Clinical and Research Benefits of AlignRT in DIBH* Breast Treatment at AUBMC

*DIBH = Deep Inspiration Breath-Hold

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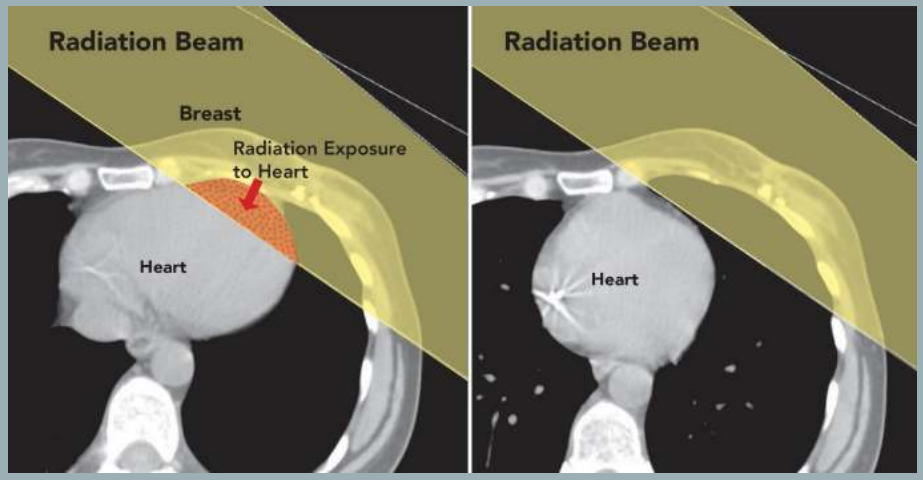
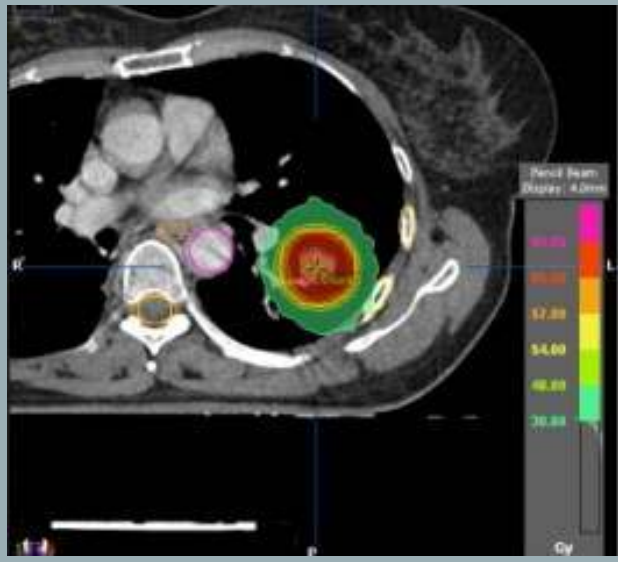
- AlignRT: Treatment Sites and Workflow at AUBMC
- AlignRT: AUBMC Study I
- AlignRT: AUBMC Study II

Sites treated at AUBMC using AlignRT:



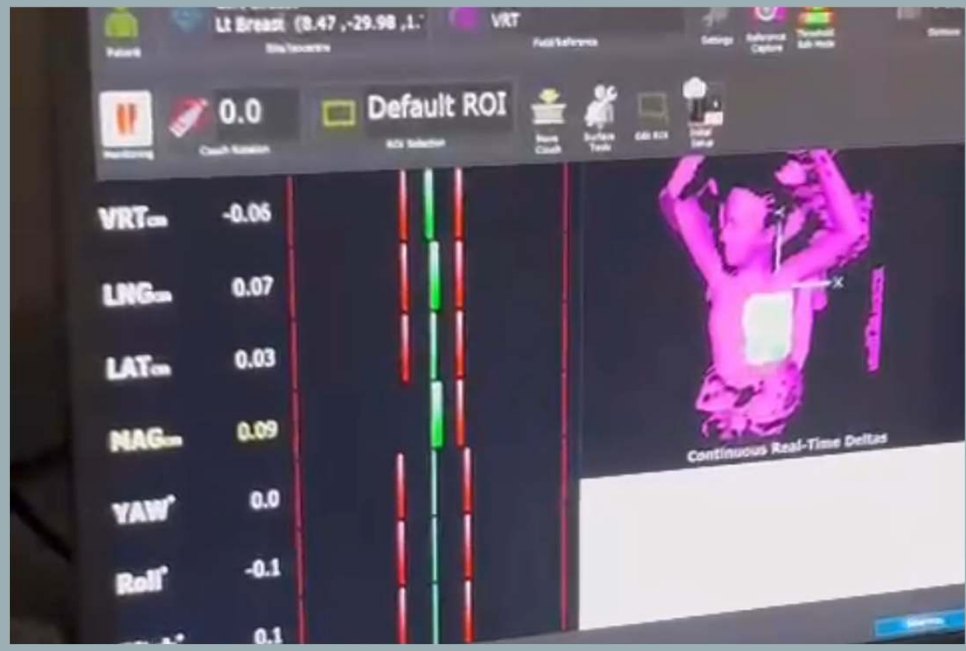
- Left or right breast in DIBH (80%)
- Lung DIBH (SBRT and conventional) (15%)
- Abdominal lesions (pancreas, liver, para-aortic LN) in DIBH (5%)



- Goals from DIBH:
  - Avoid heart, lung
  - Decrease treated volume (PTV)
  - Increase accuracy
  - Increase whole lung volume (decrease V20)

Workflow at AUBMC for breast DIBH:

1. Simulation CT
    1. Patient tested for breath-holding 10-15 sec
    2. Patient coached on DIBH (no back arching, no motion = reproducibility)
    3. One Free Breathing (FB) CT + one DIBH CT
2. Plan done on DIBH CT
3. Export to linac:
    1. FB external contour
    2. DIBH plan and external contour
4. On linac couch:
    1. Approximate positioning with FB external contour
    2. DIBH positioning using DIBH reference external contour
    3. Position verification with IGRT 2D
    4. Capture surface and use during treatment



❖ STUDY I: Decrease in heart dose with DIBH

With DIBH to left breast or chest wall:

- Lower heart dose
- Lower lung dose
- Higher accuracy

Decrease in heart dose with DIBH

- Retrospective study with 103 left breast patients
- Patients already had both DIBH and FB simulation CT

- Inspiration DIBH treatment plan
- Free Breathing (FB) treatment plan
- Compare heart dose between both plans

Duhaini, I., Shahine, B., Zeidan, Y. *et al.* The effectiveness of the DIBH technique in protecting the heart of radiotherapy breast cancer patients treated at the American University of Beirut Medical Center in Lebanon. *Health Technol.* 11, 851–857 (2021)

Results

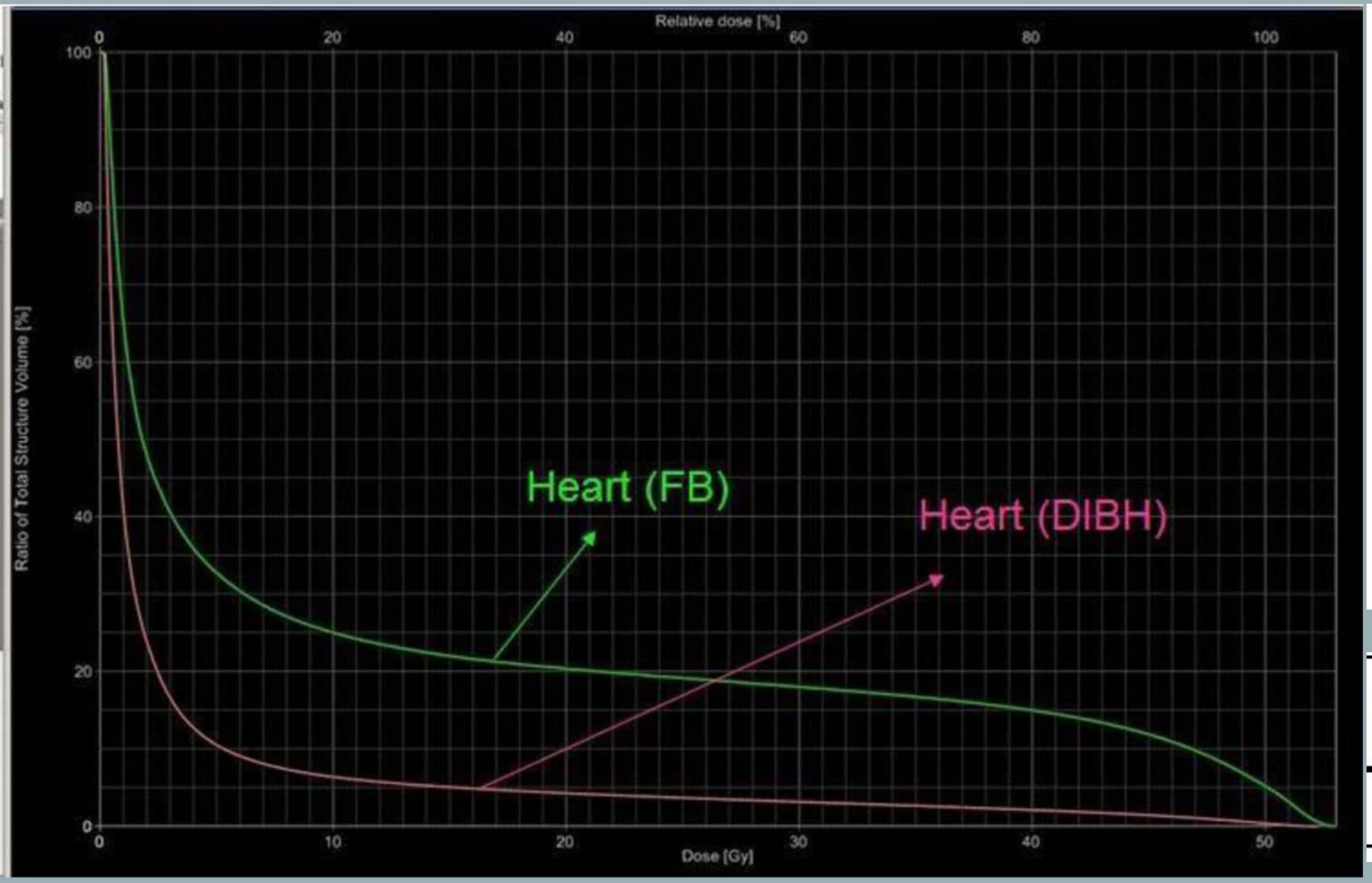
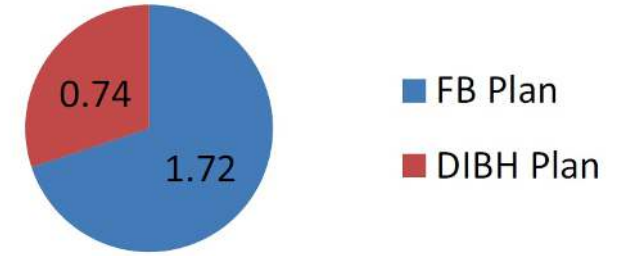


Table 6 Mean dose heart in FB VS DIBH plan and associated graph

Average heart volume for the 103 patients (cc)	Mean dose heart (Gy) in FB plan	Mean dose heart (Gy) in DIBH plan
452.9	1.72	0.74

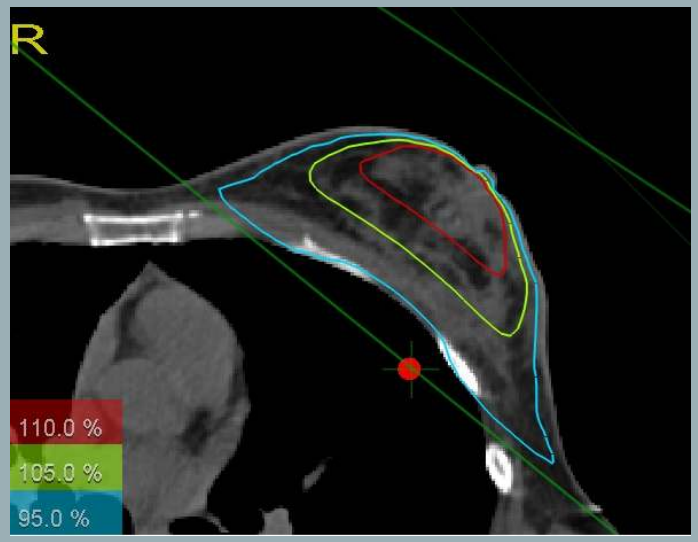


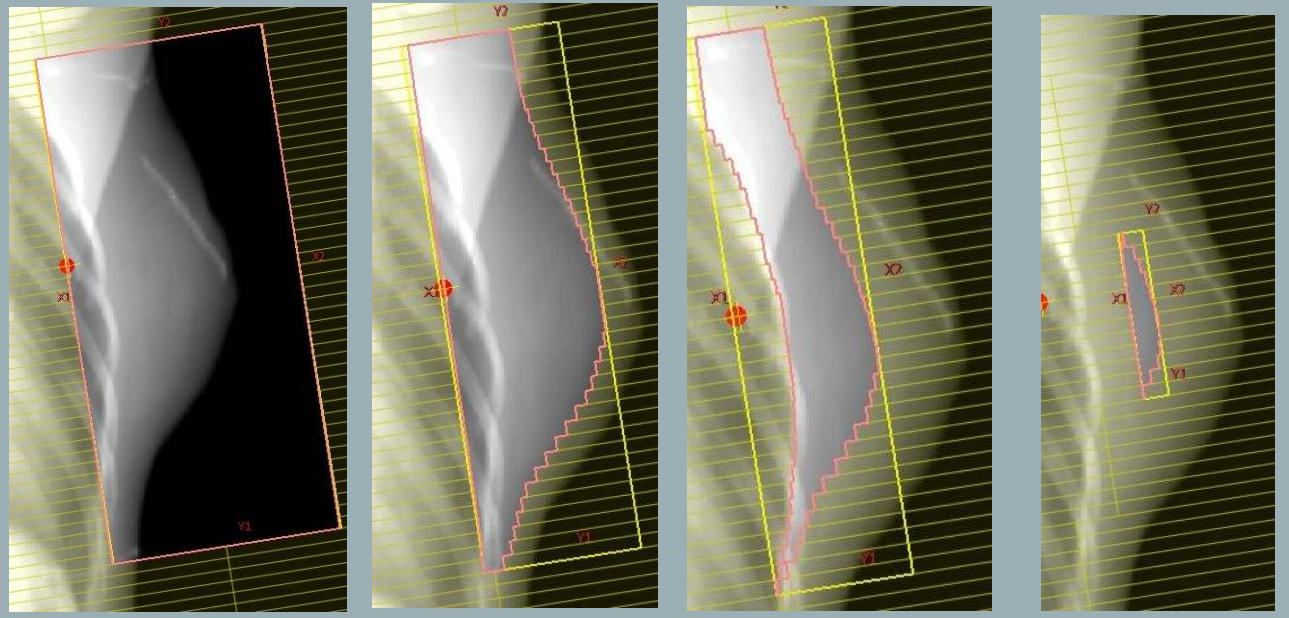
Average V4 (cc) in FB plan	Average V4 (cc) in DIBH plan
20.79	3.99

❖ STUDY II: Using FiF in FB treatment

Free breathing mode (FB) with field-in-field (FiF) technique

- FB still practiced where DIBH unavailable
- Main tangent fields are open beyond breast, breathing not a problem
- FiF are highly targeted



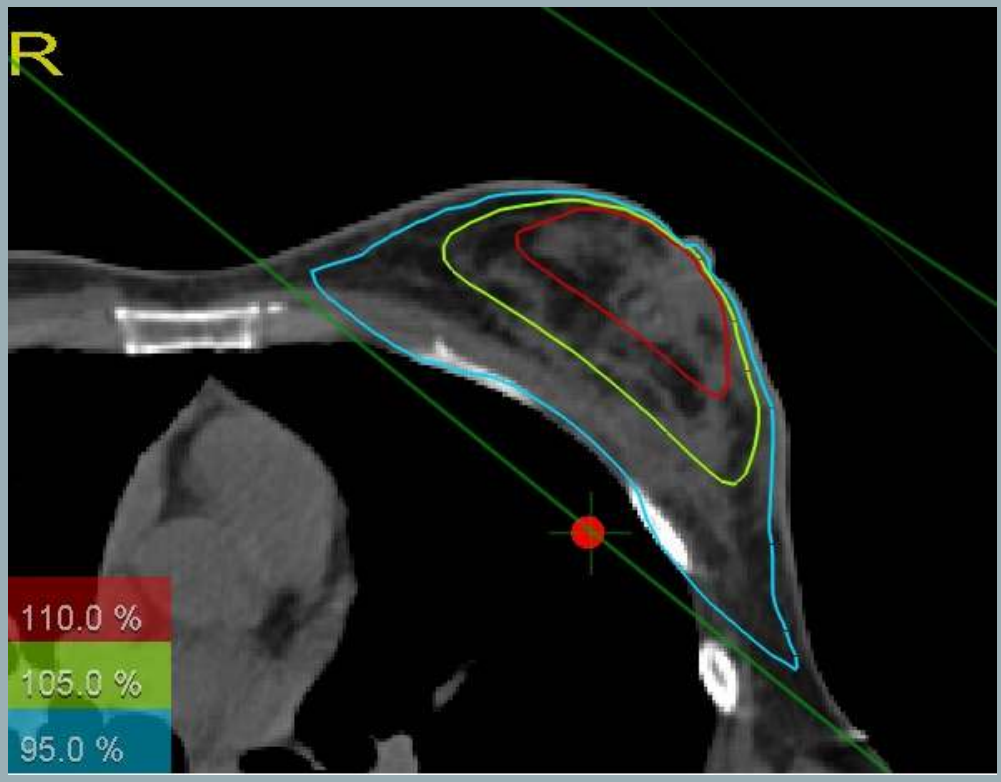


Wassim Jalbout, Dima Mahmoud, Ali Elzein, Sarah Abou Naaj, Paul Ramia, Zeina Azzam. Does Breathing Motion Invalidate the Use of Field-in-Fields in FB Breast Irradition?- Work in progress

- Need to determine error from breathing motion
  - Deterioration in target dose homogeneity
  - Target hot spot? Cold spot?
  - Increase in lung dose?
  - How much?

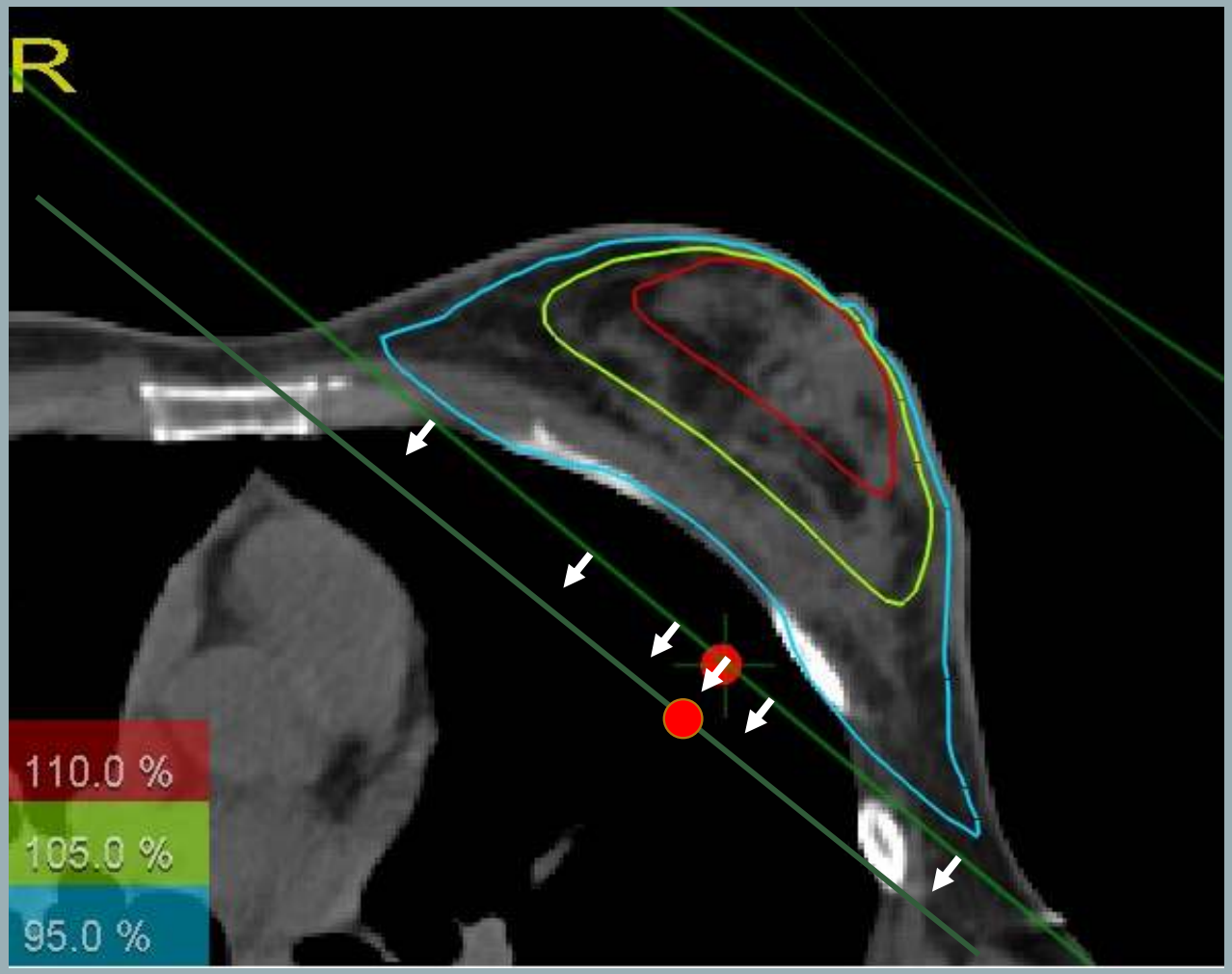
- How to simulate breathing motion on treatment plan?

→ Use existing CT and introduce shift in isocenter position to simulate breathing

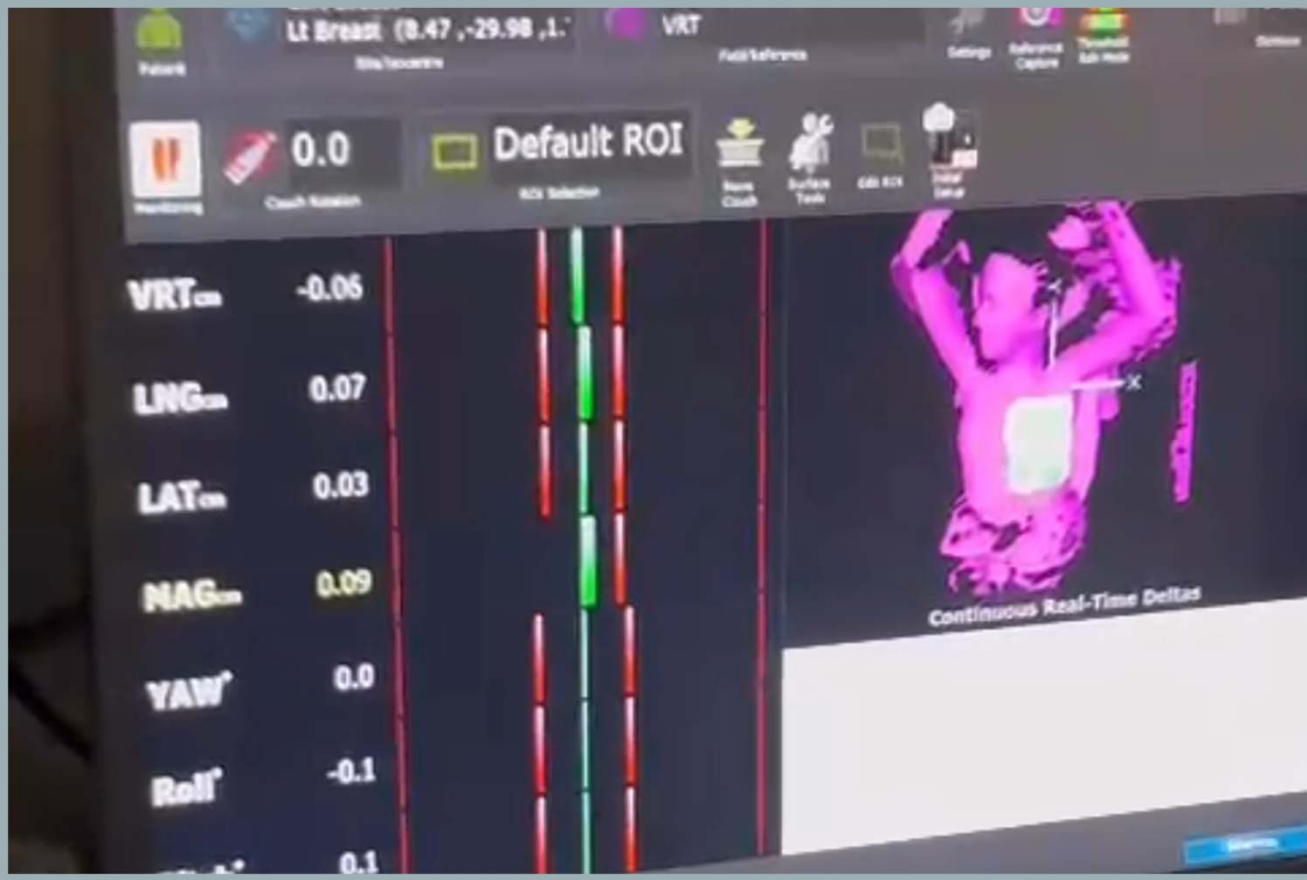


- How much should we shift the isocenter?

→ Get breathing amplitude from AlignRT



- Monitored 20 breast patients on AlignRT treated in FB
- Recorded maximum breathing amplitude for each patient
- Found average breathing amplitude
  - 2 mm in craniocaudal
  - 2 mm anteroposterior
  - 0.5 mm lateral



- Work in progress, preliminary results show negligible target homogeneity degradation

THANK YOU