Postural Variation of the Maximum Inspiratory and Expiratory Pressures in Normal Subjects

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The maximum static inspiratory and expiratory pressures (MIP and MEP, respectively) were measured in 15 normal male subjects (average age, 27.14 years) in standing and sitting position. The MIP was determined at RV and FRC and MEP was determined at TLC and FRC. No significant differences were found for these parameters between the two postures. Our study proves that the posture adopted by the subject when these two maneuvers are performed does not influence the results obtained. (Chest 1990; 97:313-14)

MIP = maximum inspiratory pressure; MEP = maximum expiratory pressure

The measurement of the maximum inspiratory and expiratory pressures under static conditions (MIP and MEP, respectively) forms a noninvasive method that provides quantitative knowledge of the ventilatory muscle function.1 The determination of these two parameters is useful in the study of neuromuscular illnesses2 and respiratory illnesses such as chronic obstructive pulmonary disease (COPD)3-8 and even for application of artificial respiration.2 Large variations in MIP and MEP have been reported in the literature,1,5-8 probably caused by their being dependent maneuvers, and many factors may be involved in their measurement.7 These factors mainly include the methodologic variations occurring in the performance of the pertinent maneuvers5,9 and even variations owing to a learning effect.7,10 One of the factors that may influence the result of these maneuvers is the position adopted by the subject when the examination is performed.

Our goal in this study was to evaluate the possible MIP and MEP variations in the standing and the sitting positions in normal subjects.

Material and Methods

Subjects

We studied 15 healthy nonsmoking male subjects with a mean age of 27.14 ± 2.71 years, height of 190.93 ± 4.12 cm, and weight of 75 ± 6.82 kg. None of the subjects showed any symptom or had any background of cardiorespiratory, neurologic, hepatic, or endocrine illness. They were previously instructed as to how to perform the necessary maneuvers for obtaining MIP and MEP.

Study of Respiratory Function

A simple spirometric test was performed by means of a spirometer equipped with a pneumotachograph (Gould 2.800-IBM System)

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Table 1 — The Spirometric Differences Between the Sitting and Standing Positions Were Not Significant

<table>
<thead>
<tr>
<th>Posture</th>
<th>FVC (L)</th>
<th>FEV₁ (L)</th>
<th>FEV₁/FVC</th>
<th>PEF (L/s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sitting</td>
<td>6.06 ± 0.675</td>
<td>5.01 ± 0.649</td>
<td>82.5 ± 6.2</td>
<td>10.8 ± 2.6</td>
</tr>
<tr>
<td>Standing</td>
<td>6.03 ± 0.626 (ns)*</td>
<td>5.02 ± 0.614 (ns)</td>
<td>82.9 ± 6.7</td>
<td>9.9 ± 2.2 (ns)</td>
</tr>
</tbody>
</table>

*ns = not significant.

Table 2 — The Differences in Maximum Inspiratory Pressure (MIP) and Maximum Expiratory Pressure (MEP) Between the Two Postures Were Not Significant (ns)

<table>
<thead>
<tr>
<th>Posture</th>
<th>MIP at TLC</th>
<th>MIP at FRC</th>
<th>MEP at TLC</th>
<th>MEP at FRC</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sitting</td>
<td>127.64 ± 5.9</td>
<td>117.26 ± 30.1 (ns) cm H₂O</td>
<td>172.71 ± 49.4 (ns) cm H₂O</td>
<td>152.86 ± 32.5 (ns) cm H₂O</td>
</tr>
<tr>
<td>Standing</td>
<td>126.86 ± 6.5 (ns) cm H₂O</td>
<td>117.26 ± 30.1 (ns) cm H₂O</td>
<td>172.71 ± 49.4 (ns) cm H₂O</td>
<td>152.86 ± 32.5 (ns) cm H₂O</td>
</tr>
</tbody>
</table>

at RV and FRC in the sitting position and MEP at TLC and FRC for both postures.

**Discussion**

The measurement of MIP and MEP statically generated against an obstruction gives an overall estimate of inspiratory muscular force. One of the factors that may influence its determination is the posture adopted by the subject during the maneuver. Our results do not show significant differences between the standing and sitting positions for these two parameters. On the other hand, Goldstone et al found significant differences between the two postures in MIP measured at TLC, although this difference could be due to the relatively small size of their sampling (six subjects). In our study we found no differences in the measurement at RV and FRC for each posture used. Similarly, Goldstone et al found that the volume at which their subjects performed did not exert any influence when the posture was changed.

It is known that the respiratory pressures generated in both inspiration and expiration depend on original lung volume. Also known is the inverse relationship that exists between MIP and MEP. In our study, the difference in inspiratory pressure at RV and FRC and expiratory pressure at TLC and FRC is maintained when the posture is changed.

Moreover, the spirometric parameters do not undergo any changes because of the posture adopted, as previously proven, a phenomenon apparently related to the absence of significant differences in taking maximum pressures.

In conclusion, the measurement of MIPs and MEPs, made at RV and FRC for MIP, and at TLC and FRC for MEP, does not vary with the standing and sitting positions in normal individuals.

**References**

15. Townsend MD. Spirometric forced expiratory volumes measured in the standing versus the sitting posture. Am Rev Respir Dis 1984; 130:123-26