Dynamic barefoot plantar pressure in gait and foot type biomechanics

Jinsup Song1*, Howard J Hillstrom2, Michael Neary3, Kersti Choe1, William Brechue3, Rebecca A Zifchock3, Steve Svoboda3, Jim Furmato1, Mandy Gibbons2, Ibadete Thaqi2, Jocelyn Hafer2, Siobhan Mangan2, Stephen Bartalini2, Marian T Hannan4

From 4th Congress of the International Foot and Ankle Biomechanics (i-FAB) Community Busan, Korea. 8-11 April 2014

Song et al demonstrated that healthy subjects with planus and neutral foot type exhibited a distinguishable foot posture and dynamic foot function [1]. However, such a relationship has not been demonstrated in a large sample study.

Foot structure was categorized into one of three foot types (cavus, neutral, and planus) based on the standing arch height index (AHI) in 1,054 incoming cadets at the US Military Academy (172 female, 18.5±1.1 years, 24.5±3.0 kg/m²) [2]. Five trials of barefoot dynamic planar pressure were obtained for each foot with the Novel emed-x (novel GmbH, Munich) using the two-step method for walking data acquisition. The Center of Pressure Excursion Index (CPEI, %) and the peak pressure (PP, in kiloPascal) were calculated for each trial. Analysis of Variance was performed across the foot type groups on the left foot.

The cavus group exhibited the largest CPEI while the planus group demonstrated the smallest CPEI. The neutral group demonstrated the lowest peak pressure, which was significantly lower than the planus group. Results of this study provide additional evidence which support the link between the dynamic plantar pressure in gait and foot type biomechanics.

Acknowledgement
Volunteers from the New York College of Podiatric Medicine, Temple University School of Podiatric Medicine, the Hospital for Special Surgery, and Novel GmbH were instrumental in the collection of these data. We appreciate the study participants and support of the United States Military Academy.

Authors' details

1Temple University School of Podiatric Medicine, Philadelphia, Pennsylvania, USA. 2Hospital for Special Surgery, New York, New York, USA. 3United States Military Academy, West Point, New York, USA. 4Hebrew Senior Life, Harvard Medical School, Boston, USA.

Published: 8 April 2014

References


Table 1 The mean Center of Pressure Excursion Index and the Peak Pressure are shown for three foot type groups. The analysis was limited to left foot only.

<table>
<thead>
<tr>
<th></th>
<th>Cavus</th>
<th>Neutral</th>
<th>Planus</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>N (female)</td>
<td>53 (5)</td>
<td>184 (29)</td>
<td>711 (121)</td>
<td></td>
</tr>
<tr>
<td>CPEI (%)</td>
<td>23.07 ± 7.46</td>
<td>21.01 ± 6.53</td>
<td>20.39 ± 6.82</td>
<td>0.0168 a</td>
</tr>
<tr>
<td>PP (kN)</td>
<td>578.5 ± 140.6</td>
<td>552.8 ± 139.2</td>
<td>600.4 ± 168.2</td>
<td>&lt;0.0001 c</td>
</tr>
</tbody>
</table>

A significant difference (P<0.05) was observed between a the cavus and planus foot types and c between neutral and planus foot types.

* Correspondence: jsong@temple.edu

© 2014 Song et al; licensee BioMed Central Ltd. This is an Open Access article distributed under the terms of the Creative Commons Attribution License (http://creativecommons.org/licenses/by/4.0), which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited. The Creative Commons Public Domain Dedication waiver (http://creativecommons.org/publicdomain/zero/1.0/) applies to the data made available in this article, unless otherwise stated.