Method to Validate the Dosimetric Accuracy of Synchrony Using a CIRS Dynamic Phantom

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Disclosure

- No financial interests to disclose
CIRS Phantom

- Dynamic Anthropomorphic Thorax Phantom
- Chest plate for beacon placement
- Lung rod within the lung that contains the target
- Target is a mini-film ball cube phantom
CIRS Phantom

- Lung rod achieves 3D target motion controlled by 2 actuators
  - 40 mm I/S motion, 7 mm L/R & A/P motion via rotation (total displacement)
- Control box offers 15 programmed profiles plus 1 manual profile
Lung Rod

7 mm A/P via rotation

7 mm L/R via rotation

40 mm S/I
Modifications

- Additional 5 cm slab
- Gold fiducials implanted
- Mini-film in film cube
Delivery

- 1fx, 20 Gy
- MD-22 mini - film
- 4 gold fiducials
- Static phantom plan
- Synchrony plan
Procedure

• Calibrate film, create calibration curve
• Scan treatment film (Epson Professional 1680)
• Acquire profile in ImageJ
• Convert profile to dose profile using calibration curve
Calibration

- Use ion chamber to verify results
- Corrected for depth, daily output
Calibration Curve

- **10 cm buildup**
  - Equation: $y = 0.01x + 0.036$

- **5 cm buildup**
  - Equation: $y = 0.0092x + 0.0349$

**Axes:**
- **x-axis:** dose/Gy
- **y-axis:** net density
Analysis

- ImageJ
- Line script
- Export to excel or calculation worksheet
Results

- Compared static plan with synchrony plan
- Visual inspection of treatment plan with dose profile
- Used goodness of fit to compare static phantom plan with Synchrony plan
Conclusions

- Synchrony can be as accurate as a static phantom case
- Dose assessment included in QA
- Gafchromic film fast and easy method for dosimetric analysis
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