



## VOIDING DYSFUNCTION/FEMALE UROLOGY

### ORIGINAL ARTICLE

# Does sacral pulsed electromagnetic field therapy have a better effect than transcutaneous electrical nerve stimulation in patients with neurogenic overactive bladder?



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#### KEYWORDS

Magnetic field therapy;  
Transcutaneous electrical nerve stimulation;  
Neurogenic overactive bladder;  
Spinal cord injury

#### ABBREVIATIONS

CNS, central nervous system;  
FMS, functional magnetic stimulation;  
MCC, maximum cystometric capacity;

**Abstract Objective:** To compare the effectiveness of pulsed electromagnetic field therapy (PEMFT) and transcutaneous electrical nerve stimulation (TENS) on neurogenic overactive bladder dysfunction (OAB) in patients with spinal cord injury (SCI).

**Patients and methods:** In all, 80 patients [50 men and 30 women, with a mean (SD) age of 40.15 (8.76) years] with neurogenic OAB secondary to suprasacral SCI were included. They underwent urodynamic studies (UDS) before and after treatment. Patients were divided into two equal groups: Group A, comprised 40 patients who received 20 min of TENS (10 Hz with a 700 s generated pulse), three times per week for 20 sessions; Group B, comprised 40 patients who received PEMFT (15 Hz with 50% intensity output for 5 s/min for 20 min), three times per week for 20 sessions.

**Results:** In Group B, there was a significant increase in the maximum cystometric capacity ( $P < 0.001$ ), volume at first uninhibited detrusor contraction ( $P < 0.002$ ), and maximum urinary flow rate ( $P < 0.02$ ).

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OAB, overactive bladder;  
 PEMFT, pulsed electromagnetic field therapy;  
 $Q_{\max}$ , maximum urinary flow rate;  
 SCI, spinal cord injury;  
 TENS, transcutaneous electrical nerve stimulation;  
 UDS, urodynamic studies

**Conclusion:** The UDS showed that the effects of PEMFT in patients with neurogenic OAB secondary to suprasacral SCI was better than TENS for inducing an inhibitory effect on neurogenic detrusor overactivity.

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## Introduction

Neurogenic bladder is defined as dysfunction of the bladder resulting from damage to or disease of the central nervous system (CNS) [1], and thus is a broad diagnosis, as it describes bladder dysfunction resulting from any neurological insult to the CNS [2].

Neurogenic bladder dysfunction is present in all patients with spinal cord injury (SCI) with persistent neurological deficits and in 70% of ambulatory patients with SCI [3]. Bladder dysfunction is also common in spina bifida, which affects about one in every 1000 live births [4].

A novel technique for stimulating the nervous system non-invasively is magnetic field stimulation (MFS), which can activate deep neural structures via induced electric currents, without pain and discomfort. Also, several clinical trials including placebo-controlled studies have shown that MFS of the pelvic floor and sacral roots is effective for overactive bladder (OAB). MFS induces inhibitory effects on detrusor overactivity in a similar manner to electrical stimulation, with significant clinical advantages. MFS of the sacral nerve roots could be a promising alternative treatment for OAB [5].

Urodynamic studies (UDS) evaluate urinary functioning and includes: urinary flowmetry, bladder cystometrogram/electromyogram, Valsalva leak-point pressure measurement, and urethral pressure profiling. The most definitive and objective way to determine abnormalities in bladder and urethral functioning is by UDS in the filling/storage phase, as well as voiding phase in neurogenic bladder dysfunction [4]. In many patients, UDS are necessary to gain a complete diagnosis of how the neurogenic dysfunction has changed the function of different components of the lower urinary tract and their interaction [6].

The purpose of the present study was to compare the effects of pulsed electromagnetic field therapy (PEMFT) vs transcutaneous electrical nerve stimulation (TENS) on neurogenic OAB in patients with spinal cord injury (SCI).

## Patients and methods

This study comprised 80 patients, 50 men and 30 women [mean (SD) age 40.15 (8.76) years], with neurogenic OAB following suprasacral SCI that occurred 6–18 months beforehand. They were referred from a neurologist and urologist to exclude the presence of other non-neurogenic causes of bladder dysfunction or other associated problems related to the bladder.

Urine analysis was done for all patients to exclude any other causal problems and life style information (e.g. smoking and alcohol consumption) was ascertained.

They were divided randomly into two equal groups: Group A, comprised 40 patients, 24 men and 16 women, with neurogenic OAB who had sacral TENS (10 Hz with a generated pulse of 700 s) applied for 20 min, three times a week for 20 sessions; Group B, comprised 40 patients, 26 men and 14 women, with neurogenic OAB who had sacral PEMFT (5 Hz, with a 15% intensity output for 5 s/min) applied for 20 min, three times a week for 20 sessions.

The patients were selected according to the following criteria: (i) diagnosed by a urologist and neurologist as having neurogenic OAB dysfunction based on careful neurological and urological investigations including patient history, physical examination, urine analysis, and UDS; (ii) patients aged 20–55 years; and (iii) onset of neurogenic OAB within 6–18 months after suprasacral SCI.

The exclusion criteria included: (i) other non-neurogenic causes of bladder dysfunction, (ii) other causes of neurogenic OAB, (iii) severe cognitive impairment, (iv) patients that had other associated problems related to the bladder, and (v) patients that had undergone a surgical procedure related to the bladder.

Every patient was assessed for pus cells, red blood cells and bilharziasis before treatment to exclude any other cause of OAB.

UDS included: maximum urinary flow rate ( $Q_{\max}$ ), maximum cystometric capacity (MCC) and first uninhibited detrusor contraction to measure bladder

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