

# Looking Forward: Use of Surface Guidance Throughout the Treatment Journey

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SGRT Community Meeting

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## Acknowledgements and Disclosures

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- I have enjoyed research and reference site agreements with both **Vision RT** and **Varian Medical Systems**.
- I have no personal stake in or financial benefit from either of these companies.
- *Special thanks to all clinical and research colleagues that I've worked with on SGRT projects and implementations in the past!*

## Our clinical experience: *where we started...*

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- 2013: acquisition and commissioning of first SGRT system
  - Needed a more accurate and reliable means of **monitoring DIBH** (and some patients were *asking for* SGRT)
  - Needed a real-time monitoring system with sub-mm accuracy for **mask-based (frameless) LINAC SRS/SRT**
- Staff reception of this new technology ranged from **hopeful skepticism** to **outright distrust** in the accuracy and/or efficiency of SGRT
- Almost universally we viewed SGRT as potentially useful but ***only for special procedures***

## **Our clinical experience: *time and experience bring a paradigm shift...***

- 2014-2019: rapidly increased use of SGRT and evolving workflows
  - Relatively short break-in period in which many questions/issues were solved

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## **Our clinical experience: *time and experience bring a paradigm shift...***

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  - Relatively short break-in period in which many questions/issues were solved
  - Proved the accuracy and efficiency of the system across treatment techniques
- Started “Every Patient, Every Fraction” approach with stereotactic treatments
- Began research study on setup of breast patients with skin marker triangulation vs. SGRT/markerless setup (ASTRO 2018)





**“I expect you all to be independent, innovative, critical thinkers who will do exactly as I say!”**

Warren. Cartoon. The Phi Beta Kappan, 71(1): 38. 1989.

## Our clinical experience: *time and experience bring a paradigm shift...*

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- Began research study on skin markers vs. SGRT/markerless setup for breast patients (ASTRO 2018)
- **Transitioned our first clinic (single-LINAC) to fully markerless treatments for *all patients* within that year**

# The ripple effect of SGRT:

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*How is the use of SGRT impacting the entire radiotherapy process?*

- Treatment simulation
- Treatment planning
- Treatment setup
- Treatment delivery

# The ripple effect of SGRT: *treatment simulation*

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## Examples:



**C-Rad Sentinel 4DCT**

<https://c-rad.com/products/sentinel-4d-ct/>



**Vision RT SimRT with RTC**

<https://www.visionrt.com/simrt/>

# The ripple effect of SGRT: *treatment simulation*

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- SGRT during the treatment simulation process comprises\*:
  - Patient identification and setup/positioning

\*Not all solutions from each vendor allow all of these features and not all similar features are technically-equivalent



# The ripple effect of SGRT: *treatment simulation*

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**2023**

## **Hospital National Patient Safety Goals**

The purpose of the National Patient Safety Goals is to improve patient safety. The goals focus on problems in health care safety and how to solve them.

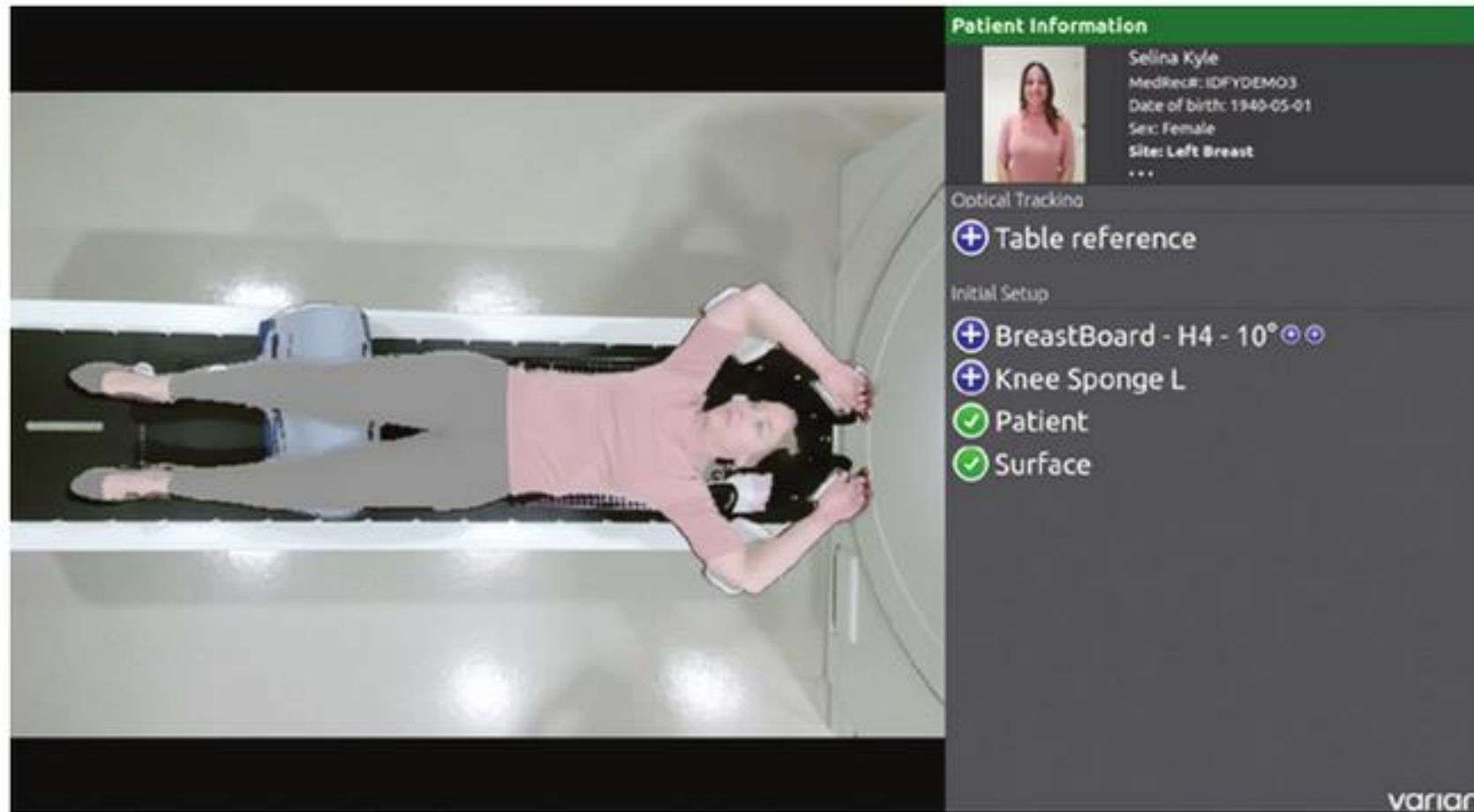
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### **Identify patients correctly**

NPSG.01.01.01

Use at least two ways to identify patients. For example, use the patient's name *and* date of birth. This is done to make sure that each patient gets the correct medicine and treatment.

# The ripple effect of SGRT: *treatment simulation*



Hoisak, Jeremy David  
Page, et al., eds. *Surface  
guided radiation therapy*.  
CRC Press. 4:80. 2020.

**FIGURE 4.4** Capture of the head-to-toe “orthopedic” surface in CT simulation mode.

# The ripple effect of SGRT: *treatment simulation*

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- SGRT during the treatment simulation process comprises\*:
  - Patient identification and setup/positioning
  - Immobilization device images/positioning and settings
  - Real-time tracking of the patient's movement
  - Acquisition of 4DCT bin/phase data (retrospective)
  - Acquisition of gated CT images (prospective)
  - Monitoring of breath positions (e.g. DIBH and EEBH)
- **\*Not** all solutions from each vendor allow all of these features and not all similar features are technically-equivalent



**While  
monitoring the  
*actual patient  
body***

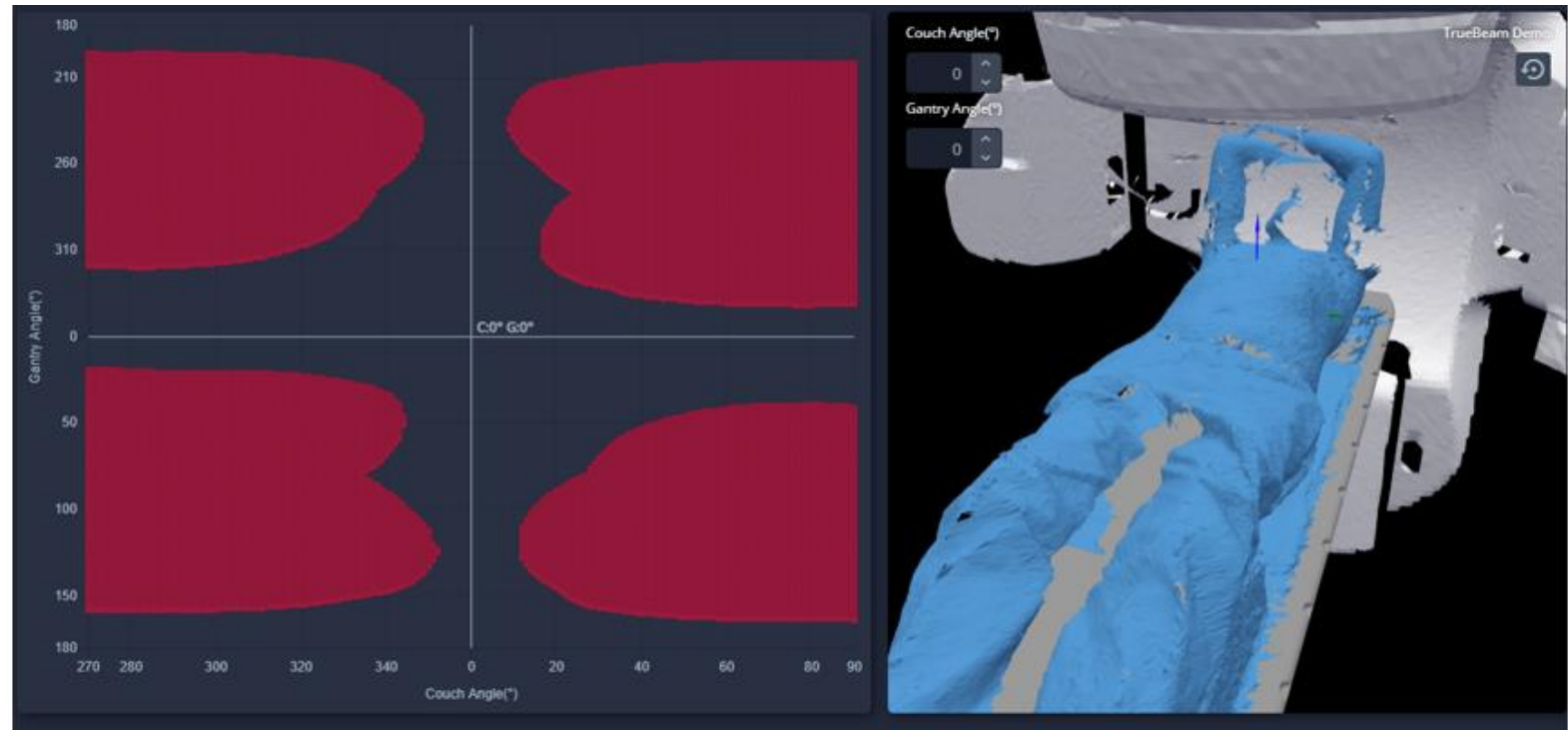
# The ripple effect of SGRT: *treatment planning*

Example:



**Vision RT**  
**MapRT**

<https://www.visionrt.com/simrt/>



# The ripple effect of SGRT: *treatment planning*

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- SGRT during the treatment planning process comprises:
  - Combine patient surface map (from simulation) with LINAC/couch geometry
    - Including immobilization visible to the SGRT cameras
  - Create a clearance map for couch and gantry angles about the isocenter
  - Check treatment clearance before simulation images are acquired
    - Avoid plans which include collisions issues, based on *quantitative 3D data*
    - Informs treatment planners such that sub-optimal geometries are not chosen due to potential **but false** collision fears



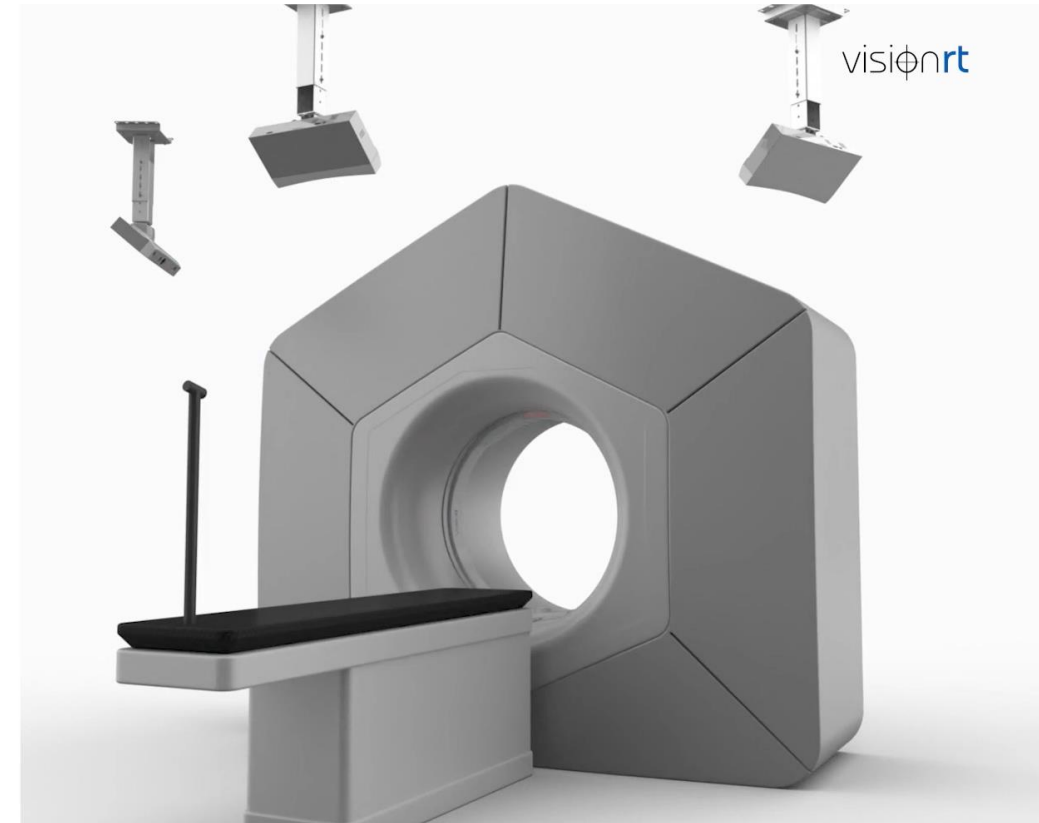
# The ripple effect of SGRT: *patient identification and treatment*

## Examples:



### Varian **Identify**

<https://www.varian.com/products/radiotherapy/real-time-tracking-motion-management/identify>



### Vision RT **AlignRT InBore**

<https://www.visionrt.com/alignrt-inbore/>

# The ripple effect of SGRT: *patient identification and treatment*

- SGRT during treatment setup and delivery comprises:
  - Patient Identification, potentially with check in, LINAC queue patient selection, and machine interlock
  - Real-time surface mapping and video monitoring for patient setup
  - Identification and verification of immobilization devices and settings
  - Real-time monitoring of static-position breath hold
  - LINAC-interfaced gating by phase or amplitude
  - Real-time visualization of surface dose-deposition via Cherenkov Imaging

# The ripple effect of SGRT: *patient identification and treatment*

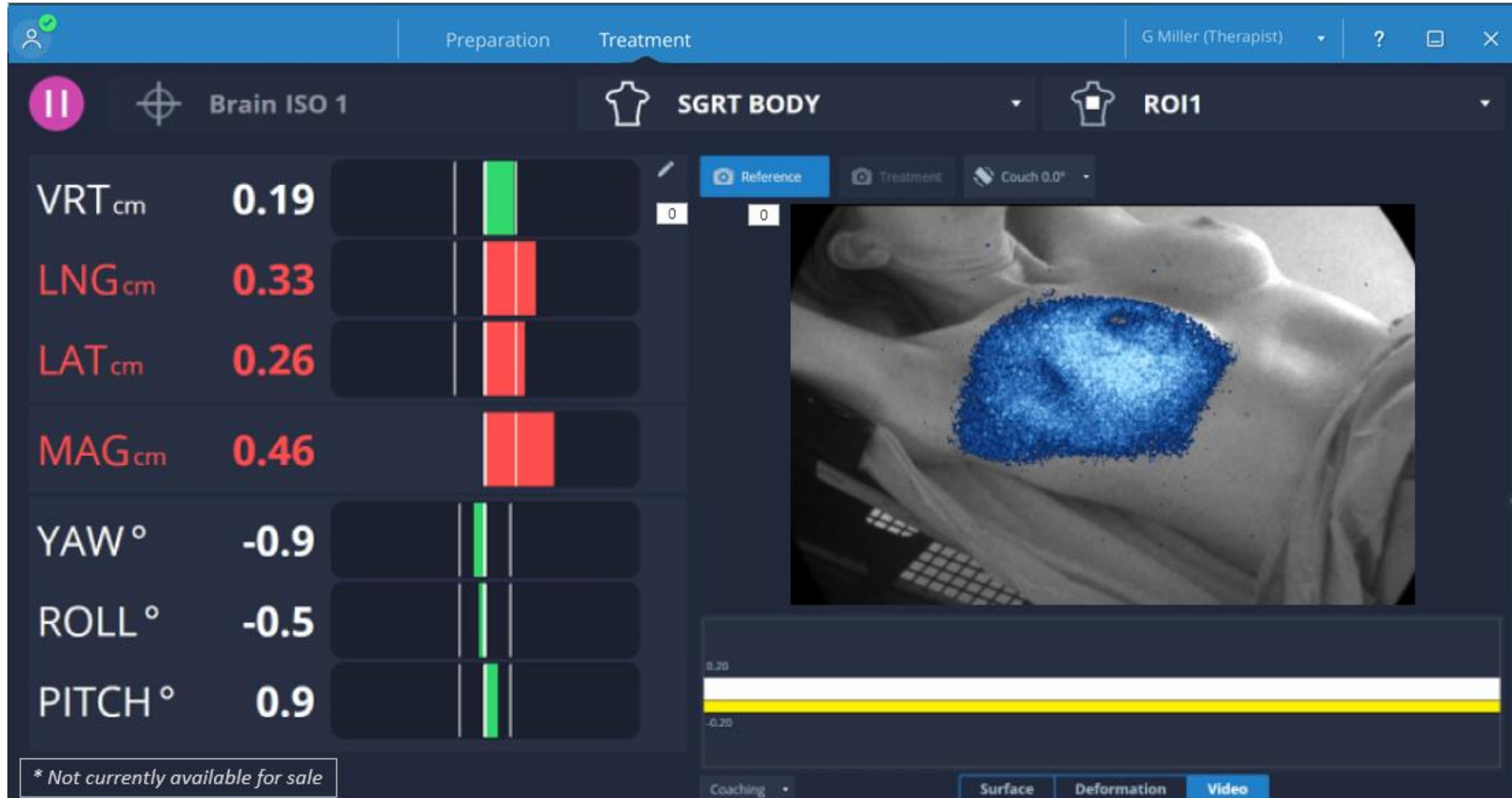


Image borrowed  
from Vision RT

# SO WHAT IS SURFACE GUIDED RADIATION THERAPY?



Image borrowed from:



**Thank  
you!**

