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**EFFECACY OF PULSED ELECTROMAGNETIC FIELD
THERAPY ON NEUROGENIC BLADDER IN CHILDREN
WITH MYELOMENINGOCELE: A Randomized
Controlled Trail**

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EFFECACY OF PULSED ELECTROMAGNETIC FIELD THERAPY ON NEUROGENIC BLADDER IN CHILDREN WITH MYELOMENINGOCELE: A Randomized Controlled Trail

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Abstract

Background: Neurogenic bladder is one of the main complications in children with myelomeningocele that affects and interferes with quality of life. Bladder function in these children is affected by disordered innervation of detrusor muscle and external urethral sphincter that may lead to hydronephrosis. **Aim:** This study was conducted to assess the efficacy of pulsed electromagnetic field therapy on neurogenic bladder in children with myelomeningocele. **Methods:** Forty myelomeningocele children with neurogenic bladder were enrolled in this study and were assessed for eligibility. Their aged ranged from four and twelve years. They were assigned randomly into two equal groups. Group (A) the control group received medical care and standard urotherapy only. And group (B) the study group received the same medical care and standard urotherapy in addition to pulsed electromagnetic field therapy that applied for 20 min, three times / week for three successful months. Urodynamic studies were used to assess neurogenic bladder pre and post treatment. All children were assisted before and after three months of intervention. **Results:** Post treatment there was significant increase in the maximum cystometric capacity, volume at first uninhibited detrusor contraction, and maximum urinary flow rate only in study group ($P < 0.05$). **Conclusion:** Pulsed electromagnetic field therapy has significant effect on neurogenic bladder in children with myelomeningocele.

Key words: Myelomeningocele, Neurogenic bladder, pulsed electromagnetic field therapy.

Introduction:

Myelomeningocele (MMC) is one of the most serious congenital defects with an incidence of 0.3 to 4.5 per 1000 births [1]. This defect is caused by the inability of neural tube to close during early gestational period and usually presents by lower limb paresis and bowel and bladder dysfunction [2]. Bladder dysfunction caused by disordered innervation of detrusor muscle and external urethral sphincter that may lead to hydronephrosis or reflux and finally renal failure with life-threatening conse-

quences [3]. Treatment of urinary system dysfunction is primarily aimed at preventing upper urinary tract damage and secondarily at gaining continence and improving quality of life and social interactions [4]. Initial treatment is based on clean intermittent catheterization (CIC) and anticholinergic medications. In those who fail to respond to medical treatment, surgical procedures might be needed [5].

Neurogenic bladder is defined as dysfunction of the bladder resulting from damage to or disease of the central nervous system (CNS) [6], and thus is a broad diagnosis, as it describes bladder dysfunction resulting from any neurological insult to the CNS [7]. Neurogenic bladder dysfunction (NBD) is present in all patients with spinal cord injury (SCI) with persistent neurological deficits and in 70% of ambulatory patients with SCI [8]. It is also common in spina bifida, which affects about one in every 1000 live births [9]. The commonest cause of NBD is myelomeningocele. Other causes of NBD involving the spinal cord include, spina bifida occulta, lipomeningocele, sacral agenesis, and tethered spinal cord associated with imperforated anus, and cloacal malformations [10, 11, 12, and 13].

Magnetic field stimulation (MFS) is non-invasive technique with low side effect risks and without problems of drug interactions in chronic inflammatory diseases [14], it stimulates the nervous system and can activate deep neural structures by induced electric currents, without discomfort or pain [15]. Pulsating electromagnetic field (PEMF) stimulation showed anti-inflammatory effects in Crohn's disease patients by induction of peripheral blood mononuclear cells apoptosis and changes in cytokine profile [16].

Subjects and methods:

A pretest-posttest randomized controlled study was conducted in outpatient clinic in faculty of physical therapy, Cairo University. Informed consent was provided for each child from their parents. The procedures followed were in accordance with the Institutional Ethical Committee Clearance No: P.T.REC/012/002423.

Subjects:

Forty myelomeningocele children with neurogenic bladder were enrolled in this study and were assessed for eligibility. Their ages ranged from four and twelve years (15 girls and 25 boys). The children participated in this study were from both sexes, with stable medical and psychological status, had the same socioeconomic status, able to follow the verbal commands or instructions. We excluded children with visual or auditory problems, children with any neurological manifestation rather than spina bifida, medically unstable children especially with cardiovascular disorders, or mentally retarded children, children with any sign of urinary tract infection, or any implanted metal and uncooperative children.

They were assigned randomly into two equal groups. Group (A) the control group received medical care and standard urotherapy only. And group (B) the study group received the same medical care and standard urotherapy in addition to pulsed electromagnetic field therapy. PEMFT applied at sacral area for 20 min (5 Hz, with a 15% intensity output for 5 s/min), three times / week for three successful months. All children were assisted using urodynamic studies before and after three months of intervention.

Materials for evaluation:

The children were selected and diagnosed by urologist and neurologist as having neurogenic OAB dysfunction based on careful neurological and urological investigations including patient history, physical examination, urine analysis, and Urodynamic studies (UDS).

UDS is objective way to evaluate urinary functioning and includes: urinary flowmetry, bladder cystometrogram/electromyogram, and urethral pressure profiling and valsalva leak-point pressure measurement. The most definitive way to determine urethral functioning and abnormalities in bladder in the filling/storage phase, as well as neurogenic bladder dysfunction in the voiding phase [17].

All children were assisted using UDS pre and post treatment period that included: maximum urinary flow rate (Qmax), maximum cystometric capacity (MCC) and first uninhibited detrusor contraction to measure bladder capacity, detrusor pressure at Qmax, and compliance.

Flow chart

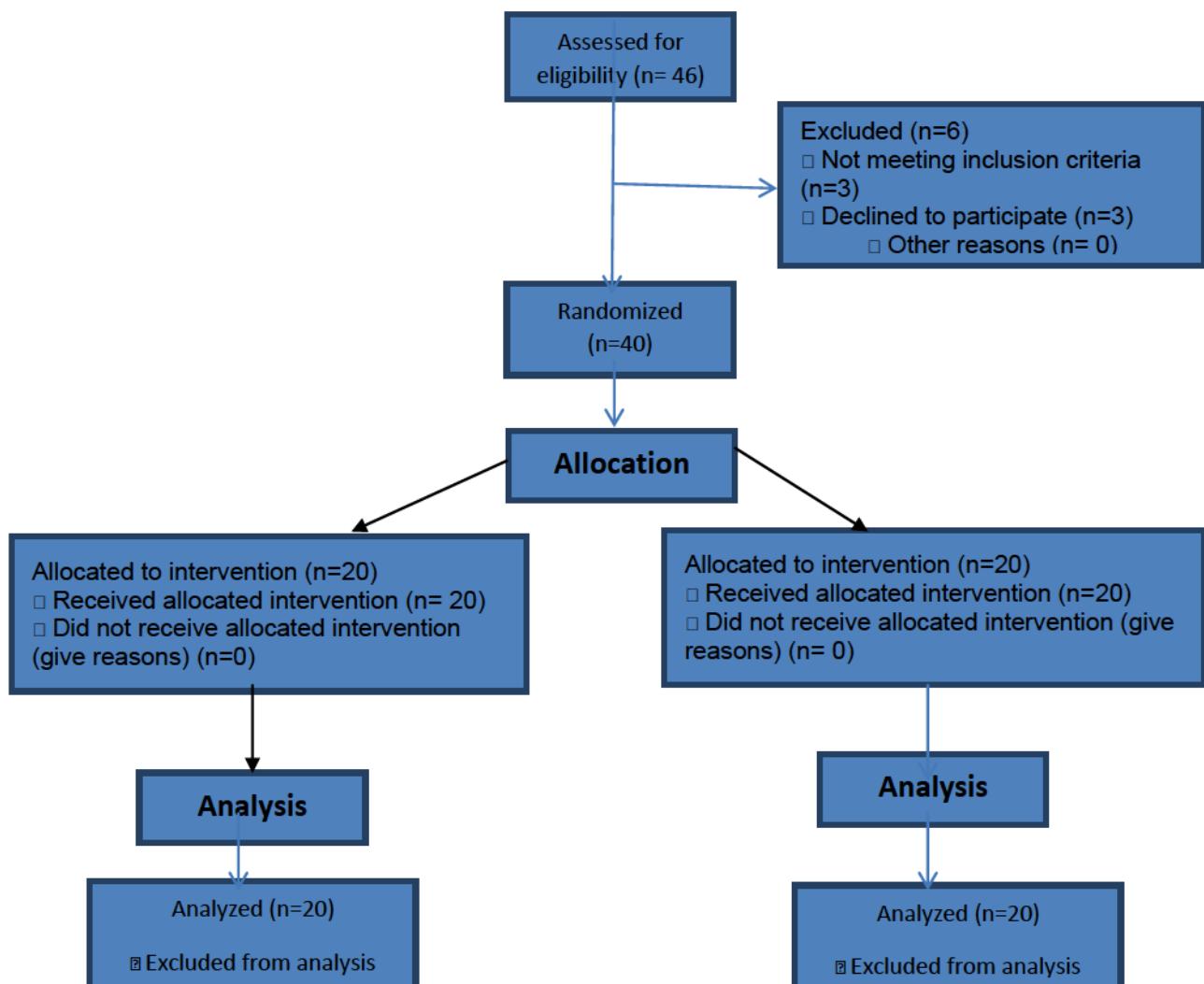


Fig 1, flow chart

Methods of Treatment

- Group (A) the control group received medical care and standard urotherapy only.
- Group (B) received the same medical care and standard urotherapy in addition to pulsed electromagnetic field therapy. The children were instructed to laying in prone position and PEMFT applied at sacral area for 20 min (5 Hz, with a 15% intensity output for 5 s/min), three times / week for three successful months. All children were assisted usingurodynamic studies before and after three months of intervention.

Statistical analysis

For analysis of data in the present study, SPSS software version 21 was used for data analysis. Descriptive statistics was used to identify the mean and standard deviation for each variable. Paired t-test was used to test pre and post changes in each group of the study.

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