

SGRT Maskless H&N Case Study

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December 2023

Centre Outline

Mater/North Shore Radiation Oncology

1. Varian Truebeam Linac Version 3.0 with AlignRT Version 6.3.235.1 with Postural Alignment Subscription
2. Varian Edge Linac Version 3.0 with AlignRT Version 6.3.235.1 with Postural Alignment Subscription



Aim

“The feasibility of maskless radiation therapy treatment for head & neck cancer using surface guidance radiation therapy”

Case Background

- ⑦ 50-year-old male
- ⑦ Diagnosed with T2N1MX SCC of the left tonsil after self-detection
- ⑦ Patient history of severe claustrophobia and anxiety
- ⑦ Patient had incomplete scans
- ⑦ Multiple unsuccessful simulation attempts
- ⑦ SGRT pathway explored



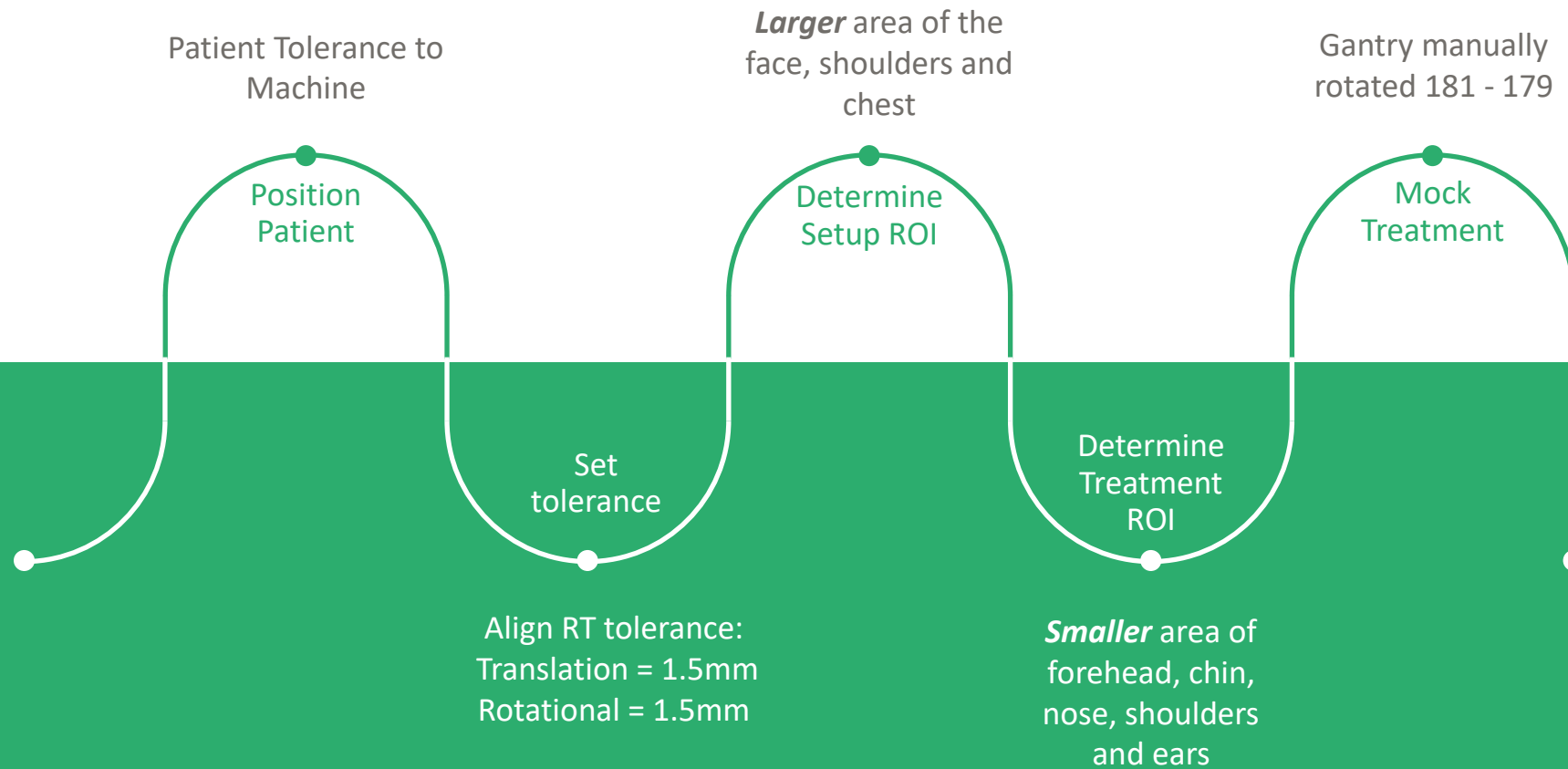
Simulation Considerations



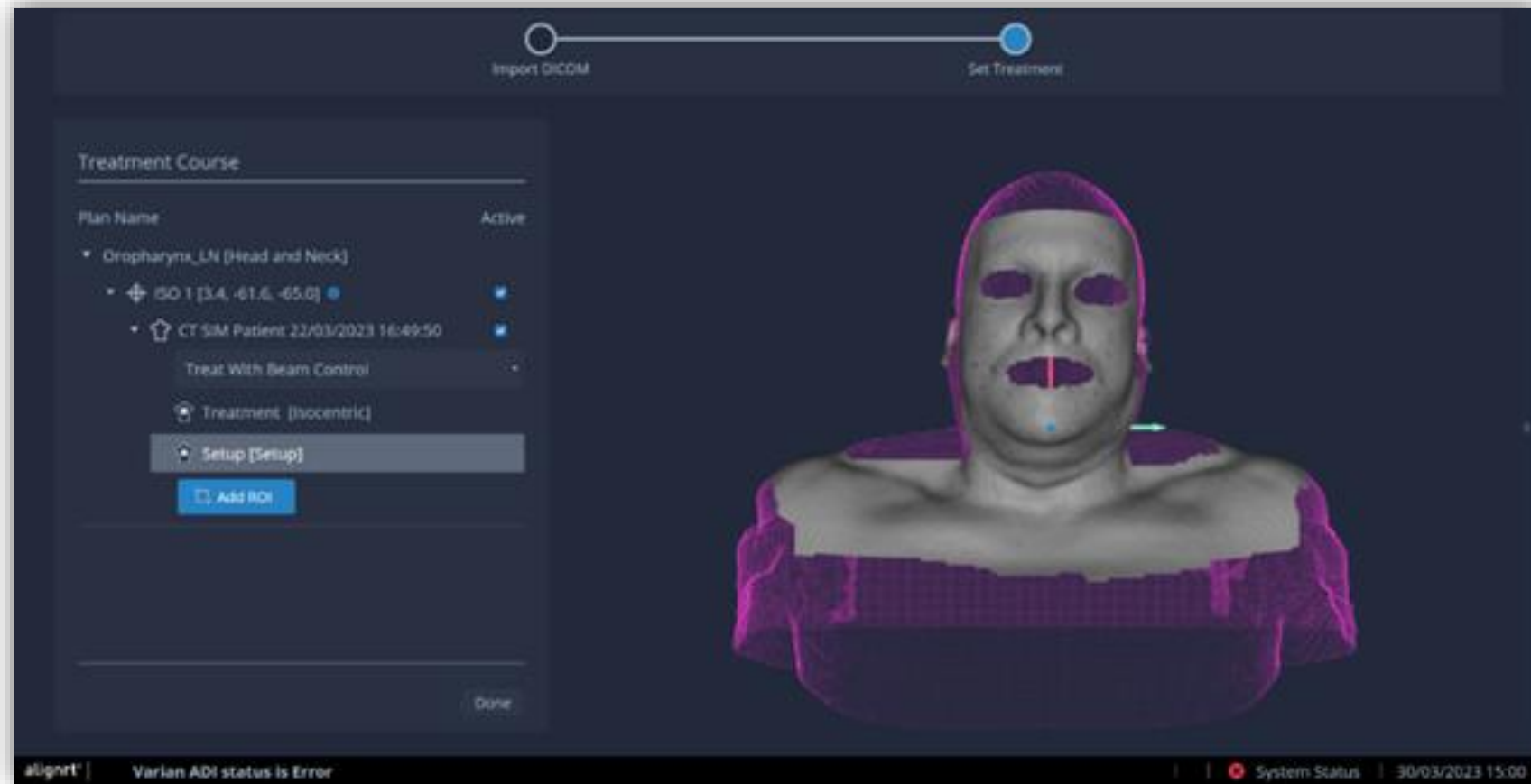
- ⑦ Head and neck board S-Frame with head rest A
- ⑦ Custom H&N mould care cushion on top of head rest
- ⑦ Indexed kneefix
- ⑦ Large nonslip mat
- ⑦ ITN marked on mouldcare cushion
- ⑦ Facial hair was also removed

Method

Mock Up
"Day 0"

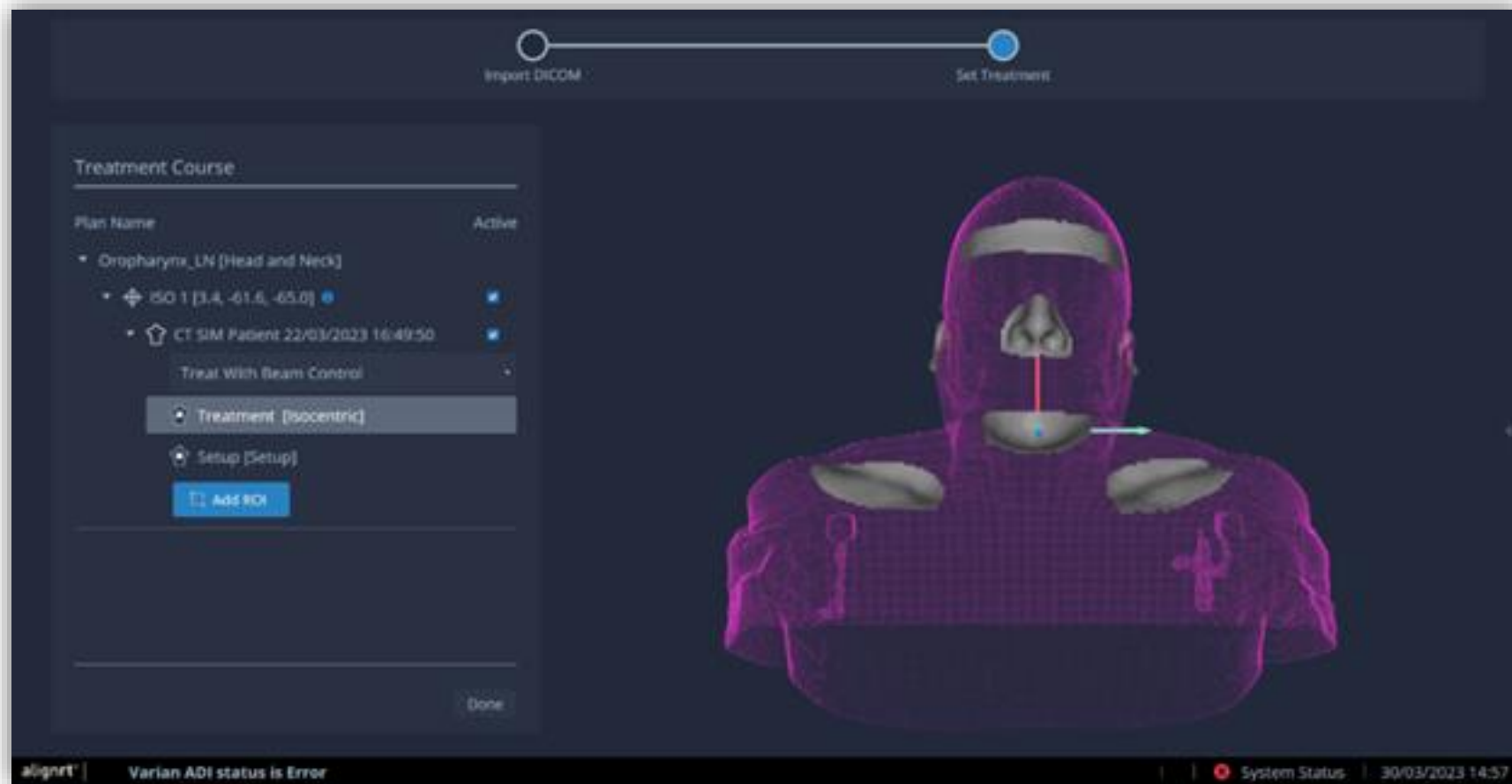


Method



Setup ROI

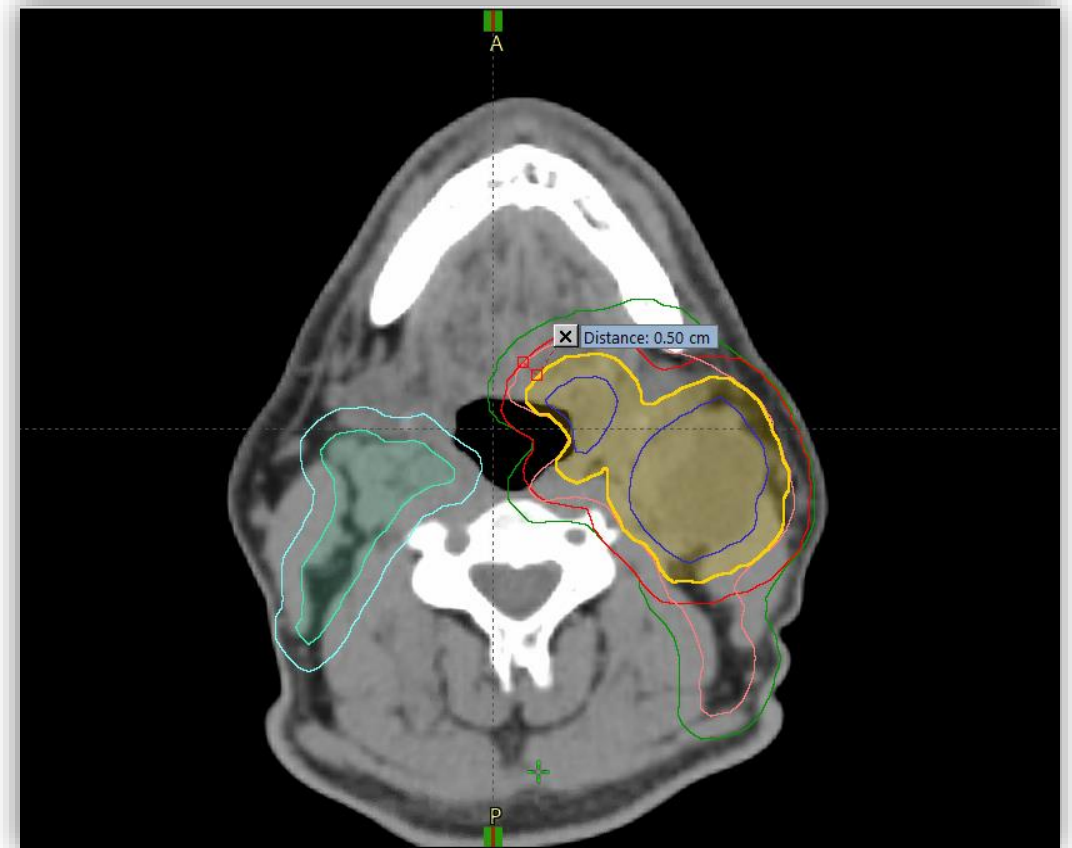
Method



Treatment ROI

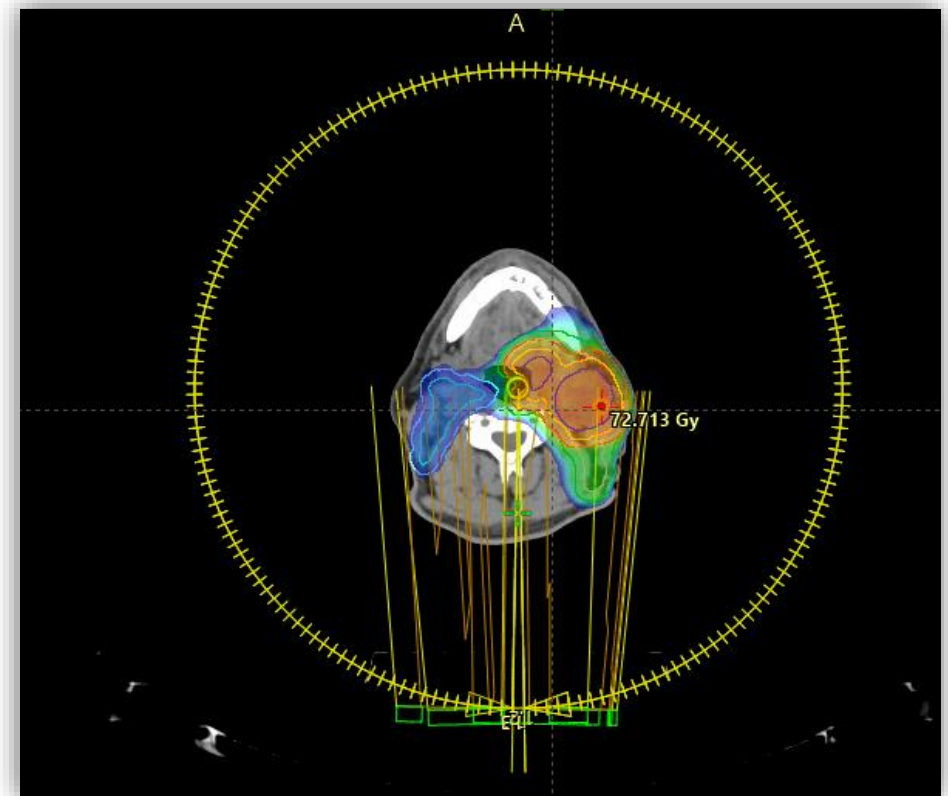
Planning Considerations

- ⑦ No suggestions were made to the planning team or Radiation Oncologist.
- ⑦ At peer review, it was decided a standard 0.5cm margin was sufficient without a need for expansion
- ⑦ Planned to a radical dose of 70Gy/35# to the oropharynx and lymph nodes
 - ⑦ High Dose = 70Gy
 - ⑦ Intermediate Dose = 63Gy
 - ⑦ Low Dose = 56Gy



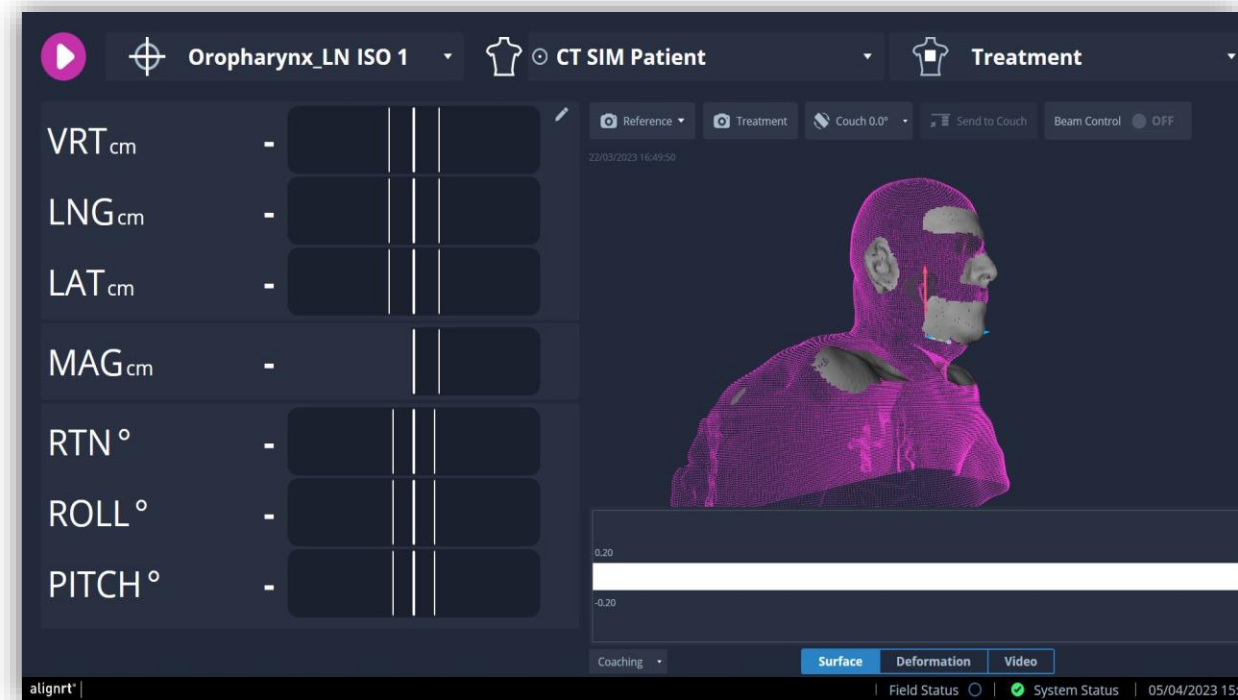
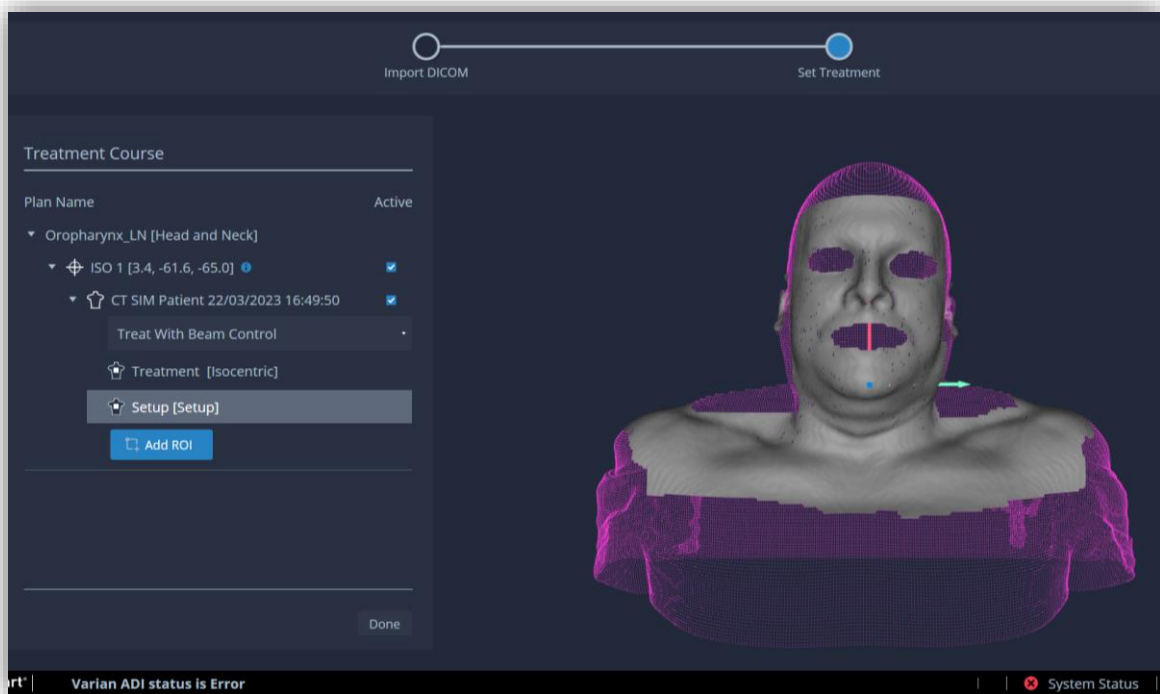
Planning Considerations

- ⑦ This patient was planned using VMAT technique with 3 full arcs due to treating bilaterally
- ⑦ 6FFF energy for faster treatments



Treatment Workflow - Setup

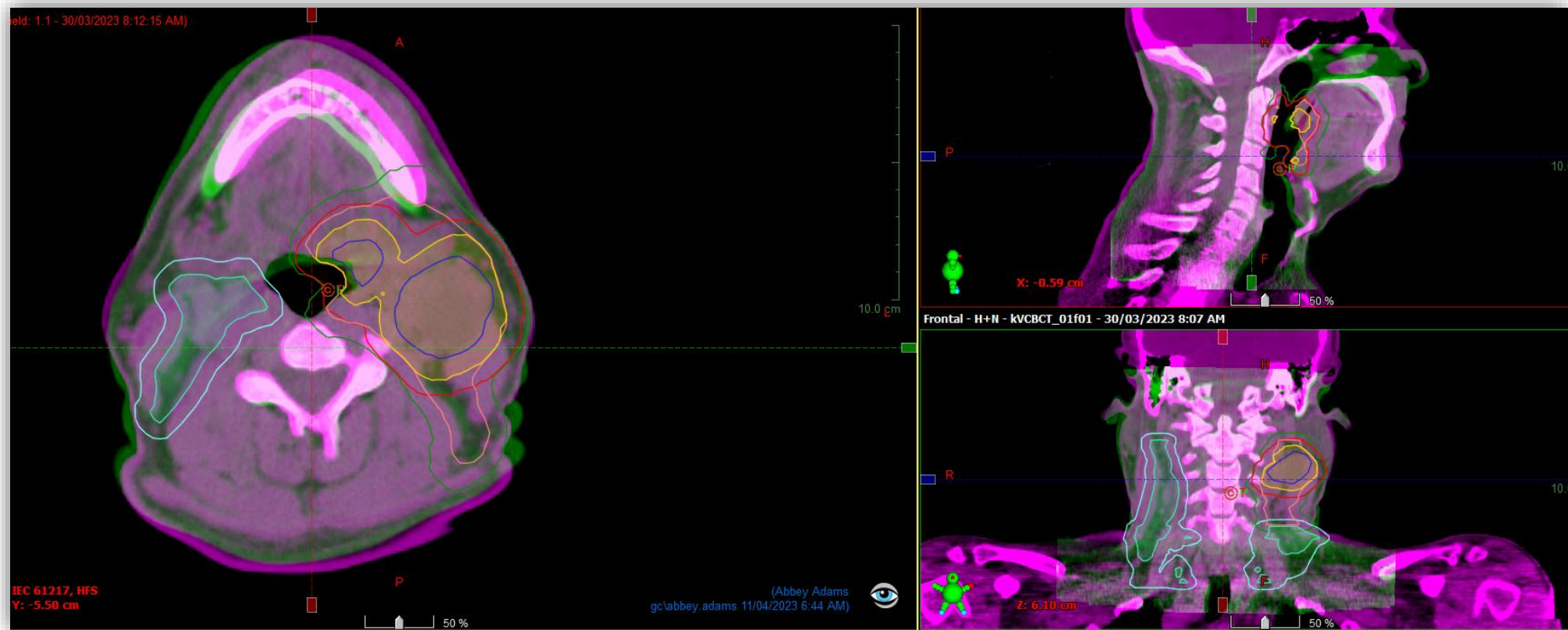
- ① Patient aligned within 2mm for the setup ROI
- ① Patient aligned within 1.5mm for the treatment ROI
- ① The video function was also switch on to check shoulder, chin and nose position
- ① Couch values were acquired



Maskless H&N Setup ROI

Treatment Workflow- Imaging

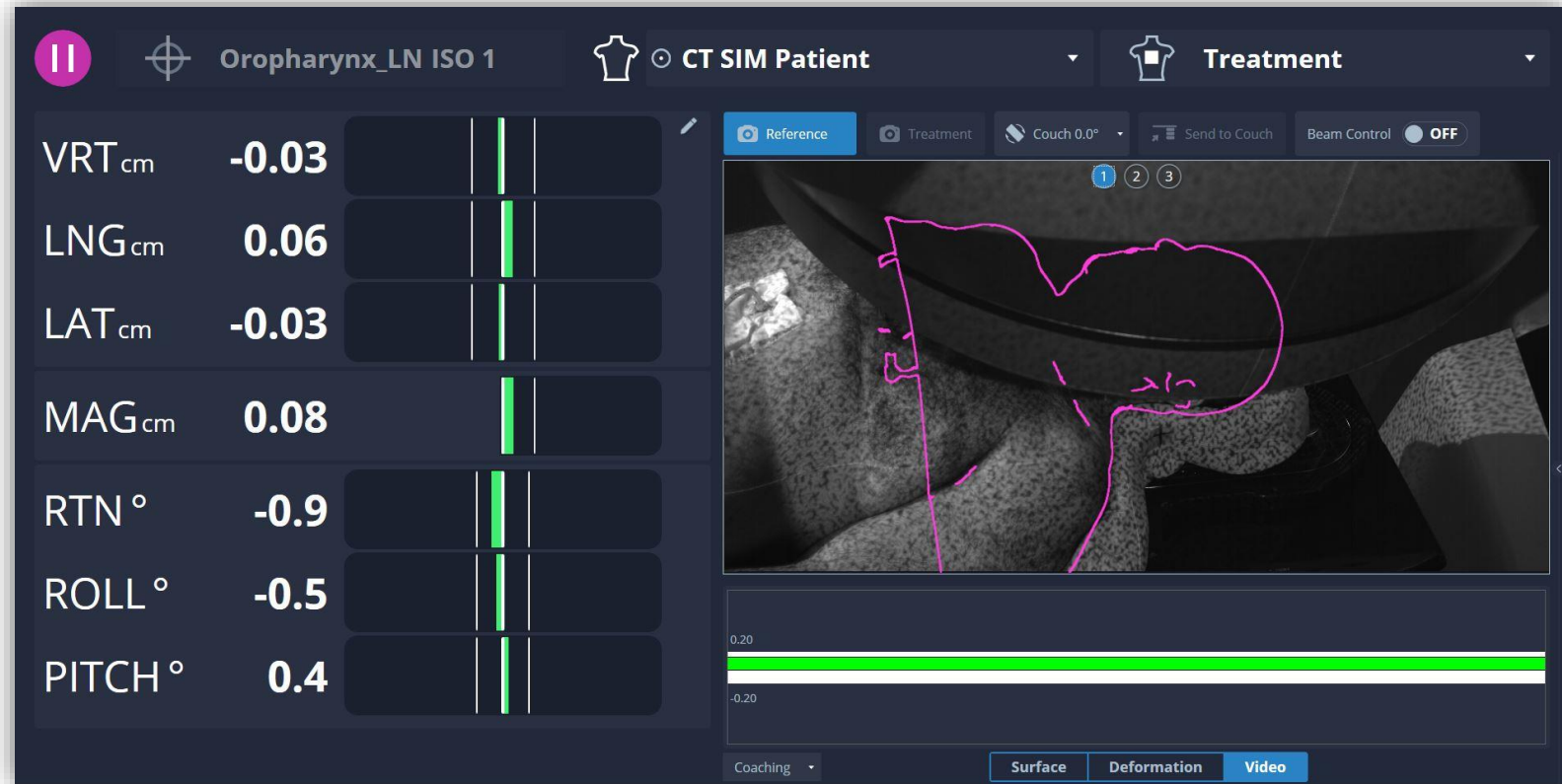
- ⑦ Daily pre-CBCT
- ⑦ Bones match priority while also ensuring all soft tissue were within high and low dose PTV margins (0.5cm)



Day 1 CBCT Image Match

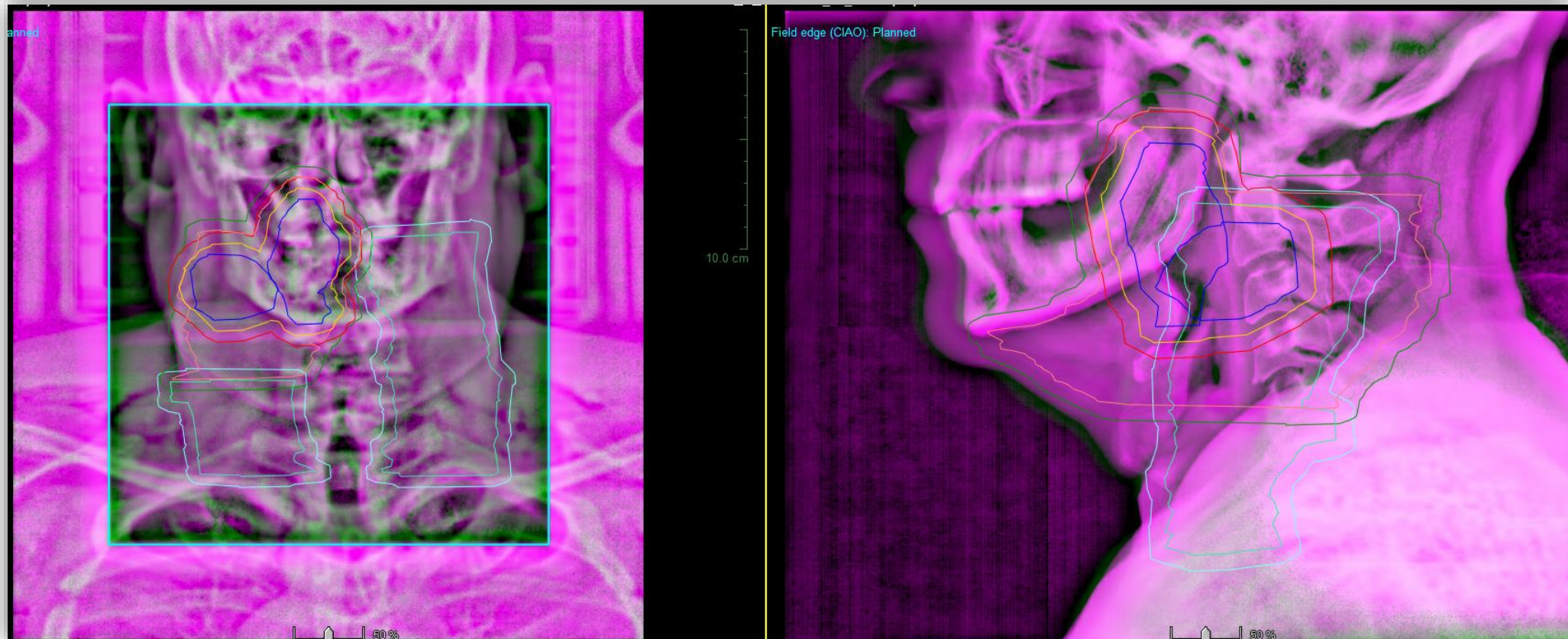
Treatment Workflow- Imaging

- ⑦ All shifts applied and recorded
- ⑦ Decision to use 4DoF only
- ⑦ Reference capture taken to detect any movement extending beyond 1.5mm and 1.5 degrees
- ⑦ If movement detected, process was to re-image and restart workflow



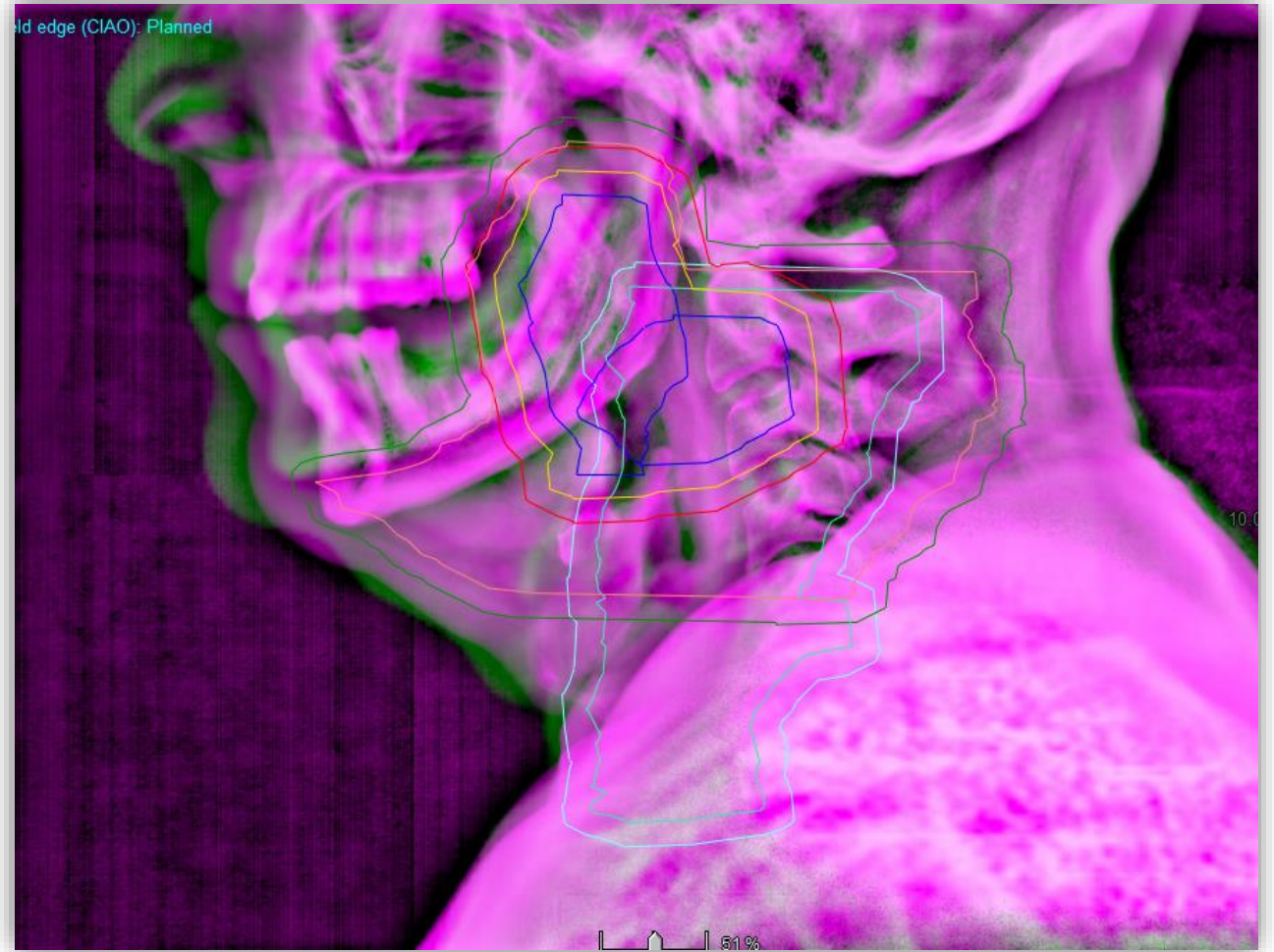
Treatment Workflow- Imaging

- ① Post kV/mV pair was delivered to ensure the AlignRT system was accurate as a precautionary measure.
- ② The kV/mV pair were matched, and the shifts were recorded.



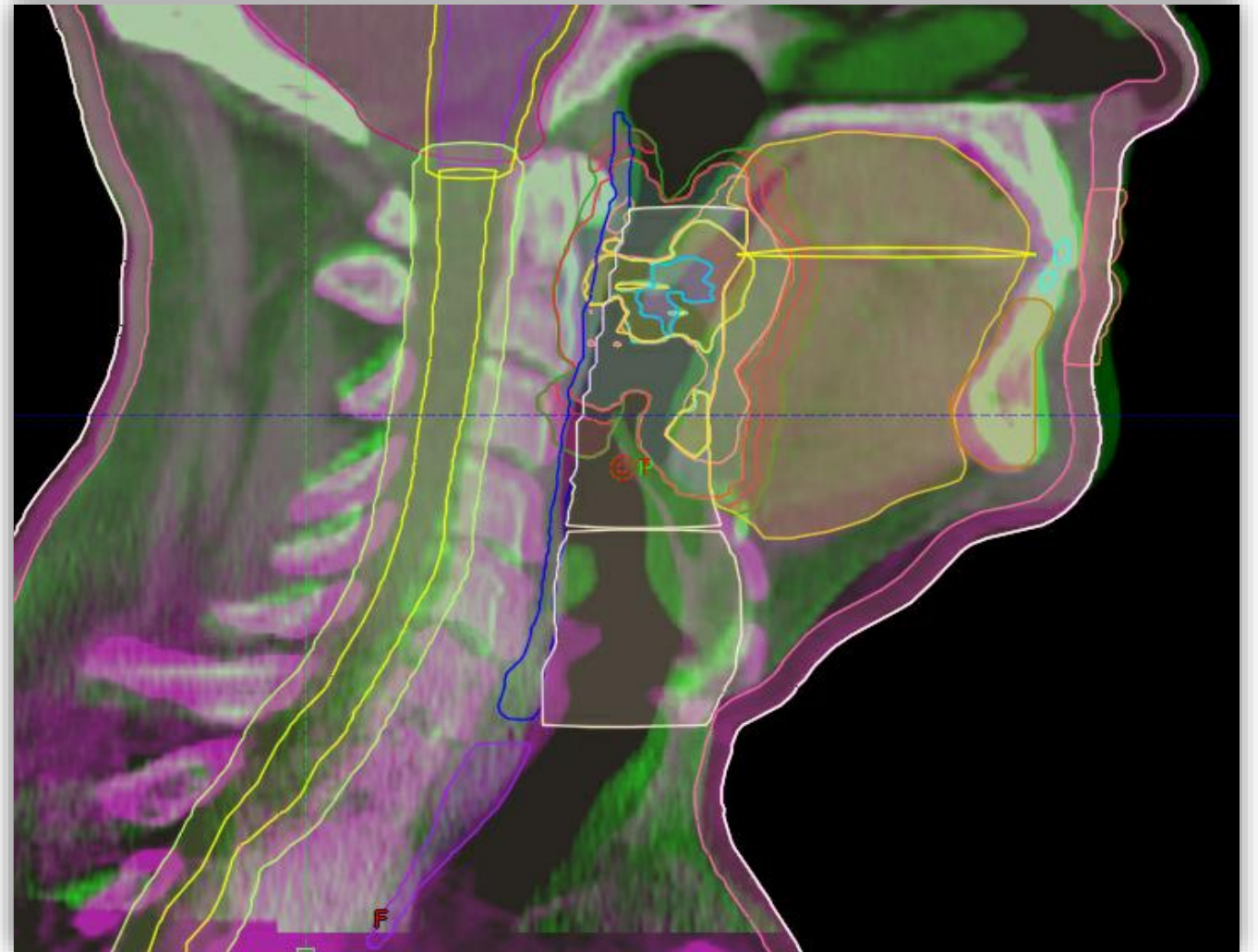
Challenges

- ⑦ On #3, the jaw was noted to open slightly.
- ⑦ To combat this, More ROI region was drawn around the chin and jaw as well as reminders over the microphone for the patient



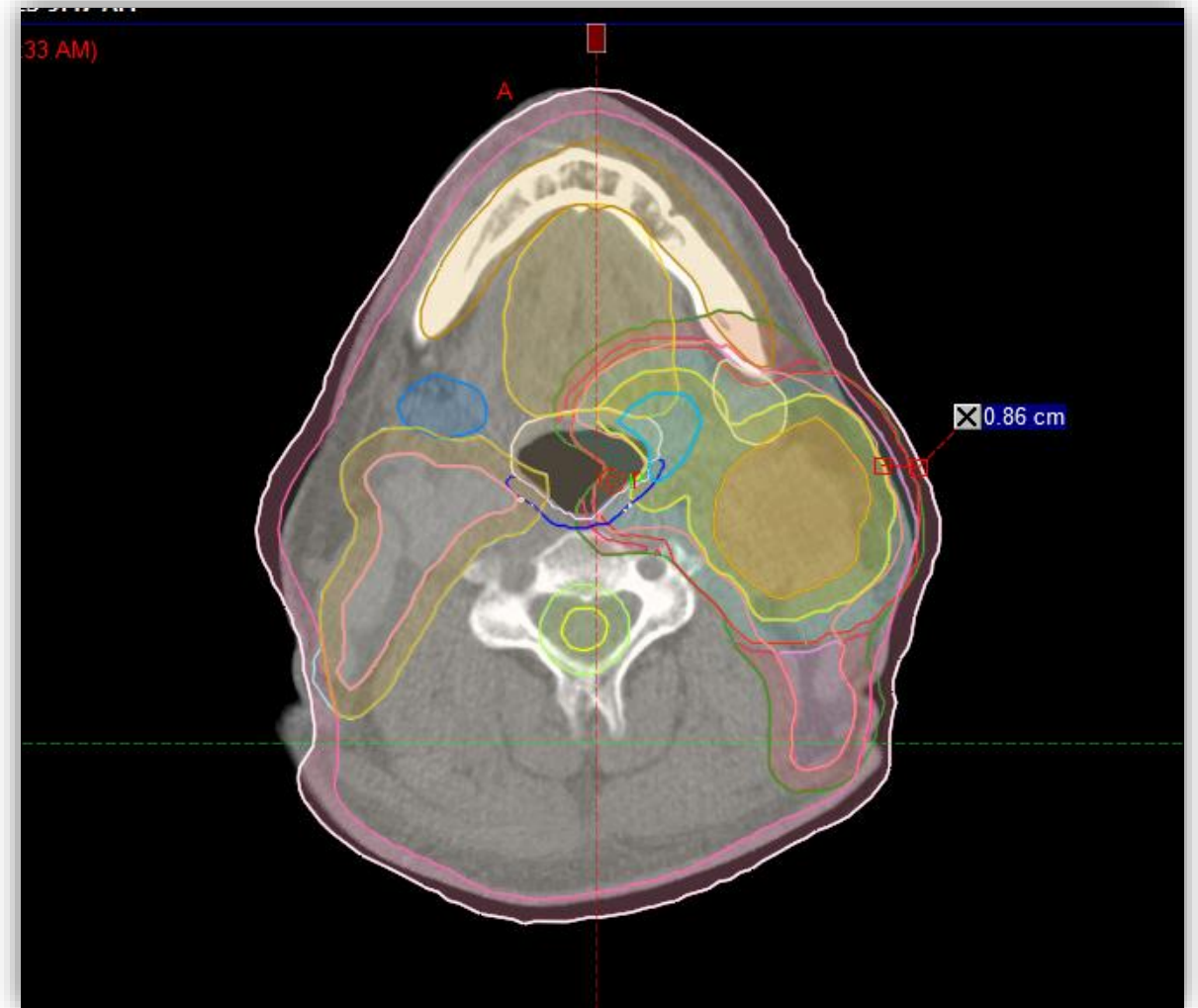
Challenges

- ⑦ Neck flexion was quite different due to the patient being more relaxed on the bed
- ⑦ This made positioning day to day very difficult to reproduce
- ⑦ Re-scan occurred after #12 which was successful in correcting these issues



Challenges

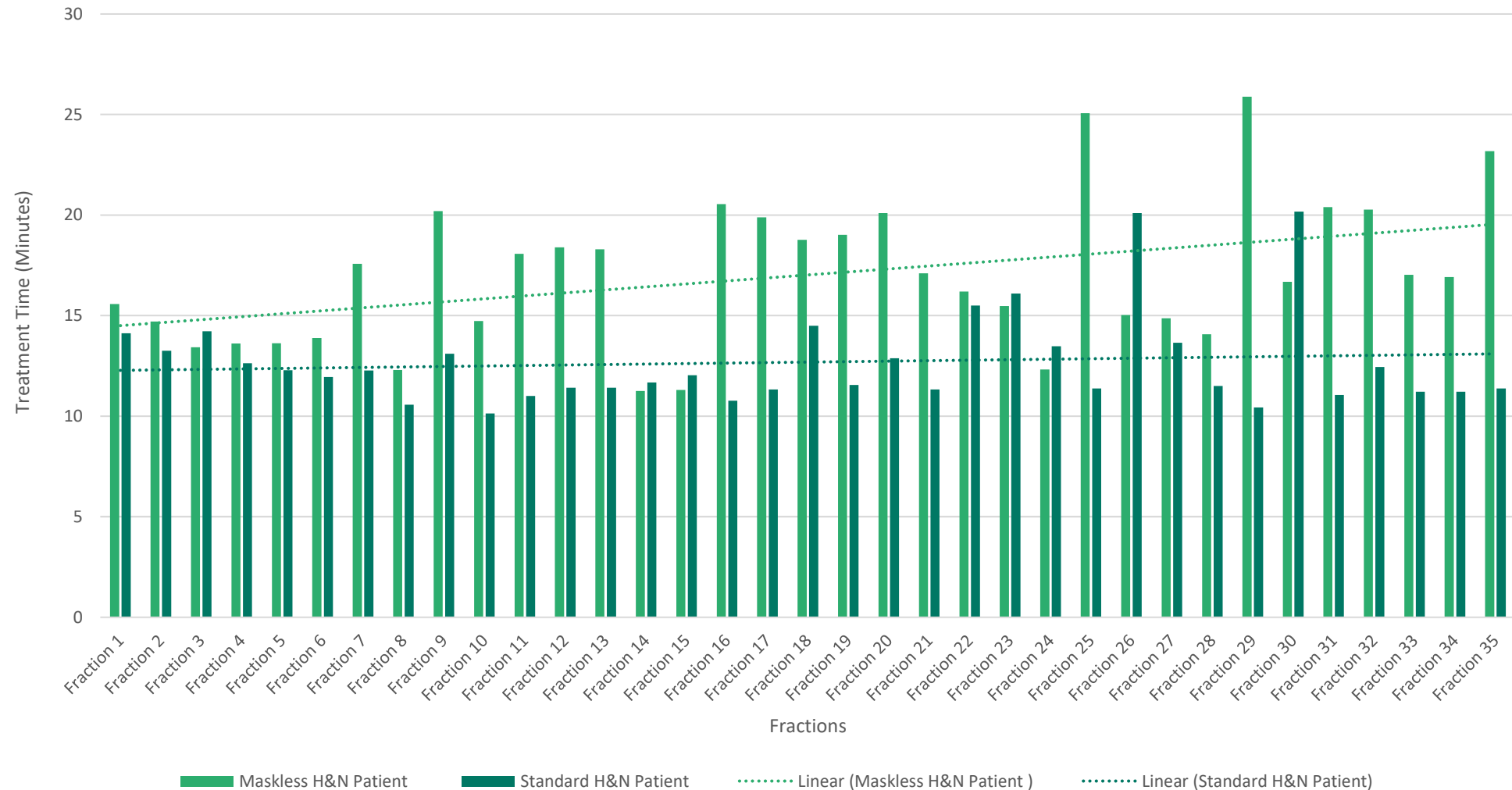
- ⑦ From #15 to #17 1cm contour decrease
- ⑦ Dose calculation
 - ⑦ 1.8% hotter in the PTV area
 - ⑦ OARs within tolerance
- ⑦ Caused issues with setup daily as AlignRT was having difficulties comparing patient setup with simulation setup due to being 1cm difference.
- ⑦ Had to take an 'SGRT reference' to be used daily for setup.



Results - Time

Maskless VS Mask H&N Treatment Times

- The average treatment time for maskless patient = 17.02 minutes
- The average treatment time for a patient being treated in a H&N mask for the same diagnosis and same fractionation = 12.70 minutes
- Maskless patient took approximately 4.32 minutes longer daily to treat



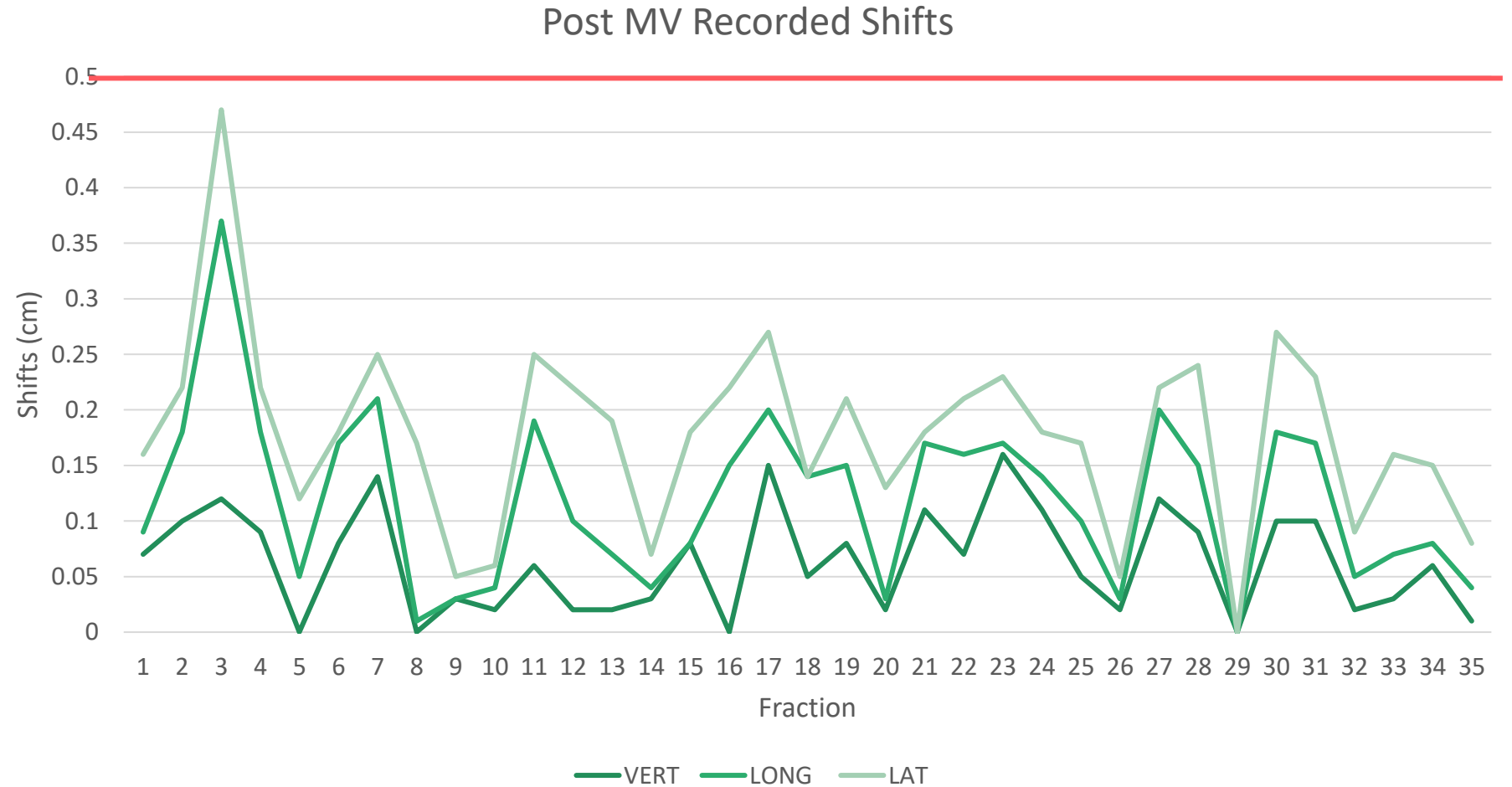
Results- Applied CBCT Shifts Maskless VS Mask

Average CBCT Shifts	VRT	LNG	LAT	RTN
Maskless H&N Patient	0.28cm	0.23cm	0.16cm	1.1 degrees
Standard H&N Patient	0.08cm	0.49cm	0.13cm	0.4 degrees

- ⑦ When comparing results from the applied shifts for the maskless H&N patient VS the standard H&N patient, it is evident both resulted in minimal shifts.
- ⑦ Comparison of results of the applied CBCT shifts demonstrates accurate in-room setup

Results- Post MV Shifts

- ⑦ No recorded post MV shifts exceeded 0.5cm- within PTV margin
- ⑦ Spike #3 due to jaw opening- ROI adjusted
- ⑦ Average VERT= 0.063cm
- ⑦ Average LONG = 0.057cm
- ⑦ Average LAT = 0.059cm



Results- Patient Experience

- ⑦ Patient voiced his appreciation and gratitude towards staff
- ⑦ He felt supported and safe
- ⑦ Liked additional TLC to ease anxiety
 - ⑦ Custom Spotify playlist
 - ⑦ Updates over the microphone of time remaining
 - ⑦ Consistent staffing
- ⑦ Side effects
 - ⑦ G1-2 moist desquamation
 - ⑦ G2 oral mucositis

Future Applications

- ① The use of Cine imaging
 - ① Takes mV images throughout treatment
 - ① No additional dose to the patient
 - ① With imaging panels are extended, would they block the view of the AlignRT cameras. Decrease effectiveness?
 - ① Involve physics input.
- ① Timings improving – no post = KV/KM, longer setup, acceptance experience
- ① Larger patient study cohort required
- ① Merge open face mask technique currently used for SRS and apply
- ① Larger rollout with additional RO involvement



Thank you.

Questions

