PELVIC FLOOR MUSCLE ELECTROMYOGRAPHY DURING COUGHING
AN EXPLORATORY AND RELIABILITY STUDY

Luginbuehl H1,2, Baeyens JP2, Kuhn A1, Christen R1, Oberli B1, Radlinger L1
1Bern University of Applied Sciences, Health, Physiotherapy, Bern, Switzerland
2Vrije Universiteit Brussel, Faculty of Physical Education and Physiotherapy, Belgium
3Department of Gynecology, Division of Urogynecology, Inselspital and University of Bern, Switzerland

Introduction

- Activities provoking stress urinary incontinence (SUI) rapidly raise the intra-abdominal pressure and impact loading on the pelvic floor muscles (PFM) [1].
- Such impact loads require reflexive muscle contractions to guarantee continence [2].
- The PFM downward displacement [3] together with the fast impact load during coughing suggests PFM stretch reflexes.
- Stretch reflexes are classified according to their latencies (i.e. reflex peaks) which happen within the first 150ms after an impact and are characterized by slow (30-60ms), mid (60-90ms), long (90-120ms) and long latency succeeding (120-150ms) responses in relation to an impact [4], e.g. the impact and beginning loading phase and strain on the PFM during coughing.

Coughing - rapidly raising the intra-abdominal pressure and typically provoking SUI - is often used to provoke urine leakage and therefore involved in SUI tests such as Pad-tests, cough stress test [5] or the Q-tip test. Furthermore, coughing is used to test for effects of PFM training. However, to date little is known on the PFM behavior or contraction characteristics during coughing.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Mean [%EMG]</th>
<th>SD</th>
<th>ICC 3.1</th>
<th>ICC 3.5</th>
<th>SEM %EMG</th>
<th>SEM% ICC 3.1</th>
<th>SEM% ICC 3.5</th>
<th>MD ICC 3.1</th>
<th>MD% ICC 3.1</th>
<th>MD% ICC 3.5</th>
<th>Friedman P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rest</td>
<td>24.9</td>
<td>3.6</td>
<td>0.996</td>
<td>0.996</td>
<td>0.4</td>
<td>1.7</td>
<td>0.9</td>
<td>1.2</td>
<td>1.2</td>
<td>1.2</td>
<td>0.90</td>
</tr>
<tr>
<td>T-30-0</td>
<td>35.1</td>
<td>14.0</td>
<td>0.587</td>
<td>0.810</td>
<td>9.0</td>
<td>25.6</td>
<td>6.1</td>
<td>17.4</td>
<td>24.9</td>
<td>71.1</td>
<td>16.9</td>
</tr>
<tr>
<td>T-90-90</td>
<td>51.7</td>
<td>23.7</td>
<td>0.623</td>
<td>0.802</td>
<td>14.6</td>
<td>28.1</td>
<td>9.7</td>
<td>18.8</td>
<td>40.3</td>
<td>78.0</td>
<td>26.9</td>
</tr>
<tr>
<td>T-90-90</td>
<td>52.2</td>
<td>23.7</td>
<td>0.623</td>
<td>0.802</td>
<td>14.6</td>
<td>28.1</td>
<td>9.7</td>
<td>18.8</td>
<td>40.3</td>
<td>78.0</td>
<td>26.9</td>
</tr>
</tbody>
</table>

Table 1: Descriptive statistics (Mean ± SD, reliability indexes (ICC(3,1), ICC(3,5), ICC-related SEM, MD, MD%, and test for systematic error (Friedman) during standing at rest and activity variables during coughing derived from PFM EMG

Results

- PFM EMG at rest: 24.9 (±3.7)%EMG.
- PFM EMG variables during coughing: 35.1-52.2%EMG (Figure 1).
- ICC(3,k): 0.67-0.91; SEM%: 11.6-27.1; MD%: 32.1-75.1 (Table 1)

![Figure 1](image1.png)

Discussion & Conclusion

- PFM activity milliseconds before and after the impact of coughing was significantly higher than PFM activity at rest (P<0.05) indicating PFM pre-activity and reflex activity during coughing.
- To date and although widely used internationally, standardization of coughing during SUI tests is still lacking [5].
- Despite standardization of coughing in the present study, PFM EMG variables showed poor reliability (good to excellent ICC(3,k) values, however high SEM and MD). Therefore carrying coughing in clinical test situations can be expected to be more heterogeneous with even lower reliability.
- Urinary leakage provoked by coughing tests should be interpreted carefully in terms of drawing conclusions on PFM activity.
- Standardization and reliability test of coughing in SUI test situations should be a part of future practitioner’s and scientific work.
- A limitation of this study is potential crosstalk from other muscles involved in coughing [6]. Cross talk during coughing should thus be subject to further investigations of PFM EMG.

References

Keywords
Pelvic floor, reproducibility, stress urinary incontinence

Contact
helena.luginbuehl@fhb.ch

References

Contact
helena.luginbuehl@fhb.ch