

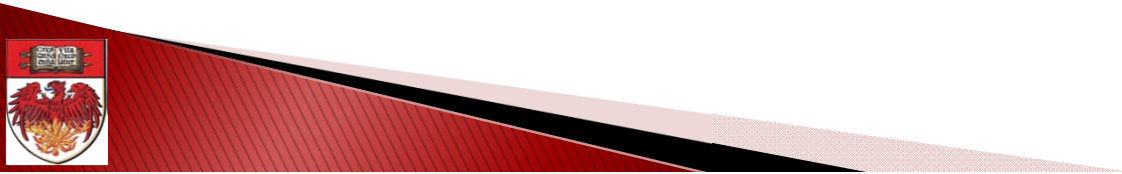
An Introduction to QA & Safety Applications of Surface Imaging

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Education Topic Specific Guided Tours

- ▶ Wednesday, Therapy: Surface Image Guided Radiotherapy Monitoring Systems:
 - 10:15am – Noon (No check in after 10:30am), Room 201B
 - First come first served!



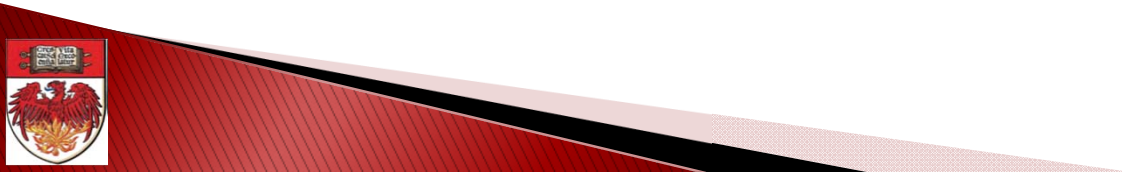
Disclosures

- ▶ I receive royalties and licensing fees for computer-aided diagnosis technology through The University of Chicago.
- ▶ I am co-Chair of “TG-302: Surface Image Guided RT” but this presentation does not represent any AAPM guidelines.



Outline

- ▶ Introduce surface imaging (SI) & its clinical applications
- ▶ Motivate QA & safety applications of SI

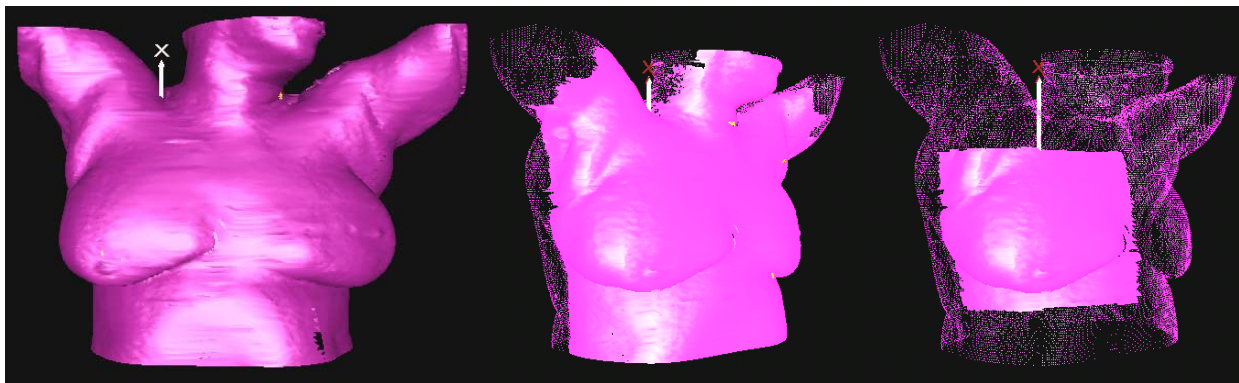


Surface Imaging Basics

- ▶ Non-invasive, optical 3D imaging modality
- ▶ Registers real-time patient surface to a *reference surface* (CT-simulation vs camera-acquired)
- ▶ Registration can be limited to region-of-interest (*ROI*)
- ▶ Compares registered translations/rotations to a user-defined *threshold* to alert the therapy team and/or hold the beam



Surface Imaging Basics



3D Surface from CT
data

'Entire' ROI

'Breast' ROI



Surface Imaging: Clinical Applications

- ▶ Initial patient positioning:
 - 3D modality
 - No radiation dose
 - Real-time feedback over a large field-of-view
- ▶ Intra-fraction monitoring:
 - Voluntary deep-inspiration breath-hold (DIBH) for whole-breast radiotherapy (WBRT)
 - Frameless SRS



WBRT DIBH: INTRA-FRACTION MONITORING



Additional Benefits of Surface Imaging

- ▶ Treatment Quality:
 - Efficiency?
- ▶ Safety Checks:
 - Correct immobilization?
 - Correct isocenter treated?



Quality Improvement: SI to ↑ Efficiency

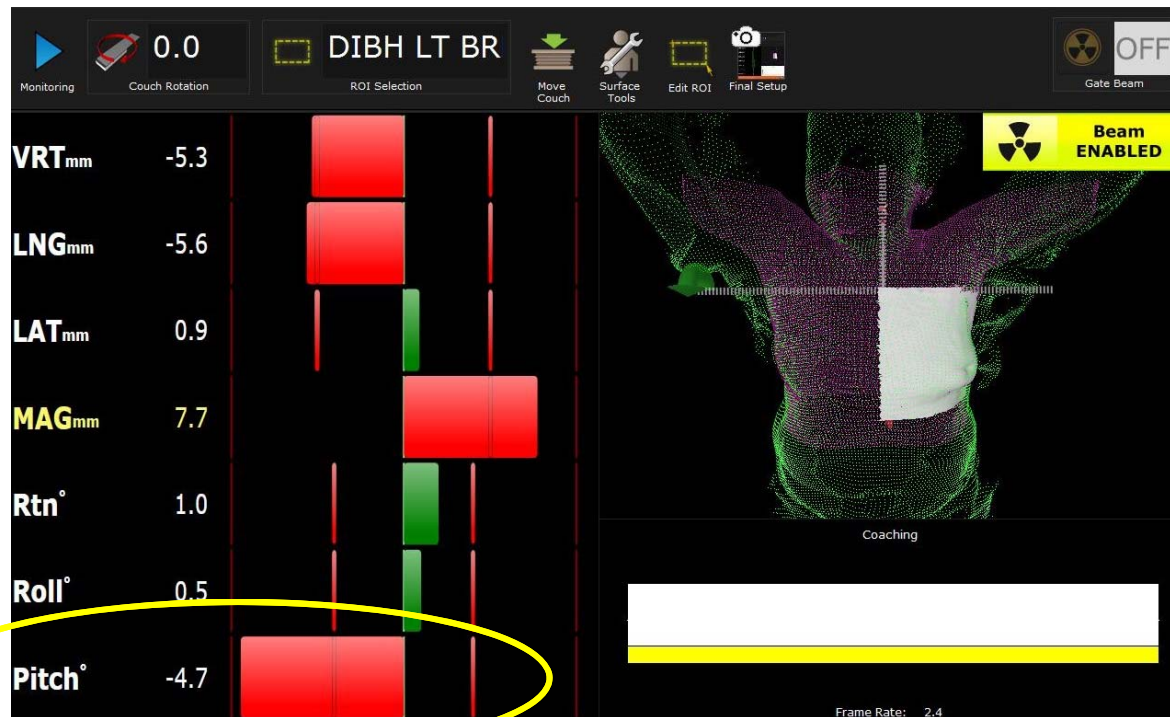
- ▶ Reduce filming frequency
- ▶ Increase throughput

The University of Chicago Medicine WBRT

n=50	Before AlignRT	AfterAlignRT
% of Patients with shifts < 1cm	64%	92%
% of Patients with shifts < 1cm; total time < 30mins	44%	72%



Voluntary DIBH Breast Case: SI on Fraction 1

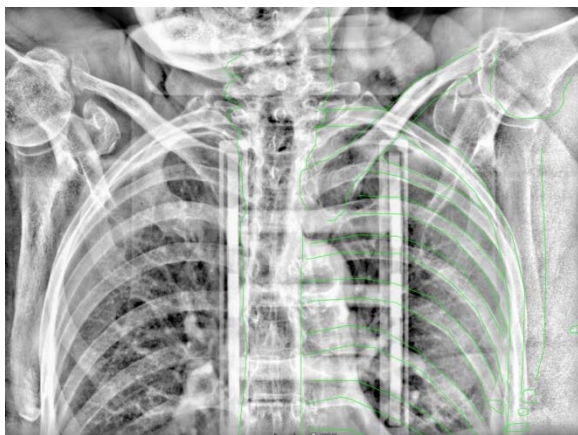


Pitch problem caused by changed in breath-hold pattern or positioning?



Voluntary DIBH Breast Case: Films on Fraction 1

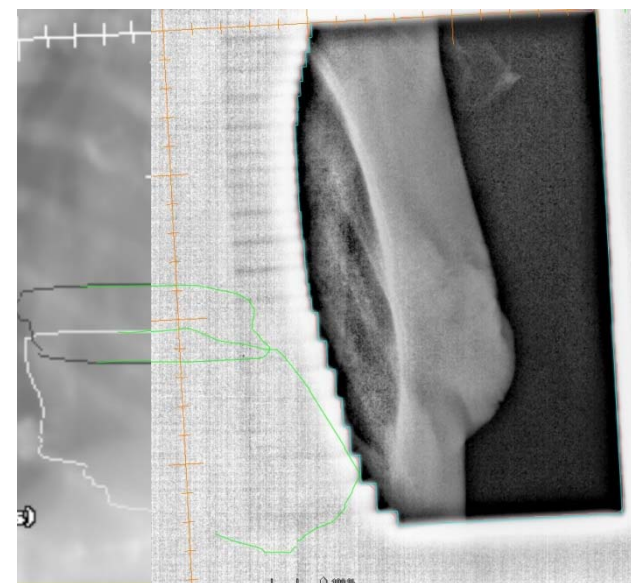
AP kV



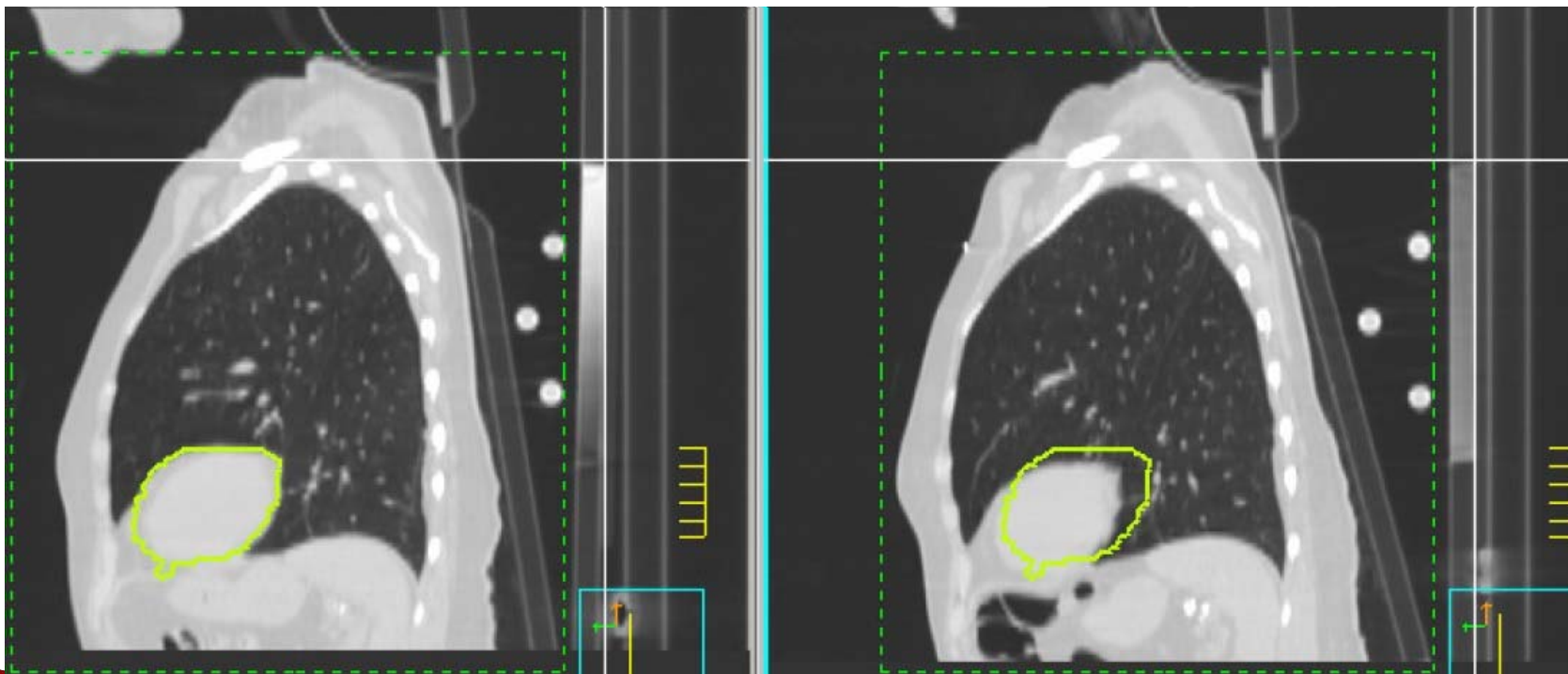
LAT kV



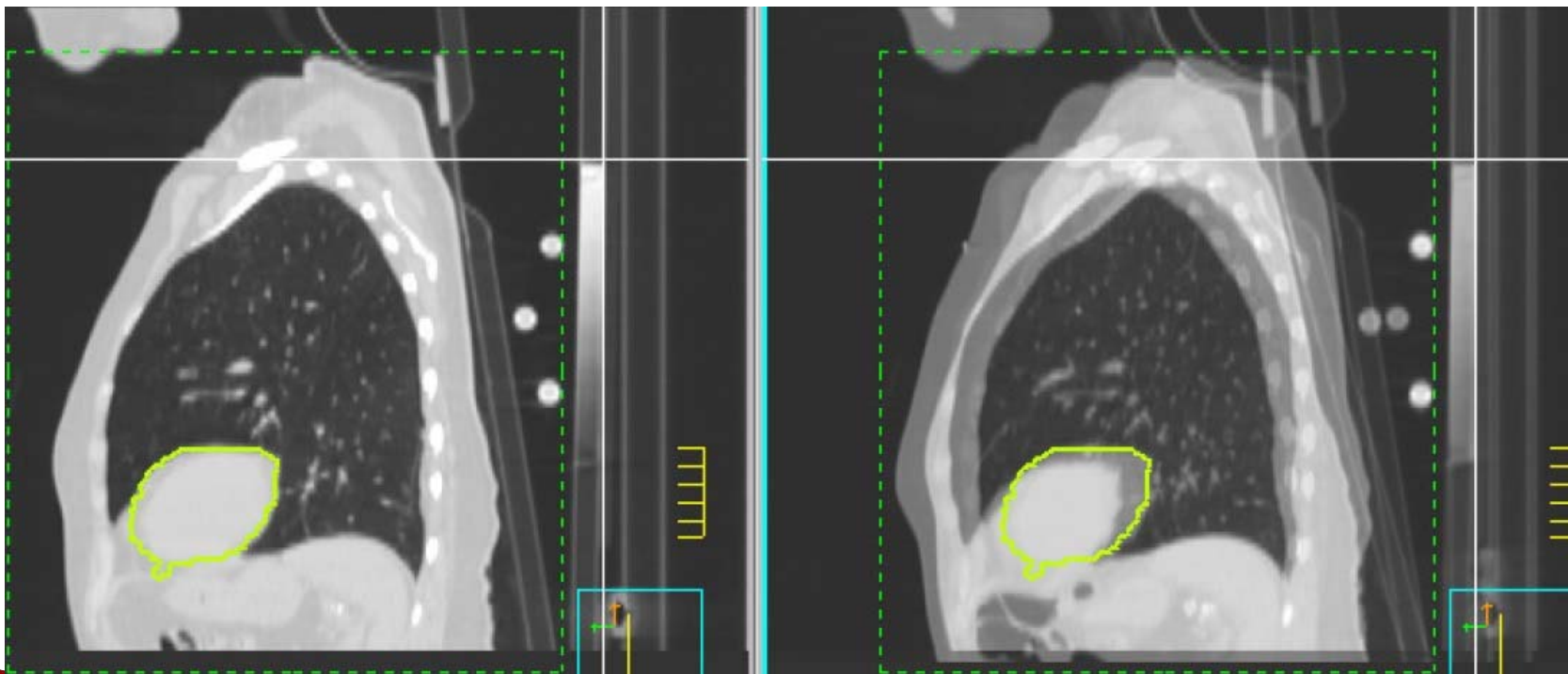
DRR/Med MV port



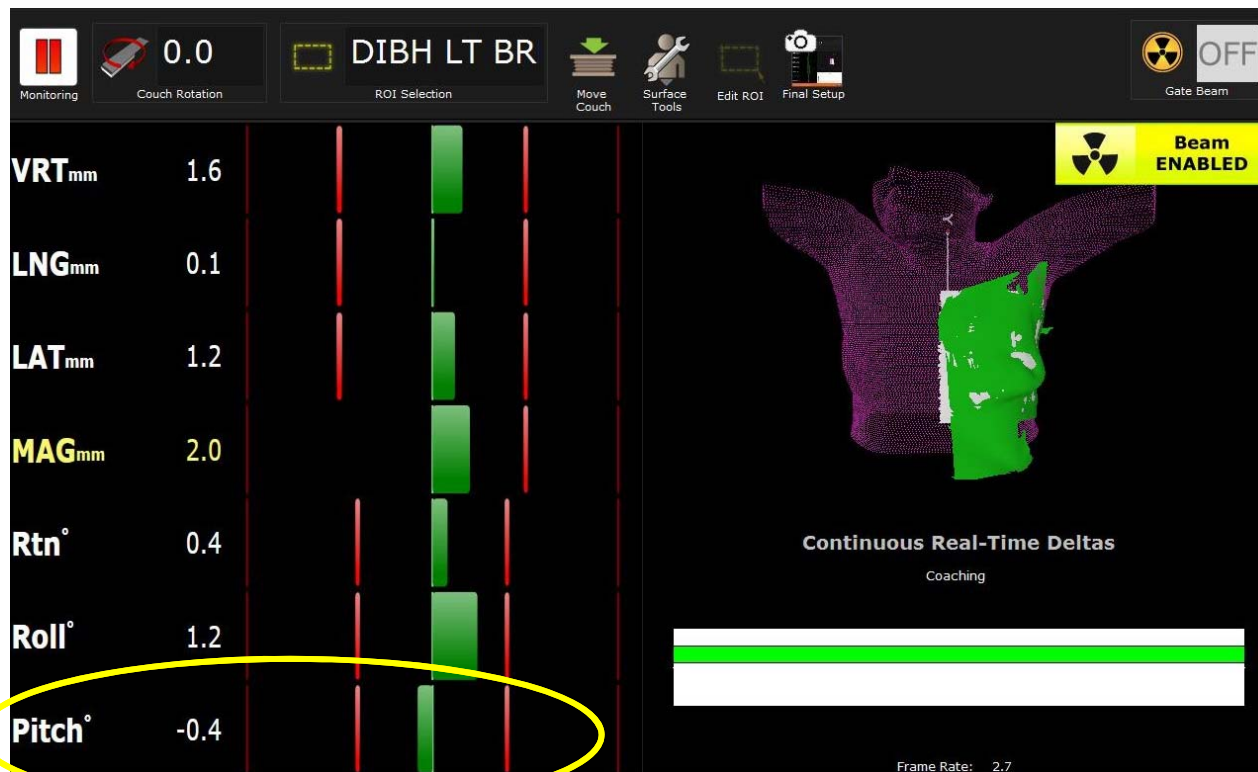
Voluntary DIBH Breast Case: CT scan comparison



Voluntary DIBH Breast Case: CT scan comparison



Voluntary DIBH Breast Case: SI on Fraction 2



Pitch resolved!



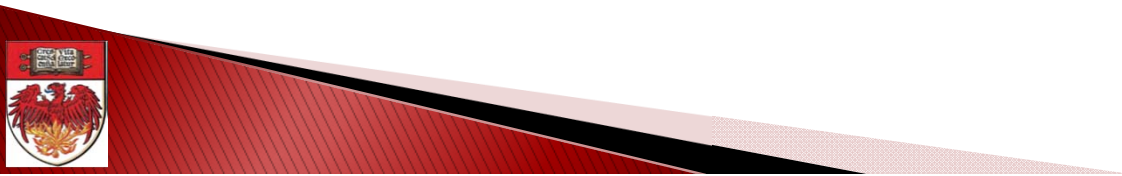
Learning Objectives

- 1) Introduce surface imaging as a quality improvement tool
- 2) Review current quality improvement applications of surface imaging
- 3) Discuss potential future quality improvement applications of surface imaging



Speakers

- ▶ Alonso Gutierrez, PhD, Miami Cancer Institute
- ▶ Hui Zhao, PhD, Univ. of Utah
- ▶ David Wiant, PhD, Cone Health Cancer Center
- ▶ Laura Padilla, PhD, Virginia Commonwealth Univ.
- ▶ Mike Tallhamer, MS, Centura Health



Acknowledgements

- ▶ Colleagues:
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- ▶ TG-302 members

