Patient Setup for Partial Breast Irradiation Using 3D Surface Imaging

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Outline

• Background
• PBI Patient Setup
• VisionRT
• PBI Study
• Conclusions
Background

• Radiation Therapy
  – Basic Terminology

• Whole Breast
  – 25-35 Fractions
  – 200 cGray/fraction
  – 8-10 Weeks

• Partial Breast Irradiation (PBI)
  – 8-10 Fractions
  – 400 cGray
  – 1 Week
Challenges of PBI

• The radiation is localized to a smaller region
  – Accuracy of radiation beam is pivotal

• Target is subsurface
  – How can the beam be aimed at the tumor bed accurately?

• Patient setup is very important
PBI Patient Setup

• Daily Films
  – Align Bony Anatomy
  – Faults

• 2D Images
  – CenSSIS Work
  – Align Surface Landmarks
  – Faults

• A Better Procedure is Needed
VisionRT: A New 3D System

- 3 systems clinically installed
- Flash picture
  - 6 images captured
- Surface coordinates in 3D
- Surface matching to minimize volume between
Camera-Uncovered

Camera-Covered

Camera Eye View

VisionRT
3D Surface
Alignment Process

- A reference image is captured during fraction 1
Alignment Process

- Images are captured at the time of each treatment.
Alignment Process

- The test image is compared to the reference and their difference is calculated.

Alignment complete.

Couch Coordinates

<table>
<thead>
<tr>
<th>VRT</th>
<th>LNG</th>
<th>LAT</th>
<th>ROT</th>
</tr>
</thead>
<tbody>
<tr>
<td>997.3 cm</td>
<td>-0.4 cm</td>
<td>2.8 cm</td>
<td>358.2°</td>
</tr>
</tbody>
</table>

Equivalent to -2.7 cm
PBI Study

- Use contouring and alignment
- Can Breathing be Neglected?
- Films v. VisionRT
  - Bony Anatomy v. Surface Data
  - Qualitative
    - Compare Contours
  - Quantitative
Breathing: Axial Plane

Sheet  Breast

Reference

Breathing Cycle

Patient Back
Breathing: Sagittal Plane

Reference
Breathing Cycle

Patient
Head

Abdomen

Breast
Contour Analysis: Axial

PBI 4: Axial Contours at 0mm from iso

- Blue: Reference
- Red: Fraction 1: Laser and Film Alignment
- Green: Fraction 1: Laser and VRT Alignment

Midline

Breast

Back
Contour Analysis: Axial

PBI 4: Axial Contours at 0mm from iso

- Blue: Reference
- Red: Fraction 1: Laser and Film Alignment
- Green: Fraction 1: Laser and VRT Alignment
Quantitative Contour Analysis

Mean Displacement of Patient and Couch Parameters

![Graph showing mean displacement of patient and couch parameters.](image-url)
Conclusions

• Traditional patient setup using films is appropriate for current margins.

• Initial observations show that VisionRT is an improvement over traditional alignment.

• Studies of surface differences and tumor bed movement should be explored.
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