Nordic Seating Symposium 2012

The effect of a shaped wheelchair cushion and a detachable lumbar support on under-seat pressure, estimated comfort, and pelvic rotation

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The Wheelchair clinic
Common complications

- Deformity
- Pressure sors
- Pain

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What kind of choices do we have?
What to choose?

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The effect of a shaped wheelchair cushion and a detachable lumbar support on under-seat pressure, estimated comfort and pelvic rotation

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Purpose

Evaluate how different seat-cushions and back supports affects on:

- under-seat pressure
- estimated comfort
- pelvic rotation
# Methods

<table>
<thead>
<tr>
<th>Subjects</th>
<th>N=30</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age m/Range</td>
<td>28 years (R=20-53 years)</td>
</tr>
<tr>
<td>Height m/Range</td>
<td>170 cm (R=157-187cm)</td>
</tr>
<tr>
<td>Weight m/R</td>
<td>65 kg (R=50-100kg)</td>
</tr>
<tr>
<td>Gender</td>
<td>8 men and 22 women</td>
</tr>
</tbody>
</table>

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Wheelchair

Two different wheelchairs were specially adjusted for the test.

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Backrest

The same back support height, seat and back angles

adjustable sling backrest with Velcro

nonadjustable sling backrest

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Equipment

Standard plane cushion

Shaped cushion with cavity under the tuber ishiis

Lumbar (pelvic) support

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Wheelchair set up no. 1

Adjustable sling back rest + Standard cushion

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Wheelchair set up no. 2 - 5

Non adjustable sling backrest

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Under seat pressure

Maximum and mean pressure
FSA (force sensing array)

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Estimated comfort

0 = Very uncomfortable
100 = Very comfortable

Visual Analogue Scale 100 mm

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Pelvic rotation

The angle between Anterior Superior Iliac Spine (ASIS) and Posterior Superior Iliac Spine (PSIS)

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Procedur sitting

WHEELCHAIR 1
Adjustable sling backrest
Standard plane seat-cushion

WHEELCHAIR 2
Non adjustable sling backrest
Standard plane seat-cushion

Under seat-pressure
Estimated comfort
Pelvic rotation

A shaped seat-cushion
A Standard plane seat-cushion and lumbar support
A shaped seat-cushion and lumbar support

10 min 10 min 10 min 10 min 10 min

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Results

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Under-seat pressure

Mean values of peak pressure after 10 min of sitting

Wheelchair Set-up

Peak pressure (mmHg)

<table>
<thead>
<tr>
<th>Nr 1</th>
<th>Nr 2</th>
<th>Nr 3</th>
<th>Nr 4</th>
<th>Nr 5</th>
</tr>
</thead>
<tbody>
<tr>
<td>114,2</td>
<td>111,9</td>
<td>122</td>
<td>108,1</td>
<td>129,7</td>
</tr>
</tbody>
</table>
Under seat pressure

1. Adjustable sling backrest, standard cushion \( m = 111.4 \pm 28.6 \) mm/Hg
2. Non adjustable backrest, standard cushion \( m = 111.9 \pm 23.1 \) mm/Hg
3. Non adjustable backrest, shaped cushion \( m = 122.0 \pm 21.5 \) mm/Hg
4. Non adjustable backrest, standard cushion, lumbal support \( m = 108.1 \pm 24.1 \) mm/Hg
5. Non adjustable backrest, shaped cushion, lumbal support \( m = 129.7 \pm 29.0 \) mm/Hg

\[ p \leq 0.01 \]

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Mean estimated comfort

**Wheelchair set-up**

Estimated comfort

- Nr 1: 71.2
- Nr 2: 75.7
- Nr 3: 64
- Nr 4: 73.6
- Nr 5: 65.6

VAS (0-100 mm)
Mean pelvic rotation

Pelvic rotation° after 10 min of sitting

<table>
<thead>
<tr>
<th>Wheelchair setup</th>
<th>Nr 1</th>
<th>Nr 2</th>
<th>Nr 3</th>
<th>Nr 4</th>
<th>Nr 5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of degrees</td>
<td>10.7</td>
<td>12.8</td>
<td>13.3</td>
<td>7.4</td>
<td>6.4</td>
</tr>
<tr>
<td>Configuration</td>
<td>Mean (° ± Standard Deviation)</td>
<td>p-value</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>-------------------------------------------</td>
<td>-------------------------------</td>
<td>-----------------</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Adjustable sling backrest, standard cushion</td>
<td>10.7 ± 4.1</td>
<td>p &lt; 0.001</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nonadjustable sling backrest, standard cushion</td>
<td>12.8 ± 4.2</td>
<td>p &lt; 0.0001</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Standard cushion, lumbal support</td>
<td>7.4 ± 4.4</td>
<td>p &lt; 0.0000</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Shaped cushion</td>
<td>13.3 ± 3.9</td>
<td>p &lt; 0.0000</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Shaped cushion, lumbal support</td>
<td>6.4 ± 5.0</td>
<td>p ≤ 0.01</td>
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</tbody>
</table>
Conclusion

The shaped seat cushion together with a lumbar support the most effective way to support pelvic in a neutral position.

However, peak pressure did increase with the shaped cushion compared to standard cushion.
Thank you for your attention!