Patient Identification and Reproducibility

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Disclosures: Materials and technical support from Vision RT
VALUE =

\[ \text{Quality} \downarrow \text{COST} \downarrow + \text{EXPERIENCE} \uparrow \]

Patient & Staff
Patient in Pain…
Prevents Gross Errors

A real life example from 2011

1.

2.
Surface imaging with SBRT

**Lung, Liver SBRT (10 tattoo, 17 SGRT)**

- Mean shifts were 7.3 mm for tattoos, 5.2 mm for SGRT
- Max shifts were 18 mm for tattoos, 11 mm for SGRT
- SGRT reduced intrafraction rescans
Off topic….But hopefully valuable

Surface imaging results depend on the input values
Outline

i. Introduction to intrafraction monitoring
ii. Intrafraction motion – Breast
iii. Intrafraction motion – Pelvis
iv. Patient Identification
Intrafraction monitoring

- VRT_{mm} = 7.2 mm
- LNG_{mm} = 3.4 mm
- LAT_{mm} = -2.9 mm
- MAG_{mm} = 8.5 mm
- Yaw° = -1.4°
- Roll° = 0.8°
- Pitch° = -3.7°
Intrafraction monitoring

Radiographic images ➔ SGRT
Intrafraction monitoring
Intrafraction monitoring
Intrafraction monitoring

- *Means, max, and STD don’t show the whole picture. Time is important now.*
Intrafraction monitoring

- *Interval? Amount of time inside a certain threshold?*
Intrafraction monitoring

- *Interval? Minute by minute means?*
Intrafraction monitoring - Breast

- 30 breast patients with similar set-ups
- 831 sessions continuously monitored with SGRT
Intrafraction monitoring - Breast

**Time Intervals**

- Intrafraction motion increases than levels off around 6-7 min into treatment

Intrafraction monitoring - Breast

**Length Intervals**

Intrafraction monitoring - Breast

Intrafraction monitoring - Pelvis

- 29 pelvis patients
- All treated supine with leg immobilization. Bladder and rectal protocol used
- 792 sessions with a surface image acquired before, during, and after treatment
Intrafraction monitoring - Pelvis

Table 2 The intra-fraction setup variations detected at mean (MT) and at final (F) times

<table>
<thead>
<tr>
<th></th>
<th>Z (vertical axes, A-P direction)</th>
<th></th>
<th>Y (longitudinal axes, C-C direction)</th>
<th></th>
<th>X (horizontal axes, L-L direction)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean (range)</td>
<td>CI −95 %</td>
<td>CI +95 %</td>
<td>Mean (range)</td>
<td>CI −95 %</td>
</tr>
<tr>
<td>I-MT</td>
<td>−1.20 (−4.6, +5.8)</td>
<td>−1.3</td>
<td>−1.07</td>
<td>−0.95 (−14.2, +4.3)</td>
<td>−1.2</td>
</tr>
<tr>
<td>I-F</td>
<td>−1.55 (−5.5, +6.7)</td>
<td>−1.7</td>
<td>−1.4</td>
<td>−1.00 (−15.2, +5.2)</td>
<td>−1.2</td>
</tr>
</tbody>
</table>

All values are expressed in millimeters (mm)

CI confidence interval, I initial treatment time acquisition, MT mid-treatment time acquisition, F final-treatment time acquisition

- 4 - 15 mm random motion

Intrafraction monitoring - Pelvis

- Significant difference between Initial and Mid-Treatment
- Mean time from Initial to Mid-Treatment was about 8 mins

Intrafraction monitoring

• What is happening around 7 mins into a treatment?
Intrafraction monitoring

Intrafractional prostate motion during external beam radiotherapy monitored by a real-time target localization system

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The purpose of the National Patient Safety Goals is to improve patient safety. The goals focus on problems in healthcare safety and how to solve them.

**Identify patients correctly**

- **NPSG.01.01.01**
  - Use at least two ways to identify patients. For example, use the patient’s name and date of birth. This is done to make sure that each patient gets the correct medicine and treatment.
  - Make sure that the correct patient gets the correct blood when they get a blood transfusion.

- **NPSG.01.03.01**

**Improve staff communication**

- **NPSG.02.03.01**
  - Get important test results to the right staff person on time.
Patient Identification

- 16 left sided breast patients with similar set-ups
- 10 same patient comparisons, 10 different patient comparisons
- 3 mm / 5 mm overlap between surfaces
Patient Identification

Patient Identification

- No overlap on any 1 patient
- 55% threshold for 3 mm would give 1% false-positives and 1% false-negatives

Thank You’s

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