Optical Guidance for Multi-Target Brain SRS/SBRT

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Leverage our Tech for Frameless SRS

• Move from frame based laser alignment to CBCT frame less alignment
• Possibility of intrafraction motion with mask based SRS setup
• Use optical system to monitor patient motions
Surgery vs SRS vs WB RT


1) What prognostic factors are important …?

4) Survival benefit for WBRT alone vs WBRT and SRS Boost?

In good prognosis patients with multiple brain metastases (all less than 4 cm in size and up to 4 brain metastases in number), radiosurgery boost when added to WBRT improves treated brain lesion and overall brain control as compared with WBRT alone. As there is no survival advantage with radiosurgery added to WBRT in patients with multiple brain metastases, WBRT alone may be considered.
Case Example

- 62 yo F with metastatic NSCLC
- Whole Brain RT in Fall 2014
- 6 Met’s Spring 2015
- 5Gy x 5 fx
- 2X per week
Case Example

- Daily Positioning using 4 DOF couch
Case Example

- Easy PTV assessment (for brain)
- Full 6 DOF registration
- Copy GTV to CBCT
- Load online match and display PTV from plan on CBCT

Standard, HFS
Z: -0.19 cm

GTVs

3.1°!
Open Face Immobilization

- Open faced mask system
  - Allows visibility of patient surface
  - Evaluated quality of immobilization
  - Clinical work flow for using OG for patient setup

Multi-Target Planning

- U Mass Initial Experience
  - 10 single iso, 2 two iso
  - Compared well to other frameless

- UAB Multi-target Guidance on …
  - Number of beams / Arcs
  - Structures for optimization
  - Optimization strategies
  - Expected CI GI HI values


### Commissioning

- **6-DOF Couch**
  - Commission accuracy of translations and rotations

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<th>Pitch angle (degrees)</th>
<th>Distance to wall (mm)</th>
<th>Offset distance (mm)</th>
<th>tan(angle)</th>
<th>Angle (Degrees)</th>
<th>% Error</th>
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## Commissioning

- **CBCT Alignment**
  - Various starting couch positions with phantom
  - 3 three translations, roll, pitch
  - Geometric phantom and table under load
  - CBCT ➔ Align ➔ Shift ➔ CBCT ➔ Align ➔ Res’ Error?

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<th>residuals (after shift)</th>
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Align RT Commissioning

- Optical System
  - Test object for testing
  - 32 offset positions
  - Measure residual error
- Average 0.06 cm
- Standard Deviation 0.11 cm
Treatment Delivery Workflow

- Optical System for initial setup
  - If >2° rotation, unlock immobilization and redo
- Use CBCT for target localization using 6DOF
- Acquire High Res’ Static Image of Position
  - Used as reference for Real Time monitoring
- Monitor motion for duration of treatment

4 Step Frameless SRS Rollout

1. Frame based with Laser Alignment
   1. One plan per target
   2. CBCT verification of isocenter
   3. Monitor patient with surface camera
   4. Three patients

2. Frame based with CBCT Alignment
   1. One plan per target
   2. Laser verification on frame
   3. Monitor Patient with surface camera
   4. Three patients
4 Step Frameless SRS Rollout

3. Frameless with Surface Camera setup
   1. One plan per target
   2. CBCT alignment
   3. Monitor patient with surface camera
   4. Three patients

4. Frameless with Single Plan Multi-Target
   1. One Plan with Multi-targets
   2. Surface Camera setup
   3. CBCT alignment
   4. We’re done
Summary

- Frame to Frameless transition opens up possibility of patient motion during treatment
- CBCT will remain standard for positioning
- Optical Guidance can be used for
  - Patient Setup
  - Monitoring During treatment
  - Verify couch rotations