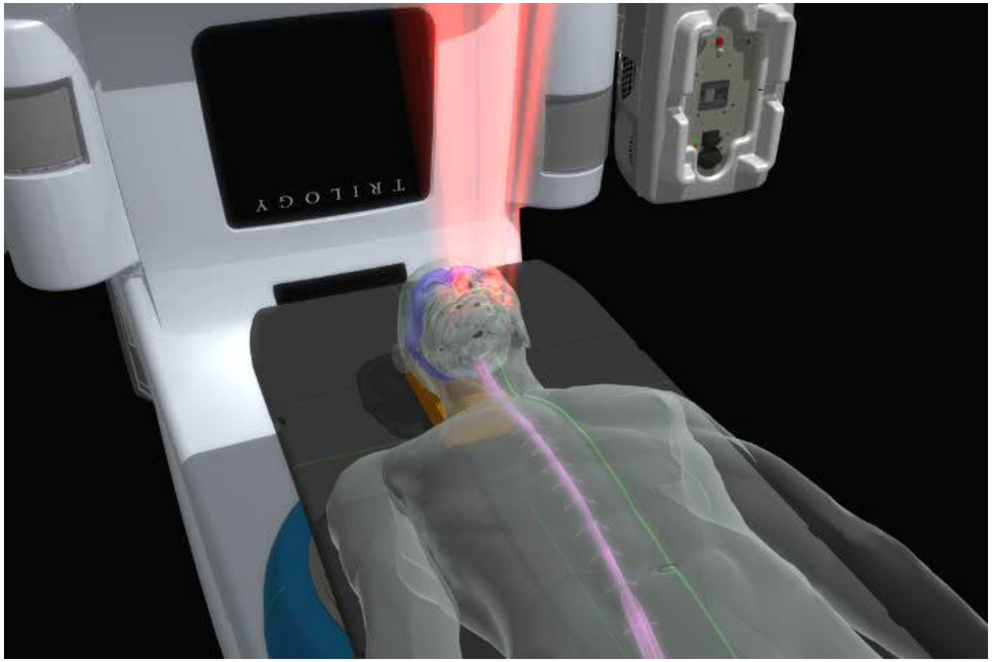
AK IMRT - Neuruppin

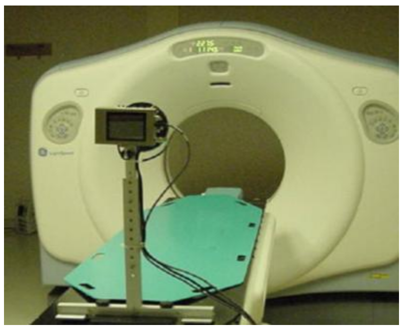
RAPID ARC
IMRT in einer Rotation

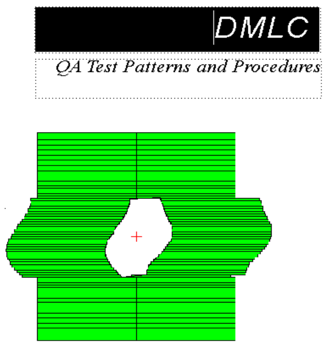


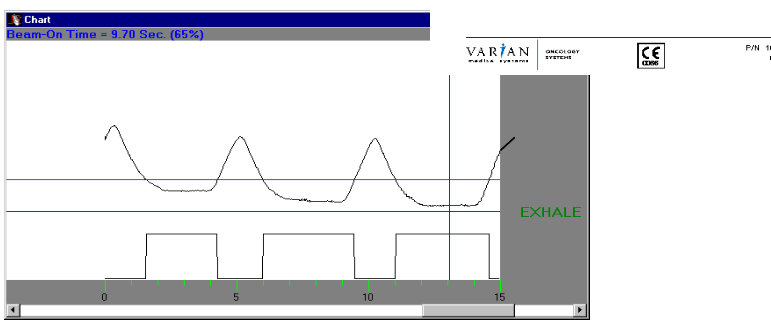
Daniel Weber, Varian Medical Systems

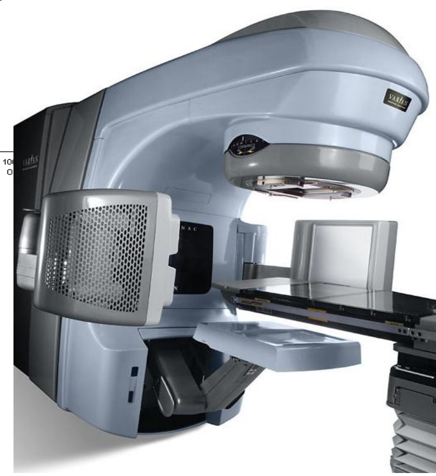
… heutige Bestrahlungstechniken

3D / IMRT / Tomo / IGRT / Partikel...









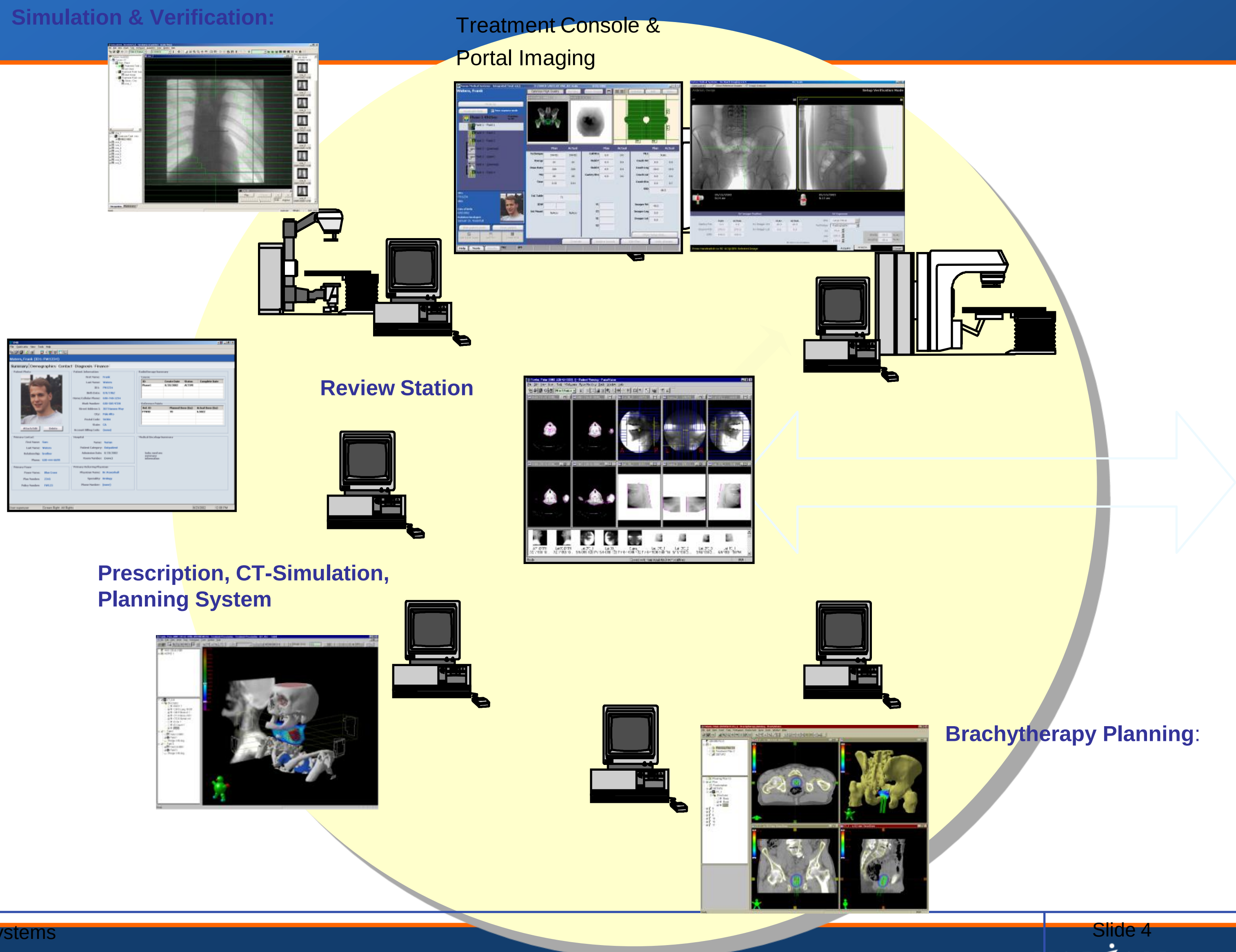
Ziele...

- Entwicklung einer Bestrahlungsplanungs- und Bestrahlungseinheit welche:
  - IMRT singnifikant schneller abstrahlen kann als ein konvent. Bestrahlungsgerät
  - Dosisverteilung in gleicher Qualität wie Tomo-therapy- & konvent. IMRT-Systeme dies liefern
  - einen optimalen Bestrahlungsplan in kürzester Zeit umsetzten können

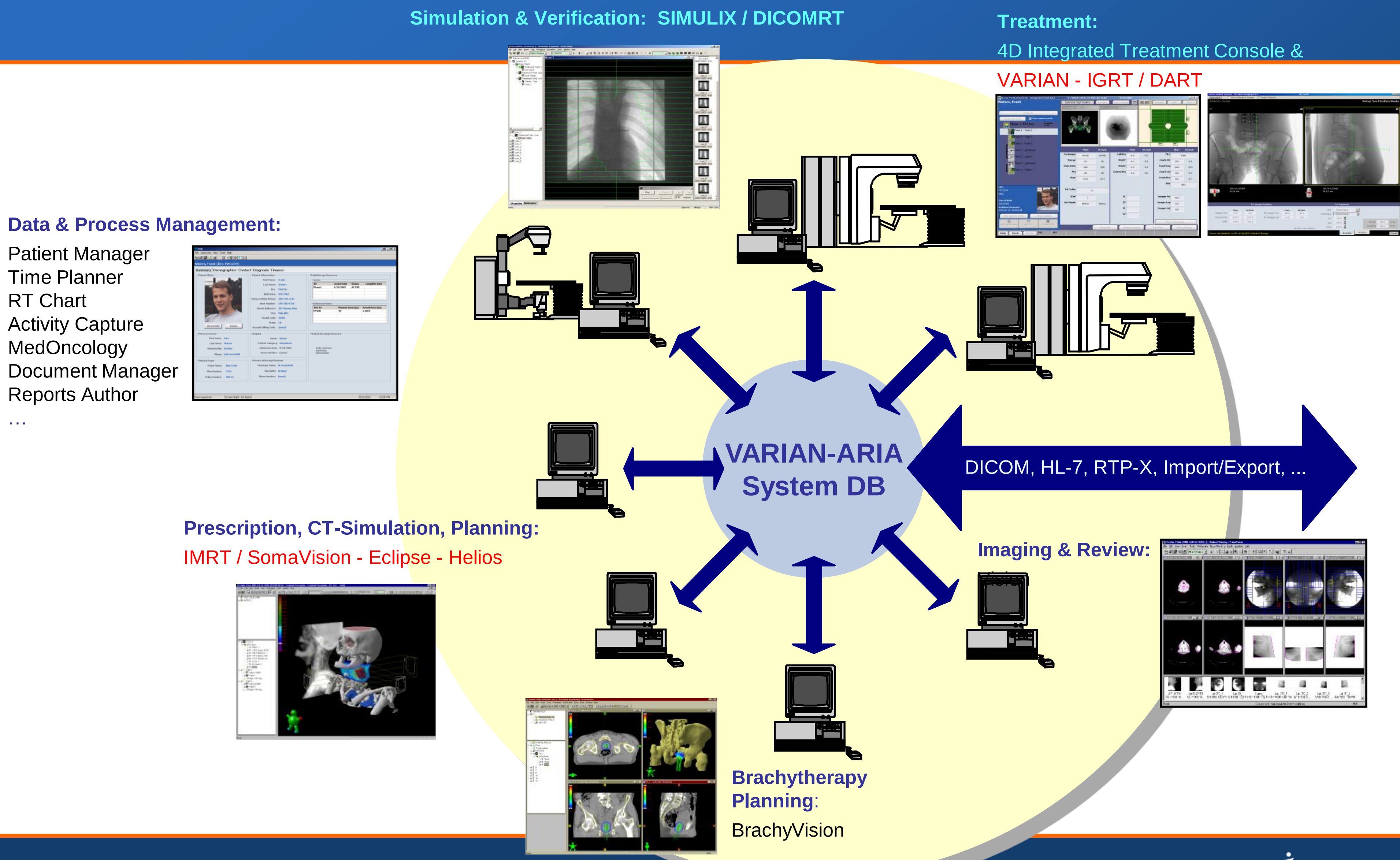
Voraussetzung Netzwerk: Insellösungen / Integration ??

R&V – System

Patient Manager
Time Planner
RT Chart
Activity Capture
Document Manager
Reports Author…



… zwingend → kompl. Systemintegration



Ziele... → die Lösung

- Entwicklung einer Bestrahlungsplanungs- und Bestrahlungseinheit welche:
  - IMRT singnifikant schneller abstrahlen kann als ein konvent. Bestrahlungsgerät
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VARIAN
medical systems

RapidArc™

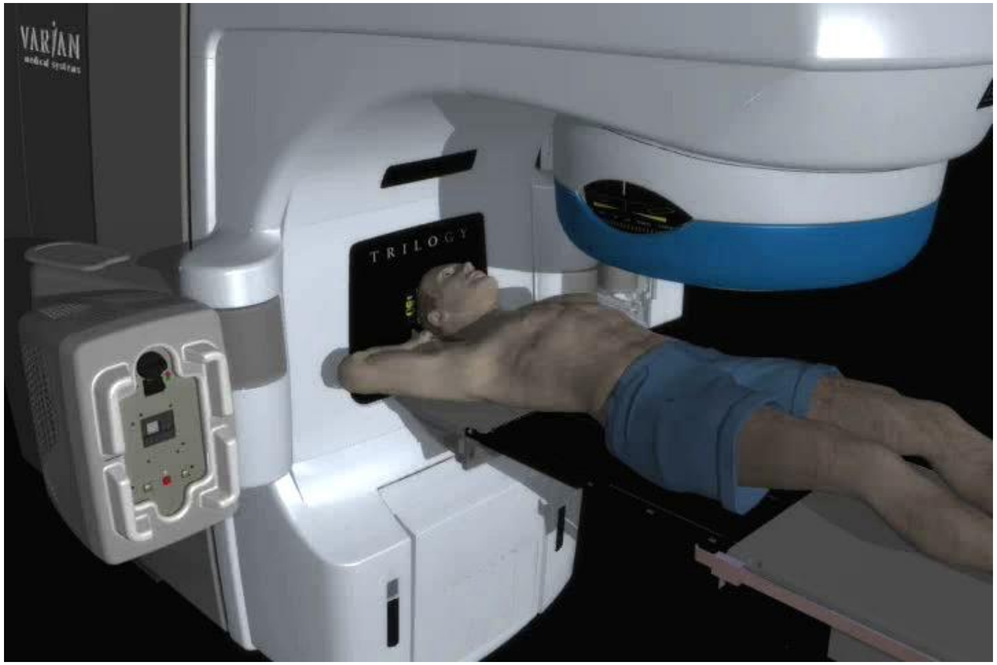
Volumetric Modulated
Arc Therapy

IMRT in **einer** Gantry-Drehung

Varian Medical Systems

RAPID ARC - VMAT in einer Gantrydrehung

- **eine einzige** 360°
  Gantry Rotation
- Vollfeld -
  cone beam
- Grenzwerte
  - MLC motion - max.
    5 mm/ deg
  - Dosisrate - maximum
  - Dosisrate - Modulation



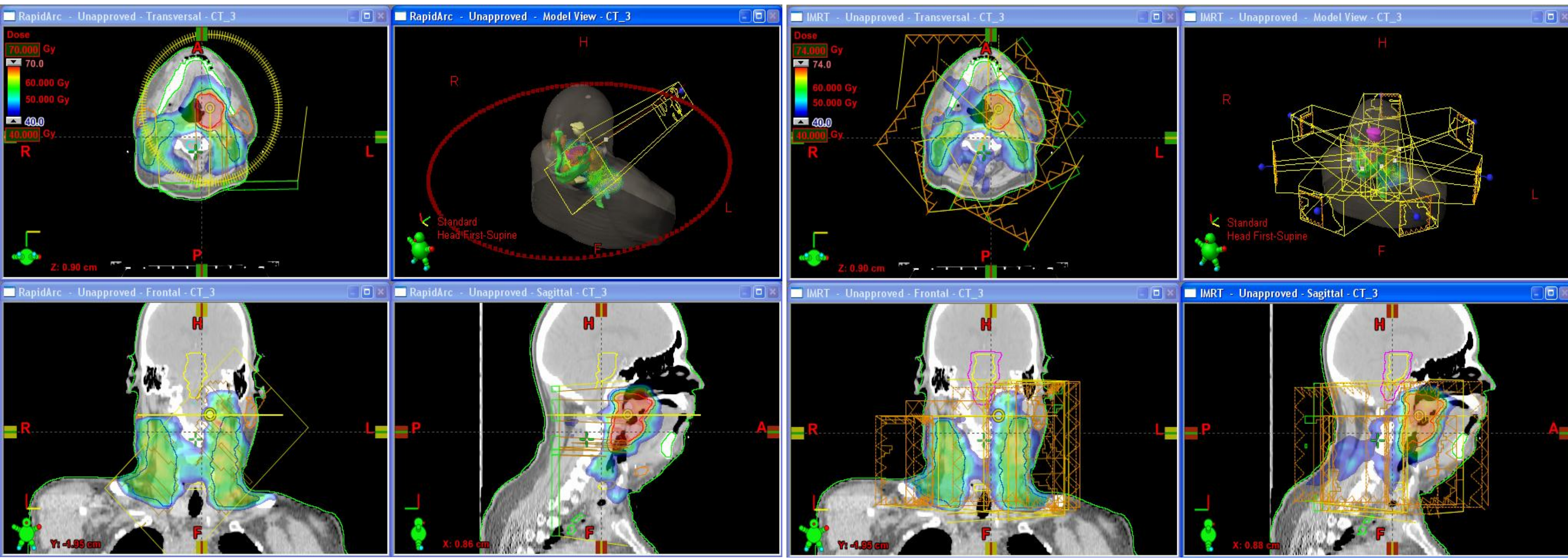
RapidArc - 2+2!

- **2 min Imaging & Repositioning**

- **2 min Treatment**
  - Less than 600 MU/ 2Gy
  - Variable gantry speed
  - Variable dose rate
  - Inter-digitating MLC
  - Dynamic MLC

RapidArc - IMRT Quality

- Highly efficient with MU and time



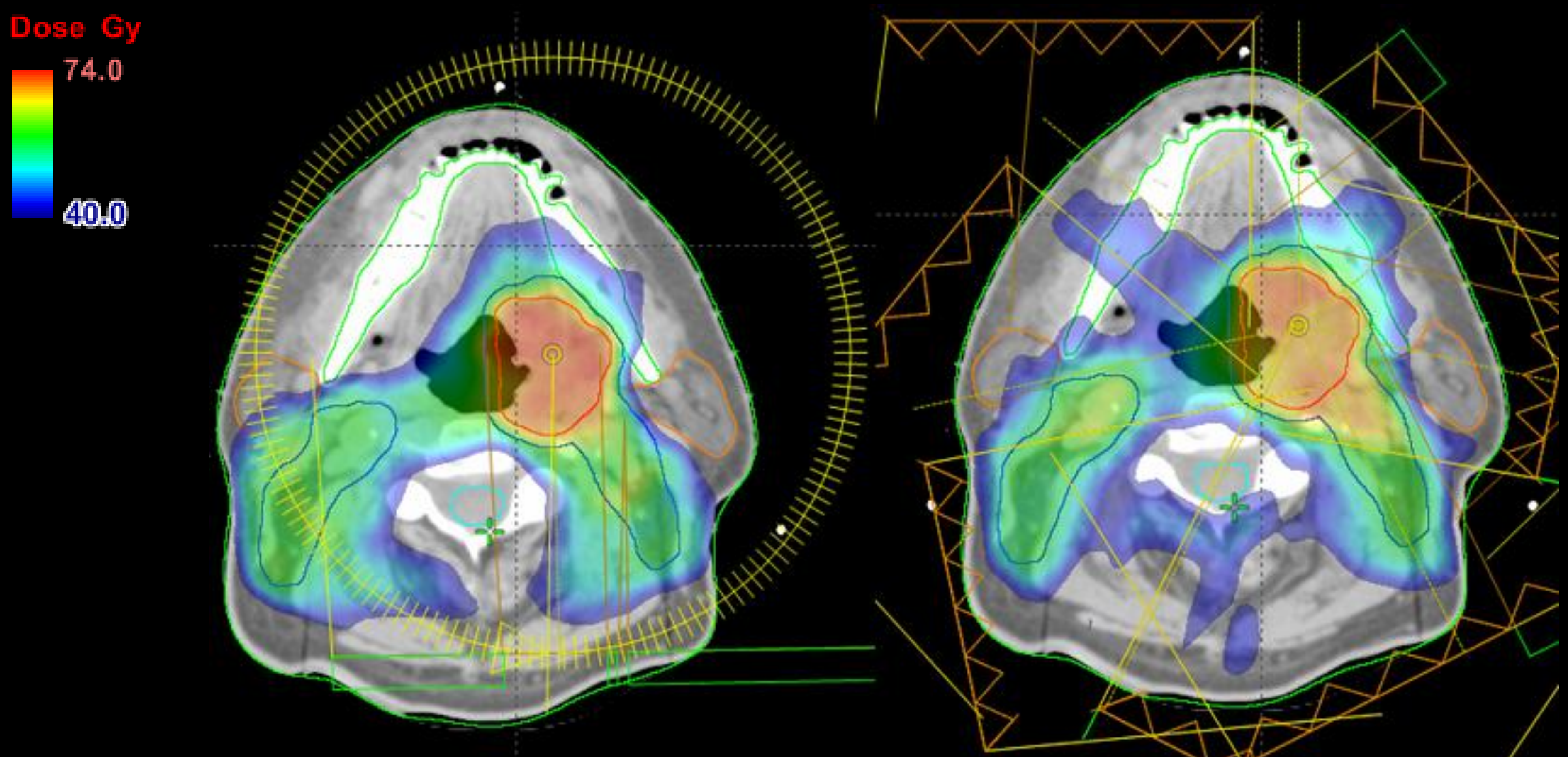
RapidArc
Single arc IMRT

496 MU

Conventional
7-field IMRT

1685 MU

RapidArc - IMRT Quality



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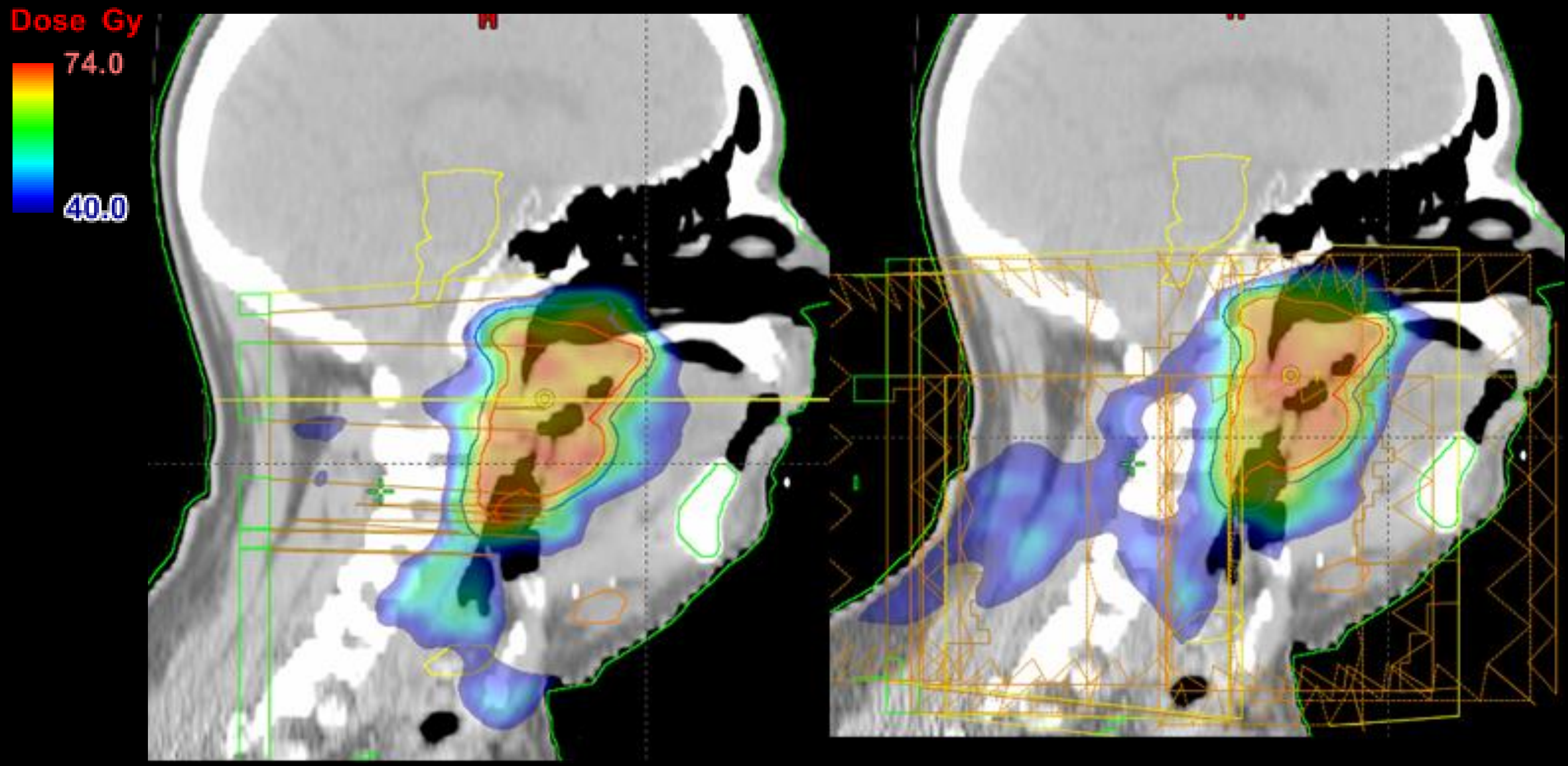
7-field IMRT

1685 MU

RapidArc - IMRT Quality



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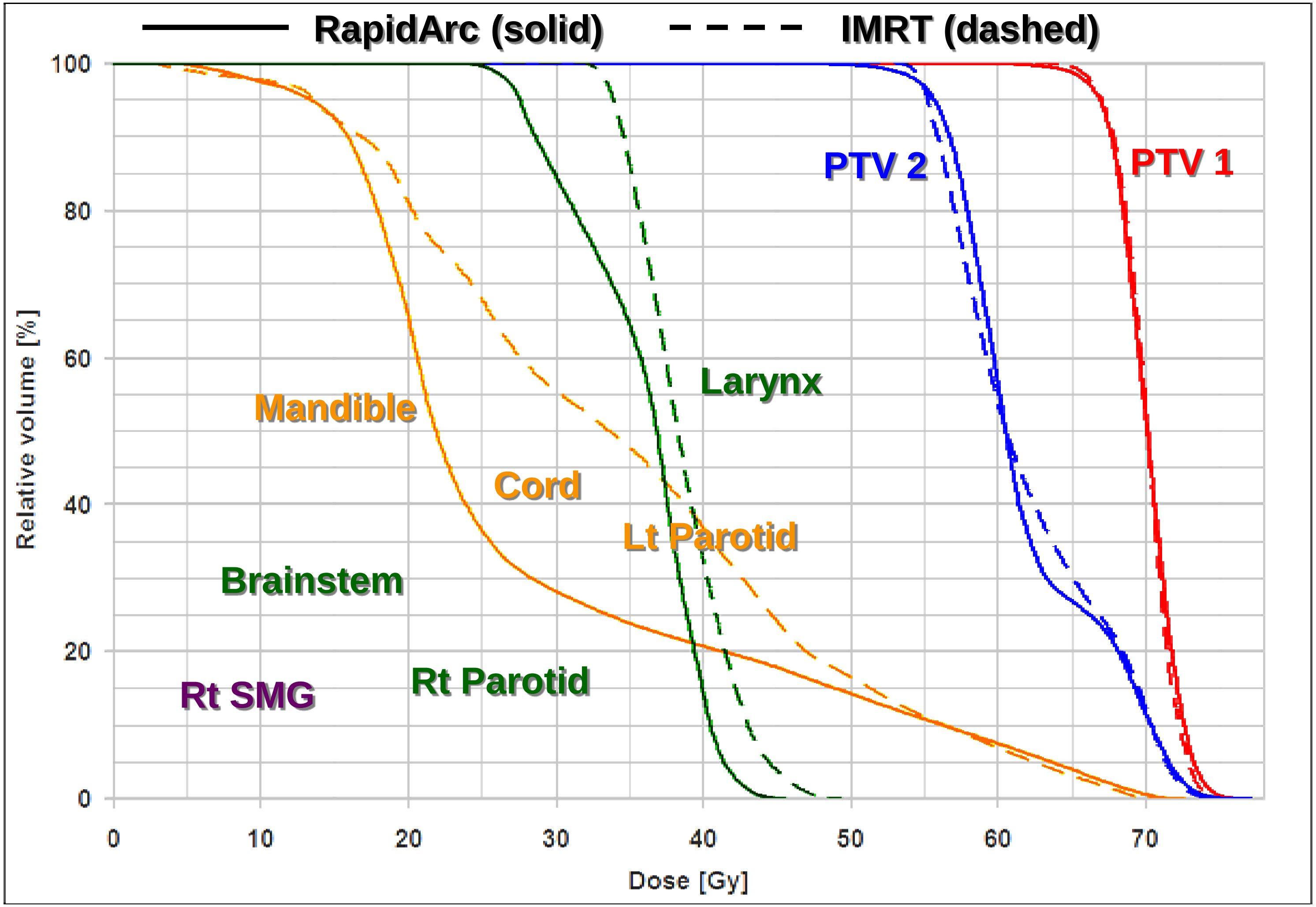
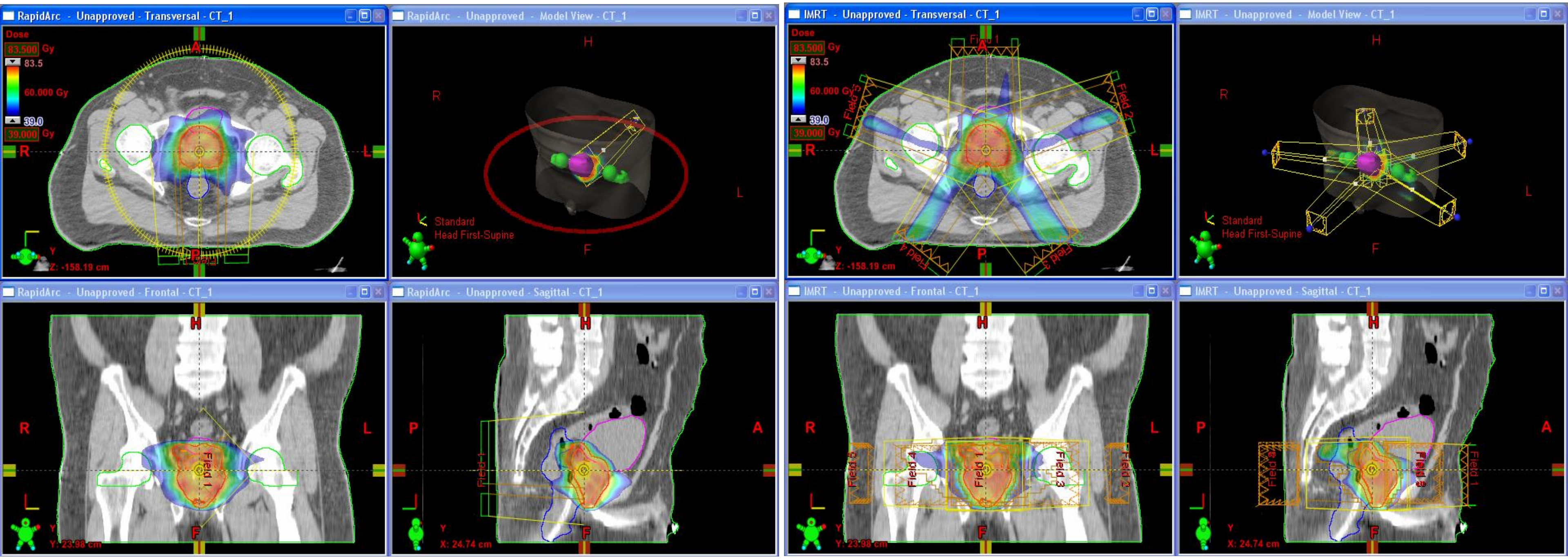
RapidArc - IMRT Quality



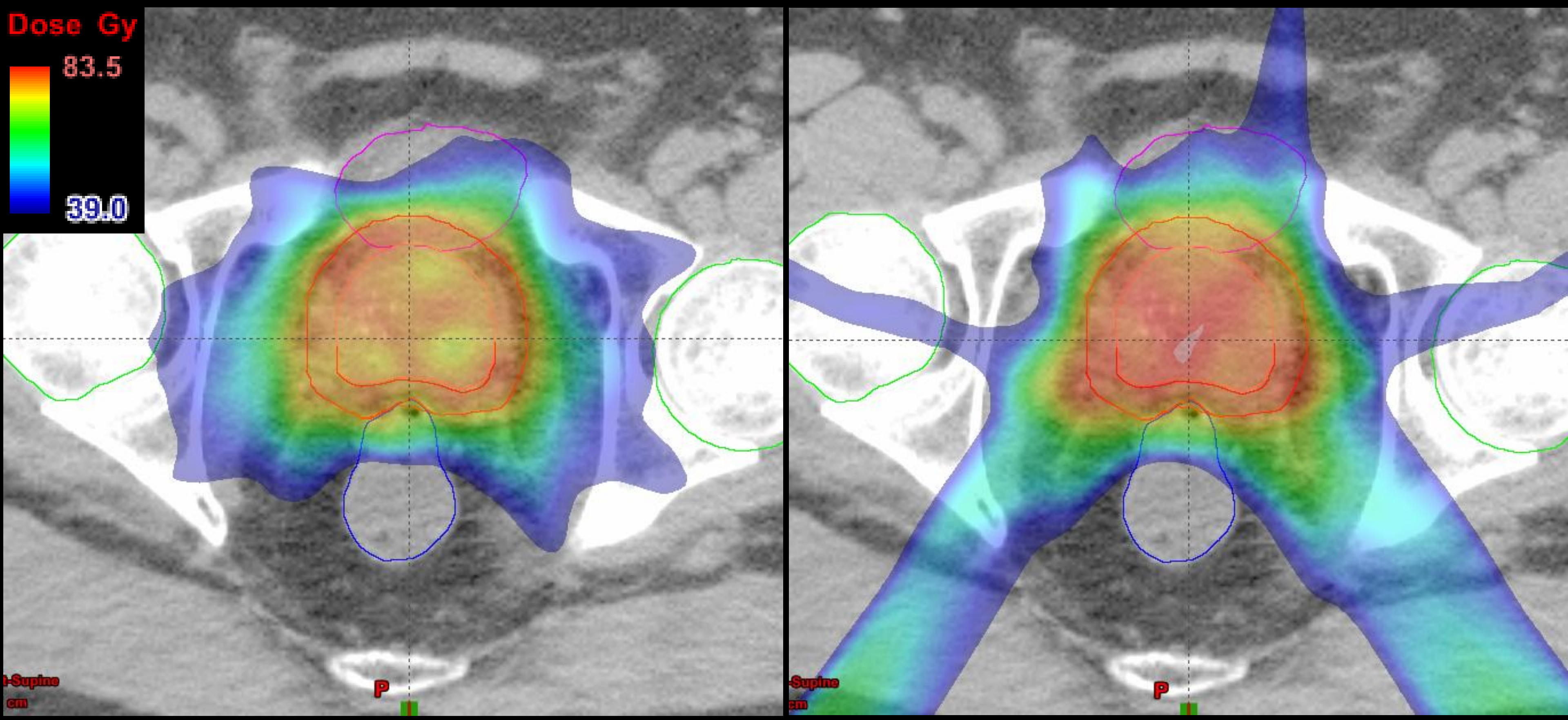
RapidArc - IMRT Quality

- Highly efficient with MU and time



RapidArc Single arc IMRT	603 MU	Conventional 7-field IMRT	915 MU

RapidArc - IMRT Quality



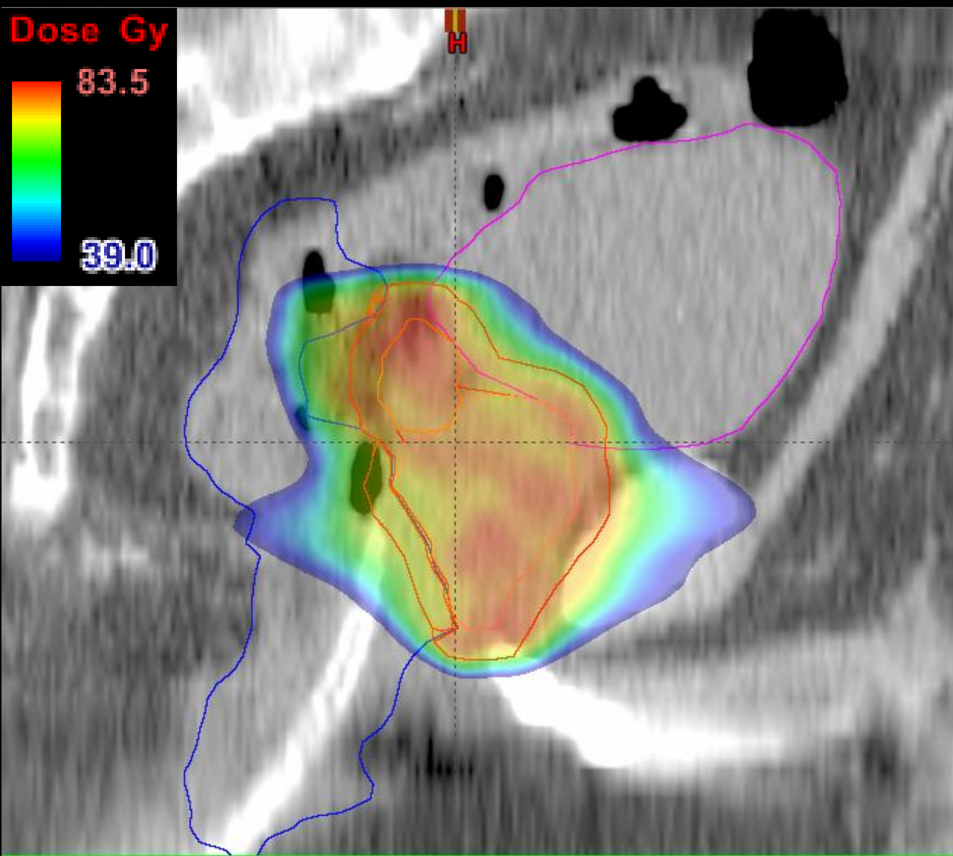
RapidArc
Single arc IMRT

603 MU

Conventional
7-field IMRT

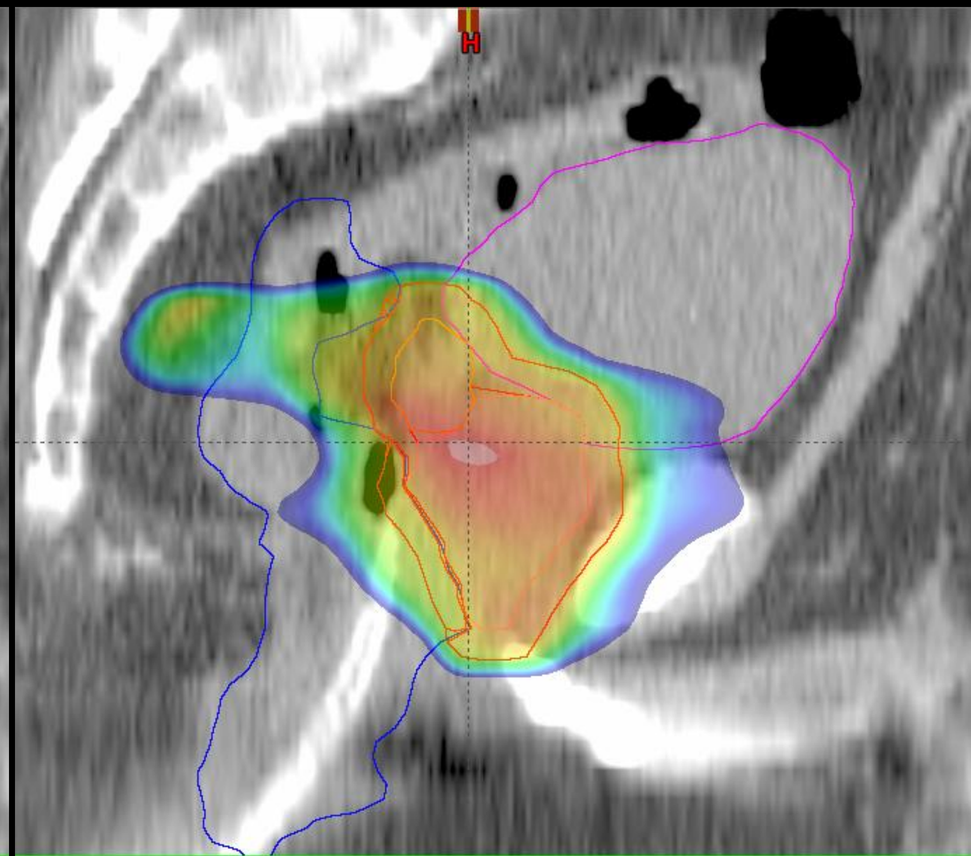
915 MU

RapidArc - IMRT Quality



RapidArc
Single arc IMRT

603 MU

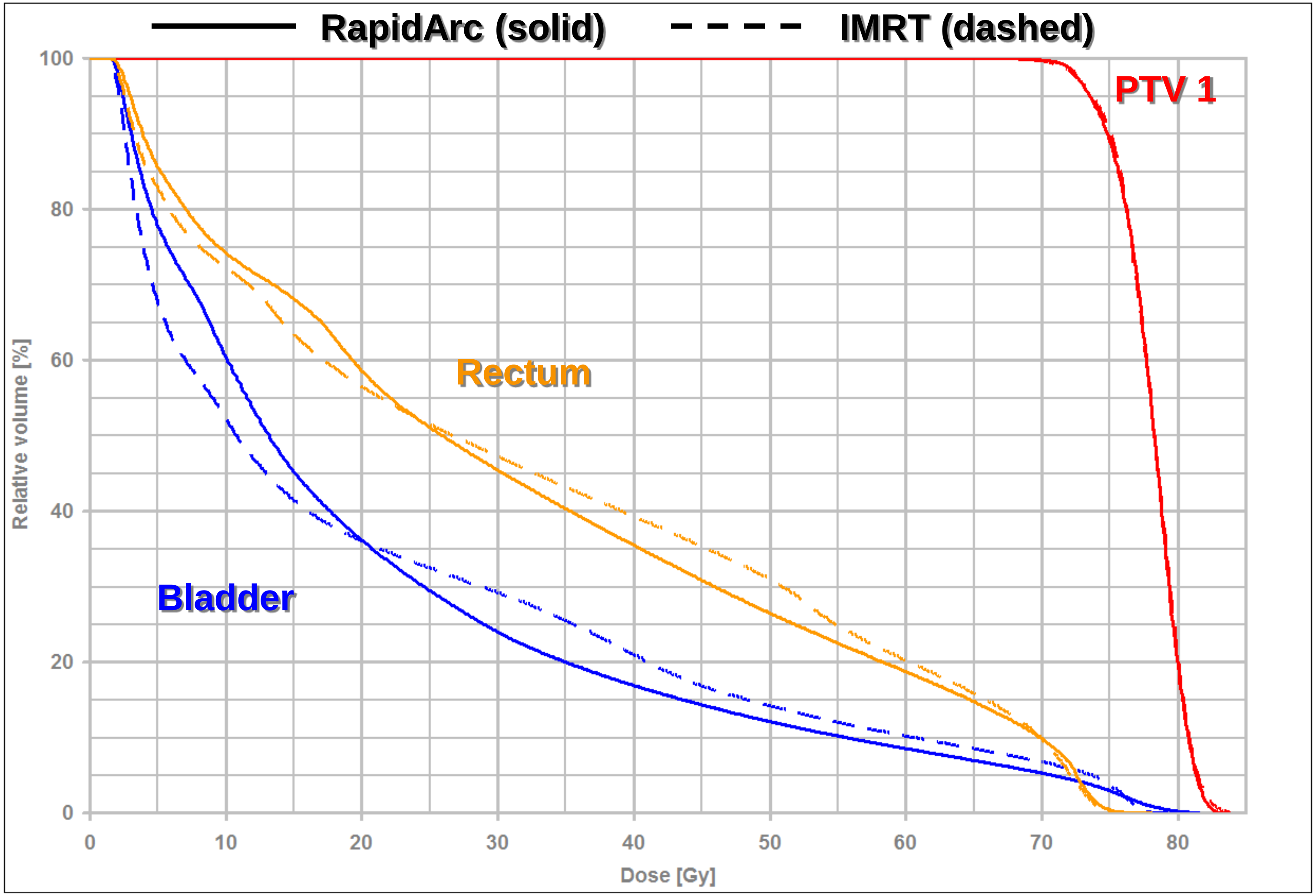


Conventional
7-field IMRT

915 MU

VARIAN medical systems

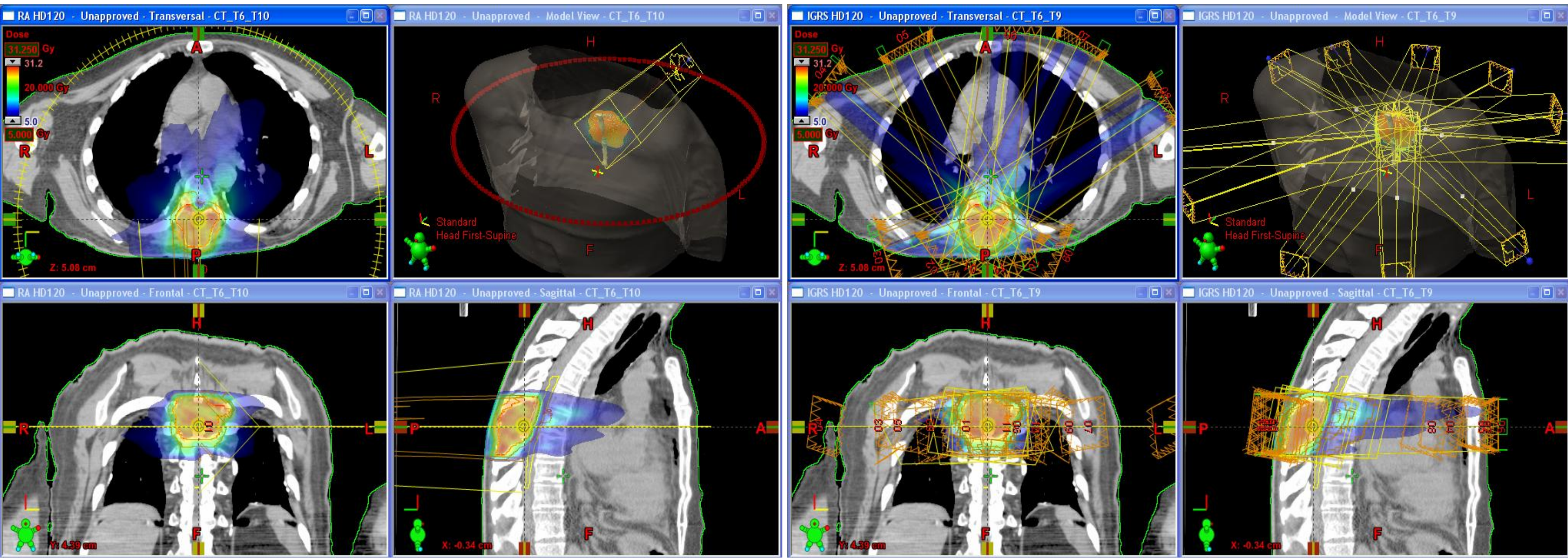
RapidArc - IMRT Quality



VARIAN medical systems

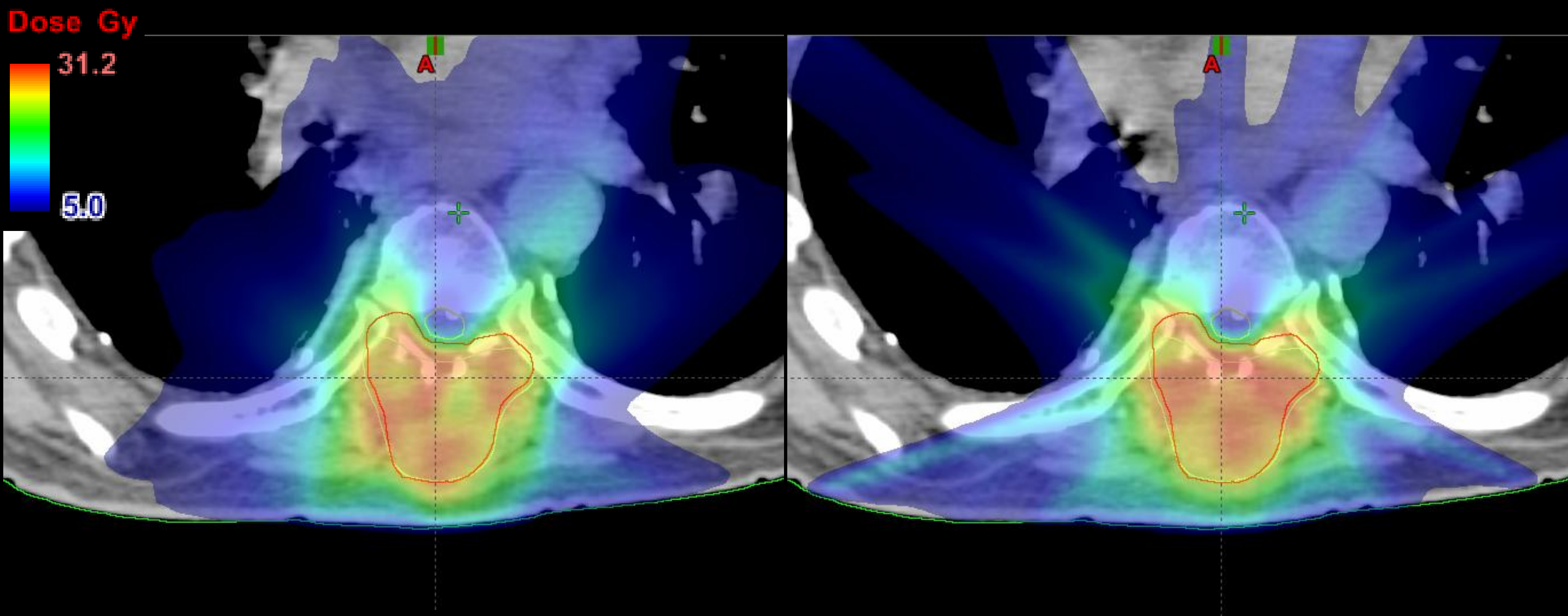
RapidArc - IMRT Quality

- Highly efficient with MU and time



RapidArc Single arc IMRT	**2174 MU**	Conventional 7-field IMRT	**3072 MU**

RapidArc - IMRT Quality



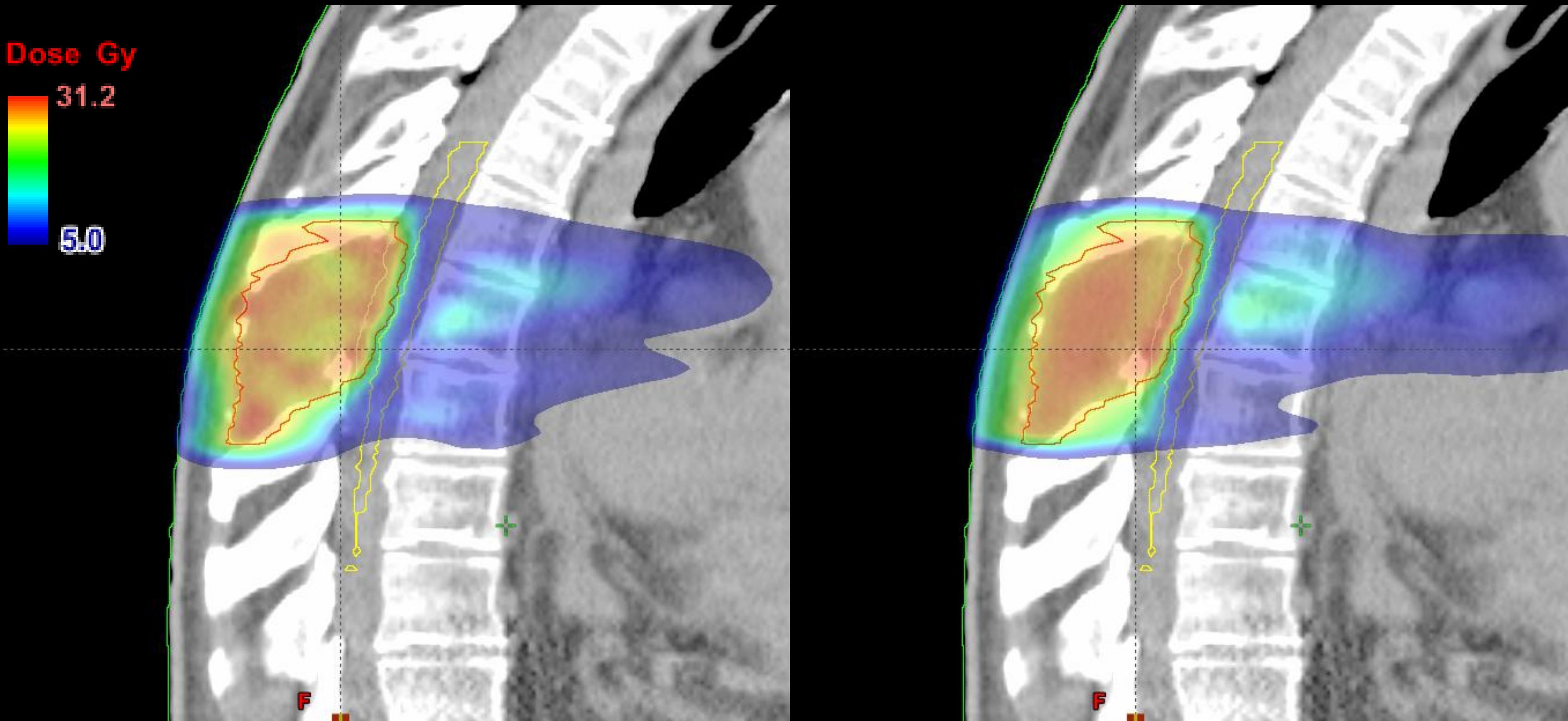
RapidArc
Single arc IMRT

2174 MU

Conventional
7-field IMRT

3072 MU

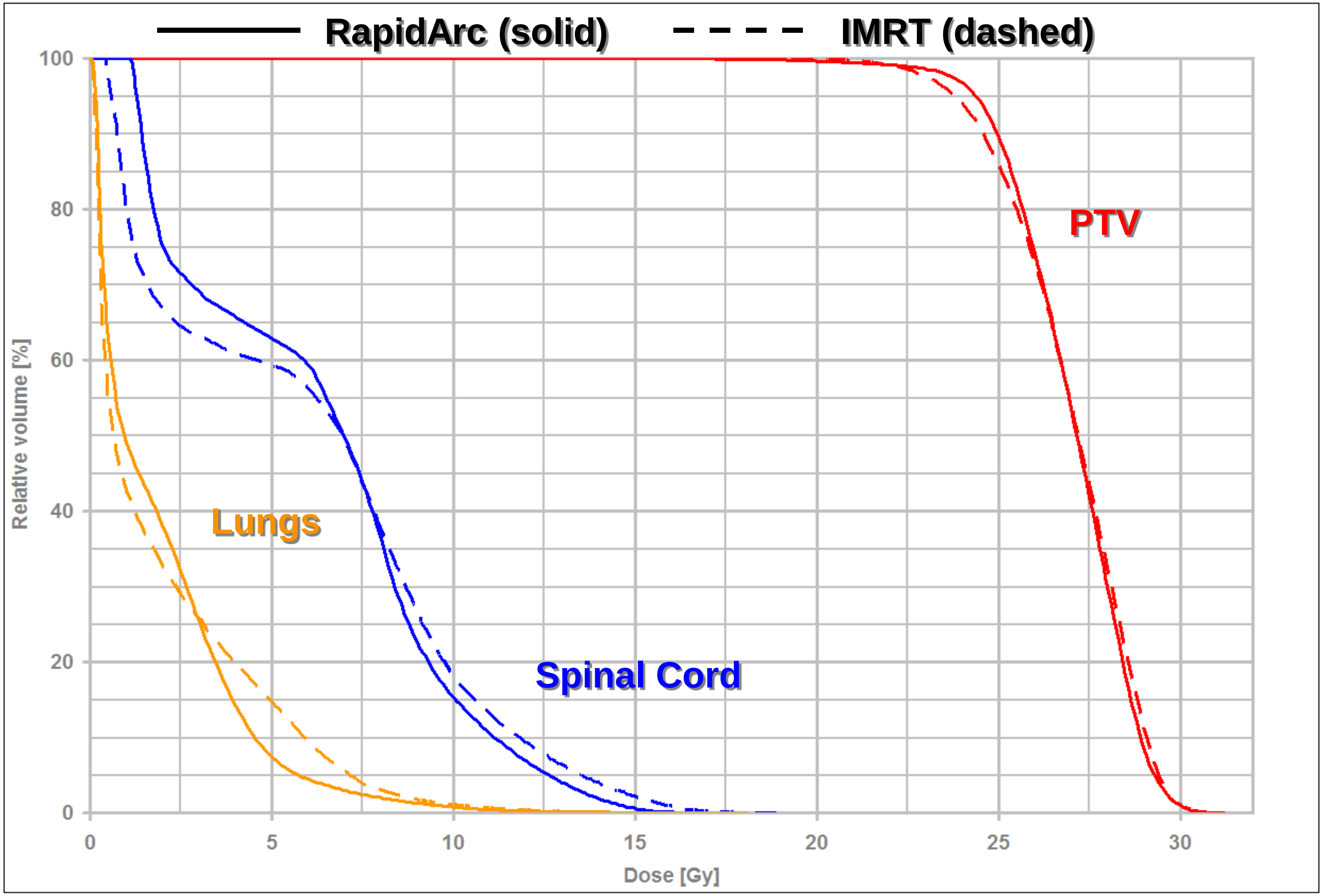
RapidArc - IMRT Quality



RapidArc
Single arc IMRT **2147 MU**

Conventional
7-field IMRT **3072 MU**

RapidArc - IMRT Quality

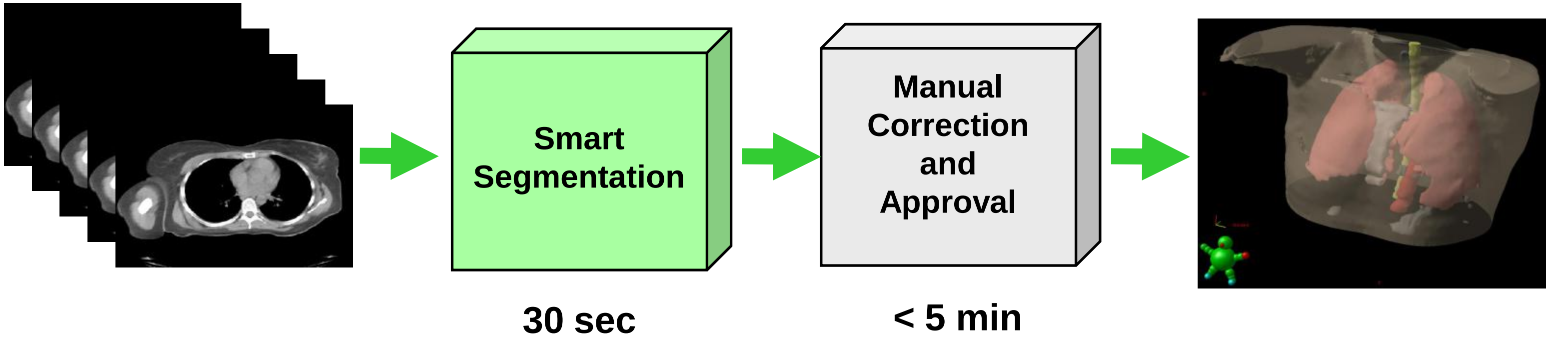


RAPID ARC - Bestrahlungsplanung mit Eclipse

- ´Normaler´IMRT-Planungsprozess
- Arc Optimierung
- Plan Verifikation
- Add. Features

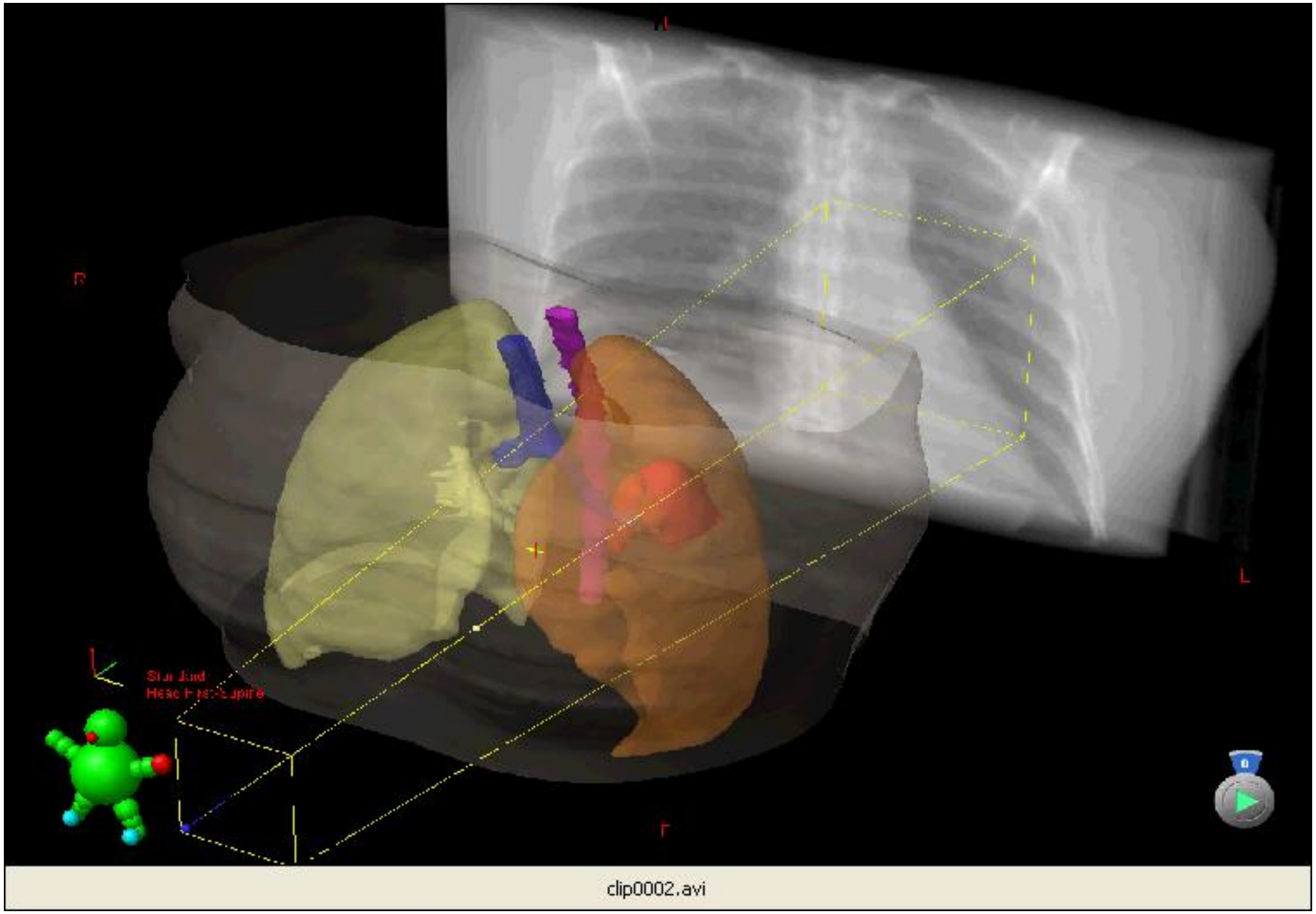
Eclipse Feature → Auto-Segmentierung

- Kompl. Konturing in weniger als 5 Minuten

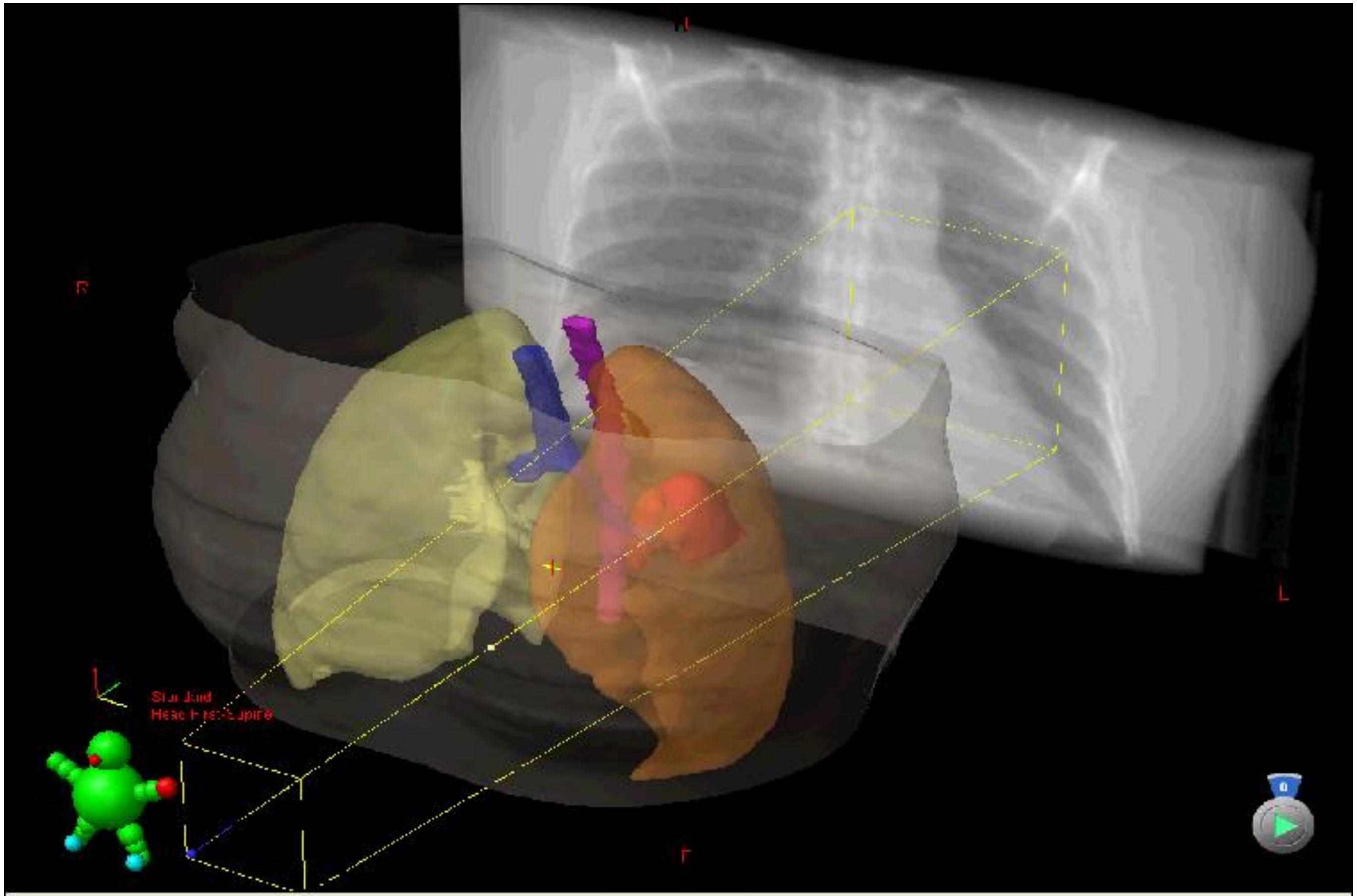


- vollautomatisch
- effektive tools zur Korrektion

Bsp: ´Smart Segmentation´



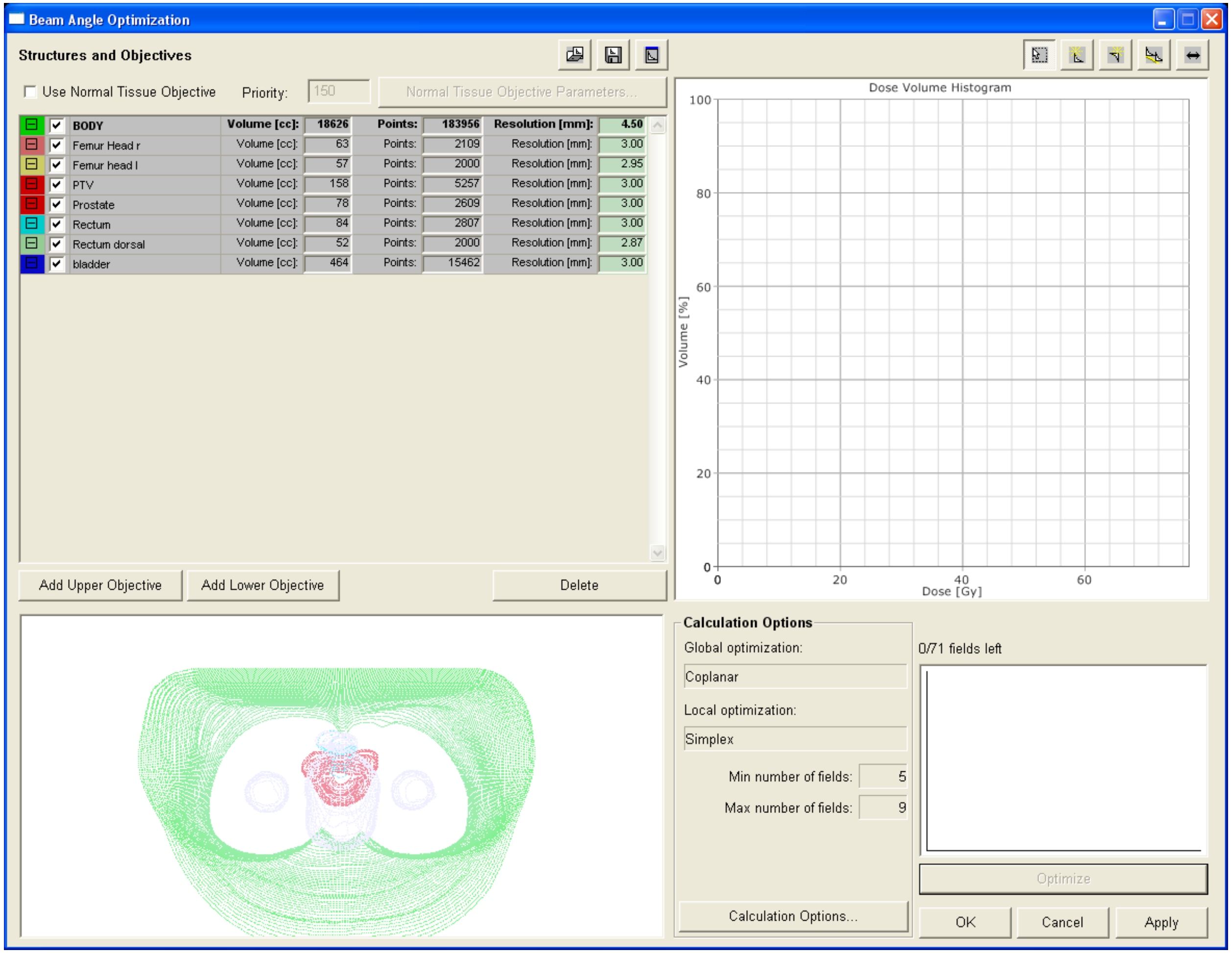
´Smart Segmentation´ mit 4D Darstellung



clip0002.avi

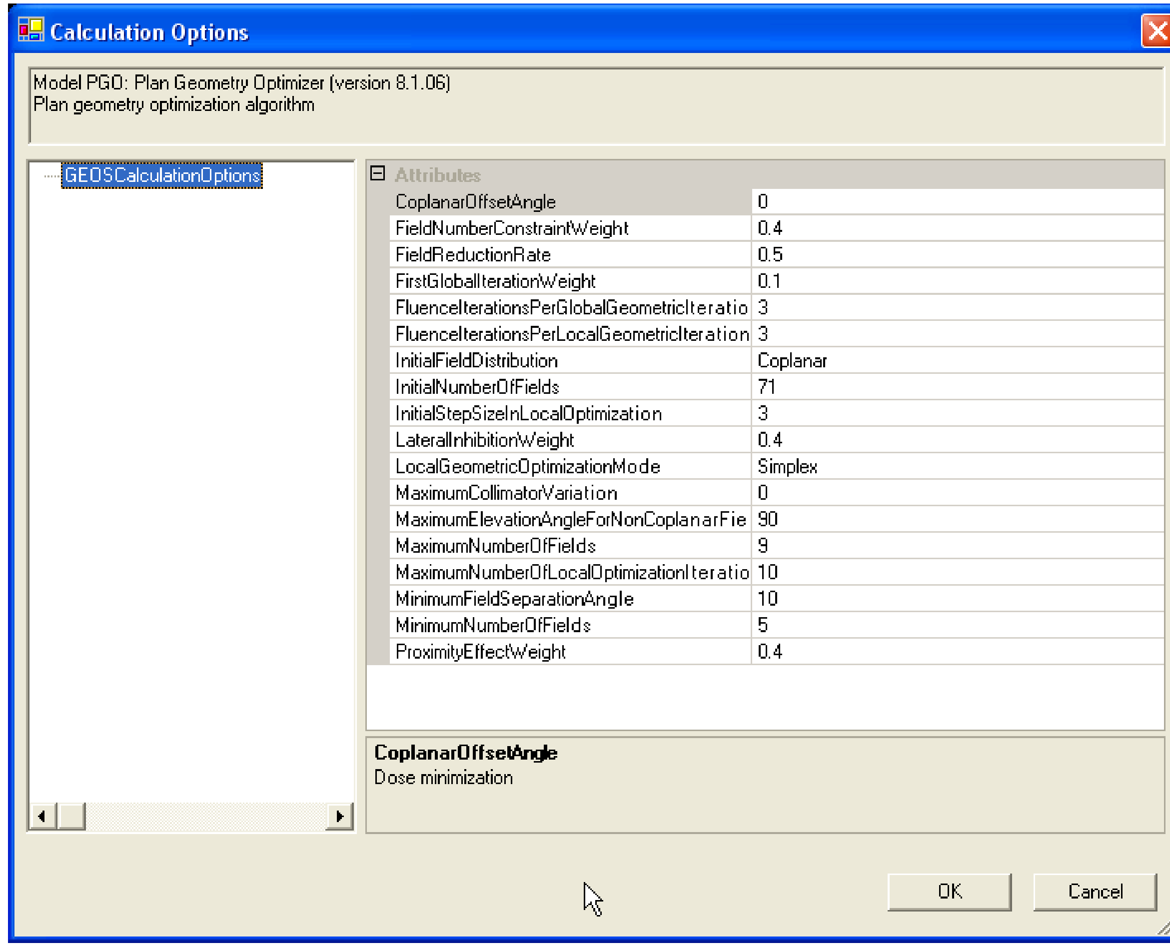
Eclipse 8.1 Beam Angle Optimierung

- Neue Darstellung des Patienten im ´Helios-Fenster´



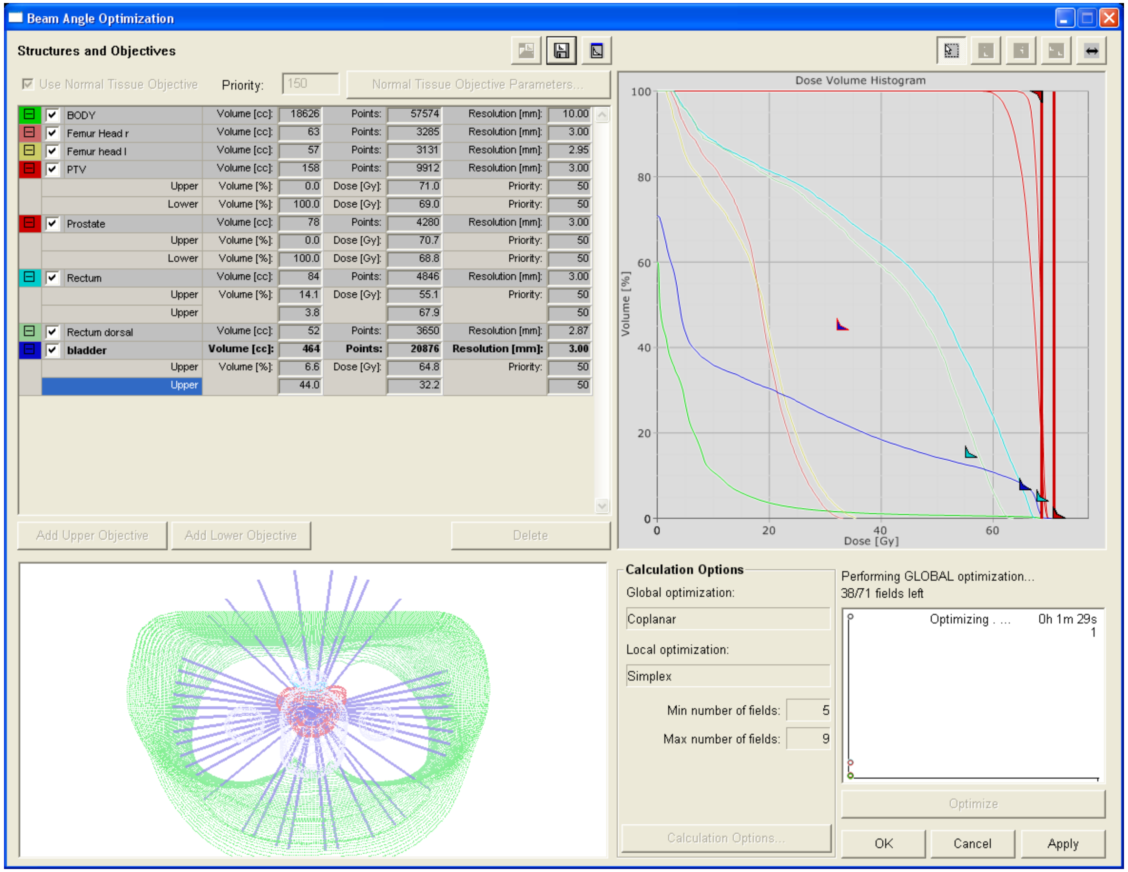
Eclipse 8.1 Beam Angle Optimization

- Berechnungs-optionen für PGO (Plan Geometry Optimizer)



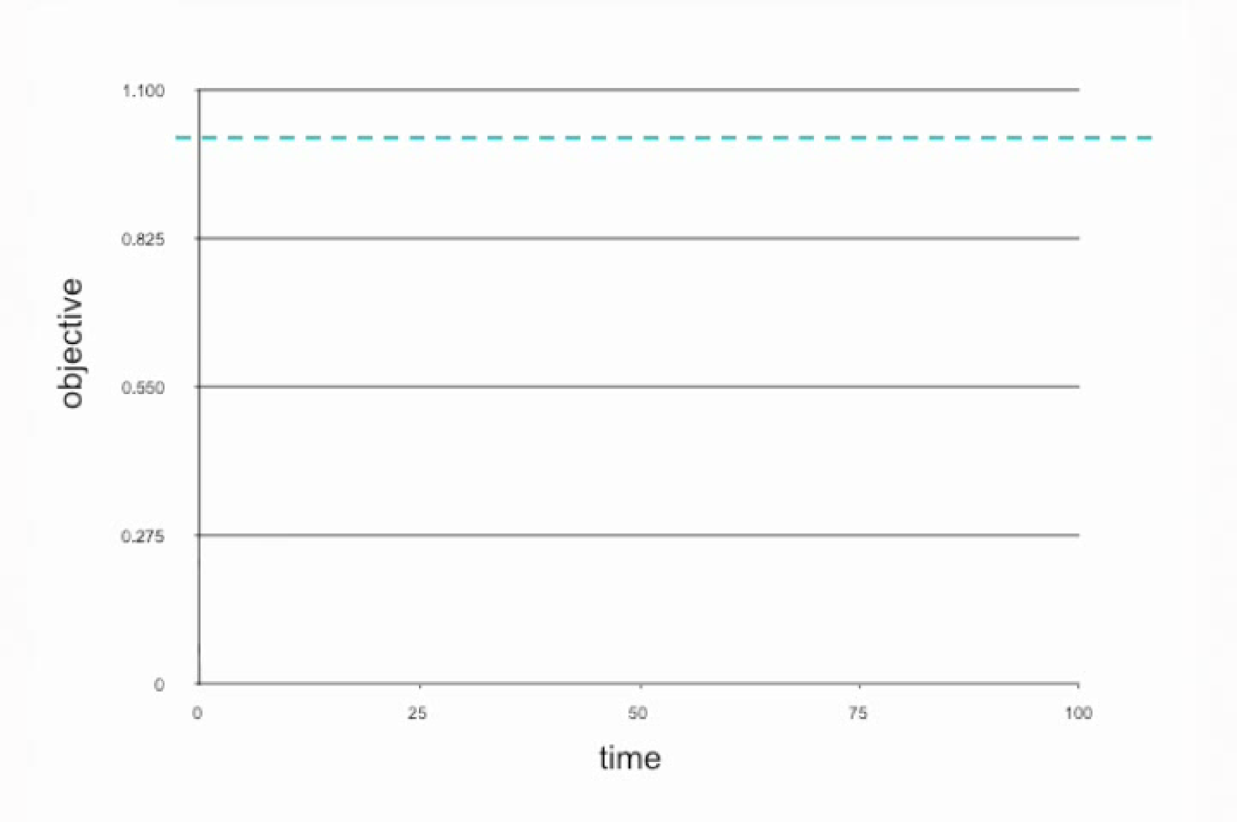
Eclipse 8.1 Beam Angle Optimierung

- Beamdarstellung für globale Optimierung



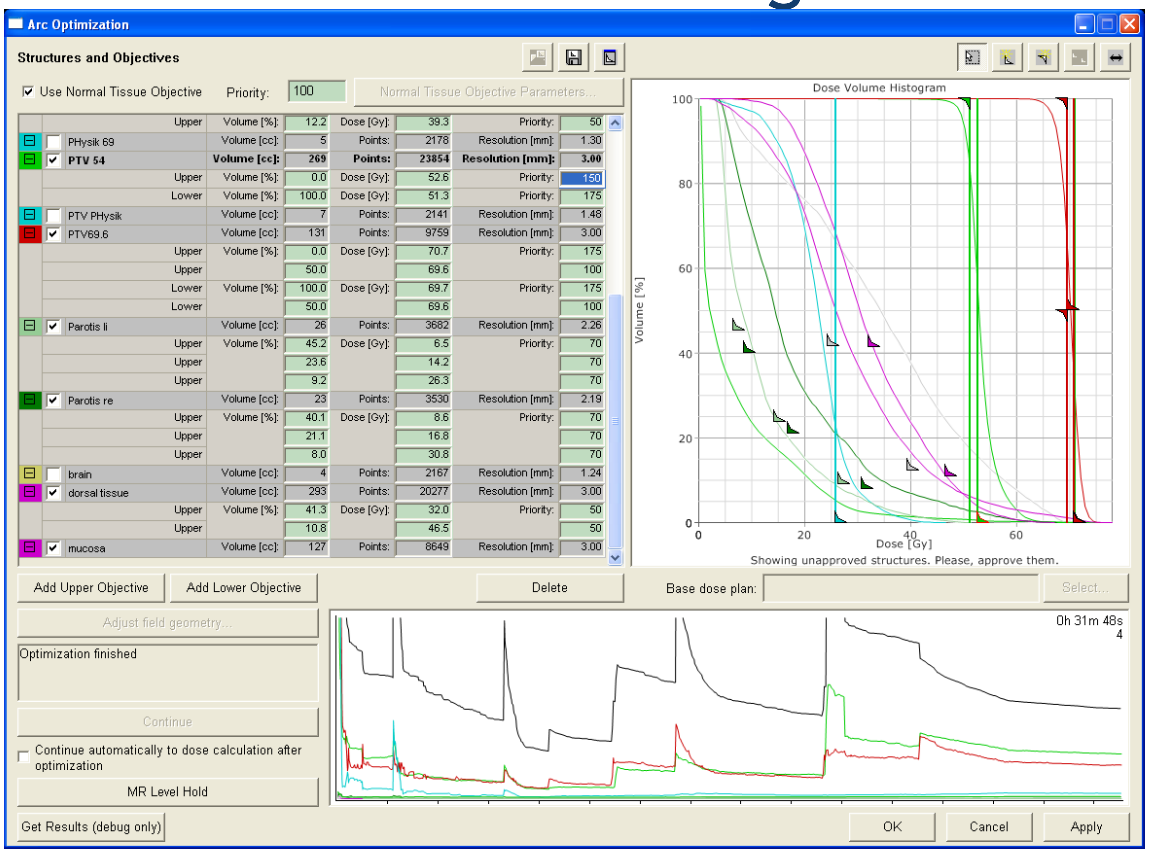
RapidArc Planning for Eclipse

- Progressive sampling in optimization



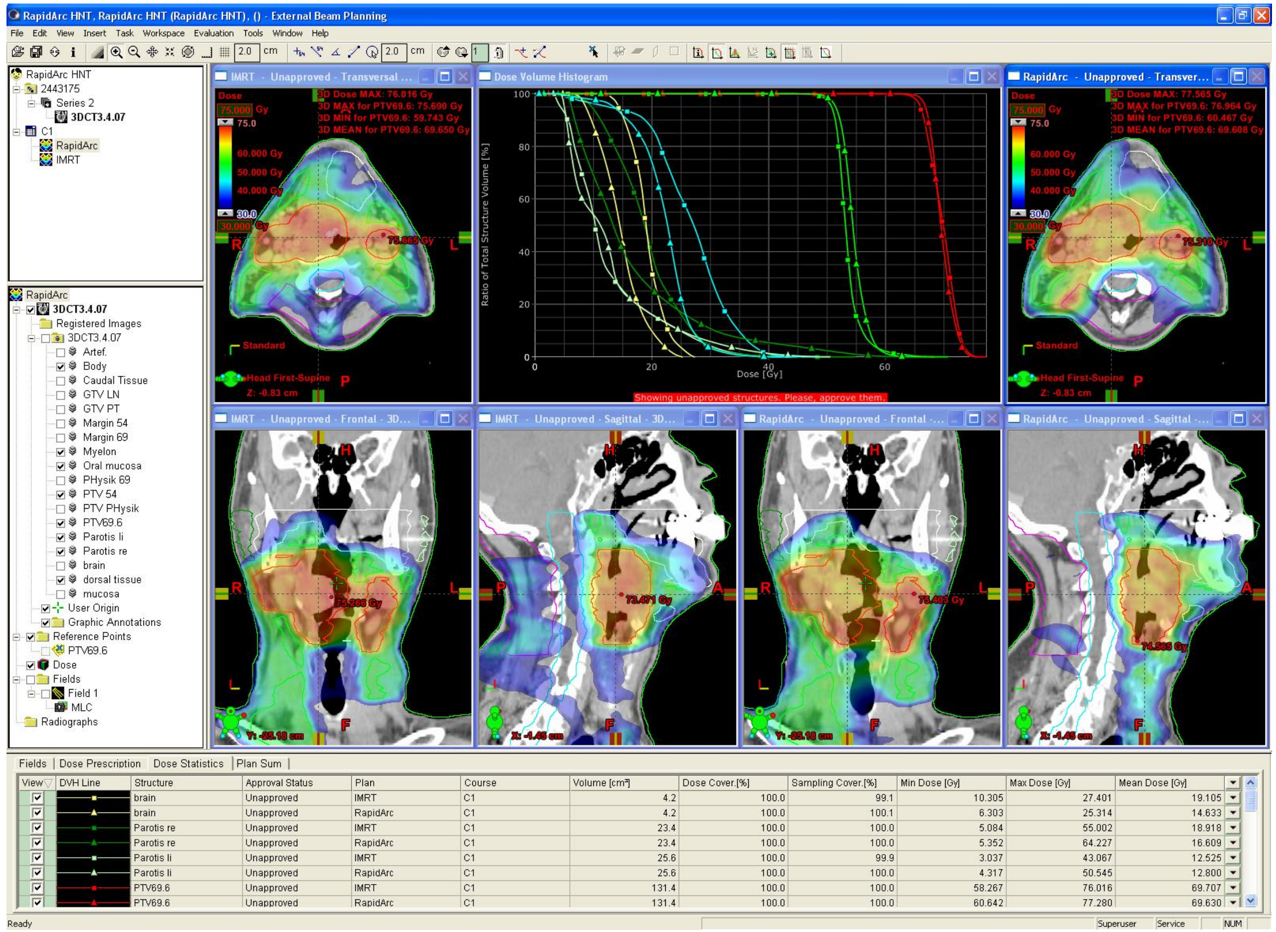
RapidArc Optimierung

- Autostart der Dosisberechnung



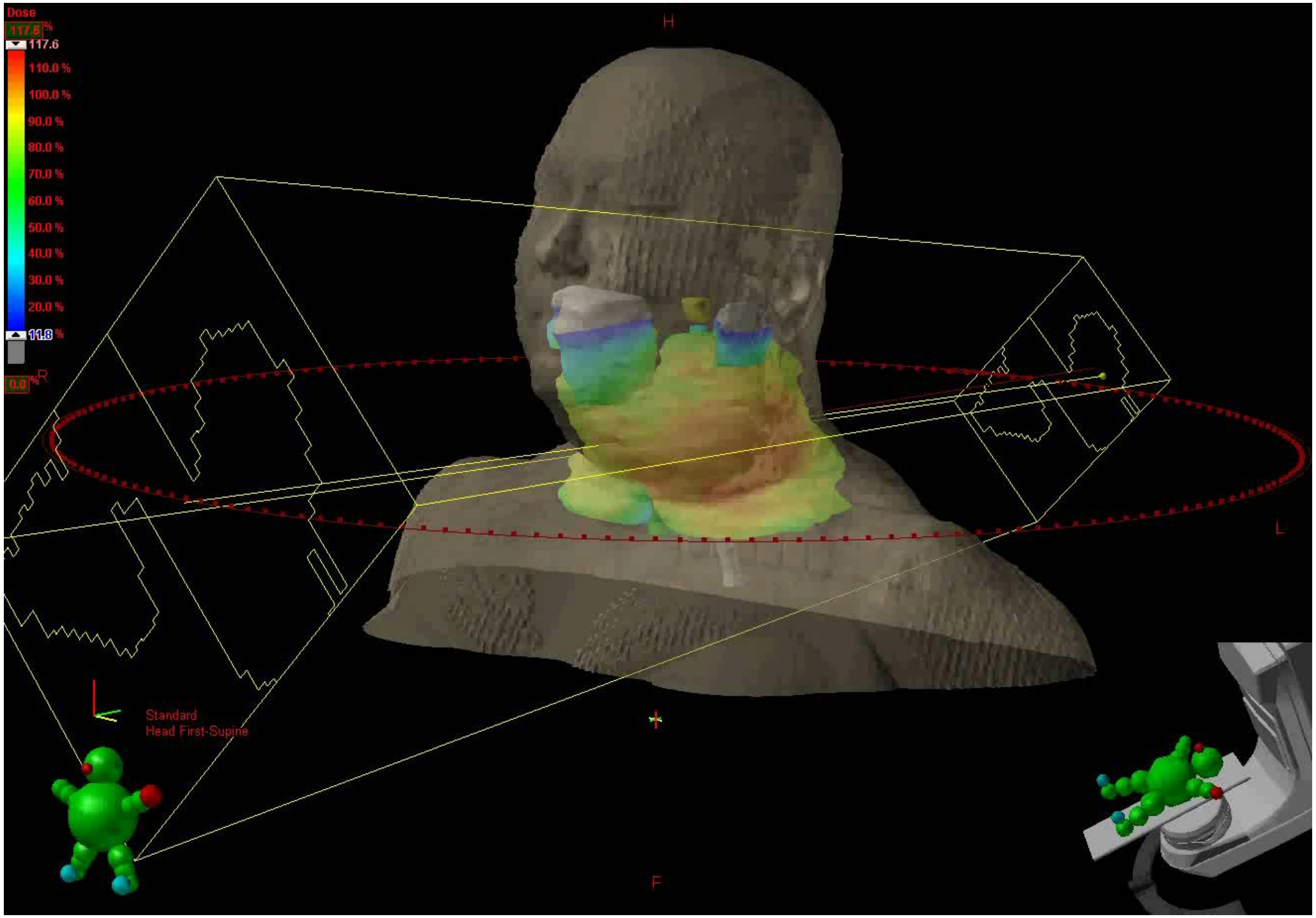
RapidArc Beispiel

- HNT
- RapidArc ▲
- IMRT ■
- RapidArc
  - 662 MU
- IMRT
  - >1000 MU



View	DVH Line	Structure	Approval Status	Plan	Course	Volume [cm³]	Dose Cover.[%]	Sampling Cover.[%]	Min Dose [Gy]	Max Dose [Gy]	Mean Dose [Gy]
☑		brain	Unapproved	IMRT	C1	4.2	100.0	99.1	10.305	27.401	19.105
☑		brain	Unapproved	RapidArc	C1	4.2	100.0	100.1	6.303	25.314	14.633
☑		Parotis re	Unapproved	IMRT	C1	23.4	100.0	100.0	5.084	55.002	18.918
☑		Parotis re	Unapproved	RapidArc	C1	23.4	100.0	100.0	5.352	64.227	16.609
☑		Parotis li	Unapproved	IMRT	C1	25.6	100.0	99.9	3.037	43.067	12.525
☑		Parotis li	Unapproved	RapidArc	C1	25.6	100.0	100.0	4.317	50.545	12.800
☑		PTV69.6	Unapproved	IMRT	C1	131.4	100.0	100.0	58.267	76.016	69.707
☑		PTV69.6	Unapproved	RapidArc	C1	131.4	100.0	100.0	60.642	77.280	69.630

Geschwindigkeit - 2-8 mal schneller



Arc Optimierung in Eclipse TPS

The Importance of Treatment Time

In vitro study of cell survival following dynamic MLC intensity-modulated radiation therapy dose delivery[a)]

Vitali Moiseenko[b)] and Cheryl Duzenli
Vancouver Cancer Centre, British Columbia Cancer Agency, 600 West 10th Avenue, Vancouver, British Columbia V5Z 4E6, Canada, and Department of Physics and Astronomy, University of British Columbia, 6224 Agricultural Road, Vancouver, British Columbia V6T 1Z1, Canada

Ralph E. Durand
BCCA Cancer Research Centre, 675 West 10th Avenue, Vancouver, British Columbia V5Z 1L3, Canada

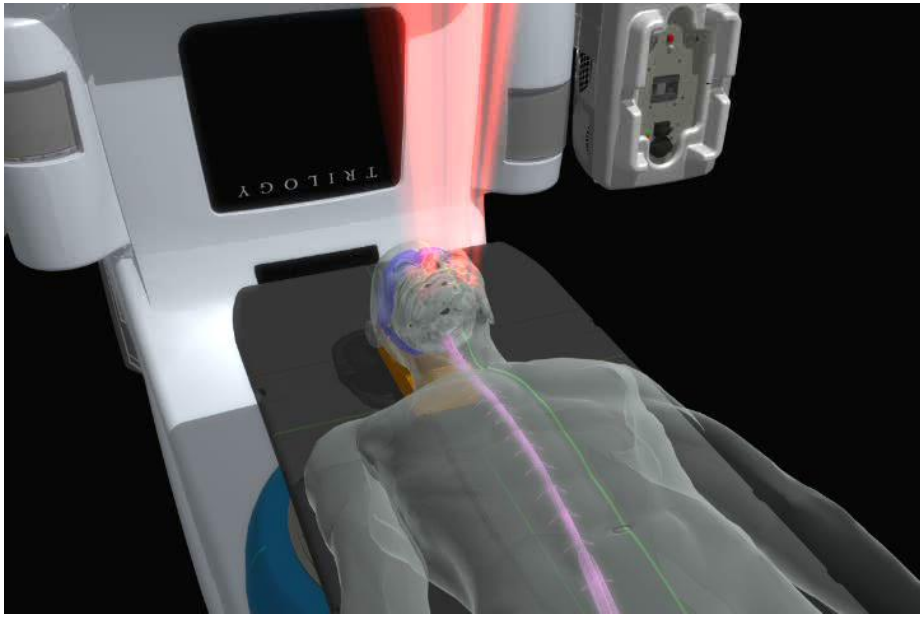
(Received 23 October 2006; revised 9 January 2007; accepted for publication 6 February 2007; published 28 March 2007)

The possibility of reduced cell kill following intensity-modulated radiation therapy (IMRT) compared to conventional radiation therapy has been debated in the literature. This potential reduction in cell kill relates to prolonged treatment times typical of IMRT dose delivery and consequently increased repair of sublethal lesions. While there is some theoretical support to this reduction in cell kill published in the literature, direct experimental evidence specific to IMRT dose delivery patterns is lacking. In this study we present cell survival data for three cell lines: Chinese hamster V79 fibroblasts, human cervical carcinoma, SiHa and colon adenocarcinoma, WiDr. Cell survival was obtained for 2.1 Gy delivered as acute dose with parallel-opposed pair (POP), irradiation time 75 s, which served as a reference; regular seven-field IMRT, irradiation time 5 min; and IMRT with a break for multiple leaf collimator (MLC) re-initialization after three fields were delivered, irradiation time 10 min. An actual seven-field dynamic MLC IMRT plan for a head and neck patient was used. The IMRT plan was generated for a Varian EX or iX linear accelerator with 120 leaf Millenium MLC. Survival data were also collected for doses 1×, 2×, 3×, 4×, and 5× 2.1 Gy to

VARIAN medical systems

RapidArc™

Innovative Systemlösungen für die Strahlentherapie aus einer Hand



Vielen Dank

für Ihre Aufmerksamkeit