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Literature review on the effect of transcranial Direct Current Stimulation (tDCS) on reduction of spasticity in neurological cases

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Introduction

Traditional treatment for reducing spasticity caused by brain damages varies from conservative approaches to aggressive interventions which are either of unsatisfactory outcome or having many side effects. Transcranial Direct Current Stimulation (tDCS) is a newly developed modality in recent years, with the concept of Top-Down Approach. Regarded as a relatively safe modality, it is popular in use in neuro-rehabilitation.
Throughout the years, studies have shown its promising effect on upper limbs motor function. PMH has used tDCS for facilitation of motor return of upper limbs. Although application of tDCS on reducing spasticity has also been evaluated recently, no protocols have yet been summarized from the current studies.

Objectives

To summarize recent studies and evaluate the effect of tDCS on spasticity.

Methodology

The electronic databases ScienceDirect, Pubmed, Medline, ClinicalKey, and Springer were searched. All interventional studies regarding the effect of tDCS on spasticity were included.

Result

6 interventional studies (Jadad Score 2-5) published from 2012-2015 involving patients with different neurological conditions were reviewed. 5 of them showed that tDCS was an effective treatment option for reducing spasticity.
(A)Direction of current, (B) placement of electrodes, (C) protocols, (D)size of electrodes, (E)adjuvant treatment and (F)adverse effect reported were all revealed:
(A)Regarding the direction of current, 2 studies adopted anodal stimulation of affected hemisphere, while 2 adopted cathodal stimulation of unaffected hemisphere. Both showed significant improvement of spasticity when compared with their sham groups. 1 study compared the two methods and showed more improvement in cathodal groups. One study adopted cathodal stimulation on the affected hemisphere reported

significant improvement of spasticity.
(B)Placement of electrodes were mainly on the motor cortex M1.
(C)Protocols were not conclusive. Duration of treatment varies from 10-20minutes. Number of sessions also varies from 5-20.
(D)Size of electrodes were mostly 25-35cm² with current of 1-2mA.
(E)In most studies, tDCS was not the only treatment given. Adjuvant treatments varied from traditional physiotherapy treatment, robotic arm training to virtual reality therapy so it was difficult to compare the effectiveness of the protocols between studies.
(F)Among the studies, only one participant in the active tDCS condition developed a 2 mm diameter erythematous rash under the electrode, which was spontaneously resolved. Therefore tDCS could be regarded as a safe modality.
Conclusion:
Although no standardized treatment protocols could be concluded, tDCS still shows positive effects on reducing spasticity in safe manner. Further studies are needed to explore its efficacy and effectiveness for different neurological cases in designing protocols.