Tips & Tricks for TomoDirect™ Treatment Delivery for Breast Planning

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Dept. of Radiotherapy - IEO
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- Full profile university RT Department
- About 15 radiation Oncologists
- 8 medical physicists
- 2 bioengineers (Politecnico of Milan)
- Latest equipment for high precision RT
- 3485 new patients (55% IMRT) in 2017
Imaging

2 CT scans (one 4D-CT)

Link to MRI and PET scan

Treatment planning

Last generation TPSs

Pt setup and treatment delivery

6 linacs for EBRT
<table>
<thead>
<tr>
<th>Linac</th>
<th>Tumor sites</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Vero</td>
<td>Stereotactic body RT, prostate cancer IMRT</td>
</tr>
<tr>
<td>1 CyberKnife® System</td>
<td>Brain, spine, lung, liver stereotactic RT</td>
</tr>
<tr>
<td>3 TomoTherapy® System</td>
<td>Breast cancer IMRT, Glioblastoma, Mesothelioma</td>
</tr>
<tr>
<td>1 Trilogy</td>
<td>Head and neck IMRT, Pelvic IMRT, Various 3D-CRT (palliative 3D)</td>
</tr>
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</table>
Numbers:

- Metastatic patients: 41%
- Breast cancer: 30%
- Prostate cancer: 11%
- Head and neck cancer: 3%
- Thorax: 7%
- GI: 2%
- Gynecological cancer: 3%
- Other: 3%
Breast cancer in 2017 → 959 patients

- Adjuvant radiotherapy with simultaneous integrated boost after BCS: 610 (64%)
- Locoregional hypofractionated EBRT: 298 (31%)
- Other breast treatments: 51 (5%)
Clinical situations where benefit is clear:

😊 Bilateral breast
😊 Unilateral irradiation of patients with bilateral breast implants
😊 Internal mammary chain nodal irradiation
😊 Pectus excavatum
IMRT techniques are significantly more complex than 3D conformal RT ……

………but they have the potential to achieve superior dose homogeneity and normal tissue sparing, especially for targets and organs at risk with complex shapes, such as the breast and the chest wall.
**TomoTherapy® Treatment System**

- Fan beam
- Ring gantry
- Binary MLC
- Fully-automated delivery
- Continuous Couch Motion

**Unique components**
- with
  - **Unique capabilities**
    - give you
      - Two unique modes of delivery

**TomoDirect™**

**TomoHelical™**
✓ A discrete angle delivery mode for treating more simple cases without compromising quality
✓ The gantry will stop rotating to generate a traditional like tangential breast treatments
✓ Increased throughput
Breast radiotherapy: TomoDirect™ vs TomoHelical™ rationale

Advantages of TomoDirect™ Treatment

- Decreased dose to contra-lateral structures
- Beam-on dose sparing
- Decreased integral dose
- Decreased planning effort
- Increased throughput
Breast radiotherapy at EIO

Breast treatment with the TomoTherapy® System

- 68% TomoDirect
- 32% Helical Tomotherapy
Breast radiotherapy at EIO

- Adjuvant hypofractionated radiotherapy + simultaneous integrated boost after quadrantectomy
- Some locoregional hypofractionated EBRT (to irradiate both the breast or the chest wall and the supraclavicular area)
- Partial Breast Irradiation
- Some bilateral breast patients
Breast radiotherapy at EIO

**Whole breast**
2.67 Gy x 15 fr

**Tumor bed**
3.2 Gy x 15 fr
Breast radiotherapy at EIO

TOMODIRECT™
Breast radiotherapy at EIO

- Adjuvant hypofractionated radiotherapy + simultaneous integrated boost after quadrantectomy
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Breast radiotherapy at EIO

**TOMO DIRECT™**

2.67 Gy in 15 fr  |  Total dose 40.05 Gy
Breast radiotherapy at EIO

TomoDirect™

2.67 Gy in 15 fr

Total dose 40.05 Gy
Breast radiotherapy at EIO

TOMODIRECT™

2.67 Gy in 15 fr

Total dose 40.05 Gy
Breast radiotherapy at EIO

**TomoDirect™**

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Breast radiotherapy at EIO

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Breast radiotherapy at EIO

**TOMODIRECT™**

2.67 Gy in 15 fr

Total dose 40.05 Gy
Breast radiotherapy at EIO

**TOMODIRECT™**

Locoregional treatment

**TOMOHELICAL™**
Breast radiotherapy at EIO

Locoregional treatment

HEART
IPSILATERAL LUNG
CONTRALATERAL LUNG
CONTRALATERAL BREAST

PTV
HELICAL
DIRECT
## TomoDirect™ for breast cancer patients with supraclavicular nodes involvement

<table>
<thead>
<tr>
<th></th>
<th>Ipsilat lung</th>
<th>Heart</th>
<th>Contral breast</th>
<th>Contral lung</th>
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<tbody>
<tr>
<td></td>
<td>$V_5$ (%)</td>
<td>$V_{20}$ (%)</td>
<td>$V_{40}$ (%)</td>
<td>$V_5$ (%)</td>
<td>$V_{25}$ (%)</td>
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<tr>
<td>TD average</td>
<td>25</td>
<td>11</td>
<td>3.8</td>
<td>4.8</td>
<td>2</td>
</tr>
<tr>
<td>HT average</td>
<td>53</td>
<td>14</td>
<td>0.7</td>
<td>71</td>
<td>0.6</td>
</tr>
</tbody>
</table>

- **Significant reduction in the volumes receiving low dose**

- **PTV coverages equivalent in TomoDirect and Helical**

- **High Target dose homogeneity with TomoDirect in both breast and node PTVs**

Arrichiello, 2°ESTRO Forum 2013
Breast radiotherapy at EIO

- Adjuvant hypofractionated radiotherapy + simultaneous integrated boost after quadrantectomy
- Some locoregional hypofractionated EBRT (to irradiate both the breast or the chest wall and the supraclavicular area)
- Partial Breast Irradiation
- Some bilateral breast patients
Breast radiotherapy at EIO

TOMODIRECT™ PBI 2.85 Gy x 13 fr
Breast radiotherapy at EIO

- ✓ Adjuvant hypofractionated radiotherapy + simultaneous integrated boost after quadrantectomy
- ✓ Some locoregional hypofractionated EBRT (to irradiate both the breast or the chest wall and the supraclavicular area)
- ✓ Partial Breast Irradiation
- ✓ Some bilateral breast patients
Breast radiotherapy at EIO

Bilateral breast with SIB
TomoDirect™ for breast cancer patients

Delivery time for treatments

**Hypofractionated radiotherapy**
with SIB

- 4 - 5 minutes

**Locoregional Hypofractionated radiotherapy**

- 6 - 8 minutes
TomoDirect™ for breast cancer patients

SET-UP

Posiboard™ 2 - Breastboard
CIVCO
TomoDirect™ for breast cancer patients

SET-UP

C–Qual M™ Breastboard
CIVCO
Conclusions

TomoDirect represents a well-suitable treatment in terms of target dose homogeneity and dose sparing to the sensitive structures and overall treatment time.

Results similar or better than by LINAC.

Greater efficiency when planning and treating simple cases.
Thank You for Your Attention!