Effects on Blood Flow Velocity, Wound Healing and Pain in Hand Microsurgery Patients Following Heating on Non-affected Side

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Key Takeaways

• Foot bath program on post operation blood circulation, pain, stress in emergency hand replantation patients (Yoon, 2009)

• Heating of one area of the body produces reflex-modulated vasodilations in distant-body areas; i.e. heat one extremity and the contralateral extremity also dilates (Lehmann, 1989)

• Simple, efficient, and inexpensive means of patient care
Significance

- Temperature has an effect on
  - Relief of pain
  - Increase in flexibility of collagenous tissues
  - Reduction of muscle spasm
  - Increase in blood flow
  - Mental relaxation

(Int’l Association for the Study of Pain, 1997)
Heat Therapy

• The extensibility of collagen tissues, ↑blood flow
  - Increased blood flow to the affected area provides proteins, nutrient, and oxygen for better healing.

• ↓Joint stiffness

• ↓Pain & relieving muscle spasms

• ↓Inflammation, edema

(Arnheim, 2008)
1. The blood flow velocity in the experimental group (EG) perform the contralateral thermotherapy will be faster compared to the control group (CG) did not perform.

2. The wound healing scores in the EG conducted a contralateral hand hyperthermia will be higher compared to the CG did not conduct.

3. The pain scores in the EG conducted a contralateral hand hyperthermia will be lower than in the CG did not conduct.
Conceptual Model

Thermotherpy

Hand Microsurgery

Physiological response
Blood flow
Wound healing

Psychological response
Pain
Study Purpose

- To identify the effects of heating on the non-affected hand on blood flow velocity, wound healing, and pain
## Research Design

<table>
<thead>
<tr>
<th>Pre Treatment</th>
<th>Post Surgery</th>
<th>1Wk</th>
<th>2Wks</th>
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<tbody>
<tr>
<td>Pre Intervention</td>
<td>Intervention</td>
<td>O2</td>
<td>O3</td>
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<tr>
<td></td>
<td>Non Intervention</td>
<td>O2</td>
<td>O3</td>
</tr>
</tbody>
</table>

O = Observation  
X = Intervention  
Wk = week
Thermotherapy Intervention Protocol

Thermotherapy

- Water temperature: 43°C, room temperature: 24-28°C
- Tissue temperature: 40-45°C
- Automatic thermo regulator for maintaining water temperature
- Duration: 30min/day
- when: 2 hours after meal
- Length of intervention: 2 weeks

Post intervention care

- Apply hand lotion after dry hand with towel
Regular Care for All Participants

Visiting Participants everyday

• Explaining healing process
• Caring wound for against infection
• Applying Infrared ray lamp on affected hand
• Zone Ⅰ & Ⅱ: leech & bleeding method for 7 days
• Wound care with hydrogen peroxide & antibiotics
• Applying ointment everyday
Participants

Inclusion criteria

- Hand microsurgery operated
- No skin injury on non-affected side
- 18 years or older
- Communicable
- Staying in a hospital at least 2 weeks
- Equivalent drug used between two groups
Measures

Blood flow velocity

- Assessed with a doppler (Hadeco, Inc. Japan)
- Mean blood flow velocity
- Systolic maximum blood flow velocity
- Diastolic maximum blood flow velocity
- Radial artery
Measures

Wound healing

- A six-item instrument
- Purulence, warmth, pain, swelling, redness, partial necrosis (partial stitch out)
- Scoring: 1 = yes, 2 = no, range: 7-14
- Higher score means better wound state

Pain

- Self-reported graphic rating scale
- 0 = no pain  10=untolerable pain
- Higher score indicating severer pain
## Demographic Characteristics of Sample

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>Total Sample (N=39)</th>
<th>Experimental group (n=20)</th>
<th>Control group (n=19)</th>
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<tbody>
<tr>
<td>Age (yrs)</td>
<td>45.3 ± 11.9 (18 - 64)</td>
<td>44.2 ± 12.1 (18 - 62)</td>
<td>46.3 ± 11.7 (20 – 64)</td>
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# Medical Characteristics of Sample

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Zones of hand

- Zone 1: DIP joint
- Zone 2: Middle phalanx
- Zone 3: PIP joint
- Zone 4: Proximal phalanges
- Zone 5: MCP joint
- Zone 6: Metacarpals
- Zone 7: Carpals
- Zone 8: Proximal wrist

http://emedicine.medscape.com/article/109111-overview
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Changes in Blood Flow Velocity Over Time by Intervention Group

Group: $F = 12.12, p < .001$

Group X Time: $F = 5.13, p < .01$

Changes in blood flow velocity (unit)
Changes in Wound Healing Over Time by Intervention Group

Group: $F = 7.95$, $p < .01$
Time: $F = 107.05$, $p < .001$
Group X Time: $F = 4.11$, $p < .05$

Changes in wound healing (unit)

![Graph showing changes in wound healing over time by intervention group. The graph includes POD numbers 1, 7, and 14 for both control and intervention groups.](image-url)
Changes in Pain Over Time by Intervention Group

Time: $F = 28.26, p < .001$

Controls and Intervention groups showed a significant decrease in pain over time, with the Intervention group experiencing a greater reduction in pain compared to the Control group.
Summary

• The contralateral hand heating was recommended as an independent nursing intervention for the operated patients who need improvement in blood flow velocity and wound healing.

• As the heating was effective even when applied on the non-affected side of hand, it is the applicable to patients who cannot tolerate any therapy on affected side.
Thank you for listening!!