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Pioneering the repetitive transcranial magnetic stimulation in promoting Upper Limb functional recovery after stroke

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Introduction

Stroke is a common global health-care problem which is the main cause of acquired adult disability. Rehabilitation is a major component of patient care. In the last few years, repetitive transcranial magnetic stimulation (rTMS) has emerged as an add-on intervention to conventional physiotherapy. The use of this noninvasive brain stimulation technique to stimulate adaptive plasticity is very appealing, and the results are promising.

A physiotherapy working group leading by researchers and clinical experts has developed clinical guidelines for the use of rTMS in patients with neurological conditions to ensure the safe, standardized treatment as well as evidence-based practice of interventions.

Objectives

To study the efficacy and safety of using the new technology rTMS as adjunct physiotherapy interventions in promoting upper limb functional recovery post stroke

Methodology

Given the technological advances, issues of risk and safety of rTMS treatment addressing the undesired effects, limits of stimulation parameters, precautions of applications, monitoring of patients and expertise of the rTMS team were discussed, and consensus was made in the working group. Three physiotherapy centers including Princess Margaret Hospital, Tuen Mun Hospital and United Christian Hospital adopted the clinical guideline. rTMS was implemented in conjunction with conventional physiotherapy in patients with upper limb impairment post stroke. Patients were included with diagnosis of stroke from Sept 2014 to Dec 2016. Those

patients with contraindications to rTMS were excluded. Subjects provided informed consent prior to rTMS.

All patients received low frequency (1Hz) rTMS to non-lesioned hemisphere for 1200 pulses, and followed by 30- to 45-minute upper limb functional training for a total of 5 to 10 sessions. The upper limb function was evaluated using Fugl-Meyer assessment at baseline (D0), day 5 (D5) and day 10 (D10). Patients were monitored during and after treatment for any harmful effects particularly seizures. The multi-center data was collected and analyzed.

Result

A total of 93 patients were recruited. When compared with baseline values, significant improvements with paired t-test were found in the Fugl-Meyer upper limb score from D0 to D5 (N=83, 32.6 ± 16.9 to 42.3 ± 18.8 , $p < 0.001$) and from D0 to D10 (N=49, 27.6 ± 17.5 to 39.8 ± 19.0 , $p < 0.001$).

No adverse effect including seizure was reported.

It is time to bring this new technology to the forefront of stroke care. Combined rTMS and physiotherapy intervention is likely to obtain positive results in the upper limb functional recovery after stroke. In addition, our rTMS protocol is safe and feasible in the clinical application. In future, randomized controlled trials are needed to validate the efficacy of this technology device.