

Peter Mac's SGRT Adoption:

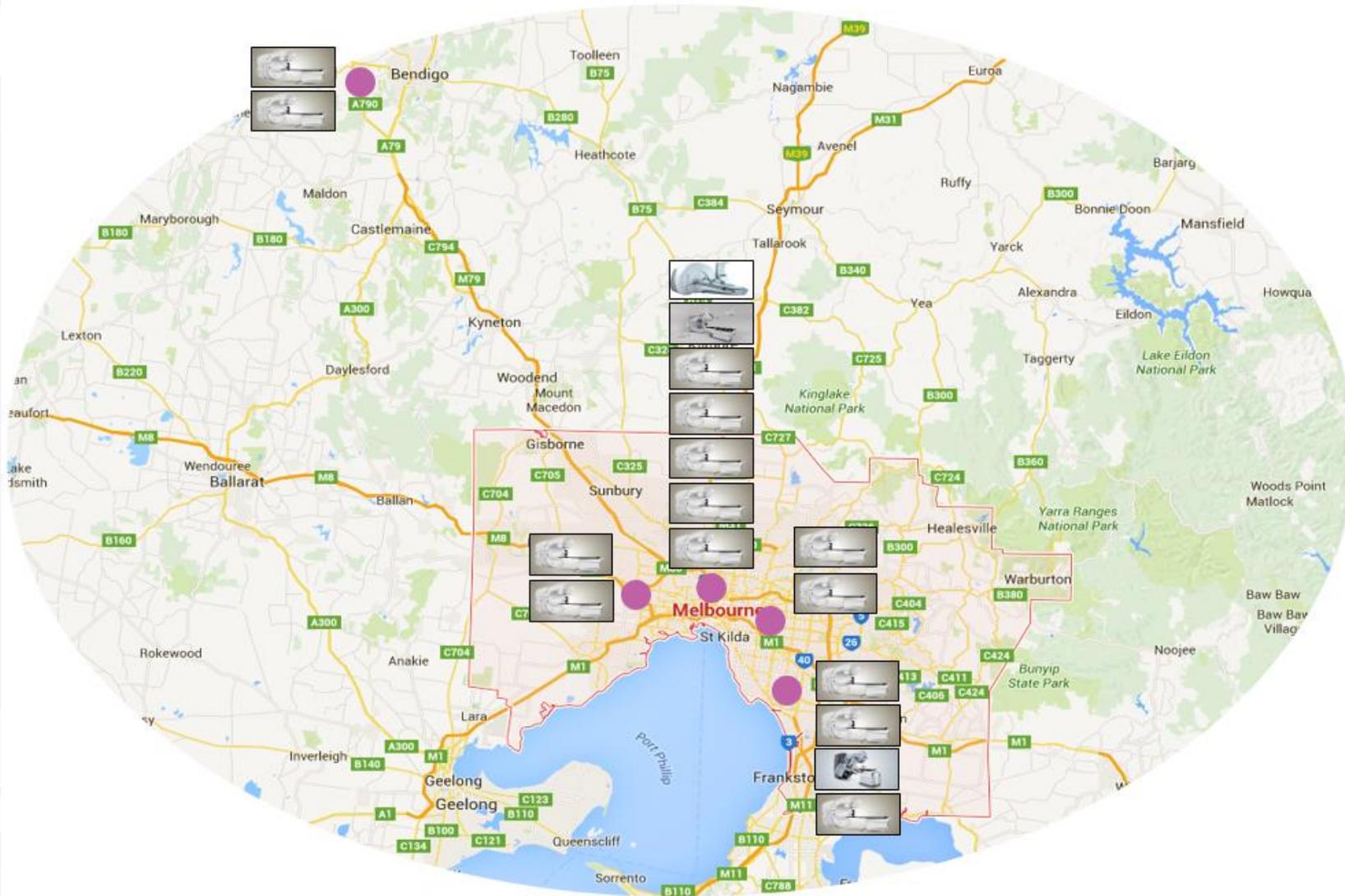
Redefining our Vision for Radiation Therapy

Karen McGoldrick and Kenton Thompson



Peter Mac
Peter MacCallum Cancer Centre
Victoria Australia

PETER MAC



8000 courses annually
16 Varian Linacs
11 AlignRT Advance
1 GammaKnife
Brachytherapy
Varian Eclipse
Brainlab Elements
Leksell GammaPlan
MOSAIQ
6 Phillips CT
1 Siemens CT
1 MapRT*

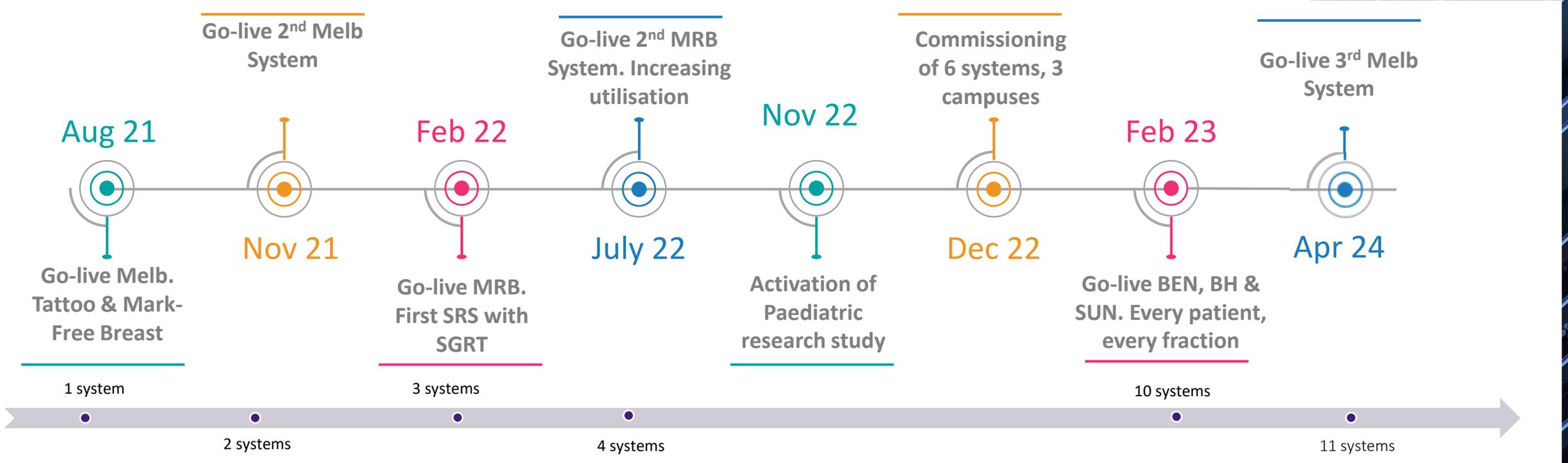
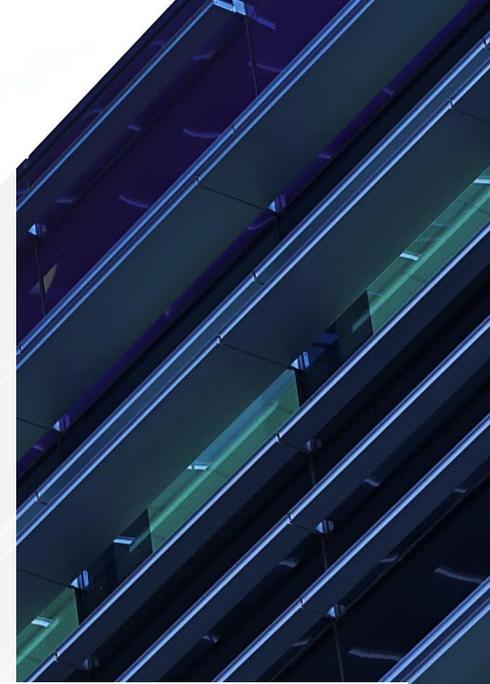


Peter Mac
Peter MacCallum Cancer Centre
Victoria Australia

PMCC VISION FOR SGRT

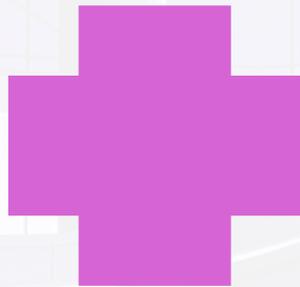
Motivation for SGRT

- Better patient care - Tattoo free treatments
- Improved accuracy - Intra-fraction monitoring
- Quality Care – Paediatric – reduce need for GA
- Staged implementation via procurement within public health system



SURFACE GUIDANCE BEGINS

- August 2021
- 1st SGRT installed on our TrueBeam with 6DoF
- Installation & Commissioning included in new linac installation
- Training



IMPLEMENTATION – STAFF TRAINING

- Training consisted of 2 components:
 - a) Online learning modules :**
 - In-service recorded video presentation by AlignRT
 - Online modules on VisionRT portal
 - Review of additional resources on Peter Mac online learning platform (LMS)
 - b) Hands on Training:**
 - QA processes
 - Preparation of Plan
 - ROI tips
 - Using phantoms to run through workflows for:
Breast, DIBH Breast, Electrons



TRAINING MATERIAL

Dashboard / My courses / RT - AlignRT Training

RT - AlignRT Training

- ▶ Participants
- 🏆 Badges
- 📊 Grades
- ▶ General
- ▶ Course Overview
- ▶ Vendor Videos
- ▶ AlignRT Training
- ▶ Quick Reference Packages
- ▶ Additional Resources
- ▶ Certificate of Completion

Administration

- ▼ Course administration
 - 👤 Unenrol me from RT - AlignRT Training
 - ▶ Reports
 - 📊 Grades
 - ▶ Badges
 - ▶ Switch role to...



 **Course Overview** >

 **Vendor Videos** >

 **AlignRT Training** >

 **Quick Reference Packages** >

 **Additional Resources** >

 **Certificate of Completion** >

 **All sections** >

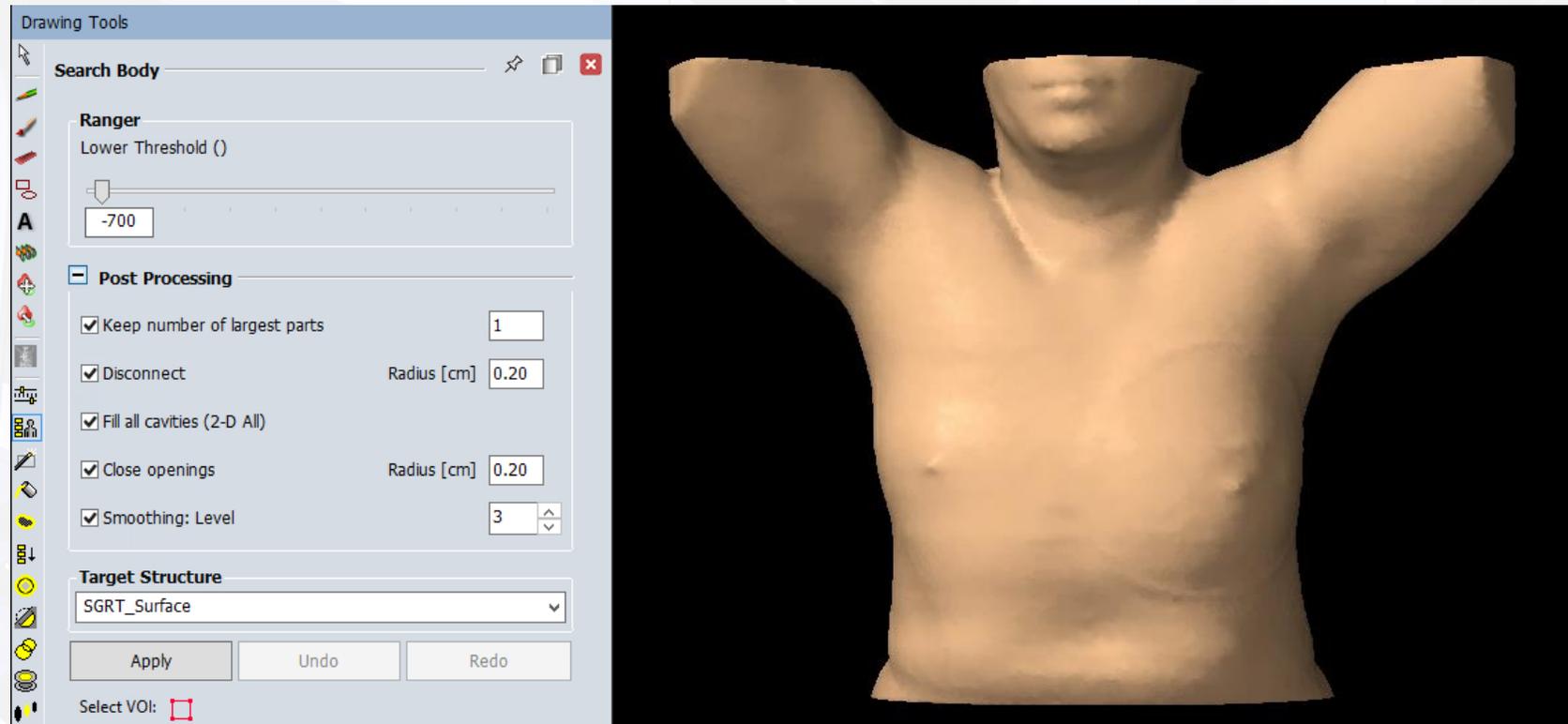
IMPLEMENTATION – STAGED CASE SELECTIONS

- Late 2021 1st & 2nd Linac (Melbourne Campus) -Priority was to treat ALL Breast patients with SGRT and treat tattoo free
- Within 1 month of Go-Live 100% of patients were treated with SGRT on this linac
- Early 2022 3rd & 4th Linac (Moorabbin Campus) – Priority Breast cases & offer tattoo free treatment, DIBH Haematology/Mediastinal Region, Sarcoma Extremities , Brain SRS, SABR
- Feb 2023 – 6 additional systems (Bendigo, Box Hill & Sunshine) -All patient treated with SGRT and tattoo free
- Excluded Radical H&N cases – due to project underway to evaluate this and not large cohort of these patients at those campuses

IMPLEMENTATION –SURFACE DEFINITIONS

SGRT_SURFACE

- SGRT_Surface is always the 1st reference surface to set up the patient with AlignRT
- RTs were instructed to use default Search Body settings ensuring VOI has been reviewed to cover relevant section of the patient anatomy

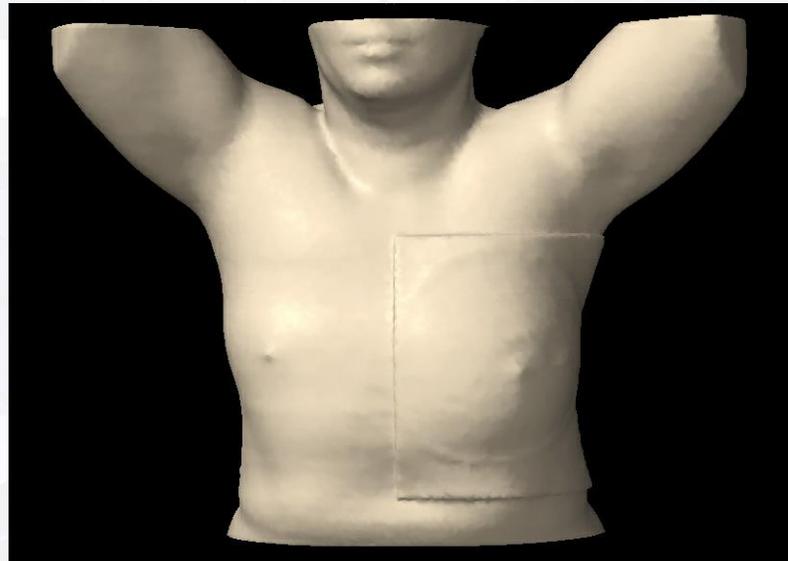


IMPLEMENTATION –SURFACE DEFINITIONS

Additional structures exported to AlignRT to assist with treatment set up and delivery included:

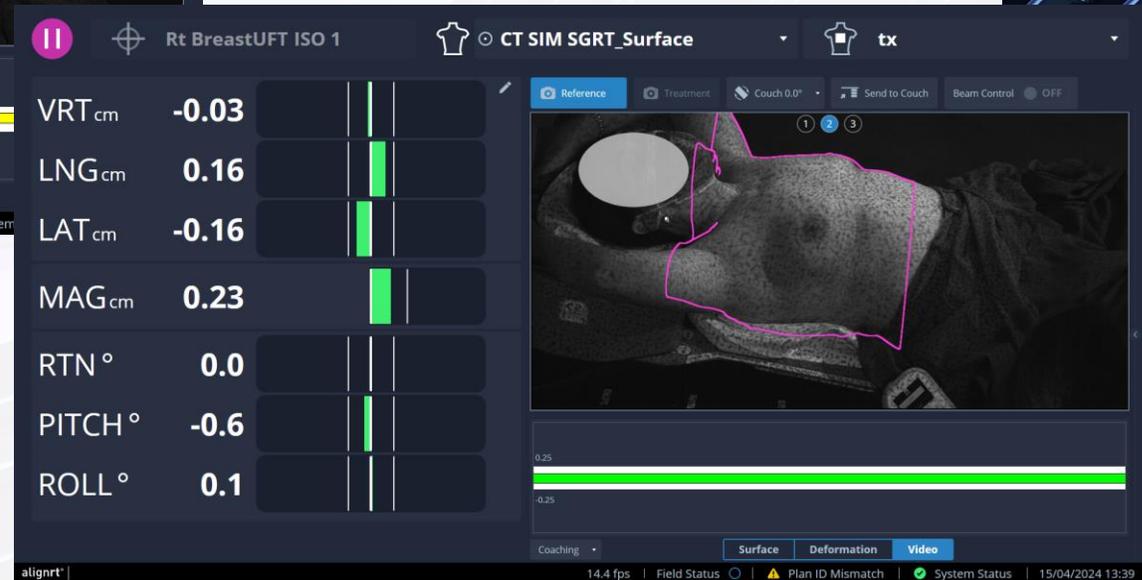
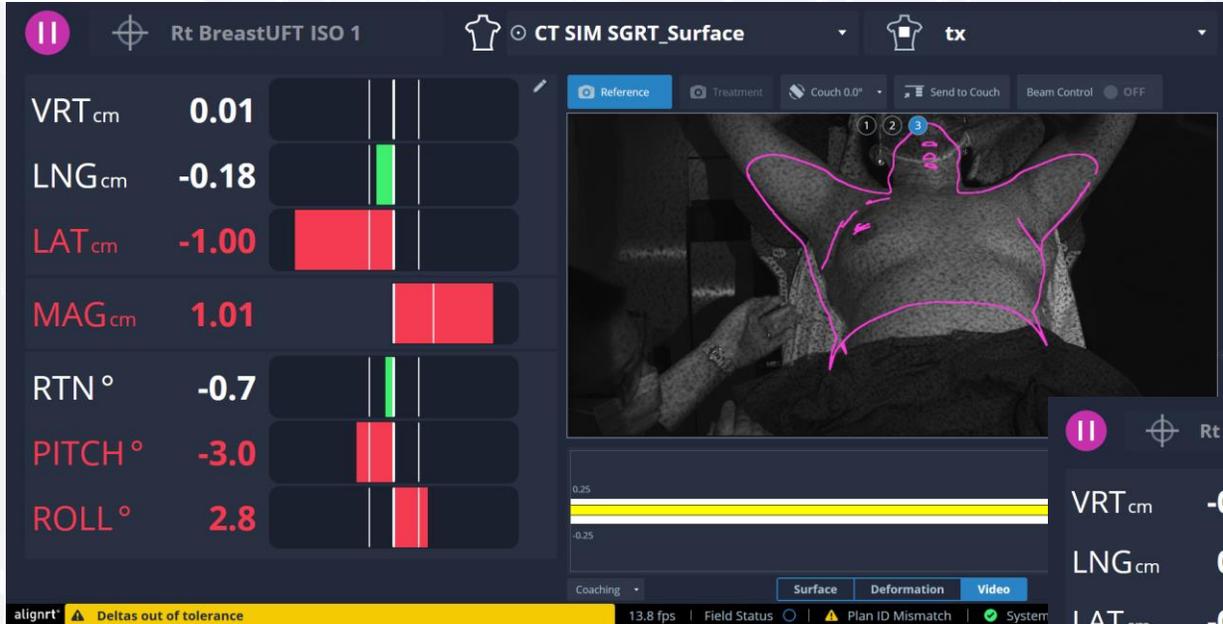
- SGRT_BOLUS
- SGRT_BH (Breath Hold)
- SGRT_BH + BOLUS
- SGRT_ELECTRON

SGRT_BOLUS



UTILASTION OF TOOLS

- Postural Video –improved set up prior to IGRT



UTILASTION OF TOOLS

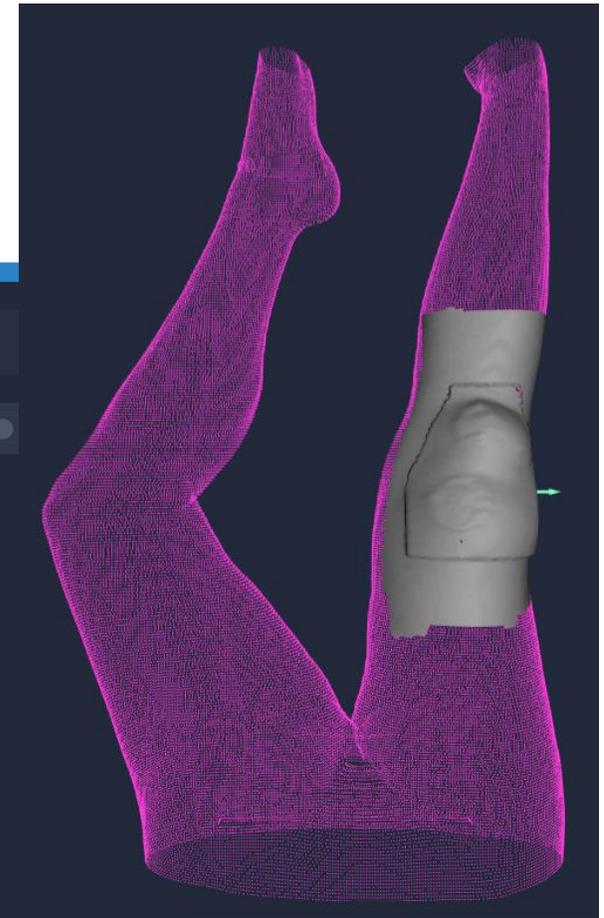
- Deformation to position bolus

The screenshot displays the alignrt software interface for patient alignment. The top navigation bar includes a play button, a crosshair icon, and the patient identifier "RT LEG UFT ISO 1". Below this, there are icons for a shirt and a person, with the text "SGRT SGRT_Bolus" and "tx".

The left panel shows alignment parameters with corresponding numerical values and visual indicators (vertical lines):

Parameter	Value
VRT _{cm}	0.00
LNG _{cm}	0.03
LAT _{cm}	0.02
MAG _{cm}	0.04
RTN [°]	0.0
PITCH [°]	0.0
ROLL [°]	0.0

The central area features a 3D model of a leg with a green bolus. Above the model are camera controls: "Reference", "Treatment", "Couch 0.0°", "Send to Couch", and "Beam Control". A timestamp "27/09/2022 17:43:47" is visible. Below the model is a horizontal bar with a green segment, ranging from -0.30 to 0.30. At the bottom, there are tabs for "Surface", "Deformation", and "Video", along with a "Coaching" dropdown. The status bar at the very bottom shows "alignrt", "Field Status" (off), "System Status" (on), and the time "27/09/2022 17:45".



UTILASTION OF TOOLS

- SSD Checks

SSD Measurements

Field	Gantry	Couch	Plan	Current
01	330.0°	0.0°	90.70cm	91.44cm
02	0.0°	0.0°	93.18cm	93.78cm
03	45.0°	0.0°	93.54cm	94.15cm
04	135.0°	0.0°	90.45cm	Fail
05	165.0°	0.0°	83.85cm	86.92cm
AA	0.0°	0.0°	93.18cm	93.78cm
BB	90.0°	0.0°	92.11cm	92.64cm

Save to Report



UTILASTION OF TOOLS

- Gated Capture

ZZARTBREAST, Right
12/08/2000, ZZARTBREAST

Preparation Treatment

Rt Breast ISO 1 CT SIM SGRT_Patient Tx

Reference Capture

This session only
 This and future sessions

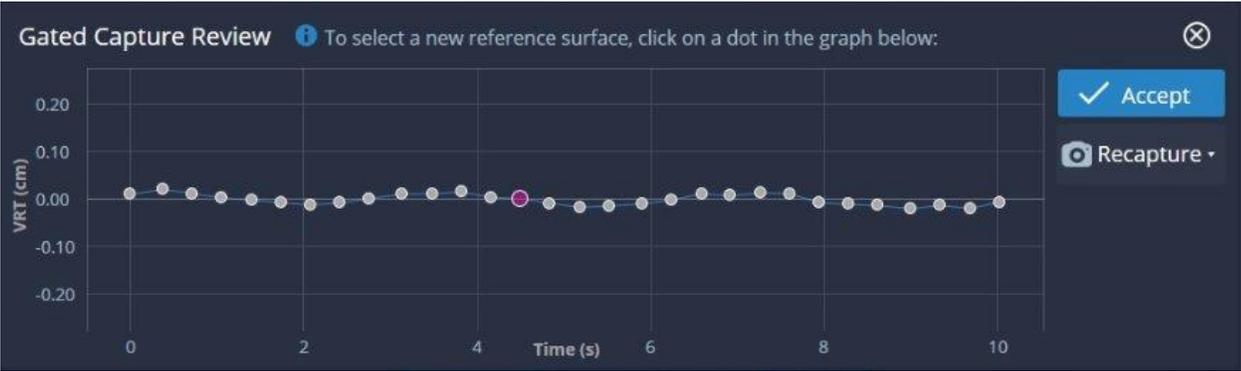
Gated Capture **ON**

Capture

You are going to replace the reference surface. Please make sure your patient is in the correct position or patient mistreatment may occur.

0.25
-0.25

Coaching Surface Deformation Video



UTILASTION OF TOOLS

- Treat with Beam Control

The screenshot displays the alignrt software interface for a patient named ZZMRB_STEEV, PHANTOM. The interface is divided into several sections:

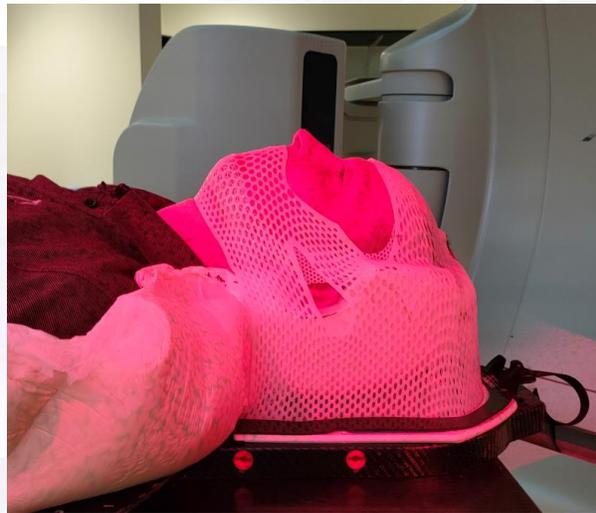
- Header:** Patient name (ZZMRB_STEEV, PHANTOM), date (01/01/2000), and treatment status (Preparation, Treatment).
- Navigation:** A top bar with a pause button, a target icon, and labels for 'SGRT_ISO UFT2 ISO 1', 'SGRT SGRT_Surface', and 'Tx'.
- Position Controls:** A list of parameters with numerical values and visual feedback bars:
 - VRT_{cm}: 0.02
 - LNG_{cm}: 0.02
 - LAT_{cm}: 0.02
 - MAG_{cm}: 0.04
 - RTN[°]: -0.1
 - PITCH[°]: -0.2
 - ROLL[°]: -0.2
- Beam Control:** A section with a 'Beam Control' toggle set to 'ON' and a 'BEAM: ENABLED' indicator with a radiation symbol.
- Surface Deformation:** A central 3D visualization of a patient's head and neck area, overlaid with a green mesh representing the surface deformation. It includes data for 'Current Position' and 'Corrected Position', both showing 'Surface within tolerance: 97%' and 'Average displacement: 0.0cm'. A 'Tolerance Limits' bar is shown below, ranging from -0.3 cm to +0.3 cm.
- Coaching:** A horizontal bar at the bottom of the 3D view, with a green bar indicating the current position relative to the tolerance limits.
- Footer:** The alignrt logo and system status information: 25.3 fps, Field Status (checked), Plan ID Mismatch (warning), System Status (checked), and timestamp 21/11/2023 18:35.



BRAIN SRS – OPEN FACED MASKS

CDR™ Stabilisation:

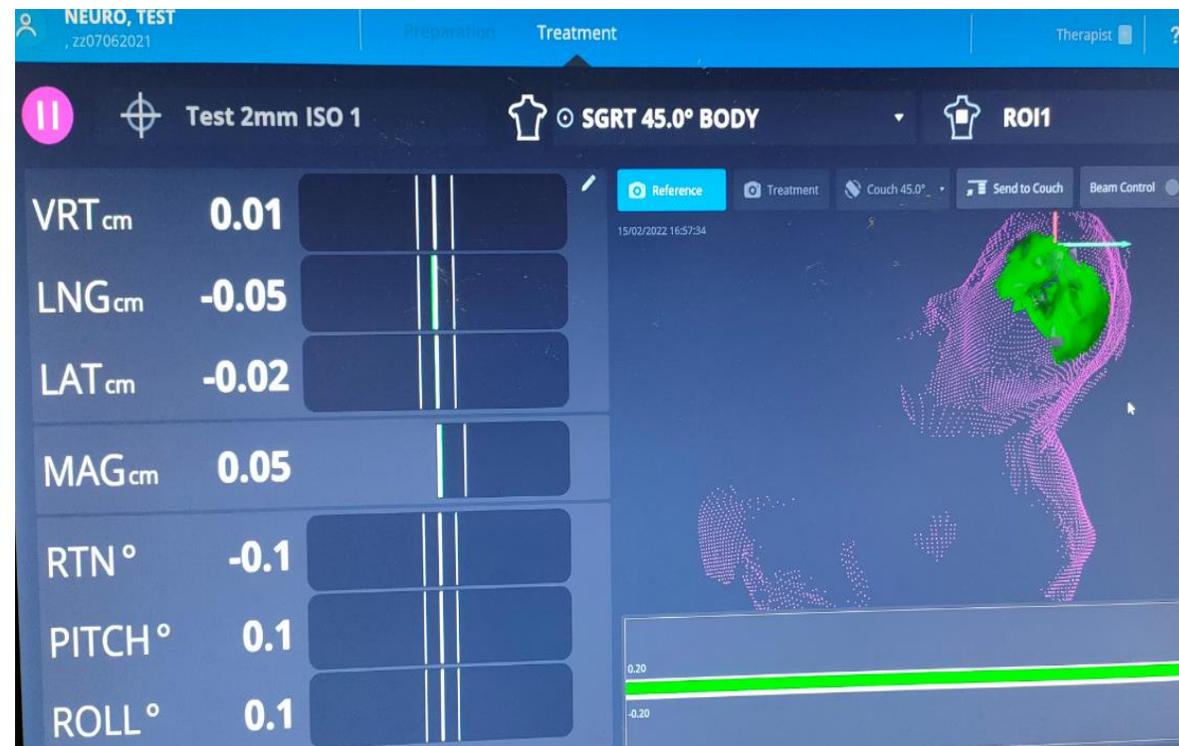
- FreedomX board
- Personalised head & Neck foam support using intuition click
- CDR Open Faced Mask



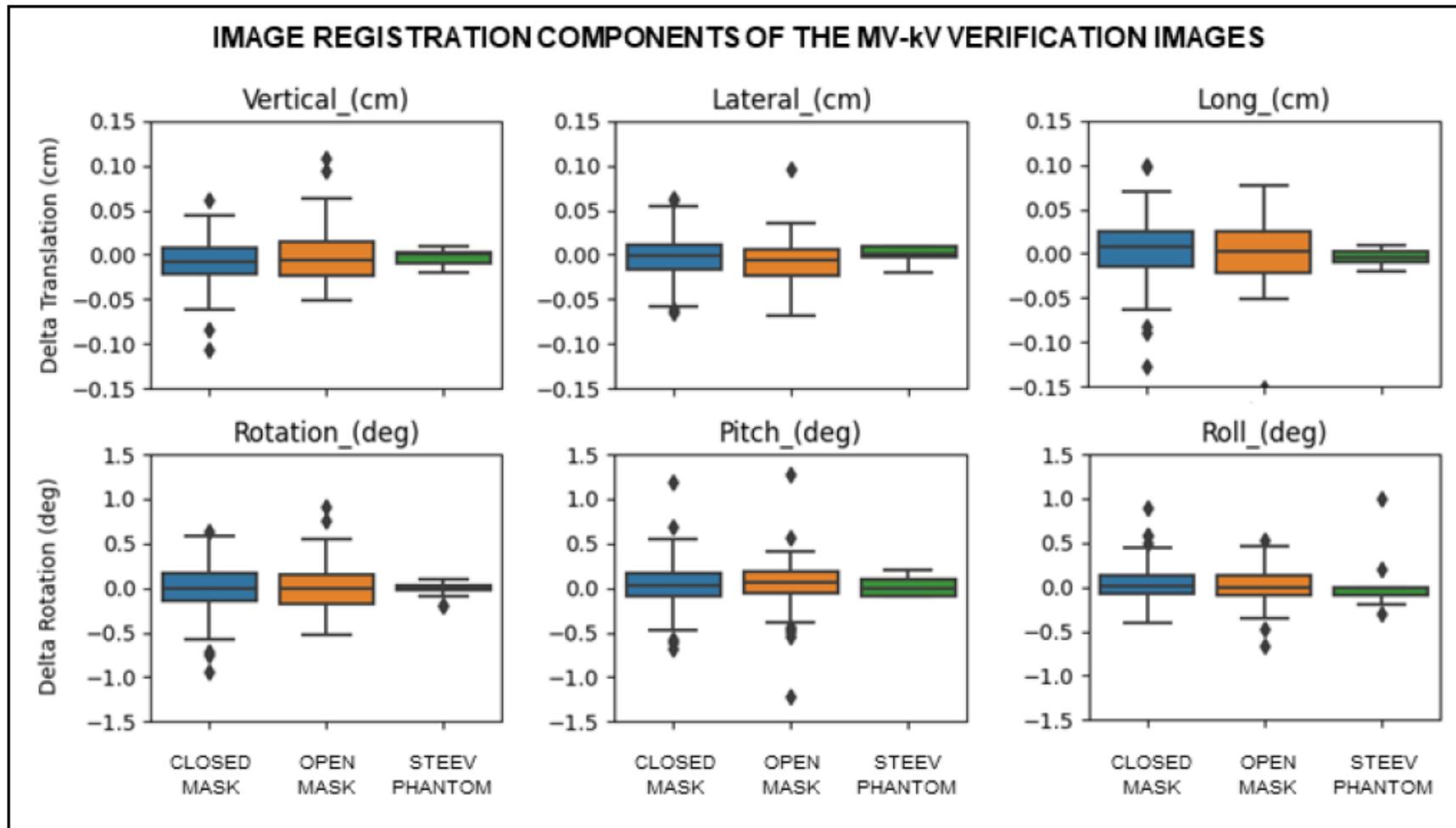
Peter Mac
Peter MacCallum Cancer Centre
Victoria Australia

BRAIN SRS – OPEN FACED MASKS

- Initial patient positioning closer to planned position
- Post CBCT Reference capture for patient monitoring throughout treatment



COMPARISON OF INTRAFRACTION IMAGING SHIFTS FOR CLOSED VS OPEN FACED MASKS



Courtesy: J Hughes PMCC 2022

COMPARISON OF FREQUENCY OF INTRAFRACTION SHIFTS FOR CLOSED VS OPEN FACED MASKS

	Number of couch 45°/315° treatment angles	Repositions Required (n)	Repositions Required (%)
Closed Mask	49	31	63.3%
Open Mask	115	59	51.3%
STEEV Phantom	10	0	0.0%

Table 1: Summary of the number of times a reposition was required at couch 45°/315°. Tolerance of repositioning was 0.05cm/0.5°

Courtesy: J Hughes PMCC 2022



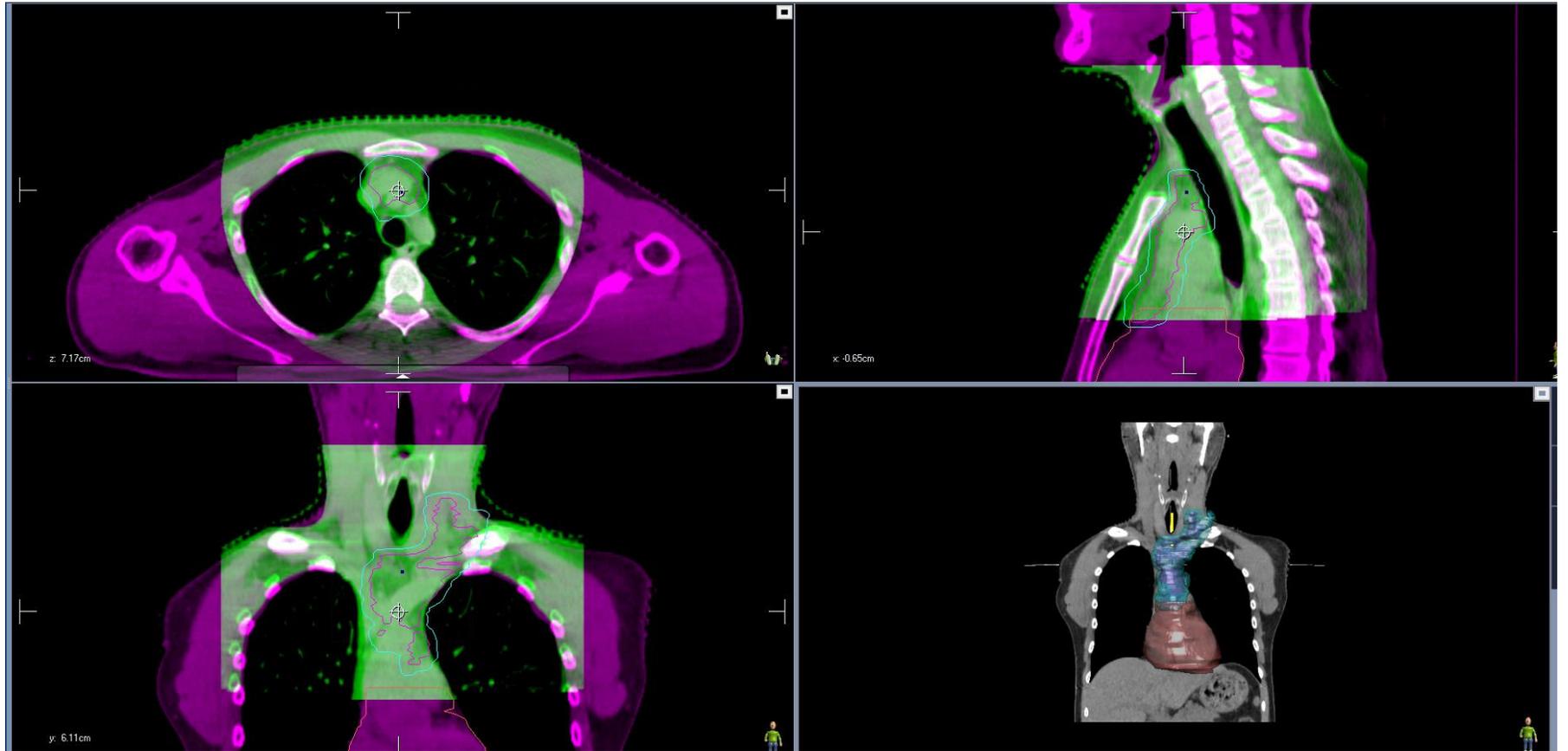
Peter Mac
Peter MacCallum Cancer Centre
Victoria Australia

DIBH

Using RPM & AlignRT concurrently

Advantage of RPM:

- I. Able to employ Gated imaging to ensure CBCT only captured in EBH
- II. Previous confidence in RPM for motion management

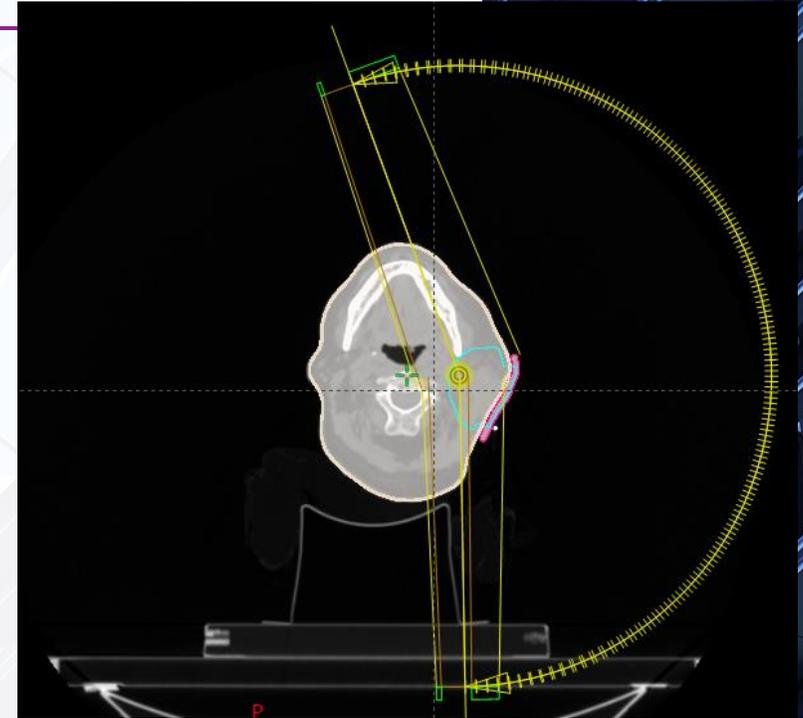
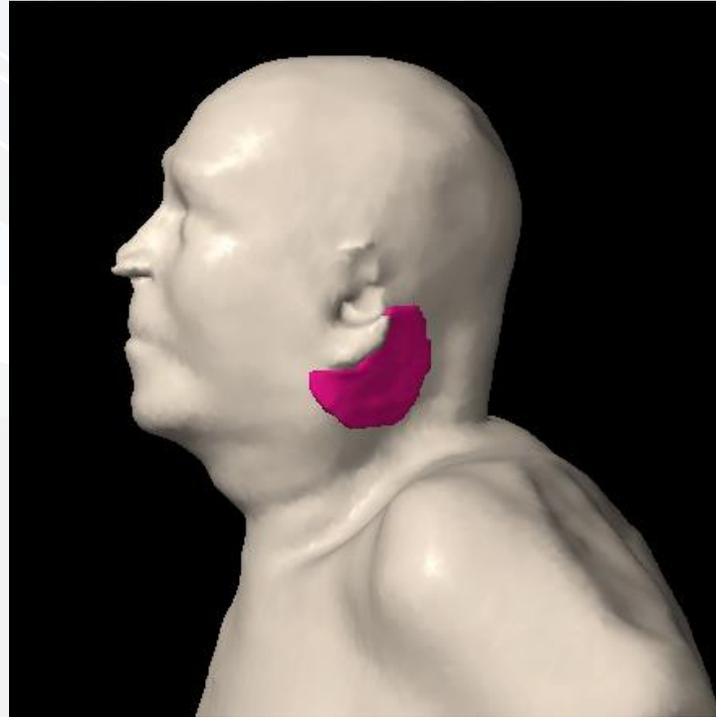
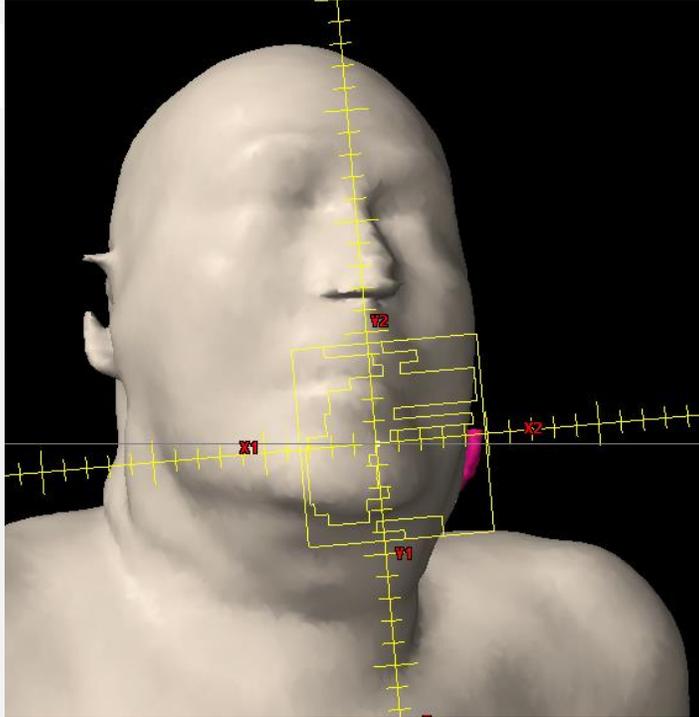


Advantage of AlignRT:

- I. Increased set up accuracy prior to CBCT
- II. Surface tracking of treatment region, in this case the sternum to ensure patient position remains consistent in DIBH



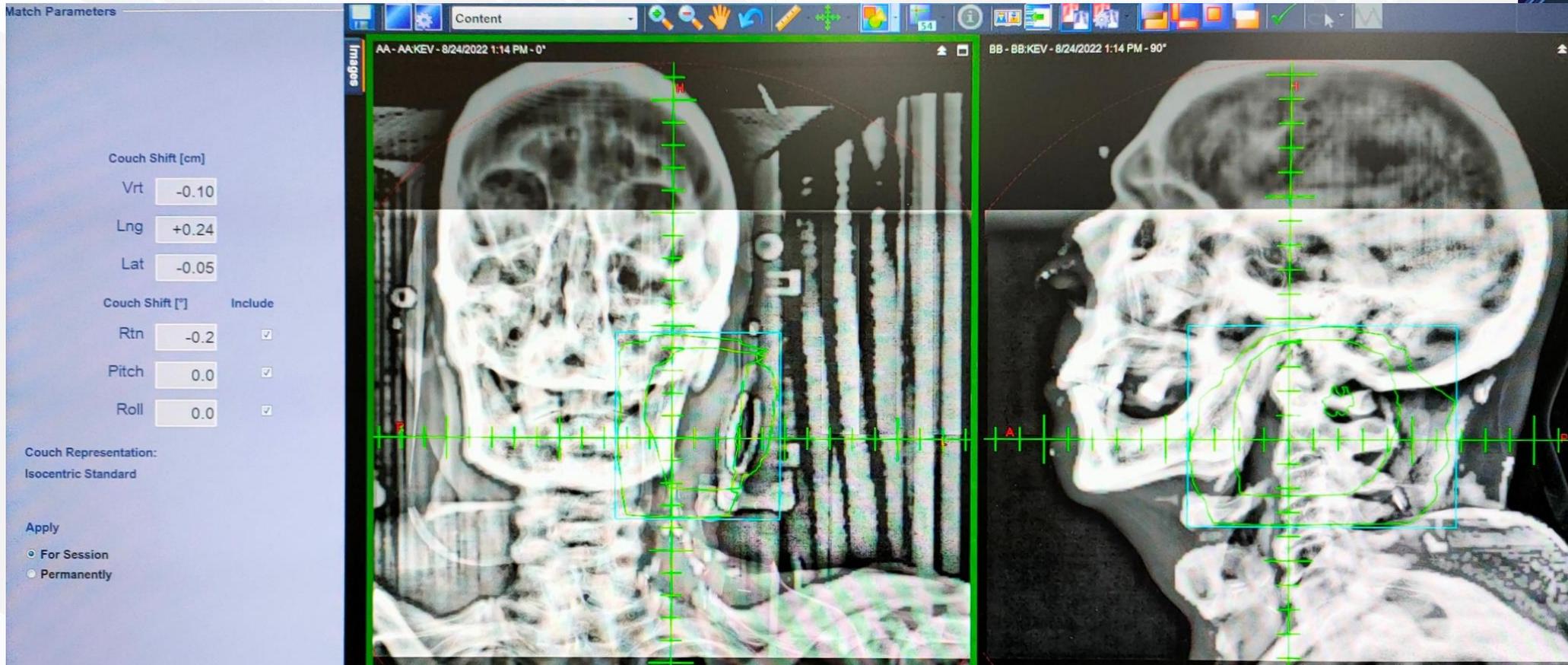
UNUSUAL CASE – MR M - H&N WITHOUT MASK



- H&N patient:
- Unable to tolerate mask, originally palliative intent
- Changed to radical does 70Gy in 35 #
- SGRT – setup & monitoring



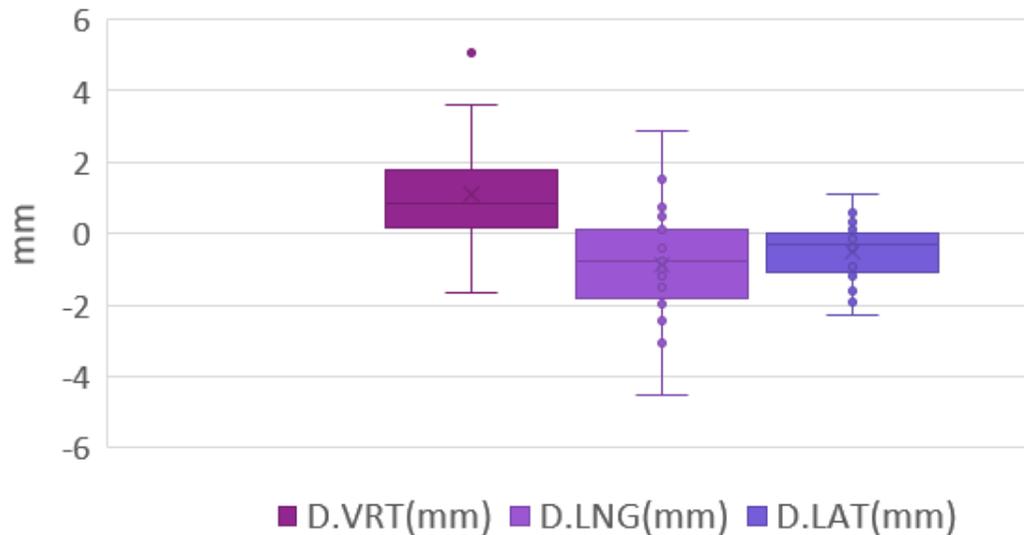
MR M



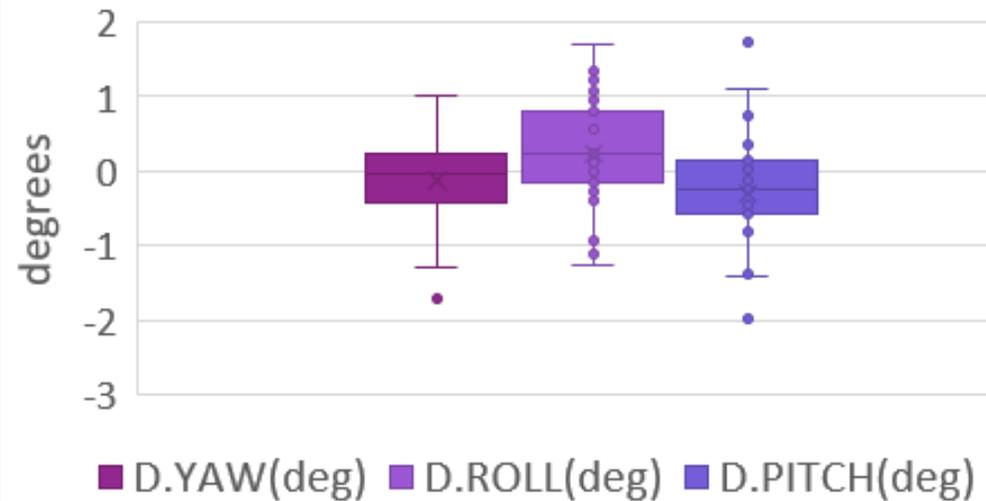
MR M

- IGRT Shifts from initial Setup Surface prior to treatment

Translational Shifts



Rotational Shifts

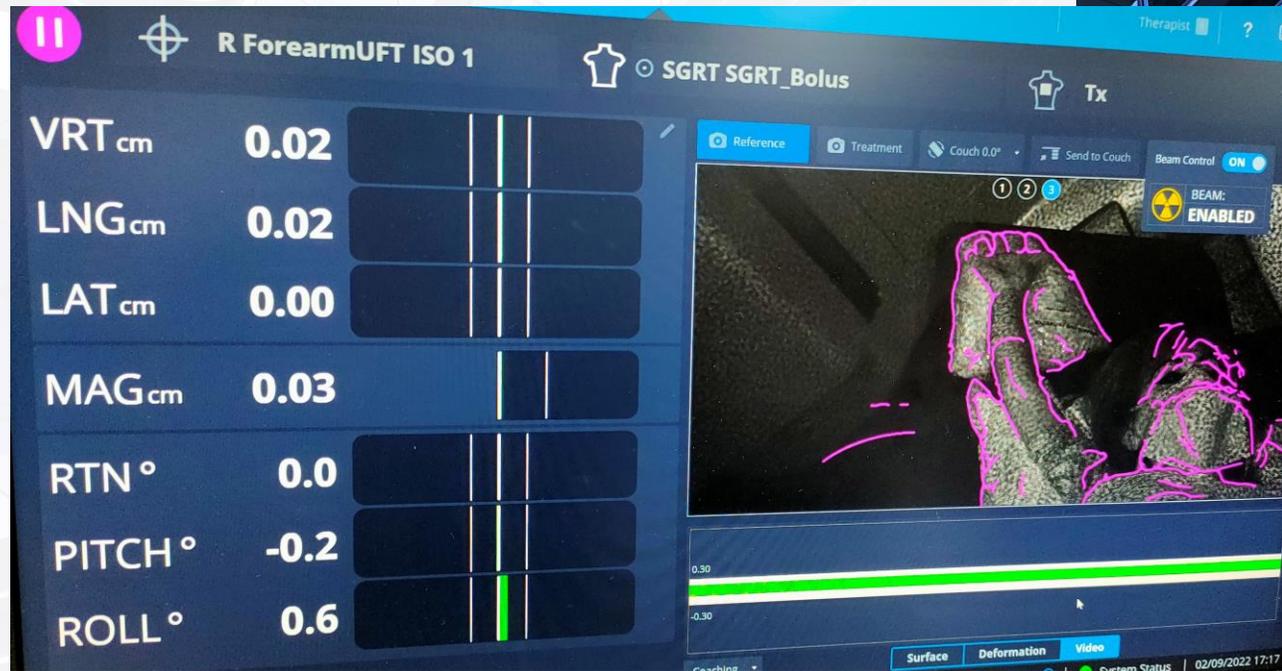
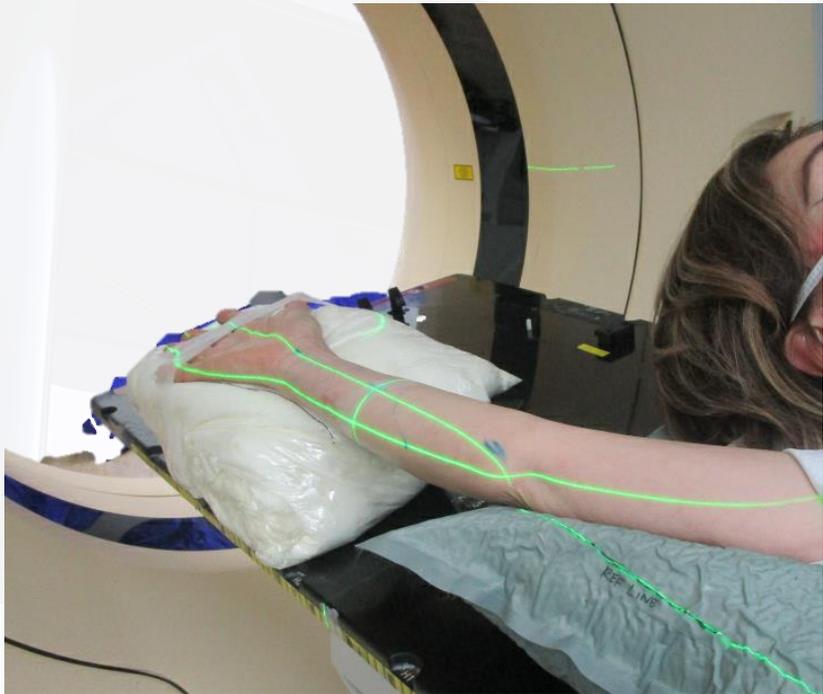


MR M

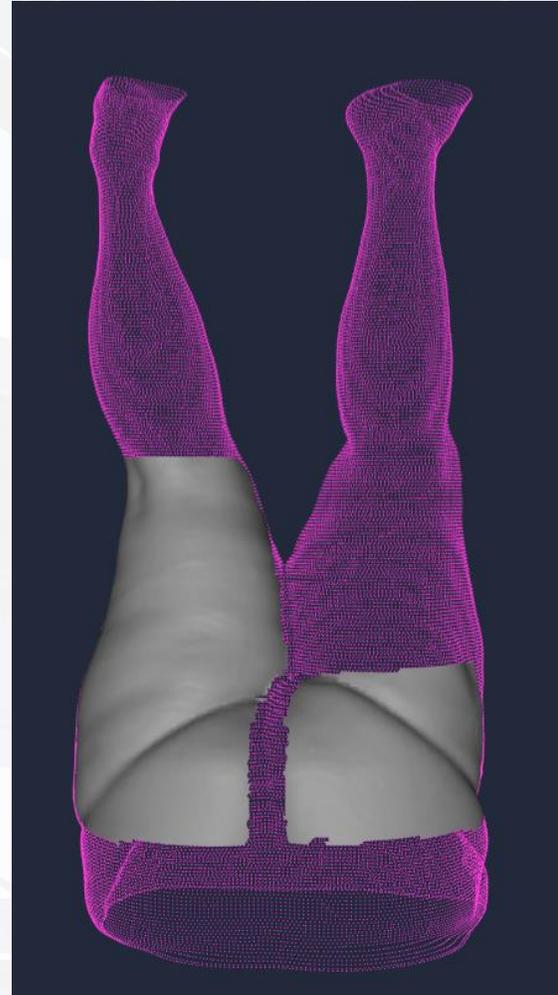
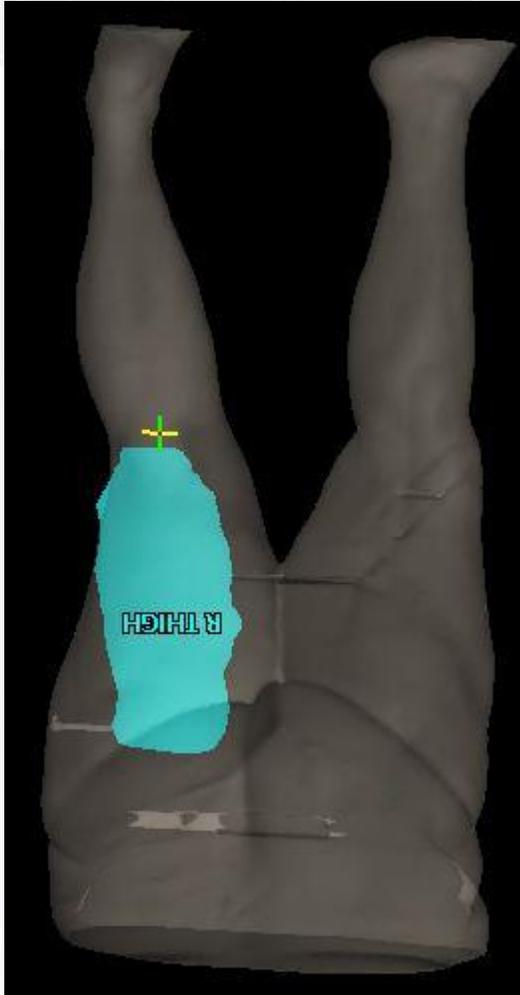


NO LIMB LEFT UNTURNED

- SGRT a total game changer for managing extremities
- Enormous benefit by enabling pitch , rotation & roll to be corrected prior to IGRT
- CBCT with match using 6DoF = increased accuracy of treatment delivery



SARCOMA – POSTERIOR THIGH



R ThighUFT ISO 1 SGRT SGRT_Patient TX

VRT_{cm} -0.01

LNG_{cm} 0.00

LAT_{cm} 0.11

MAG_{cm} 0.11

RTN[°] -0.7

PITCH[°] -0.2

ROLL[°] -0.2

Reference Treatment Couch 0.0° Send to Couch Beam Control OFF

14/09/2022 13:10:33

0.30
-0.30

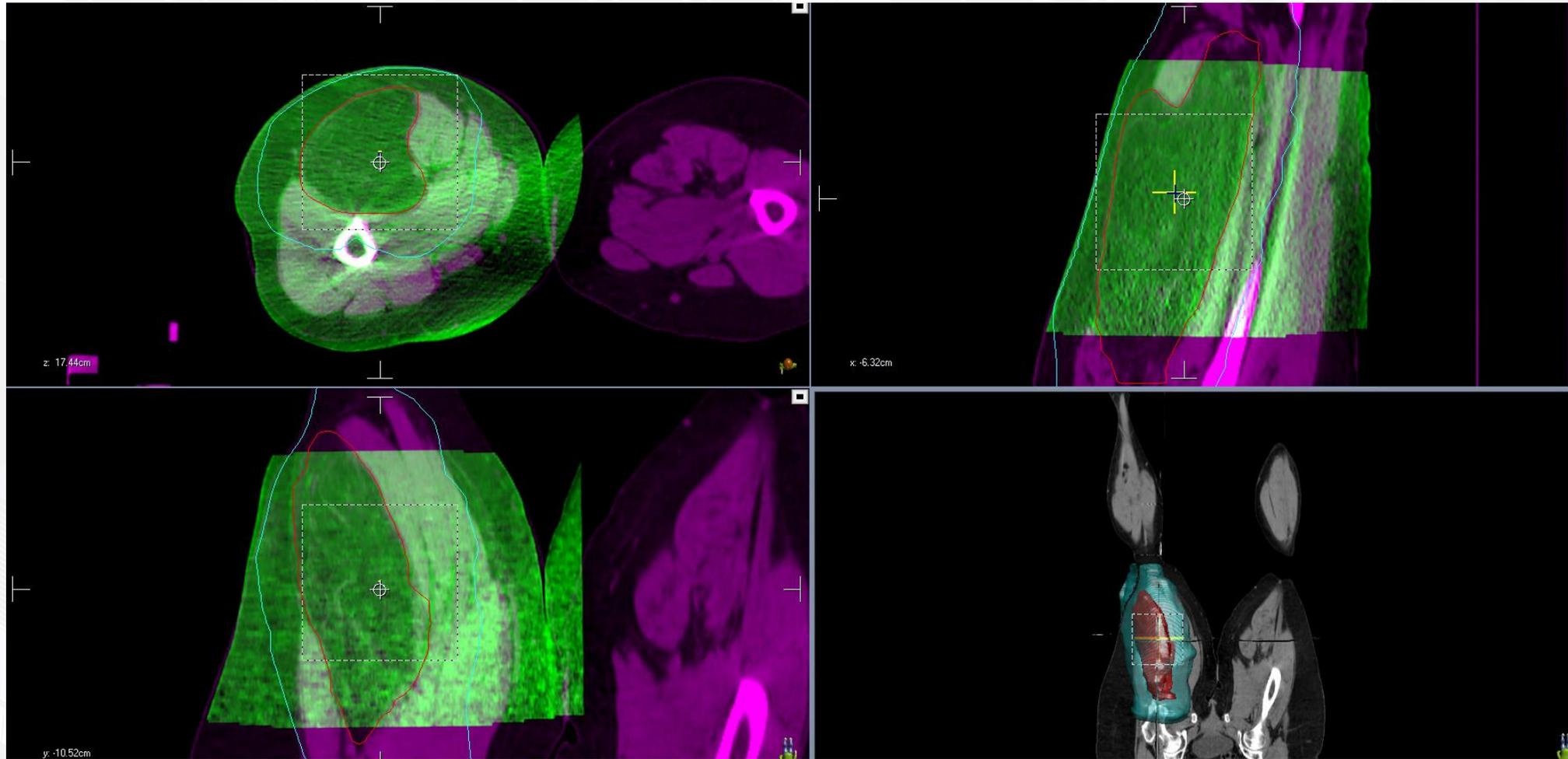
Coaching Surface Deformation Video

alignrt Field Status System Status 14/09/2022 13:13

The screenshot shows the SGRT software interface. On the left, a list of alignment parameters is displayed with their values and corresponding visual indicators (vertical lines). On the right, a 3D model of the patient's lower body is shown with a magenta mesh overlay on the right thigh. The interface includes various controls and status indicators at the top and bottom.



SARCOMA – POSTERIOR THIGH



Peter Mac
Peter MacCallum Cancer Centre
Victoria Australia

SGRT GROUP

- Cross Campus group
- Initially met every 2 weeks
- Discussed complex cases
- Supported & co-ordinated training needs
- Developed training materials for non-standard scenarios and new staff/re-orientation of staff
- A forum to raise topics for potential projects and research opportunities
- Promoted publications on SGRT



ADDITIONAL RESOURCES

Documents > Instructional Guide Library > 3_Treatment > AlignRT

 Name ▾

-  3_Treatment_AlignRT_Cheat sheet.pdf
-  3_Treatment_AlignRT_CSI workflow.pptx
-  3_Treatment_AlignRT_DeformationCheck_MonolsoBreast.pptx
-  3_Treatment_AlignRT_Extended SSD.pptx
-  3_Treatment_AlignRT_FOV guide.pptx
-  3_Treatment_AlignRT_PreTx check.pptx 
-  3_Treatment_AlignRT_ProblemSolvingGuide.pptx
-  3_Treatment_Authorisation Quick Ref guide.docx
-  3_Treatment_Beam control & send to couch funtion for AlignRT & TB.pdf
-  3_Treatment_ROI Flipbook guide.pdf
-  3_Treatment_Software troubleshooting tips.pptx



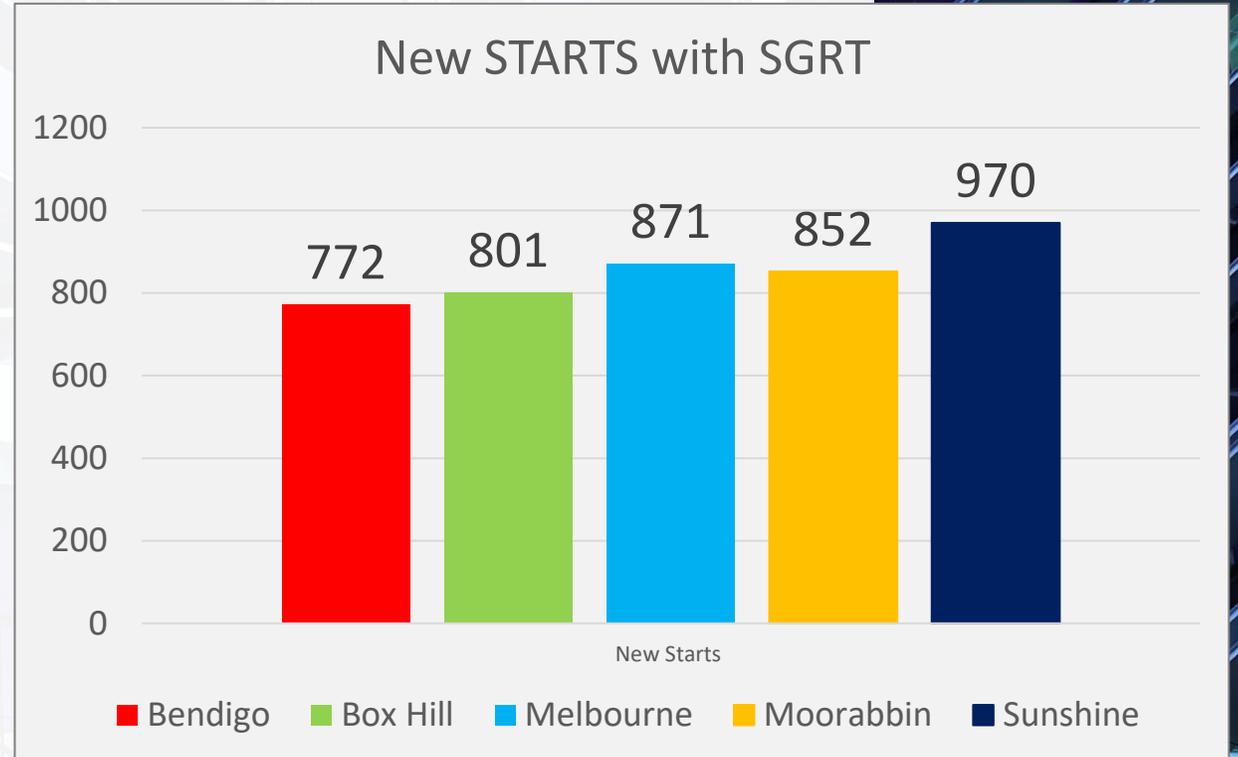
Peter Mac
Peter MacCallum Cancer Centre
Victoria Australia

SINCE IMPLEMENTATION @PMCC

- New starts – over 4000 patients
- 187 staff completed Online Learning modules and hands on training

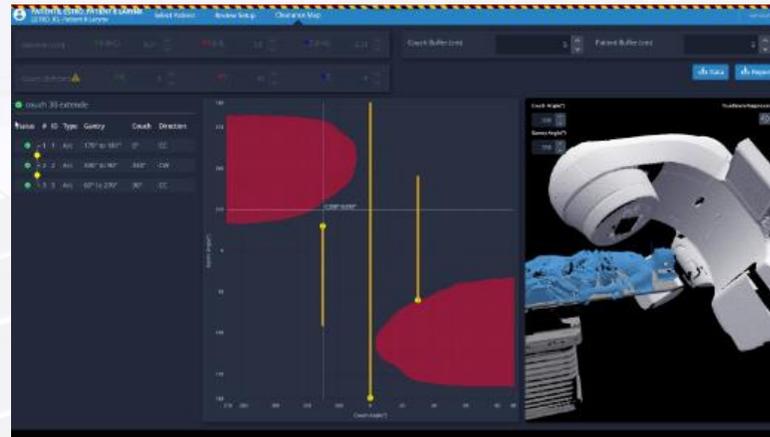
STAFF FEEDBACK:

- Less manual handling
- Works well for extremities
- Very good for DIBH Breast treatments
- Open masks for Brian SRS better comfort for patients & no compromise to stability



FUTURE DIRECTIONS

- 11 th system April 2024 - only 5 linacs to go!
- End goal **EVERY** patient – tattoo free & treatment monitoring
- MapRT – June 2024
Collision avoidance - resolve current issues
Increase non-coplanar planning



OUR TEAMS



Peter Mac
Peter MacCallum Cancer Centre
Victoria Australia