New Threshold Values for Spinal Mobility Measures Based on a Study in a Large Representative Sample of US population

Shervin Assassi, Michael H. Weisman, Zhongxue Chen, Mohammad Rahbar, John D. Reveille

• No Disclosures

Spinal Mobility Measures

• Utilized for diagnosis and assessment of disease severity in patients with ankylosing spondylitis.

  - Occiput-to-Wall Distance
  - Thoracic Expansion
  - Anterior Lumbar Flexion (modified Schober)

Spinal Mobility Measures

• The previously proposed threshold values for spinal metrology were determined based on distributions of these measures in convenience samples of healthy volunteers.

  - Schober original article: 4-6 cm → unclear how the normal controls were recruited.
  - Normal values for modified Schober test by Moll & Wright → 237 subjects who were normal relatives of patients with psoriatic arthritis.

Objective:

To determine population based percentile reference range values for selected spinal mobility measures in a nationally representative sample of the US population

Methods

• Occiput-to-Wall Distance (OWD), Thoracic Expansion (TE), Anterior Lumbar Flexion (modified Schober) were measured by trained examiners in a standardized fashion in 5103 U.S. adults ages 20-69 years in the 2009-10 U.S. National Health and Nutrition Examination Survey (NHANES).
Occiput-to-Wall Distance

The participant stands with heels and buttocks touching the wall behind and with the knees straight. The patient is asked how far back he/she can get the head, still keeping the chin in the normal position. In the straight position, the distance between the posterior convexity of the occiput and the wall is measured to the nearest 0.1 centimeter. The better of 2 attempts is recorded. Any result other than zero is regarded as abnormal.

Thoracic Expansion

• One chest circumference measure is taken at full inhalation and a second one at full exhalation. The measurement was conducted at the Xiphoid process level. The recorder kept their finger on the tape to keep it from displacing during the inhalation and exhalation measurements. Once the tape measure is properly positioned, ask the study participants to raise their hands straight up over their heads.

Anterior Lumbar Flexion (Schober)

• Two horizontal marks are made on the lower spine. The first mark is placed midway along a line level with the superior margin of the lateral iliac crests and a then second mark was placed 10 cm above it. Ask the study participants to bend over at the waist (“curl your back over your belly button”) keeping the knees straight and hands touching/reaching for the ankle area if possible.

Ideal Case

Schober acknowledging problems with the proposed measurement

• Die Fossae lumbales, die über den Spinae posteriores superiores liegen, sind aber nicht bloß am weiblichen Körper vorhanden, sondern auch, wenn vielleicht etwas weniger häufig und deutlich, am männlichen. Wenn man den Rumpf ein wenig nach hinten beugen läßt, so findet man sie bei seitlicher Betrachtung ohne Schwierigkeit in der großen Mehrzahl der Fälle. Freilich kommen Ausnahmen vor, sogar beim Weibe. In solchen Fällen mag man sich dadurch helfen, daß man schwach handbreit über das hintere obere Ende der Rima an heranfährt und hier den dermographischen Strich zieht.

• Of course exceptions occur, even in the female. In such cases, one may overcome the problem going hand’s breadth above the rear top of the gluteal cleft and drawing the dermographic line.

Often Reality
Modified Schober

In NHANES 2009/2010, the superior margin of the lateral iliac crests was used to determine the level of the first mark to avoid inconsistencies in the measurements arising from invisibility of dimple of Venus in a large number of study persons.

Comparison of Spinal Measurement Results with Previously Established Cut-offs

- Occiput-to-Wall >0 cm → 4%
- Thoracic Expansion < 2.5 cm → 13.6%
- Modified Schober < 3.5 cm → 44.2%

Occiput-to-Wall Distance=upper 95th percentile; Thoracic Expansion/Modified Schober=lower 5th percentile.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Percentile Cut Points</th>
<th>Mean (SE)</th>
<th>Adjusted Percentile Cut Points*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Occiput-to-Wall</td>
<td>0</td>
<td>0.21 (±0.03)</td>
<td>0</td>
</tr>
<tr>
<td>Thoracic Expansion</td>
<td>2</td>
<td>4.8 (±0.06)</td>
<td>2.3</td>
</tr>
<tr>
<td>Modified Schober</td>
<td>2</td>
<td>3.8 (±0.03)</td>
<td>2</td>
</tr>
</tbody>
</table>

* After Exclusion of Subjects with Morbid Obesity

Table 1. Percentile Cut Points1 in cm, for Arthritis Body Measures: NHANES 2009-10

<table>
<thead>
<tr>
<th>Age (years)</th>
<th>Occiput-Wall Distance</th>
<th>Thoracic Expansion</th>
<th>Modified Schober</th>
</tr>
</thead>
<tbody>
<tr>
<td>20-35</td>
<td>0 Men 0 Women</td>
<td>2.7 Men 2.5 Women</td>
<td>2.3 Men 2.2 Women</td>
</tr>
<tr>
<td>36-49</td>
<td>0 Men 0 Women</td>
<td>2.4 Men 2.3 Women</td>
<td>2.2 Men 1.8 Women</td>
</tr>
<tr>
<td>50-69</td>
<td>6.3 Men 0 Women</td>
<td>1.9 Men 1.8 Women</td>
<td>1.9 Men 1.6 Women</td>
</tr>
</tbody>
</table>

1 Occiput to Wall Distance=upper 95th percentile; Thoracic Expansion/Modified Schober=lower 5th percentile.

Conclusion

- We verified the threshold of zero for OWD.
- The currently utilized clinical cut points for TE and Schober Test assign “abnormal” values to a large portion of the general population.
- Using population based percentile reference range values, we recommend new threshold values for TE and the modified Schober test.

Many Thanks

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- Laura Diekman

Cedar Sinai:
- Michael Weisman
Pilot Project

• 37 patient with AS seen at UTHealth
• 13 (35.1%) did not visible dimple of Venus
• The difference between the two measurement methods (starting point ⇒ dimple of Venus versus superior margin of lateral iliac crests) was 0.42 cm in patients with visible dimple of Venus.