Measuring the Interface Pressure

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Compression Therapy: What Is the Real World Practice?

Authors: Trinh F, Bittar S, Fish J, Kasper G, Lurie F

Introduction
The most current evidence-based practical guidelines for treatment of venous leg ulcers (VLU) give a 1A grade to only one recommendation, which is "in a patient with a venous leg ulcer, we recommend compression therapy over no compression therapy to increase venous leg ulcer healing rate." Several consensus documents recommend 30 to 40 mm Hg interface pressure for compression therapy to be effective in VLU patients. However, in a real-world practice, pressure under the bandages or stockings is rarely measured, and what pressure is actually delivered is unknown. The goal of this study is to investigate the variation in delivered interface pressure in patients with VLU receiving care in a community-based wound care clinic.

Methods
For 12 months a community-based wound care clinic was provided with a PicoPress® pressure monitor and probes to use in VLU patients during application of compression bandages. This was a part of the quality improvement project, and all of the readings were recorded without patient identification. For the first three months, the nurses who applied bandages were blinded to the measurements; the next six months the nurses were unblinded, and monitored the pressure while applying the bandages. Target pressure of 30 to 40 mm Hg in a graduated fashion was achieved in all cases. During the last three months, random blinded pressure measurements were performed 3 to 6 times by each nurse to ensure that they could deliver a desirable pressure.

Study

Community based wound clinic

<table>
<thead>
<tr>
<th>3 MONTHS</th>
<th>6 MONTHS</th>
<th>3 MONTHS</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Nurses applied bandages</td>
<td>• Nurses applied bandages</td>
<td>• Nurses applied bandages</td>
</tr>
<tr>
<td>• Blinded to pressure measurements</td>
<td>• Unblinded to pressure measurements</td>
<td>• Blinded to pressure measurements</td>
</tr>
<tr>
<td>• 163 measurements</td>
<td></td>
<td>• 38 measurements</td>
</tr>
</tbody>
</table>

Target pressure 30-40 mmHg

How we measured pressure

Results
Seven nurses participated in the study. In the first 3 months, a total of 163 bandage applications were done in 54 patients. Interface pressure varied from 9 mm Hg to 85 mmHg with the mean of 26 ± 14 mm Hg. The median pressure was 22 mm Hg, and the mode was 11 mm Hg. In the last 3 months 38 applications were done in 21 patients. Despite the six months of unblended bandaging reaching targeted pressure the variability remained high. The mean pressure was 29 ± 8 mm Hg, not statistically different from the first 3 months of the project (P=0.1). The median pressure was 32 mm Hg, and the mode was 35 mm Hg. Graduated compression was delivered in 24% of applications compared to 15% during the first 3 months (P=0.06). There were no differences among the nurses, but there were significant differences among the patients in the magnitude of the pressure and its variability between applications.

Conclusion:
In the real-world practice, the delivered interface pressure varies significantly. Pressure monitoring is needed to ensure that desirable dose of compression is delivered to the extremity with VLU.

References:
Measuring the Interface Pressure

Poster presented by Jobst Vascular Institute, American College of Phlebology, 2017

Felix Trinh, MD

Compression Therapy: What is the Real-World Practice?
“Several consensus documents recommend 30 to 40 mm Hg interface pressure for compression therapy to be effective in VLU patients. However in the real world practice pressure … is rarely measured and the pressure actually delivery is unknown.”
Measuring the Interface Pressure

First three months nurses wrapped bandages blindly

Followed by six months of applying bandages with measured pressure known

Last and final session three months of again blinded application of bandages
Measuring the Interface Pressure

Conclusion “In real world practice the delivered interface pressure varied significantly. Pressure monitoring is needed to ensure that desirable dose of compression is delivered to the extremity with VLU.”
Venous edema, leg ulcers & compression therapy

New Technologies allow measuring interface bandage pressure
Multi-Layer Wrap with Smart Sleeve

Sleeve: Terry Cloth inner surface
Multi-Layer Smart Wrap with Smart Sleeve

1. Smart Sleeve
   - Provides light uniform compression approx. 5mmHg
   - All compression is controlled by overlying wrap
   - Used with any wrap system: MEASURE THE INTERFACE Pressure
   - Two Silver thread incorporated vertical electrodes
   - Additional sleeve components:
     - One Piezoelectric Pressure measuring electrode
     - One Reader attached by two lead wires

2. Elastic Vascular Wrap
   - Fabric hook (velcro) fasteners
Multi-Layer Sleeve Wrap System

1. Sleeve benefits

- No overlapping fabric inherent with all wraps
  - No seams
  - Reciprocating heal
  - Friction between sleeve & wrap helps maintain position
  - Wicks fluid from saturated underlying dressing
  - Soft terry cushioning (reversible) Nylon-Polyester Blend
  - Copper ion - bacteria, fungi, yeast, bed-mites, HIV, influenza, VRE, MRSA, etc.
# Broad Spectrum Antimicrobial Effectiveness

<table>
<thead>
<tr>
<th>Organism</th>
<th>% Reduction</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Bacteria</strong></td>
<td></td>
</tr>
<tr>
<td><em>Klebsiella pneumoniae</em></td>
<td>99.9</td>
</tr>
<tr>
<td><em>Staphylococcus aureus</em></td>
<td>99.9</td>
</tr>
<tr>
<td><em>Escherichia coli</em></td>
<td>99.9</td>
</tr>
<tr>
<td>Meticillin Resistant <em>S. aureus</em> (MRSA)</td>
<td>99.9</td>
</tr>
<tr>
<td>Vancomycin Resistant Enterococcus (VRE)</td>
<td>99.9</td>
</tr>
<tr>
<td><em>Pseudomonas aeruginosa</em></td>
<td>99.9</td>
</tr>
<tr>
<td><em>Acinetobacter baumannii</em></td>
<td>99.9</td>
</tr>
<tr>
<td><strong>Fungus</strong></td>
<td></td>
</tr>
<tr>
<td><em>Listeria monocytogenes</em></td>
<td>99.8</td>
</tr>
<tr>
<td><em>Candida albicans</em></td>
<td>99.9</td>
</tr>
<tr>
<td><em>Trichophyton mentagrophytes</em> (foot fungus)</td>
<td>99.99</td>
</tr>
<tr>
<td><em>Trichophyton rubrum</em> (foot fungus)</td>
<td>99</td>
</tr>
<tr>
<td><em>Aspergillus niger</em></td>
<td>99.9</td>
</tr>
<tr>
<td><strong>Virus</strong></td>
<td></td>
</tr>
<tr>
<td>HIV-1</td>
<td>99.99</td>
</tr>
<tr>
<td>Influenza H1N1 (swine flu)</td>
<td>99.8</td>
</tr>
<tr>
<td>Influenza H9N2 (bird flu)</td>
<td>99.9</td>
</tr>
</tbody>
</table>
2. New Vascular Wrap
Specially designed fabric wrap
- Not occlusive as can be with self-adhesive wraps
- Wicks fluid
- Broad range sustained compression levels
  - Utilizes 420 denier spandex
  - “Zig-zag “Z” pattern aids graduated pressure
- “Smooth” compression level changes even with limb girth reduction as edema reduces unlike Unna Boot, 4 layer wraps
  - —appropriate stress strain curve
Multi-Layer Wrap Application
Multi-Layer Wrap Application
Multi-Layer Wrap Application
Multi-Layer Wrap Application
Multi-Layer Wrap Application
Smart Sleeve Application

Apply wrap with ankle maximally dorsiflexed.
ML Wrap Application - Measure the interface pressure
Measuring the Interface Pressure
Concluding remarks:
Measuring interface pressure has never been easier to obtain now that several devices available and more will coming to market at prices that are affordable.
Measuring the Interface Pressure

- Should measuring interface pressure be recommended?
- Should it be the standard of care especially with nonresponsive patients and those with bordering ischemia?
- How can we possibly deliver consistent interface pressure from one treatment session to the next and especially with different providers are involved?
Can you think of any other medical standard treatment where dosage is not measured, monitored and adjusted as per patient response?
The presentation provides a rationale for the medical community to consider going forward and recommend measuring interface pressure with any multilayer wrap system especially for those patients where nonresponsive to prior treatment or bordering on a level of ischemia.
References


- Compression Therapy: What is the Real-World Practice? A poster Abstract, Jobst Vascular Institute, American College of Phlebology, 2017, Felix Trinh, MD

Measuring the Interface Pressure


- Hegarty-Carver, M., Grant, E., Kravitz, S., Kwon, C., Reid, L. Simulated pressure changes in multilayer, multicomponent wrap systems when transitioning from rest to standing, Journal of wound care, Academy of physicians in wound healing supplement. 2015 24: S14-S20

Measuring the Interface Pressure

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- **Materials**
- Smart Sleeve®, Carolon, 601 Forum Parkway, Rural Hall North Carolina, 27045
Measuring the Interface Pressure

Thank you