ORIGINAL ARTICLE

Neuromodulation through electromagnetic wave therapy (Neotonus chair) for urge incontinence: an experience in Mexico

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ABSTRACT

Introduction: Neuromodulation with the Neotonus electromagnetic wave chair has been successfully used in patients with urge incontinence.

Objective: To evaluate the response of patients with overactive bladder to neuromodulation with the Neotonus chair.

Methods: From January 2008-2010 case records of women with treatment-refractory urge incontinence treated with neuromodulation utilizing the Neotonus chair were reviewed. Data referring to age, perineometer contraction measurements, quality of life index, and number of incontinence towels used in 24 hours (bladder diary) before and after therapy, respectively, were collected. Data recorded in Excel were processed by means of chi-square test and t-test with 95% confidence interval using the SPSS statistical program.

Results. Thirty-three complete case records were evaluated. Mean age was 58.03 years (13.34 SD). Before and after therapy, respectively, mean contraction measurement with perineometer was 10.55 cm H_2O (DS 9.43) and 24.15 cm H_2O (10.04 SD) (*P*<0.000 t-test); mean quality of life index was 45.42 points (12.81 SD) and 75.97 points (11.71 SD) (*P*<0.000 t-test); mean number

RESUMEN

Introducción: *La neuromodulación con la silla de ondas electromagnéticas (NEOTONUS) se ha aplicado con éxito en incontinencia urinaria de urgencia (IUU).*

Objetivo: *Evaluar la respuesta de pacientes con IUU a la neuromodulación con la silla de Neotonus.*

Métodos: *De enero 2008 a 2010, fueron revisados los expedientes de mujeres con IUU rebelde a tratamiento, tratadas con neuromodulación por la silla de Neotonus. Se recabaron edad, perineometría, índice de calidad de vida (IQoL) y número de toallas en 24 horas (diario vesical), antes y después de la terapia respectivamente. Los datos capturados en Excel fueron procesados por Ji cuadrada y t-test con 95% Intervalos de Confianza (95% IC), usando el programa estadístico SPSS.*

Resultados: *Se evaluaron 33 casos con expedientes completos. La media de edad fue 58.03 años (DS 13.34). La media de la perineometría fue de 10.55 cm H_2O (DS 9.43) y de 24.15 cm H_2O (DS10.04) (p <0.000 t-test); la media del IQoL fue de 45.42 puntos (DS12.81) y de 75.97 puntos (DS11.71) (p <0.000 t-test); la media del número de toallas fue de 4.45 (DS 2.88) y de 0.36 (DS 0.60) (p <0.000 t-test), antes y después de la terapia respectivamente.*

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of incontinence towels used was 4.45 (2.88 SD) and 0.36 (0.60 SD) (*P*<0.000 t-test).

Conclusions: All variables showed statistically significant difference (*P*<0.000 t-test) after use of the chair, especially in quality of life index and number of incontinence towels used. In the present series the correlation index for being able to discontinue incontinence towel use was 0.76 and for maintaining satisfaction in regard to quality of life index was 0.71 with the Neotonus chair. This treatment is suggested for patients that do not respond to "conventional" urge incontinence management.

Keywords: Neuromodulation, urge incontinence, electromagnetic waves, Neotonus chair, Mexico.

Conclusiones: *Todas las variables mostraron diferencia estadísticamente significativa (p <0.000 t), después del uso de la silla, especialmente el IQol y el número de toallas. En nuestra serie el Índice de correlación para dejar de usar toallas fue de 0.76 y de quedar satisfecha (IQoL) de 0.71 con la silla de Neotonus. Se sugiere usar este tratamiento en pacientes que no responden al tratamiento "convencional" para IUU.*

Palabras clave: *Neuromodulación, incontinencia urinaria de urgencia, ondas electromagnéticas, silla de Neotonus, México.*

INTRODUCTION

Bladder function and pelvic floor activity are integrated. One influences the other in both a facilitatory and inhibitory manner. When the plexus hypogastrium is stimulated (originating in the T10-L2 medullar segments), detrusor muscle relaxation and internal sphincter contraction are produced, inhibiting micturition. Parasympathetic nerve stimulation (originating in S2-S4) produces the opposite effect. [1]

Pelvic floor and external sphincter innervation proceeds from the same S2-S4 segments, partially explaining the interaction at the spinal level. Supraspinal interaction is much more elevated and complex. [2]

Correct bladder and sphincter function depends on the conservation of the delicate balance between the inhibitory and facilitatory stimulus. Peripheral nerve fiber injury intervening in the integration of these interrelations or injury in the part of the central nervous system involved, causes micturition emptying or storage dysfunction, depending on the severity of balance alteration between micturition facilitation and inhibition. [1]

Neurological and urodynamic evaluation help the clinician determine the degree of damage and choose the best therapeutic method. [3] This can range from conservative treatment such as biofeedback, retraining of the pelvic floor musculature, [4] oral medication, parenteral and intravesical agents, self-catheterization, intravesical electrostimulation, [5,6] intravaginal electrostimulation, [7] electroneurostimulation, and electroneuromodulation,[8,9] to surgical methods and their consequences, serious side-effects, and limited success.

Magnetic stimulation has been used to activate neuromuscular tissue. Its effect is due to the fact that it creates an electric medium that can stimulate neuromuscular tissue, including the pelvic floor musculature. Electromagnetic stimulation has been used as a non-invasive, safe, and painless alternative to electric stimulation in the control of urinary incontinence. [10] Yamanishi et al. studied patients with detrusor hyperactivity treated with neuromodulation through electromagnetic waves and found that bladder volume at first micturition desire changed from 160 cc before treatment to 277 cc after treatment and that maximum cystometric capacity rose to 211cc before treatment and 336 after treatment. In the series of this group 86% of patients with stress urinary incontinence were reported to be cured or their condition was improved, as were 75% of patients with urge incontinence.[11] Other effects of pelvic floor electromagnetic wave stimulation have been reported such as increase in orgasmic capacity in women being treated for urinary incontinence. This group reported that women in their series improved their sexual performance by increasing their orgasmic capacity up to 300%. [12,13] The objective of the present study was to evaluate response through neuromodulation using the electromagnetic wave therapy chair (Neotonus chair) in patients with urge incontinence that had not responded to conventional treatment.

METHODS

Case records of women presenting with conventional treatment-refractory urge incontinence during the time frame of January 2008-2010 were reviewed. They were treated with electromagnetic wave neuromodulation.

The apparatus used was the Neotonus chair with neocontrol system from Neotonus Inc., Powder Springs, GA 30127, USA. The apparatus consists of a chair that has the appearance of a living room armchair. It has a coil in the seat that produces electromagnetic waves with frequencies from 1Hz to over 50Hz. Controls adjust working time, resting time, frequency, and intensity. The electromagnetic wave reaches the pelvic floor and produces muscular and pudendal nerve stimulation (**Image 1**). [11,12] Data on the variables of age, perineometry, Incontinence Quality of Life Questionnaire (IQOL), and number of incontinence towels used in 24 hours (bladder diary) before and after electromagnetic wave therapy were obtained. Data were entered on an Excel calculation sheet and processed by means of the chi-square test and t-test using the SPSS commercial statistics program.

Perineometry technique: With the patient in lithotomy position an intravaginal balloon catheter was placed 3.5 cm within the vaginal introitus and connected to a pressure transducer. Pelvic floor musculature strength at rest and in maximum contraction was tested, asking the participant to "tighten the perineum as strongly as possible as if to avoid passing gas", and the reading from a standing position was registered.[14,15]

Neuromodulation technique: Patients underwent twenty 20-minute sessions of neuromodulation with the Neotonus electromagnetic wave chair three times a week. Each session consisted of 10 minutes at a frequency of 5 Hz. Stimulation duration was 5 seconds (work) at maximum intensity and then 5 seconds of rest. After a resting period of 1 minute the session continued another 10 minutes at a frequency of 50 Hz. Stimulation duration was 5 seconds at maximum intensity and then 5 seconds of rest. Patients that presented with clotting alterations, had metallic devices in the pelvis, cardiac arrhythmia, pacemaker, were pregnant or suspected of being pregnant, or had mental or psychiatric alterations did not receive this therapy.

RESULTS

Thirty-three cases with complete case records were evaluated. Mean age was 58.03 years. Variables before and after treatment are shown in **Table 1**.

Image 1. Neotonus Chair. Electromagnetic wave stimulation device from Neotonus, Inc. Ga, USA. Left.- Computer with controls for dosing therapy. Right.- Neotonus Chair where the patient sits to receive electromagnetic wave stimulation.

DISCUSSION

The complex neural control of the lower urinary tract involves central and peripheral mechanisms that must function in perfect balance and coordination among each other and with the bladder urothelium transduction system. [16] The degree of alteration in the balance between the inhibitory stimulus and facilitatory stimulus of the bladder and sphincter should be carefully evaluated. Urodynamic diagnosis is obligatory in order to classify micturition dysfunction and to suggest the therapeutic alternative and prognosis.[3,17]

A wide variety of treatments have been used for urinary incontinence management, including self-catheterization, medication, pelvic floor exercises, biofeedback, electro- stimulation, neuroelectric stimulation, and neuroelectric modulation, but the majority of these treatments entail a certain degree of difficulty for the patient such as:

a. difficulty in correctly identifying the pelvic floor muscle group that should be contracted
b. pain, infection, or bleeding caused by the use of intravesical or intravaginal electrodes
c. pain at the puncture site of the posterior tibial nerve or sacral roots that can include cerebrospinal fluid leakage[4-9]
d. high cost and high desertion rate.

Yamanishi et al. have shown an increase of up to 100cc in maximum cystometric capacity in women with urge incontinence after electromagnetic wave

Table 1. Variables before and after electromagnetic wave neuromodulation using the Neotonus chair.

Variable n = 33	Pre TX	Post TX	*P*
Perineometry (cm H_2O, Normal value=/>52)	10.55 (SD 9.43)	24.15 (SD 10.04)	*P* <0.000
IQol (points, Normal value >79)	45.42 (SD 12.81)	75.97 (SD 11.71)	*P* <0.000
Incontinence towels (number, Normal value 0)	4.45 (SD 2.88)	0.36 (SD 0.60)	*P* <0.000

neuromodulation.[11] This group demonstrated cure or improvement in 86% of patients with stress urinary incontinence and in 75% of patients with urge incontinence. [11] No significant adverse effects were reported.

Other "beneficial" side effects such as improvement in female sexual dysfunction have been reported, including an increase of up to 300% in orgasmic capacity [12,13] in women that underwent electromagnetic wave neuromodulation for the control of urinary incontinence.

The present series included women with urge incontinence that did not respond to conservative therapeutic modalities. A total of 76% of women were able to stop using incontinence towels and 71% had symptom improvement (IQOL). This technique is simple, practical, painless, and non-invasive, all of which motivates treatment adherence with no desertion.

CONCLUSIONS

All variables showed statistically significant difference (*P*<0.000 t-test) after chair use, especially in IQOL and number of necessary incontinence towels. Paired Samples Correlation for discontinuation of incontinence towels was 0.76 and for satisfaction (IQOL) was 0.71 with electromagnetic wave neuromodulation in urge incontinence patients.

For those patients for whom conventional urge incontinence treatment has failed, electromagnetic wave neuromodulation should be considered after thorough urodynamic and endoscopic evaluation has been carried out. [3,14,15,17,18]

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