



UZ
LEUVEN

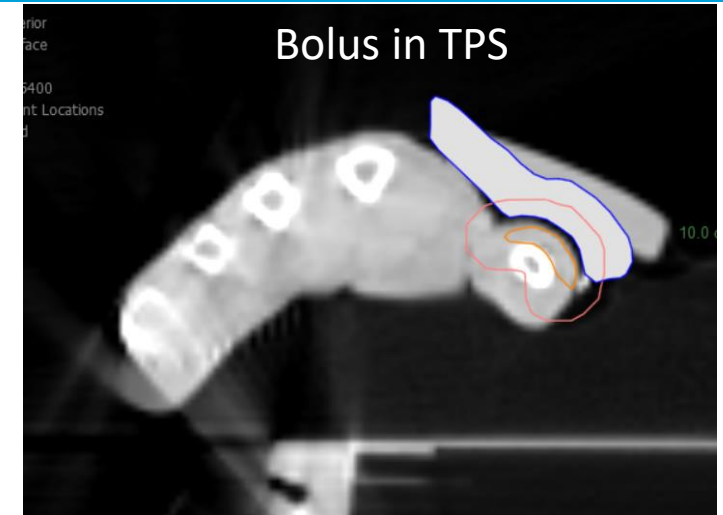
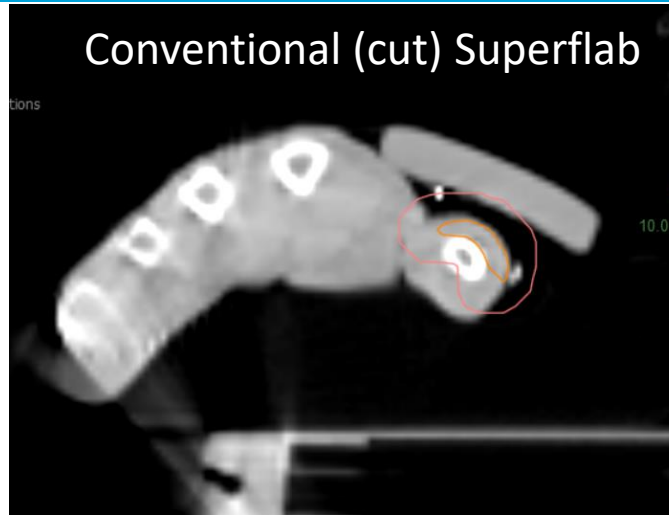


Patient specific bolus positioning with AlignRT

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Bertrand Dewit
Truus Reynders
Tom Depuydt

The department of Radiotherapy-Oncology is a reference site for VisionRT and Varian Medical Systems

The issues with gel bolus...

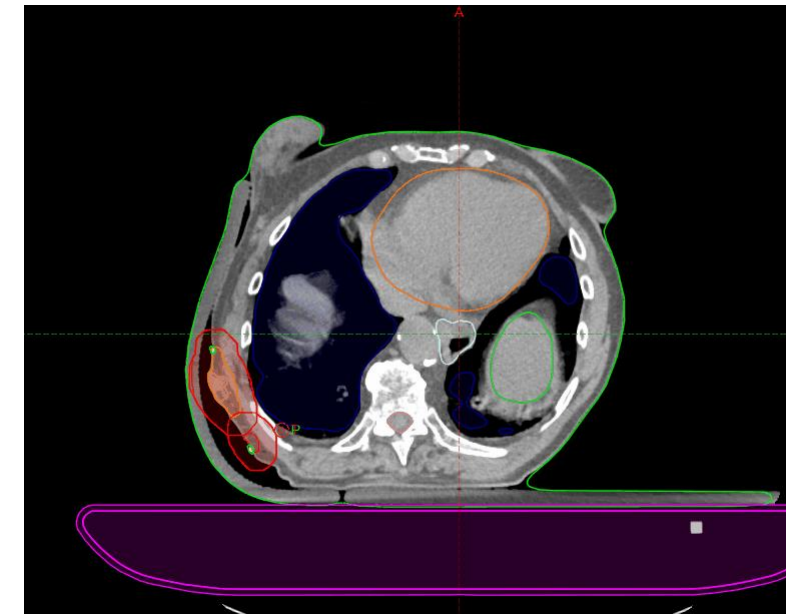


... if not included in scan

→ how to exactly position flap during RT?

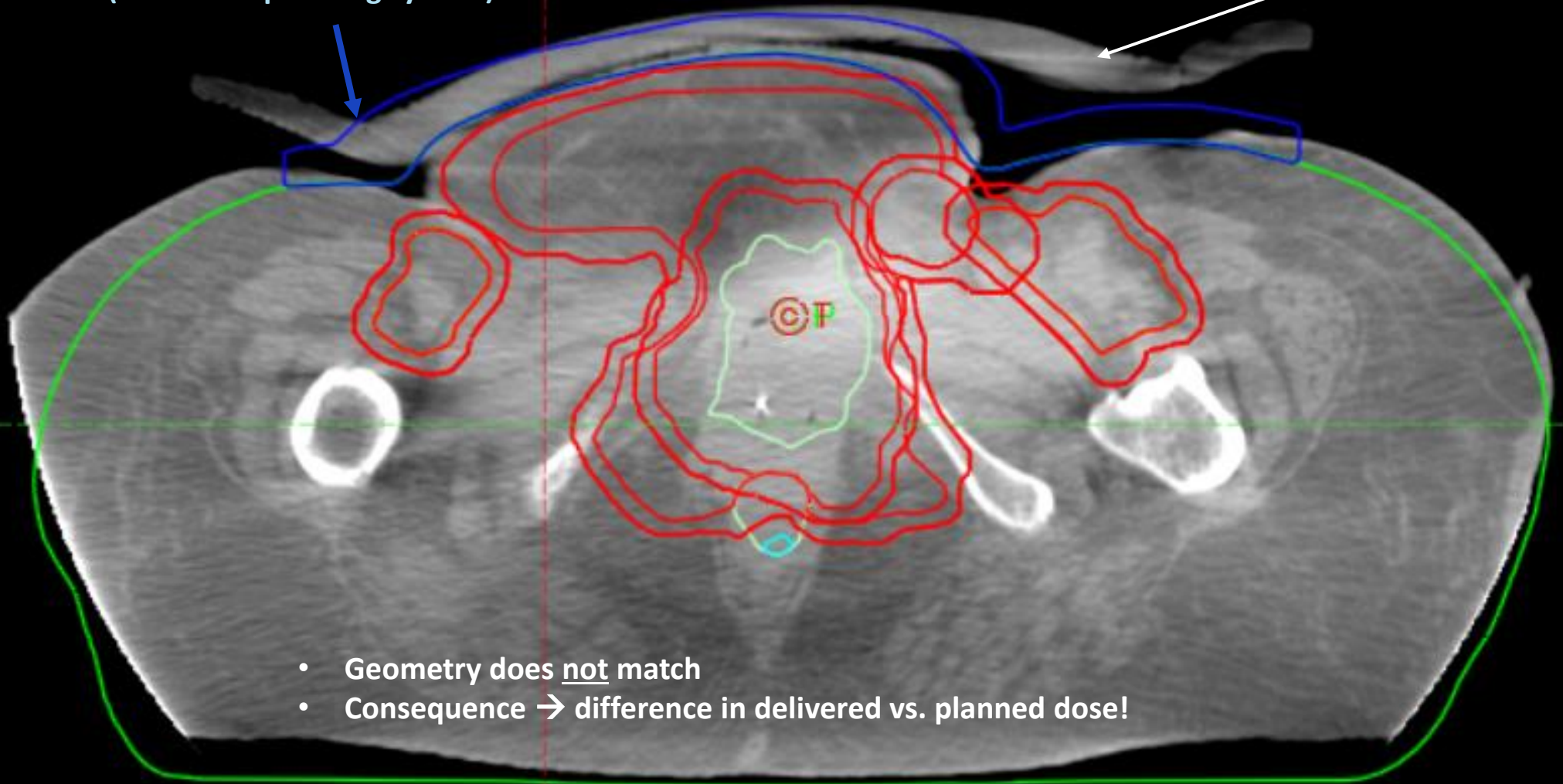
...if included in scan

→ how to position patient with AlignRT?



TPS bolus
(treatment planning system)

Conventional bolus



- Geometry does not match
- Consequence → difference in delivered vs. planned dose!

20.0 cm

Standard, HFS

Z: -7.20 cm

P



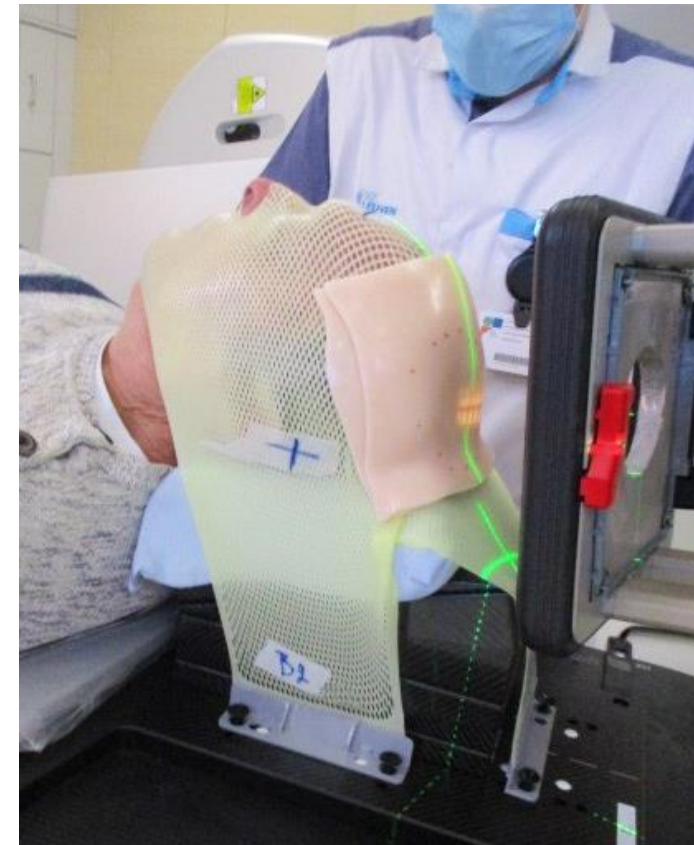
Develop a method for patient-specific bolusses

- Decrease the air gap to the skin/mask
- Cover difficult regions (vulva, groin, scalp, nose, cheek, etc)
- Complete freedom for the dosimetrist (shape, thickness, location) ↔

After introduction in the clinic:

- Use Postural Video of AlignRT for check/positioning

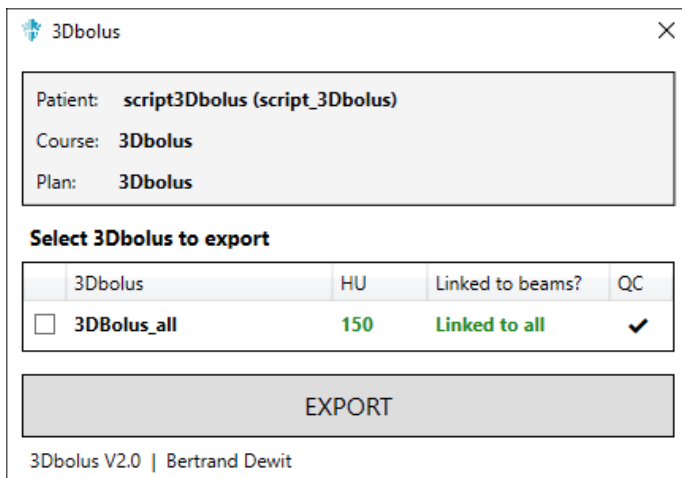
(this presentation does not focus on the development but the current workflow)



Orfit 5 mm sheets



- External contour needs to be verified
- Dosimetrist creates the bolus (150 HU)
+ create a copy of the bolus (**AlignBolus**) as a 'true' structure
- After physics review → export with **C# Eclipse script** + RTPlan and RTStruct to AlignRT



3Dbolus

Patient: script3Dbolus (script_3Dbolus)

Course: 3Dbolus

Plan: 3Dbolus

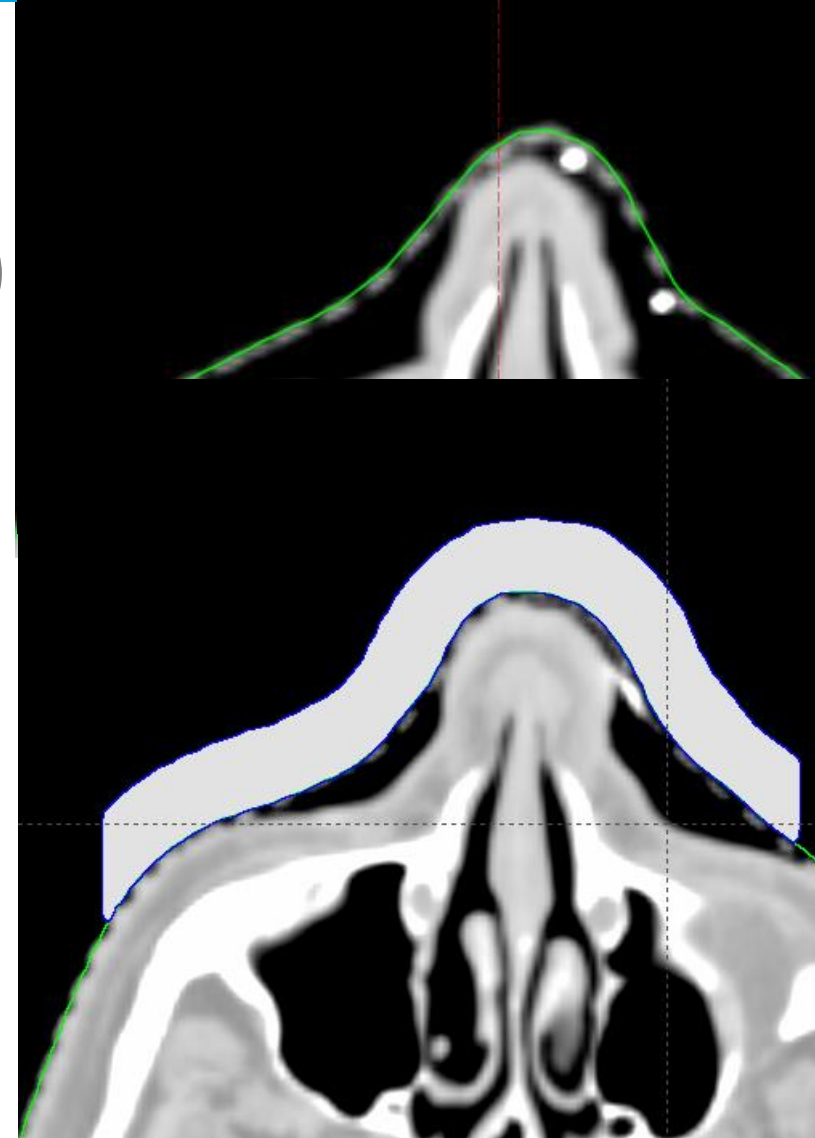
Select 3Dbolus to export

	3Dbolus	HU	Linked to beams?	QC
<input type="checkbox"/>	3Dbolus			
<input checked="" type="checkbox"/>	3DBolus_all	150	Linked to all	✓

EXPORT

3Dbolus V2.0 | Bertrand Dewit

~ 5 min



- Script generates mold from bolus

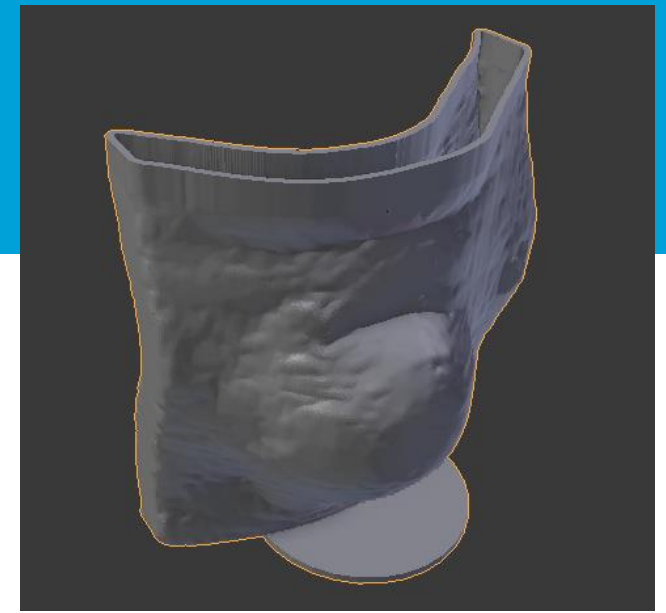
Using toolbox in Blender  

Orientation automatically corrected in the script
Includes patient nr. and bolus volume

- Print the mold

Raise3D N+ printers
Fused Deposition Modelling with PLA

~ 1 min



● TPS

○ Bolus
creation

○ AlignRT
import

○ Treatment



3D bolus workflow

TPS

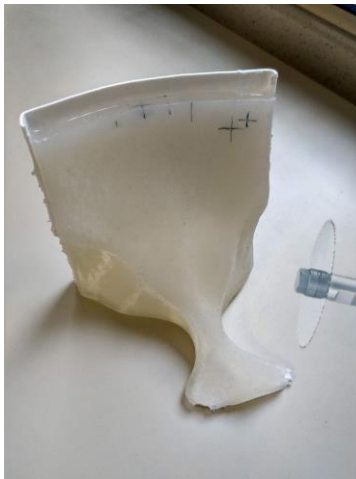
- Fill mold with two-component silicone

Eurosil 8 (Shore A 8)
Remains liquid for 15 min, sets in 2 hours



Bolus creation

- Cut open mold with plaster saw



Partially opaque → limits AlignRT use
Add skintone pigment (<0.1%)



AlignRT import

Treatment

~20 min





- Quality Control

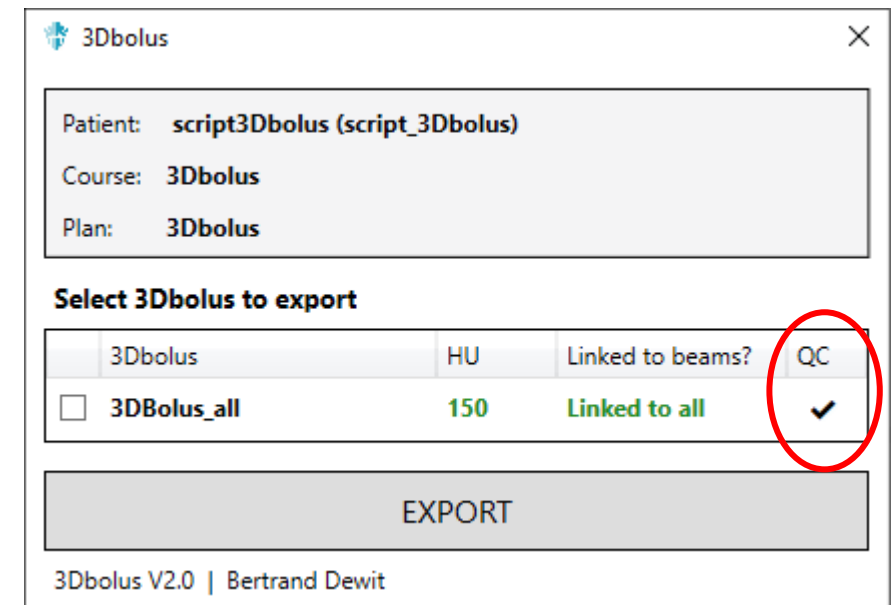
The script performs a random selection of patients for QA (1/3)

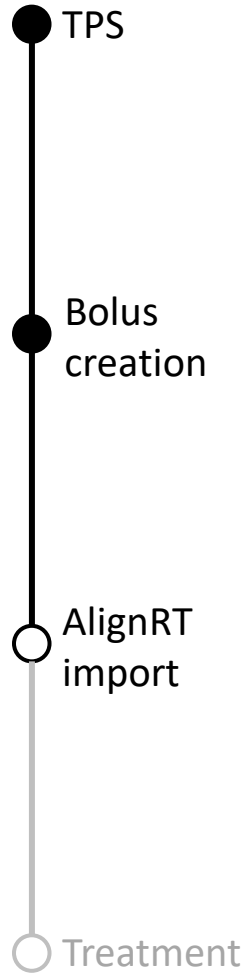
Acquire a CT scan of the bolus to check for:

- Air bubbles
- Shape congruence with TPS bolus structure



~ 15 min





- Export RTPlan and RTStruct to AlignRT

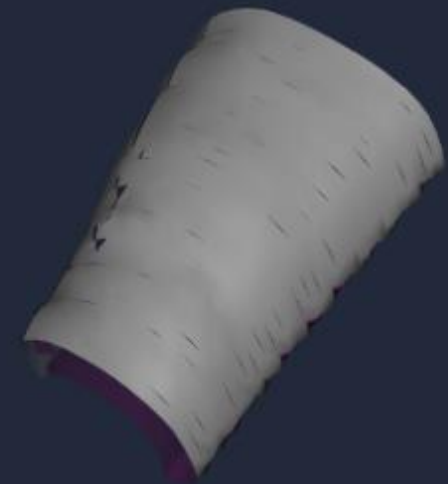
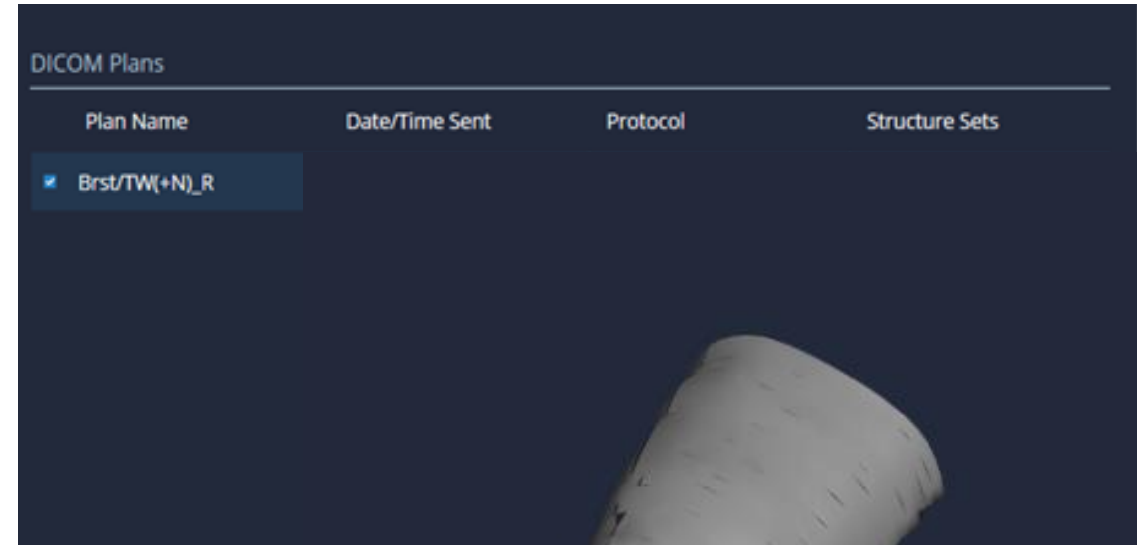
Select the **BODY** and **AlignBolus** structure

- Draw ROI on body contour

Follow the usual procedure

- Draw ROI on AlignBolus

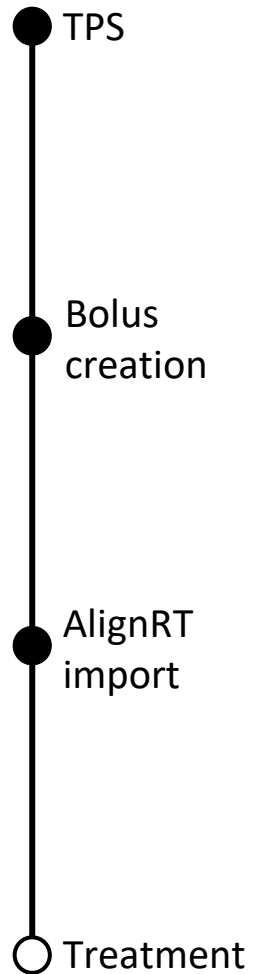
Selection does not matter, as we will use Postural Video for positioning



~ 5 min

3D bolus workflow

*



Brst+N21-4256 ISO 1

CT SIM AlignBolus

RO11

VRT _{cm}	-0.30
LNG _{cm}	-0.48
LAT _{cm}	0.53
MAG _{cm}	0.77
YAW [°]	2.8
ROLL [°]	-0.7
PITCH [°]	0.1

Reference Treatment Couch 0.0° Send to Couch Beam Control OFF

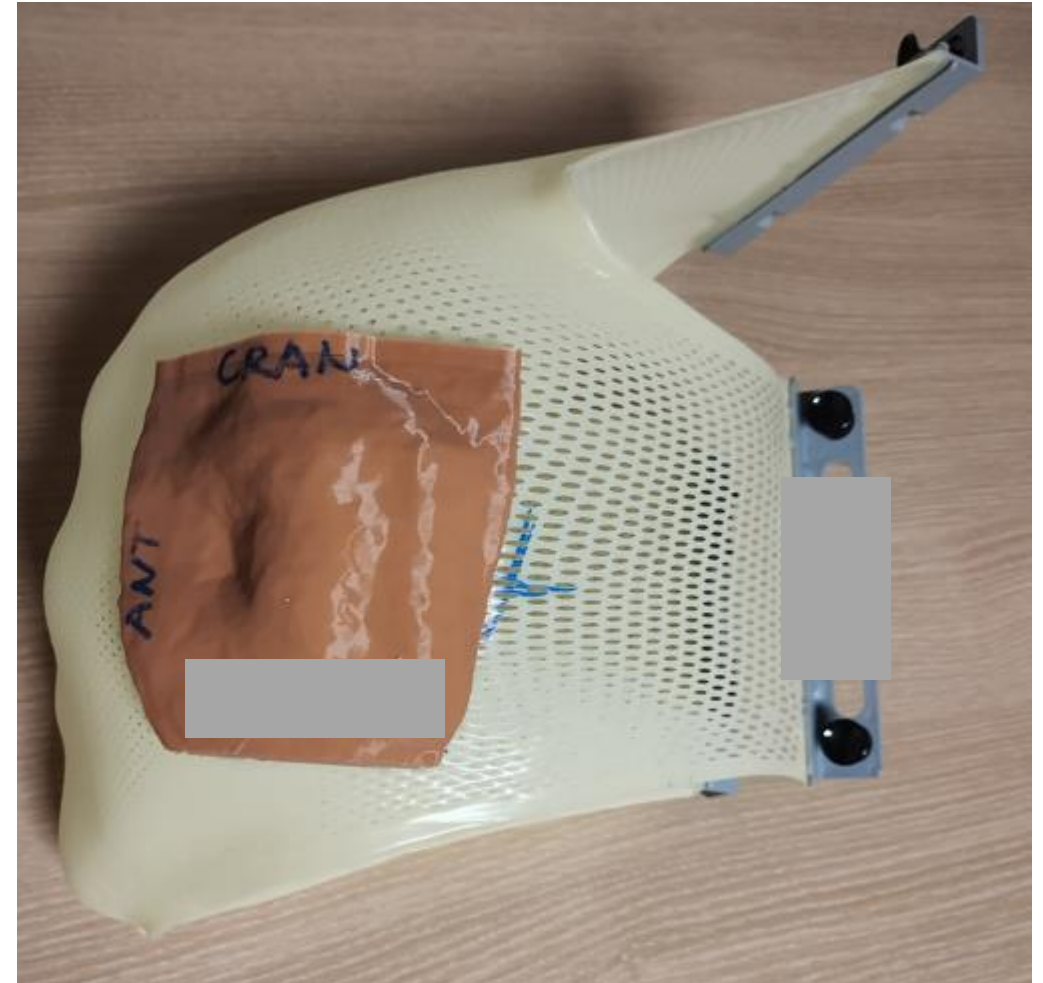
1 2 3

0.30

-0.30

Coaching Surface Deformation Video

3D bolus workflow



● TPS

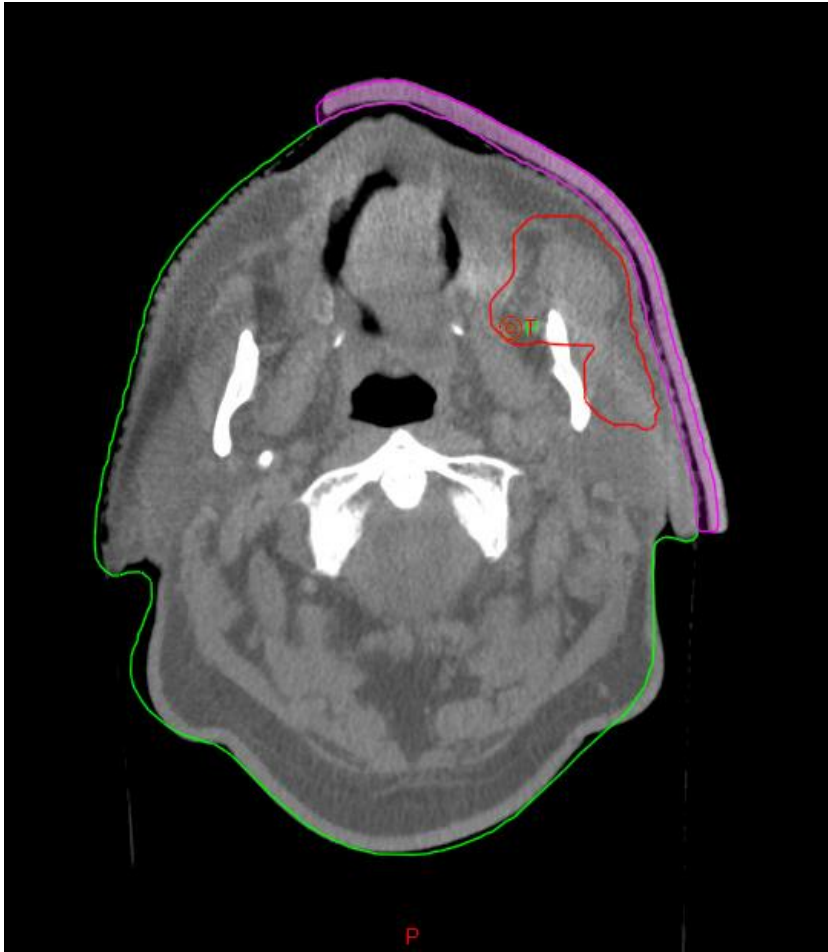
● Bolus
creation

● AlignRT
import

○ Treatment

Bolusses on masks are contoured to allow easy positioning from fraction 2 onwards...

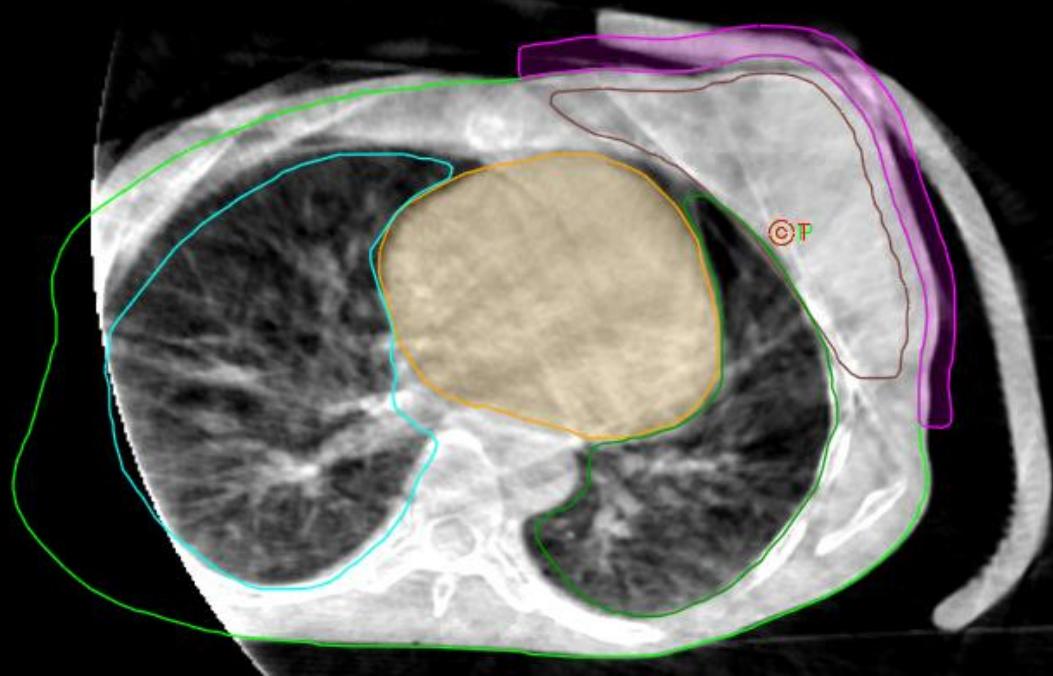
A selection of results... H&N



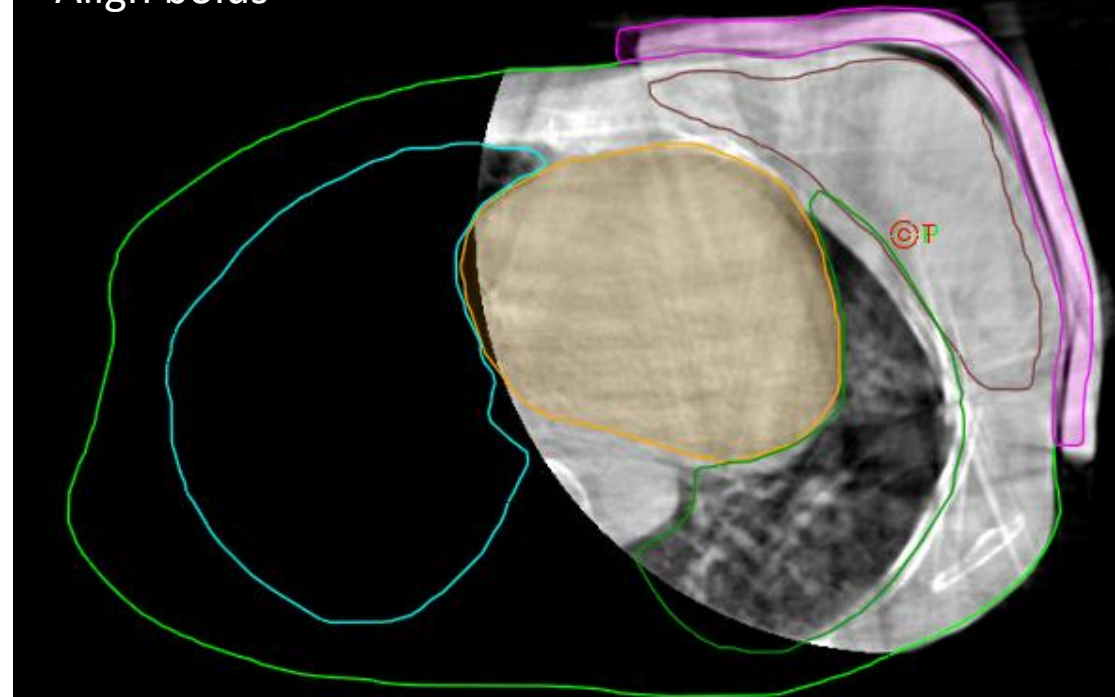
Bolus on mask are generally the easiest...

A selection of results... hygienic breast

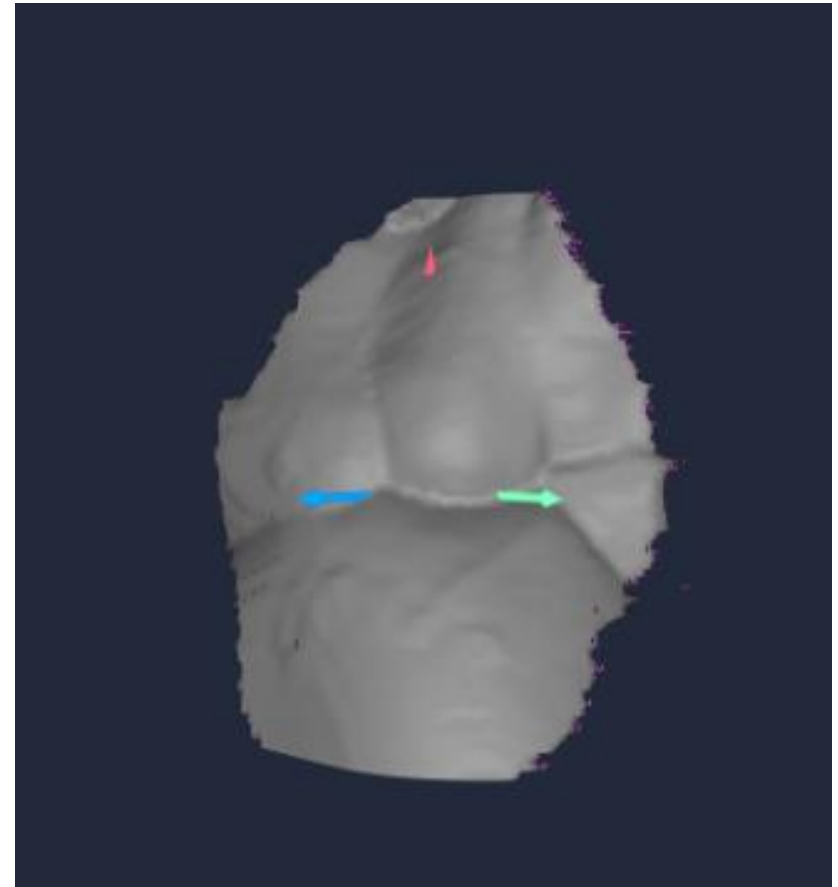
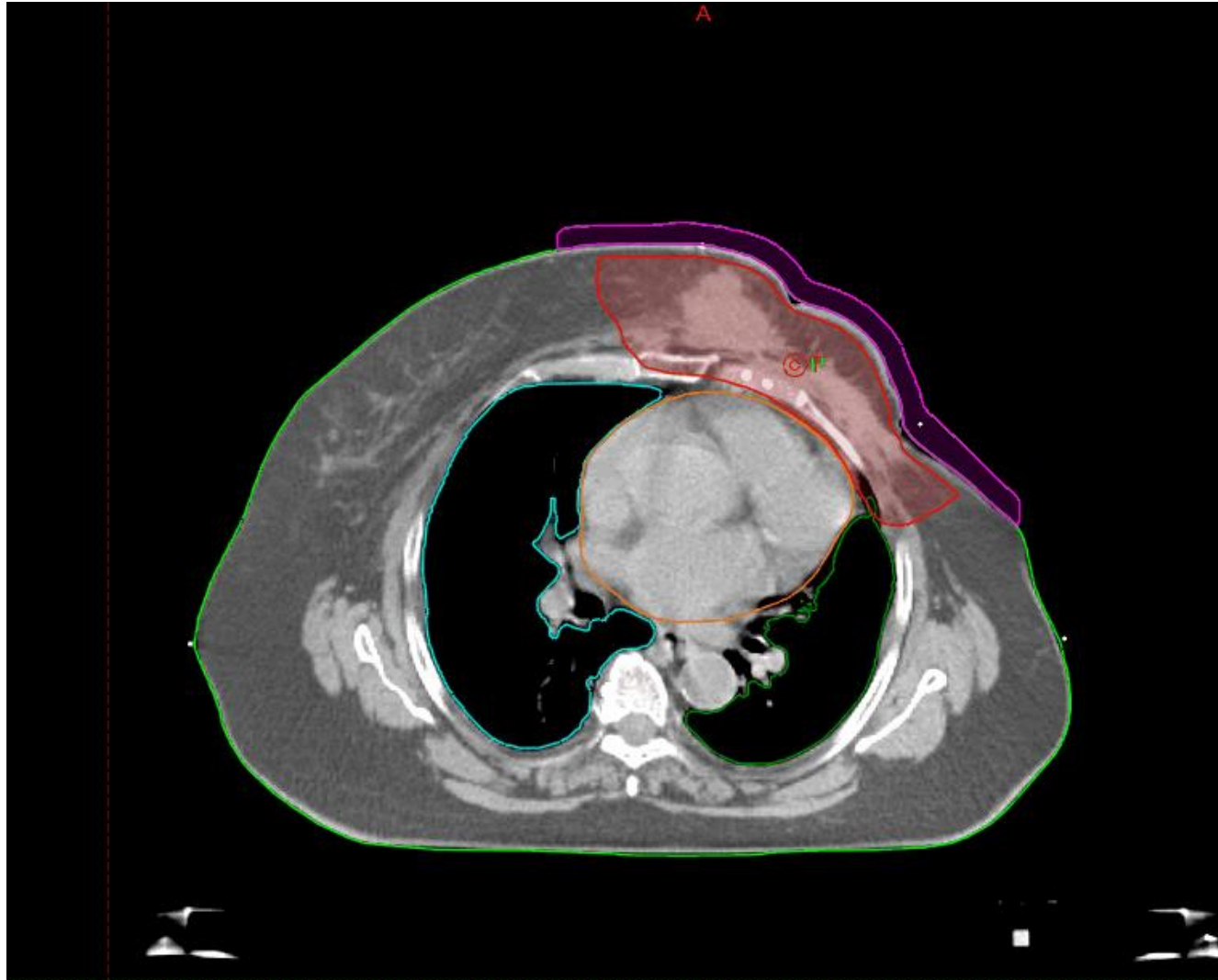
gel flap



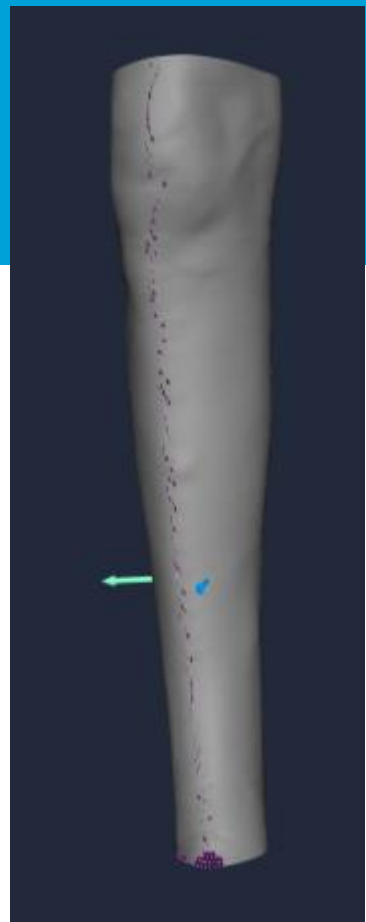
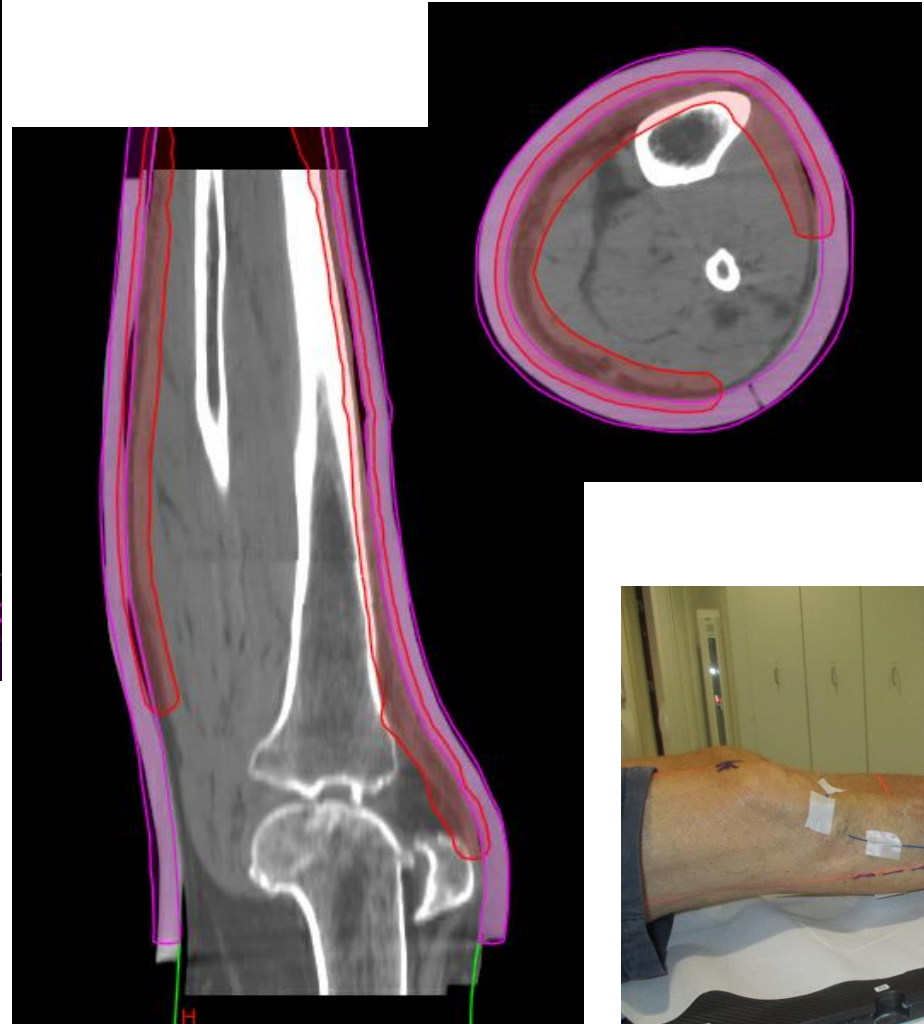
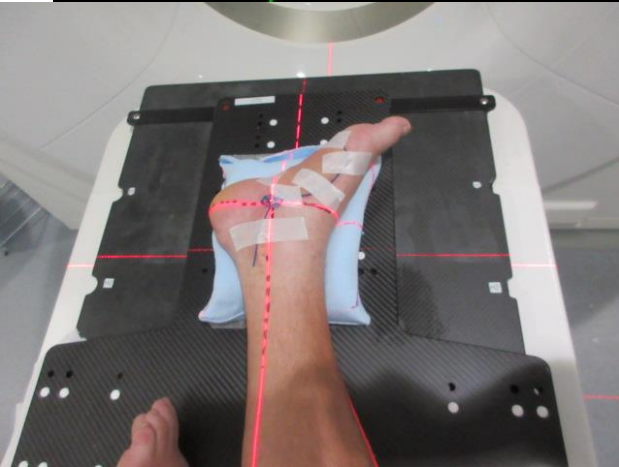
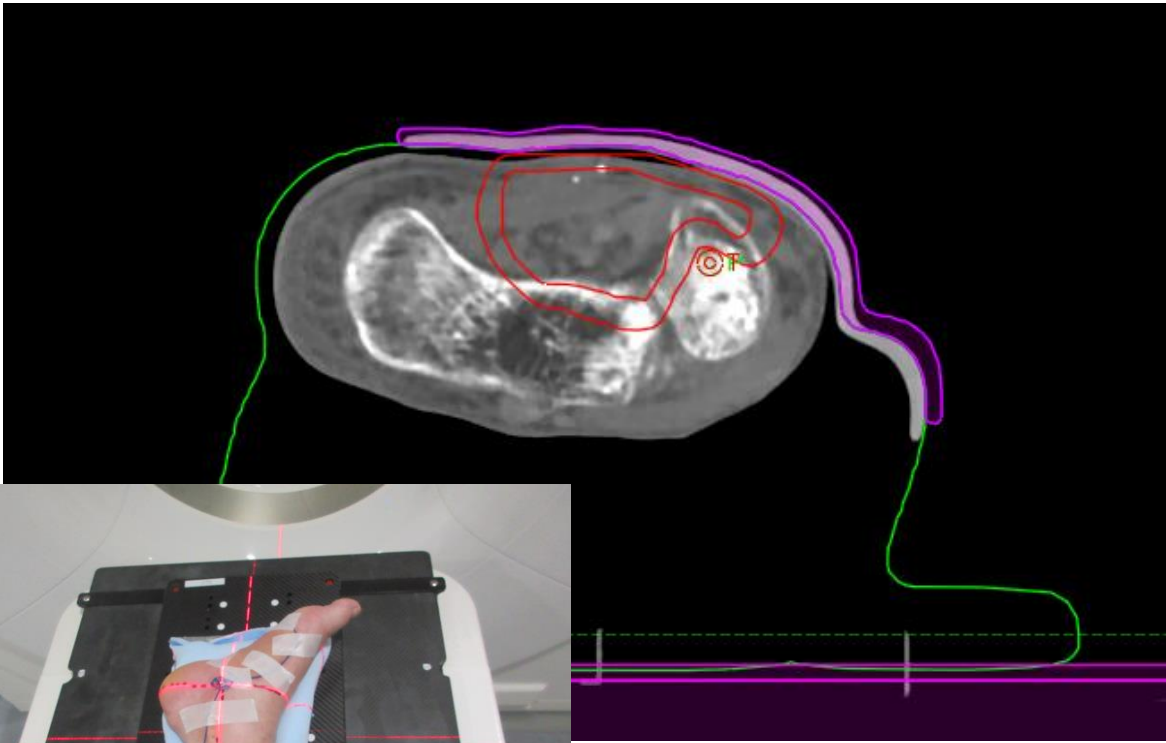
Align bolus



A selection of results... hygienic breast

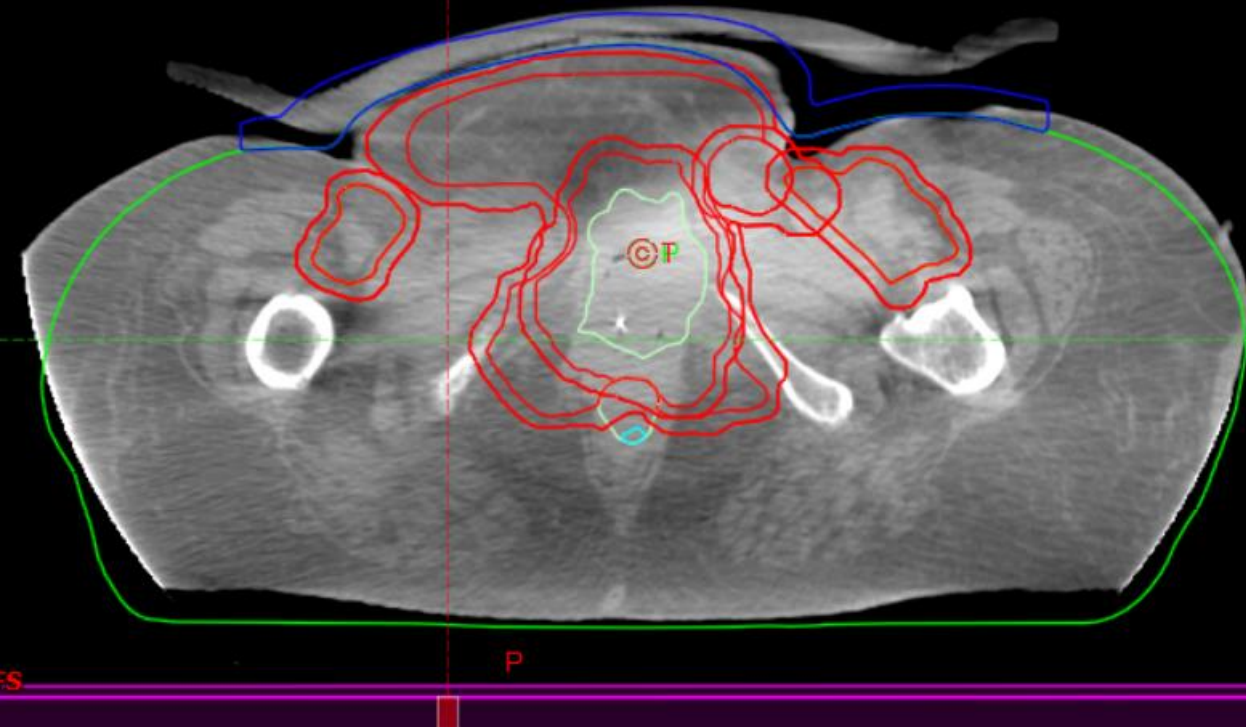


A selection of results... extremities

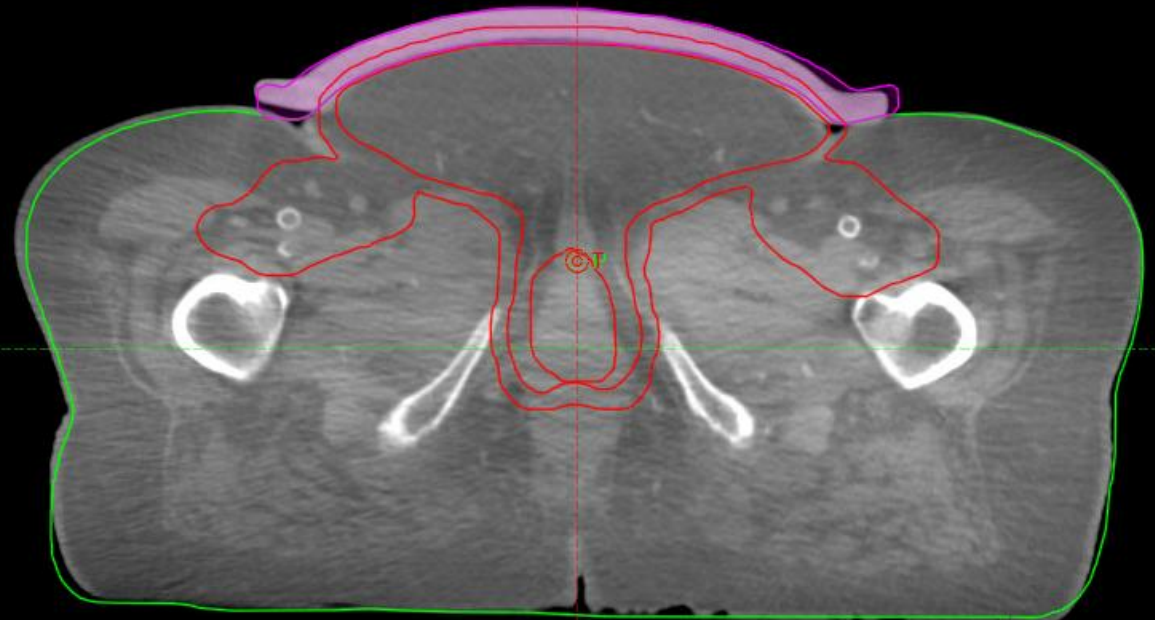


To conclude...

We started from this...



... and now we can achieve this.



Thank you for your attention!

SAMEN
GRENZEN
VERLEGGEN

