



UNIKLINIKUM
SALZBURG
LANDESKRANKENHAUS

Einführung
intrafraktioneller
Bildgebung bei der
Bestrahlung der Prostata
mit Goldmarkern

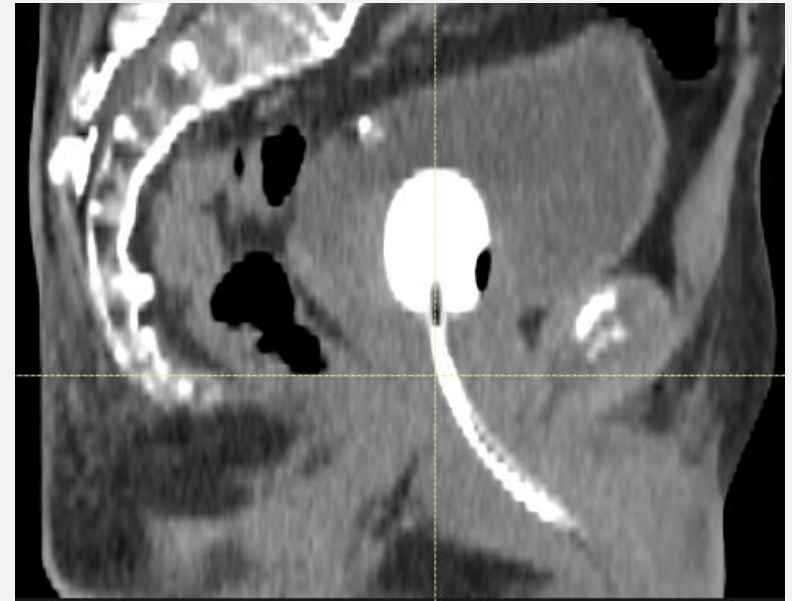
Marco Meinschad

Ziele

- Kompensation intrafraktioneller Bewegungen
- Ausfallskonzept zum HypoCath
- Erweiterung Behandlungsspektrum
 - Gating/DIBH Leber
 - Gating/DIBH Lunge

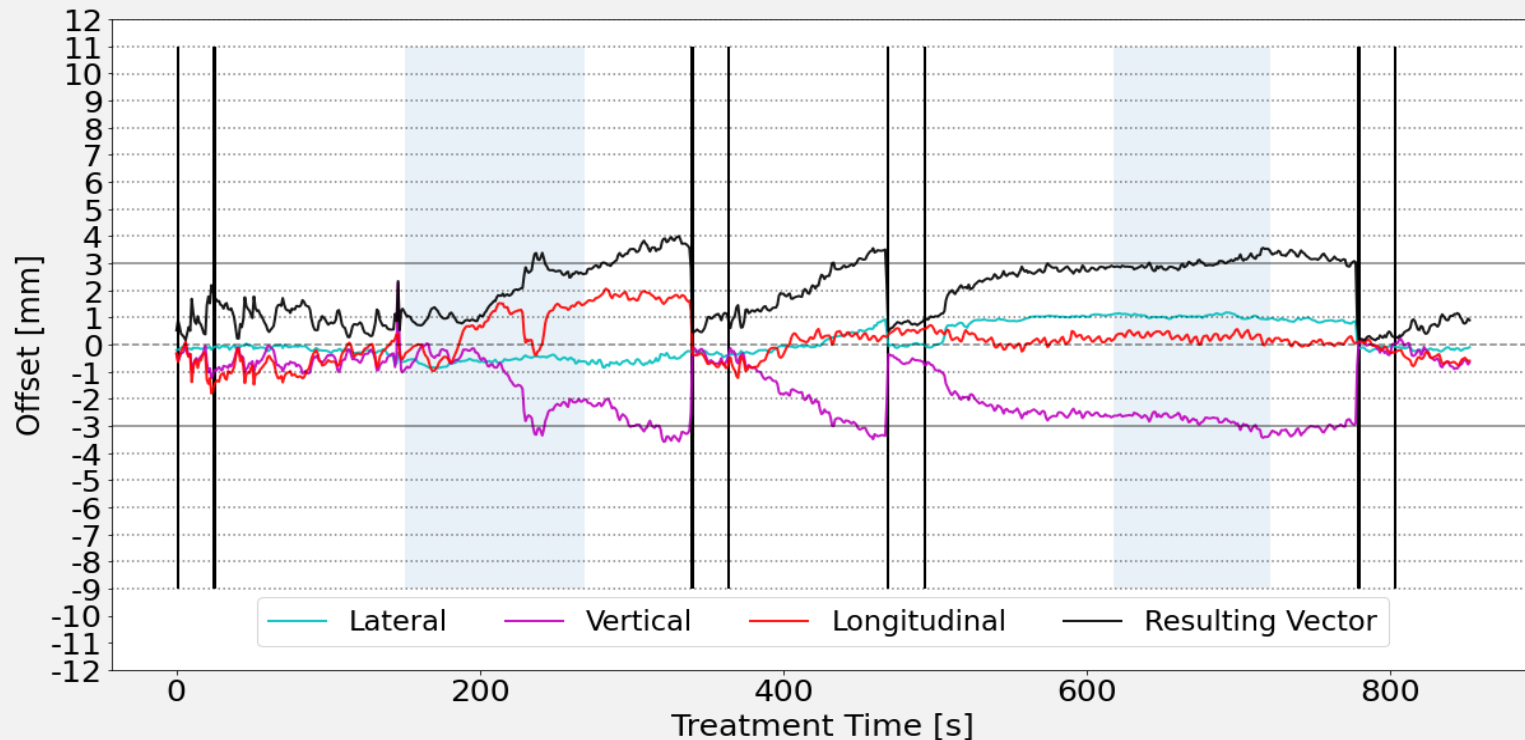
Einschub - HypoCath

- Prostata
- 5 fx
- CTV = 8 Gy/fx = 40 Gy
- Urethra-Sparing 7,25 Gy/fx = 36,5 Gy



Einschub - HypoCath

- 3 mm Toleranz
- neues CBCT

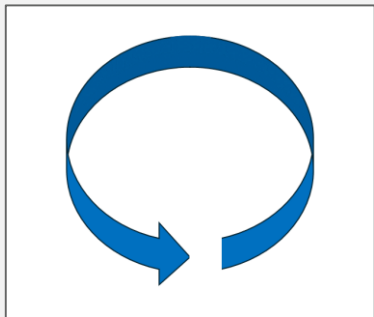


Johannes Berchtold, Salzburg

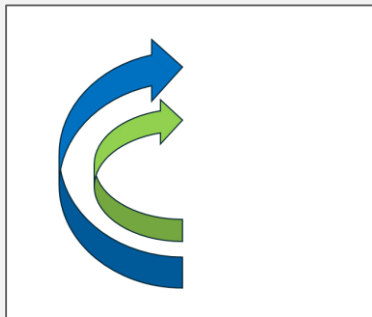
Ablauf

- 360° CBCT zur Lagerung
- 4x 180° Arc VMAT
- 3x davon 180° Intrafraction-CBCT
- CBCT + VMAT dieselben Winkel

1) CBCT



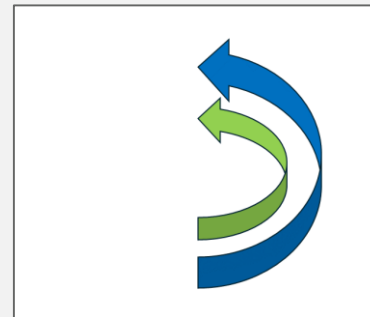
2) Arc 1 + IF



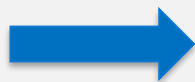
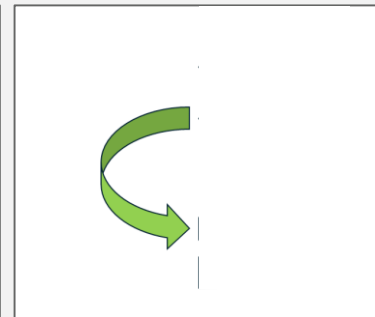
3) Arc 2 + IF



4) Arc 3 + IF



5) Arc 4



CBCT



VMAT-Arc

CBCT Presets

- alle Presets mit S10 F1

	mA	ms	Frames	Gantry [°]	Dosis* [mGy]
CBCT	64	40	660	360	100,6
IF low dose	10	10	206 ±10	180	1,01 ±0,05
IF high dose	20	20	206 ±10	180	4,27 ±0,21

- Drei Intrafraction-CBCTs entsprechen:
3 % (low dose)
13 % (high dose)
der initialen CBCT-Dosis

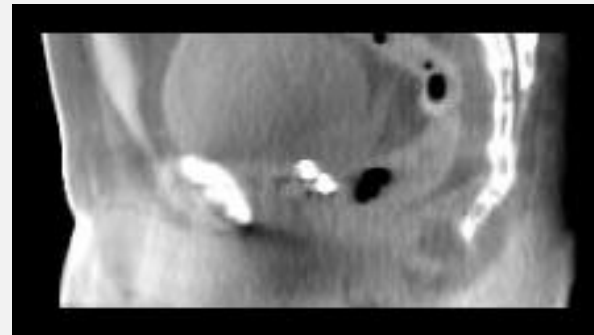
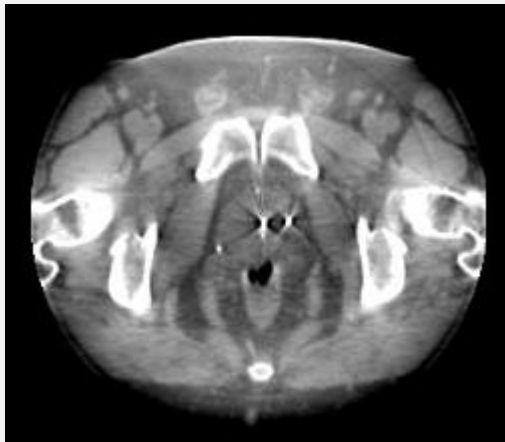
* Air Kerma konzentrierte Hautdosis

Bildqualität

Planungs-CT

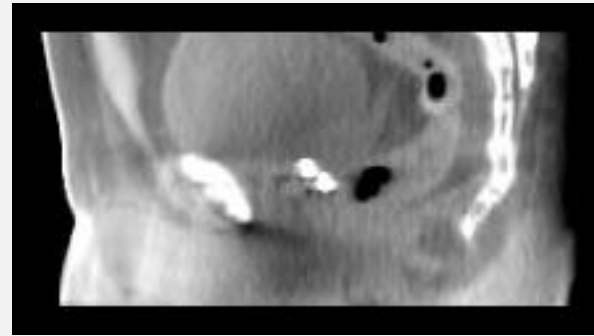
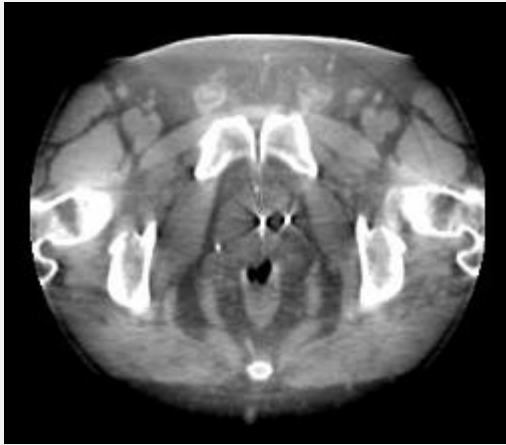


CBCT (normal)

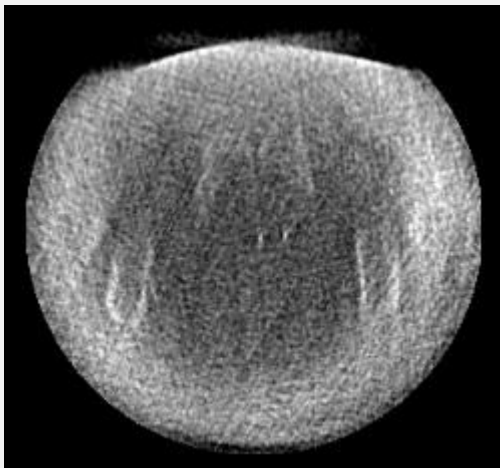


Bildqualität

CBCT (normal)

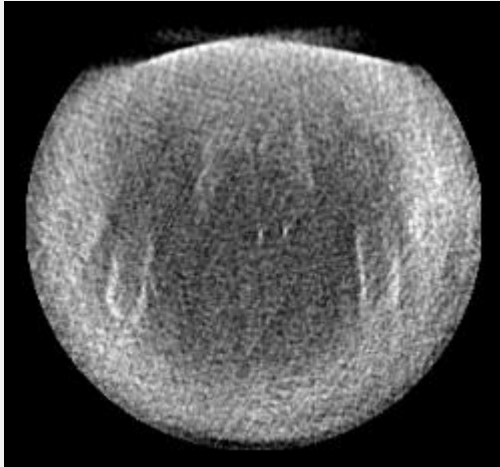


IF-CBCT (low dose)



Bildqualität

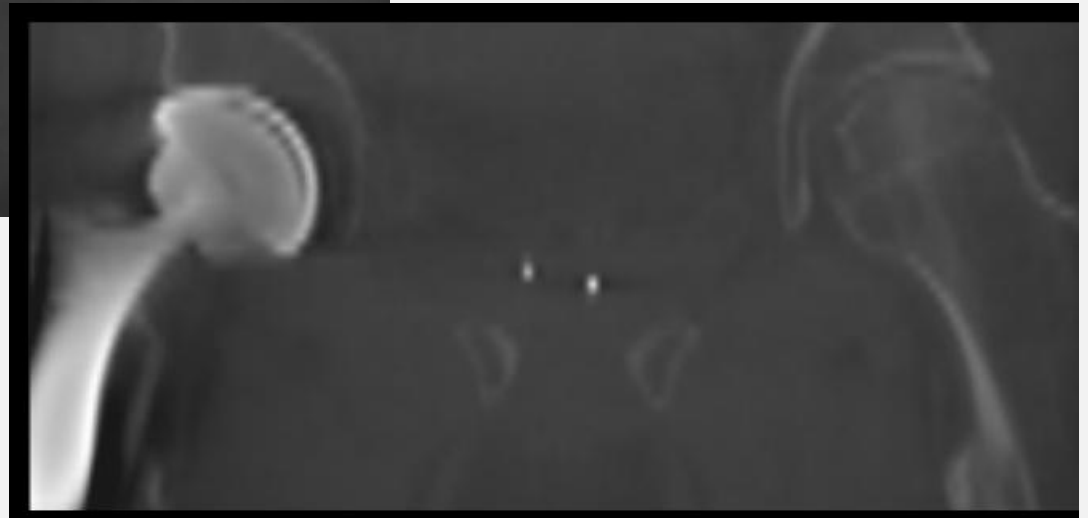
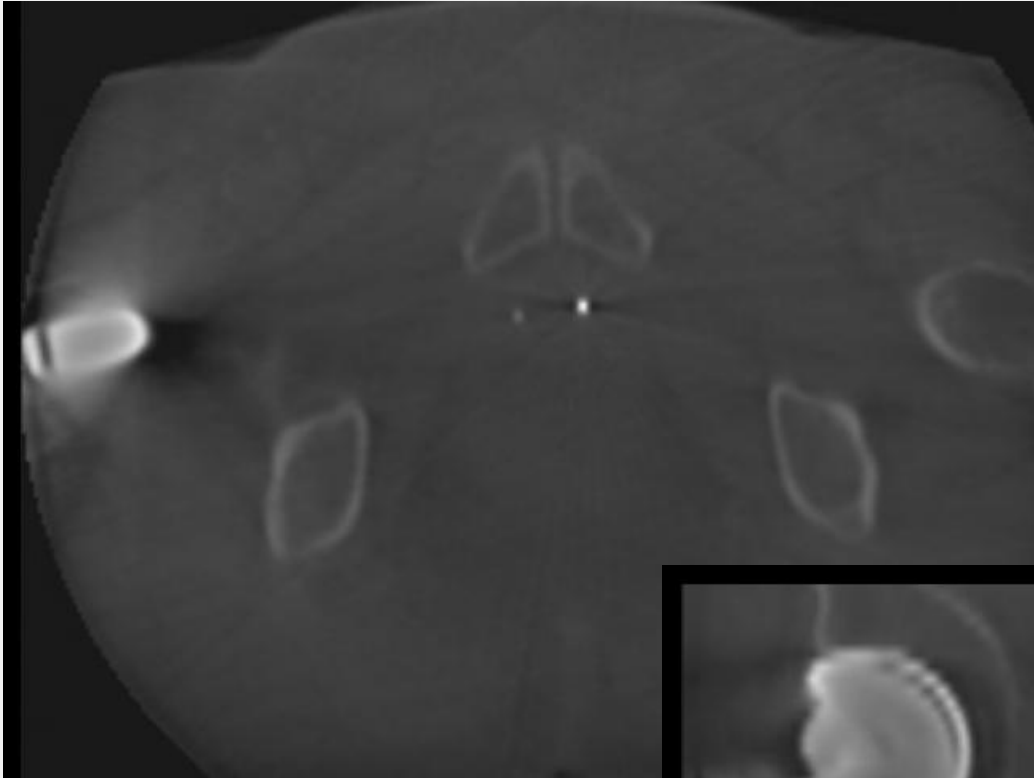
IF-CBCT (low dose)



IF-CBCT (high dose)

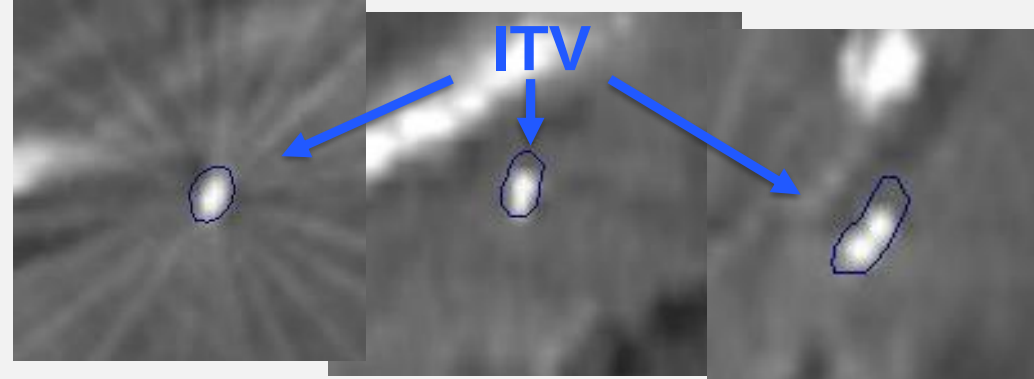
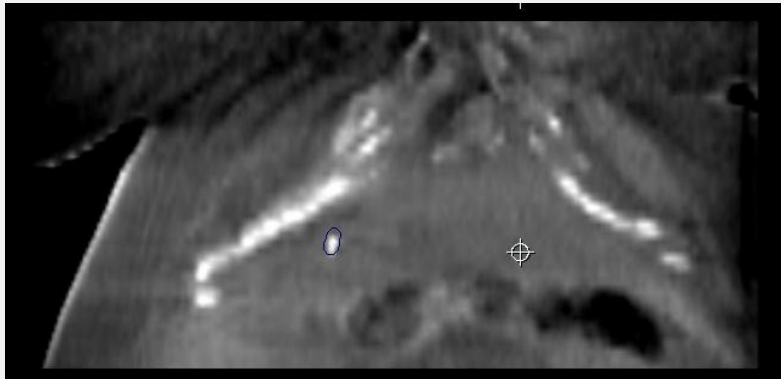
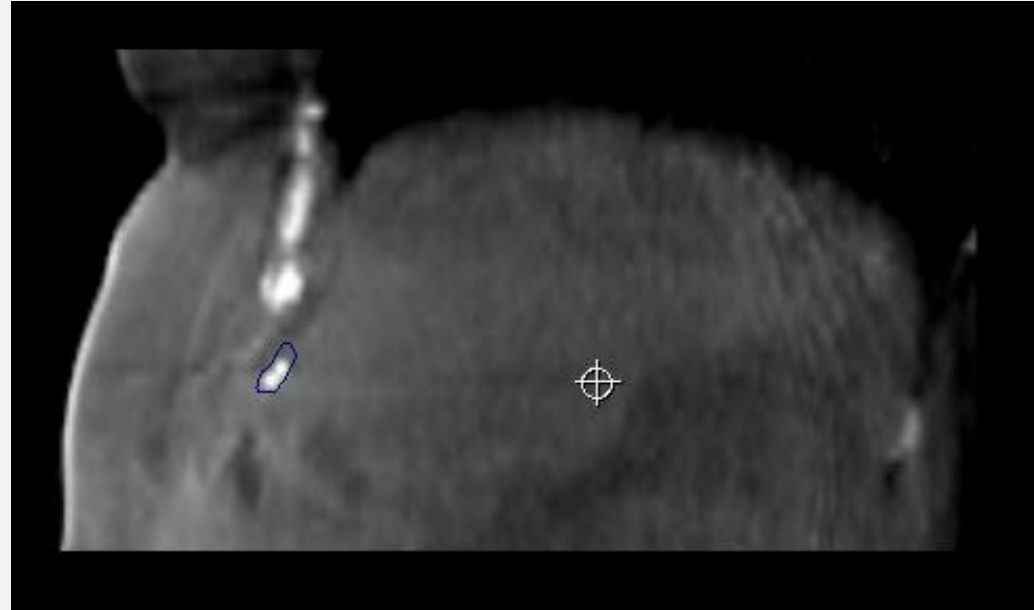
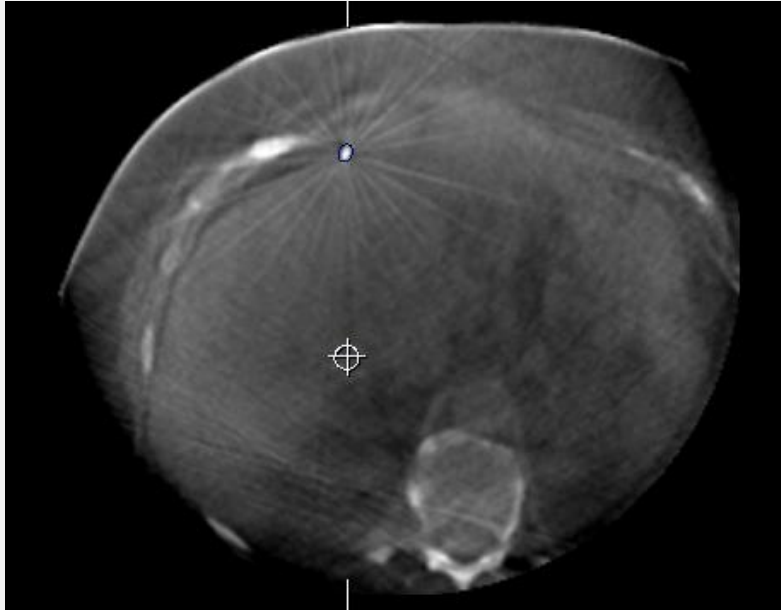


Bildqualität - Hüftprothese



Bildqualität

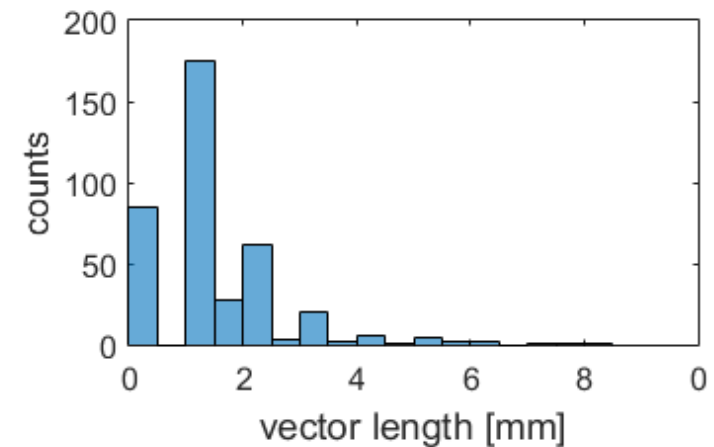
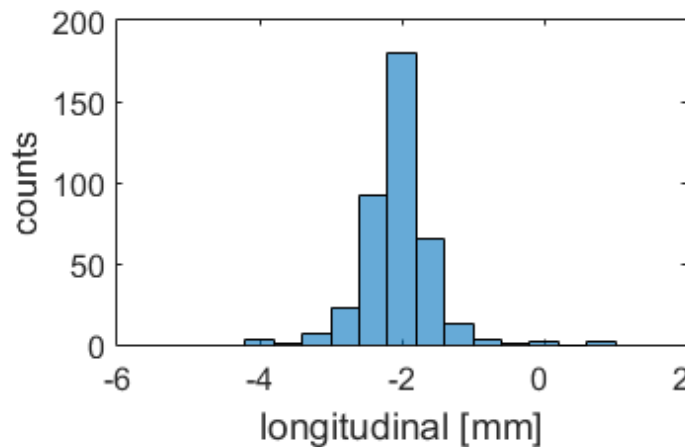
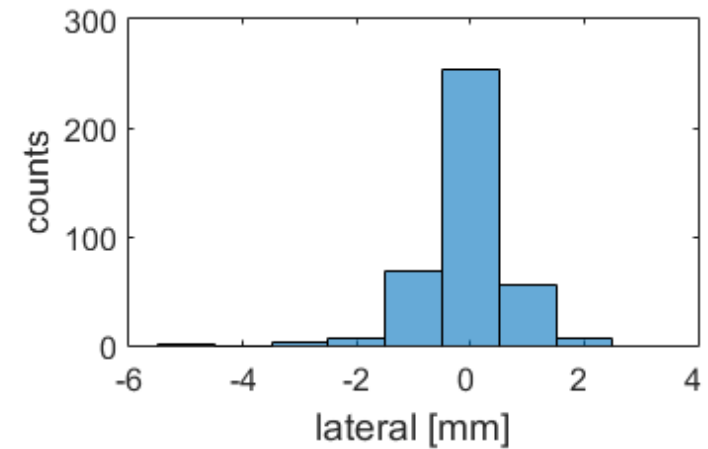
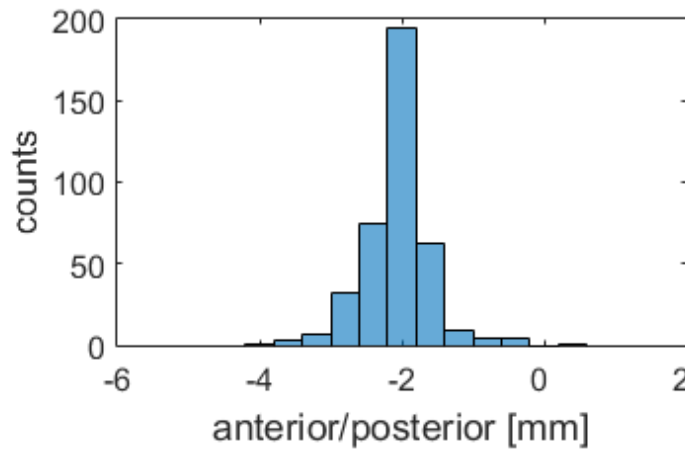
Leber Goldmarker ITV – Intrafraction CBCT



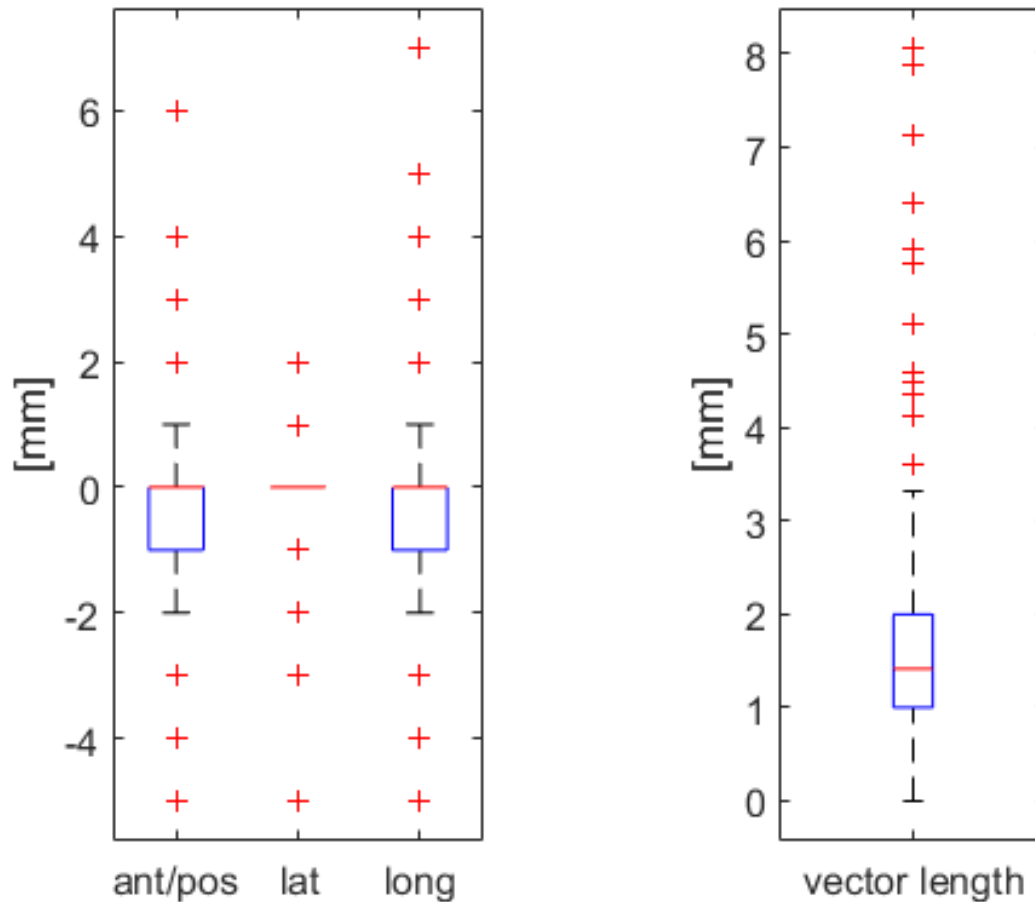
bisher bestrahlt (Stand 2.2.2026):

- Patienten: 31
 - davon Prostata: 30
 - davon Leber: 1
- Anzahl Fx: 142
- Anzahl IF-CBCTs: 392

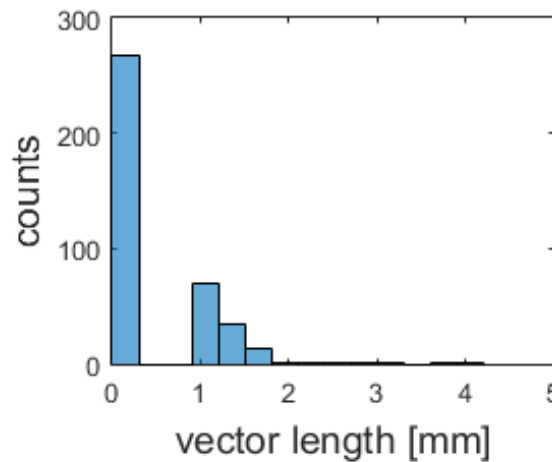
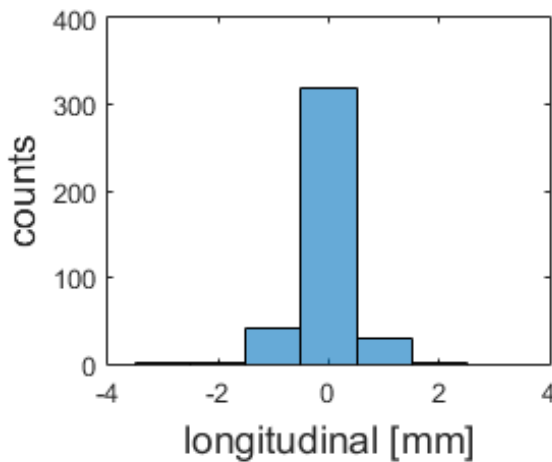
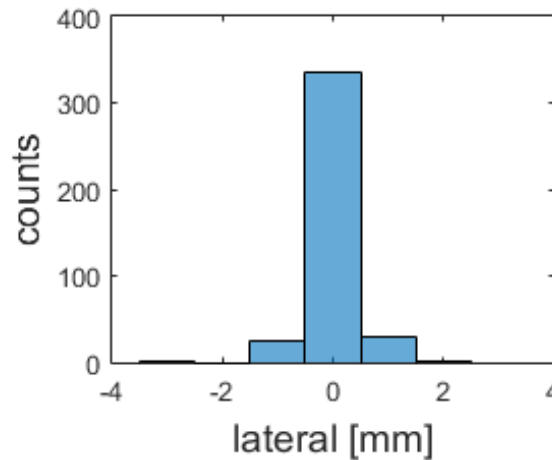
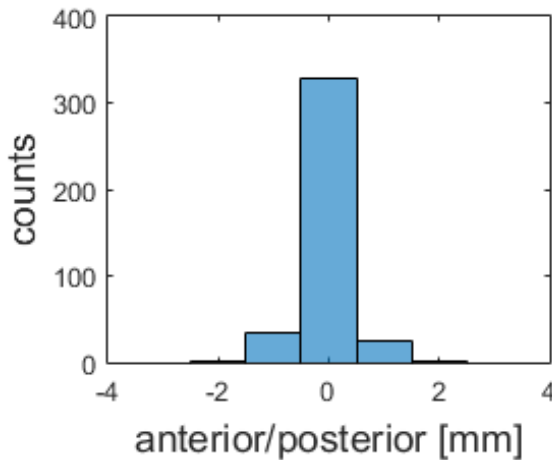
Intrafraktionelle Bewegungen (CBCT zu CBCT)



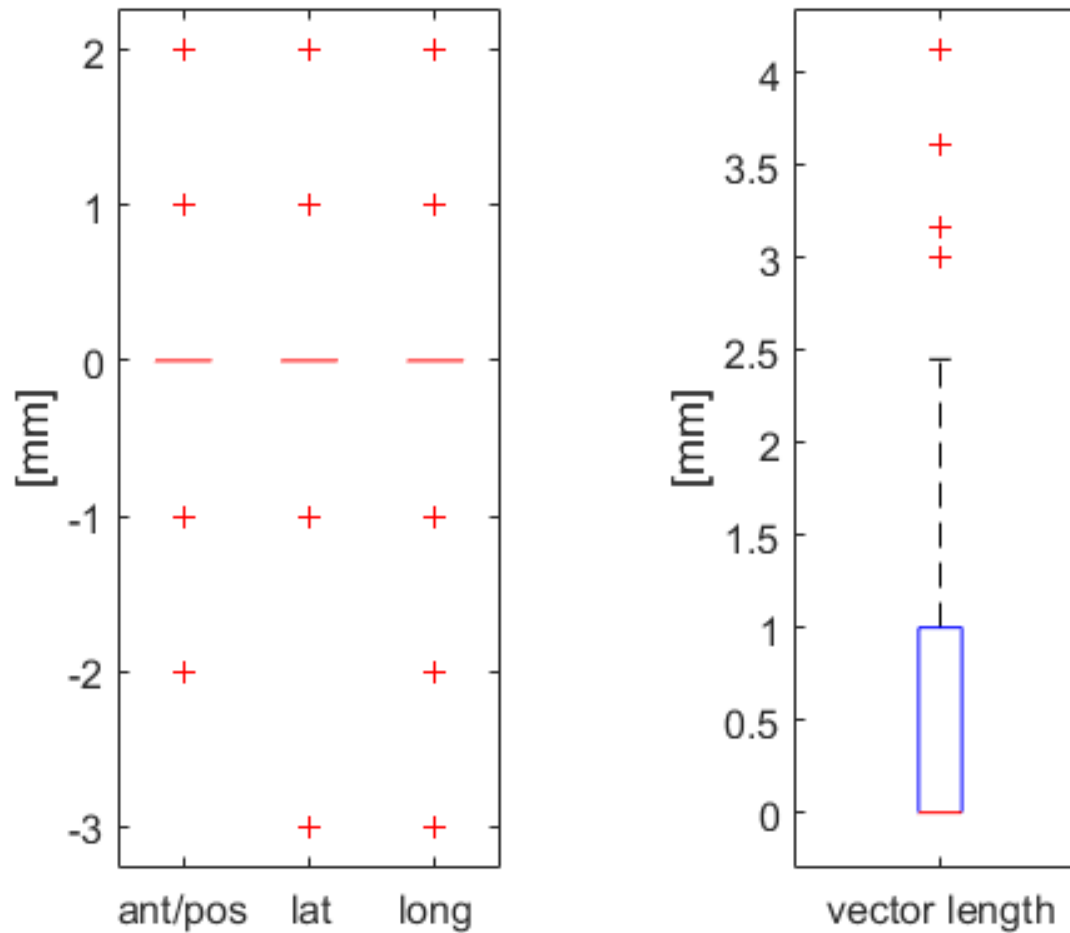
Intrafraktionelle Bewegungen (CBCT zu CBCT)



Offsets mit denen bestrahlt wurde (bzgl. Ref.)



Offsets mit denen bestrahlt wurde (bzgl. Ref.)



Intrafraktionelle Bewegungen (CBCT zu CBCT)

	0 mm	>= 1 mm	>= 2 mm	>= 3 mm	all
Counts	85	203	64	40	392
% of all	21,7 %	51,8 %	16,3 %	10,2 %	
Couch moved	0	106	56	36	198
% moved	0 %	52,2 %	87,5 %	90,0 %	50,5 %

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Effektive Offsets bei Bestrahlung (bzgl. Ref.)

	0 mm	>= 1 mm	>= 2 mm	>= 3 mm	all
Counts	268	117	3	4	392
% of all	68,4 %	29,9 %	0,7 %	1,0 %	

davon	=1 mm	= 1.41 mm	= 1.73mm
Counts	51	58	19
% of all	10,7 %	14,1 %	5,1 %

**Effektive Offsets
evtl. etwas kleiner
(Rundung im MQ)**

Vielen Dank! 😊

herzlichen Dank an:
Ivan Messner
Elvis Ruznic
für die Datenaquisition aus
der MQ-DB

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Vergleich Pläne IF + konventionelle VMAT

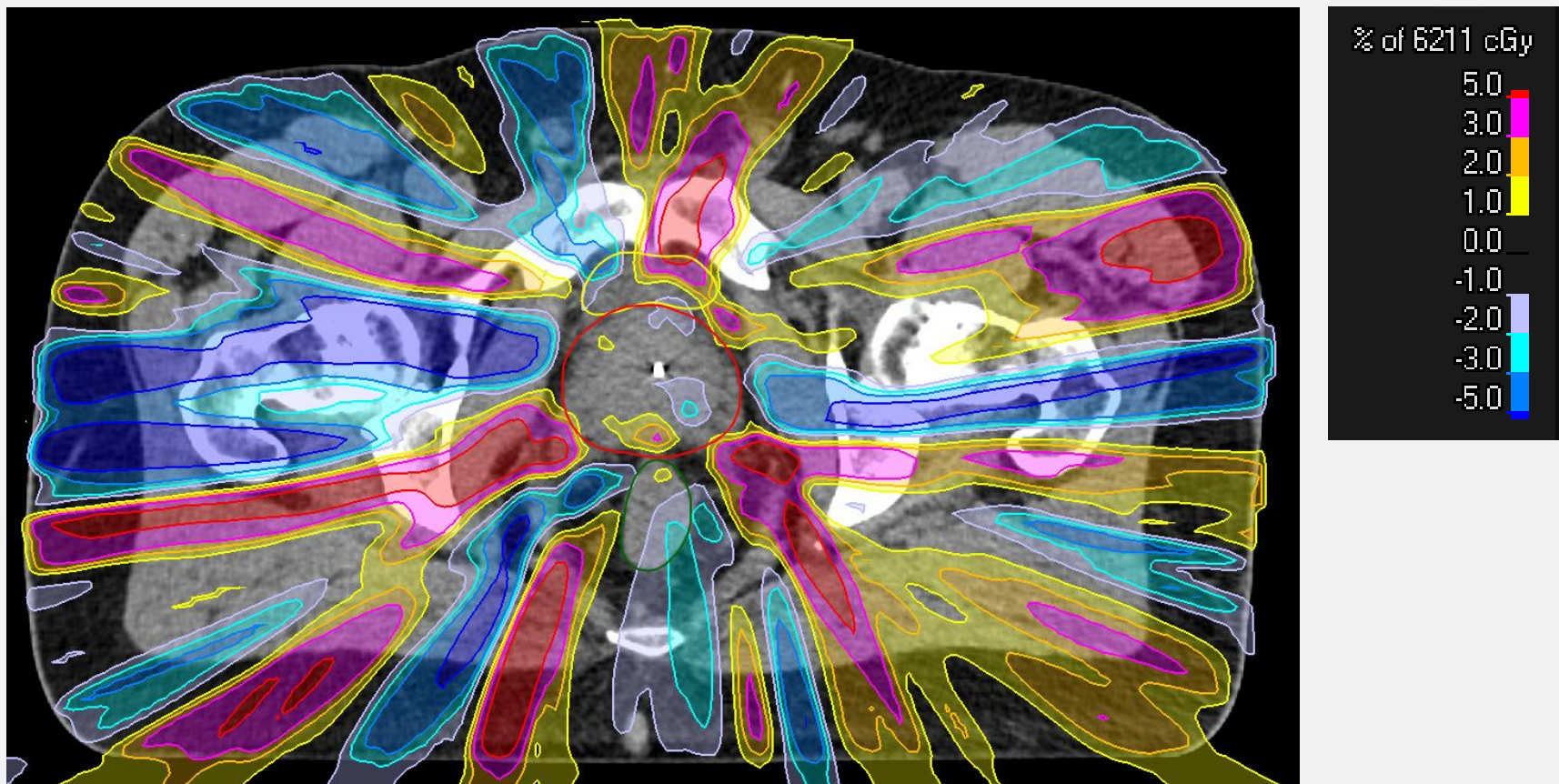
- dieselben Optimierungsparameter - DVH



PTV
Blase
Rektum

Vergleich Pläne IF + konventionelle VMAT

- dieselben Optimierungsparameter - Differenzenbild



Ablauf – benötigte Zeit

Technik	Zeit [min:s]	Minimum	Maximum
Intrafraction	11:35 $\pm$ 1:07	09:00	13:00
konventionell	04:05 $\pm$ 0:38	03:00	05:00
Differenz	07:30		
„Automatisierung“	02:33 $\pm$ 0:48		
CBCT matchen + Verfahren	01:28 $\pm$ 0:38		
IF aktuell 02/2026	10:26 $\pm$ 1:46	08:23	16:28