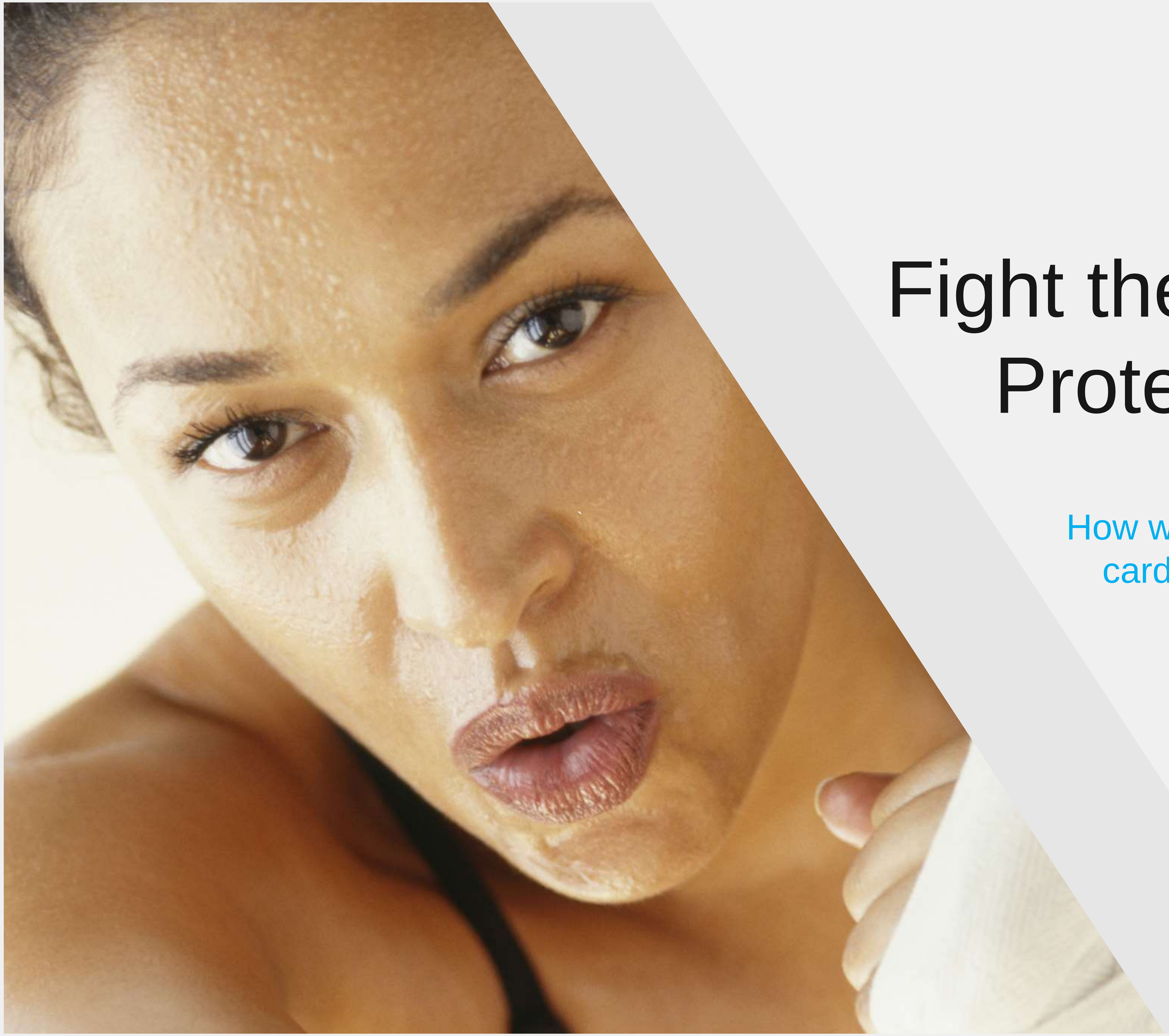

Fight the cancer. Protect the heart.

How we use AlignRT to help prevent cardiac toxicity in left-breast radiotherapy

Joe Deister
Regional Sales Manager
Vision RT

AlignRT

Market leading solution for Surface Guided Radiation Therapy (SGRT)

Increases accuracy in treating left-breast cancer while helping to protect patients' hearts

The Hidden Danger in Treating Left-breast Cancer

Proximity

Proximity of the left breast to the heart leaves the heart vulnerable to radiation exposure.

Cardiac complications

Radiation exposure increases risk of serious long-term cardiac complications.

UNC Study Publication - CLINICAL Review

International Journal of Radiation Oncology biology • physics

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Clinical Investigation

Utility of Deep Inspiration Breath Hold for Left-Sided Breast Radiation Therapy in Preventing Early Cardiac Perfusion Defects: A Prospective Study

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Evidence of Perfusion Defects

Siemens single-photon emission computed tomography machine in operation.
Photograph courtesy of Y Trottier.

Single-photon emission computed tomography **(SPECT)** is used to predict short-term cardiac events[3]

Background

Purpose of Current Study:

- To evaluate radiation-induced cardiac toxicity after left breast/chest wall RT with DIBH

Existing Data – 2005 Study:

- Marks at al. studied the incidence of new perfusion defects post-RT (1998-2001) [1]
- 114 patients were treated in free-breath with no surface guidance
- Post-RT SPECT were compared with the pre-RT studies

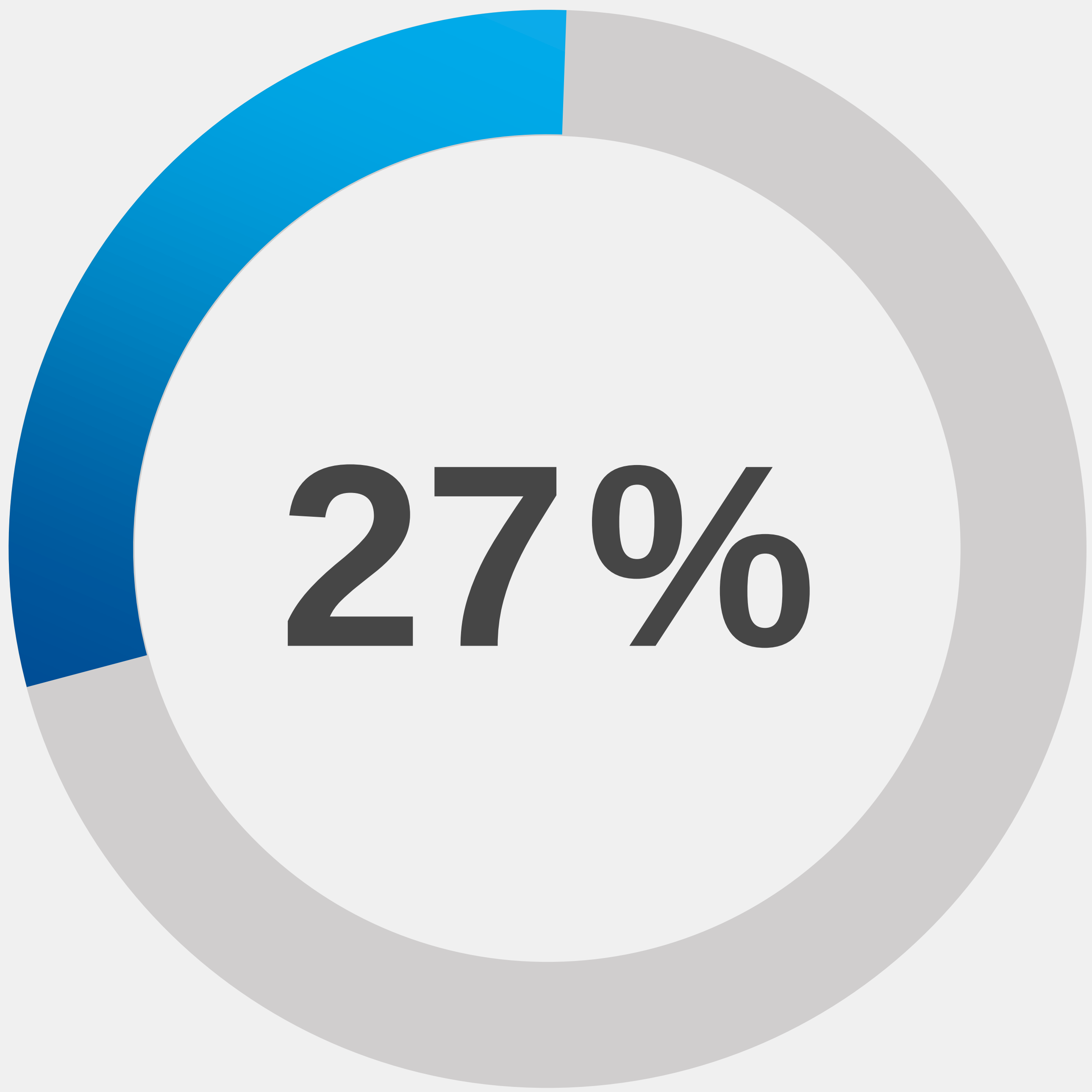
- *Results:*
  - **Incidence of new perfusion defects = 27%** 6 months after RT (increasing to 42% after 24 months)
  - **12% to 40% of patients with perfusion defects also reported wall motion abnormalities** (compared to 0% to 9% without perfusion defects)

- *Conclusions:*

"RT causes volume-dependent perfusion defects in ~40% of patients within 2 years"

[1] Marks, L. B. et al. The incidence and functional consequences of RT-associated cardiac perfusion defects. IJROBP 63, 214-223, doi:10.1016/j.ijrobp.2005.01.029 (2005).

Evidence of Perfusion Defects



In one study, **twenty-seven percent** of patients treated for left-breast cancer demonstrated SPECT volume-dependent cardiac perfusion defects within **6 months.**[4]

DIBH: Part of a Robust Solution

Deep Inspiration Breath Hold (DIBH)

How DIBH Works

01 Patient breathes in

02 Heart moves down & away from chest wall

03 Patient holds breath (typical duration: 20s)

04 Radiation administered

Images courtesy of J Matney PhD

Traditional DIBH Techniques Also Have Their Limitations

Breath hold without guidance —

- Not necessarily reproducible[6]

Breathing control systems —

- Large positional variations can occur[11]
- Invasive for the patient[7]

Box on chest —

- Tracks vertical displacement of box on xiphoid process: Measures breath hold in one dimension only

Issues With DIBH: Implications

DIBH, if not performed effectively, may not be enough to prevent heart damage.[8]

Deep Inspiration Breath Hold (DIBH) + AlignRT

CT Planning for DIBH

- Patient achieves optimal breath hold during planning
- Moves the heart away from the treatment site

Therapy with AlignRT

- Patient's position tracked with extreme accuracy to match planning position
- Helps ensure reproducibility and accuracy for every breath hold and every fraction

USER COMMUNITY INCLUDING

UK Heidelberg
UK Erlangen
Klinikum Bayreuth
Bonn, Germany
UK Dresden
Proton Center Essen
Biel, Switzerland
UK Zürich
Universitetssjukhuset Örebro
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Dartmouth-Hitchcock Medical Center, NH
Emory University
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Memorial Sloan Kettering Cancer Center
University of California: San Diego, Davis, San Francisco
University of Florida: Gainesville, Jacksonville
University of North Carolina

More than 700 installations worldwide, including:

- UK Heidelberg
- UK Dresden (x2)
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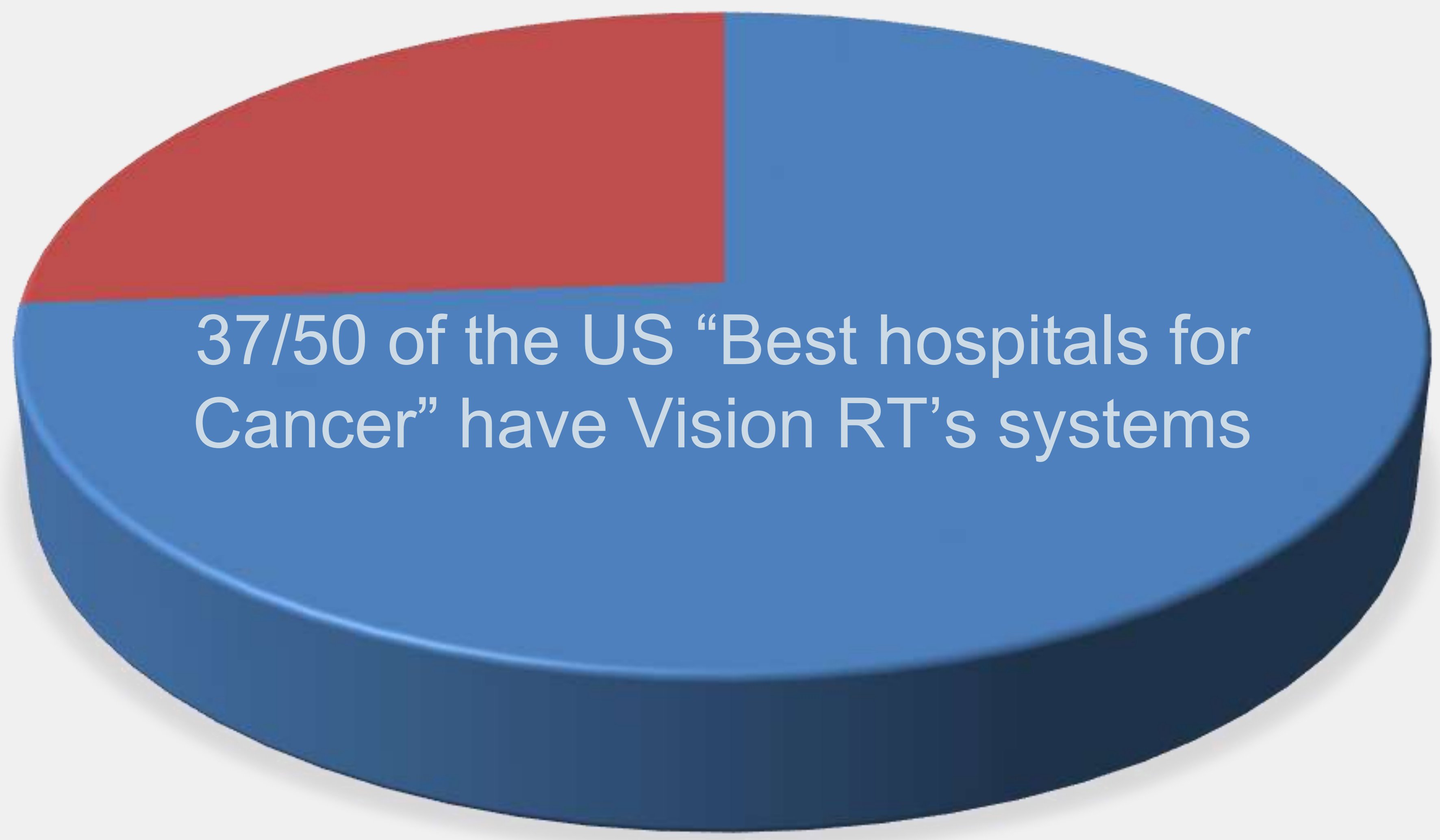
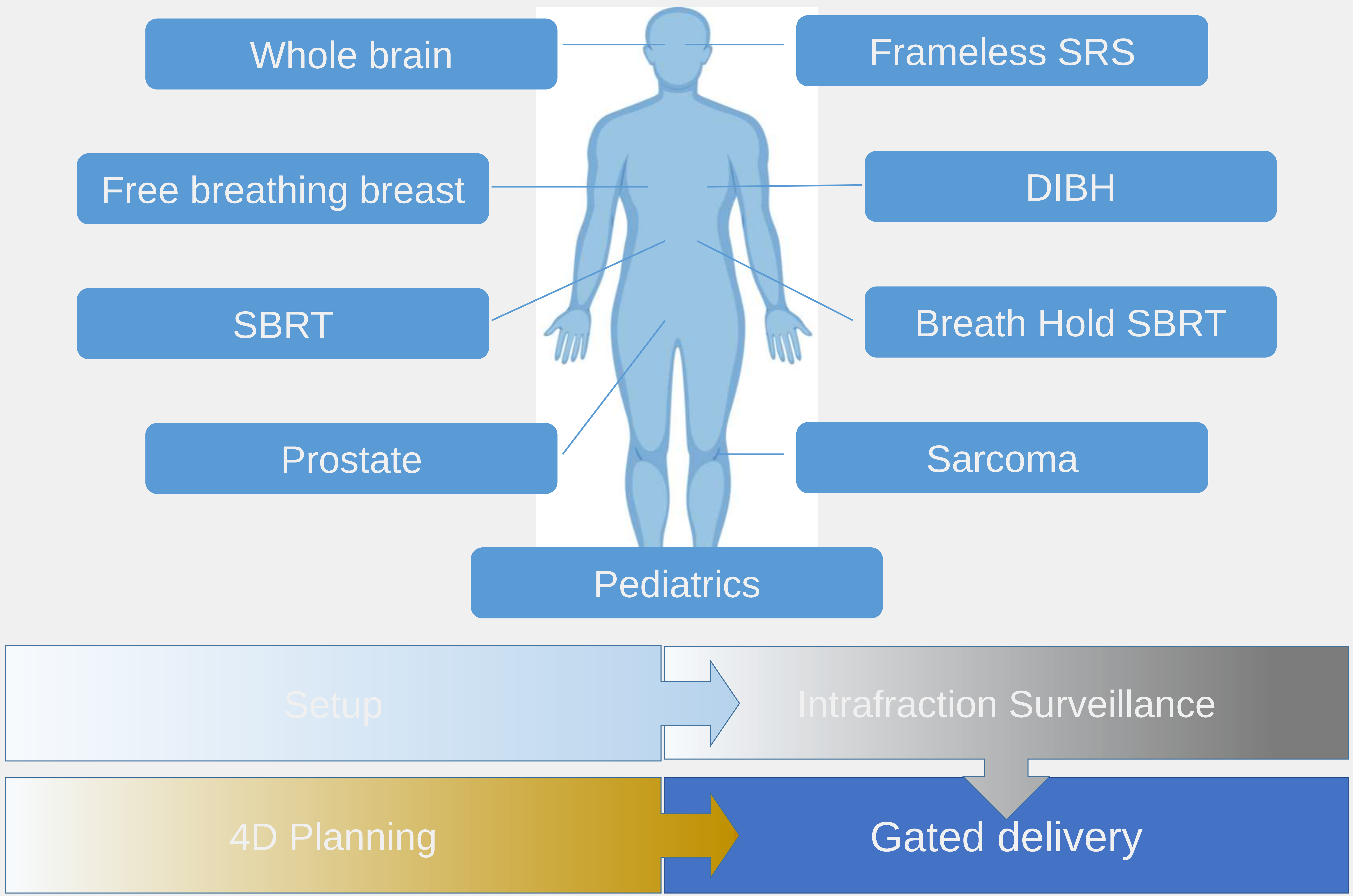
- UK Erlangen (x3)
- Bonn-Rhein-Sieg (x3)
- Darmstadt (x2)
- Zürich University Hospital
- Biel (x2)
- Guy's and St Thomas' Hospital (4)
- Dublin Beacon Hospital
- Memorial Sloan Kettering Cancer Center (9)
- Massachusetts General Hospital (6)
- Mayo Clinic, Rochester (5)
- Cleveland Clinic
- Oslo University Hospital
- University of California (10) - San Diego,
  UC Davis, San Francisco, Irvine, Los Angeles




Whole brain
Frameless SRS
Free breathing breast
DIBH
SBRT
Breath Hold SBRT
Prostate
Sarcoma
Pediatrics
Setup
Intrafraction Surveillance
4D Planning
Gated delivery

Three stereo camera units measure the 3D patient surface

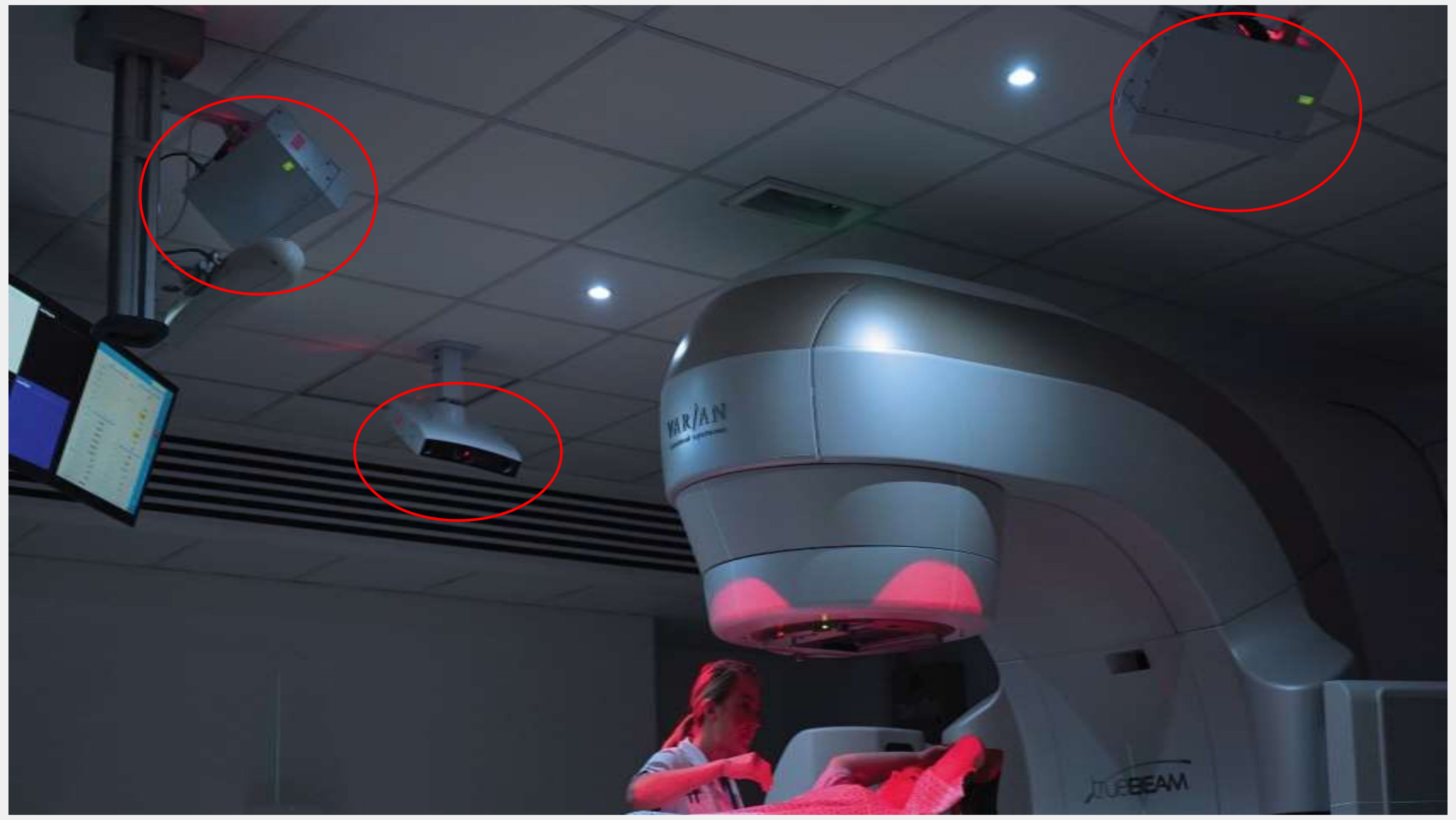
This is matched to the CT reference

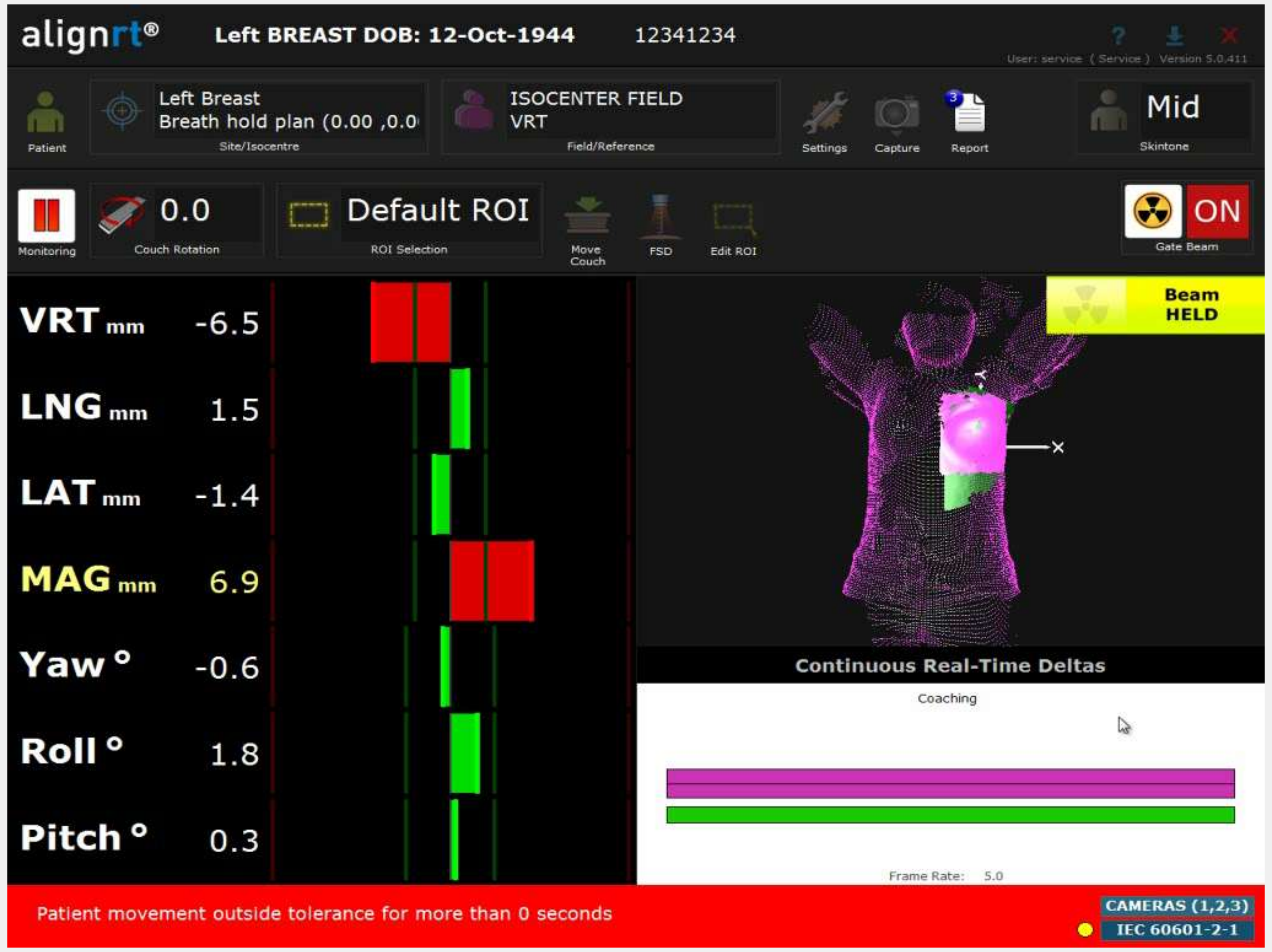
Patient setup:

Gives XYZ translations and rotations **<1mm, <1 degree accuracy**

Treatment:

Holds beam if patient moves out of tolerance in any of **6 degrees** of freedom, **enables beam** when patient moves back into position





20s Video DIBH

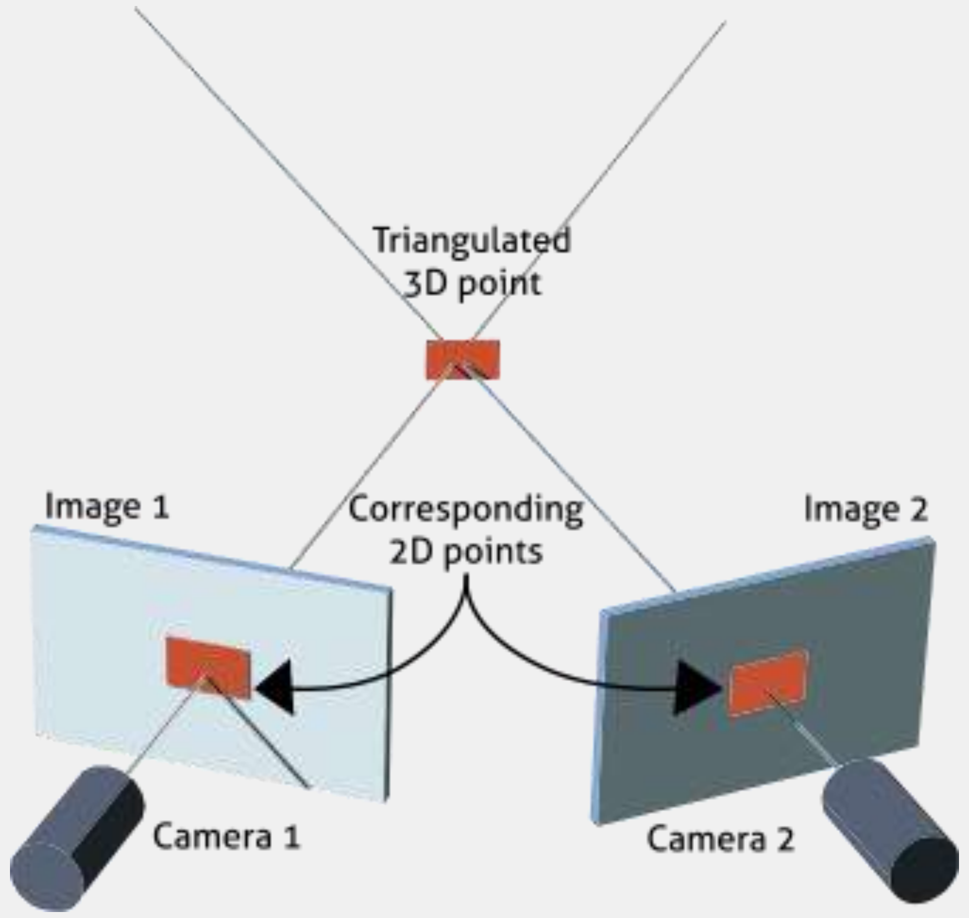
- Near infrared light in pseudo random speckle pattern

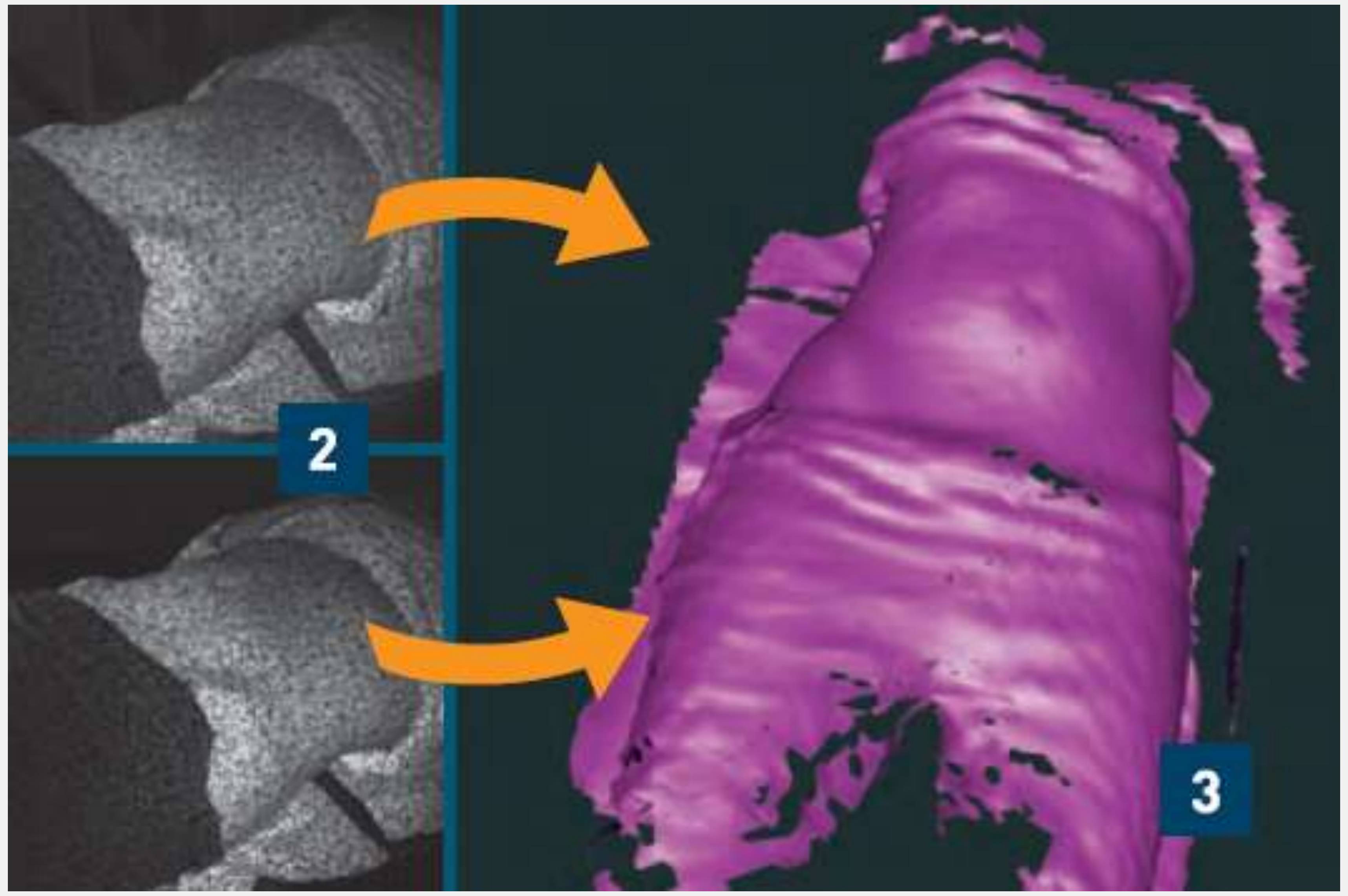
- Map of ~20,000 points of patient's external anatomy

- Rigid registration algorithm computes deviation from reference surface

- Sub-millimetre accuracy in all 6 degrees of freedom

- **Holds beam** if patient moves out of tolerance in any of **6 degrees** of freedom, **enables beam** when patient moves back into position



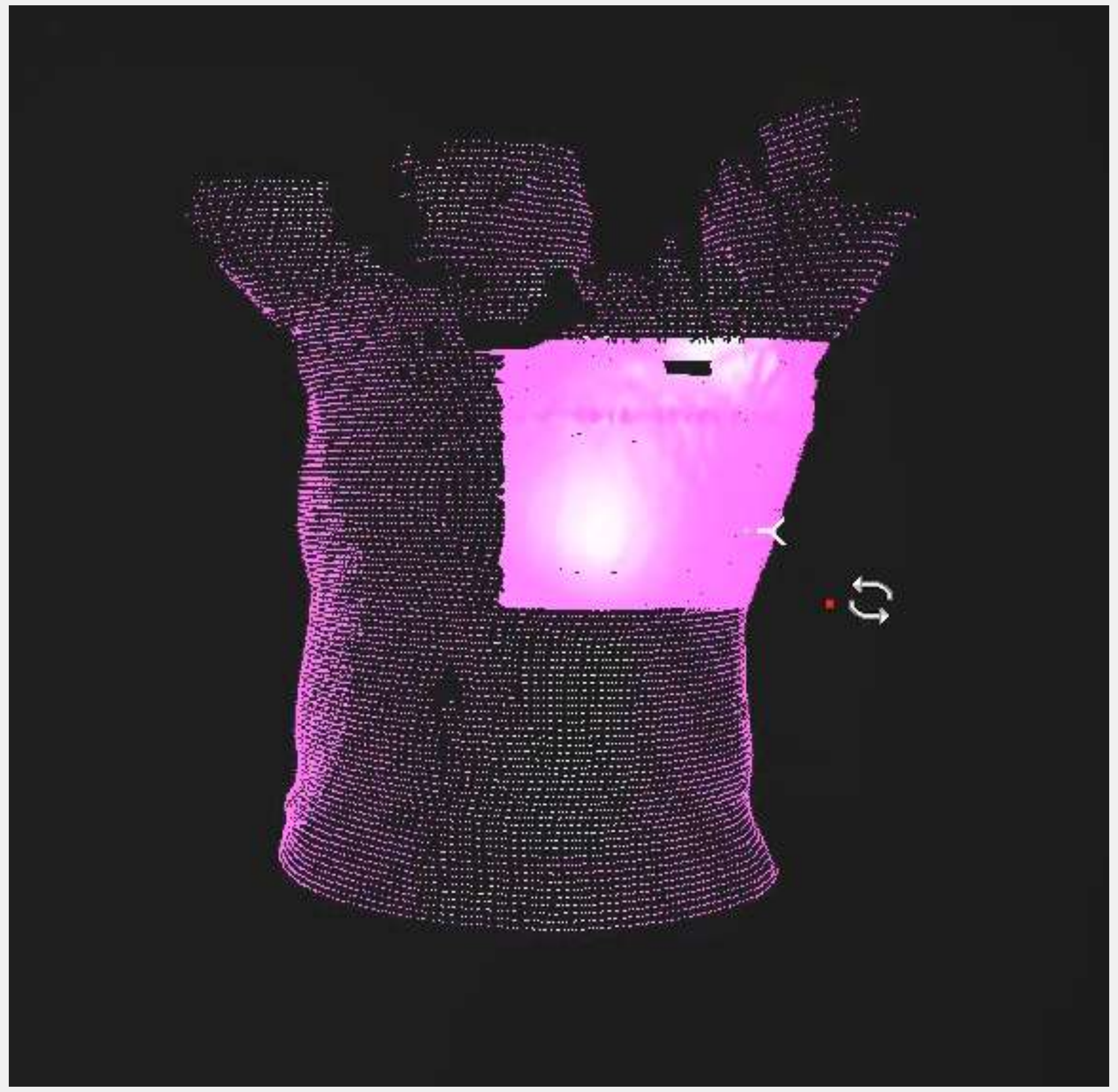


Back to main menu

How AlignRT Helps To Protect the Heart

01

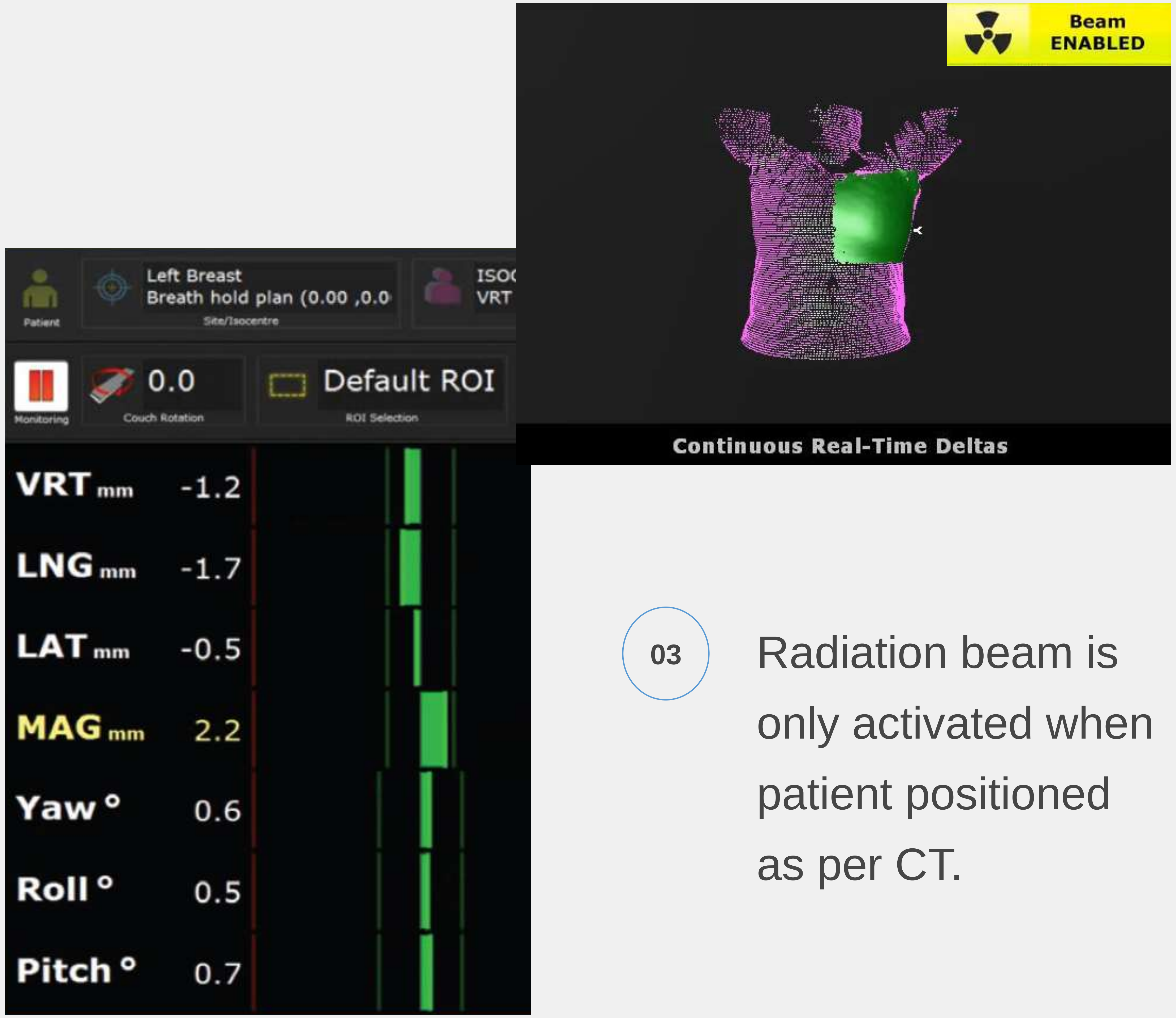
DIBH CT scan is performed as normal and exported to AlignRT.



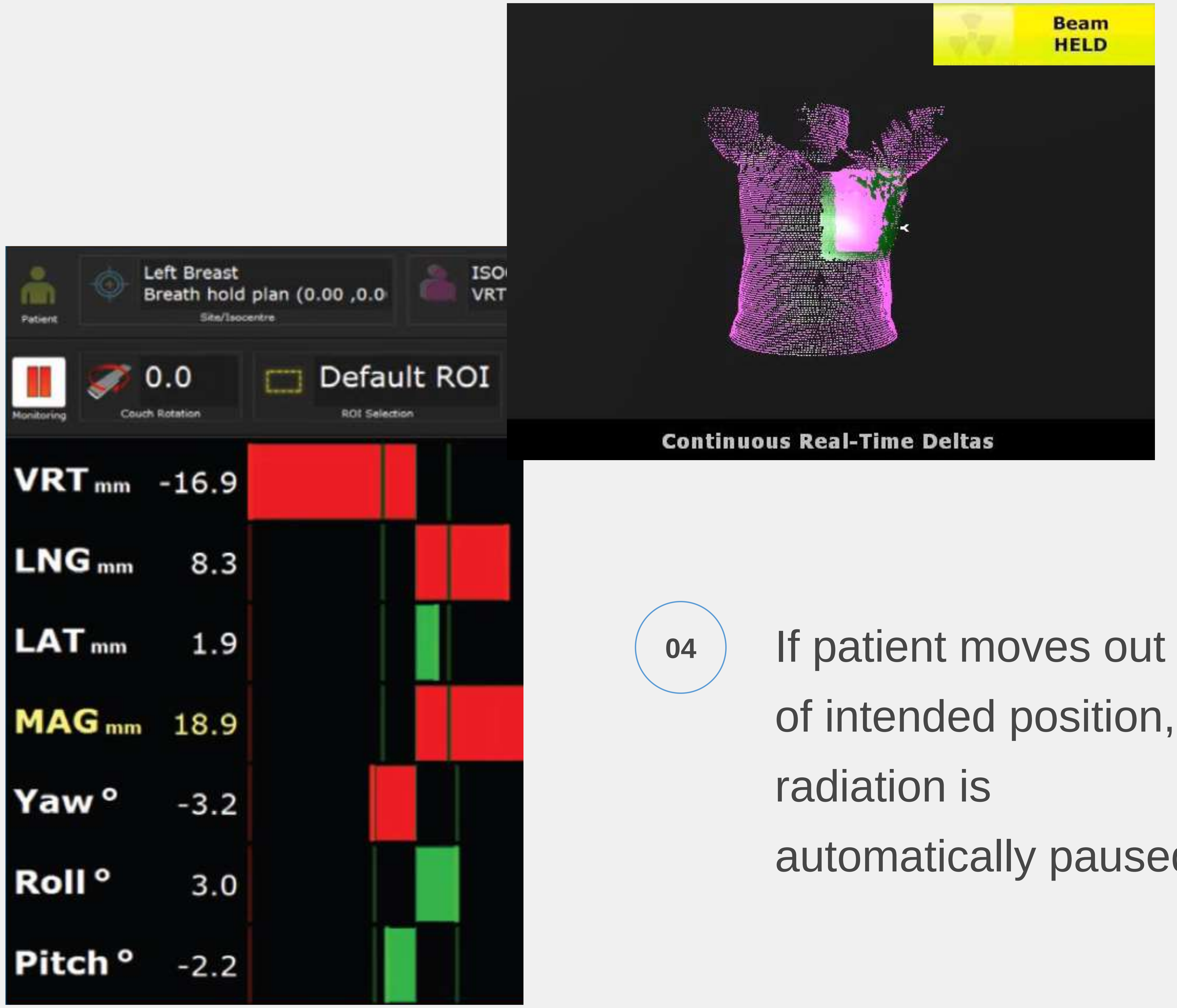
02

During treatment, patient motion is tracked by AlignRT.

How AlignRT Helps To Protect the Heart



03 Radiation beam is only activated when patient positioned as per CT.



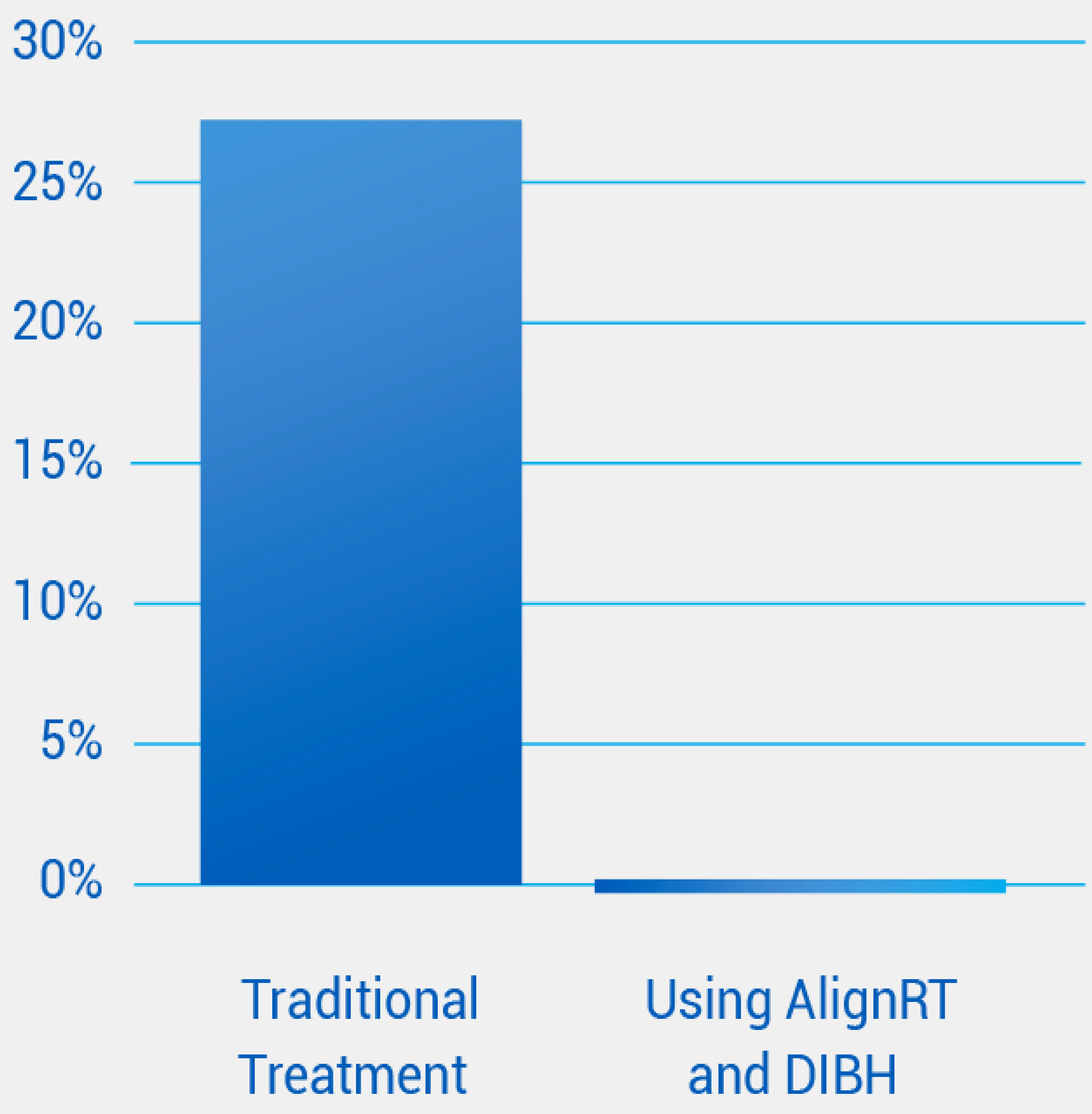
04 If patient moves out of intended position, radiation is automatically paused.


visionrt


Default ROI

Cardiac perfusion defects at 6 months

as measured using SPECT imaging



Various studies using older techniques of breast radiation have been studied, with varying rates of resultant heart damage[4,9].

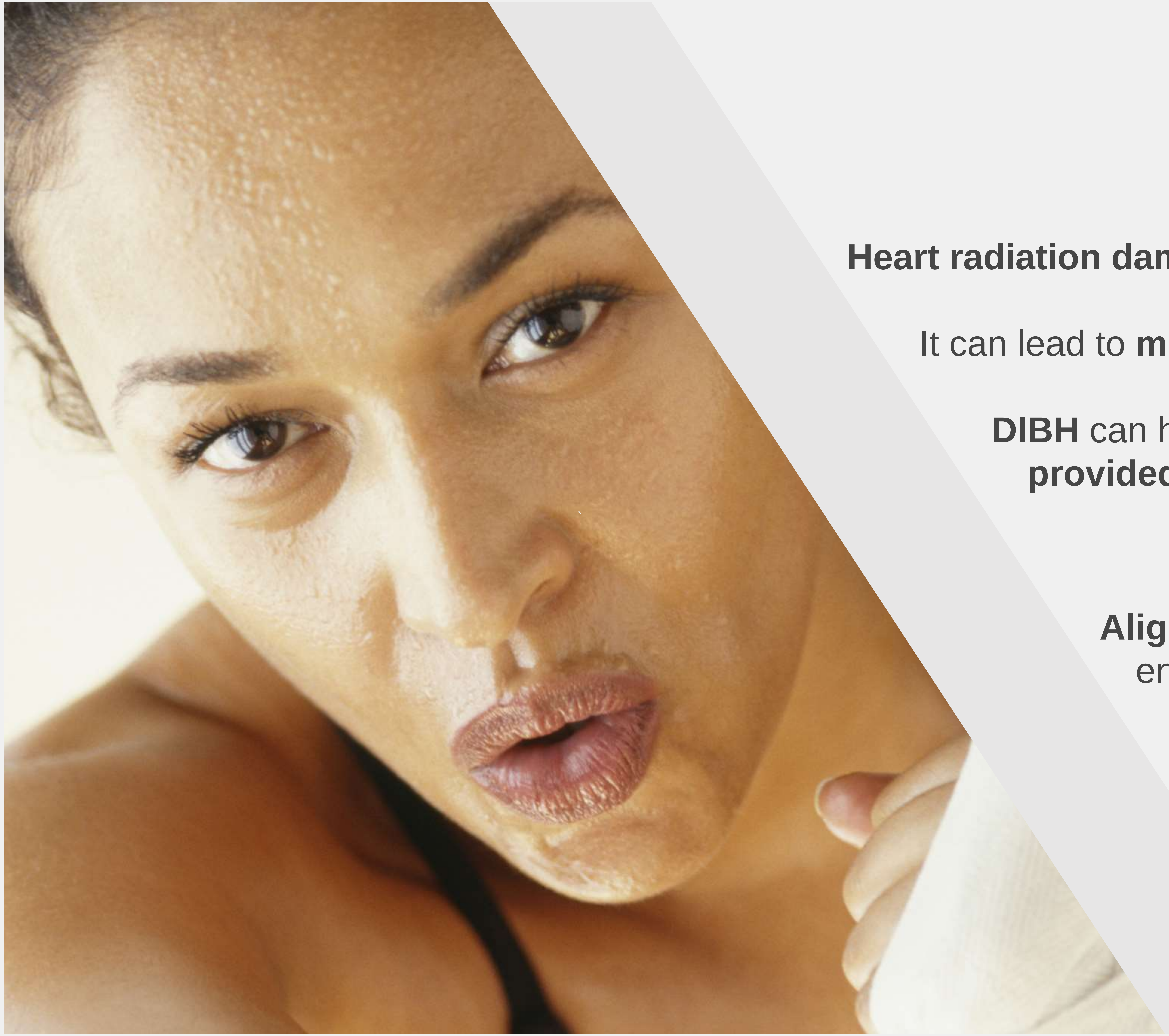
In recently published study at the University of North Carolina, patients were treated using AlignRT for DIBH. **0% exhibited cardiac perfusion defects six months after treatment[10].**

Why AlignRT is different

10 published papers in DIBH showing reproducibility of the technique / reduction in cardiac dose[6,12-20]

- New study suggests prevention of cardiac perfusion defects for left breast patients at 6 month follow-up[10]
- Monitors patient surface throughout treatment in all 6 degrees of freedom
- Adds no time to procedure[6]
- Completely safe and non-invasive: no radiation exposure, non-contact
- Published papers also show value for AlignRT use in other indications including non-DIBH breast, brain, head and neck, sarcoma and other cancers[21-30]

To review papers, visit VisionRT.com/heartstudies



Summary

Heart radiation damage is a widely acknowledged issue.

It can lead to **morbidity and mortality**.

DIBH can help avoid heart radiation exposure – **provided** it is performed accurately and reproducibly.

AlignRT is a fast, non-invasive means to help ensure effective, **reproducible DIBH**.

A new study suggests that **AlignRT helps prevent cardiac perfusion defects** in left-breast radiation therapy patients.

Vielen Dank

Joe Deister

000-000-0000

www.GeneralCancerHospital.com/AlignRT

General Cancer Hospital

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