Evaluation of Patient Positioning and Procedure for SBRT Lung Simulation and Treatment

Gina Bellreng, R.T. (T)
Roswell Park Cancer Institute
Outline

- Reproducible patient positioning for SBRT lung procedures. Why is it important?
- Simulation overview of Lung SBRT
- Treatment overview of Lung SBRT
- Challenges in patient positioning
- VMAT vs. 3D Procedure
- What’s Next? - Advancements in patient positioning for SBRT lung
Reproducible Patient Positioning

SBRT Lung Treatment Time-Frame

- VMAT vs. 3D
- Free-Breathing, Breath-Hold, Phase Based
- VMAT 30-45 mins for all three techniques
- 3D 45-60+ mins for all three techniques
- Length can vary depending on number of fractions, monitor units per field, and general patient status.
Reproducible Patient Positioning Cont.

No matter how accurately you set a patient up or how reproducible the treatment set up may be, if the patient is not comfortable, they will move.

- Give patient an overview of what to expect (time frame, noises in room, intercom system, etc.)
- Answer any questions from patient regarding treatment
- Introduce team members
- Explain the positioning process as you go along
- Address any concerns or discomfort issues before you leave the room
Simulation

- An SBRT lung simulation appointment will generally take about an hour.
- Patients are asked to lay supine on top of a blue BodyFIX® pentagon bag with the arms above their head.
- A triangle knee cushion, gray mat, and small rectangular cushions are used as a part of a standard SBRT lung set-up.
- Additional cushions, folded sheets, styrofoam blocks and pillows are sometimes used to aid with comfort for certain patients.
- After the bag is molded, the CA is identified by the MD and cube is placed on abdomen for respiratory gating tracking.
SBRT Lung Immobilization Devices
Simulation Cont.

- Patient is then coached (which is key) for the utilization of respiratory gating during simulation.
  - Breath hold - Deep breath in through the nose until you naturally stop and then hold. Visual gating glasses are given after bar is set.
  - Phase based - Nice even breaths. No deep breaths and stay awake.

- Markers are placed to begin simulation scans. Often adjustments are needed based on scans. Continual communication is important to patients in order for them to remain still.

- Once scans are complete and MD finishes analyzing respiratory motion the therapists will begin to mark patient/ SBRT bag, tattoo, take measurements and photos.
Simulation - Marking the Patient

Tattoos are placed at anterior CA and laterally on each side.

- Special consideration for patients with large breasts or large skin folds
- Lower marks or tattoos are often given to allow for second point of reference for set up
- Coinciding marks are placed on bag where tattoos and references marks are given
- Cube location is marked on bag as well as measurement documented
- Vertical & Lateral (after simulation is complete & patient is removed from bag) laser locations are marked on bag to help with setup and checking of clearance.
Simulation - Photos

*The most important documentation and necessity for a reproducible setup*

Include CLEAR photos of:
- Hand/arm position
- Cube placement
- All tattoos and reference marks from top of patient & each side
- Full body photo
- Standard immobilization devices and any special devices used for complicated setups
When Simulation is complete patient education is helpful for SBRT treatment:

- Explain the importance of taking care of markings (showering/not scrubbing)
- Give a tour of the department (where to go when they return for treatment)
- Importance of arriving early (to change, use restroom and be ready for appointment time)
- For patients with high anxiety sometimes meeting the therapists or showing them treatment room helps significantly with this
Pre-Treatment Check

- Before patient arrives for treatment a dosimetrist will check clearance on ALL SBRT plans. This includes checking all angles and couch rotations of the treatment plan to insure proper clearance.

*Please note that patient is not in bag during this check. Therapists should also verify clearance on first day for any questionable angles or rotations.
Treatment

- Introduction to team members, brief explanation of procedure and address any questions before setup begins
- Help the patient into the SBRT bag (generally done in steps to make sure the patient doesn’t lie down rotated or twisted)
- Explain the process as you are setting up the patient
- Verify all shifts, SSDs and check clearance after setup is complete
- Remind patient to breathe normally, keep eyes open and stay awake
Challenges in Patient Positioning

- **Clearance Issues with Elbows (Simulation and Treatment)**
  
  Answer: Tape is your friend! Taping elbows help give patients something to rest against during treatment.

- **Head Discomfort**
  
  Answer: Bolus under head. Placing a small piece of bolus where head lies in bag helps with hard folds created from hardening of BodyFIX® bag.

- **General Patient Anxiety**
  
  Answer: Warm pillowcases/blankets and music help alleviate some general anxiety.

- **Reproducible Breathing Patterns**
  
  Answer: Administering oxygen and open communication with patient helps patient stay awake and breathe more regularly.
SBRT Procedure - VMAT

- A CBCT is acquired (Free-Breathing or Breath-Hold) and analyzed by MD.
- A Fluoroscopic image is acquired to show the real-time movement of the tumor.
- KV/KV images are acquired to verify the shifts of the CBCT.
- Treatment then begins after verification of all shifts and treatment parameters by the SBRT physicist and a timeout has been performed by the Radiation Therapists.
- VMAT plans are generally 2-3 arcs. If more than this a second CBCT may be performed halfway through treatment to verify patient has not moved.
- After treatment is complete a Port Film of the fluoroscopic field is taken to verify the treatment was completed on target.
SBRT Procedure - VMAT
SBRT Procedure - 3D

- Generally take longer than VMAT procedures
- Typically 11 treatment fields with multiple couch kicks and gantry angles
- Radiation Therapists port film each field prior to first fraction to verify MLC blocking of all treatment fields (included in physics chart check)
- An SBRT worksheet is created prior to first treatment
- MD selects what fields to port film during treatment using SBRT worksheet
- The SBRT worksheet is then used to order treatments fields to allow for shorter treatment time and for the therapists to know when/if they need to go into treatment room.
SBRT Procedure - 3D

**SBRT Worksheet**

<table>
<thead>
<tr>
<th>Patient:</th>
<th>Gating:</th>
<th>Number of Fractions:</th>
<th>Fluoro/Arm/Post</th>
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<tbody>
<tr>
<td>Group John</td>
<td>Y/N</td>
<td>3</td>
<td></td>
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<tr>
<td>Phases: 30 to 30</td>
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### Group 1

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<thead>
<tr>
<th>Field #</th>
<th>Gantry</th>
<th>Couch</th>
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<tr>
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<tr>
<td>7</td>
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<td>9</td>
<td>280</td>
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### Treatment Order

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<tbody>
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<td>8</td>
<td>4</td>
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<table>
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<tbody>
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<td>7</td>
<td>4</td>
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<tr>
<td>10</td>
<td>9</td>
<td>11</td>
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### Group 1

<table>
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<th>MV</th>
<th>1</th>
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### Group 2

<table>
<thead>
<tr>
<th>MV</th>
<th>8</th>
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</table>
SBRT Procedure - 3D

- A CBCT is acquired (Free-Breathing or Breath-Hold) and analyzed by MD
- A fluoroscopic image is acquired to show real-time movement of the tumor
- A port film of the first field in the first group is acquired
- Treatment of the first group of fields begins (Physics check & timeout)
- A CBCT is repeated after first group of fields (half) are treated
- A port film of the first field in the second group is acquired
- Treatment of the second group of fields begins
- After treatment is complete a fluoroscopic image is acquired to verify the treatment was completed on target
SBRT Procedure - 3D
Advancements in Patient Positioning for SBRT Lung

**Surface-Guided Radiation Therapy (SGRT)**
- Is a rapidly growing technique which uses cameras to track patients’ surface in 3D, for both setup and motion management during treatment.
- Integration with treatment units to automatically interrupt the beam upon detection of patient motion.

**MRI-Guided Radiation Therapy**
- MRI solves both of the primary issues with CBCT—poor soft tissue contrast and difficulty capturing moving organs.
- Daily MRI and soft tissue imaging will account for daily positional changes.
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