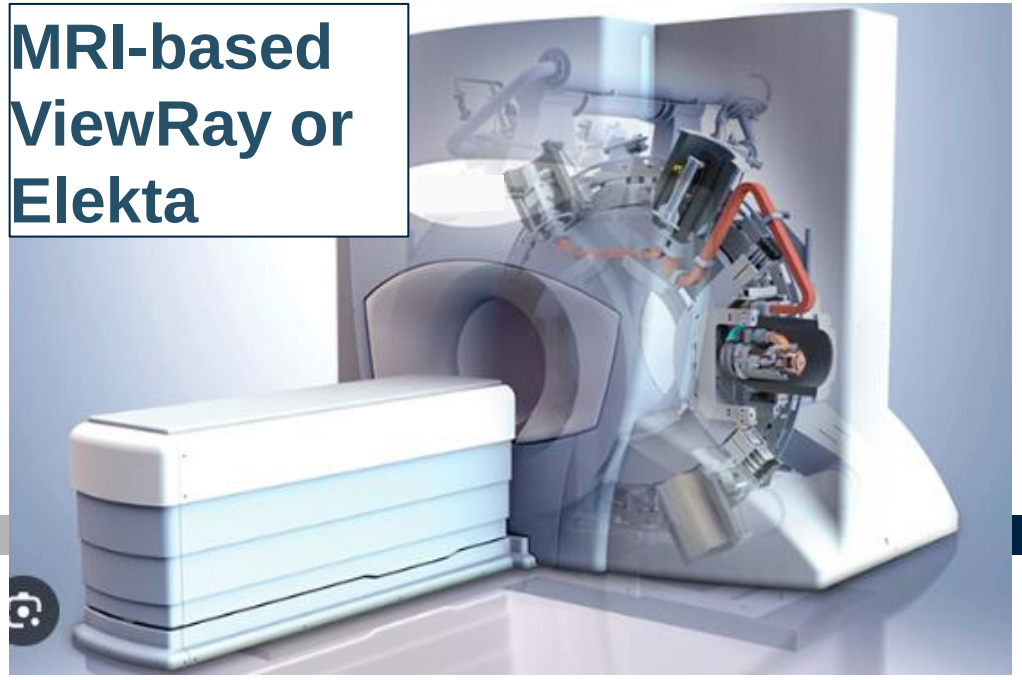
Linac

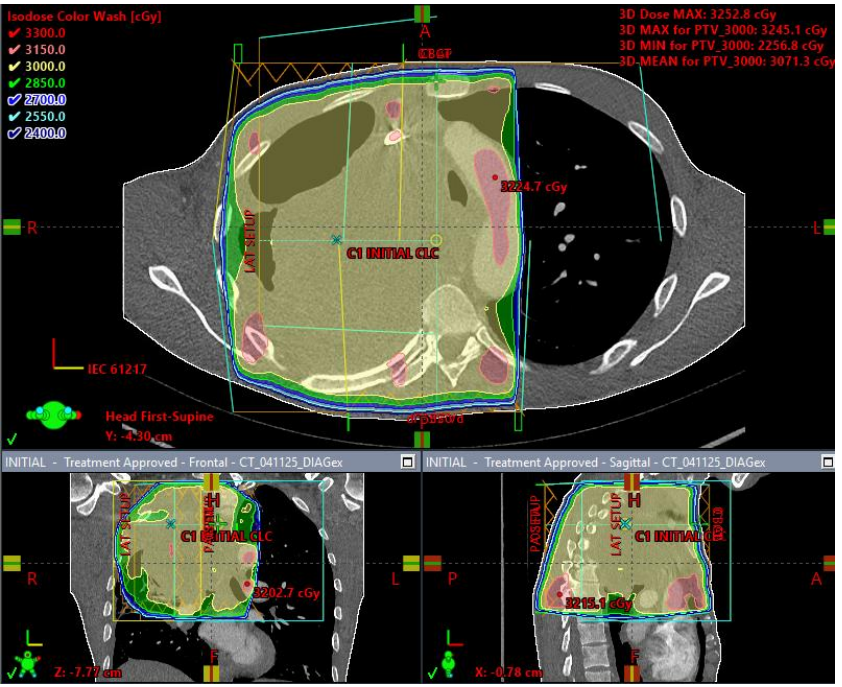
CT-based
Halcyon / Ethos

MRI-based
ViewRay or
Elekta



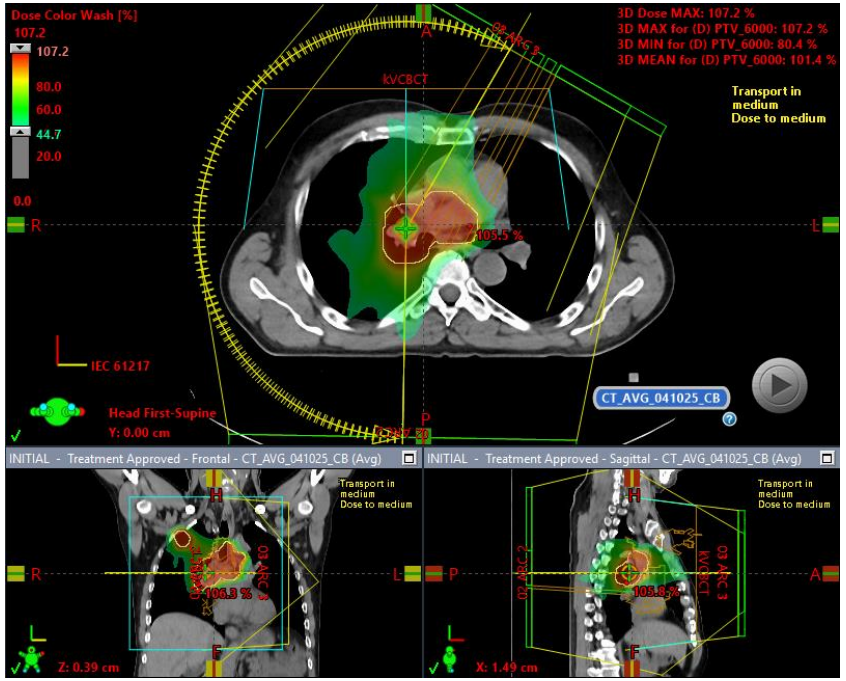
PET-based
Reflexxion

3DCRT - photons



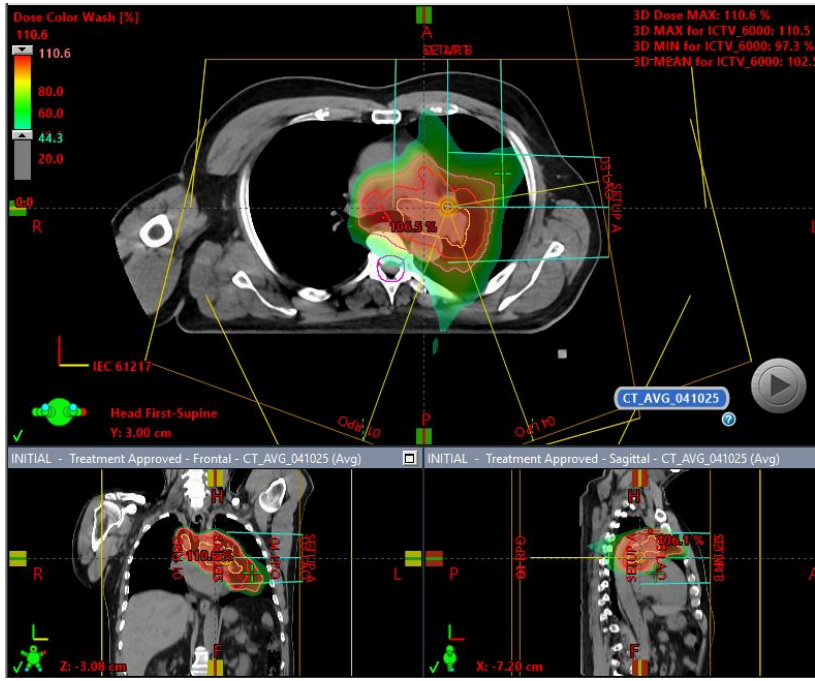
-Palliative RT
-Quick forward planning
-Commonly 30 Gy / 10 fractions or 20/5

VMAT IMRT - photons



-All OARs contoured
-Inverse planning (AI automated)
-Commonly 60-66 Gy in 30-33 fractions with chemo
-Can be hypofractionated (w/o chemo)
-Applies to adaptive RT equipment

IMPT - Protons



-All OARs contoured
-Forward planned
-Commonly 60-66 Gy in 30-33 fractions with chemo
-Can be hypofractionated (w/o chemo)

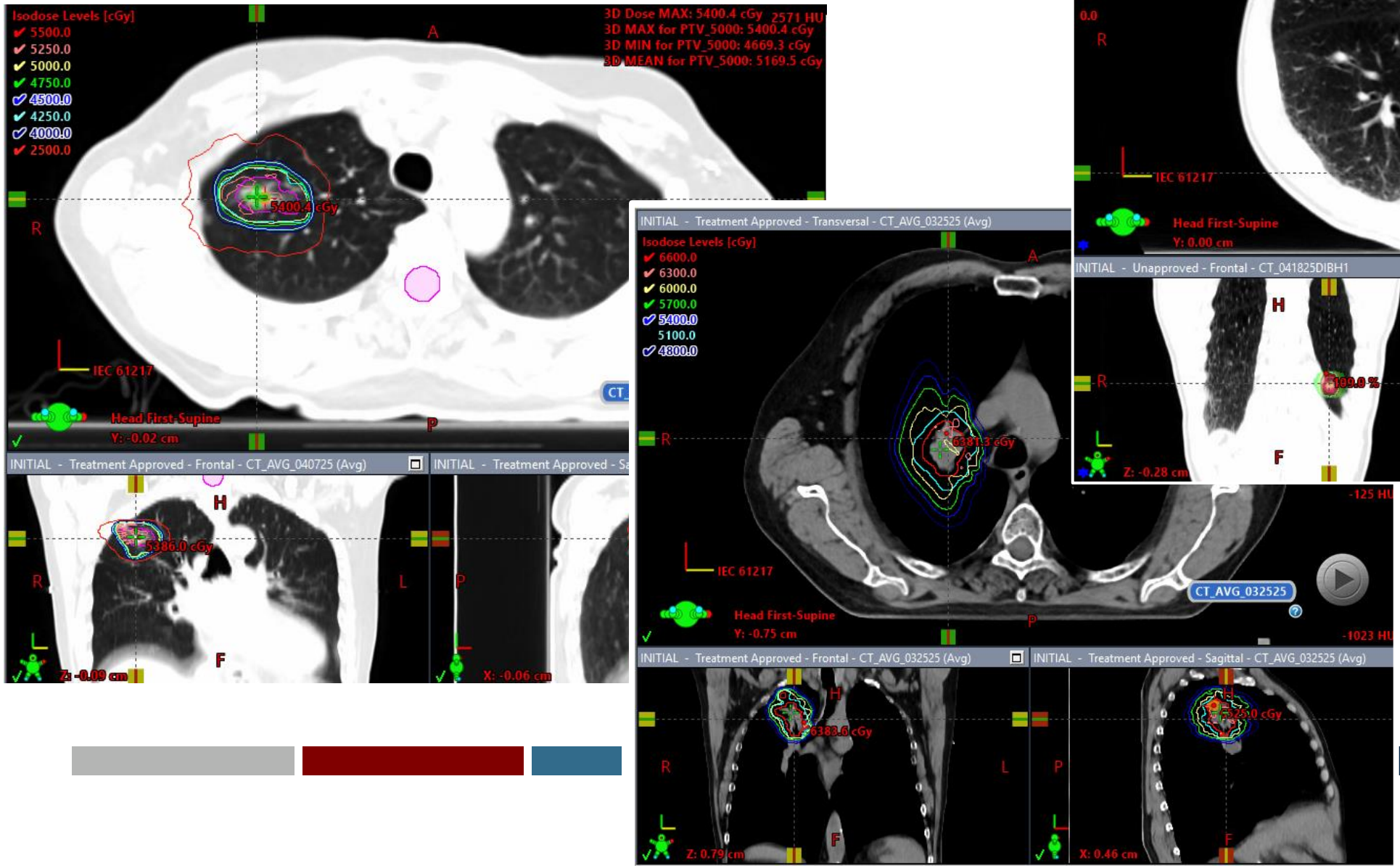
Radiosurgery options

Cyberknife-
Brain and body

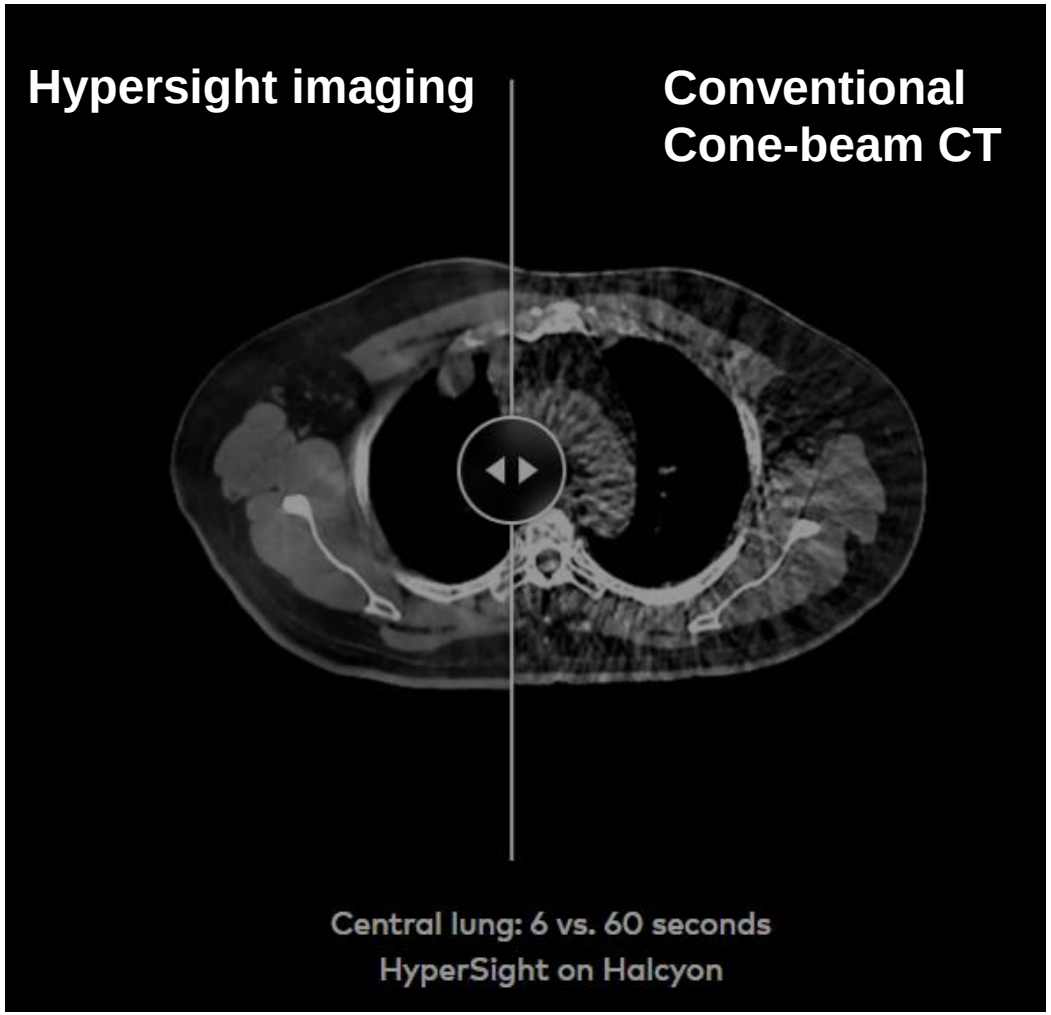
Gamma knife –
Frame-based
Brain and BOS

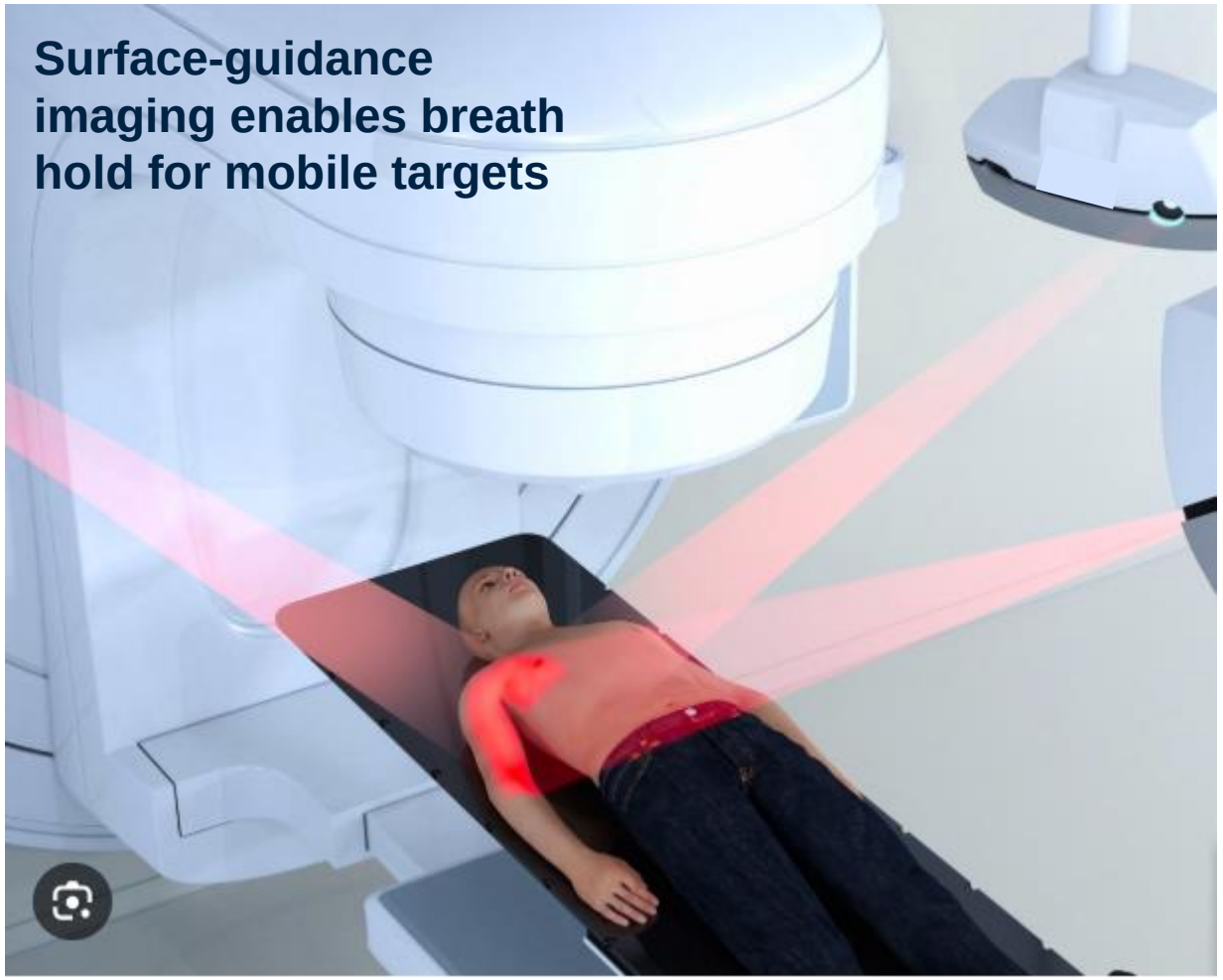
Linac-based
Frameless
Brain and body

Size, location, and OARs

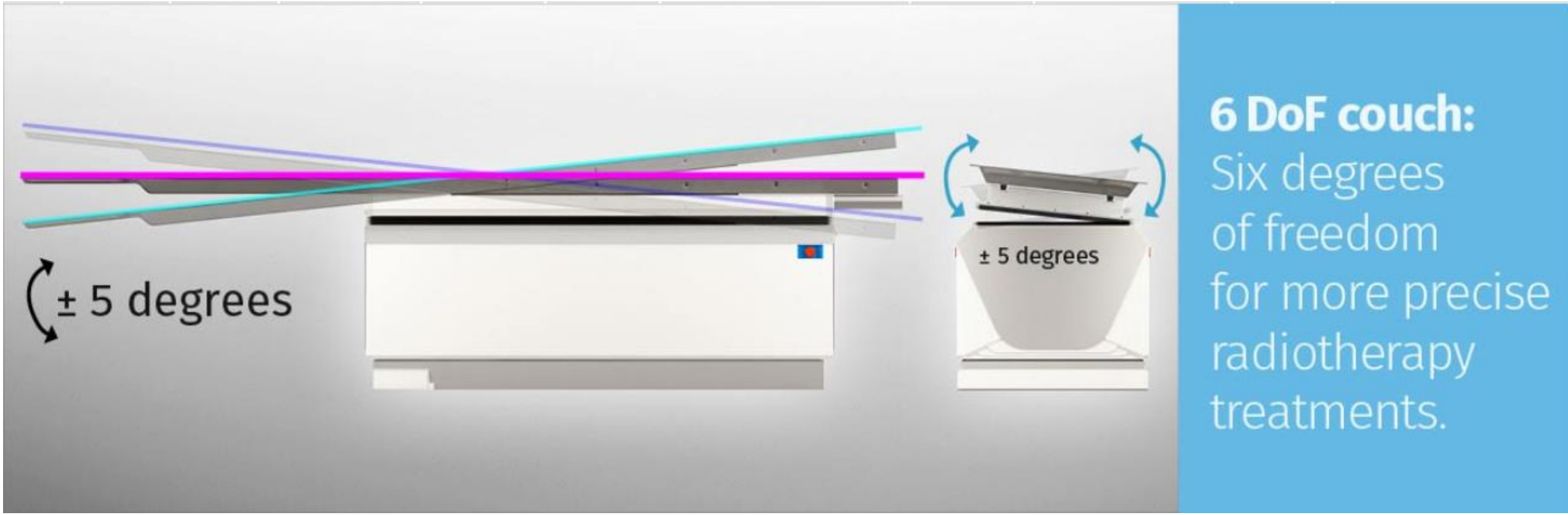


Special Features: On-board imaging and Surface guidance examples



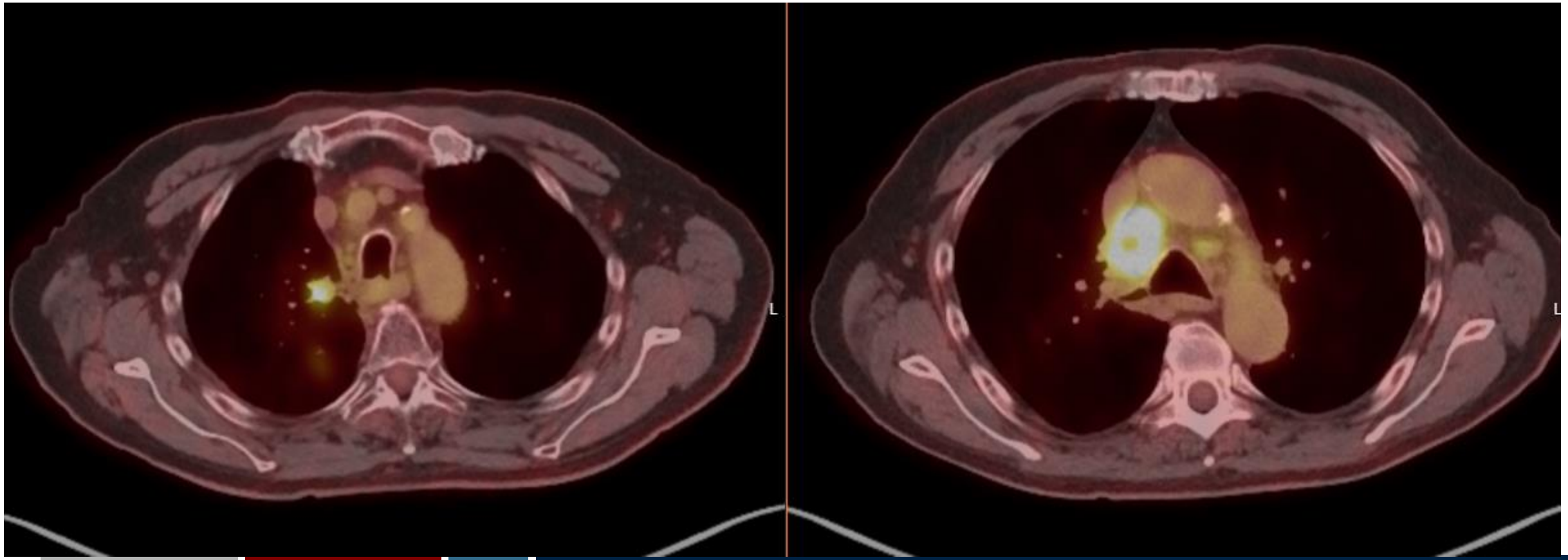


What is a 6 DoF couch?



Patient case

- 74 yo male with severe COPD with newly-diagnosed RUL squamous cell carcinoma involving R4 node. PDL1 is 20%. Has solitary brain metastasis.
- What do you recommend?



Patient case

- 74 yo male with severe [illegible] cell carcinoma involving R4 node. PDL1 is 20%.
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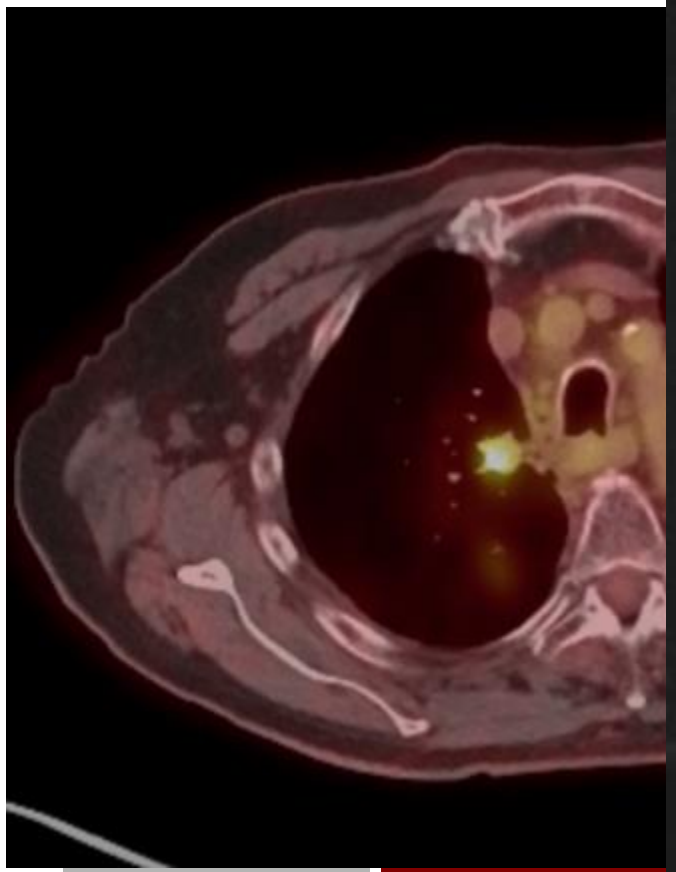

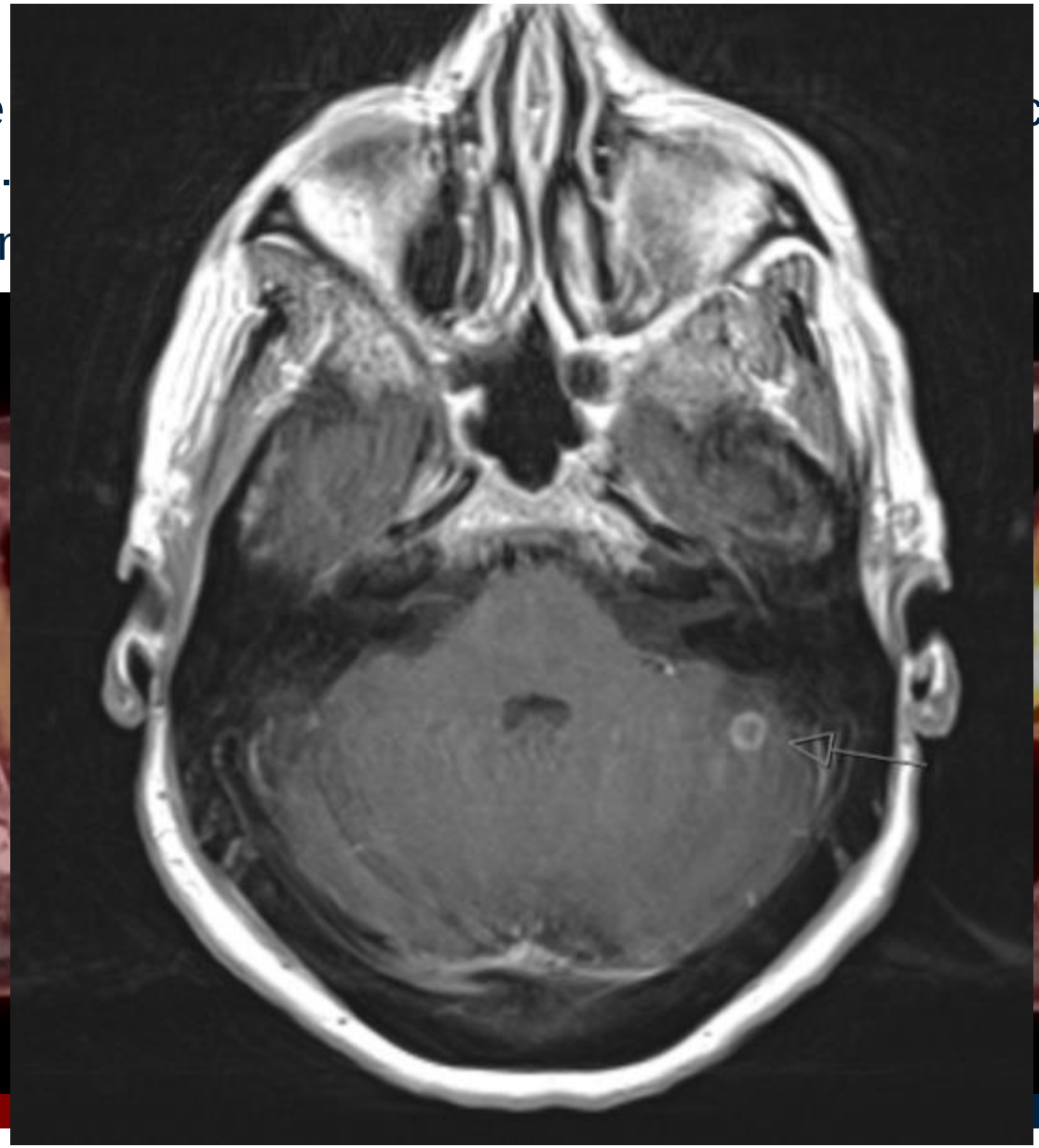

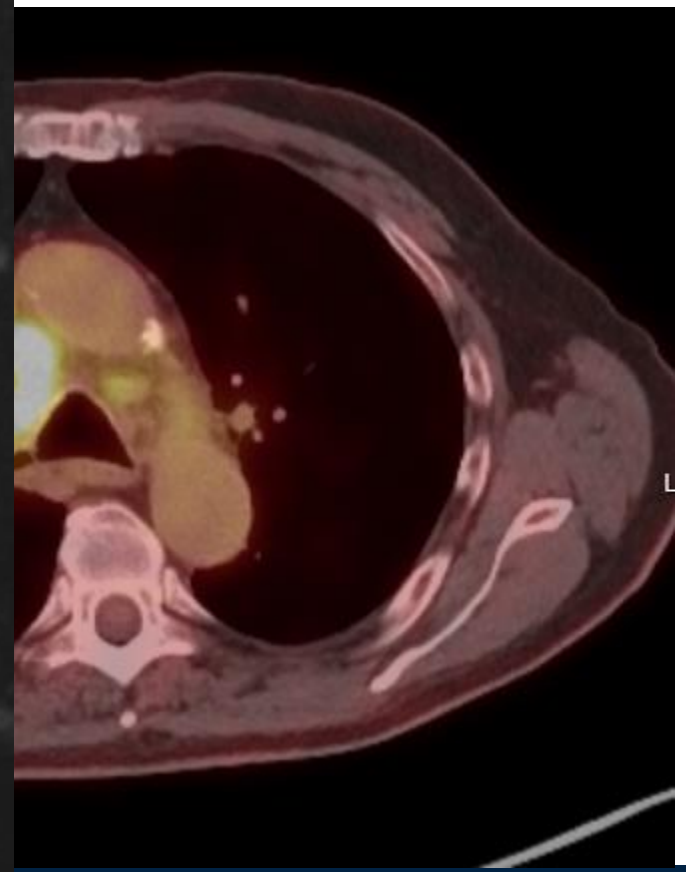

Patient Case

Major decisions to make

- Curative vs Palliative

- Operable vs inoperable
  - Brain
  - Lung

- Systemic therapy
  - Palliative setting - chemo vs. IO vs. both
  - Curative setting - sequential chemo vs. concurrent with RT
  - IO – when to add

- Radiation therapy
  - Radiation dose, fractionation, volume, method of delivery

Patient Case

Major decisions to make

- Curative vs Palliative
  - Curative
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  - Brain – non-operative management w/ SRS
  - Lung
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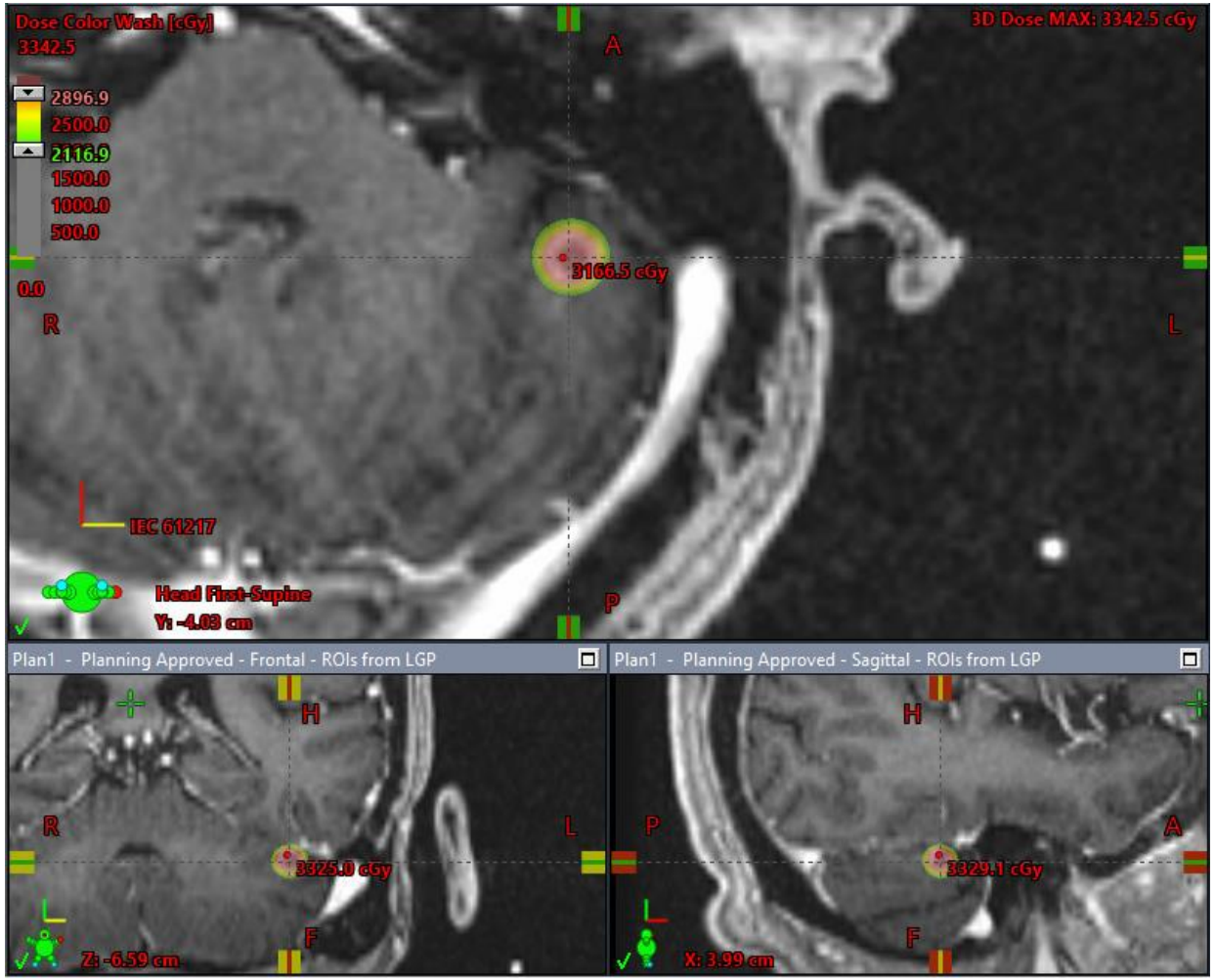

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  - Lung – poor pulmonary function, so non-operative

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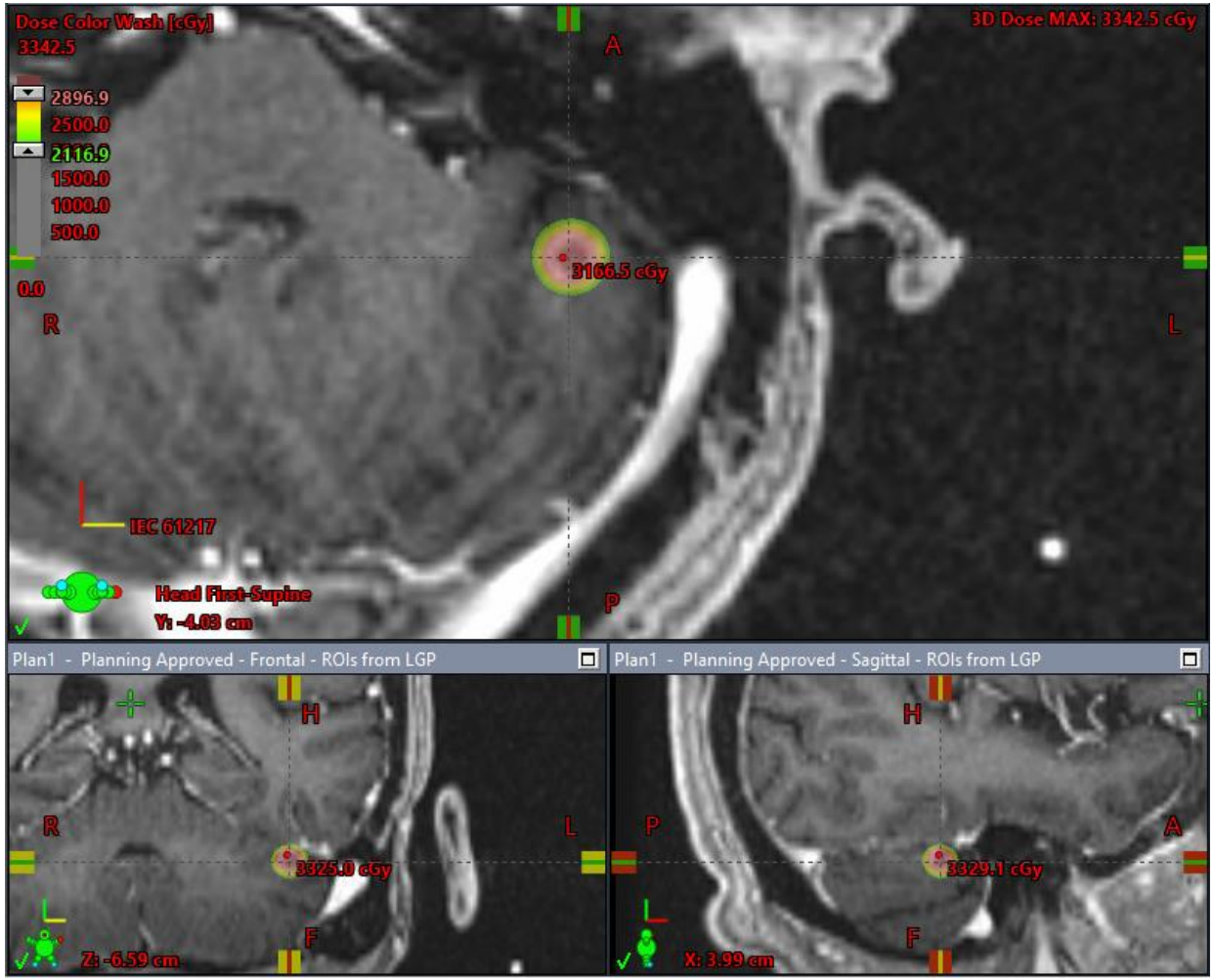

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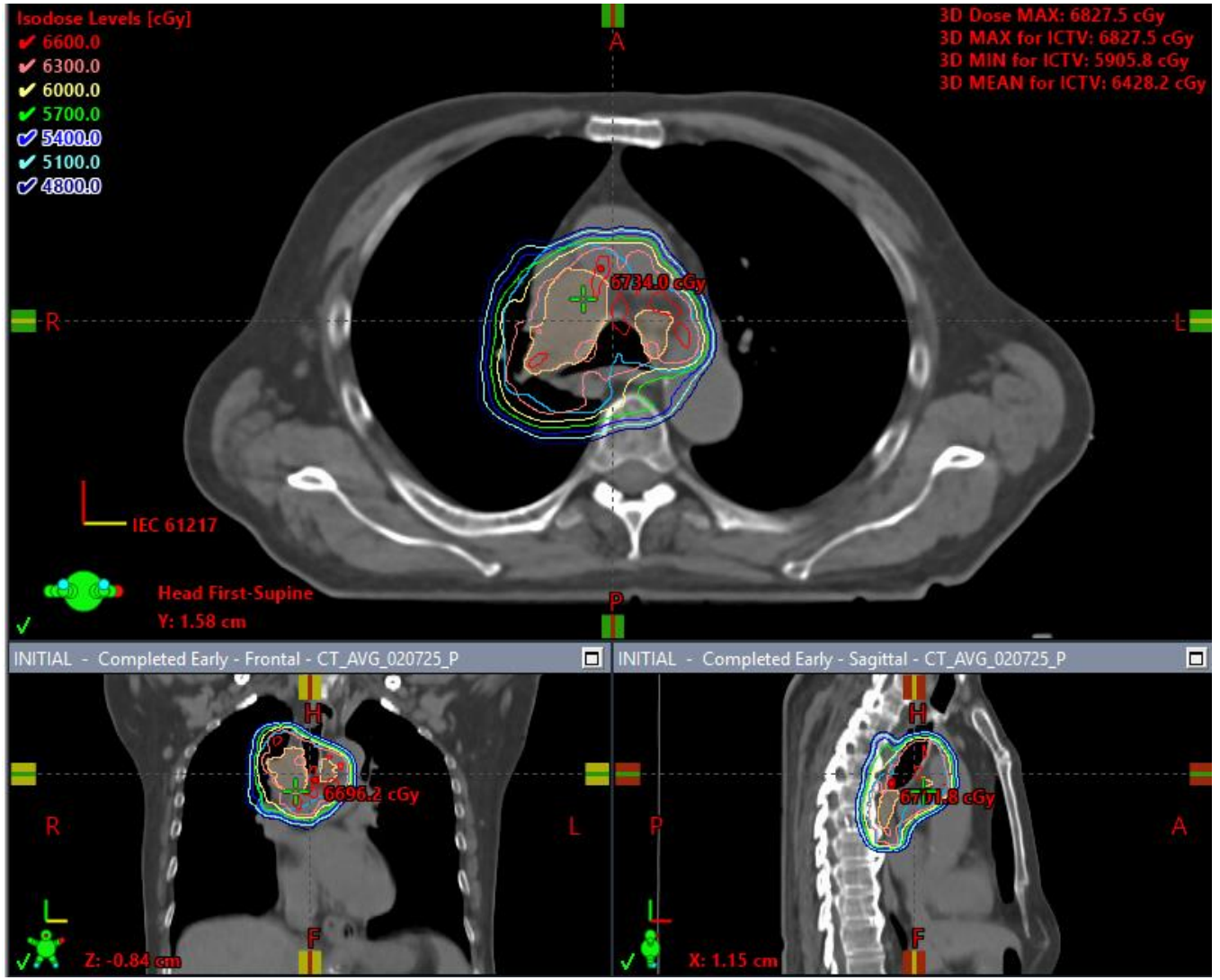

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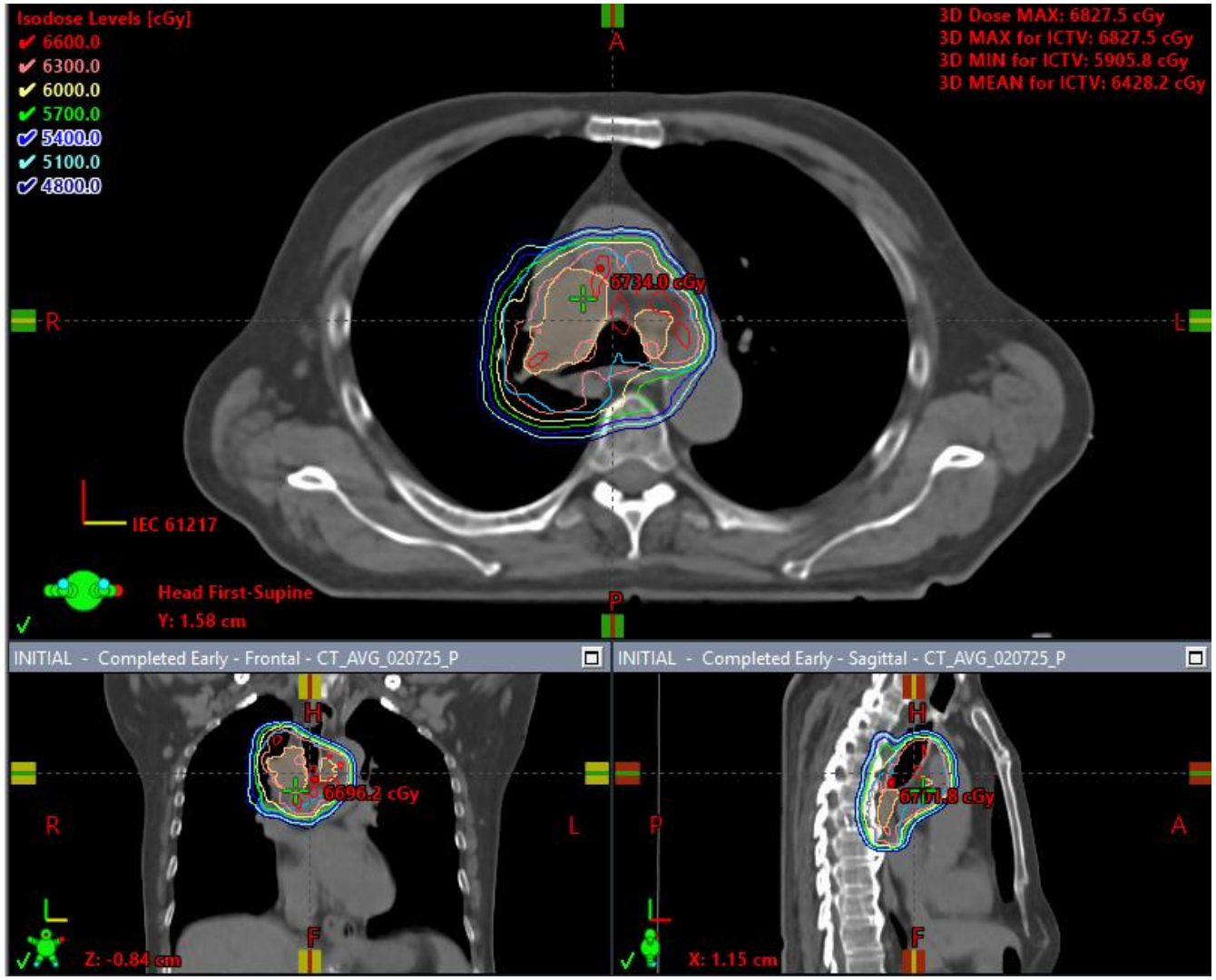


Patient Case

Radiation Decisions and why

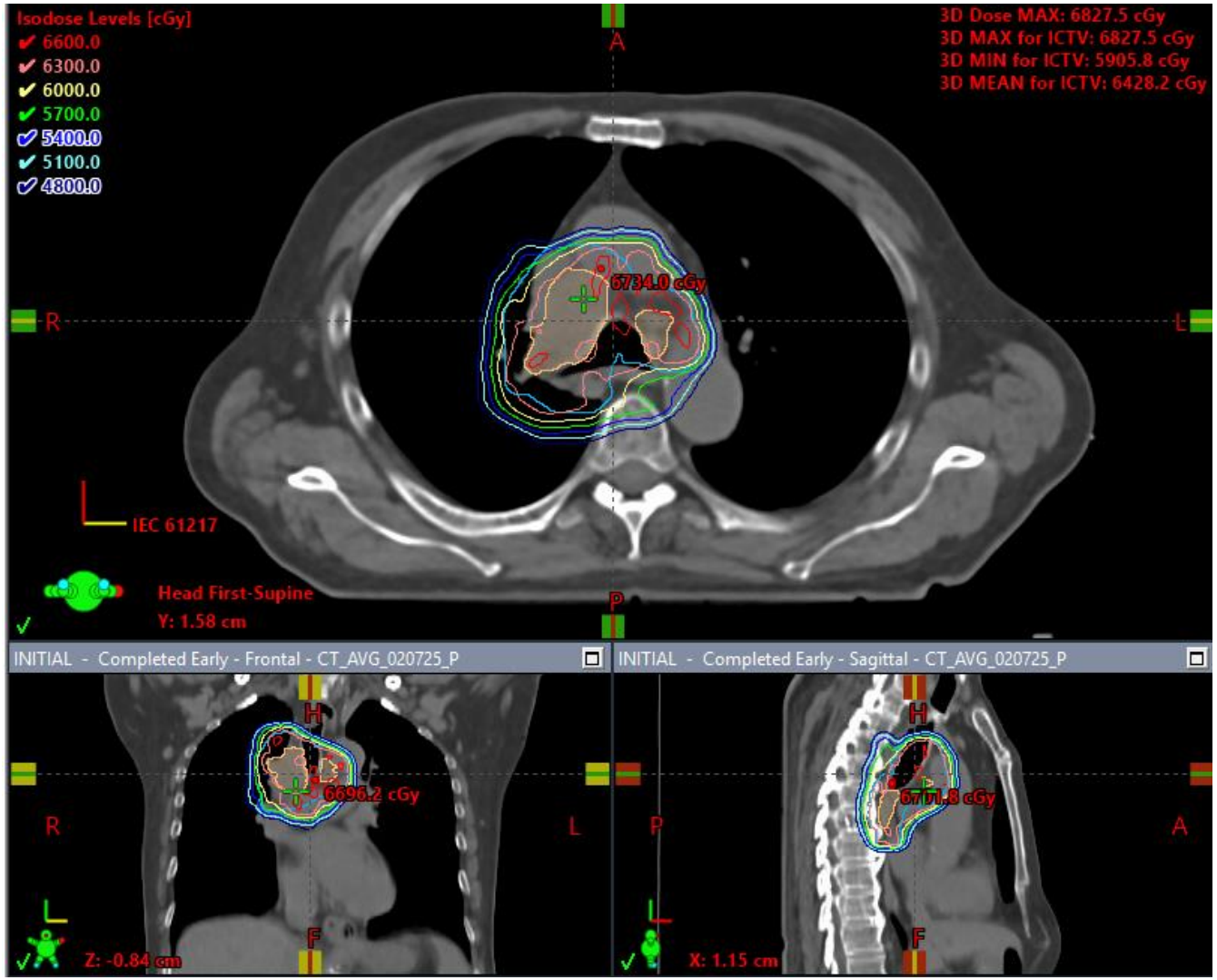
- 60 Gy in 2 Gy daily fractions
  - SOC per RTOG 0617 and PACIFIC trials
- IMRT delivery
  - Target volume is above the heart,

  and IMRT does a good job there.
- Daily CBCT for alignment
  - Daily tumor imaging helps with accurate
  - delivery and monitoring response
- Expectations: Esophagitis
  - No great prevention strategy

- If chemo was <u>not</u> concurrent delivery,

would consider hypofractionation with 20 fx

Example: 50-55 Gy in 20 fractions using alpha/beta = 3



Open for discussion