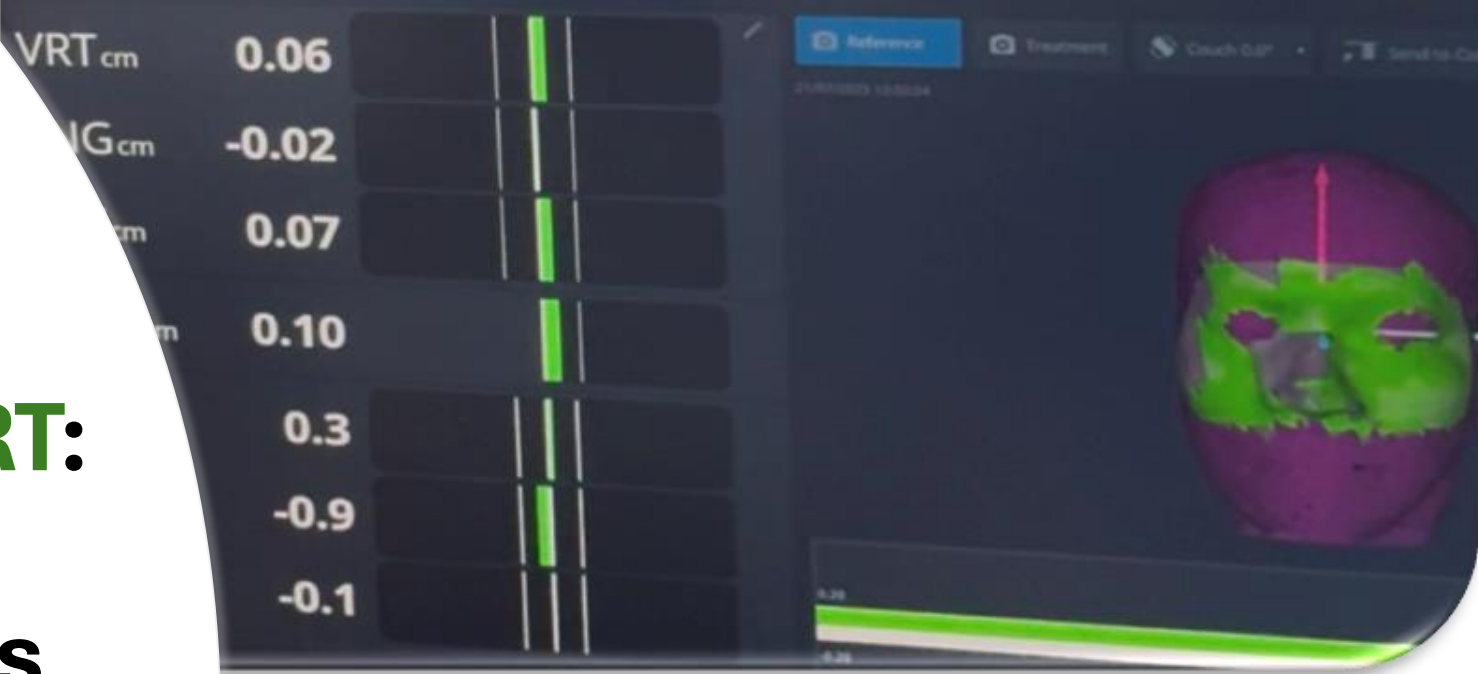


Open-Face Mask
Double Shell with SGRT:
A Better Approach for
Brain SRS/SRT Patients

Mr. Adisak Teerakaew
Radiation Therapist
Bangkok Cancer Hospital
(Wattanosoth)



Wattanosoth Hospital is a specialized cancer care hospital in Bangkok Thailand that focuses on comprehensive services for

- Cancer prevention
- Diagnosis
- Treatment
- Supportive care

using advanced medical technology and multidisciplinary expert teams. It is recognized internationally and accredited by the Joint Commission International (JCI).

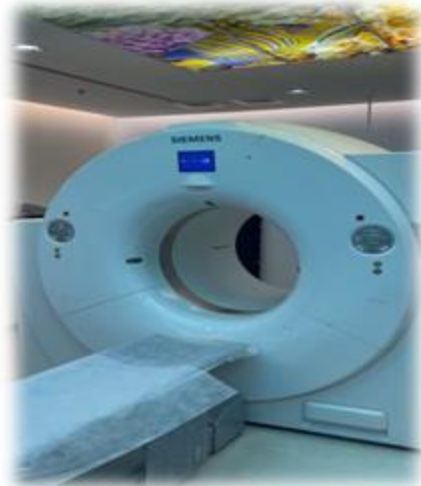




The Radiation Oncology Department has provided comprehensive radiotherapy services for more than 20 years (in 2005). Approximately 900 patients are treated per year, covering a wide range of tumor sites.

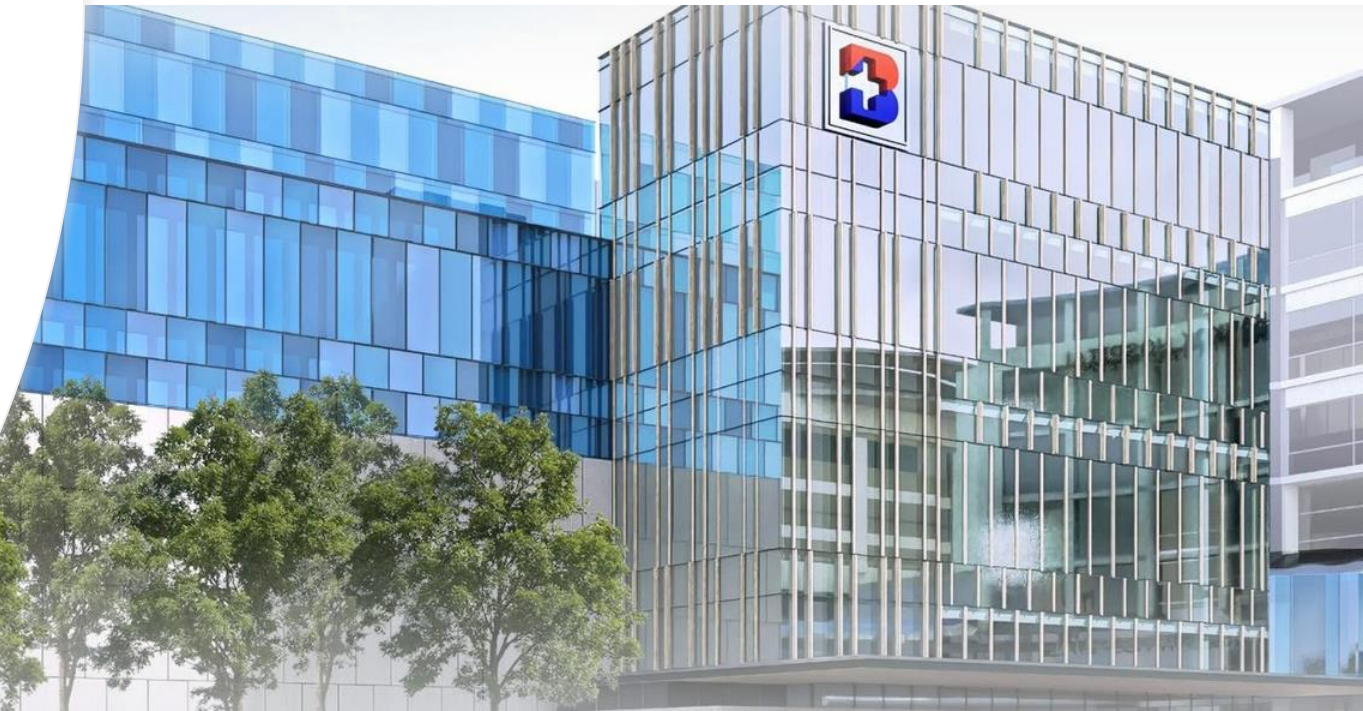
Advanced radiotherapy facilities

- 3 Linear Accelerators:
 - Varian Vital Beam
 - Varian Edge
 - Varian True Beam
- 1 CT Simulator (Philips Big Bore)
- Dedicated PET/CT for radiotherapy planning
- 1 Brachytherapy unit
- Fully integrated treatment planning and image-guided workflow



Bangkok Proton Center

- Bangkok Hospital plans to establish a Proton Therapy Center that is **expected to begin operations in 2029**, offering advanced proton therapy for complex cancers where high precision is critical, such as brain, spinal, and pediatric cancers.

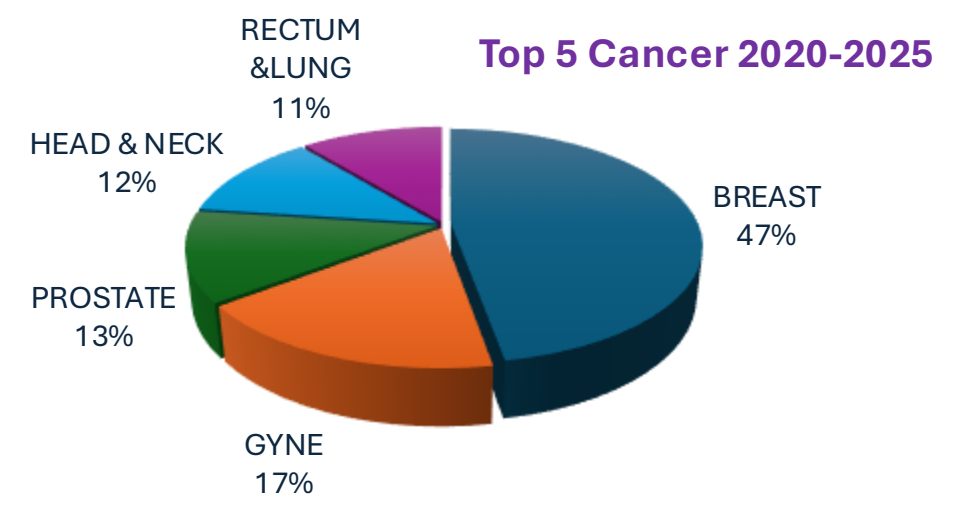
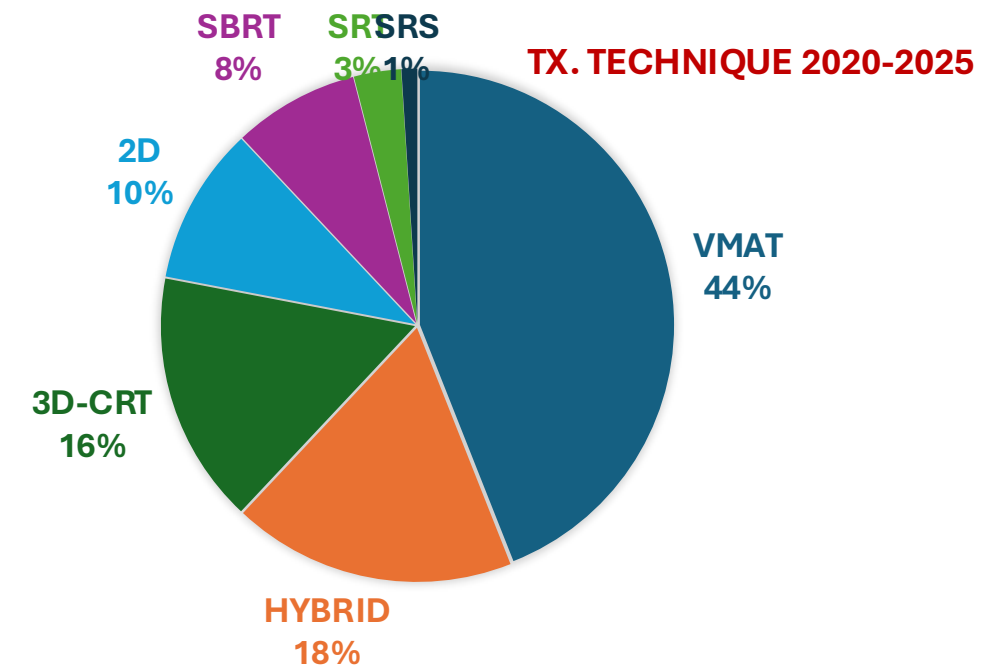
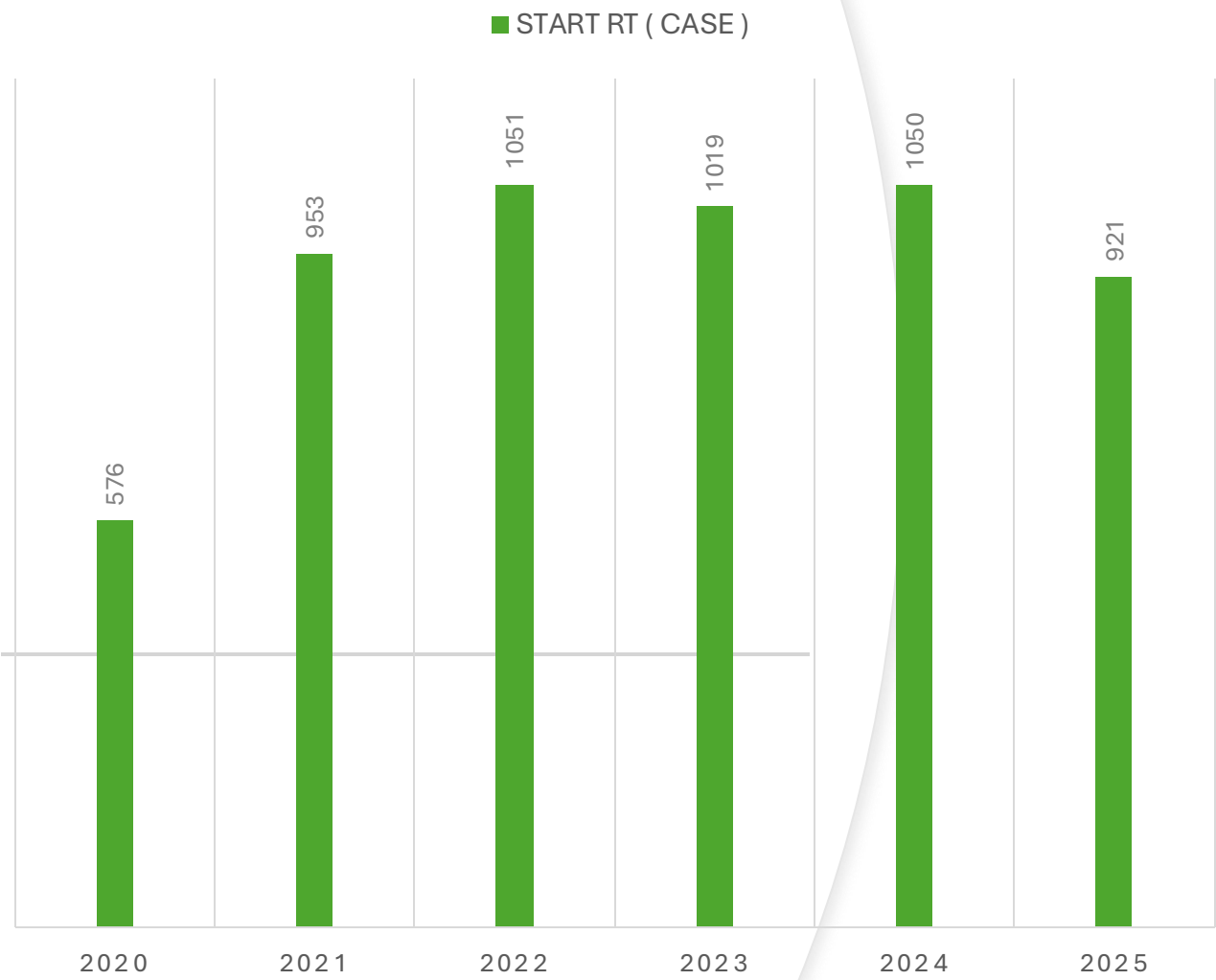


Full time staff

- 6 Radiation oncologists
- 6 Medical physicists
- 12 Radiation therapists
- 8 Oncology nurses
- 1 Head of Department
- 1 Administrative officer



START RT (NEW CASE) 2020-2025



■ BREAST ■ GYNE ■ PROSTATE ■ HEAD & NECK ■ RECTUM & LUNG

Traditional Treatment Approach for Brain SRS/SRT

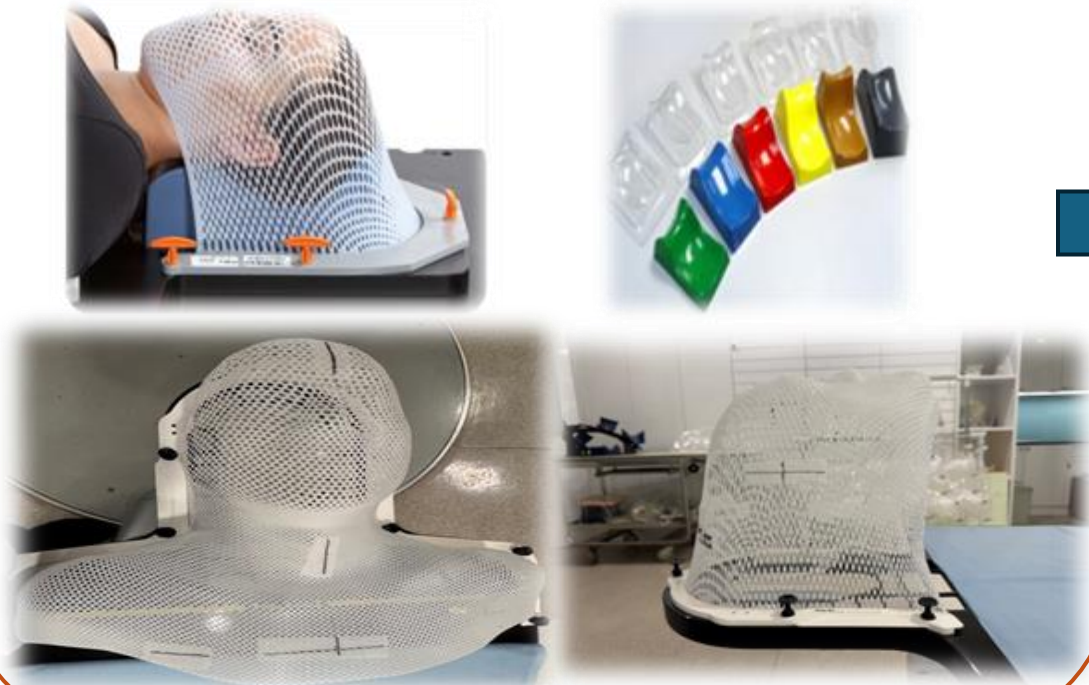
These treatments use: **High dose per fraction** , **Small target volume**, **Very steep dose gradient**

If the patient moves, there is a risk of missing the target or overdosing critical organs

So, precise setup and good immobilization are essential.

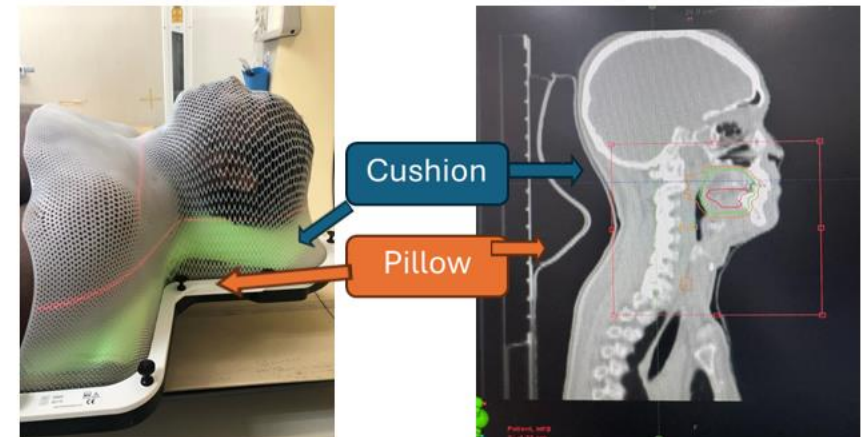
traditionally, SRS and SRT treatments rely on: **Closed mask & Head support**

Limitation: Uses a standard design and cannot be fully customized for individual patients



Cushion Head Support

Improves head and neck support, enhancing positioning accuracy; **however, it does not address patient claustrophobia or limitations associated with closed-face masks.**



Limitations of Traditional Closed – Face Mask

1. Patient Discomfort and Anxiety

Claustrophobia / Breathing difficulty:
Nasal congestion or respiratory issue.

2. Setup and workflow challenges:

Closed face mask molding techniques (Molding quality)

More time consuming to mold compared to open face mask.

Mask shrinkage over time.

Patient might move underneath the mask during treatment –
cannot be detected.

3. **Limited patient communication** during treatment delivery

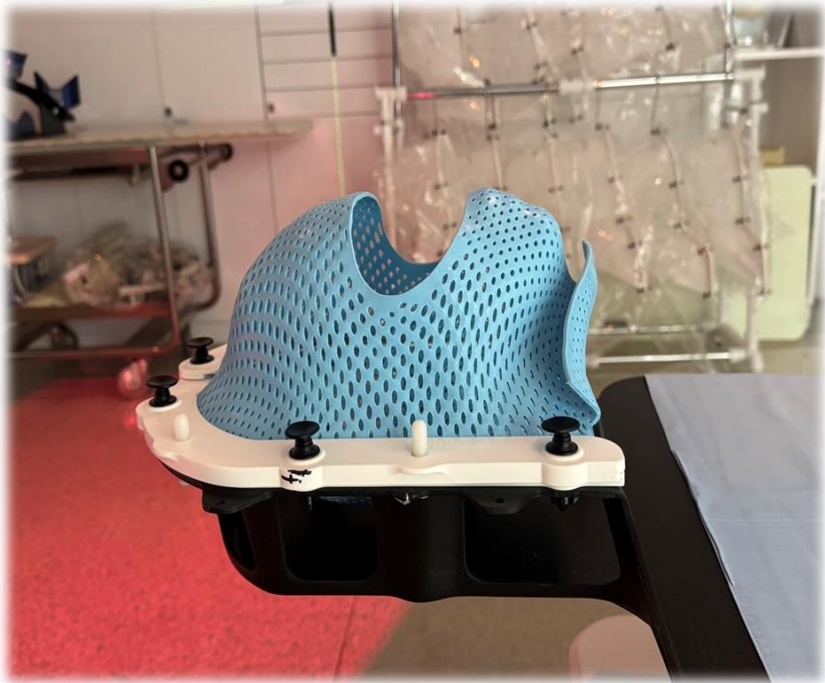
4. **Facial pressure and irritation** , especially in prolong treatment

5. **Limited visual monitoring of patient condition and breathing**

6. **Accuracy and Precision:**

Setup Errors / Fitting issue caused by weight loss or swelling
can lead to setup errors during radiotherapy

A change to open face mask double shell...



Open face mask + Cushion Head Support

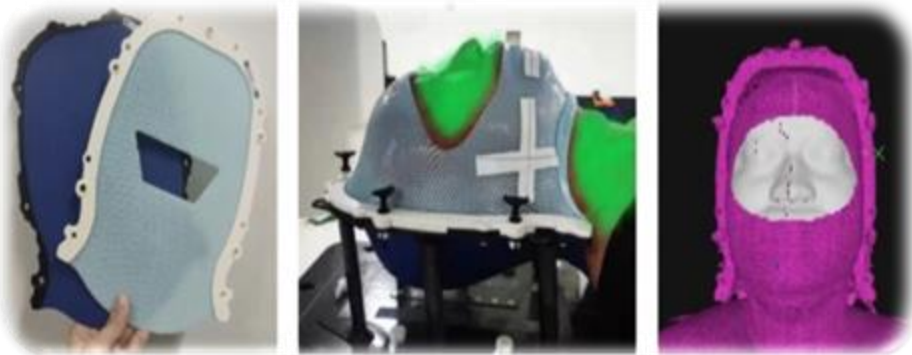
Individual customization around the neck and occipital bones, and secure fit for each patient.

Benefits and Features

- Enhanced immobilization stability
- Improved reproducibility between fractions
- Better compatibility with SGRT (Non-ionizing, enable non-coplanar real time monitoring)
- Increased patient comfort with open-face design

Practical Notes from Our Experience

- Proper head positioning during mask molding is critical
- Ensure sufficient mask tightness without compromising comfort
- Pay attention to shoulder and neck support
- Consistent landmark exposure for reliable surface tracking





Role of AlignRT in SRS/SRT

What AlignRT Can Do in SRS/SRT

- Initial patient setup without radiation
- Real-time intrafraction motion monitoring
& non-coplanar real time monitoring
- Automatic beam hold if motion exceeds tolerance
- Improved patient safety and confidence

Overall, AlignRT enhances both precision and workflow efficiency



Materials and Methods



Patient Cohort: Retrospective study (2020–2025)

45 patients treated with cranial SRS/SRT

Treatment schedule	1–5 fractions per patient
Treatment platform	Varian EDGE linear accelerator
Immobilization technique	Open-face double-shell thermoplastic mask
Position verification	Cone-Beam CT (CBCT)
Setup and Monitoring	AlignRT Surface-Guided Radiotherapy (SGRT)
Evaluated parameters:	Translational errors: Vertical, Longitudinal, Lateral Rotational errors: Pitch, Roll, Yaw

CT Simulation:

- Create SGRT-friendly immobilization

Planning:

- Create accurate head contour (DICOM)
- Export plan and head contour to SGRT system

Prepare data in SGRT system:

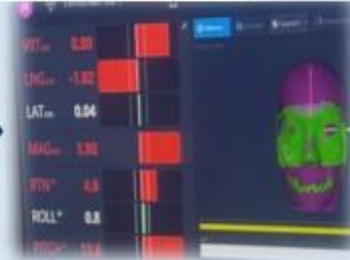
- Import plan and head contour
- Select ROI and settings including thresholds

Positioning for Treatment:

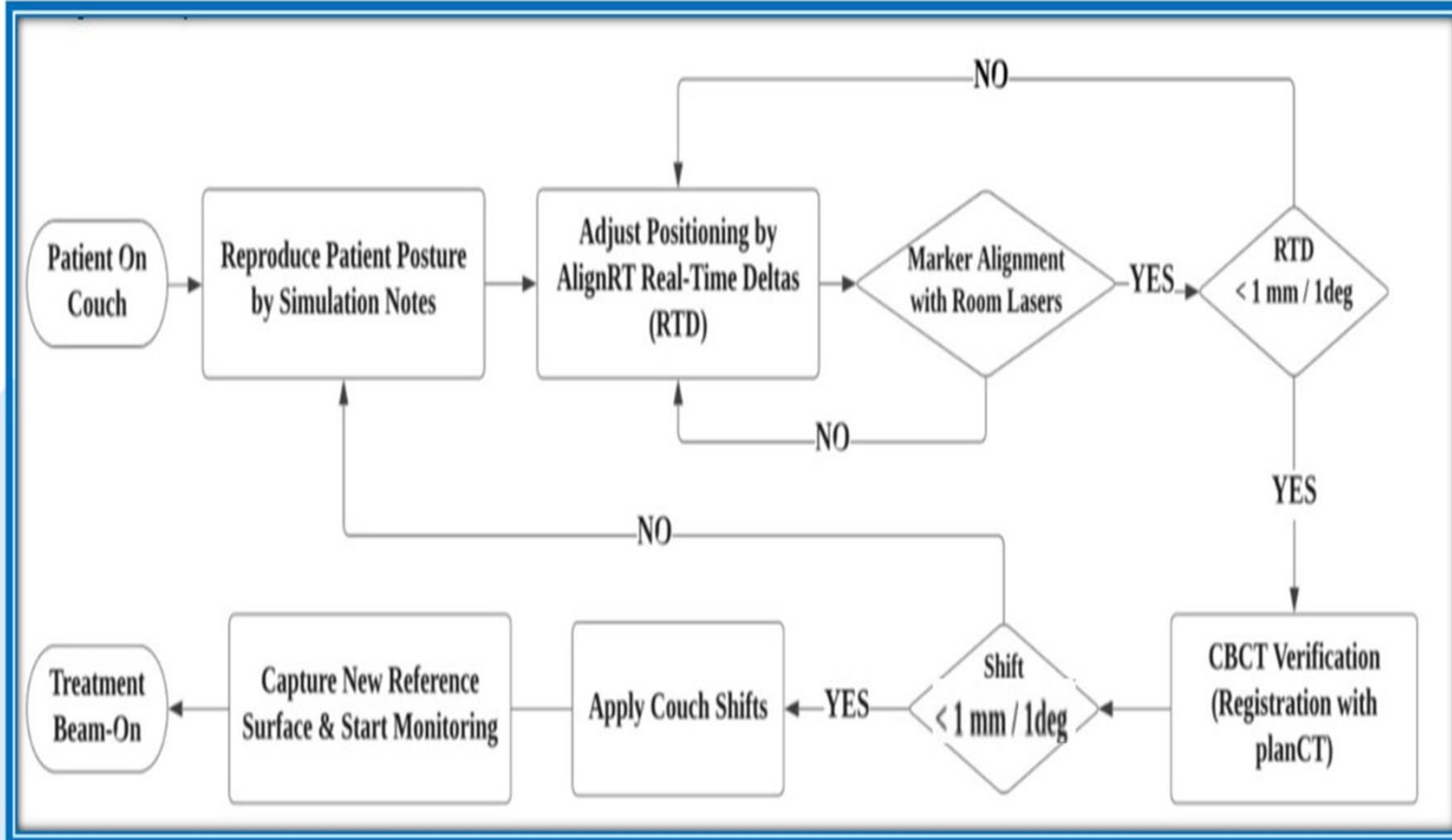
- Initial positioning with aid of SGRT head contour
- X-ray based target localization (e.g., CBCT)
- Acquire new SGRT surface at treatment position

Treatment:

- SGRT monitoring of new reference surface
- If motion exceeds tolerance, go back to "Positioning for Treatment"

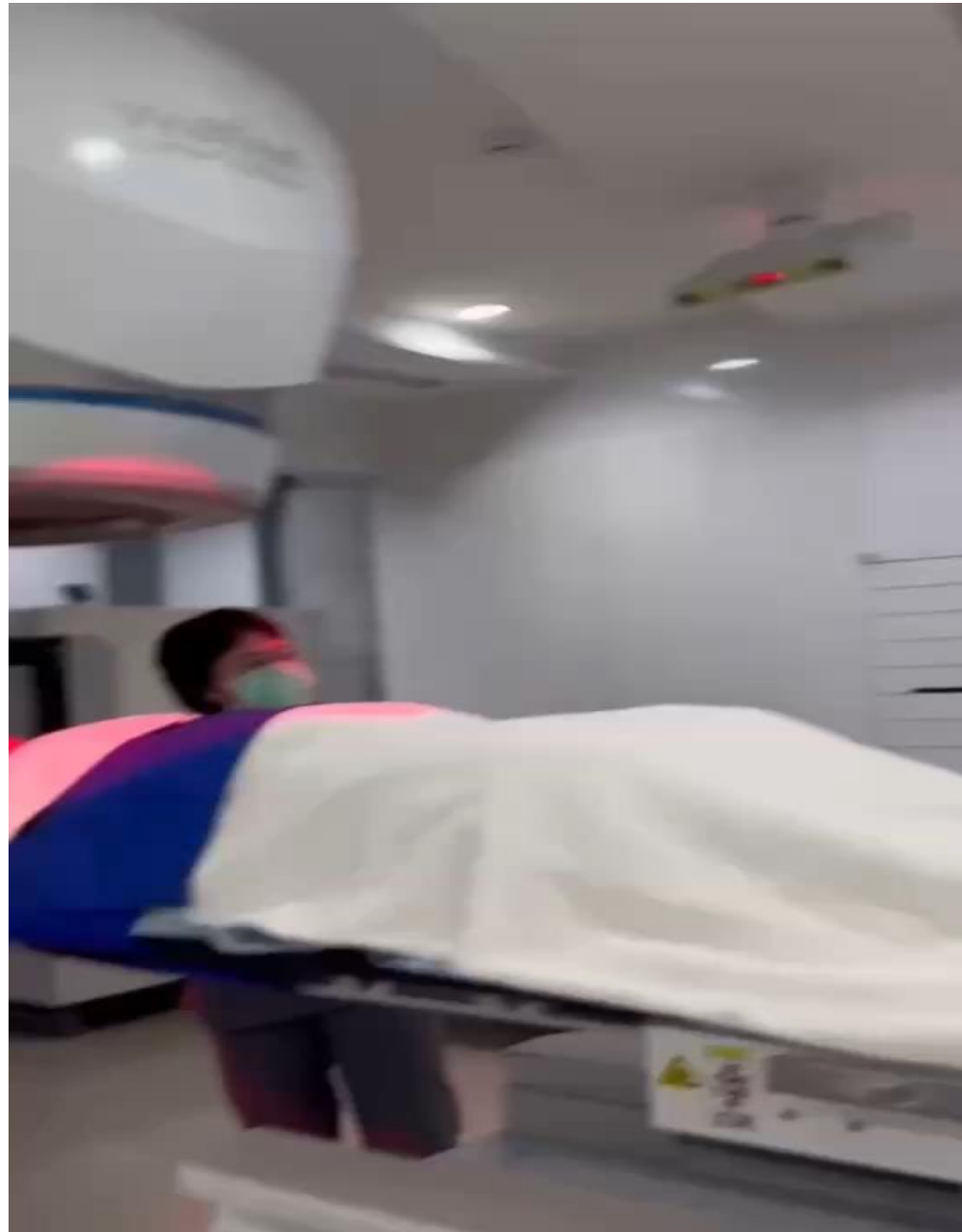
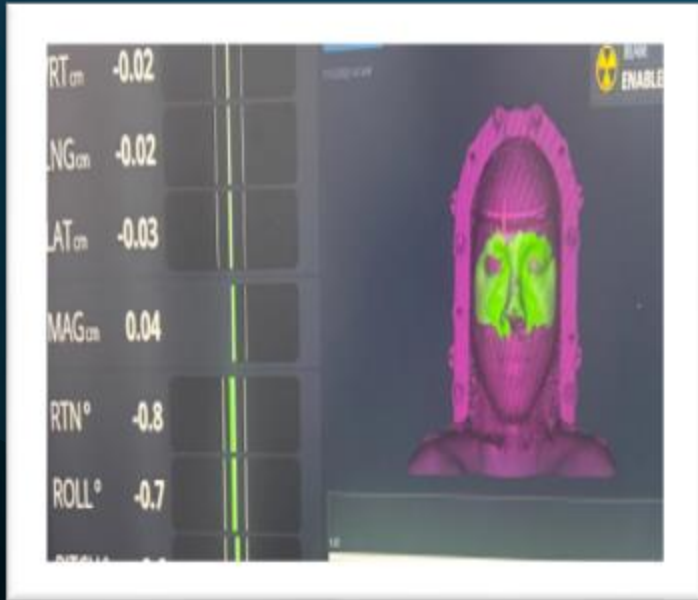


SG-SRT/SRS positioning workflow

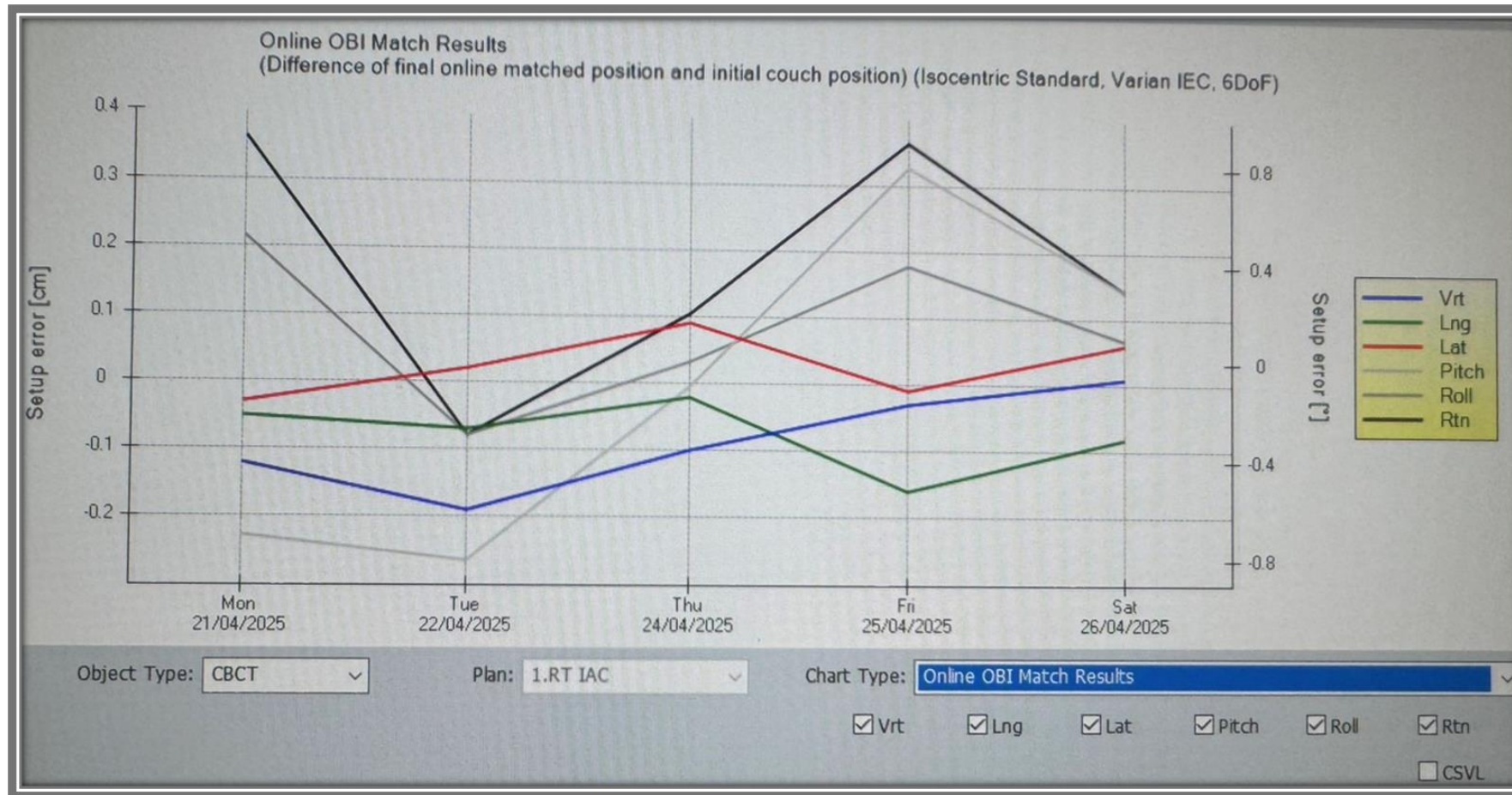


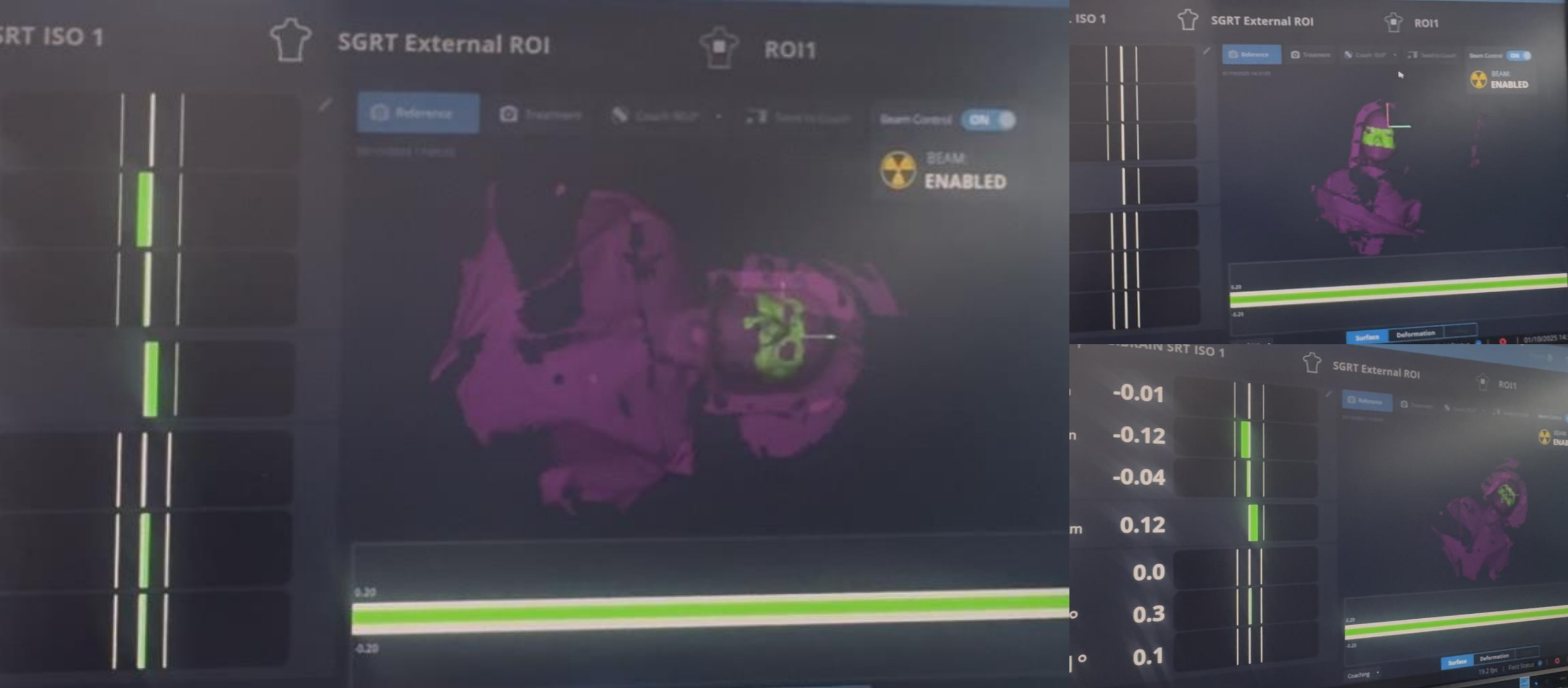
Case study 1 :

Co-planar monitoring
(Couch Rotation 0°)



Result Case study 1 : (Couch Rotation 0°)



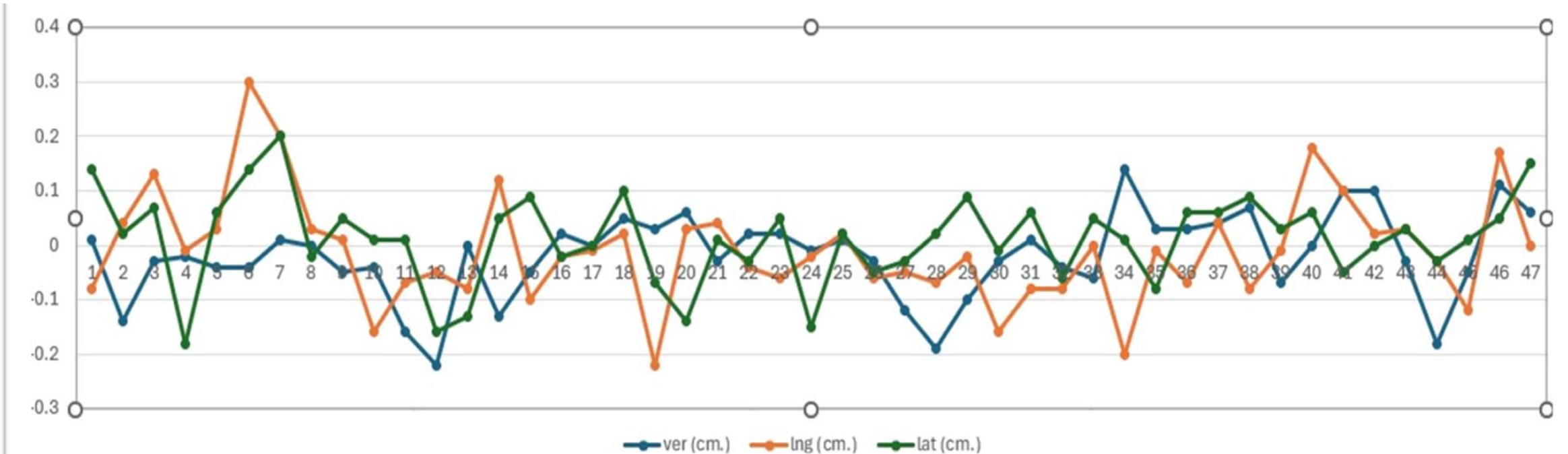


Case study 2: non-coplanar monitoring
(Couch Rotation 15° , 45° , 90°)



Result Case study 2 : non-coplanar monitoring (Couch Rotation 15°, 45°, 90°)





Results – Setup Accuracy 45 patients treated with cranial SRS/SRT

- Sub-millimeter and sub-degree accuracy achieved

Mean translational errors:

- Vertical: 0.7 ± 0.3 mm
- Longitudinal: 0.8 ± 0.4 mm
- Lateral: 0.6 ± 0.3 mm

• Mean rotational errors:

- Pitch: $0.7 \pm 0.4^\circ$
- Roll: $0.6 \pm 0.3^\circ$
- Yaw: $0.8 \pm 0.4^\circ$

Results – Reproducibility and Comfort

- All patients within 1 mm / 1° tolerance

- High setup reproducibility confirmed

- Reduced immobilization time

- Improved patient comfort

- Patient-reported outcomes:

- 95% high satisfaction

- Better breathing

- Reduced anxiety

- Improved communication with therapists





• Discussion – Clinical Impact

- Reliable and patient-friendly immobilization technique

Combination of:

- SGRT real-time tracking
- CBCT verification
- Optimized double-shell structure

Clinical benefits:

- Reduced motion uncertainty
- Maintained patient comfort
- Improved therapist visibility and interaction
- Increased patient confidence and cooperation



Conclusion

Open-face double-shell with SGRT provides:

- Superior immobilization accuracy
- High precision (< 1 mm / 1°)
- Improved patient comfort
- Better workflow efficiency
- More effective than traditional closed-face masks
- Highly suitable for cranial SRS/SRT on Varian Edge



**Thank you for your
attention**