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

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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
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
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 setup
- 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
Simulation - Patient Education

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**

**Patient:** John Gano
**Gating:** ON
**Phases:** 30 to 30
**Number of Fractions:** 3
**Fluoro:** Anti/Post

#### Group 1

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#### Treatment Order

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<tbody>
<tr>
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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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