Changes in Tissue Water and Indentation Resistance of Lymphedematous Limbs Accompanying Low Level Laser Therapy (LLLT)

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Does LLLT acutely affect tissue hardness and/or water content?
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Ann                Attendee                Aki
Australia                 ?                    Finland
NLN 2008 – San Diego
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Patients studied had clinically identified lymphedema and fibrosis (37 Arms 36 Legs)

1. Pre-LLLT Tx
   5 min LLLT

2. Post – LLLT Tx
   51.2 ± 1.5 min MLD

3. Post – MLD Tx
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Measurements
- Girth → Tape measure
- Tissue Water → Tissue Dielectric Constant (TDC)
- Tissue Indentation Resistance → Force for a fixed indentation

Patients studied had clinically identified lymphedema and fibrosis (37 Arms 36 Legs)
Legs: Lymphedema due to Varied Etiologies
Males: 18 Females: 18

Control Site
Five treatment sites marked with template
LLLT Tx
1 min/site
Arms: All Breast Cancer Treatment-Related Lymphedema All Unilateral N=37
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Girth

Measured with fixed tension
Tissue Dielectric Constant (TDC)

TDC ~ % H₂O

100% ≈ 78
Tissue Resistance (Force-Indentation)

Force

Indentation
2, 3 & 4 mm
LLLT 1 min @ each site
Results

Pre-Treatment Comparisons
Affected vs. Control
Arms → 37
Legs → 36
Limb Girth

Affected > Contralateral

Girth (cm)

Arms

Legs

P < 0.001

P < 0.001
Tissue Water

Tissue Dielectric Constant (TDC)

Affected > Contralateral

P < 0.001
Tissue Force

Tissue Resistance (Force-Indentation)

<table>
<thead>
<tr>
<th>FORCE (gm @ 4 mm)</th>
<th>Arms</th>
<th>Legs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Affected</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Control</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

P < 0.001

P < 0.01

Affected > Contralateral
Results

LLLT Treatment Effects

Pre - Tx → Post - Tx
Pre - Tx → Post - MLD
Tissue Force - Arms

FORCE (gm)

Indentation Depth (mm)

Pre-LLLT Tx
Post-LLLt Tx
Post-MLD Tx

Pre-TX
PST-TX
PST-MLD
MLD

P<0.01
P<0.001

P<0.01
P<0.001

P<0.001

P<0.001
Tissue Force - Legs

Indentation Depth (mm)

FORCE (gm)

Pre-LLLT Tx
Post-LLLT Tx
Post-MLD Tx

P<0.001
P<0.05

P<0.05

P<0.001
Tissue Water

- Pre-LLLT Tx
- Post-LLLT Tx
- Post-MLD Tx

**Arms**
- Pre-TX
- PST-TX
- PST-MLD

**Legs**
- Pre-TX
- PST-TX
- PST-MLD

TDC

- P < 0.001
- P < 0.001
- NS

- P < 0.05
Results

Active LLLT Treatment Vs. Sham Treatment

N = 17 Legs
Active vs. Sham

Force @ 4 mm or TDC

Legs N=17

FORCE (x10^-1)

- Pre-LLLT Tx
- Post-LLLT Tx

Active vs. Sham

P<0.001  P<0.05  P<0.001  P<0.05

Active  Sham  Active  Sham

N=17
Active vs. Sham

Legs N=17

% Decrease

P<0.001

Active vs. Sham

FORCE

Active
Sham

TDC

Active
Sham
Summary

• Rapid acute reduction in local tissue water and hardness with 5 minute treatment

• Occurs with active LLLT & with SHAM but greater reductions with ACTIVE

• Tissue water & hardness trend back toward pre-tx levels by the end of an MLD session

• Specific role & mechanism of low level laser light in observed changes is not yet known
Thanks for your Attention