Utility of Local Tissue Water Measurements to Assess Breast Cancer Treatment-Related Lymphedema

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**Postmastectomy Lymphedema**

- Develops secondary to surgery and/or radiation therapy
- Occurs in 20-40% of persons treated for breast cancer
- Onset can be from months to years after surgery
- If untreated, gets progressively worse

“Recognizing lymphedema early and treating it promptly is the best way to manage the condition.”

Judith R. Casley-Smith & J.R. Casley-Smith

**Available Assessment Methods**

**Limb Volume or Girth Assessments**

- Mainly for Tracking and Documenting
- If unilateral then lymphedema if difference > X cm

**Main Method Used in this Study**

**Tissue Water via Dielectric Constant**

- Low power 300 MHz incident wave
- Reflected wave depends on the tissue’s dielectric constant
- Dielectric constant depends on total tissue water (free + bound)
- Calibrated for each probe from 1 - 80

**RESULTS**

- **SUBJECTS and PROTOCOL**
  - 18 women with unilateral arm lymphedema (74 ± 16 yrs)
  - 15 premenopausal women (26.2 ± 3.9 yrs)
  - 15 postmenopausal women (59.1 ± 6.7 yrs)

- **Triplicate dielectric values on each arm with each probe**
- **Segment volumes determined based on frustum model**
- **Segmental percentage edema**

\[ 100 \times \frac{V_A - V_C}{V_C} \]

**Measurements on lymphedema patients prior to treatment**

**Measurements on premenopausal 4 days after menses**

**CONCLUSIONS**

- This local tissue water method can rapidly detect and document lymphedema presence
- May also have utility for early detection
- Criteria for such early detection as of now for the limited data set:
  - For at-risk unilateral cases:
    - Arm TDC ratio > 1.2
  - For bilateral cases (or with absolute values):
    - Threshold depends on depth
    - Based on +3 SD of data, estimates are shown in Table 1

**Diagnostic Utility**

**No overlap between Patients vs. Controls**

**RESULTS**

**TABLE 1. AVERAGE THRESHOLD ABSOLUTE VALUES**

<table>
<thead>
<tr>
<th>Depth (mm)</th>
<th>Premenopausal</th>
<th>Postmenopausal</th>
<th>Lymphedema</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.5</td>
<td>42</td>
<td>37</td>
<td>34</td>
</tr>
<tr>
<td>2.5</td>
<td>60</td>
<td>55</td>
<td>52</td>
</tr>
<tr>
<td>5.0</td>
<td>75</td>
<td>70</td>
<td>65</td>
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</table>

**Contact**

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