Influence of a mobilization of the mesentery on the hepatic portal vein capacity measured with Echo-Doppler

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Overall question

Can an osteopath influence the physiology of an organ by applying a manual technique on this organ?
Questions asked

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General research question
What could be the possible physiological changes after mobilization of the mesentery?
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What could be the possible physiological changes after mobilization of the mesentery?

Specific research question
Is there a measurable change of the portal capacity after mobilization of the mesentery?
Study Design

- Multicentric
- Subject and evaluator blinded
- Randomized
- Observational
- Experimental
Experimental Design

- **T1**: Doppler measurement before intervention
- **MT/NST**: Intervention
- **T2**: Doppler measurement after intervention
- **T3**: Doppler measurement 60 minutes after intervention

Every Doppler measurement is the mean of 3 consecutive measurements (Lafortune et al., 1998)
Mobilization Technique (MT)

- 15 Subjects
- Position: left side
- Mobilization of the mesentery
- Painless
- Duration: 3 minutes
Non-Specific Technique (NST)

- 15 Subjects
- Position: left side
- Stretching of the iliopsoas muscle
- Painless
- Duration: 3 minutes
Exclusion Criteria

- Women
- Medication
- BMI > 27
- Alcohol > 60 gr/day
- Smoking
- Inflammatory pathologies
- Hepatic and/or cardiac diseases
Inclusion Criteria

- 30 Men
- BMI 20 – 27
- Age 20 – 45 years
- Light dinner the night before and no food or fluid intake after midnight
Blinding and Randomization

- The 2 operators: 2 experienced radiologists of two different university hospitals
- Distribution NST-group and MT-group at random
- Distribution hidden to radiologists and subjects
Choice of Echo-Doppler

- Non invasive
- Relatively low cost
- Easy repetition of measurement
- Visualisation in colour
- Acoustic Information

Echo-Doppler, type ATL (Philips), HDI 5000, Bothell, USA, frequency of the medical transducer: 2.5 MHz
$$Q = V \cdot A \cdot 60$$

Q = Capacity of the portal vein (ml/min)

V = Mean blood flow velocity (cm/sec)

A = Area of the portal veins cross section (cm$^2$); (D/2)$^2$ with D = diameter
Limitations of the flow measurement by Echo-Doppler

- Angle of measurement
- Cross section of the vessel
Ideal angle to measure flow velocity = 55° (Sabba et al., 1990)

No valid flow velocity can be made at angles > 70° (Dauzat et al., 1984; Gill, 1985)

This study: mean angle was 58° (min: 48°, max: 70°)
Capacity of the portal vein

964.1 ml/min
Adapted Research Question

Is there a difference between the NST-group and the MT-group, regarding the three moments of measurement?
Influence of Radiologist?

Table 2: The mean portal vein capacity in ml/min (standard deviation) for the two radiologists for measurements at T1, 2 and 3

<table>
<thead>
<tr>
<th></th>
<th>R1</th>
<th>R2</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>T1</td>
<td>T2</td>
</tr>
<tr>
<td></td>
<td>n (14)</td>
<td>n (16)</td>
</tr>
<tr>
<td>R1</td>
<td>755.71</td>
<td>878.05</td>
</tr>
<tr>
<td></td>
<td>(176.57)</td>
<td>(227.07)</td>
</tr>
<tr>
<td>R2</td>
<td>764.38</td>
<td>1079.04</td>
</tr>
<tr>
<td></td>
<td>(359.53)</td>
<td>(374.24)</td>
</tr>
<tr>
<td></td>
<td>p = .752</td>
<td>p = .980</td>
</tr>
</tbody>
</table>
Influence of Radiologist?

- R1 had 9 subjects in the MT-group while R2 had only 6
- After statistical correction for condition (MT and NST) there was no significant difference found between R1 and R2
## Results

<table>
<thead>
<tr>
<th>Group/T</th>
<th>T1</th>
<th>T2</th>
<th>T3</th>
</tr>
</thead>
<tbody>
<tr>
<td>NST</td>
<td>755.71</td>
<td>878.05</td>
<td>751.51</td>
</tr>
<tr>
<td></td>
<td>(176.57)</td>
<td>(227.07)</td>
<td>(246.40)</td>
</tr>
<tr>
<td>MT</td>
<td>764.38</td>
<td>1079.04</td>
<td>1039.87</td>
</tr>
<tr>
<td></td>
<td>(359.53)</td>
<td>(374.24)</td>
<td>(281.43)</td>
</tr>
<tr>
<td></td>
<td>p = 0.934</td>
<td>p = 0.86</td>
<td>p = 0.006</td>
</tr>
</tbody>
</table>

Table 1: The mean portal vein capacity in ml/min (standard deviation) for the NST and MT group for measurements at T1, 2 and 3.
Results
Conclusion

A multivariate analysis shows a statistical difference between the NST-group and the MT-group when the results of T1 are compared with those of T2 and T3

\[ F(1,28) = 4.726, \ p = 0.038 \]
### Contribution to capacity

**Table 3:** Mean values of flow velocity, diameter and capacity for measurements at T1, 2 and 3

<table>
<thead>
<tr>
<th>T (Group)</th>
<th>n</th>
<th>Flow velocity (cm/s)</th>
<th>Diameter (cm)</th>
<th>Capacity (ml/min)</th>
</tr>
</thead>
<tbody>
<tr>
<td>T1 (MT &amp; NST)</td>
<td>30</td>
<td>11.25</td>
<td>1.21</td>
<td>760</td>
</tr>
<tr>
<td>T2 (MT)</td>
<td>15</td>
<td>12.12</td>
<td>1.38</td>
<td>1079</td>
</tr>
<tr>
<td>T3 (MT)</td>
<td>15</td>
<td>10.75</td>
<td>1.42</td>
<td>1040</td>
</tr>
</tbody>
</table>
Contribution to capacity

<table>
<thead>
<tr>
<th>T</th>
<th>Flow velocity (cm/s)</th>
<th>Diameter (cm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>T1</td>
<td>0.81</td>
<td>0.88</td>
</tr>
<tr>
<td>T2</td>
<td>0.89</td>
<td>0.61</td>
</tr>
<tr>
<td>T3</td>
<td>0.66</td>
<td>0.64</td>
</tr>
</tbody>
</table>

Table 4: Standardized regression coefficients for the MT-group at T1, 2 and 3
This study supports the hypothesis that manipulation of visceral organs in the abdominal cavity has a physiological effect. Further studies will be needed to confirm the outcome of this study, and more knowledge is needed regarding the specific mechanisms that are involved with visceral manipulation.
Thank you for your kind attention!