The Effectiveness of an Abdominal Binder for Improving Respiratory Function in Amyotrophic Lateral Sclerosis

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Background

Respiratory insufficiency is a major cause of death for those diagnosed with Amyotrophic Lateral Sclerosis (ALS). Weakened or paralyzed abdominal muscles can increase the effort of breathing as distension of the abdominal contents affects the ability of the person’s diaphragm to contract. Abdominal binders (AB) have been utilized in the treatment of those who have suffered a spinal cord injury (SCI) to facilitate breathing by improving the length-tension relationship of the diaphragm. Because for many patients with ALS, abdominal muscles can become weak or paralyzed, an abdominal binder may also be beneficial. Unlike patients with SCI, those with ALS will continually decline in their respiratory status. Delaying this decline and need for mechanical ventilation could improve functional ability and quality of life. (Clark Lunsford Chatto, 2012) No single pulmonary function test has been shown to reliably correlate to respiratory failure in individuals with ALS. Utilization of a standard abdominal binder will improve performance on common pulmonary function tests.

Results

Subjects’ respiratory data are summarized in Table 2. Performance on typical and novel pulmonary function tests are depicted in Figures 1 and 2.

<table>
<thead>
<tr>
<th></th>
<th>Subject One - BO</th>
<th>Subject Two - LO</th>
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</thead>
<tbody>
<tr>
<td>FVC best (L)</td>
<td>3.61</td>
<td>3.18</td>
</tr>
<tr>
<td>FVC average (L)</td>
<td>3.56</td>
<td>2.96</td>
</tr>
<tr>
<td>SNIP best (cm H2O)</td>
<td>15</td>
<td>24</td>
</tr>
<tr>
<td>SNIP average (cm H2O)</td>
<td>11.67</td>
<td>20.33</td>
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Table 2. BO = Bulbar Onset ALS; FVC = Forced Vital Capacity; L = Liters; LO = Limb onset ALS; SNIP = Sniff Nasal Inspiratory Pressure

Discussion

- The order in which the respiratory measures were taken was the same for both patients (binder: PFT off, PFT on, SNIP on, SNIP off). The decline in performance between trials may be an indicator of fatigue. Additionally, the experimental condition was not randomized, rather, it was performed in the most convenient order to prevent over-tasking the subject.
- SNIP may be more sensitive for specifically isolating the function of diaphragm (primary muscle of inspiration)
- FVC may be a more accurate predictor of overall respiratory function (inspiration + expiration)
- The use of an abdominal binder may be beneficial for the treatment of inspiratory muscle weakness, which may be more evident earlier in the disease progression of individuals with bulbar onset ALS.

Clinical Implications/Future Research

- Investigate the sensitivity of SNIP vs. FVC in predicting the effectiveness of the abdominal binder on inspiratory muscle strength.
- Investigate the effectiveness of the abdominal binder on overall respiratory function in individuals with ALS.
- Investigate the effectiveness of the abdominal binder on voice, fatigue, and quality of life.

References: