Temporal and spatial gait characteristics of transfemoral amputees fitted with osseointegrated fixation: preliminary data

Véronique Pinard (1), Roy Tranberg (2), Eva Haggstrom (3), Laurent Frossard (1)

(1) Groupe de Recherche en Activité Physique Adaptée, UQAM, Montreal, Canada
(2) Department for Orthopaedics, Sahlgrenska University Hospital, Göteborg, Sweden
(3) Department for Prosthetics and Orthotics, Sahlgrenska University Hospital, Göteborg, Sweden


Background
The conventional method of attachment of prosthesis involves on a socket. A new method relying on osseointegrated fixation is emerging. It has significant prosthetic benefits. Only a few studies demonstrated the biomechanical benefits.

Purpose
The ultimate aim of this study was to characterise the functional outcome of transfemoral amputees fitted with osseointegrated fixation, which can be assess through temporal and spatial gait characteristics. The specific objective of this preliminary study was to present the key temporal and spatial gait characteristics.

Methods
Four male transfemoral amputees fitted with a fixation were asked to performe 3 trials of straight level walking. The speed of walking, cadence, duration of gait cycle, support and swing phases, length of stride and step, and walking base were extracted from displacements of foot markers using a 3D motion analysis system recording at 200 Hz.

Results
The speed of walking and the cadence were 0.81±0.16 m/s and 46.03±4.70 steps/min, respectively. The duration of the gait cycles, support and swing phases were 1.31±0.13 s, 0.76±0.07 s and 0.55±0.07 s, respectively. The stride and step length, and walking base were 1.29±0.09 m, 0.10 ± 0.65 m and -0.09 ± 0.138 m for the prosthetic leg, and 1.31±0.07 m, 1.00±0.64 m and 0.11 ± 0.12 m for the sound leg, respectively.

Conclusion
The results demonstrate that the amputees fitted with an osseointegrated fixation showed a highly functional walk compared to normative data presented in previous studies focusing on amputees fitted with a socket and able-bodied.

References
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INTRODUCTION

• The conventional method of attachment of prostheses of transfemoral amputees involves a socket.
• An alternative method relying on osseointegrated fixation is emerging and have significant prosthetic benefits.
• The purpose of this study is to characterise the functional outcome of transfemoral amputees fitted with osseointegrated fixation using gait spatial and temporal characteristics.

METHODS

• Equipment: Gait spatial and temporal characteristics were extracted from displacements of foot markers using a 3D motion analysis system recording at 200 Hz.
• Subjects: Four male transfemoral amputees fitted with a fixation were asked to perform three trials of straight level walking (N=12).
• Protocol: The person have to walk about 15m without aids. If the subject need it, a rest could be taken to avoid tiredness.
• Variables: Gait spatial and temporal characteristics included the speed of walking, cadence, duration of gait cycle, support and swing phases, length of stride and step, and walking base.

RESULTS

Tableau 1. Mean and standard deviation of the speed of walking, cadence, duration of gait cycle, support and swing phases, length of stride and step, and walking base for four male transfemoral amputees (three trials).

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>Transfemoral amputees osseointegrated</th>
<th>Transfemoral amputees Socket</th>
<th>Able-bodies</th>
</tr>
</thead>
<tbody>
<tr>
<td>Speed (m/s)</td>
<td>0.82±0.15</td>
<td>1.01±0.18</td>
<td>1.51±0.20</td>
</tr>
<tr>
<td>Cadence (steps/min)</td>
<td>45.99±4.63</td>
<td>44.04±2.67</td>
<td>57.7±2.89</td>
</tr>
<tr>
<td>Gait cycles (sec)</td>
<td>1.33±0.13</td>
<td>1.37±0.08</td>
<td>1.09±0.12</td>
</tr>
<tr>
<td>Support (sec)</td>
<td>0.77±0.08</td>
<td>0.83±0.07</td>
<td>0.66±0.08</td>
</tr>
<tr>
<td>Support (%)</td>
<td>58.07±2.02</td>
<td>61.38±1.36</td>
<td>46.0</td>
</tr>
<tr>
<td>Swing (sec)</td>
<td>0.55±0.07</td>
<td>0.55±0.05</td>
<td>0.43±0.05</td>
</tr>
<tr>
<td>Swing (%)</td>
<td>41.93±2.02</td>
<td>40.75</td>
<td>54.0</td>
</tr>
<tr>
<td>Stride length (m)</td>
<td>PRO 1.29±0.10</td>
<td>SND 1.31±0.09</td>
<td>1.33±16</td>
</tr>
<tr>
<td>Step length (m)</td>
<td>PRO 0.70±0.65</td>
<td>SND 0.85±0.51</td>
<td>0.61±0.84</td>
</tr>
<tr>
<td>Walking base (m)</td>
<td>PRO 0.16±0.06</td>
<td>SND 0.15±0.07</td>
<td>0.21±0.44</td>
</tr>
</tbody>
</table>

DISCUSSION

I. Limitations:
- The spatial and temporal characteristics were determined from external markers.
- There were variations of prostheses in terms of components, particularly the knees, and alignments

II. Take away results:
- Like most studies focusing on functional outcomes of transfemoral amputees osseointegrated, the results were either comparable or better than transfemoral amputees with socket mostly for the gait cycle and the support phase.
- Overall, the participants were less functional than able-bodied.
- However, the most functional transfemoral amputees osseointegrated and the least functional able-bodied were similar.

REFERENCES


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CONFUSIONS

1. Pinard Véronique P.MSc Kinanthropologie, Université du Québec à Montréal
Phone : 514-604-7634
Email : veroniquep.kinesiologue@gmail.com

SPEAKER INFORMATION

Véronique Pinard Bsc
Kinanthropologie, Université du Québec à Montréal