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## Therapeutic approaches on neurogenic bladder: A comprehensive literature review

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### Abstract

**Background:** Neurogenic bladder is a term applied to a malfunctioning urinary bladder due to neurologic dysfunction or insult emanating from internal or external trauma, disease or injury. Successful bladder management is multi-dimensional, and as such, treatments may be multi faceted.

**Objective:** This literature review is to find out an evidence based physiotherapy management following neurogenic bladder.

**Methods:** This study reviewed 9 studies on effect of therapeutic techniques on neurogenic bladder, and all studies reviewed different types of therapeutic regimen.

**Result:** There were 9 studies reviewed out of which 2 experimental and 6 review articles were taken for the review which showed that techniques like non invasive transcutaneous electrical stimulation, electro acupuncture, neuromodulation of (sacral nerve, tibial nerve and pudendal nerve), electrical stimulation of tibial nerve, therapeutic exercises and therapeutic exercises along with biofeedback are effective for the treatment of neurogenic bladder.

**Conclusion:** The current review of the literature though seems to be controversial in certain areas concluded that the therapeutic interventions in the recent studies are effective for the improvement of urinary symptoms in patients with neurogenic bladder.

**Keywords:** Therapeutic approaches, neurogenic bladder, comprehensive literature review

### Introduction

The normal function of the urinary bladder is to store and expel urine in a coordinated, controlled fashion. This coordinated activity is regulated by the central and peripheral nervous systems. The urinary bladder is a muscular reservoir of urine, which lies in the anterior part of the pelvic cavity. The detrusor muscle is a layer of the urinary bladder wall made of smooth muscle fibers adapted for mass contraction encouraging the bladder to expel urine through the urethra <sup>[1, 2]</sup>. Physiology of Micturition is the process by which the urinary bladder empties when it becomes filled. This involves: The progressive filling of the bladder until the tension in its walls rises above a threshold level, and therefore eliciting a nervous reflex called the micturition reflex that empties the bladder or causes a conscious desire to urinate. Although the micturition reflex is an autonomic spinal cord reflex, it can also be inhibited or facilitated by centers in the cerebral cortex or brain stem <sup>[3]</sup>. Neurogenic bladder is a term applied to a malfunctioning urinary bladder due to neurologic dysfunction or insult emanating from internal or external trauma, disease or injury. Successful bladder management is multi-dimensional, and as such, treatments may be multi-faceted, while others have focused on isolated strategies such as dietary, pharmacological, electrical stimulation and surgery. Clinical and physiotherapy Management are Timed voiding, Valsalva's or crede's maneuver, Bladder stimulation, Anal stretch voiding, Pelvic floor exercises – kegel exercise and Biofeedback therapy. Objective of this literature review to find out an evidence based physiotherapy management following neurogenic bladder <sup>[4-6]</sup>.

### Methods

This study reviewed 9 studies on effect of therapeutic techniques on neurogenic bladder, and all studies reviewed different types of therapeutic regimen that can help to improve strength of detrusor, internal and external sphincter. Martin Slovaka, *et al.* (2015) Non-invasive transcutaneous electrical stimulation in the treatment of overactive bladder. Aim of the study

Was to review the literature on transcutaneous electrical nerve stimulation (TENS) used as a therapy for overactive bladder (OAB) symptoms, with a particular focus on: stimulation site, stimuli parameters, neural structures thought to be targeted, and the clinical and urodynamic outcomes achieved? The electronic database PubMed from inception until December 2013 was searched. The primary search identified 410 articles. Using the defined exclusion criteria 16 articles was reviewed in detail. Conclusion: There is tantalising evidence for efficacy of the transcutaneous stimulation approach, although further large placebo-controlled studies are required to provide a robust evidence base [7]. Li-Ping Xia, *et al.* (2014) Effects of electro acupuncture combined with bladder training on the bladder function of patients with neurogenic bladder after spinal cord injury. The aim of this study was to explore effects of electro acupuncture combined with bladder training on bladder function of patients with neurogenic bladder after spinal cord injury (SCI) above the sacral segment. Forty-two patients with neurogenic bladder after SCI were evenly divided into two groups (n=21) and given only bladder function training (control group) or electro acupuncture combined with bladder function training (treatment group). Conclusions: This study reveals that combined electro acupuncture with bladder training can improve bladder function, and reduce urinary tract symptoms. The treatment has excellent efficacy, it is of high clinical value [8].

Byung-Cheul Shin, *et al.* (2012) Acupuncture for spinal cord injury and its complications: A Systematic Review and Meta-Analysis of Randomized Controlled. To evaluate the evidence supporting the effectiveness of acupuncture treatment for SCI and its complications, they conducted search across 19 electronic databases to find all of the 27 randomized controlled trials (RCTs) that used acupuncture as a treatment for SCI and its complications. Conclusion: The results of the systematic review and meta-analysis suggest that the evidence for the effectiveness of acupuncture as a symptomatic treatment for SCI and its complications is encouraging but limited [9].

Anwar Abdelgayed Ebid (2011) Effect of 12-weeks posterior tibial nerve stimulation in treatment of overactive bladder. The aim of this study is to investigate the effect of posterior tibial nerve electrical stimulation (PTN) on urodynamic parameters and in treatment of overactive bladder. Sixty patients their ages ranged from 20-70 years were participated in this study. They were randomly allocated into two groups. Group (A) received 12 weeks posterior tibial nerve electrical stimulation and group (B) received pelvic floor exercises for 12 weeks. Conclusion: This study has demonstrated that PTNS, which is a minimally invasive technique, is effective to suppress detrusor over activity. Also, demonstrated objective effect of PTNS on especially bladder stability, and maximum flow rate, improved urodynamic parameters with PTNS, which is observed in this study, is an encouraging finding that further supports its use as an effective treatment modality in the clinical practice of detrusor over activity [10].

Frank N. Burks, *et al.* (2010) Neuro modulation and the Neurogenic Bladder This article reviews the application of various electrical neuromodulation techniques to treat neurogenic bladder. Conclusion: Neuromodulation is changing the management of voiding dysfunction. Techniques using

both electrical and mechanical stimulation are being researched to help correct the underlying bladder and bowel dysfunction. Advances in neuromodulation techniques may allow the clinician to abandon irreversible destructive/reconstructive procedures such as bladder augmentation and urinary diversion [11].

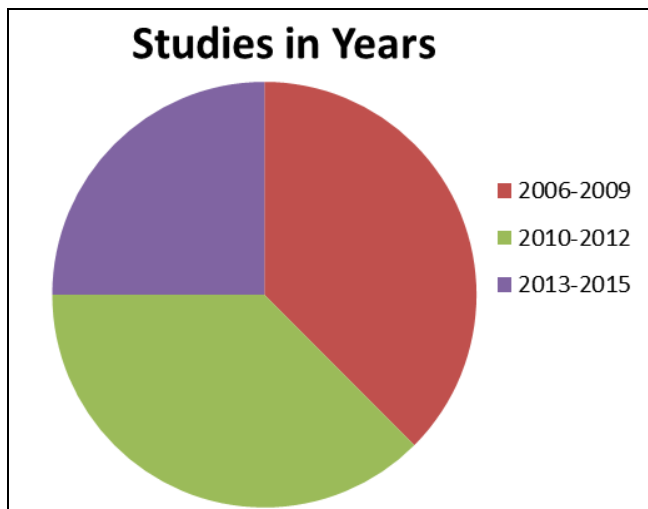
Peter T. Dorsher, *et al.* (2009) Review Article Acupuncture's Effects in Treating the Sequelae of Acute and Chronic Spinal Cord Injuries: A Review of Allopathic and Traditional Chinese Medicine Literature. The purpose of this treatise is to review the allopathic and traditional Chinese medicine (TCM) literature that discuss the potential uses of acupuncture to treat acute and chronic 15 spinal cord injuries and their sequelae, and present the neurophysiologic mechanisms for acupuncture's beneficial effects. Conclusions: There is evidence that use of electro acupuncture in acute spinal cord injured subjects may significantly improve their long term neurologic recovery including motor, sensory and bowel/bladder function. Acupuncture may even improve neurourologic function in spinal cord injured individuals with chronic neurogenic bladder [12].

Marilyn freedman, *et al.* Pelvic Floor Rehabilitation the authors' goal in setting out the rudimentary knowledge of function, assessment, and intervention with PFMD is to emphasize the importance of using this awareness in the overall assessment and intervention with all patients. Therapeutic exercises, biofeedback, relaxation methods, home exercise training devices, dilators. Conclusion: Physical therapy is an integral part of the interdisciplinary team treating PFMD. Expertise in exercise, posture, activities of daily living, myofascial mobilization, and physical agents makes the involvement of physical therapists in PFMD rehabilitation inevitable [13].

H. Madersbacher, *et al.* Conservative Management in Neuropathic Urinary Incontinence This chapter deals with the conservative treatment of urinary incontinence due to neurological pathology, which can be caused by (a) suprapontine, (b) spinal cord and (c) subsacral (cauda equina and peripheral nerves) lesions. Triggered reflex voiding. This could be recommended for patients whose situation has proven to be urodynamically safe and stable, and who can manage reflex incontinence bladder expression (crede and valsalva). This only guarantee a good quality of life and are cost-effective in long term when the indication is proper and when the situation remains stabile throughout the years. Electrical neuromodulation: Non-invasive electrical neuromodulation should always be applied before invasive electrical neuromodulation (sacral nerve stimulation of S3) is considered. Electrical stimulation of the pelvic floor musculature. In patients with incomplete denervation of the pelvic floor muscle and the striated sphincter electro stimulation via anal or vaginal plugs performed over months, may improve pelvic floor function, thus improve incontinence [14].

**Results:** Total of 9 studies reviewed, few studies were experimental and few were review articles, author year, type of study, treatment and interpretation was explained below.

| Author                          | Year and Type of Study  | Treatment  | Interpretation   |
|---------------------------------|-------------------------|--|--|
| Martin Slovaka, <i>et al.</i>   | 2015 literature review  | Non-invasive transcutaneous electrical stimulation.  | There is tantalizing evidence for efficacy of the transcutaneous stimulation approach, although further large placebo-controlled studies are required to provide a robust evidence base  |
| Li-Ping Xia, <i>et al.</i>      | 2014 experimental study | Electro acupuncture combined with bladder training   | combined electro acupuncture with bladder training can induce rhythmic contraction and relaxation of detrusor muscle and internal bladder sphincter, promote the formation of micturition reflex, improve bladder function, and reduce urinary tract symptoms.             |
| Byung-Cheul Shin, <i>et al.</i> | 2012 review article     | Acupuncture  | systematic review and meta-analysis suggest that the evidence for the effectiveness of acupuncture as a symptomatic treatment for SCI and its complications is encouraging but limited   |
| Anwar Abdelgayed Ebid           | 2011 experimental study | Posterior tibial nerve stimulation.  | posterior tibial nerve electrical stimulation is a new trend in the treatment of overactive bladder and urgency  |
| Frank N. Burks, <i>et al.</i>   | 2010 review article     | Neuromodulation  | Advances in neuromodulation techniques may allow the clinician to abandon irreversible destructive/reconstructive procedures such as bladder augmentation and urinary diversion.   |
| Peter T. Dorsher, <i>et al.</i> | 2009 Review Article     | Acupuncture  | There is evidence that use of electro acupuncture in acute spinal cord injured subjects may significantly improve their long-term neurologic recovery including motor, sensory and bowel/bladder function.   |
| Marilyn Freedman, <i>et al.</i> | 2009 Review Article     | Therapeutic exercises, biofeedback and home exercise training devices.   | Physical therapy is an integral part of the interdisciplinary team treating PFMD. Expertise in exercise, posture, activities of daily living, myofascial mobilization, and physical agents makes the involvement of physical therapists in PFMD rehabilitation inevitable. |
| H. Madersbacher, <i>et al.</i>  | 2009 Review Article     | Triggered reflex voiding, bladder expression, electrical neuromodulation, electrical stimulation of the pelvic floor musculature | In patients with incomplete denervation of the pelvic floor muscle and the striated sphincter electro stimulation performed over months, may improve pelvic floor function, thus improve incontinence.   |



**Discussion:** Neurogenic bladder, is a dysfunction of urinary bladder due to some condition in central nervous system or peripheral nerves involved in the control of micturition (urination) and physiotherapy has been an integral part in the conservative management of neurogenic bladder. Therefore this literature review is to find out an evidence based physiotherapy management following neurogenic bladder. This study reviewed 9 studies on effect of therapeutic techniques on neurogenic bladder, out of which 2 experimental studies and 6 review article where reviewed with different types of therapeutic regimen which shows that techniques like electro acupuncture, neuromodulation, TENS, electrical stimulations and exercise regimens are effective ways of therapy and is more effective when used in combination with the traditional physiotherapy treatments techniques like Timed voiding, Valsalva's or crede's maneuver, Bladder stimulation, Anal stretch voiding, Pelvic floor exercises – kegel exercise.

**Conclusion:** Supportive evidence from the literature review though seems to be controversial in certain areas concluded that physical therapy is an integral part of the interdisciplinary team treating neurogenic bladder. The recent advances in therapeutic rehabilitation augments the diagnostic intervention skills of other health professionals and improve urinary symptoms in patients with neurogenic bladder through the treatments interventions which can be implemented alone or in combination like acupuncture; electro acupuncture; electrical stimulation of sacral nerve, tibial nerve, pudendal nerve; neuromodulation; transcutaneous electrical and nerve stimulation; home exercise training using devices. Hoping that in the near future, as we make greater strides and advancements in the areas of physiotherapy, there will be additional more attractive forms of therapy that will allow patients with neurogenic bladder to keep their kidneys safe, their clothing dry, and their quality of life strong.

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