EFFICACY OF REPETITIVE PERIPHERAL MAGNETIC STIMULATION ON THE FUNCTIONAL RECOVERY IN STROKE PATIENTS

A thesis presented for the partial fulfillment of

MD Degree in Neurology

By

Fatma Fathalla Mahmoud Kenawy

M.B.B.Ch, M. Sc. Ain Shams University

Supervised By

Prof. Dr. Samia Ashour Mohamed Helal

Professor of Neurology

Faculty of Medicine, Ain-Shams University

Prof. Dr. Mohamed Mahmoud Moustafa

Professor of Neurology

Faculty of Medicine, Ain-Shams University

Prof. Dr. Nevine Medhat El Nahas

Professor of Neurology

Faculty of Medicine, Ain-Shams University

Prof. Dr Lobna Mohamed El Nabil

Professor of Neurology

Faculty of Medicine, Ain-Shams University

Prof. Dr. Mohamed Amir Tork

Assistant Professor of Neurology Faculty of Medicine, Ain-Shams University

Faculty of Medicine Ain Shams University Cairo,

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List of Contents

List of Abbreviations

ANOVA	One-way analysis of variance
CMA	Cingulate Motor Areas
CST	Corticospinal Tract
cTBS	Continuous Theta Burst Stimulation
EMG	Electromyogram
ES	Electrical Stimulation
ESWT	Extracorporeal Shock-Wave Therapy
GARS	Gait Assessment Rating Scale
iTBS	Intermittent Theta Burst Stimulation iTBS
LTD	Long-Term Depression
LTP	Long-Term Potentiation
MAS	Modified Ashworth Scale
MEP	Motor Evoked Potentials
MRI	Magnetic resonance imaging
MS	Multiple Sclerosis
NMES	Neuromuscular Electrical Stimulation
PMS	Peripheral magnetic stimulation
ROM	Range of Motion
rPMS	repetitive Peripheral Magnetic Stimulation

RST	Reticulospinal Tract
rTMS	Transcranial Magnetic Stimulation
SMA	Supplementary Motor Area
TBS	Theta Burst Stimulation
tDCS	Transcranial Direct Current Stimulation
TENS	Transcutaneous Electric Nerve Stimulation
UMN	Upper Motor Neuron
VST	Vestibulospinal Tract
WBV	Whole body vibration

List of Figures

List of Tables

Introduction

Optimizing the management of stroke is a national priority. Stroke is the third most common cause of disability affecting millions of people worldwide with estimate of 25 million stroke survivor in 2013 ***(Feigin et al., 2017)***.

Improving limb functions has been the concern of numerous researches. Spasticity is often blamed for the disability of the upper limb. In this regard, invasive or non-invasive brain stimulations, that have the capacity to modulate cortical excitability and to optimize brain plasticity, were studied. Several studies showed that repetitive transcranial magnetic stimulation (rTMS) has beneficial effects on motor recovery that can be translated to clinically meaningful improvement in disability in patients with post-stroke hemiparesis ***(Khedr et al., 2005; Emara et al., 2010; Kim et al., 2010)***. Despite that, a later systemic review surprisingly didn't recommend rTMS for post stroke motor rehabilitation ***(Hao et al., 2013).***

Theta burst stimulation (TBS) is a new faster modality of the conventional rTMS. Two different methods have been described: intermittent theta burst stimulation (iTBS) and continuous theta burst stimulation (cTBS) with facilitating and inhibitory effects, respectively. The iTBS involves the application of bursts of three pulses at a frequency of 50 Hz every 200

millisecond ***(Bulteau et al., 2017)***. Centrally applied iTBS was investigated in the management of neurological disorders as post stroke spasticity ***(Kim et al., 2015)*** and also in psychiatric disorders ***(Li et al., 2014; Desmyter et al., 2016 & Bulteau et al., 2017)*** all showing variable but promising results.

Another application of the rTMS is the repetitive peripheral magnetic stimulation (rPMS) where the rTMS is either directed to the nerve supplying the affected muscle or to the muscle itself. Werner studied the effect of rPMS on muscle of upper limb in chronic stroke patients, and results showed superiority over sham ***(Werner et al., 2016).***

To date, there is very limited data on the effect of application of iTBS directly to the spastic muscles and further studies were recommended.

Aim of the work

The aim of the work was to study the efficacy of peripheral iTBS on the limb spasticity following stroke and to evaluate the effects of peripheral iTBS on the functional recovery following stroke.