Is compression improving vein symptoms through inflammation regulation?

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Disclosure

• Speaker’s travel expenses and accommodation costs were covered by Center of Interdisciplinary Research on Compression
Conclusions

• No
• ... but, yes
No doubt there...

.... is compression improving leg symptoms?
## Compression and venous symptoms

<table>
<thead>
<tr>
<th>Study</th>
<th>Population Treatment duration</th>
<th>Pressure (mmHg)</th>
<th>End-points (symptoms assessed)</th>
<th>Conclusion</th>
</tr>
</thead>
<tbody>
<tr>
<td>Blattler et al., 2008</td>
<td>Healthy (C0) 3w</td>
<td>4-9 12-18 18-22</td>
<td>Set of symptoms</td>
<td>Not improved Improved Improved</td>
</tr>
<tr>
<td>Blazek et al., 2013</td>
<td>Hairdressers (C0-2) 3w</td>
<td>15-20</td>
<td>Pain Sensation of swelling</td>
<td>Improved Improved</td>
</tr>
<tr>
<td>Schul et al., 2011</td>
<td>C1 6w</td>
<td>20-30</td>
<td>Aching Pain Cramping Sensation of swelling Restlessness</td>
<td>Improved Improved Not improved Improved</td>
</tr>
<tr>
<td>Couzan et al., 2009</td>
<td>C0-C2 2w</td>
<td>14 to 20 20 to 7</td>
<td>Fatigue</td>
<td>Improved Improved</td>
</tr>
</tbody>
</table>
Compression and venous symptoms

It works...
Compression alleviates symptoms in:

C2
C1
C0

.... why does it work the same in so different patients?
# Symptomatic venous patients

<table>
<thead>
<tr>
<th></th>
<th>C2S</th>
<th>C1S</th>
<th>C0S</th>
</tr>
</thead>
<tbody>
<tr>
<td>Varicose veins</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Spider veins / TAE</td>
<td>+/-</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Reflux</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
</tr>
</tbody>
</table>
Symptomatic venous patients

C2S    C1S    C0S

... all patients have the same symptoms like pain, heaviness, fatigue, sensation of swelling etc. ...
Symptomatic venous patients

• What is common for them?

  Symptoms develop after some hours of orthostasis
What standing/sitting leads to?

Leg volume increases immediately!

+ 1.6-2.5% in 10 min
(100-150 ml)

What diurnal orthostasis leads to?

CVD patient with standing occupation

+ 80 mL

morning

evening

How’s volume connected to symptoms

Do degree of volume increase depends on CVD severity?

Yes
How’s volume connected to symptoms

Do symptoms relate to degree of volume increase?

Yes, for pain and tiredness, but slightly

How’s volume connected to symptoms

Why symptoms not develop in many CVD patients?

May be because volume does not increase in every patient

How’s volume connected to symptoms

40% of legs with CVD had normal or even decreased leg volume in the evening.

How’s volume connected to symptoms

60% of legs with CVD had leg volume increased in the evening.

The more severe CVD is, the higher volume increase is observed.

How’s volume connected to symptoms

60% legs with CVD have venous symptoms

The more severe CVD is, the higher number of symptoms is observed

How’s volume connected to symptoms

It seems that extra volume triggers venous symptoms


What makes volume decreased?
Do walking makes volume decreased?

Yes, but we don’t usually walk the whole day
Do walking makes volume decreased?

In golfers, having finished 18-hole game (3 to 4 hours), calf volume increased by 5%
What makes volume decreased?

In golfers, having finished 18-hole game (3 to 4 hours), calf volume increased by 5%.

In golfers, having finished 18-hole game while wore 23 mmHg stockings, calf volume decreased by 4%.

Wearing of compression stockings led to less fatigue.
... compression reduces extra volume. But, what it has to do with inflammation ...?
Where this extra volume hides?

- Extracellular space

- Venous system itself: vein calibers are bigger in the evenings*

Tsukanov YT, Nikolaichuk AI. Orthostatic-loading-induced transient venous refluxes (day orthostatic loading test), and remedial effect of micronized purified flavonoid fraction in patients with telangiectasia and reticular vein. Int Angiol. 2017;36(2):189-196.
Increased volume and inflammation: how are they can be connected?

↑ vein calibers after prolonged orthostasis
↓ velocity
↓ shear stress alteration
expression of adhesion molecules on the endothelium
leukocytes trapping and migration into venous wall
expression of proinflammatory cytokines by leukocytes
activation of nociceptors
Increased volume and inflammation: how are they connected?

Target for compression

↑ vein calibers

↓ velocity

shear stress alteration

expression of adhesion molecules on the endothelium

leukocytes trapping and migration into venous wall

expression of proinflammatory cytokines by leukocytes

activation of nociceptors
Is compression improving vein symptoms through inflammation regulation?

Yes, but ...
not in direct way