Exploring the instantaneous effects of tDCS on postural stability to improve stroke rehabilitation

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INTRODUCTION:
• Postural instability, balance problems and subsequent falls are very common after stroke.
• Restoration of adequate standing balance is a key factor in regaining independence and preventing fall-events.¹
• Transcranial direct current stimulation (tDCS) is a novel non-invasive technique.
• Proof of principle studies have shown that tDCS applied on the primary sensorimotor cortex can improve motor function in patients after stroke.²
• TDCS applied on the cerebellum during training could further optimize motor learning, thereby improving standing balance and functional outcome after stroke.

OBJECTIVE:
To assess the optimal stimulation paradigm and explore the effects of tDCS during active balance training on posturographical parameters in chronic stroke and healthy subjects, as a preparation for a Randomized Clinical Trial.

METHODS:
One subject was measured on a forceplate in three different conditions (i.e. eyes open, eyes closed and tandem stance) before and after a single training session.

Training: lateral balance tracking task.

Cerebellum stimulation. 20 minutes:
• anodal tDCS (1.5 mA) ipsi-lesional
• anodal tDCS (1.5 mA) contra-lesional
• sham tDCS

Outcome measure: medio lateral Center of Pressure (COP) velocity.

RESULTS:

<table>
<thead>
<tr>
<th>Patient characteristics</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>gender</td>
<td>male</td>
</tr>
<tr>
<td>Age</td>
<td>56</td>
</tr>
<tr>
<td>Bamford classification</td>
<td>LACI</td>
</tr>
<tr>
<td>Affected side</td>
<td>right</td>
</tr>
<tr>
<td>Time after stroke</td>
<td>5.5 years</td>
</tr>
<tr>
<td>FM-LE (max. 34)</td>
<td>26</td>
</tr>
<tr>
<td>BBS (max. 56)</td>
<td>53</td>
</tr>
</tbody>
</table>

Table 1: FM-LE: Fugl-Meyer lower extremity, BBS: berg balance score, LACI: lacunar infarct

DISCUSSION:
The observed changes in COP parameters suggest an improvement in postural stability with ipsi-lesional stimulation. Cerebellar tDCS shows promise as a tool to improve balance stability when combined with a postural training task, encouraging research in chronic and sub-acute stroke patients.


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