

THE 2026 US SGRT
COMMUNITY MEETING

A WHOLE NEW WORLD OF SGRT



Future of SGRT

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SURFACE GUIDED RADIATION THERAPY

The Future of SGRT

From motion management to workflow intelligence

A clinical perspective on adaptive, automated, integrated care

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Disclosures

- AdventHealth – Parker has a PSA agreement with Vision RT.
- AdventHealth – Celebration has a COE agreement with Vision RT.

Why this conversation, why now

1

WORKFLOW PRESSURE

Patient volumes up, staff capacity flat

Clinics need throughput without losing precision. SGRT is positioned to absorb that load.

2

TECHNOLOGY CONVERGENCE

Adaptive, AI, and proton are maturing

Each one demands richer surface, motion, and identity data — exactly what SGRT provides.

3

PATIENT EXPECTATIONS

Tattoo-free, mask-free, dignified care

Patient experience is now a quality metric, not a nice-to-have. SGRT enables both.

Three forces are converging — and SGRT is increasingly central to the answer.

PART 1 OF 3

What's going on

Setup • Motion Management • Breath Control • Precision

AdventHealth's SGRT Radiation Oncology Therapy Workflow



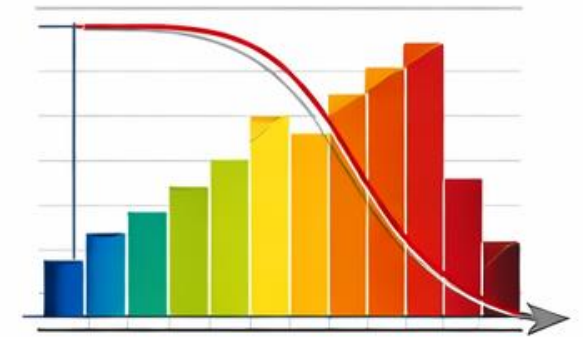
Sim



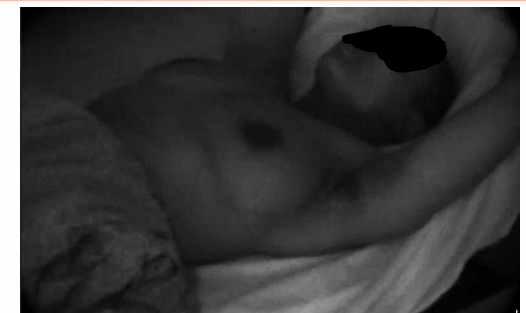
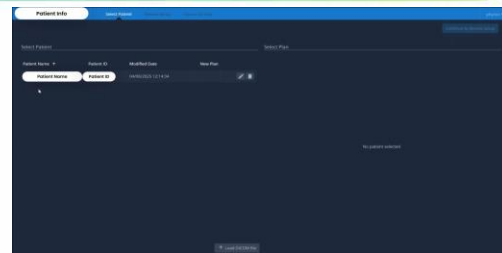
Plan



Treat



Dose



Four established pillars of clinical use

01

Initial Setup

Sub-mm patient alignment without skin tattoos. Reduces shift volumes and bony-anatomy reliance.

02

Active Motion Management

Continuous tracking with automatic beam-hold when the patient drifts beyond tolerance.

03

DIBH for Breath Control

Reproducible breath-hold gating reduces OAR doses and improves long-term outcomes.

04

SRS / SBRT Precision for All Patients

SGRT provides sub-mm intrafraction confidence.

These four pillars are mature, validated, and increasingly considered standard of care.

Four new applications emerging in clinical use

01

Surface Based Planning

Using 3D reconstructed surface to assist in clinical treatment plan design and to validate safe delivery of complex treatments (i.e. Noncoplanar treatments)

These four pillars are new or emerging within the SGRT framework, validation and significant workflow integration are required.

Summary of Non-Coplanar Planning Since 2020

Site	Advantage Magnitude	Key Study	Disadvantage Magnitude	Recommendation
GBM / High-grade glioma	✓✓✓ (16% OAR reduction)	In Vivo, 2025	⚠ Longer planning/delivery	Use non-coplanar (HyperArc preferred)
Brain metastases (SRS)	✓✓✓ (Superior CI: 0.91 vs 0.77)	JACMP, 2024	⚠ Planning complexity	Use HyperArc or CyberKnife
HS-WBRT	✓✓✓ (Critical hippocampal sparing)	PubMed, 2023	⚠ Moderate planning burden	Use non-coplanar regardless of delivery method
Head & neck	✓✓✓ (2–7 Gy parotid reduction)	Adv Rad Oncol, 2025	⚠⚠ Delivery time, QA	Consider DSA or NC-VMAT; weigh efficiency
Cervical (ovarian-sparing)	✓ (Modest bowel benefit)	ScienceDirect, 2025	⚠⚠ Workflow complexity	Coplanar VMAT preferred; NC-VMAT for selected cases
Liver SBRT	✓✓✓ (140 cc OAR reduction at 10 Gy)	JACMP, 2024	⚠⚠ High MUs, delivery time; ring gantry unavailable	Use non-coplanar on C-arm; problematic on Halcyon/Ethos
Lung SBRT	✓✓✓ (V20 ↓11%, GI ↓7.3%)	PMC Meta-analysis, 2021	⚠⚠ MUs, setup complexity	Use non-coplanar VMAT; consider oblique arcs
Prostate (intact)	✓ (Marginal)	GVSU, ongoing	⚠⚠⚠ High planning/delivery cost for modest benefit	Coplanar VMAT adequate; reserve non-coplanar for exceptional cases

Based on peer-reviewed literature published 2020-2025 | OAR = Organ at Risk, CI = Conformity Index, HS-WBRT = Hippocampal-Sparing Whole-Brain RT

Summary of Non-Coplanar Planning Since 2020

Literature Review

Study

In Vivo. 2025 Mar 3;39(2):1009–1021. doi: 10.21873/invivo.13906

A Dosimetric Comparison of HyperArc Therapy Planning and Volumetric Modulated Arc Therapy Planning in Treating Patients With Glioblastoma Multiforme

J Appl Clin Med Phys . 2024 Aug;25(8):e14404. doi: 10.1002/acm2.14404. Epub 2024 May 27.

Dosimetric comparison of HyperArc and InCise MLC-based CyberKnife plans in treating single and multiple brain metastases

Med Dosim . 2024;49(2):85-92. doi: 10.1016/j.meddos.2023.08.010. Epub 2023 Nov 27.

Dosimetric comparison of coplanar and noncoplanar volumetric modulated arc therapy for hippocampal-sparing whole-brain radiation therapy

Adv Radiat Oncol. 2024 Dec 30;10(3):101706. doi: 10.1016/j.adro.2024.101706. eCollection 2025 Mar.

Dosimetric Comparison of Noncoplanar VMAT Without Rotating the Patient Couch Versus Conventional Coplanar/Noncoplanar VMAT for Head and Neck Cancer: First Report of Dynamic Swing Arc

Journal of Radiation Research and Applied Sciences Volume 18, Issue 2, June 2025, 101531

Dosimetric comparison of coplanar and noncoplanar volumetric modulated arc therapy for ovarian-sparing cervical cancer radiation therapy

J Appl Clin Med Phys. 2024 Sep;25(9):e14396. doi: 10.1002/acm2.14396. Epub 2024 Jun 18.

Serial and parallel organ-at-risk-specific noncoplanar arc optimization for small versus large target volumes in liver SBRT

J Appl Clin Med Phys. 2021 Feb 26;22(4):34–43. doi: 10.1002/acm2.13197

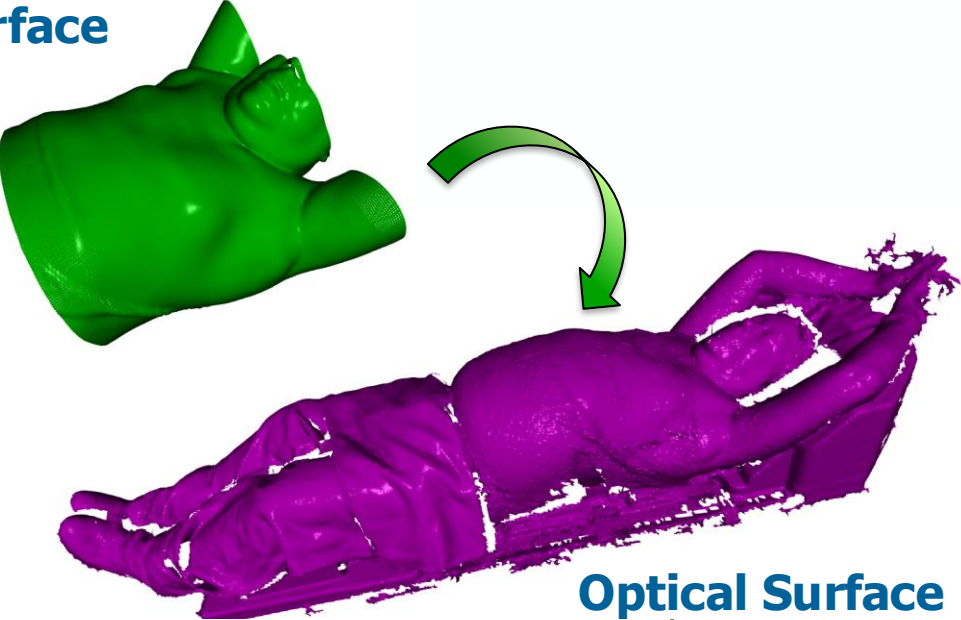
Dosimetric comparison of coplanar and noncoplanar beam arrangements for radiotherapy of patients with lung cancer: A meta-analysis

Grand Valley State University ScholarWorks@GVSU

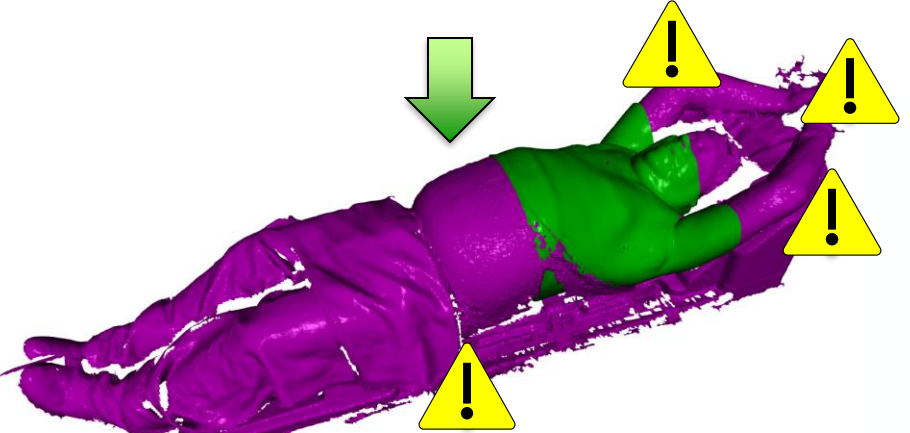
Evaluating coplanar and noncoplanar treatment plans for the Varian Halcyon and Varian Truebeam for intact prostate patients.

Combining 3D Volumetric and 3D Surface Information for Planning

CT Surface

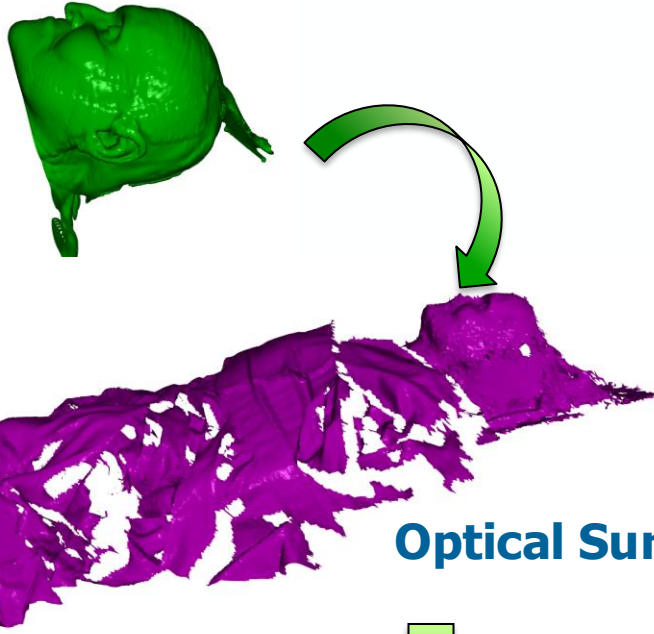


Optical Surface



Merged Result

CT Surface

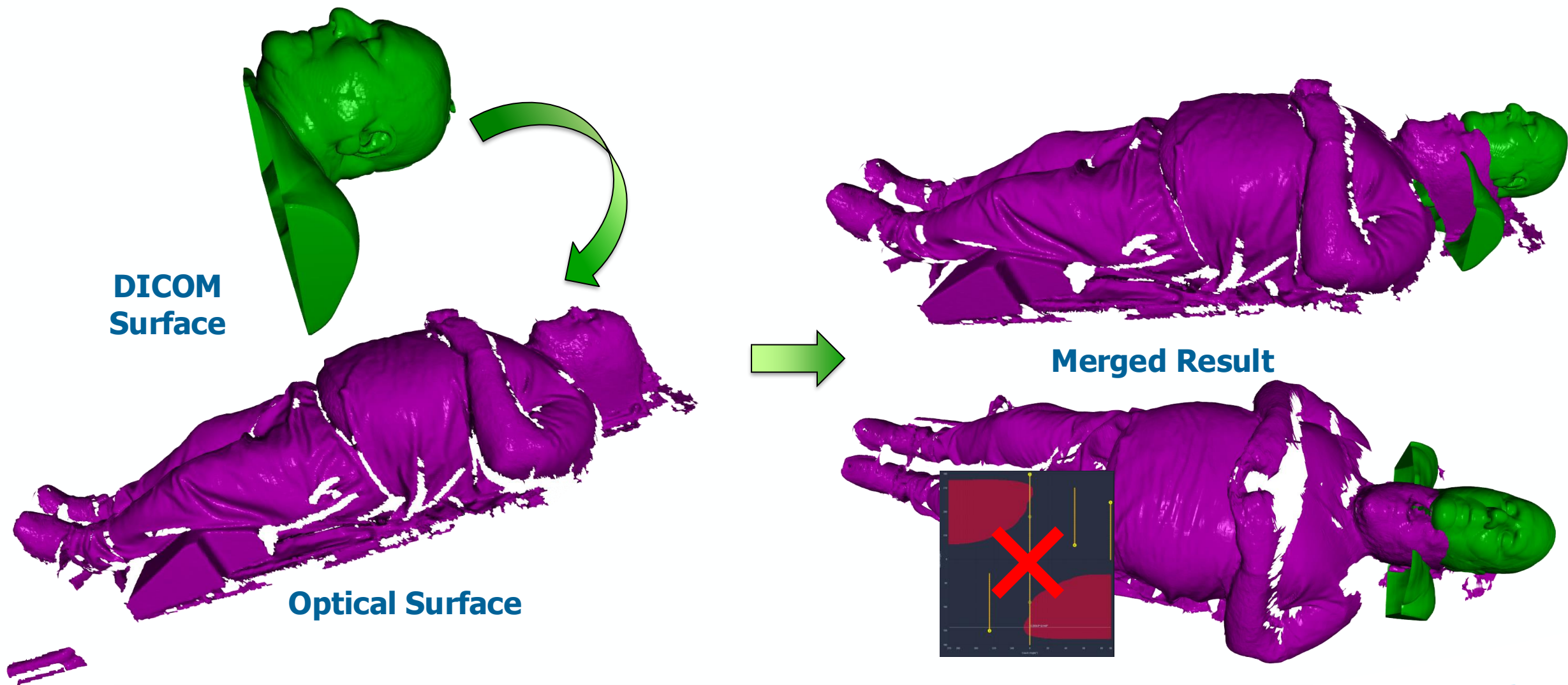


Optical Surface



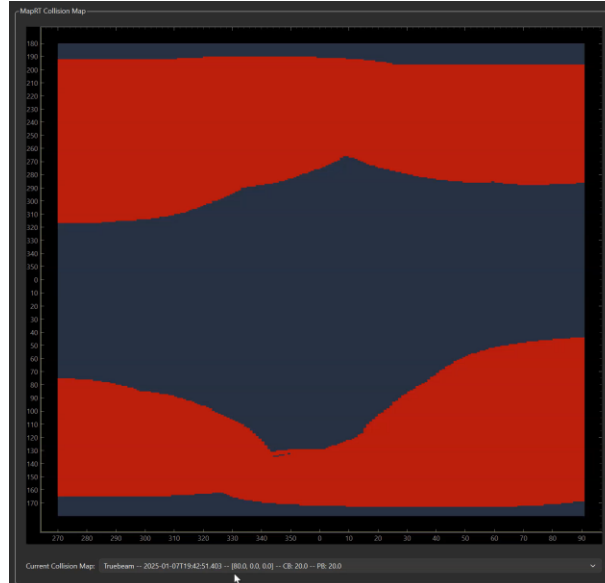
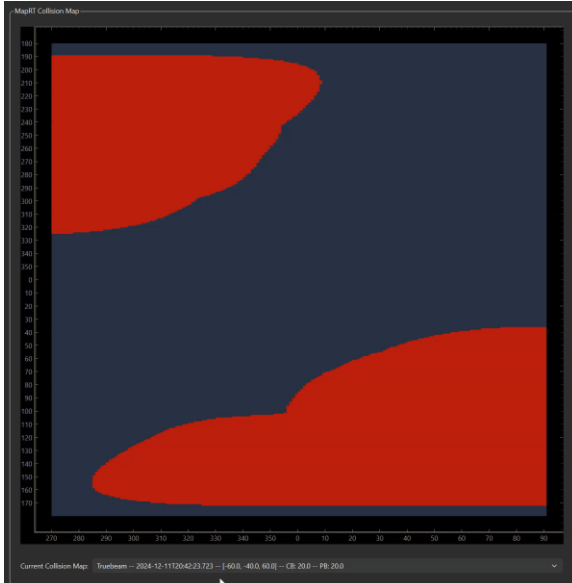
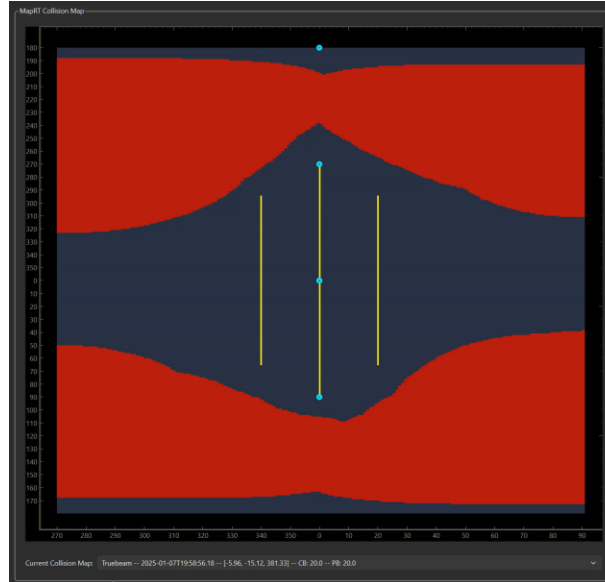
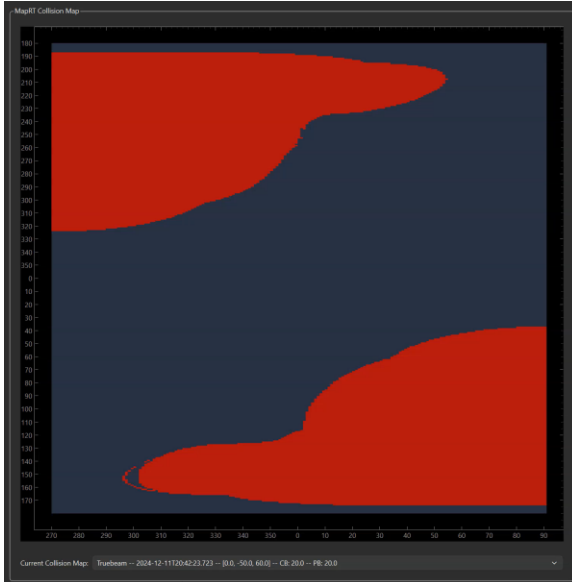
Merged Result

API Integration for Additional Isocenter Verification



Incorrect captures can result in artificial clearance due to an offset in DICOM isocenter

Async Protocols and Map Caching for Isocenter Placement



Leveraging Automation and Asynchronous API calls for Dynamic "5D" Exploration

- The web API allows for asynchronous calls
- Sorting clearance map calls by isocenter coordinates allows you to order the resulting clearance maps for dynamic exploration
- Combining the above with caching and call hooks allows the user to automate the construction of a search protocol around a plan isocenter.
- The resulting dataset can be explored dynamically to identify more advantageous isocenter positioning

Four new applications emerging in clinical use

01

Surface Based Planning

Using 3D reconstructed surface to assist in clinical treatment plan design and to validate safe delivery of complex treatments (i.e. Noncoplanar treatments)

02

Delivery Visualization

Visualization of the treatment delivery in real-time with the ability to review composite image overlays.

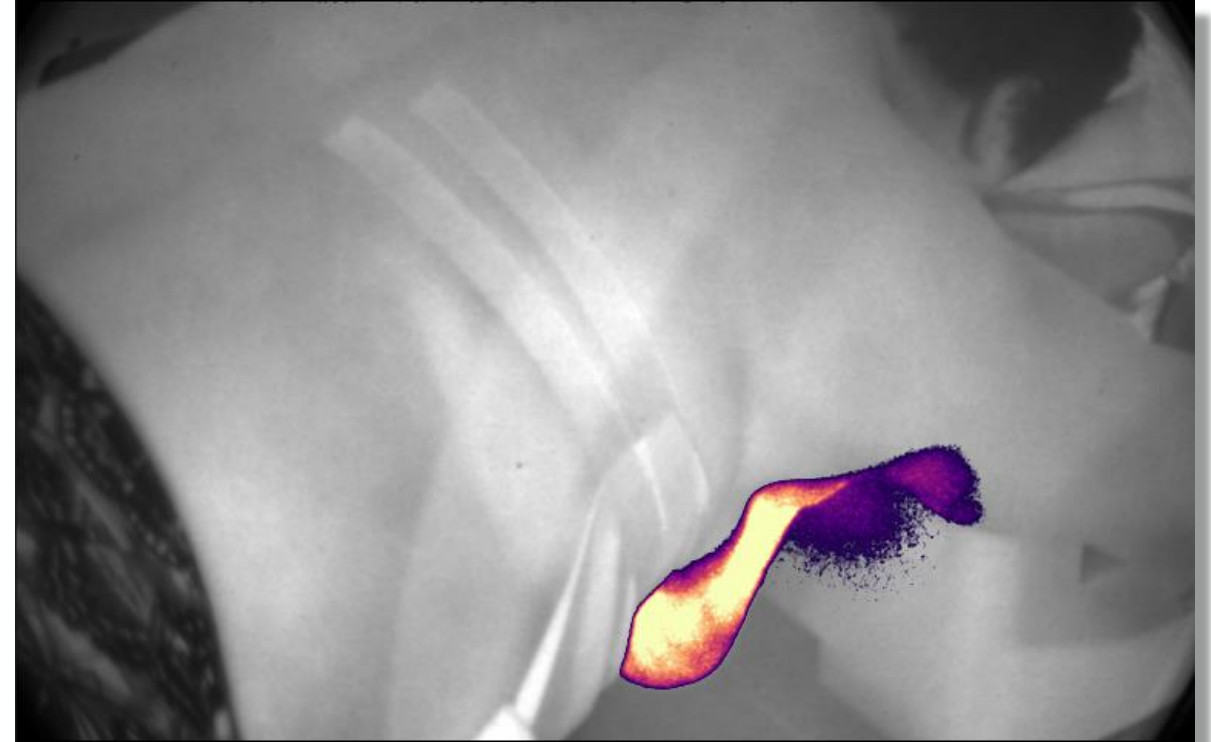
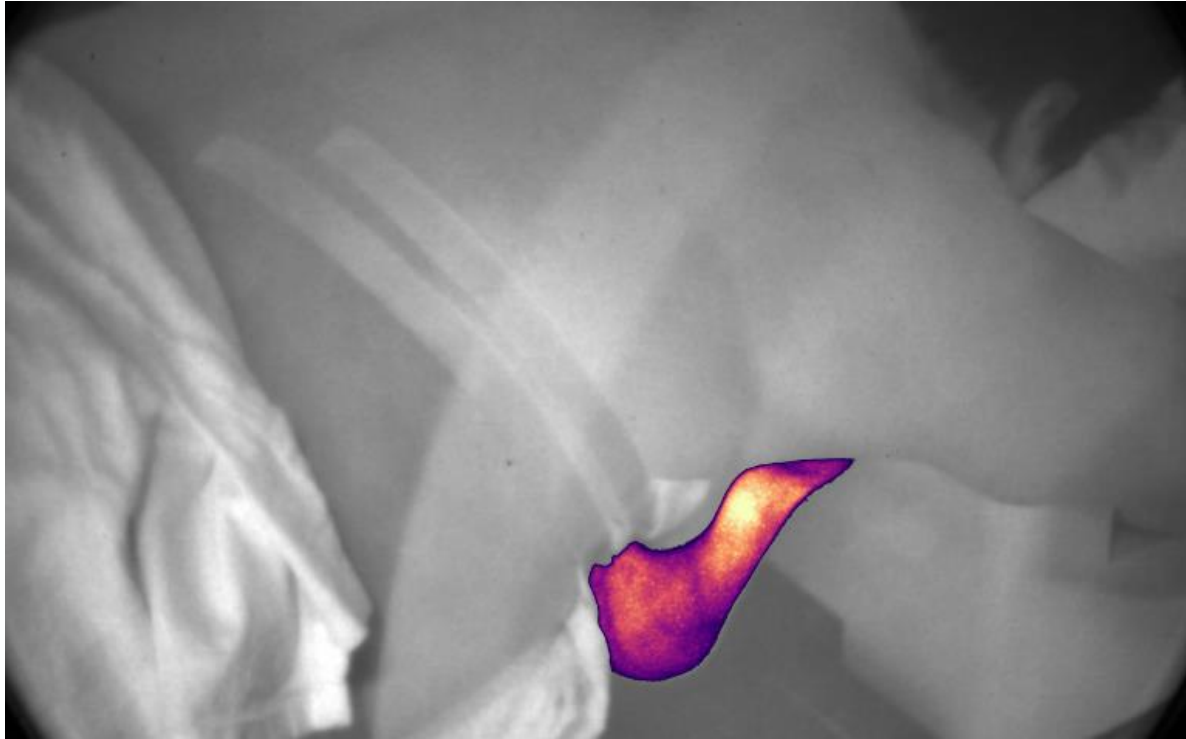
03

Plan Visualization

Ability to visualize both plan field projections and live field projections on the patient in real-time during setup.

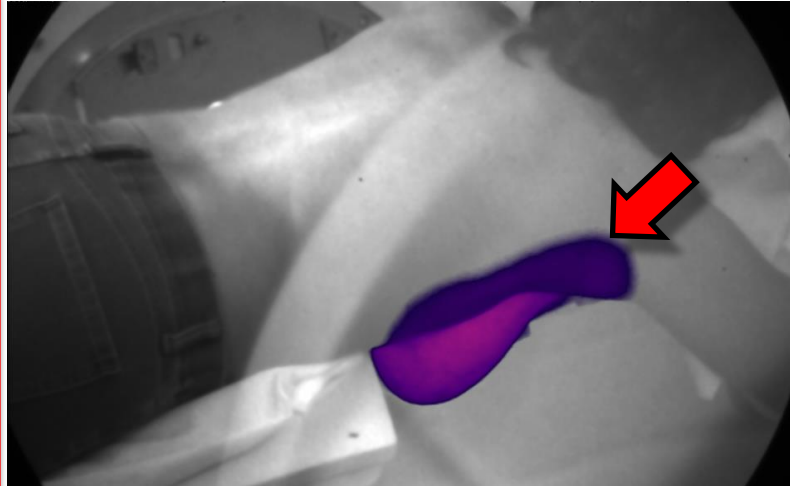
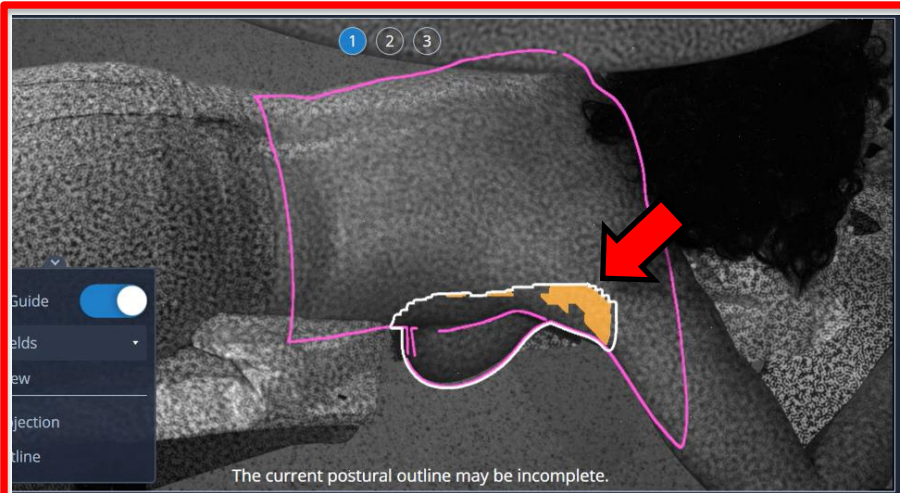
These four pillars are new or emerging within the SGRT framework, validation and significant workflow integration are required.

Future SGRT – Cherenkov Imaging for Real-Time Delivery Information



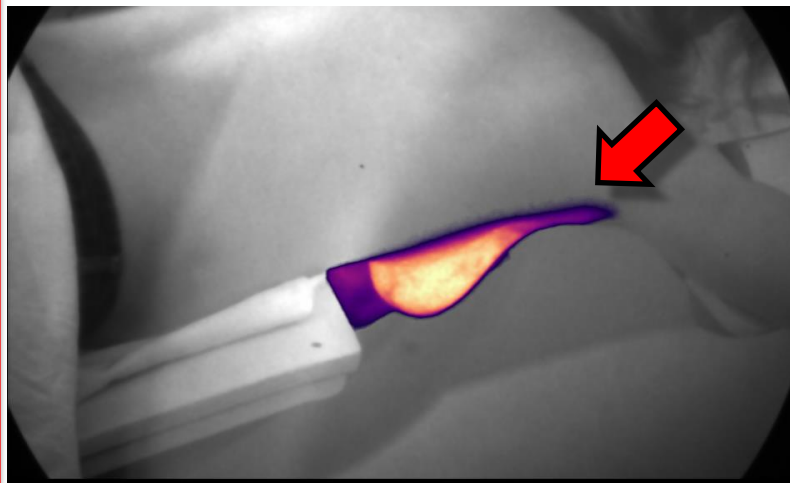
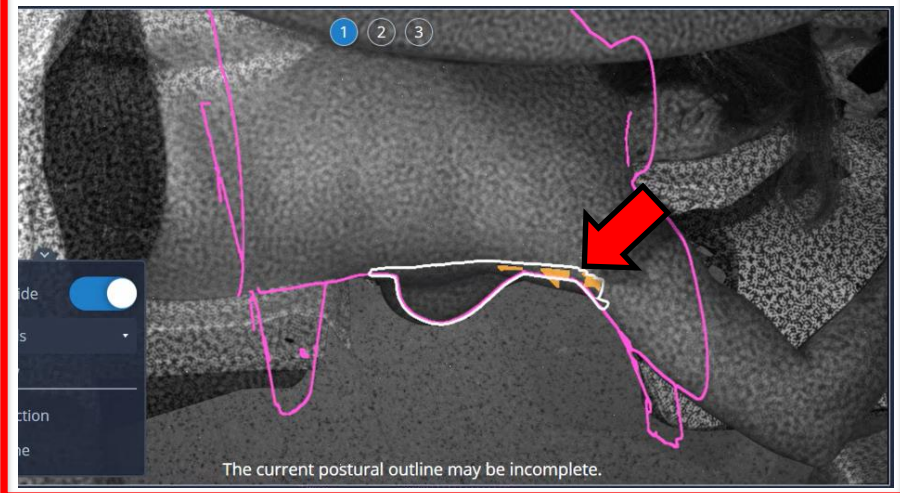
- 67 Year Old Female undergoing 3DCRT for Prone Breast
- Visual verification of treatment dose initiated from fraction 1 of treatment
- Fraction 3 - Exit dose through arm noted by physics team during daily review
 - Investigation showed prone pad indexing places slightly inferior resulting in wrong elbow position
 - Decreased arm extension resulted in beam exiting through upper arm.

Future SGRT Insights – Merging Plan, Surface and Cherenkov Data



➤ Planned Exposure?

- Does the patient have entrance and exit dose exposure to posterior lateral chest wall and upper arm to address coverage concerns on breast and nodal regions or is this a setup error?



➤ Planned Exposure?

- Are we limiting the entrance and exit dose exposure to posterior lateral chest wall and upper arm or is this a setup issue?

Four new applications emerging in clinical use

01

Surface Based Planning

Using 3D reconstructed surface to assist in clinical treatment plan design and to validate safe delivery of complex treatments (i.e. Noncoplanar treatments)

02

Delivery Visualization

Visualization of the treatment delivery in real-time with the ability to review composite image overlays.

03

Plan Visualization

Ability to visualize both plan field projections and live field projections on the patient during real-time monitoring.

04

AI and Adv. Workflow Integration

Use of AI tools and potential integration of 3D reconstruction techniques into new and existing workflows.

These four pillars are new or emerging within the SGRT framework, validation and significant workflow integration are required.

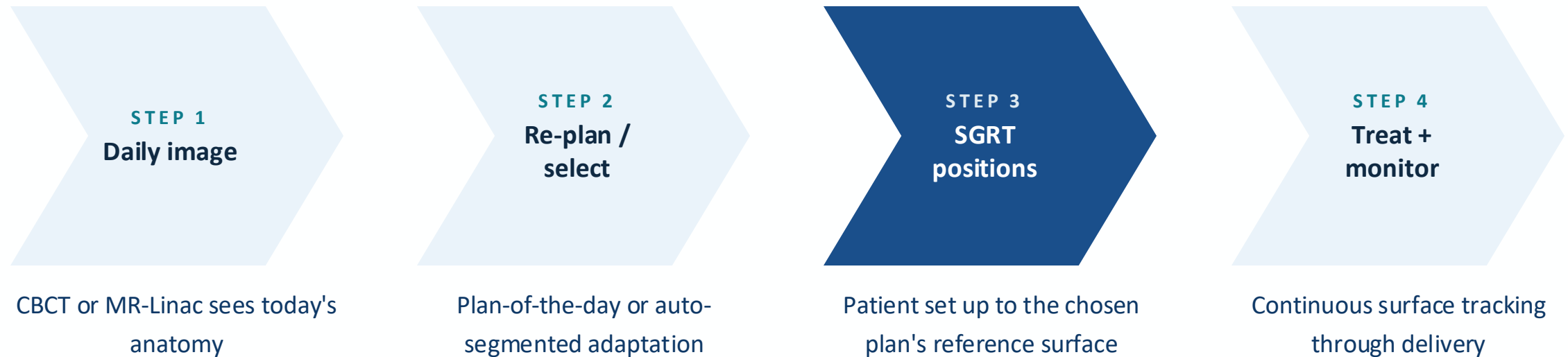
PART 2 OF 3

What's changing

Adaptive RT • proton therapy • planning integration • automation

Adaptive Radiotherapy Integration

SGRT is the connective tissue between **seeing the anatomy** and **delivering the right plan**.



The shift: From "set up to yesterday's plan" to "set up to today's plan, using today's surface, with today's tolerance."

The future: Pre-treatment SGRT surface evaluation to determine day-to-day change to flag potential need for adaptive workflow.

Proton and Particle Therapy

Why protons need surface guidance even more than photons

THE PHYSICS PROBLEM

Protons stop. The Bragg peak makes proton therapy uniquely sensitive to small range and position errors — millimeters of setup error can shift dose by centimeters in tissue.

THE OPERATIONAL PROBLEM

- Gantry rotations are slow, fractions are long, and many proton centers don't have volumetric imaging.
- SGRT isocenter radiographic correction methods currently do not accommodate proton gantry / imaging setups.

WHAT SGRT BRINGS TO PROTON

- Continuous, gantry-independent monitoring
- Catches drift between imaging verifications
- Pediatric workflows: less anesthesia time, more confidence
- Surface based planning for complex deliveries

OPERATIONAL CHALLENGES

- Surface based planning requires accurate machine models that may include complex geometries and node paths for proton couch motion.
- Imaging presents a challenge for isocentric corrections

Automation and Real-Time Safety

01

Wrong-patient prevention

Surface-based identity check at the door (facial recognition), integrated with OIS — fewer near-miss events ever reach the couch.

02

Tighter, smarter tolerances

Site-specific thresholds and SGRT data aware PTV margins

03

Therapist-in-the-loop, not therapist-as-the-loop

Automation should handle the repetitive checks; the therapist should focus on judgement calls and patient interaction.



The next safety gain isn't a new check —

it's continuously running the checks we already trust.

Planning System and OIS Integration

SGRT becomes a first-class citizen of the planning and record ecosystem — not a bolt-on console.



- Surface base planning integration into TPS
- Tolerance and gating window set at planning time adjustable at treatment time

- Reads reference surface directly — no manual export
- Patient identity verified against plan as a forcing function
- Alerts and identification saves back into the OIS, not just the local console
- HIS/RIS integration at simulation
- Validation console or routine for daily checks (Think MPC for SGRT) with export to QM system

- Surface trace logged with each fraction
- QA dashboards across machines and sites
- Adaptive review triggers when trends are detected between SGRT data and imaging data

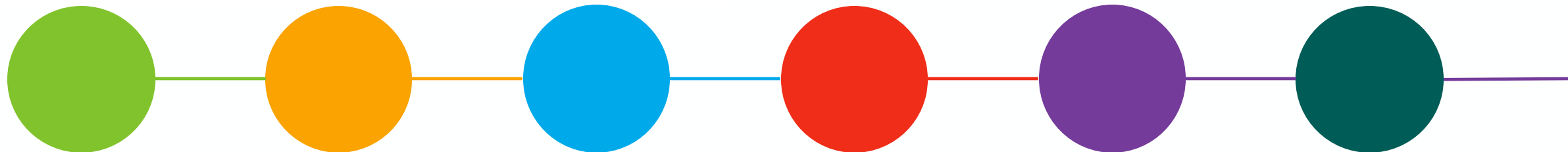
PART 3 OF 3

What comes next

Let's get a little crazy

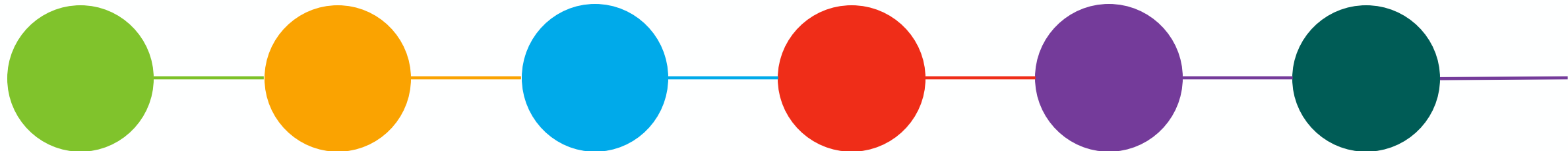
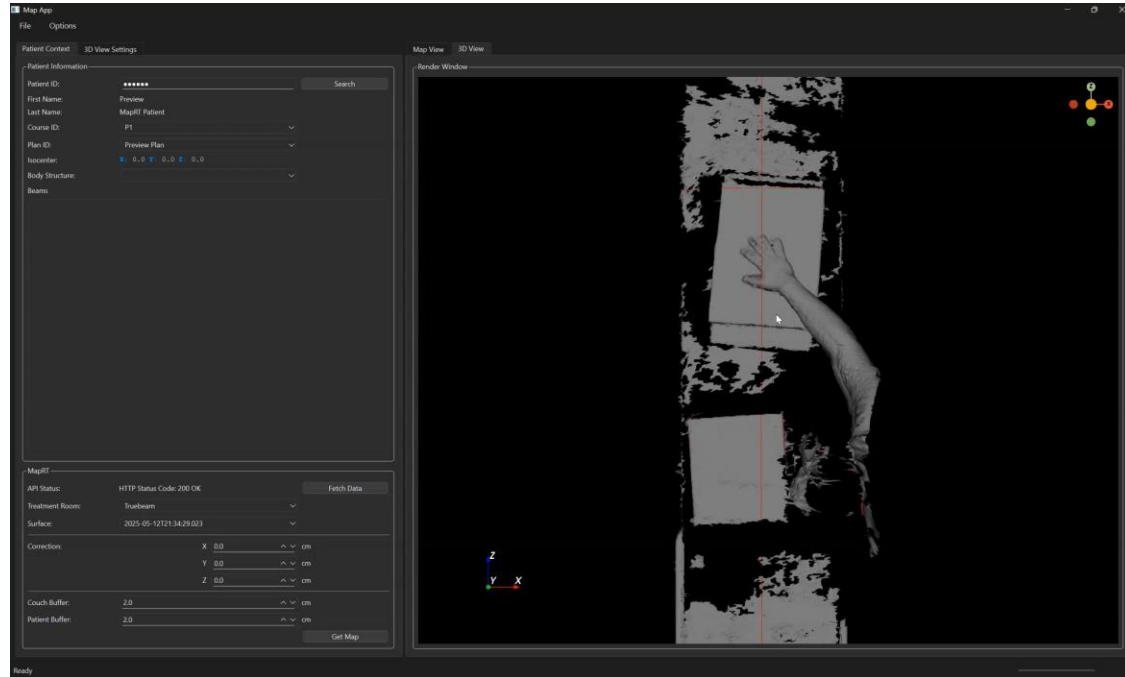
Osteoarthritis Workflows Reimagined

ALAR for non-malignant disease sites



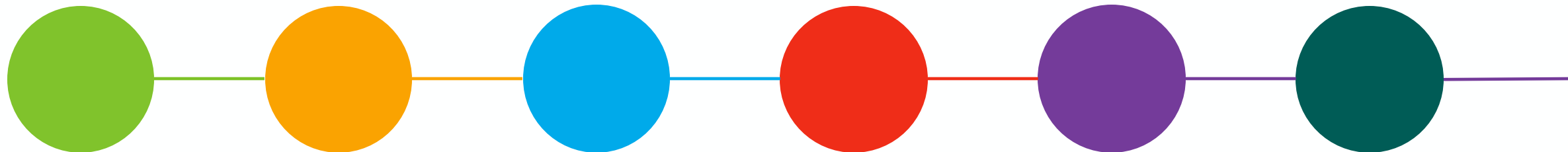
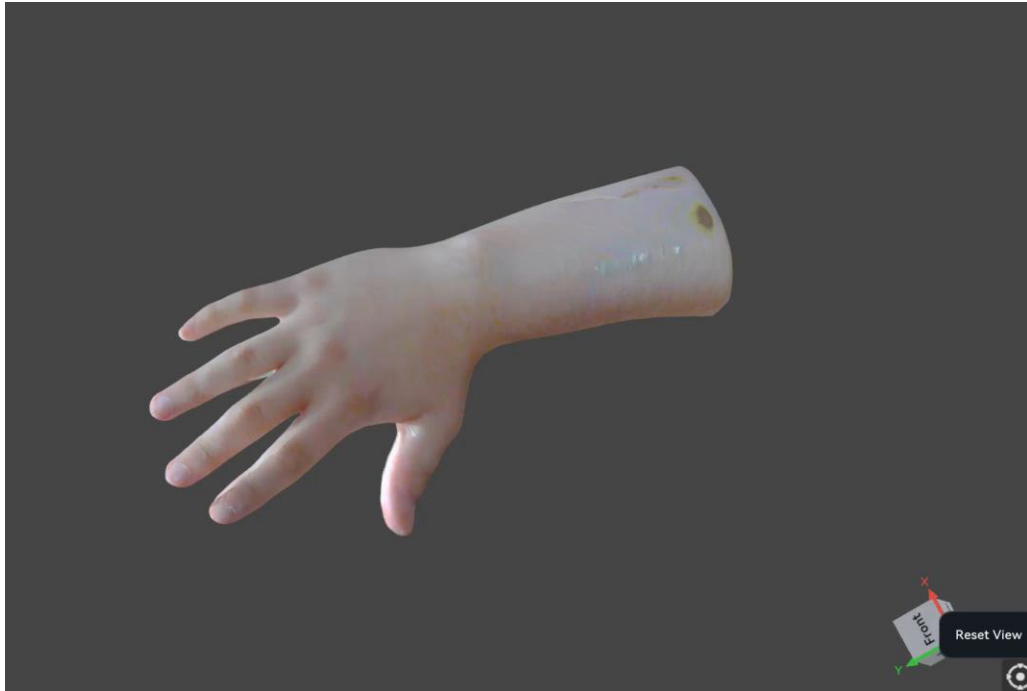
We can replace a standard CT sim with a completely optical sim for some indications.

Osteoarthritis Workflows Reimagined



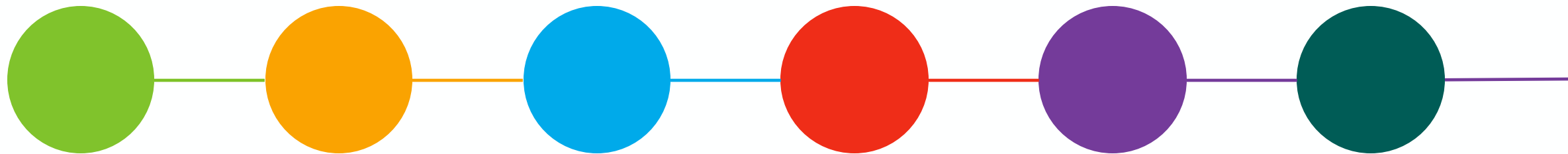
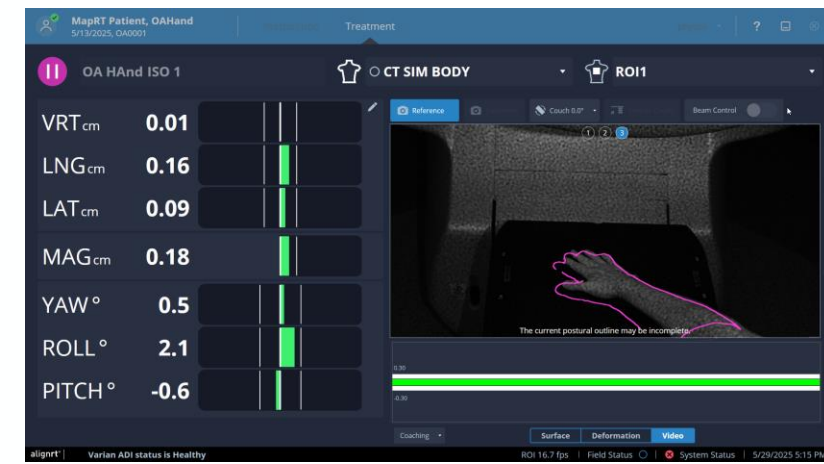
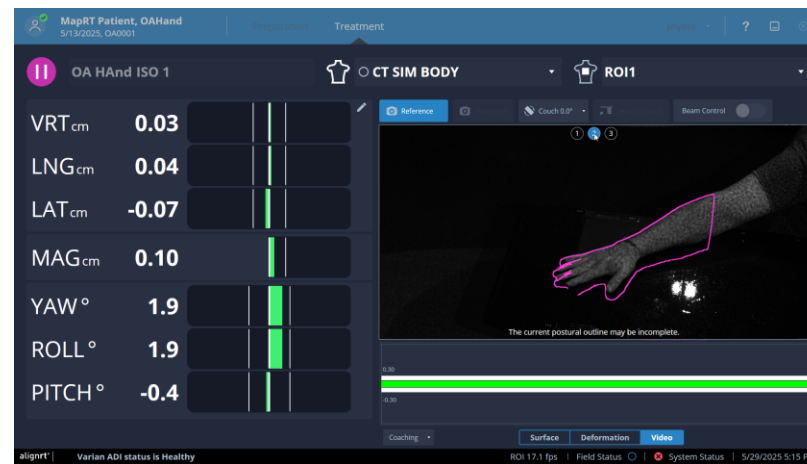
We can replace a standard CT sim with a completely optical sim for some indications.

Osteoarthritis Workflows Reimagined



We can then convert an optical sim surface to a synthetic planning CT.

Osteoarthritis Workflows Reimagined



The sim surface then becomes the treatment setup surface.

Osteoarthritis Workflows Reimagined

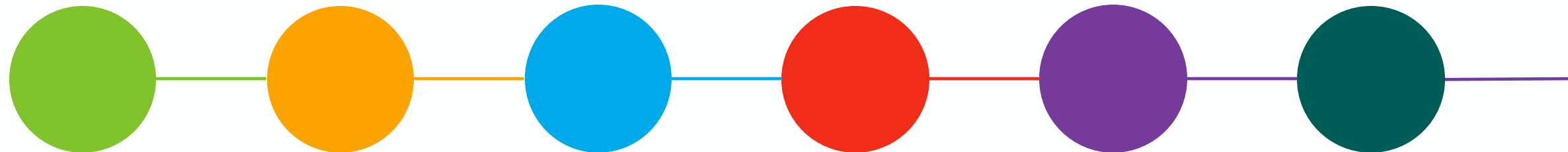
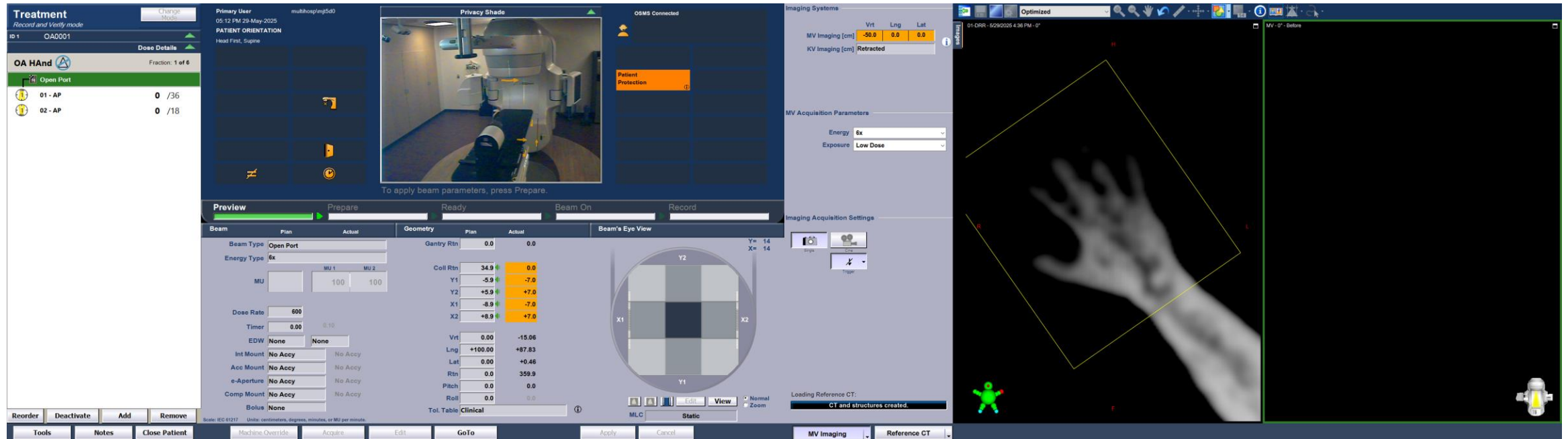
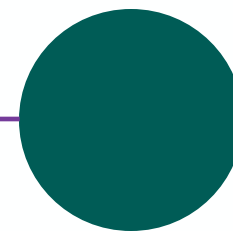
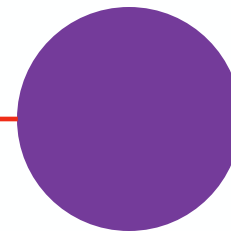
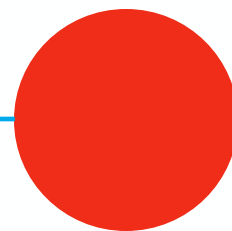
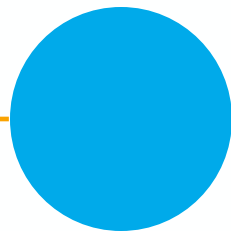
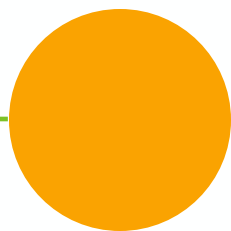
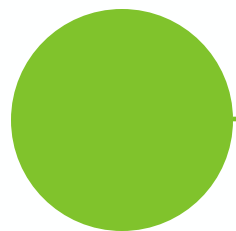


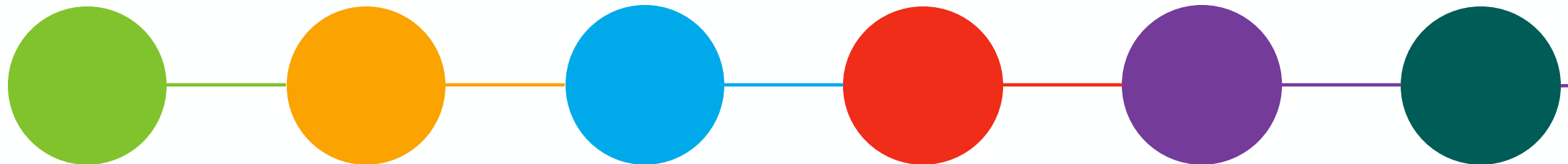
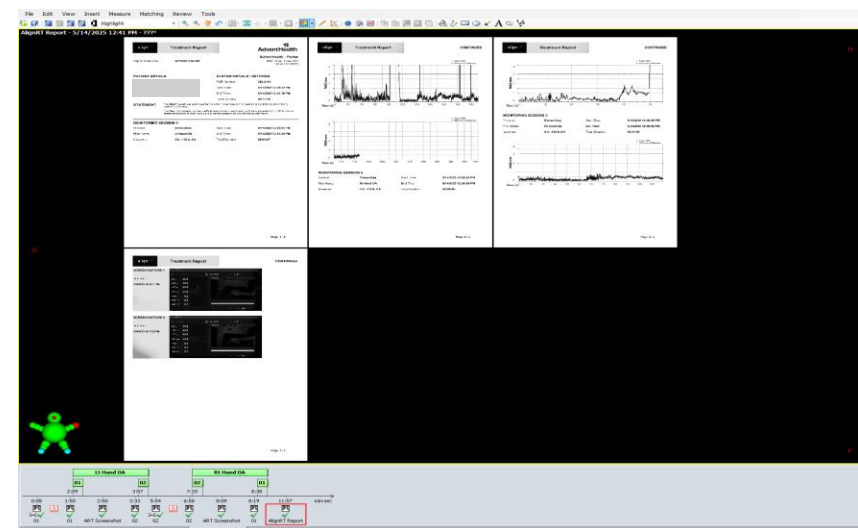
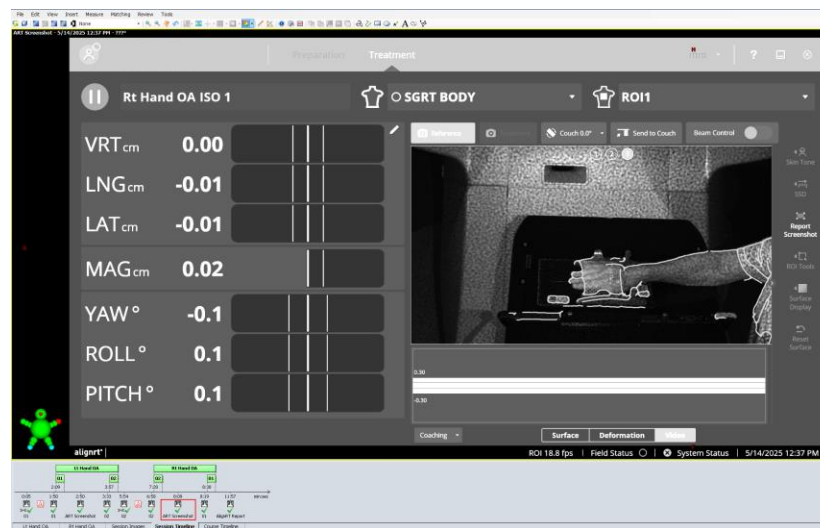
Image and deliver the treatment as planned using the synthetic CT.

Osteoarthritis Workflows Reimagined



Visualize the dose delivery using Cherenkov imaging.

Osteoarthritis Workflows Reimagined



Document and review the treatment in the OIS (Offline Review) just like any other treatment.

Ancillary Therapy: Radiation Patient Lymphedema

01

Radiation Patient Lymphedema

- Radiation oncology patients are at increased risk, especially when nodal radiation is combined with surgery or other lymphatic disruption.
- Early detection supports earlier intervention, which can reduce progression and improve long-term outcomes.

02

Detection struggles

Lymphedema clinics commonly struggle with baseline measurement gaps, inconsistent tools, and limited standardization, and excessive technological cost which can cause early disease to be missed until swelling is more obvious.

03

Main Challenges

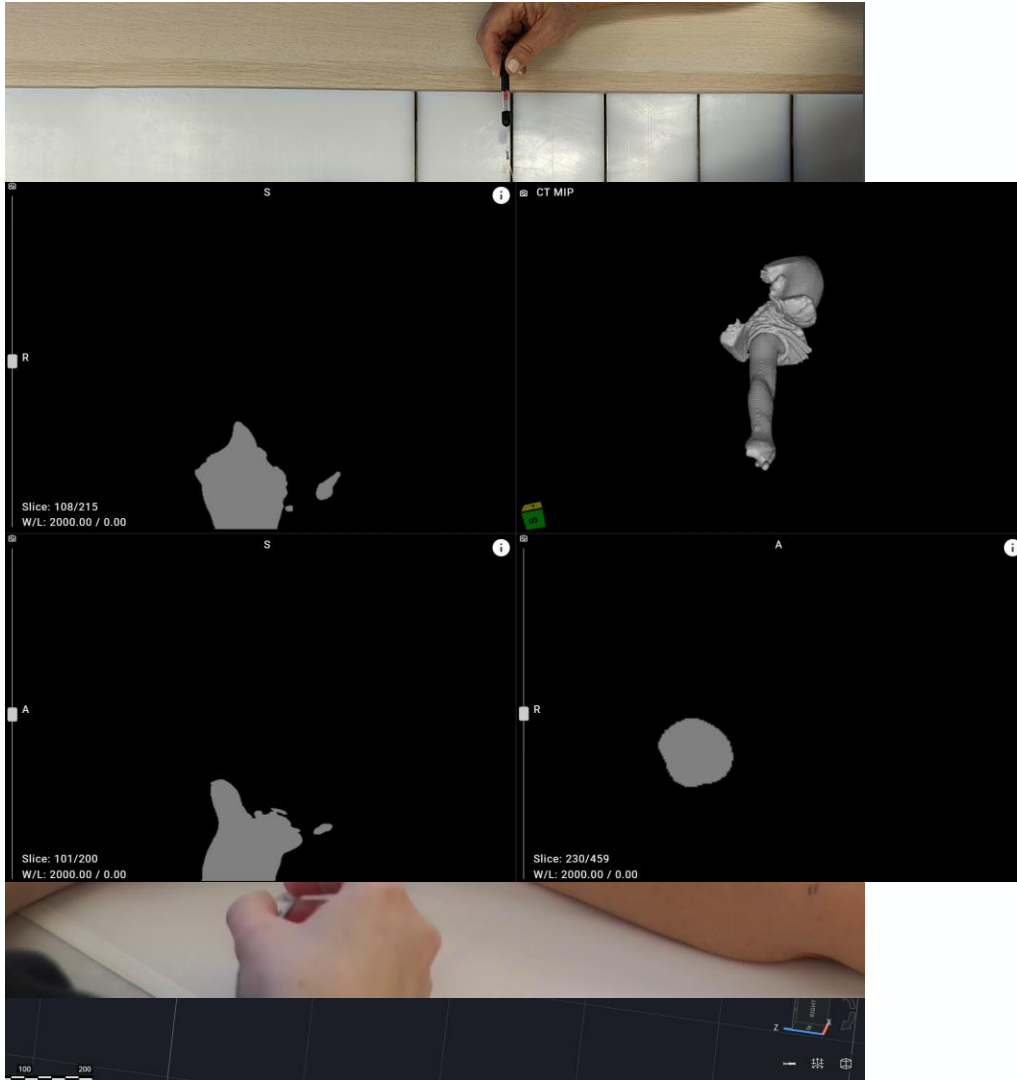
- No pre-treatment baseline
- Measurement method variability
- Inconsistent protocols
- Limited access to objective tools

04

Why it matters

These barriers matter because early-stage lymphedema is more reversible, and missing the early window can lead to chronic swelling, infection risk, and harder-to-manage disease

Ancillary Therapy: Radiation Patient Lymphedema



- **Circumferential Tape Method:** A therapist or patient marks the limb (e.g., every 4 cm) and measures the girth with a tape measure. These measurements are recorded in a spreadsheet to calculate volume.
- **Water Displacement (Gold Standard):** The affected limb is submerged in a tank of water; the volume of displaced water directly correlates to the limb's volume.
- **Perometry:** An infrared light-based machine scans the limb, providing an accurate, automated outline of its volume.
- **Bioimpedance Testing (L-Dex):** Electrodes are used to pass a low-strength electric signal through the limb, measuring the fluid surrounding cells.
- **Imaging Tests:** MRI, CT scans, or lymphoscintigraphy can confirm diagnosis by visualizing fluid accumulation or blockages.

Three things to take with you

If you remember nothing else from the last 30 minutes:

1

SGRT is becoming a workflow platform.

Treat it as infrastructure, not a feature. The downstream investments in adaptive, automation, and AI all assume it.

2

The anchor case is your test case.

If your maskless H&N patient — or breast DIBH, or pediatric SBRT — flows smoothly today, the future builds on that. If not, fix that first.

3

The future is integration, not invention.

Most of what makes the next decade work already exists. The hard part is refining it and connecting it across sim, plan, treat, and dose.

Thank You!

➤ Special Thanks to the AdventHealth Physics team.