

Adapting to Patient's Limitations

A Case Study

Presenter Name: Ella Horgan

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Case background:

- 91 year old
- Diagnosed with left pre-auricular metastatic squamous cell carcinoma
- Chronic obstructive pulmonary disease (COPD)
- High body mass index (high BMI)
- Falls risk
- Vertigo



Standard H&N immobilisation example

- 5 point thermoplastic mask
- Headrest
- Kneeblock



Open head and neck mask



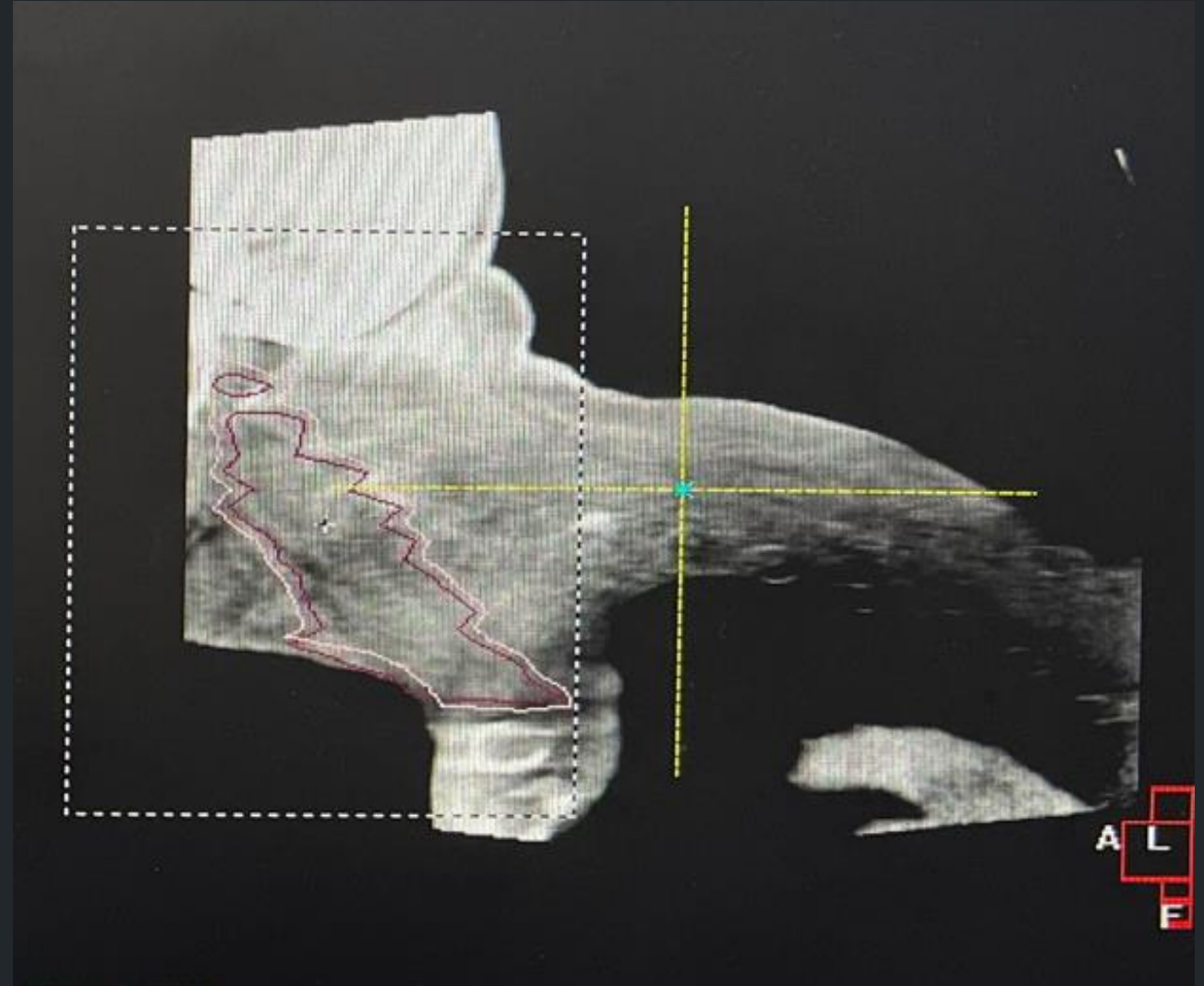
CT Simulation

- Patient immobilised with a vacbag and a headrest
- Breast board with a large tilt of 20 degrees used
- Kneeblock
- Chin to suprasternal notch measurement provided
- Micropore used for patient support

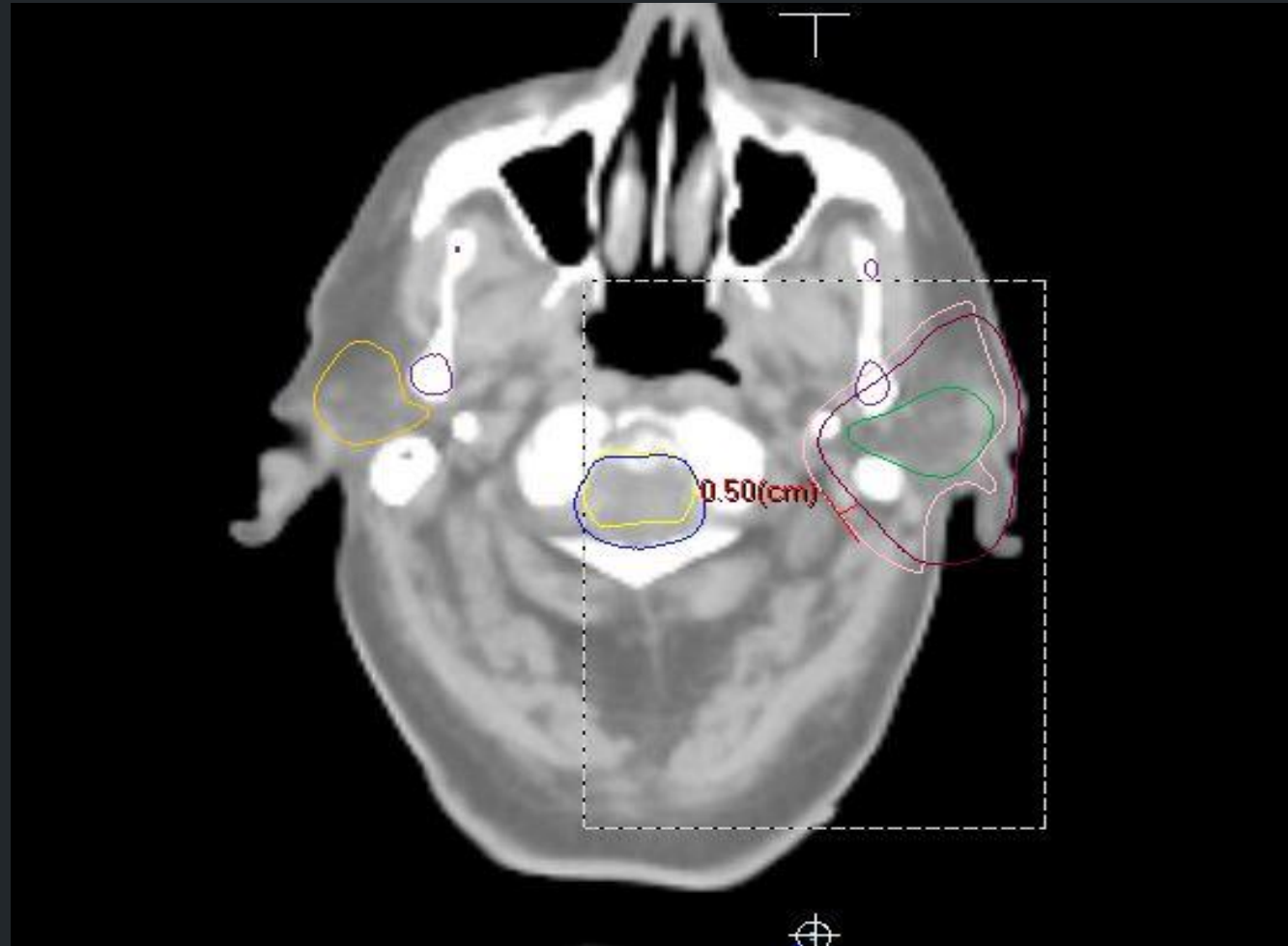


Planning

- IMRT plan was created
- Isocenter placement important to ensure there is no collision.
- Isocenter was placed 10cm inferior to the PTV



0.5cm CTV-PTV margin



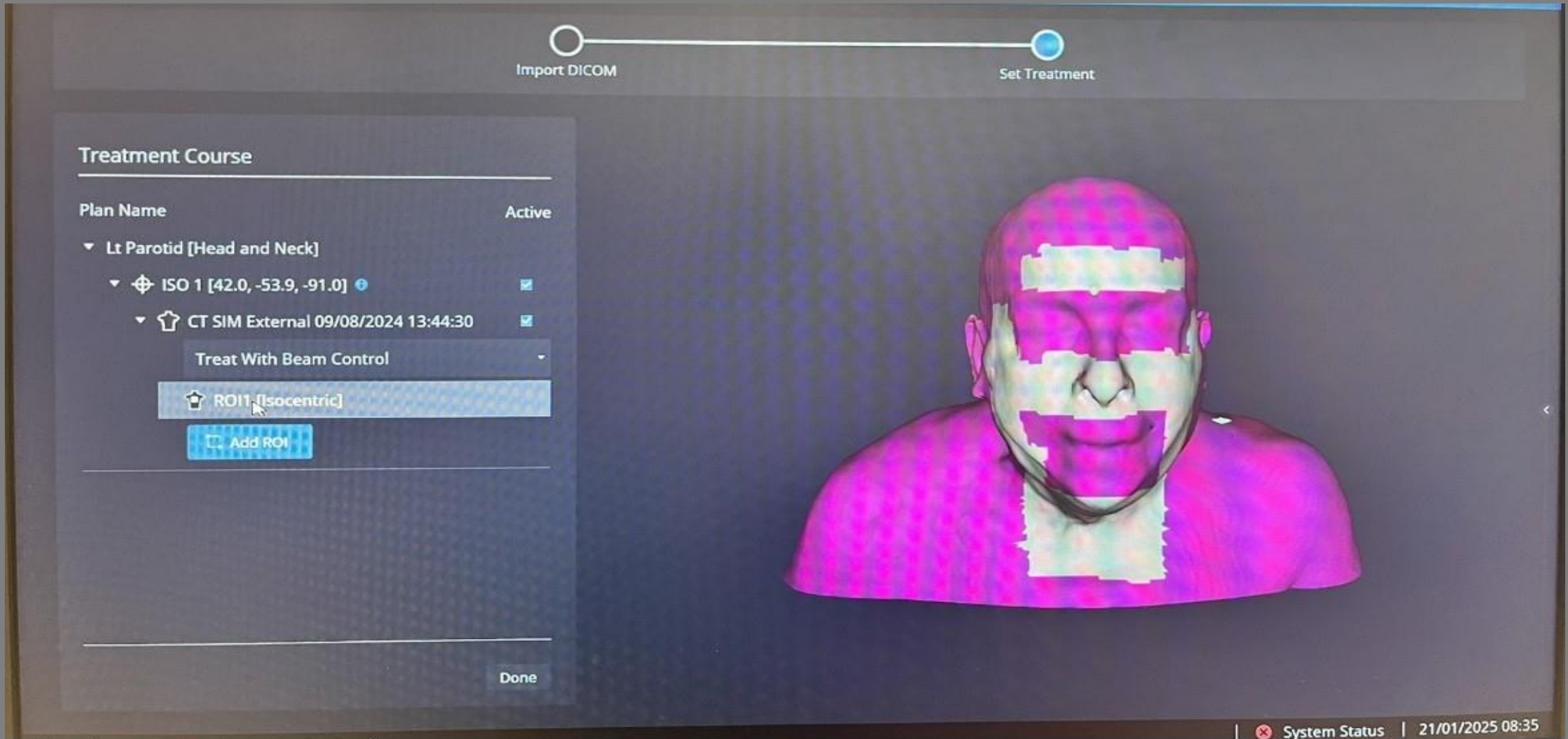
Setup and intra-fractional motion measurements using surface scanning in head and neck cancer radiotherapy– A feasibility study

Results:

Maskless setup with SGRT and CBCT was just as accurate as with a mask. SGRT showed that intrafraction motion was gradual during the treatment.

The CTV-PTV margin correcting for intrafraction motion was 1.7mm for maskless treatment. [1]

SGRT Region Of Interest



Lt Parotid ISO 1

CT SIM External

ROI1

VRT_{cm}

-

-0.20

0.20

LNG_{cm}

-

LAT_{cm}

-

MAG_{cm}

-

YAW[°]

-

ROLL[°]

-

PITCH[°]

-

Beam Hold Delay (seconds)

0

-

+

Save for Future Sessions

Save for Session only

09/08/2024 13:44:30

Reference

Treatment

Couch 0.0°

Send to Couch

Beam Contr

Translations

Vertical

Longitudinal

Lateral

Translation (cm)

4.00

0.00

500

505

510

515

520

Time (s)

Surface

Deformation

Video

Treatment

- Prescribed 48/20 at 2.4gy/#
- Daily CBCT
- SGRT used for patient set up and treatment
- Daily collision checks prior imaging



Lt Parotid ISO 1



CT SIM External



ROI1

VRT_{cm}

-

-0.20 0.20

LNG_{cm}

-

LAT_{cm}

-

MAG_{cm}

-

YAW°

-

ROLL°

-

PITCH°

-

Beam Hold Delay (seconds)

0

-

+

Save for Future Sessions

Save for Session only

Reference

Treatment

Couch 0.0°

Send to Couch

Beam Contr

09/08/2024 13:44:30



Vertical Longitudinal Lateral

Translation (cm)

4.00
0.00

500

505

510

Time (s) 15

520

Translations

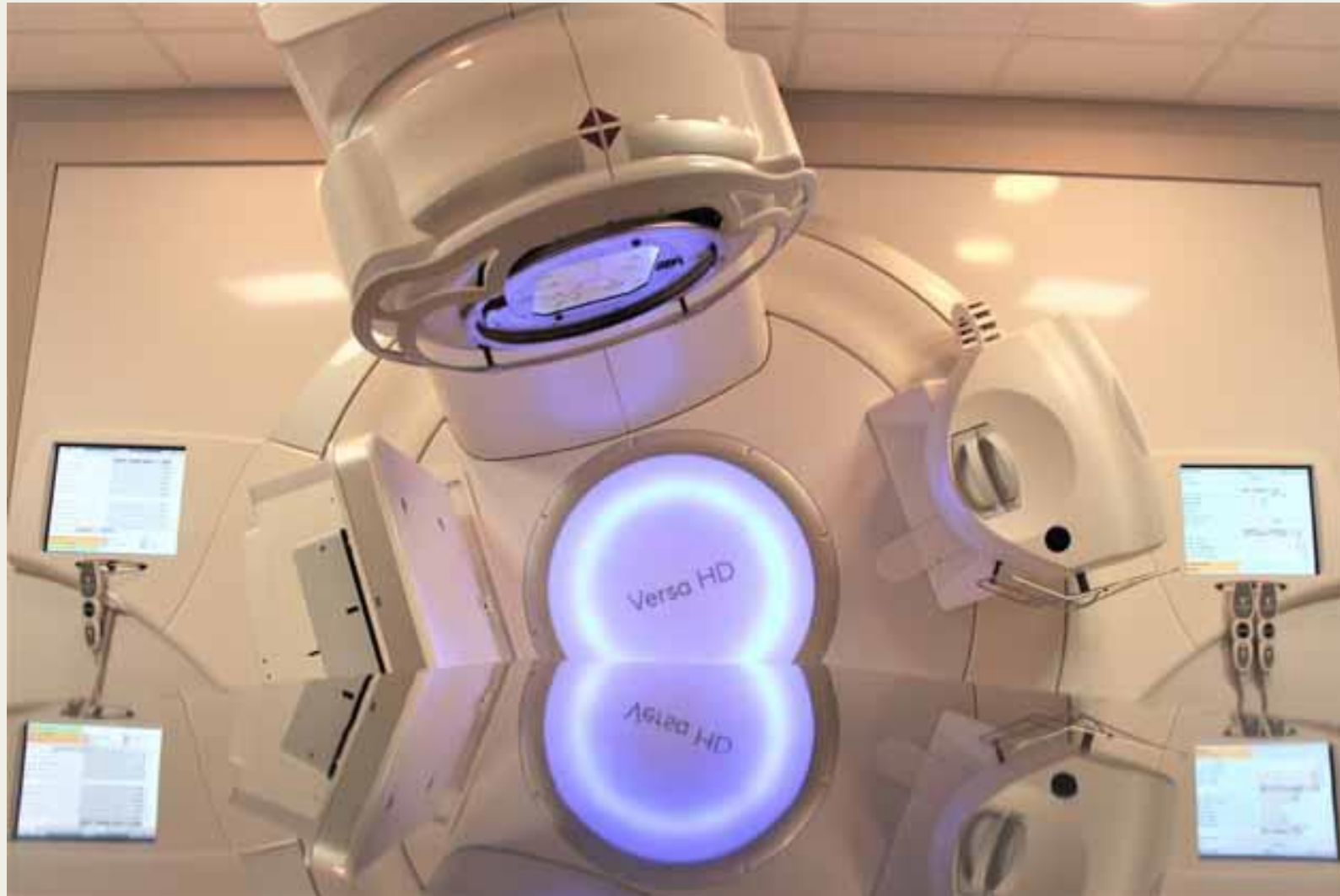
Surface

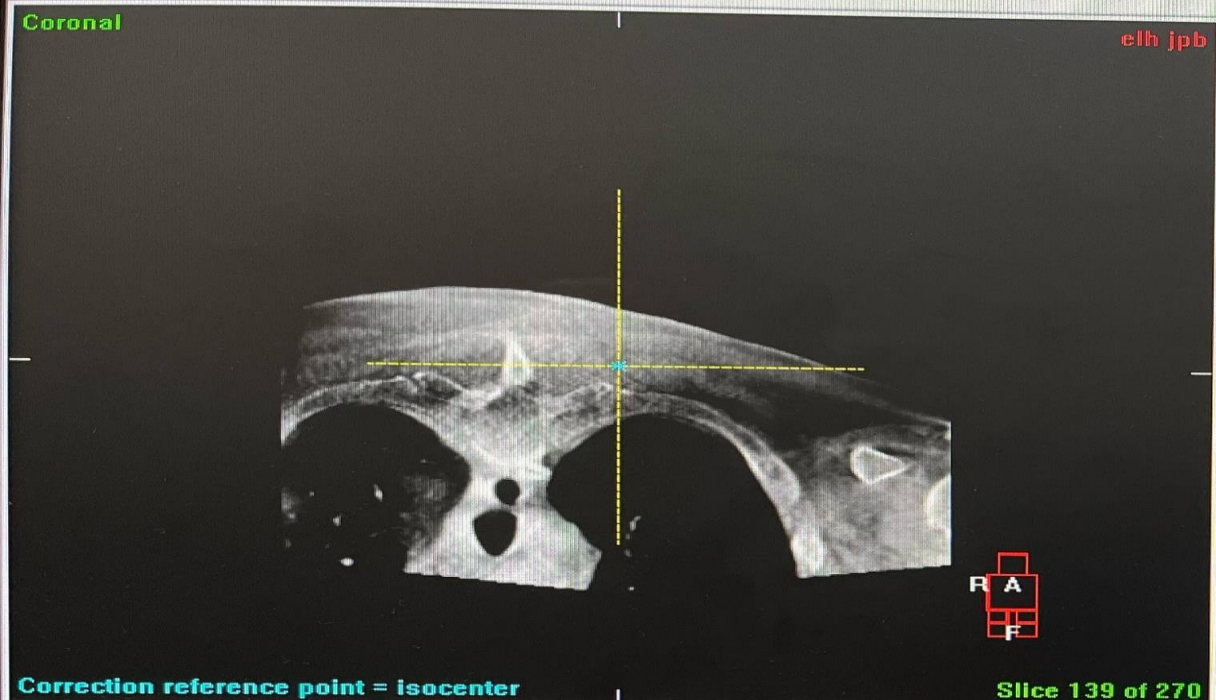
Deformation

Video

alignrt: Beam Control software is not locked

Dummy run



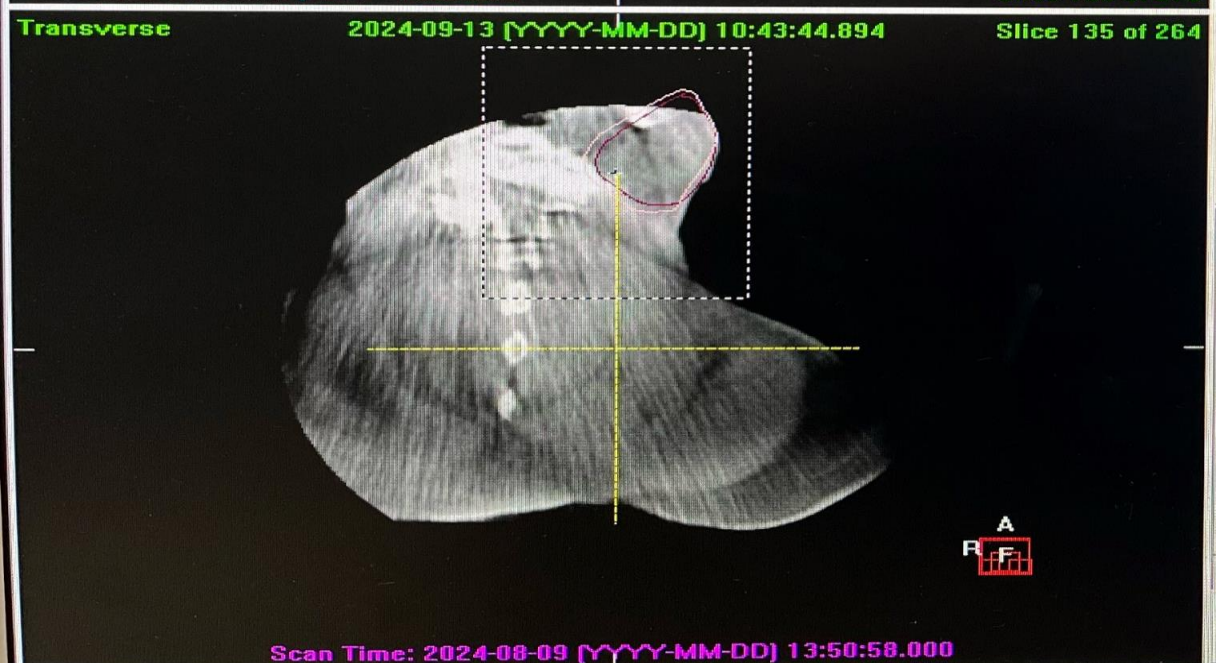


Image

Slice averaging
None

Display mode
Localization on

Navigation icons: Crop, Zoom In, Zoom Out, Pan, Rotate



Reference

☒ Scan... ☒ Clipbox... ☒ Cor Ref... ☒ Structures... ☐ Mask...

Protocol

Registration: Clipbox
Correction from: Clipbox
Correction by: Precise Table

Registration (Clipbox)

Method: Manual

Manual Registration on viewer

Position Error

Translation (cm)		Rotation (deg)	
X	0.00	X	0.0
Y	-0.35	Y	0.0
Z	-0.37	Z	0.0

Reset

Convert To Correction

Register Clipbox Correction Overview

VolumeView Registration

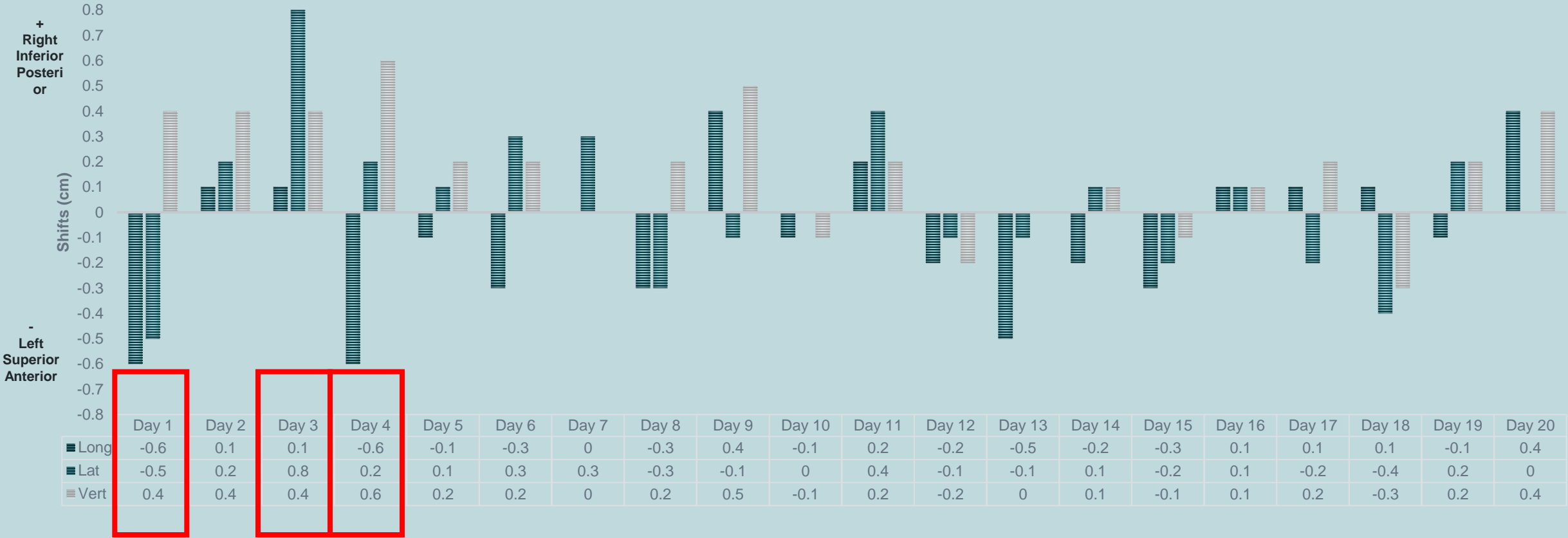
Dismiss Accept

Imaging

- Daily CBCT was required
- All translations were applied
- Imaging panels retracted
- A new reference capture on SGRT was taken (post imaging)
- SGRT response button turned on
- Beam control turned on (post imaging)

CBCT SHIFTS

Long Lat Vert



Case study challenges

- Isocenter positioning
- Rotational shifts unavailable
- Patient difficulties getting on and off treatment couch

Pros to mask-less treatment	Cons to mask-less treatment
Increased comfort for patient	Monitor patient more closely
Cost effective	Limitations for certain patients
Less time spent making mask	Possible extended treatment times
Reduced anxiety for patients	
Increased flexibility in positioning	

Conclusion

- With the help SGRT, we were able to successfully treat this man with numerous limitations without the use of a thermoplastic mask.
- CTV-PTV margin remained the same for this mask-less treatment compared to masked treatment
- This approach highlights the potential of SGRT with CBCTs as a reliable and effective alternative to conventional techniques especially for patients with limitations.

References



[1] Essers, M. et al. (2024) Setup and intra-fractional motion measurements using surface scanning in head and neck cancer radiotherapy- a feasibility study, Physics and imaging in radiation oncology. Available at: <https://pmc.ncbi.nlm.nih.gov/articles/PMC10912619>).



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Questions