Clinic Experiences of DIBH-based Breast Treatment Using C-RAD System

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Disclosure

I did not received royalty, honorarium or any kind of financial support (from any industrial partners or vendors) for this talk.
Roadmap

▪ **Clinic Background on DIBH Treatment for Whole Breast RT**

▪ **Clinical Options for DIBH**
  - Tidal Volume-based DIBH systems
  - Surface-guided DIBH systems

▪ **DIBH workflow using C-RAD system**
  - CT simulation
  - Planning
  - Treatment

▪ **Conclusions**
Background


Background

Radiation Induced Toxicity

• Acute toxicity: skin discoloration
• Pneumonitis
• Lymphedema
• **Cardiac toxicity**
  - **Myocardial infarction, coronary revascularization, death from ischemic heart disease**
  - 1.76 fold increase with Surgery + RT compare to Surgery alone
  - 1.56 fold increase for left V.S. right breast RT
  - **Rates of major coronary events increased linearly with mean dose to heart by 7.4%/Gy with no apparent threshold.**
The separation between the chest wall and the heart is small. So the tangent beams can pass through the heart. Even the beam geometry can barely spare the heart, the scatter doses to the heart are still significant.
Clinic Options

Breath Hold Techniques
- Tidal Volume-based BH
- Surface-Guided BH
Clinic Options

Volume-based Deep-Inspirational Breath Hold

- **ABC (Active Breathing Coordinator)**
  - Control lung expansion at user-defined volume, usually 75% of max inspiration for at least 20 seconds
- **SDX**
  - Similar to ABC with addition of real-time feedback to patient through goggles and shorter breathing tube

**Pros:** safe breath hold

**Cons:** patient comfort, no certain correlation between volume and chest position
Clinic Options

Surface-Guided Deep-Inspiration Breath Hold

- Vision RT
  - Using stereo cameras to acquire the infrared light projected to patient’s surface

- C-RAD
  - Digital Light Processing (DLP) surface scanning system (Catalyst) and laser surface scanning (sentinel)

Both systems can provide accurate breast/chest wall position during DIBH

Workflow-wise, I personally prefer C-RAD system
CT Simulation

• Patient selection
  ❑ Can patient perform consistent breath hold?
  ❑ Can patient hold breath long enough?

• BB alignment and positioning

• surface imaging acquiring through Laser scanning
DIBH workflow using C-RAD system

CT Simulation (cont.)

• DIBH training
• Free breathing CT scan
• Breath Hold CT scan
DIBH workflow using C-RAD system

Planning
• Ensure to use DIBH CT as the primary
• Define CT iso based on BB
• Design beams
• Dose Evaluation
  ☐ Mean dose to heart should be less than 500cGy
• Sent Plan information to CRAD system
DIBH workflow using C-RAD system

Treatment

• Setup preparation
  - Camera parameter setting
  - Bounding box define
    - From Neck to upper abdomen
    - Including the tracing point
    - Ensure the superior boarder high enough to be able to cover the contour during DIBH
  - Motion control specs define
    - cRespiration
    - cMotion
    - cPosition
DIBH workflow using C-RAD system

Treatment (cont.)
• Coarse alignment using Sentinel acquired images
DIBH workflow using C-RAD system

Treatment (cont.)

• Practice DIBH and acquire reference contour at 50% of breathing window
DIBH workflow using C-RAD system

Treatment (cont.)
• Performing DIBH-based CBCT and re-align the patient
  - Short time scanning time
  - Pause if breaks needed
  - Start or resume scan when all three within specs
    - cRespiration
    - cMotion
    - cPosition
DIBH workflow using C-RAD system

Treatment (cont.)

- Perform treatment based on the guidance of CRAD
  - Gated treatment through ELEKTA response box
  - Provide enough rest time between BH
  - Ensure the FB return to the baseline after each BH
  - Most of the patient prefer verbal instruction than feed back system
Conclusions

• DIBH technique is effective for decreasing cardinal toxicity for whole breast RT

• SGRT-based DIBH treatment become more popular than Tidal-volume based treatment due to its patient comfort and position accuracy

• C-RAD system provide a clinic-friendly workflow for DIBH RT
Acknowledgement

Therapists
• Yadi Castillo
• Helen McGee
• Chad Lowe
• Kristin Ragosta
• Amanda Carter

Physicists
• Chihray Liu
• Guanghua Yan

Dosimetrists
• Jeff Mott
• Jill Mint
• Richard Binkley

Physicians
• Damilola Oladeru
• Paul Okunieff

Physic Residents
• Luke Maloney
• Sheng-Hsuan Sun

UF Radiation Oncology
Any Question?