

# Will innovations in IGRT change compliance in radiotherapy treatments?

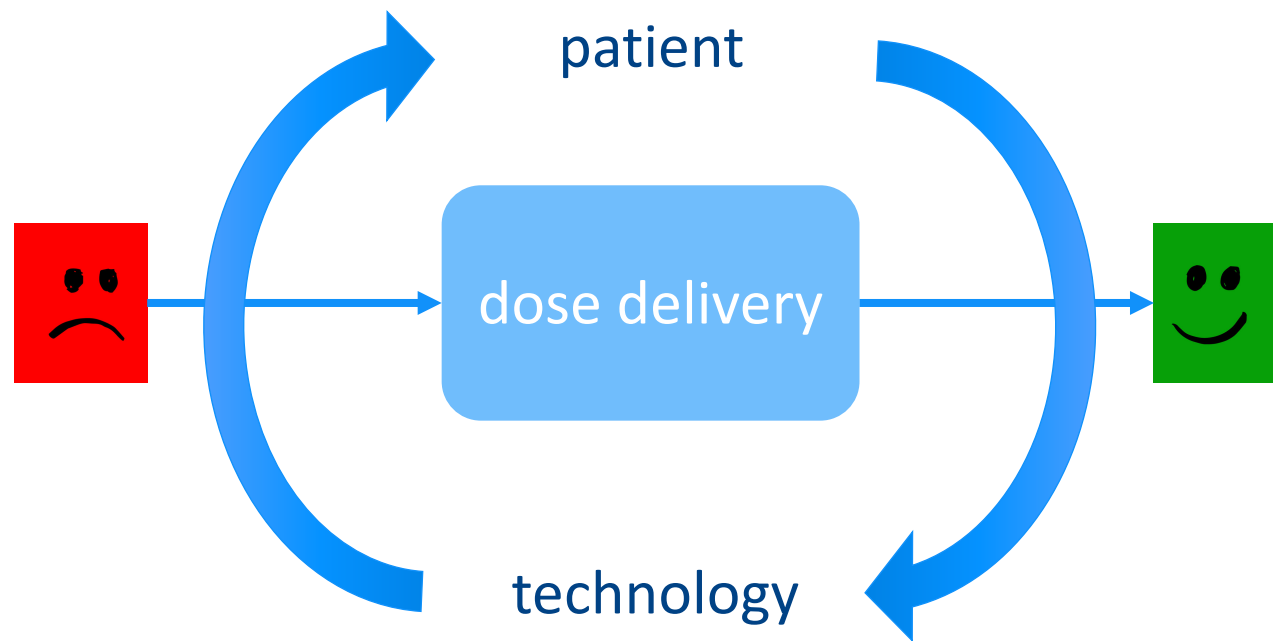
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Department of Radiation Oncology | UMC Utrecht



UMC Utrecht

Will innovations in IGRT change compliance in radiotherapy treatments?



# Invasive treatments (UMC Utrecht)

uncomfortable immobilization!

the 90's

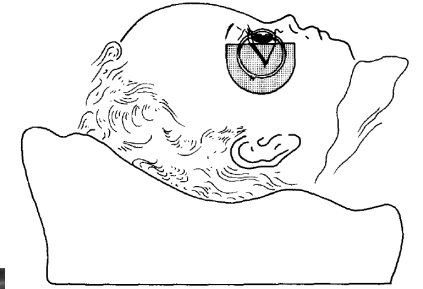
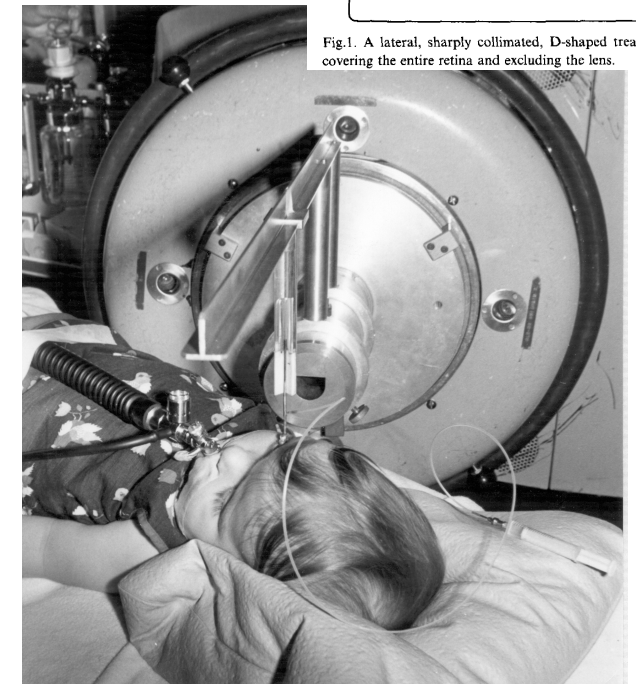
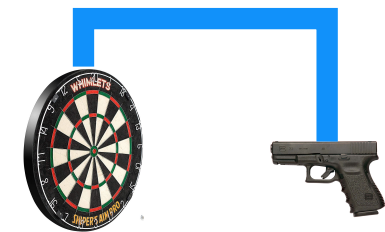


Fig.1. A lateral, sharply collimated, D-shaped treatment field covering the entire retina and excluding the lens.

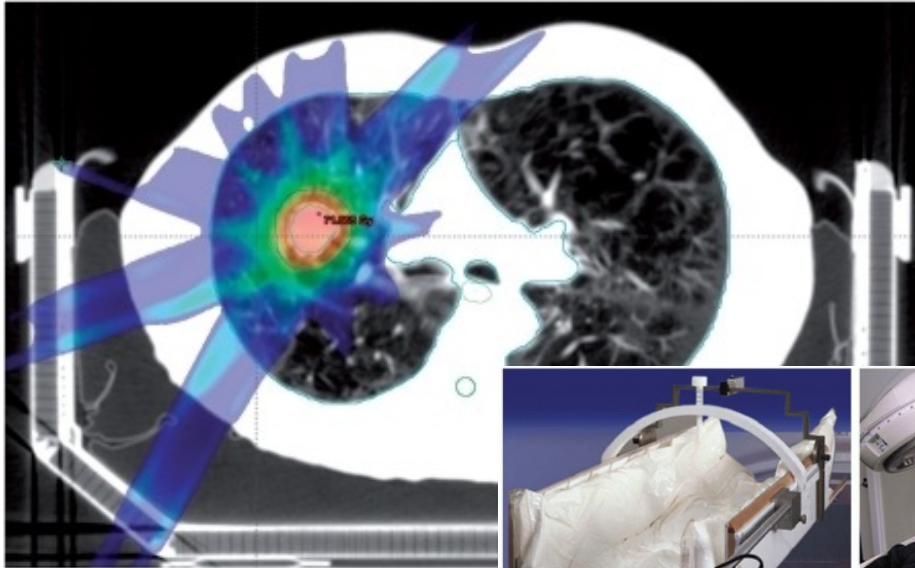


pre-IGRT era: move patient to the dose!



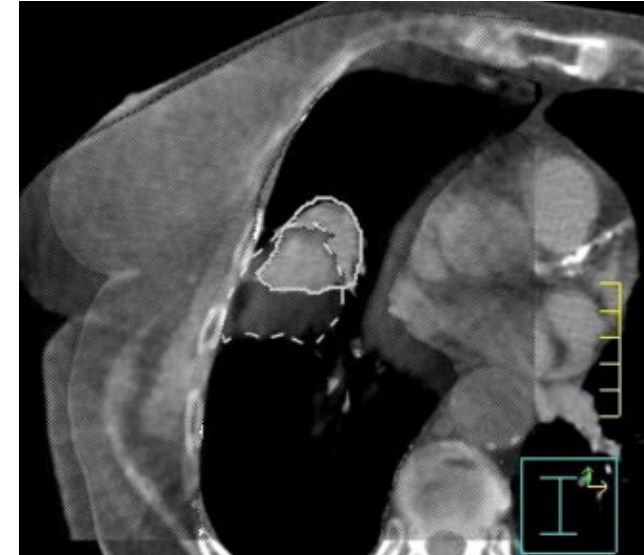
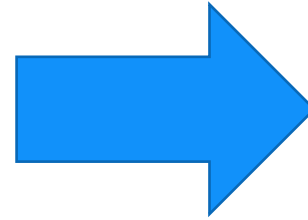
# The advent of image guided radiotherapy

2000



stereotactic body frame

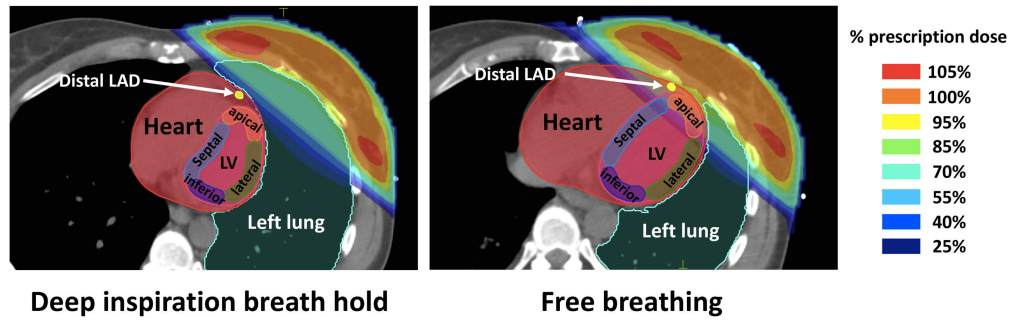
move patient to the dose!



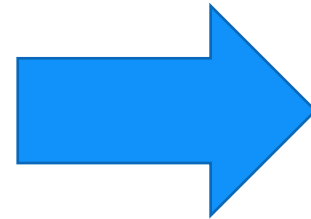
in room CBCT

move dose to the patient!

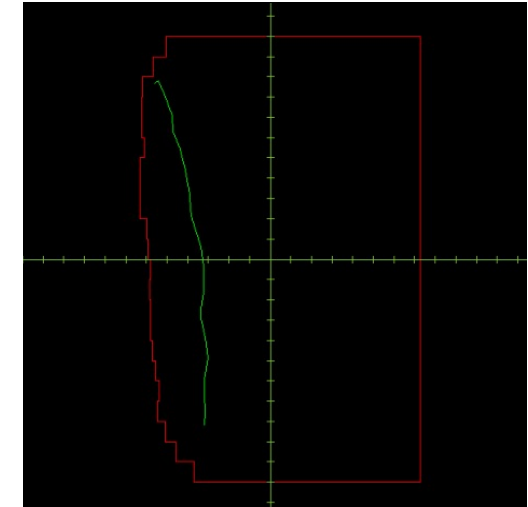
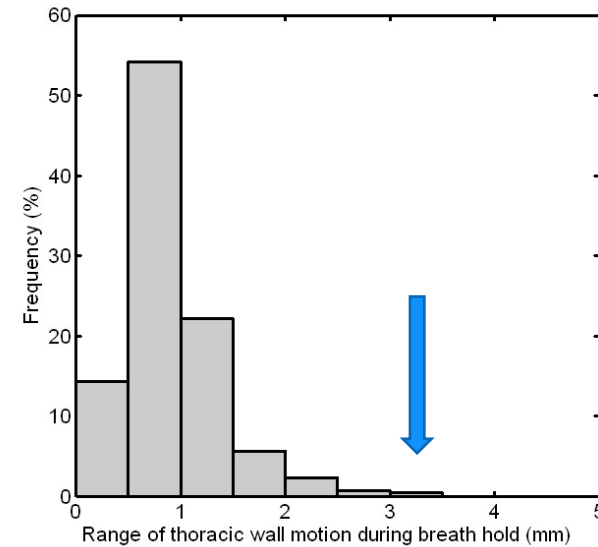
# Image guidance paved the way to more patient friendly treatment procedures



Active Breathing Control

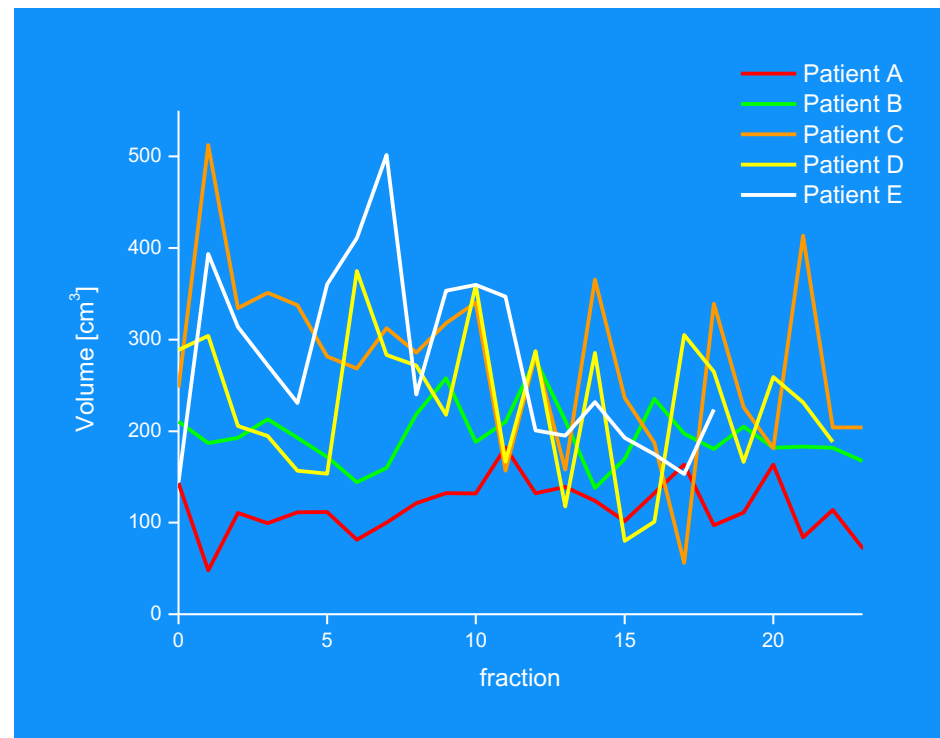
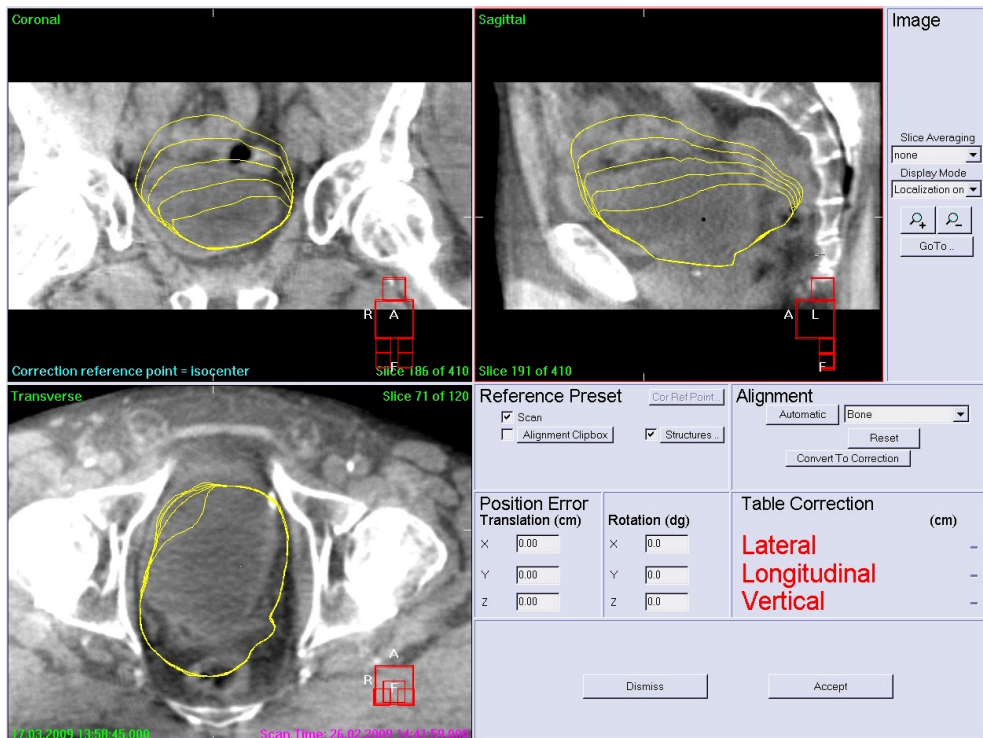


voluntary deep inspiration breathhold works as well



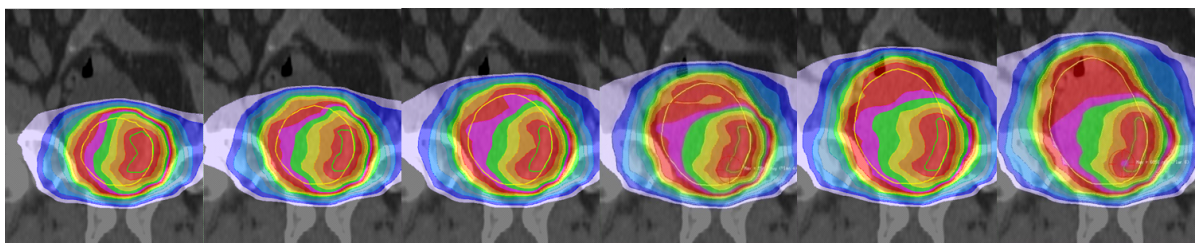
97% patient compliance with breath hold instructions

# Adapt the dose to the anatomy of the day using a **library of plans**



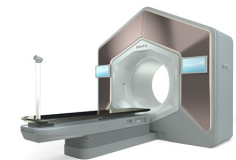
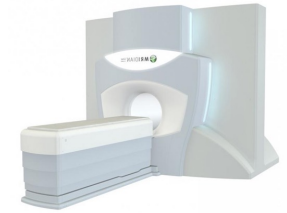
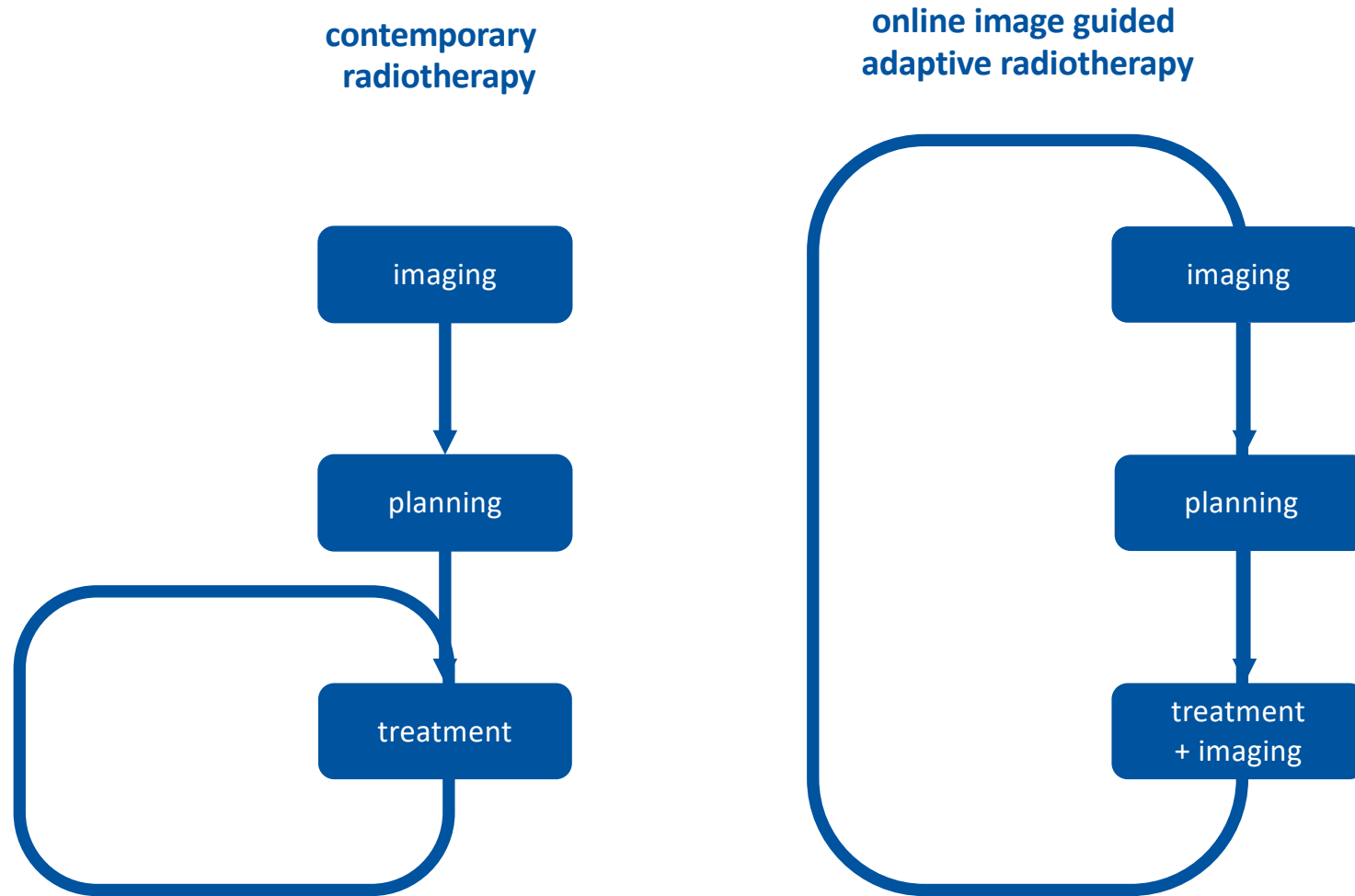
empty

full



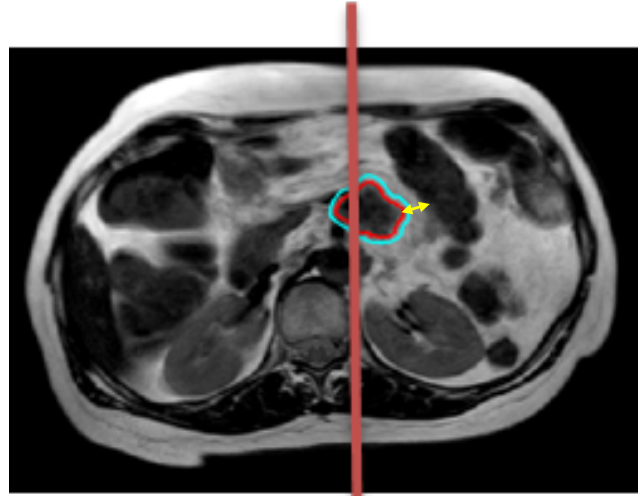
poor compliance to drinking instructions, but .....

# the advent on online image guided adaptive radiotherapy

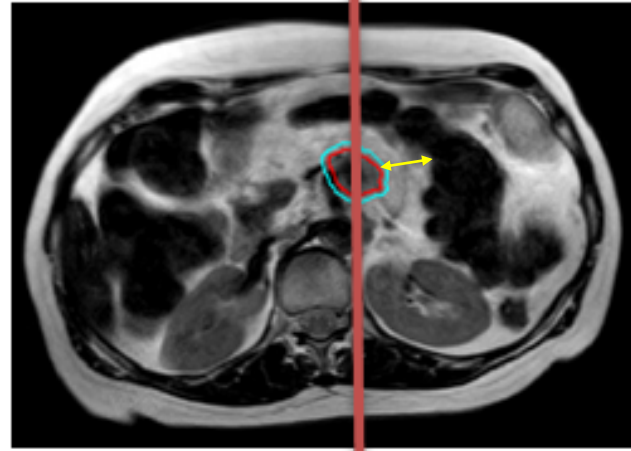


# Adapting the dose to the patient with online MRgRT

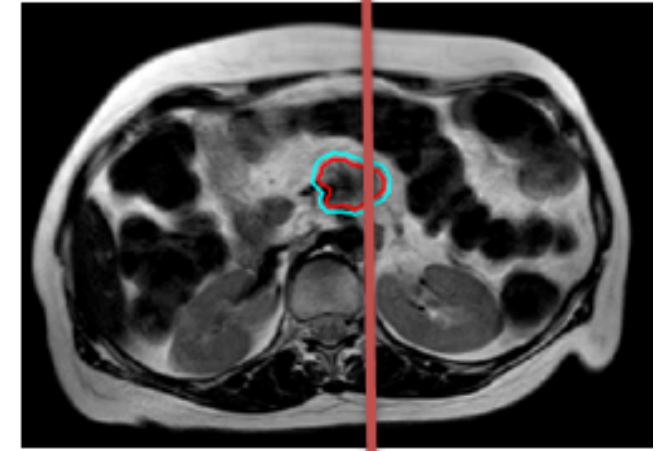
locally advanced pancreas SBRT



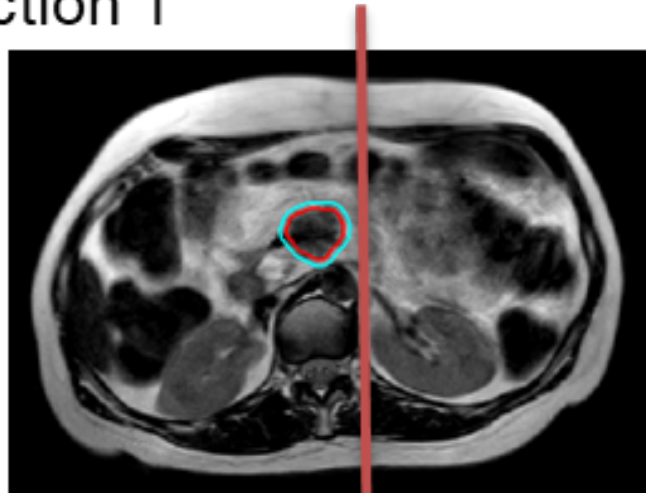
Fraction 1



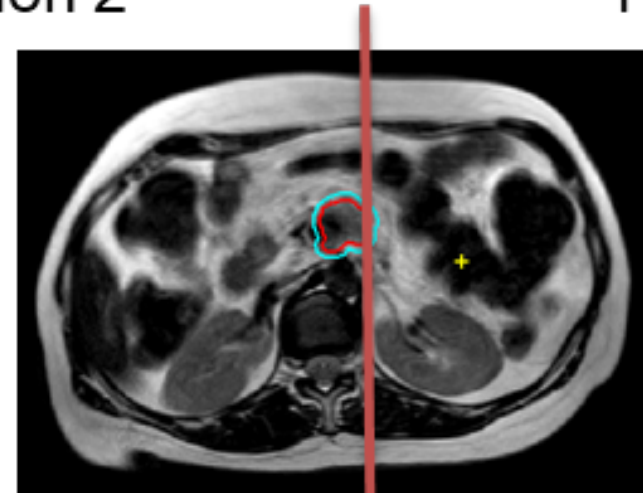
Fraction 2



Fraction 3

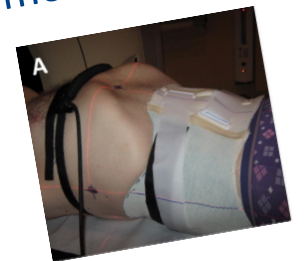


Fraction 4



Fraction 5

accurate treatments  
without extensive  
immobilisations





# Compliance with video-feedback systems for online MRgRT



**Table 4** Results of the patient-reported outcome questionnaires

| How do you rate ...   | After the first fraction<br>(n = 34) | At the end of treatment<br>(n = 34) | p-value |
|---|--------------------------------------|-------------------------------------|---------|
|   | Mean (range)                         | Mean (range)                        |         |
| Respiratory gated dose delivery (N = 22)  |                                      |                                     |         |
| Was it difficult to control the target by holding your breath?                                    | 1.3 (1-3)                            | 1.2 (1-2)                           | 0.739   |
| Was it confronting to watch your tumor on the monitor?  | 1.2 (1-2)                            | 1.1 (1-2)                           | 0.564   |
| How did you like the possibility to have an active role in controlling the duration of treatment? | 1.2 (1-2)                            | 1.1 (1-2)                           | 1.000   |

Klüter et al. Strahlenther Onkol. 2020

|  | Not at all    | A little     | Moderate     | Very much    |
|--|---------------|--------------|--------------|--------------|
| Was it difficult to control the target by holding your breath? | 42% (N = 34)  | 45% (N = 36) | 9% (N = 7)   | 4% (N = 3)   |
| Was it confronting to see your tumor during treatment? (N=79)  | 86% (N = 69)  | 9% (N = 7)   | 3% (N = 2)   | 1% (N = 1)   |
| Did you like having an active role during treatment? (N=79)    | 10% (N = 8)   | 13% (N = 10) | 40% (N = 32) | 36% (N = 29) |
| Did you worry about your contribution to the treatment?        | 62% (N = 50%) | 30% (N = 23) | 7% (N = 6)   | 1% (N = 1)   |

**TABLE 4: PRO-Q Results Regarding the Video-feedback System (N = 80 patients)**

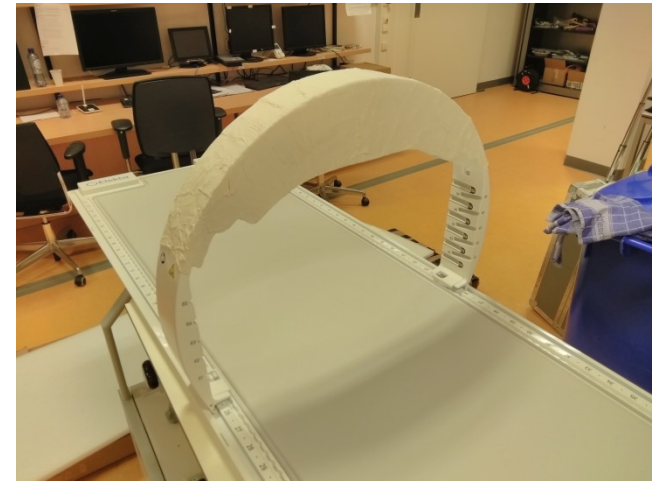
N: number

Tetar et al. Cureus 2018

# Eligibility MR-linac treatment

## 1. MR eligibility

- Patient-related
  - Claustrophobia
  - BMI
  - Noise
  - Implants/ Cardiac devices



Dummy coil

## 2. MR-Linac eligibility → Duration of treatment: 45 to 60 minutes vs. 10-20 min

- Patient-related
- Tumor/imaging-related
- Treatment-related

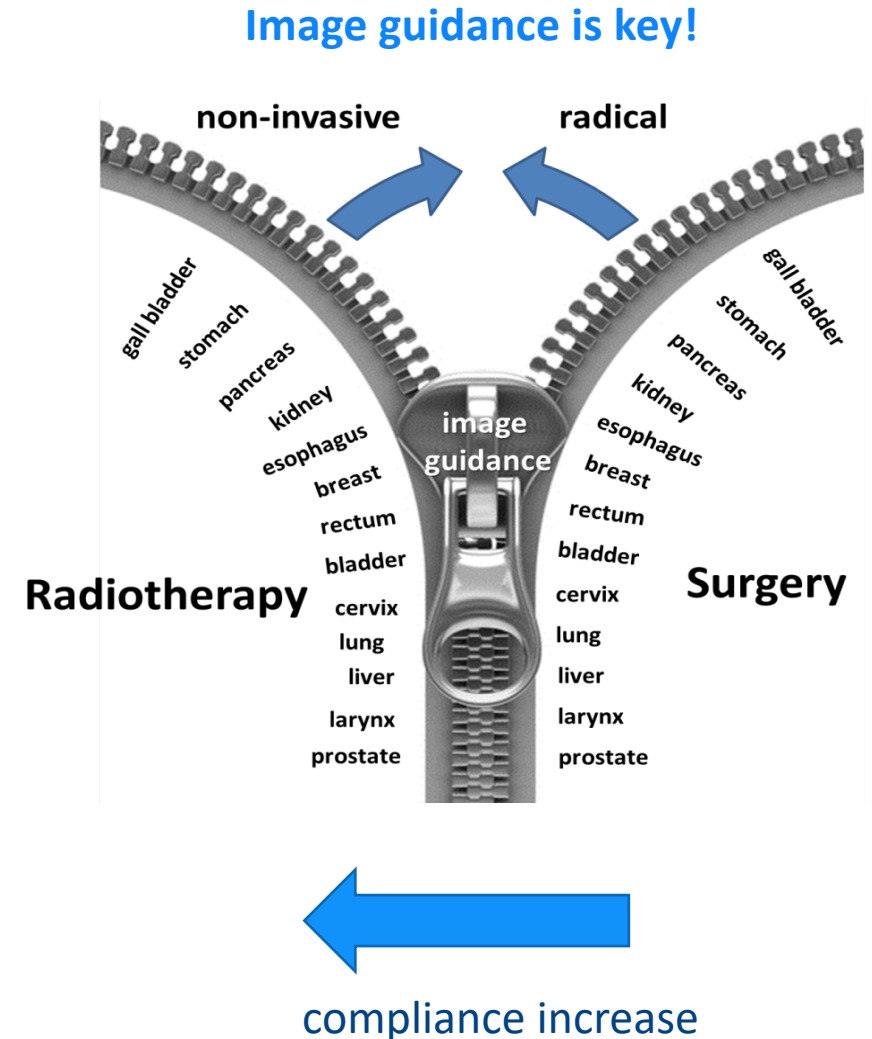
|                       | Yes          | Considerable |
|-----------------------|--------------|--------------|
| Noise                 | 60% (N = 90) | 17% (N=26)   |
| Cold                  | 29% (N = 44) | 10% (N = 15) |
| Paresthesia           | 28% (N = 42) | 6% (N = 9)   |
| Dizziness             | 11% (N = 16) | 1% (N = 2)   |
| Local heat sensations | 9% (N = 13)  | 1% (N = 2)   |
| Metallic taste        | 2% (N = 3)   | -            |
| Light flashes         | 2% (N = 3)   | -            |

TABLE 3: MR-related Complaints

MR: magnetic resonance; N: number

# Resuming

- IGRT has drastically diminished the need for immobilization, potentially increasing eligibility (and compliance)
- IGRT has decreased dose to the surrounding tissues enhancing treatment compliance
- MRgRT well tolerated for hypofractionated regimens
- However, the true merit of IGRT/MRgRT is the increased possibility of non-invasively eradicating macroscopic disease thereby further bridging the gap between radiotherapy and surgery



# Disclosures

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