

## LOW FREQUENCY REPETITIVE TRANS-CRANIAL MAGNETIC STIMULATION PRODUCES INHIBITION OF DETRUSOR OVERACTIVITY IN PATIENTS WITH PARKINSON'S DISEASE

### Hypothesis / aims of study

Transcranial magnetic stimulation (TMS) is a non invasive method of brain stimulation frequently used as diagnostic and research tool since its introduction in 1985 (1). TMS uses magnetic fields to induce electric currents that cross the nervous tissue, producing neuronal depolarization. It is performed positioning an electromagnetic coil on the skull over the cerebral motor area (motor hot spot). The evoked motor responses are recorded as electromyographic potentials from the muscles. The repetitive transcranial magnetic stimulation (rTMS) is the application of magnetic stimuli at frequencies of 1 Hz (low frequency) or higher (high frequency). When applied over the motor cortex, high frequency rTMS is able to induce facilitatory effects on cortico-spinal excitability, while low frequency stimulation rather induces inhibitory effects (2). High frequency rTMS has been found to improve the voiding phase parameters in multiple sclerosis patients, with detrusor underactivity (3). Low frequency rTMS could theoretically produce opposite effects (e.g. improvement of detrusor overactivity). Aim of this study was to analyse effects of low frequency rTMS on lower urinary tract activity in Parkinson's disease (PD) patients.

### Study design, materials and methods

10 patients (6 females and 4 males) affected by mild-moderate (Hoehn Yahr scale  $\leq 3$ ) PD were included in this study, after signing an informed consent. Mean age was 63 (58-70) years. All patients had overactive bladder (OAB) syndrome. No patients had any obvious lower urinary tract pathology or abnormality. None of them were using drugs conditioning the lower urinary tract, except those for PD; PD therapy remained unchanged during all the study period. Each patient was submitted to 10 inhibitory (1 Hz) rTMS sessions in two consecutive weeks. rTMS was applied over the primary motor cortex (pelvic floor hot spot) of the dominant hemisphere at 100% resting motor threshold intensity. Every session was composed from 20 trains of 10 seconds (50 stimuli each train) with intervals of 30 seconds. 1 to 5 days before, and 1 to 3 days after rTMS treatment, a urodynamic evaluation was performed; an IPSS symptom score was also fulfilled by all patients before and after treatment. Results obtained were statistically compared.

### Results

Results are reported in table.

N. Pats.10	Before rTMS (mean)	After rTMS (mean)	p
IPSS (total)	12,5	8,7	0.01
IPSS (filling phase symptoms)	10,3	6,5	0.004
IPSS (QoL)	3,8	2,4	0.01
First desire (ml)	125	184	0.01
Bladder capacity (ml)	324	386	0.01
Detr. Involuntary contractions volume (ml)	286	311	0.01
Detr. involuntary contractions amplitude (cmH <sub>2</sub> O)	34	26	0.12

The remaining urodynamic parameters analysed during the filling and the voiding phase were not significantly changed after rTMS.

### Interpretation of results

While high frequency rTMS has been shown to produce effects on voiding phase of the micturition cycle, inhibitory low frequency rTMS seems to produce effects on the filling phase. In our series, PD patients with OAB syndrome showed a symptomatic and urodynamic improvement of their condition after inhibitory rTMS. In particular, a reduction of IPSS symptom score was noticed: this reduction was produced by a significant decrease of the scores of the three questions on filling phase symptoms (frequency, urgency, nocturia); on the other hand, no difference was noticed between scores of the remaining questions (voiding phase symptoms). It is worthy to note that the score of IPSS final question on quality of life was reduced significantly as well, thus demonstrating that this treatment could produce a good clinical improvement of PD patients with OAB. Urodynamic parameters showed an improvement of detrusor overactivity, with significant increase of first desire, volume at detrusor involuntary contractions appearance and bladder capacity.

### Concluding message

Inhibitory rTMS seems to be an effective, non invasive treatment for mild-moderate PD patients with OAB. Further studies on the long term effects of this treatment are needed.

### References

- 1) Electroencephalogr. Clin. Neurophysiol. 1994; 91: 79-82.
- 2) Exp Brain Res. 2003;148: 1-16.
- 3) Mult Scler. 2007 Mar;13(2):269-71.

<b>Specify source of funding or grant</b>	None
<b>Is this a clinical trial?</b>	No
<b>What were the subjects in the study?</b>	HUMAN
<b>Was this study approved by an ethics committee?</b>	No
<b>This study did not require ethics committee approval because</b>	It is a pilot study on non investigative treatments commonly used in this patients' population. A larger clinical study is under evaluation of our local ethics committee.

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*Was the Declaration of Helsinki followed?*

**Yes**

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*Was informed consent obtained from the patients?*

**Yes**

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