

Maidstone and Tunbridge Wells

NHS Foundation Trust



PROSTATE
BRACHYTHERAPY

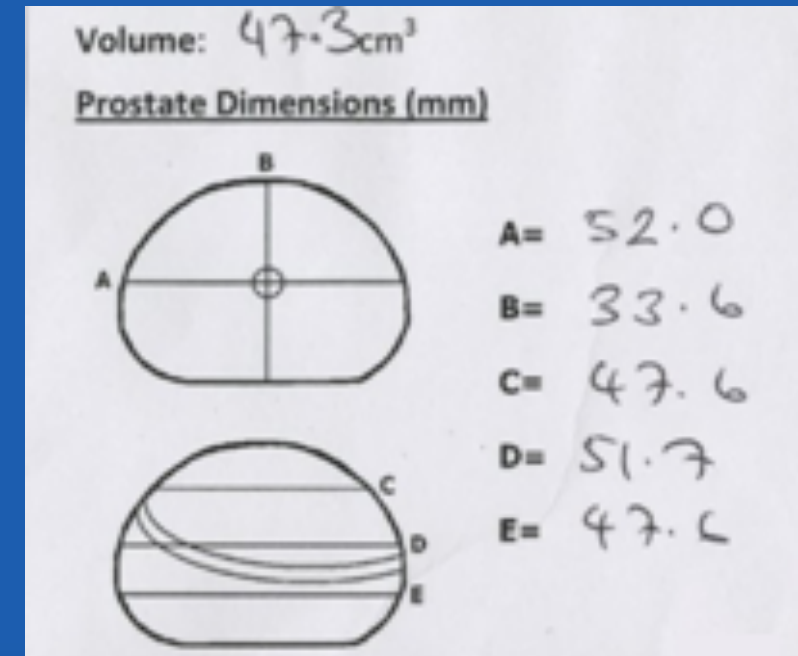
UK & Ireland Conference 2018

Summary

- 4D interactive planning (very brief introduction)
- Implants results
 - How many seeds to order???
 - Evolution of dosimetric parameters
- Our experience
 - Reducing number of insertions
 - Assessing feasibility of a plan
 - Patient top up

4D TECHNIQUE

- Measurements taken from ultrasound study
 - 5 cross sectional measurements



- Data entered into WebBXT:
 - Nomogram created

Order Details > Prostate Details > Nomogram > Order List > Delivery > Summary

New Seed Order

TRANSVERSE PLANE

PROSTATE WIDTH (mm)
52.0

PROSTATE HEIGHT (mm)
33.6

SAGITTAL PLANE

PROSTATE ANTERIOR LENGTH (mm)
47.6

PROSTATE CENTRAL LENGTH (mm)
51.7

PROSTATE POSTERIOR LENGTH (mm)
47.6

VOLUME

47.297 cc

CALCULATE

IMPLANT TYPE

ISOTOPE
Iodine ✓

IMPLANT TYPE
Monotherapy ✓

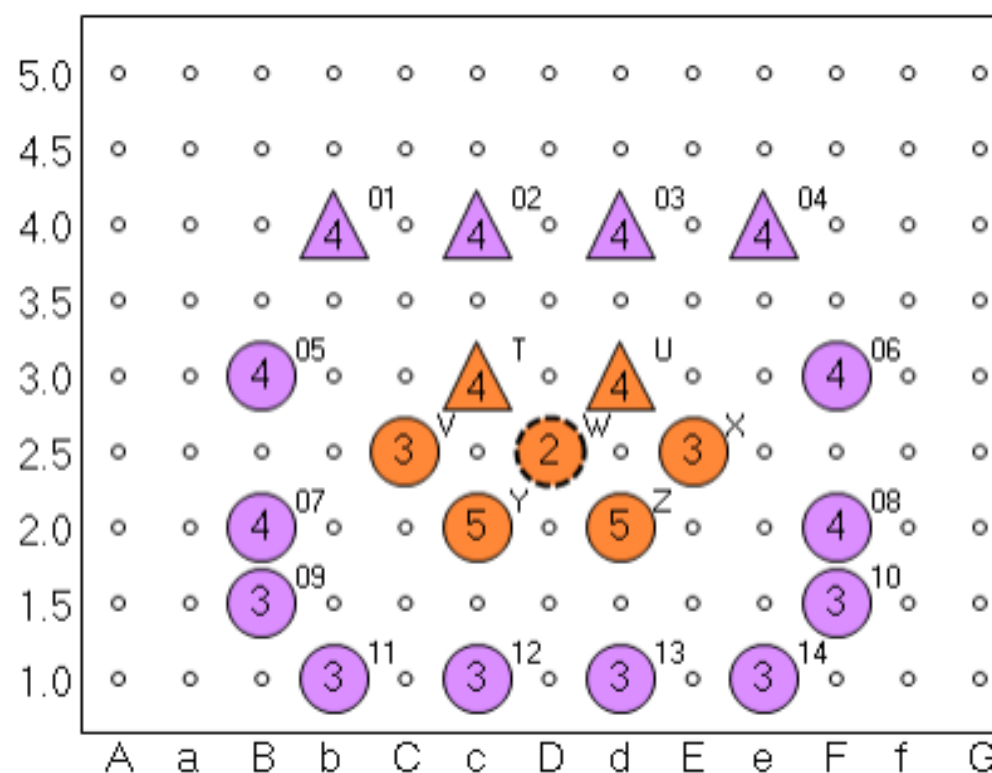
BACK

AUTO-GENERATE ORDER

NOMOGRAM

Needle Number	Order Plane (cm)	Hole Location	Number Seeds
01	0.50	b4	4
02	0.50	c4	4
03	0.50	d4	4
04	0.50	e4	4
05	0.00	B3	4
06	0.00	F3	4
07	0.00	B2	4
08	0.00	F2	4
09	0.00	B1.5	3
10	0.00	F1.5	3
11	0.00	b1	3
12	0.00	c1	3
13	0.00	d1	3
14	0.00	e1	3
T	0.50	c3	4
U	0.50	d3	4
V	0.00	C2.5	3
W	3.00	D2.5	2
X	0.00	E2.5	3
Y	0.00	c2	5
Z	0.00	d2	5

The needle loading chart shown is a guide only and should not be used as an alternative to calculation made on the date of the Brachytherapy procedure using the medical practitioner's own seed planning software



Order Plane Legend		
Plane 0	Plane 1	Special
0.00 cm	0.50 cm	Other

Number of Needles	Seeds per Needle
10	4
8	3
1	2
2	5

INTERACTIVE PLANNING



1. Ultrasound images acquired
2. Consultant contours prostate and OARs
3. Peripheral needles positioned in prostate; dosimetric stats evaluated.
4. Peripheral needles implanted
5. Planning of central seeds (very much quicker than pre-planning – typically < 10 mins in duration).

INTERACTIVE PLANNING

Content activity =
2 x apparent activity

EA permit!!!



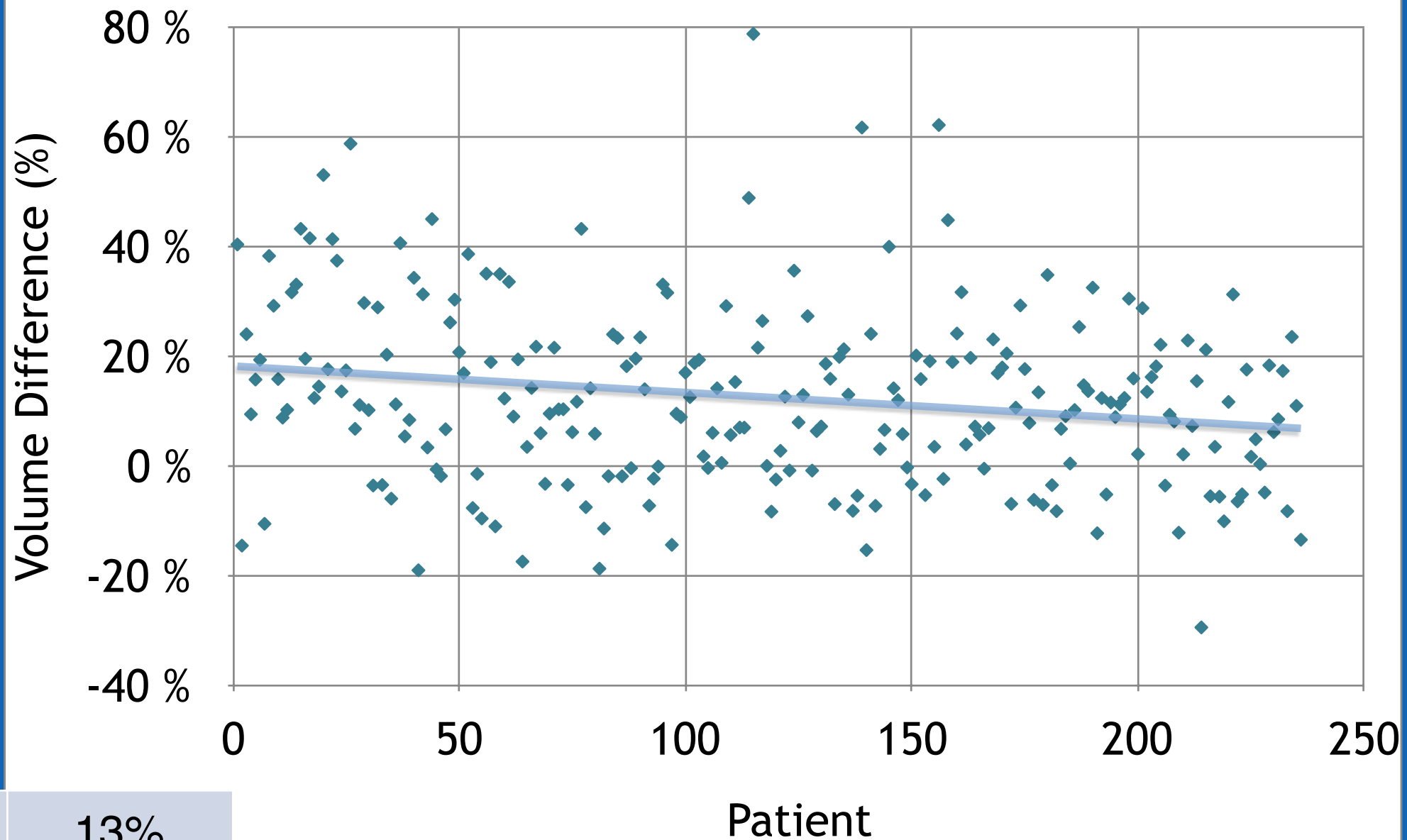
6. Custom made needles manufactured using Isolader. Needles are implanted into patient as further needles manufactured
7. Capacity to optimise the plan with further custom made needles if required

Implants results

- 2 implants a week on the same day.
- Follow up CT 4 weeks afterwards (3 mm):
 - Seeds finding + Contouring.
- 236 patients: June 2015 - March 2018.

Prostate Volume

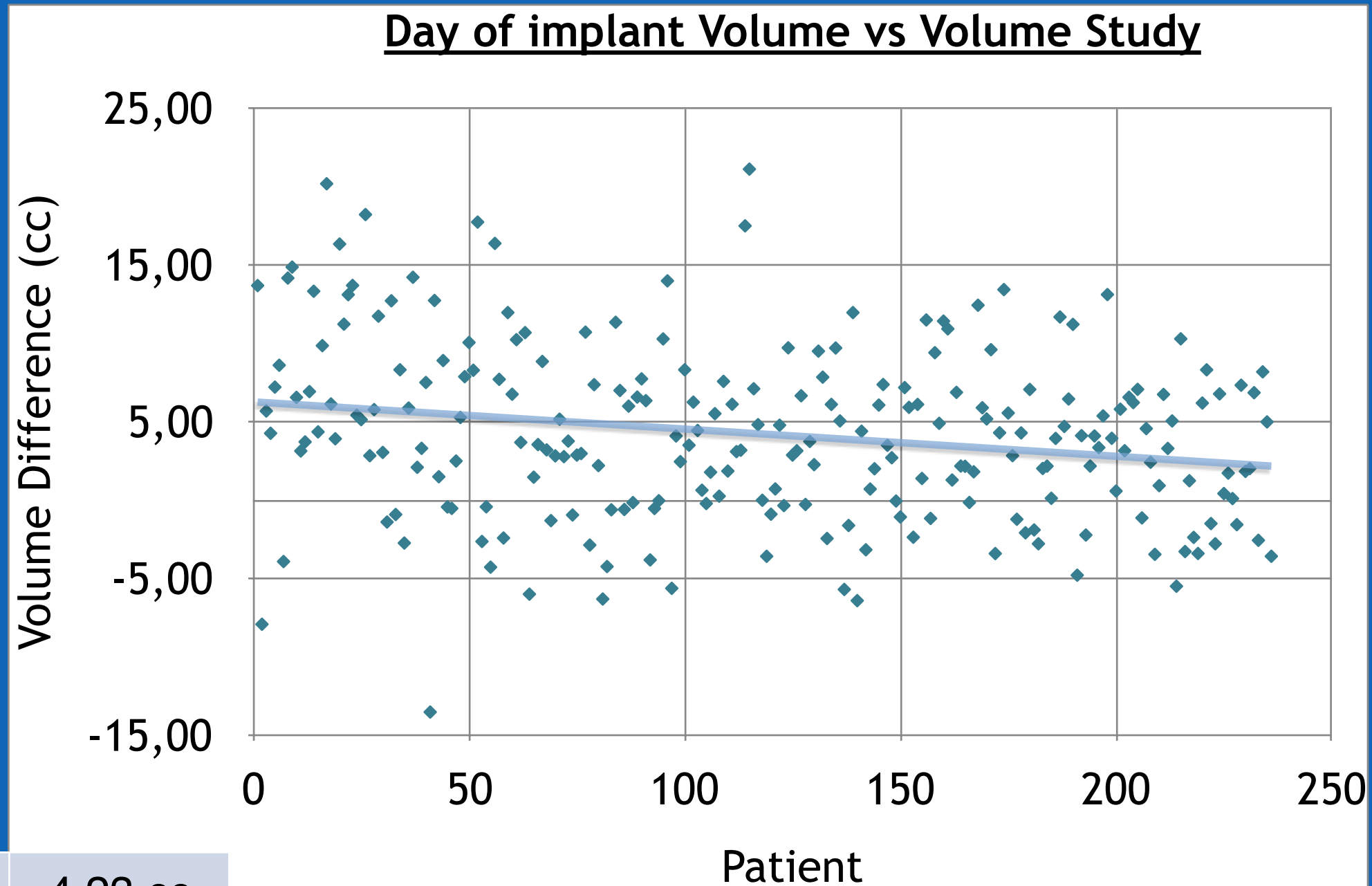
Day of implant Volume vs Volume Study



Mean	13%
Min	-29%
Max	79%
Std Dev	0.16

- Agreement improved with time.

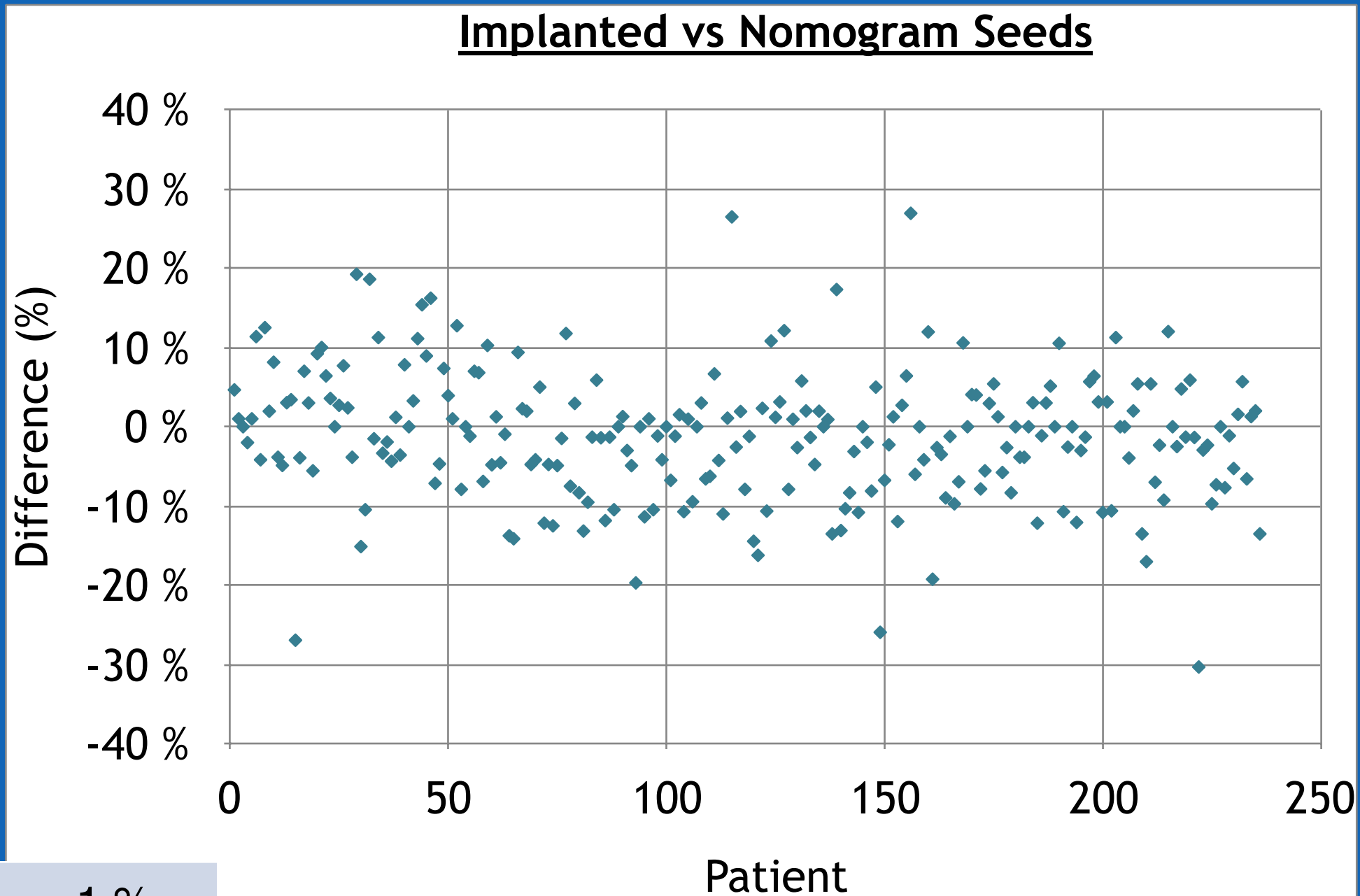
Prostate Volume



Mean	4.23 cc
Min	-13.50 cc
Max	21.13 cc
Std Dev	5.53

- 13% relative difference translates into 4.3 cc.
- Five measurements define accurately the size of the prostate.

Nomogram's accuracy



Mean	-1 %
Min	-30 %
Max	27 %
Std Dev	0.08

- We end up using almost exactly what nomogram predicts.
- We have an 8% buffer when ordering seeds.

Follow up CT

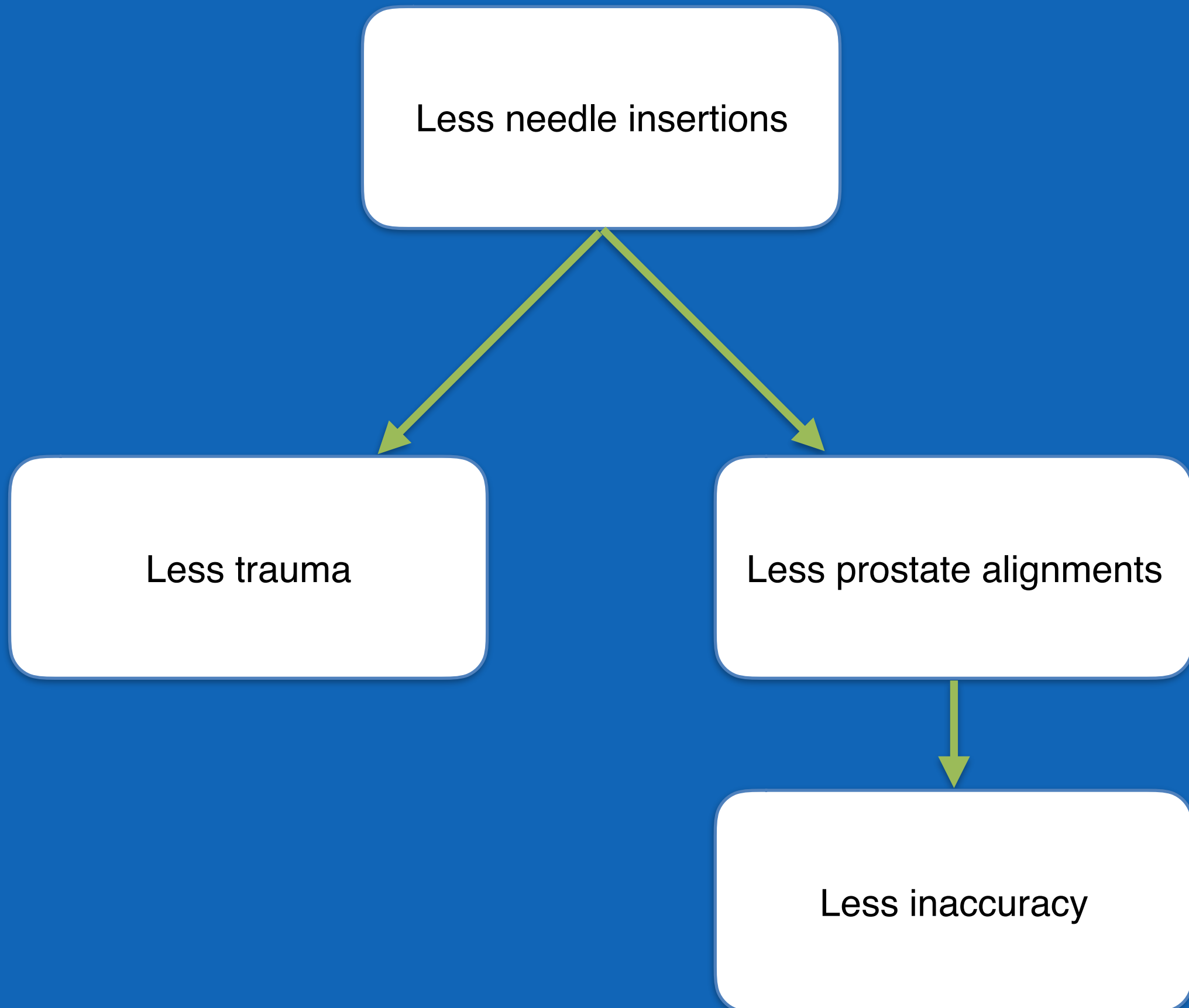
Dosimetric parameter	Variation respect to implant day
Prostate V150	+5 %
Prostate V100	-3 %
Prostate D90	-5 %
Rectum V100	+0.3 cc

- All the dosimetric parameters are robust and consistent with respect to planning data.

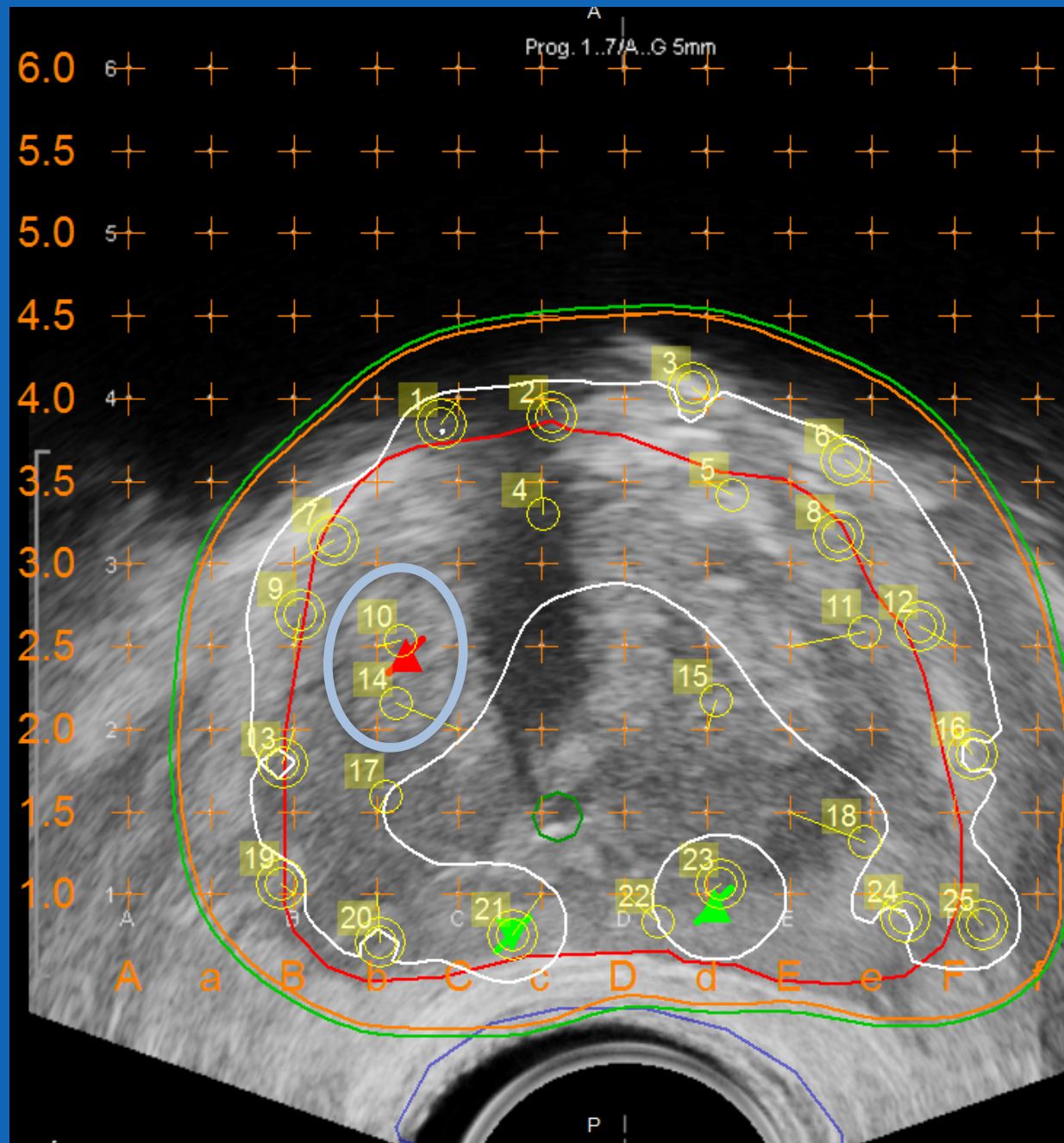
Our experience

- Fusing needles
- Bending needles
- Assessing feasibility of an implant
- Top-up of a patient

Fusing needles

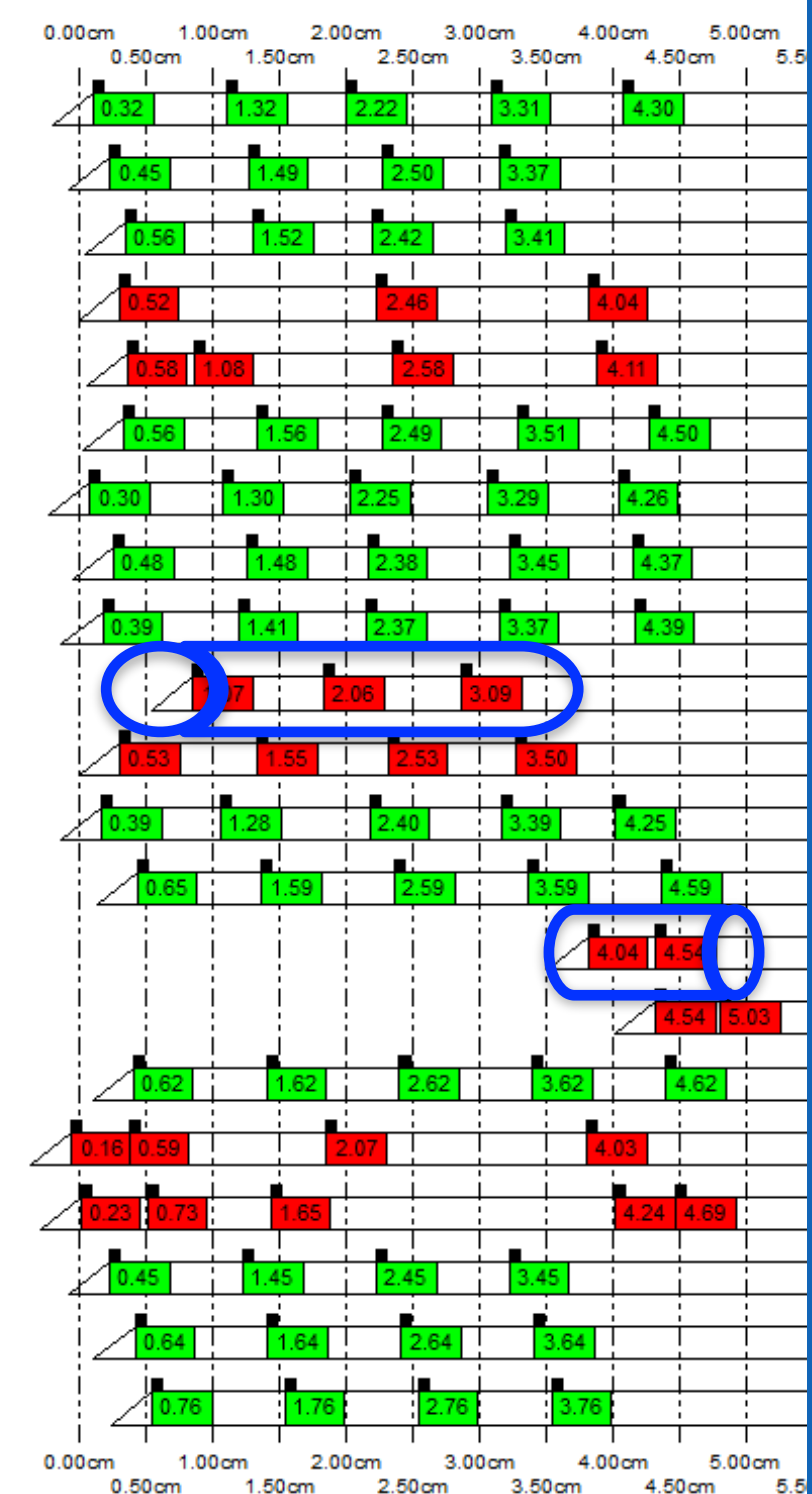


Fusing needles



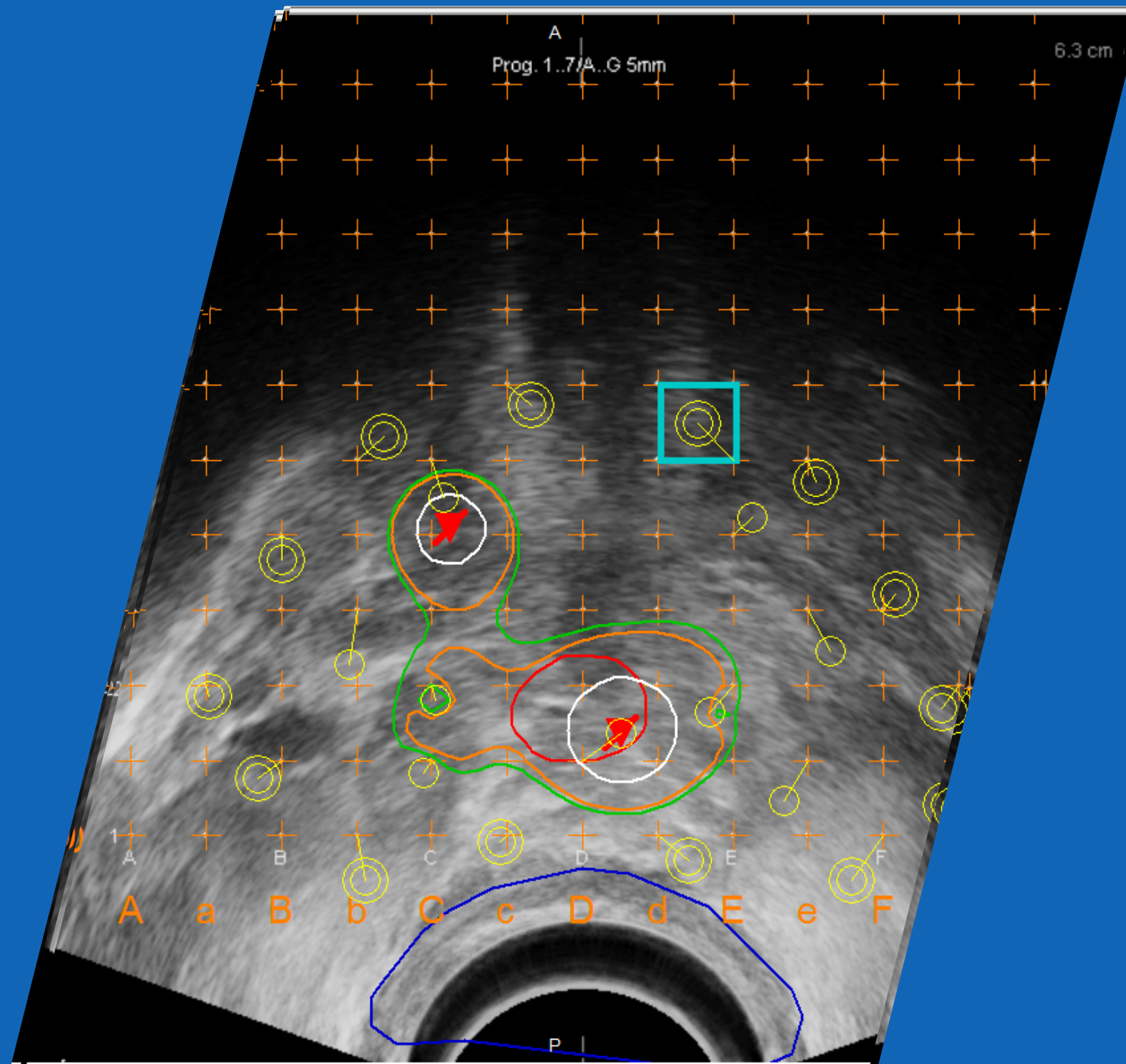
Needle Number	Retraction (cm)	Hole Location	Number Seeds
1	0.32	C4.0	5 ☒
2	0.45	c4.0	4 ☒
3	0.56	d4.0	4 ☒
4	0.52	c3.5	3 ☒
5	0.58	d3.5	4 ☒
6	0.56	e3.5	5 ☒
7	0.30	B3.0	5 ☒
8	0.48	e3.0	5 ☒
9	0.39	B2.5	5 ☒
10	1.07	b2.5	3 ☒
11	0.53	E2.5	4 ☒
12	0.39	F2.5	5 ☒
13	0.65	B2.0	5 ☒
14	4.04	C2.0	2 ☒
15	4.54	d2.0	2 ☒
16	0.62	F2.0	5 ☒
17	0.16	b1.5	4 ☒
18	0.23	E1.5	5 ☒
19	0.45	B1.0	4 ☒
20	0.64	b1.0	4 ☒
21	0.76	c1.0	4 ☒

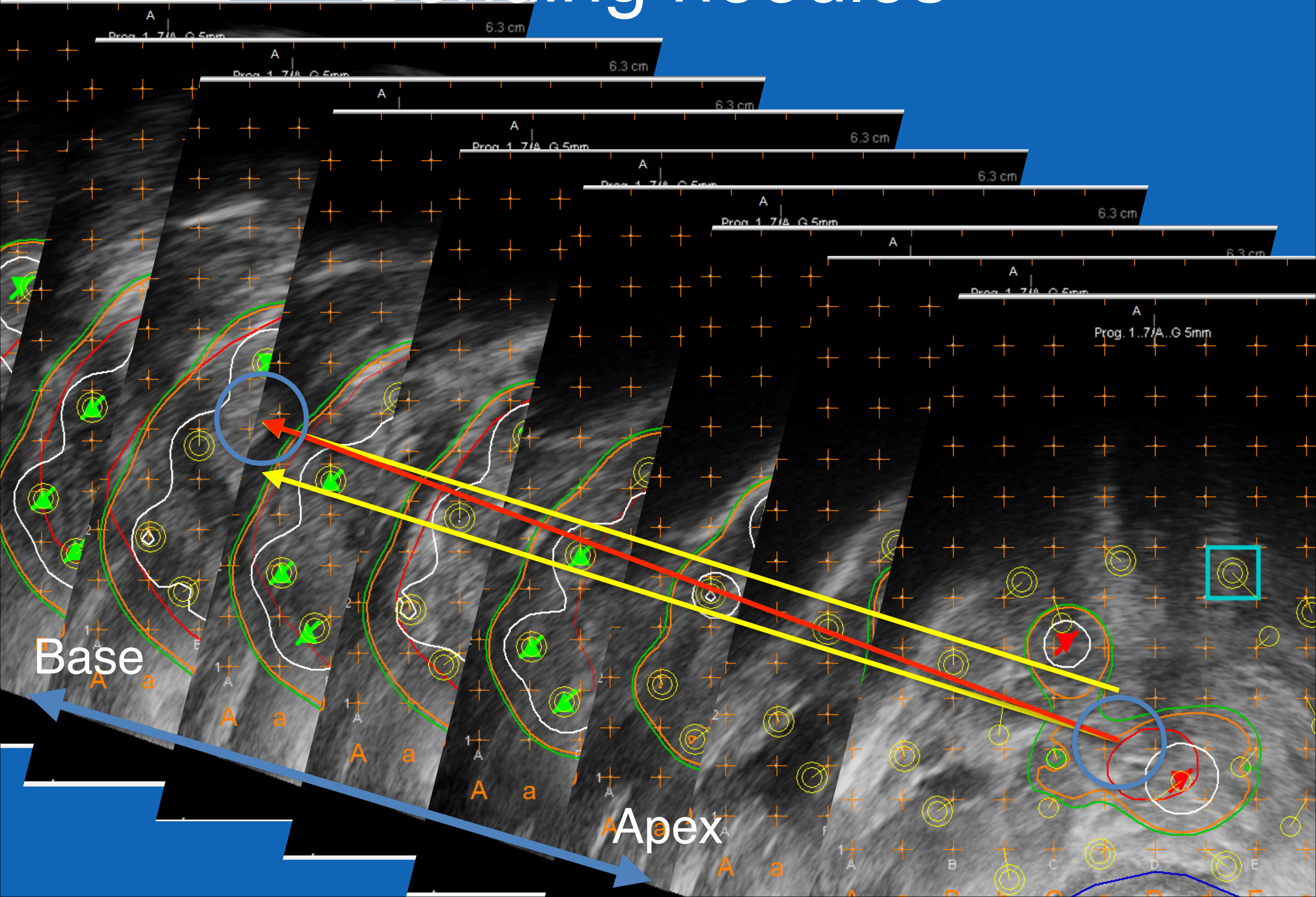
● = Special loading
■ = Stranded



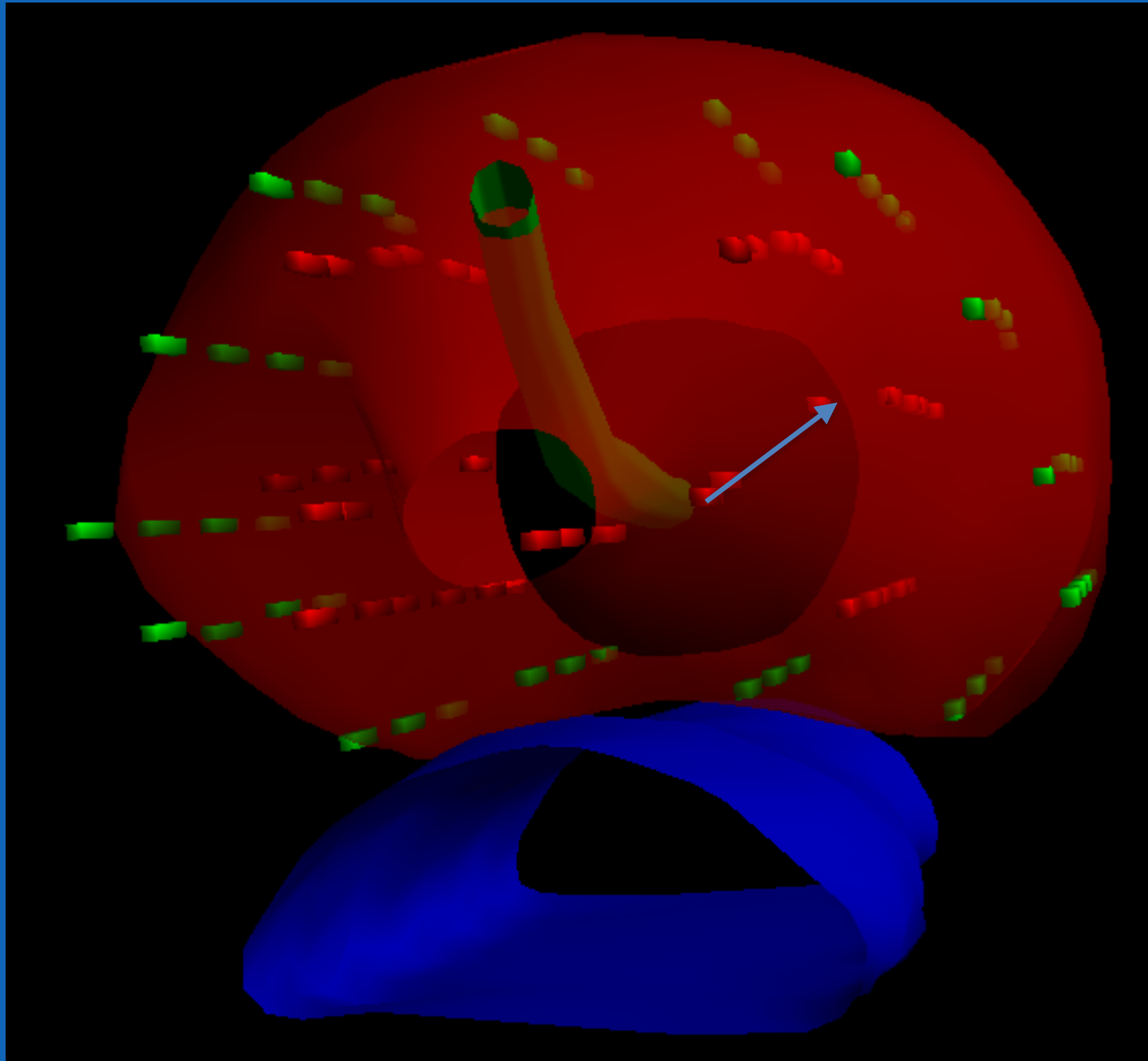
- Needles 10 and 14 are just 3.8 mm apart.

Bending needles



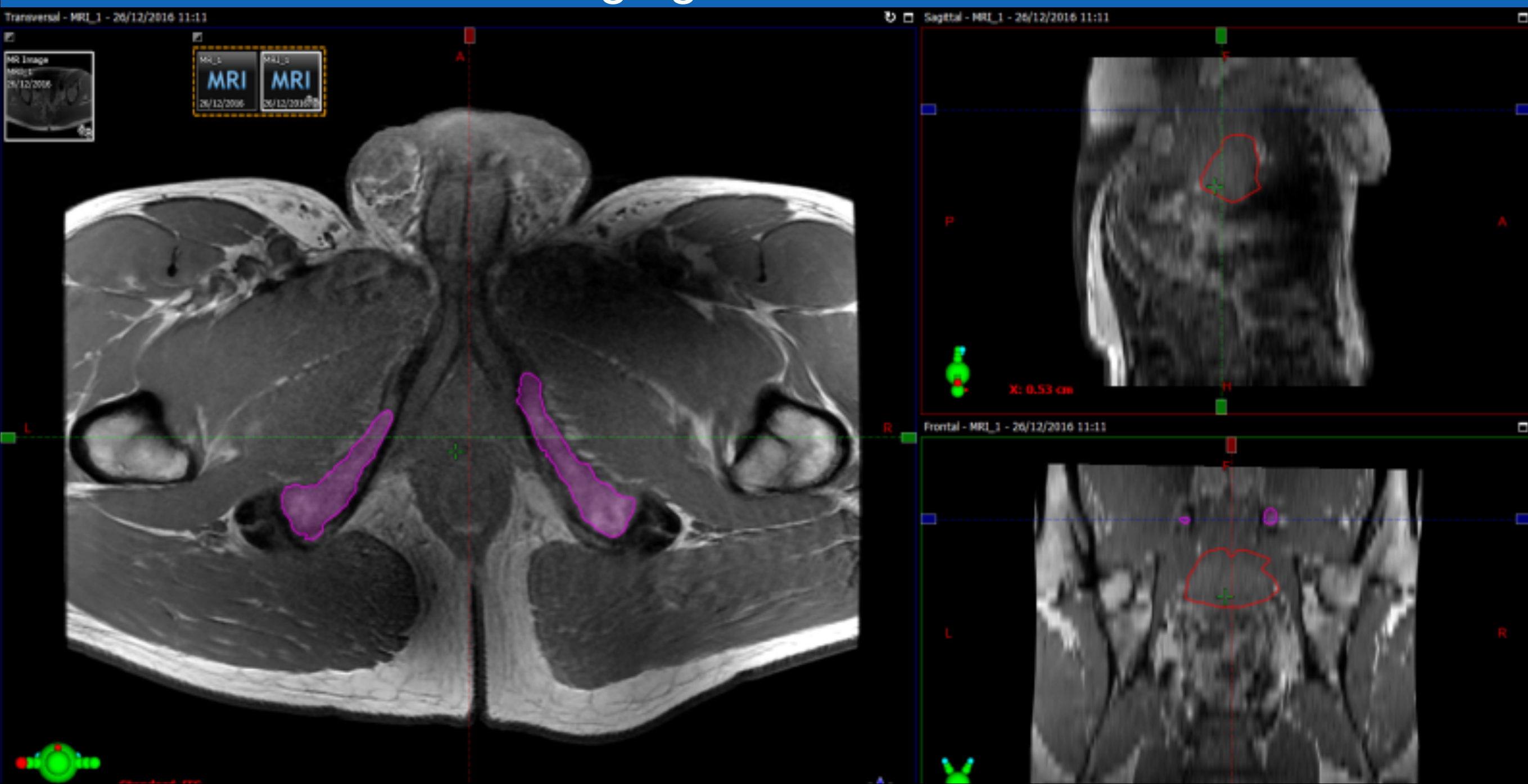


Bending needles

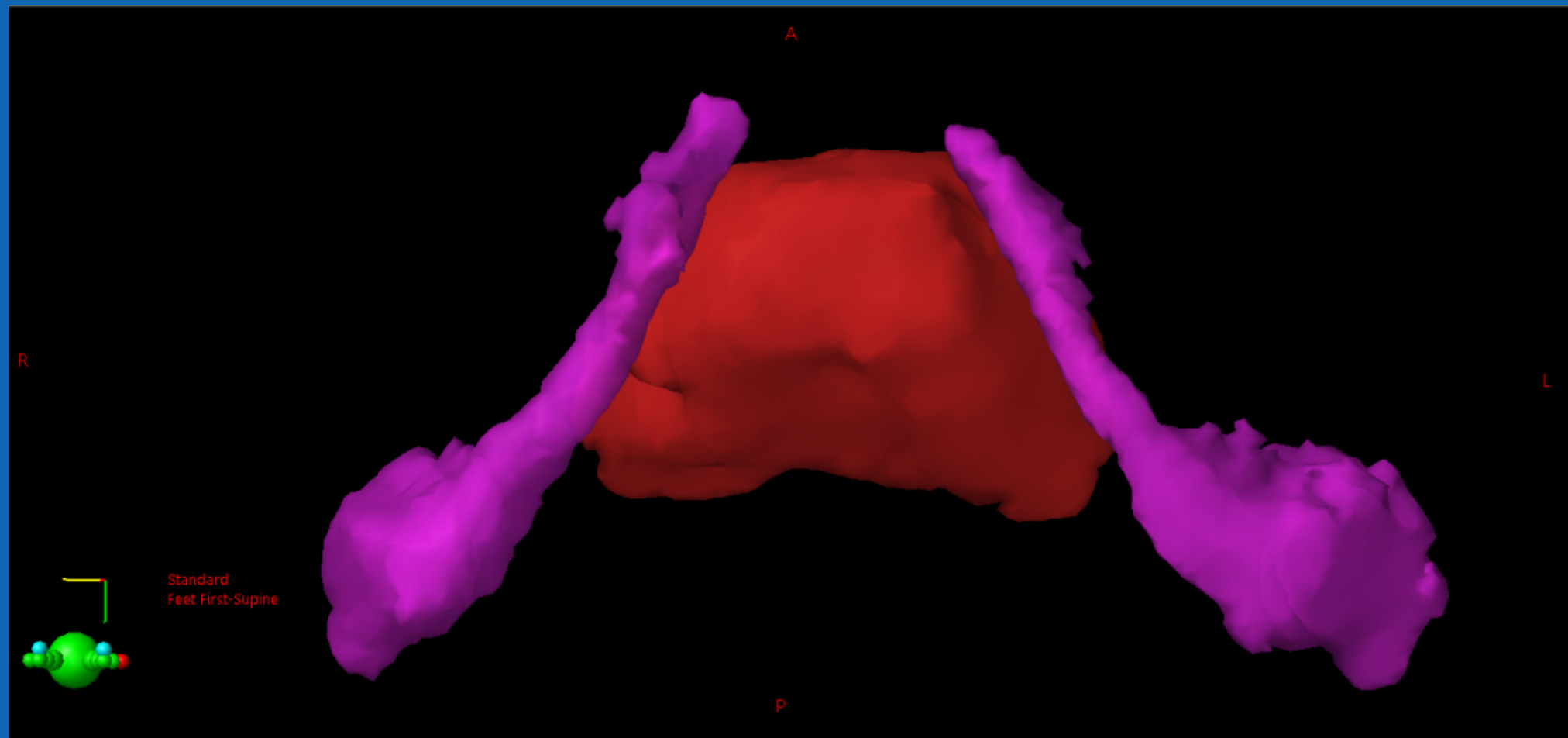


Feasibility of implant

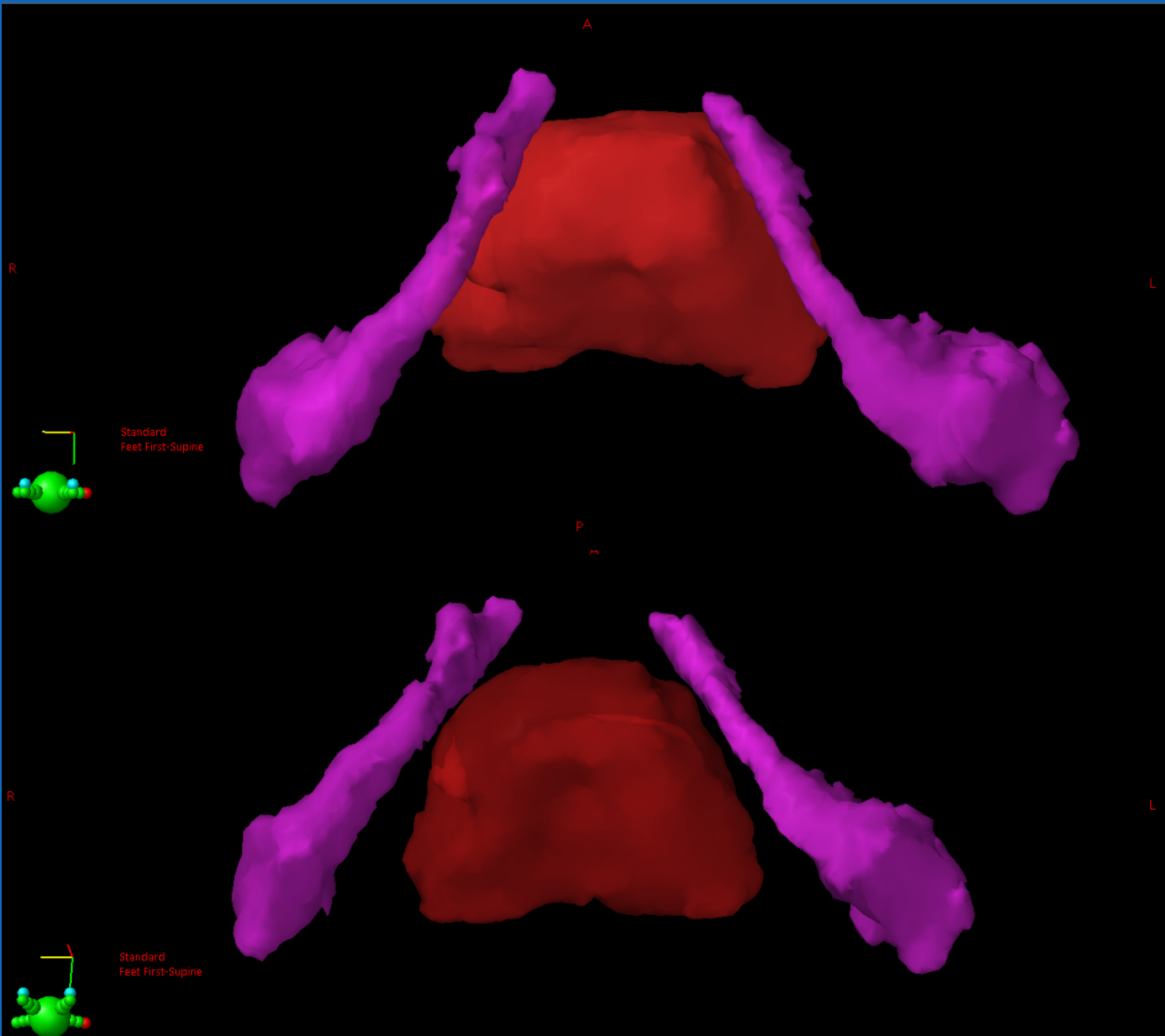
- Challenging to implant prostheses width ≈ 60 mm (pubic arch interference).
- Use of the staging MRI.



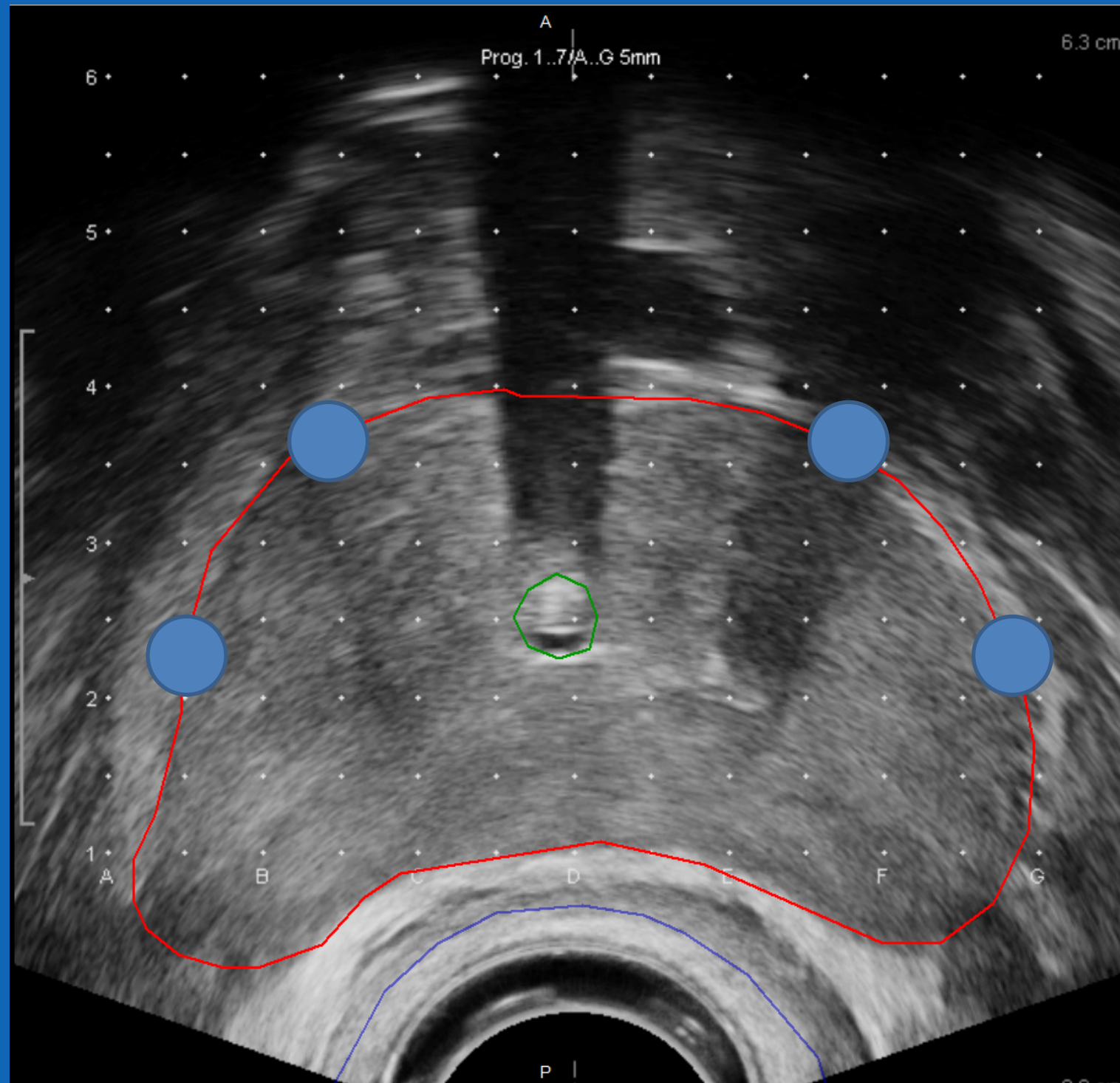
Feasibility of implant



Feasibility of implant



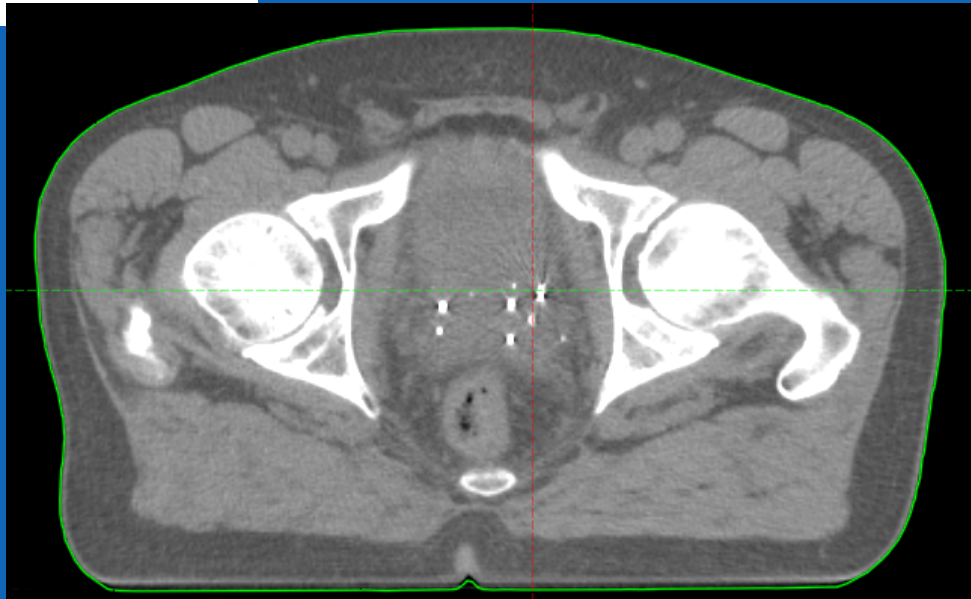
Feasibility of implant



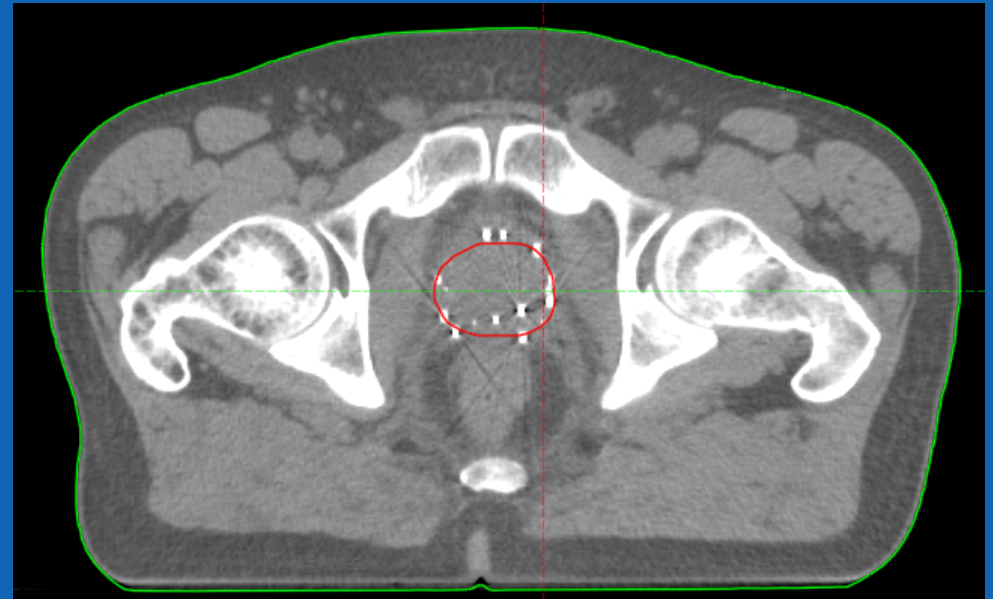
- Use of sterile empty needles.
- 2 top laterals.
- 2 mid-laterals.

Patient top-up

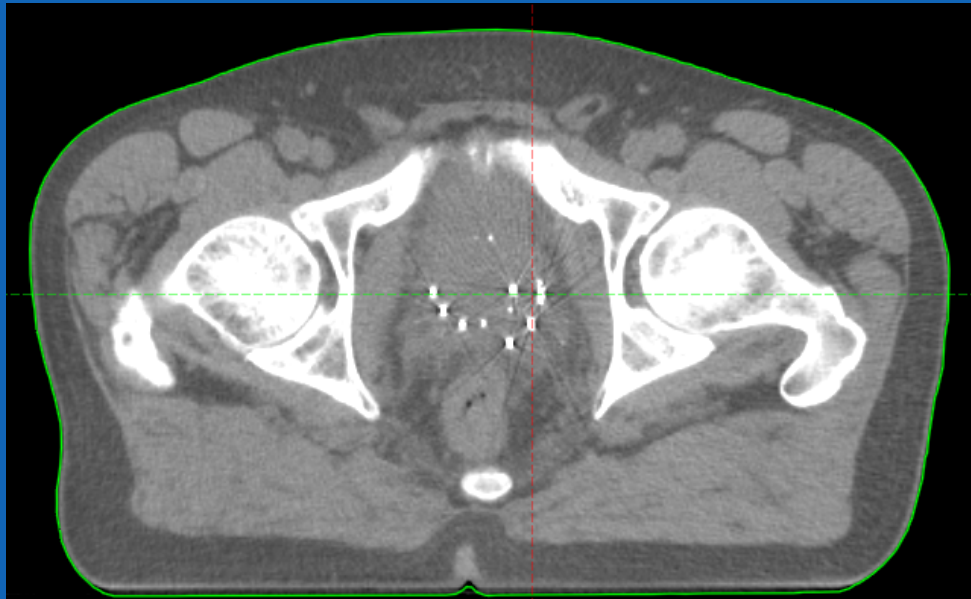
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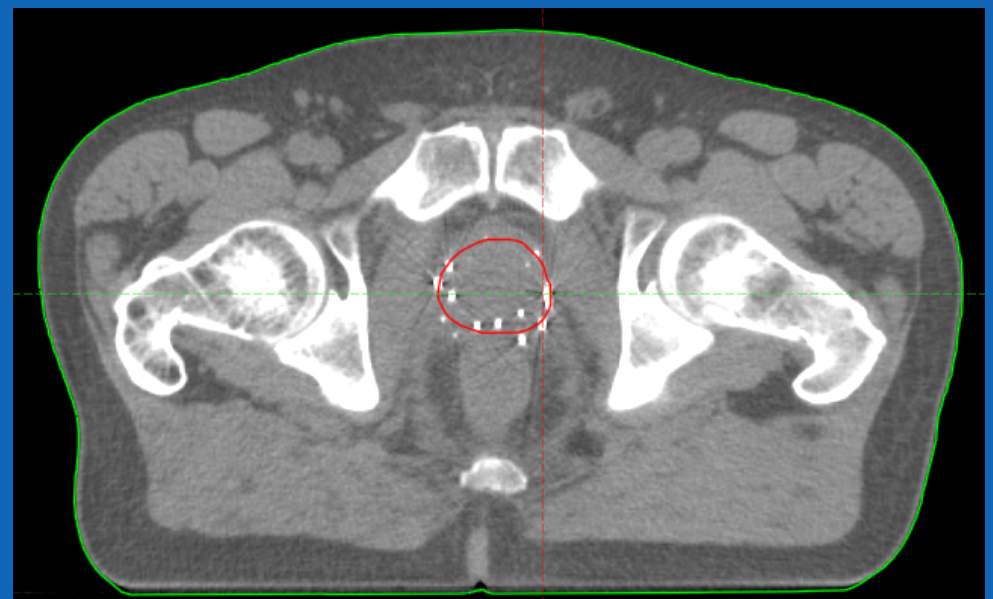
4



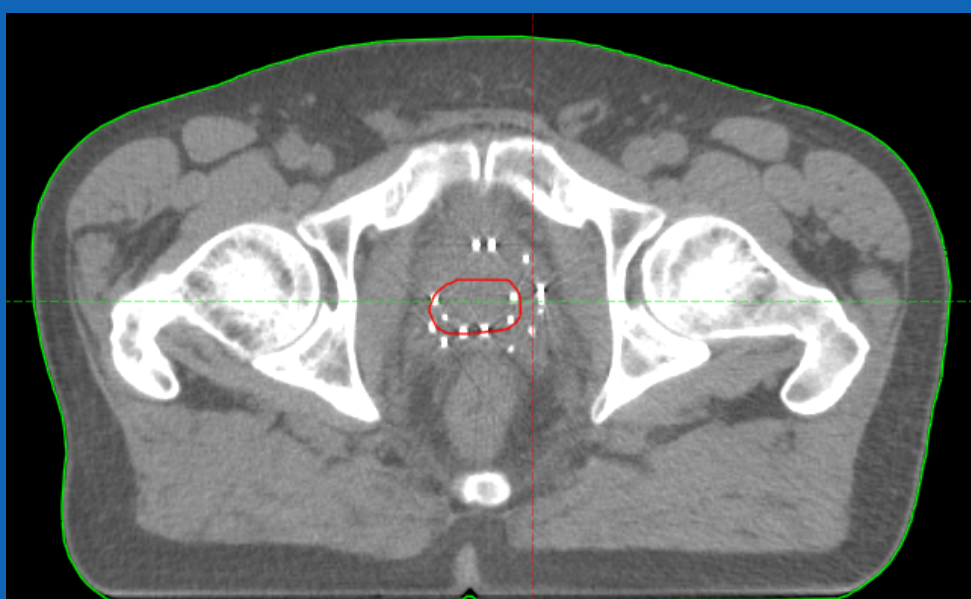
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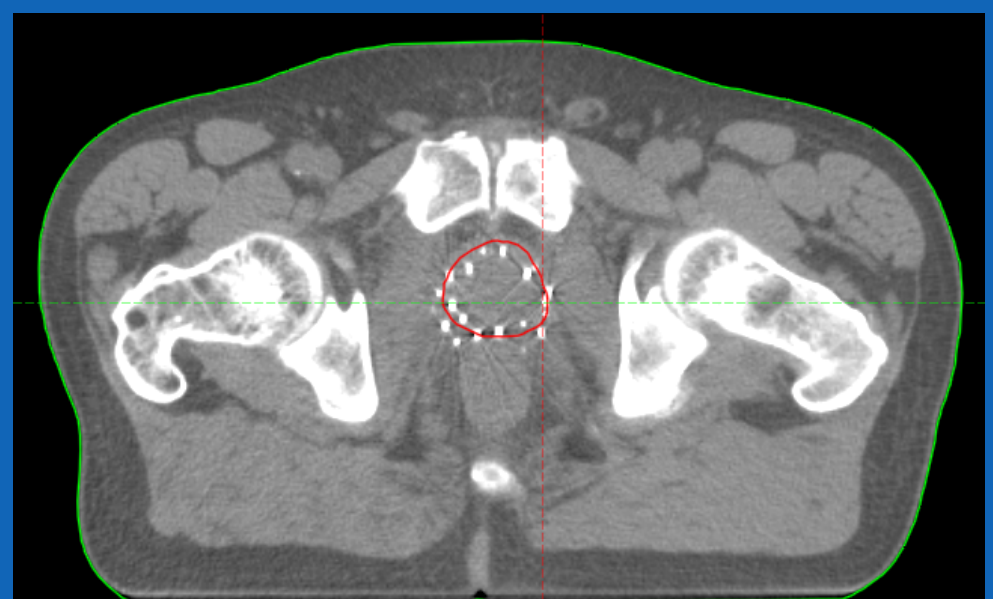
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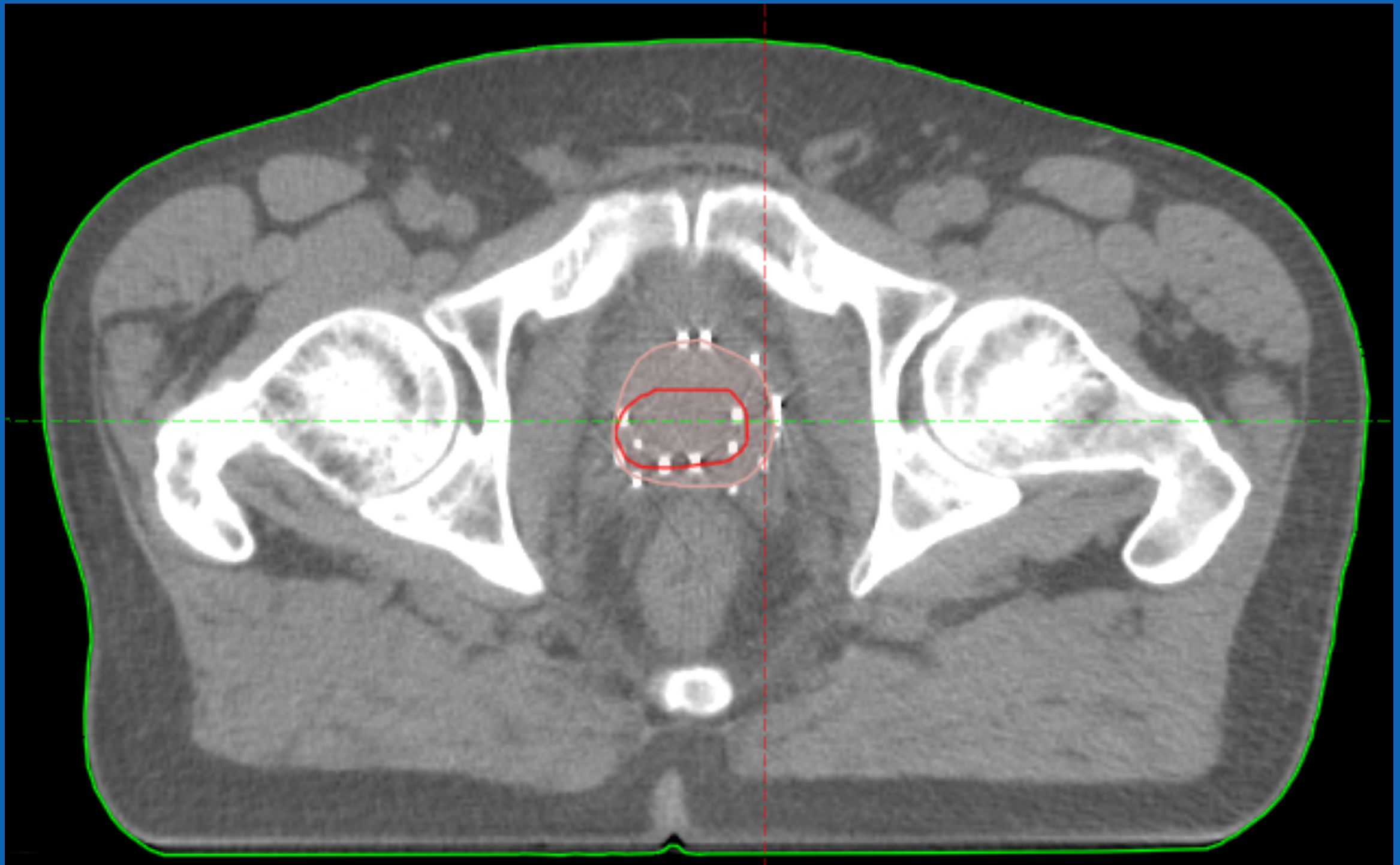
3



6

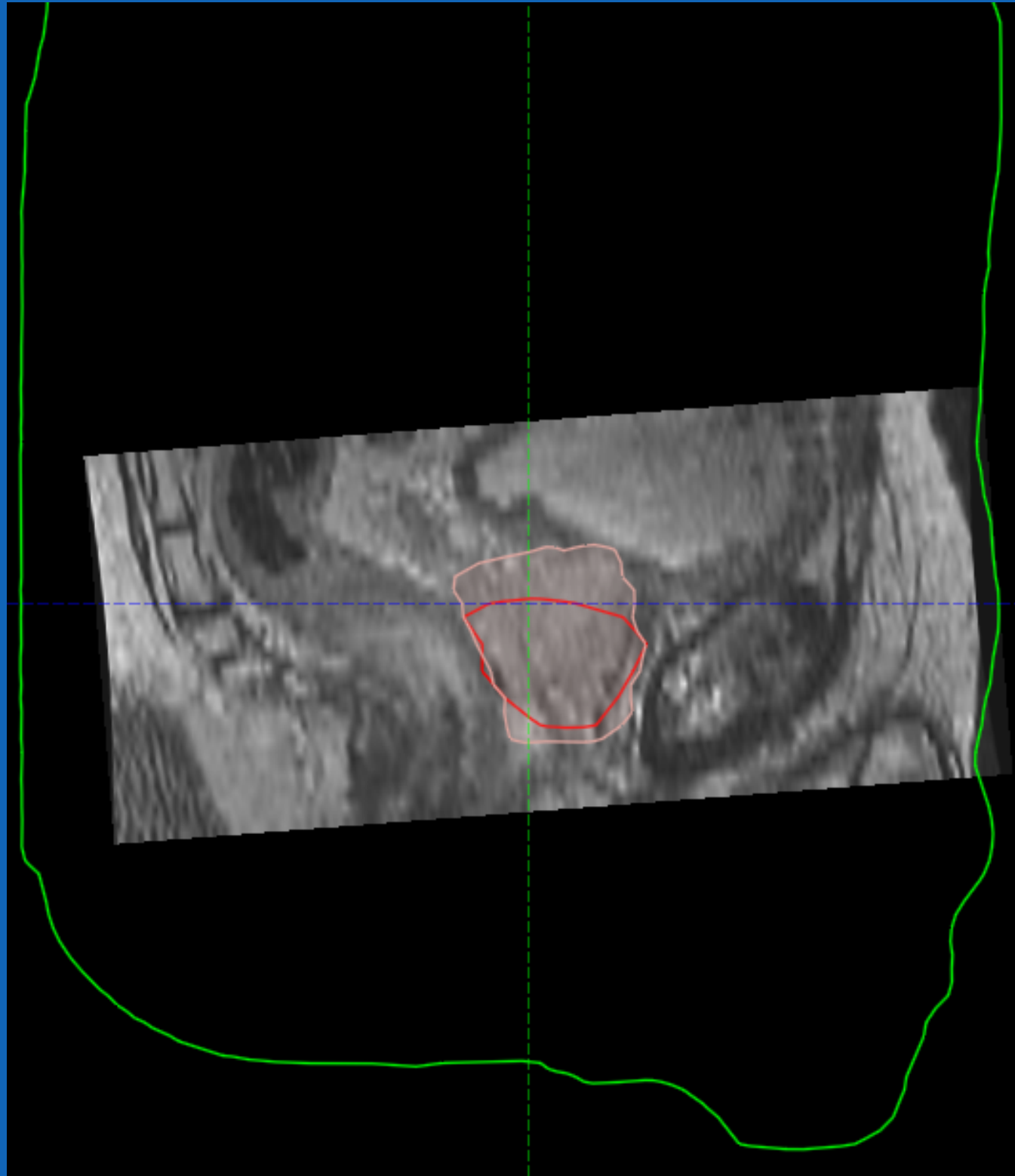


Patient top-up



Followup-CT co-registered with MRI

Patient top-up



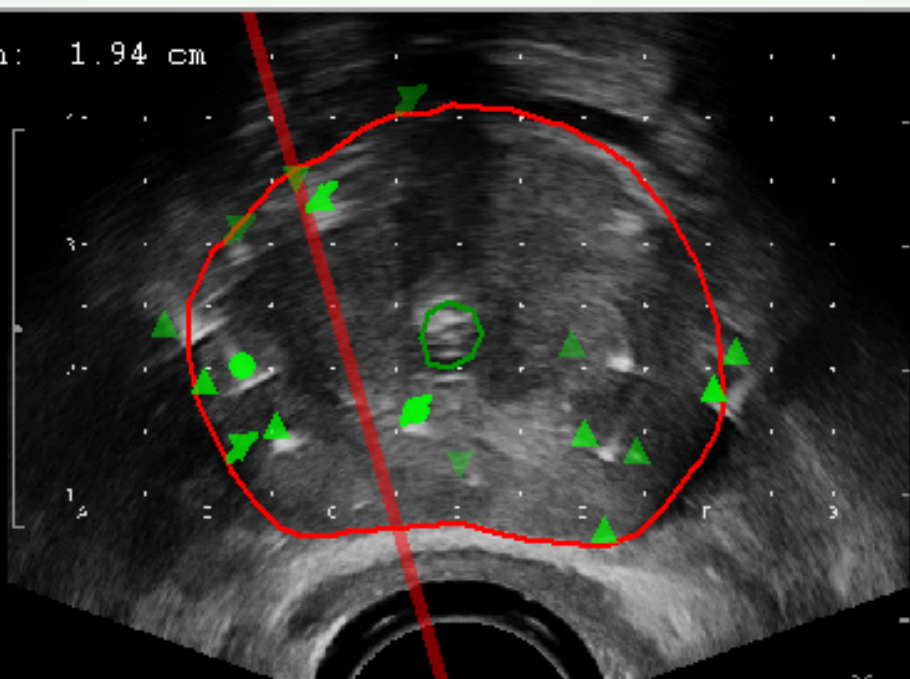
We agreed there was real risk of under dosage.

Patient top-up

- Identification of previously implanted seeds.
- Sagittal sweep across the patient (10 - 15 min).
- Hard to identify coplanar seeds.
- We confirmed dose gap where expected to be.
- Planning and construction of custom needles.

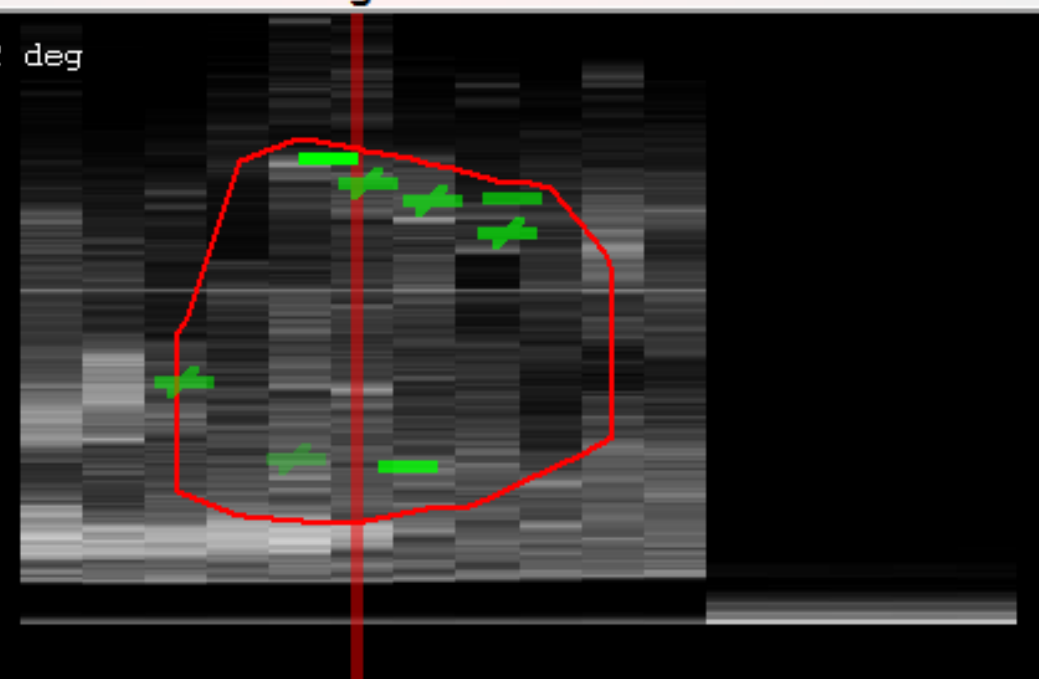
Transverse

Position: 1.94 cm



Longitudinal

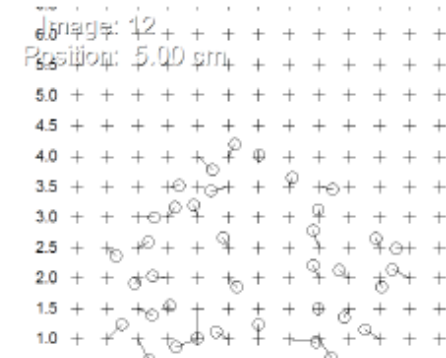
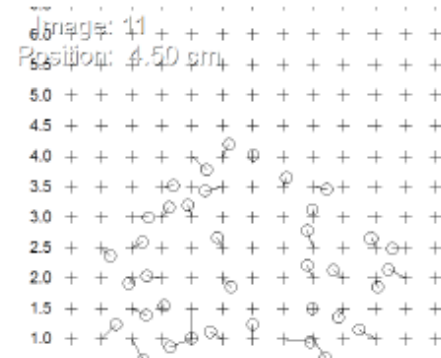
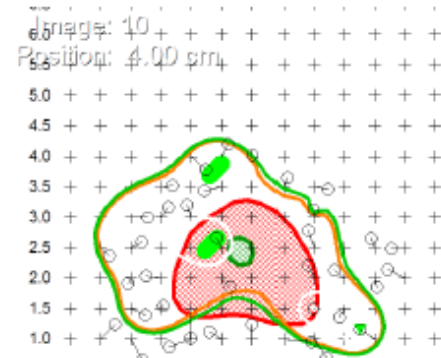
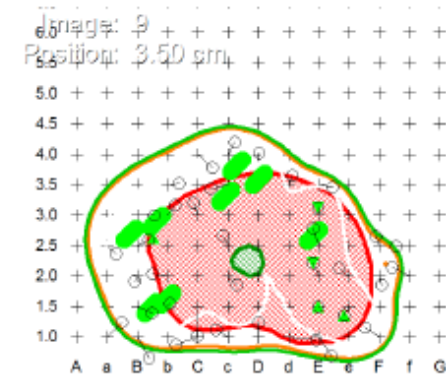
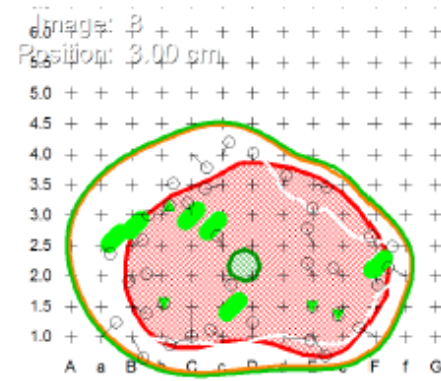
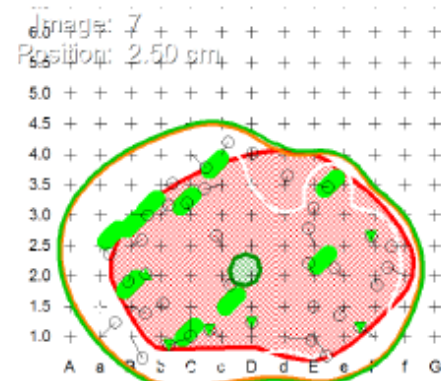
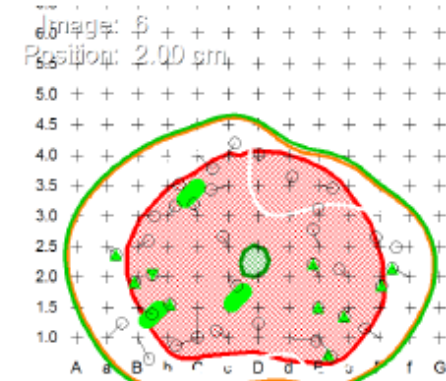
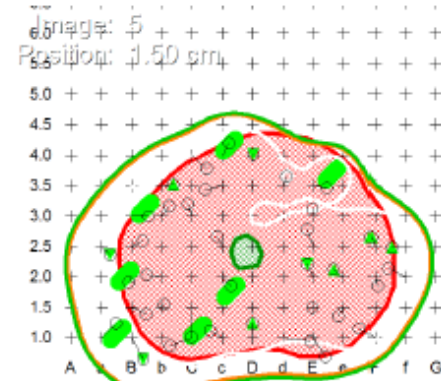
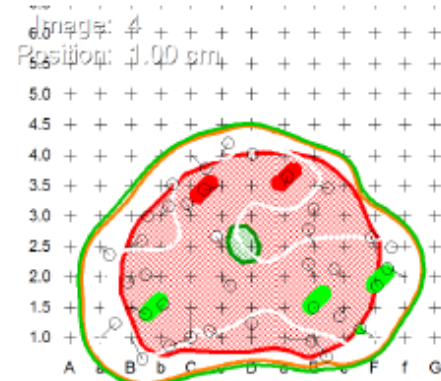
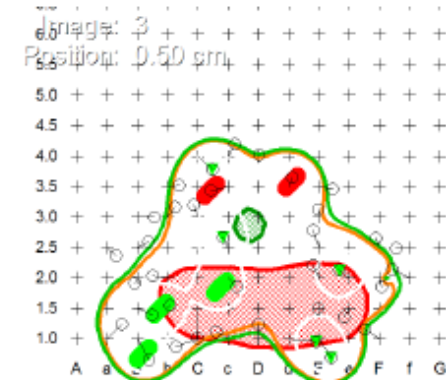
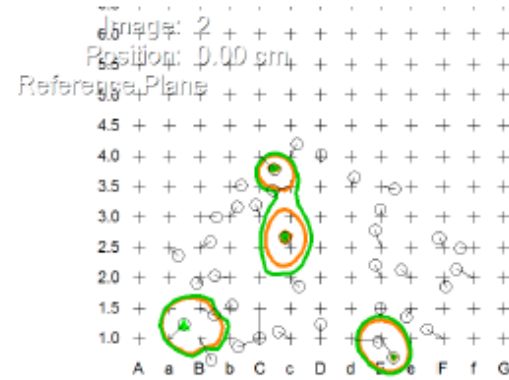
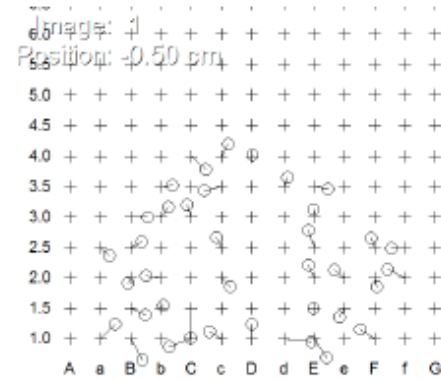
Angle: -16.2 deg

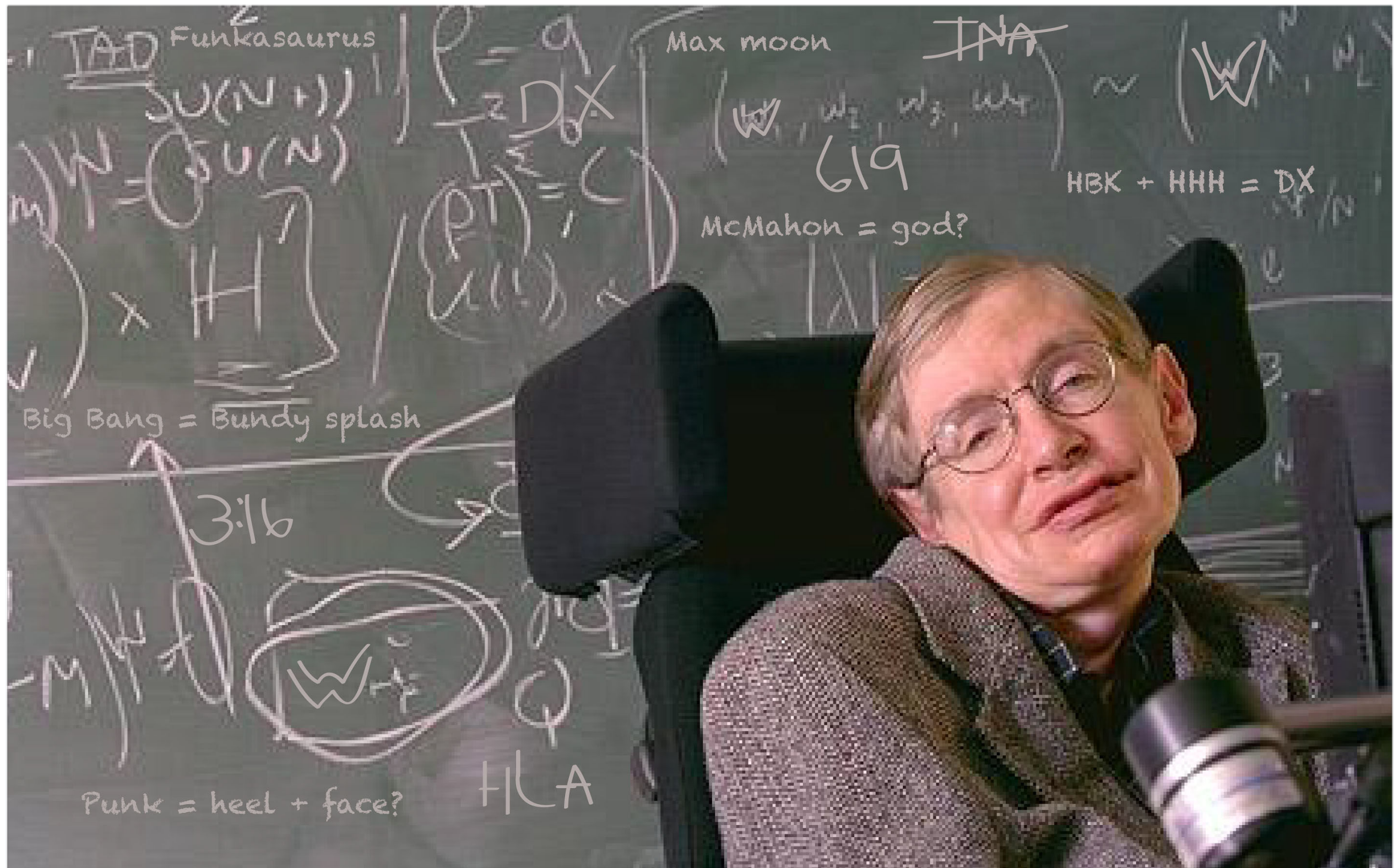


Top-up patient

Isodose Legend
Gy [% of Prescription Dose] 217.50 [150.00%] 137.70 [94.97%]
145.00 [100.00%]

Anatomy/Landmark Legend Prostate Urethra





Thanks for your attention.

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