

## Transcutaneous Tibial Nerve Stimulation in Older Adults with Overactive Bladder

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### ABSTRACT

**Introduction:** Overactive bladder (OAB) is prevalent among older adults and treatment options include transcutaneous tibial nerve stimulation (TcTNS). The objective of this study is to evaluate the effectiveness of at home self-administered TcTNS therapy in older adults with OAB.

**Methods:** A prospective observational study of 37 women, 65 years of age and older, with OAB was conducted. Previous continence surgery, pelvic organ prolapse of  $\geq$  to POP-Q stage III, recurrent urinary tract infections, neurogenic OAB or cognitive deficits were excluded. Subjects were instructed and treated themselves at home daily with a TcTNS for one month. Efficacy was evaluated using a 3-day bladder diary and Quality of life questionnaire (oab-q). A positive treatment response was at least a 50% reduction in episodes of urinary urgency. STATA V.12.1 was used for data analysis, with a p-value of 5%.

**Results:** A total of 37 women were studied. The mean age was 79 years (range: 68 – 90). No adverse effects were reported. After the monthly TcTNS treatment, there was a significant improvement in all the bladder diary parameters quality of life survey, compared to the baseline data ( $p < 0.05$ ). The overall response to treatment was 53%, and 13% of patients reported no episodes of incontinence post TcTNS.

**Conclusions:** TcTNS is an effective tool for controlling symptoms of OAB in older women. Daily at home stimulation for a month achieves therapeutic effects similar to those described after weekly or bi-weekly stimulation over the course of three months.

### KEYWORDS

Overactive bladder syndrome, Nerve stimulation, Urinary incontinence.

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## Introduction

Overactive bladder (OAB) syndrome is defined as the presence of urinary urgency, with or without urgency urinary incontinence (UI), and is often associated with an increase in both day-time and nocturnal urinary frequency, in the absence of an inflammatory bladder disorder which could explain symptomatology [1]. Older adults are nearly three times as likely to suffer from OAB, in comparison to the general population, and the syndrome can severely affect the quality of life of patients. This can lead to the institutionalization of those affected, due to the negative personal and familial consequences of untreated OAB. Epidemiological data has demonstrated that as the population ages, the prevalence and severity of UI increases, and this effect is particularly noxious among those 65 years of age and older [2]. This is principally due to an increase in OAB symptoms, rather than those related with stress urinary incontinence (SUI), which tends to remain stable or even slightly decrease with age.

The increase in OAB among older adults is multi-factorial and can be explained by co-morbidities affecting this population, which exacerbate or trigger symptoms; by anatomical and physiological changes in the lower urinary tract associated with aging, which tend to be greater in women [3,4]. In this vein, a study conducted in institutionalized latino older adults found that 30% of the women had some type of UI, and female sex was the sociodemographic factor most likely to predict development of UI among older adults [5]. The deterioration of the command centers of the central nervous system that regulate continence also play an important role. In fact, UI is considered to be a geriatric syndrome, since its causes are not necessarily related to the changes in the genitourinary tract [6]. Physiological changes related to aging, that impede continence, can be seen at multiple levels – in the brain, the medulla, the bladder, and the urethra – and generate different types of dysfunctions, in the storage phase or in the voiding phase, classified based on the affected functions and structures [7].

UI affects older adults differently than the general population [8-10]. Evidence related to the mortality of patients with UI is contradictory, with some studies showing there is an increased risk among those with this condition [11,12], while others concluded that UI cannot be considered an independent risk factor for mortality [13,14]. Bazán et al. have suggested that the appearance of UI during a hospitalization after a heart attack increases mortality among elderly patients [15]. In institutionalized patients, UI is directly correlated with an increase in falls among older adults, with a consequent greater risk of hip fractures and associated co-morbidities [16].

In light of the aforementioned, it is fundamental that urogynecology and pelvic floor specialists give special consideration to the physiological changes among older adults, the risk factors associated with frequent co-morbidities, pharmacological restrictions and side effects, and the medical and surgical management of UI in

this age group. The correct treatment of this prevalent condition has important implications for patients' quality of life, and that of their family. Therapy for UI would also reduce the necessity of institutionalization, associated mortality, and the frequency of adverse effects due to inadequate or ineffective medical treatment [17,18].

Transcutaneous posterior tibial nerve stimulation (TcTNS) can offer older patients with OAB an alternative treatment that is innocuous but also effective in controlling symptoms [19]. In addition, it can improve patient and family quality of life and save on costs associated with the condition (e.g., diapers, laundry, frequent medical appointments) [20]. To the best of our knowledge, the effectiveness of daily TcTNS in the treatment of OAB in older women has yet to be investigated. Previous studies in other populations have found that this technique reduces symptomatology in 70% of treated patients, with no known adverse effects, without altering the metabolism of any medication, and without affecting cognition; furthermore, in some cases, symptoms related to fecal incontinence and chronic constipation – which are also prevalent among this elderly population – have also improved [21-23].

The objective of this study is to evaluate the effectiveness of daily, at home, self-administered transcutaneous tibial nerve stimulation (TcTNS) therapy in older women with overactive bladder (OAB).

The primary outcome is the reduction of the number of episodes of urinary urgency and urge incontinence, and secondary outcomes are improvement of quality of life and the occurrence of adverse effects.

## Materials and Methods

Women with OAB, who were 65 years of age and older, were recruited to the prospective observational study. The participants signed an informed consent and then completed a three-day voiding diary and quality of life questionnaire (OAB-Q), prior to starting the intervention, and then again in 30 days. The research study was reviewed and approved by the local Ethical Committee of the Clinical Hospital of Universidad de Chile (# 39/2016).

Each patient was trained in administering TcTNS, using a transcutaneous electrical nerve stimulation (TENS) 7000 unit, with surface electrodes, was issued to each patient so that she could self-administer the treatment at her home on a daily basis for 30 days. The stimulation parameters were 20 Hz, 200  $\mu$ /sec, 30 minutes, normal mode. All patients underwent a geriatric evaluation before starting treatment, and those who had an estimated survival of fewer than 6 months, or who were unable to adequately understand and follow instructions due to cognitive impairments, were excluded from the study. Patients who had undergone surgery for UI; who had untreated uterine prolapse  $\geq$  POP-Q stage III; recurrent urinary infections; or a suspected neurological disease were also excluded.

Two weeks prior to completing the voiding diary and quality of life questionnaire, women were instructed to suspend all liquids which could irritate their bladder, such as tea, coffee, and other caffeinated drinks, and they had to continue throughout the treatment period with these restrictions.

The primary study outcome was the 50% or greater reduction of number of episodes of urinary urgency comparing the pre- and post-treatment voiding diaries. The percentage of women who were dry or continent was also recorded. The secondary outcomes, quality of life improvement and adverse effects were collected using the OAB-Q and by recording the adverse treatment effects reported by the patients at each visit. Post treatment results were obtained at day 30.

Results were reported through descriptive statistics, specifically with measures of central tendency (median) and measures of dispersion (25<sup>th</sup> and 75<sup>th</sup> percentiles), due to the nature of the data distribution. To obtain the type of distribution of the sample, the Shapiro-Wilk test was used. The before and after comparison of each of the parameters was conducted using the paired samples Wilcoxon rank test, with a p-value of <5%. The program STATA V.12.1 was used for data analysis.

## Results

A total of 37 women were recruited but the final analysis included the complete data, pre- and post-TcTNS, from only 30 patients. Seven patients did not complete the voiding diary at the end of the stimulation period. The average age was 79 years (68-90). Overall 53% of the women reported a  $\geq$  50% reduction in urgency episodes, with 13% reporting no incontinence post-intervention. There was a significant improvement in voiding frequency, in the number of episodes of urinary urgency and urge incontinence episodes and in the number of diapers used (Table 1). There was no significant change in fluid intake pre- and post-treatment. No adverse effects were reported by the patients, OAB-Q findings before and after treatment are shown in Table 2.

**Table 1:** Results of the evaluation of the voiding diary in older adults with overactive bladder, treated with TcTNS.

Parameter	Pre-treatment	Post-treatment	p-value
<i>Results expressed in the 50<sup>th</sup> percentile (25<sup>th</sup>, 75<sup>th</sup>)</i>			
Daily frequency	9.33 (8.67; 11.67)	7.16 (5.67; 9.67)	<0.0001
Fluid Intake (ml)	1491.67 (123.33; 1666.67)	1416.67 (1133.33; 1669.67)	0.7037
SUI*	0.5 (0; 1.67)	0.33 (0; 1)	0.0351
Nocturia	2 (1.33; 2.33)	1 (0; 1.33)	<0.0001
Pad used	2.5 (1.0; 3.33)	1.17 (0.33; 2)	0.0002
Urge incontinence	2.67 (1.33; 5.67)	0.83(0; 2.67)	<0.0001
Urgency	4.67 (3.33; 7.67)	2.17(1.33; 3.33)	<0.0001

\*Stress urinary incontinence.

**Table 2:** OAB-Q before and after TcTNS.

OAB-Q domains	Pre-treatment	Post-treatment	p-value
<i>Results expressed in the 50<sup>th</sup> percentile (25<sup>th</sup>,75<sup>th</sup>)</i>			
1 (adaptation to live)	48 (43; 48)	24 (19; 28)	<0.001
2 (concern about OAB symptoms)	77.5 (69; 84)	34.5 (28; 45)	<0.001
3 (sleep & social impact)	43.5 (37; 51)	23 (20; 30)	<0.001

## Conclusions

From the results of this study, TcTNS appears to be a useful and effective tool to manage OAB in older women  $\geq$  to 65 years of age. It is easy to teach and self-administer, and it is also inexpensive and safe.

What is especially intriguing about these results are the questions that arise upon comparing these data to those obtained in younger patients. Our previous study from 2016 reporting the effectiveness of TcTNS in younger women with OAB found that treatment response was 70%, with 26% of patients reporting continence after the intervention [20]. The different results between the two populations may be due to the physiological changes associated with aging that occur in the urinary tract and central and peripheral nervous systems.

As described at the turn of the century, TNS functions 1.7 times less effectively in patients with OAB whose underlying pathophysiological mechanism is uninhibited detrusor contraction [24], combined with increased urothelial sensitivity, and this OAB mechanism is present more frequently in older women. This age group has a great prevalence of asymptomatic hyperactive detrusor which is consequently the cause, in part, of the insensible UI that affects some older adults [25].

Another interesting aspect of these findings is that the results were obtained after a month of daily, at home stimulation. The TcTNS unit is relatively inexpensive and easy to perform. As described previously, the final effects of tibial stimulation in patients with OAB do not seem to be related to the frequency of the stimulation, but can be achieved sooner by stimulating more frequently [26].

A limitation of this study is the small number and short term follow up. Despite the small numbers a statically and clinically significant improvement was noted. Longer term follow- up is necessary to determine the durability of these findings. Future research is necessary in older women, and it should be encouraged that other investigators develop additional studies with elderly population. As the world population continues to rapidly age, the findings of future studies on elderly populations will undoubtedly have important clinical applications in the coming decades.

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## References

1. Haylen BT, De Ridder D, Freeman RM, Swift SE, Berghmans B, et al. An International Urogynecological Association (IUGA)/International Continence Society (ICS) joint report on the terminology for female pelvic floor dysfunction. *Int Urogynecol J*. 2010; 21: 5-26.
2. Thom D. Variation in estimates of urinary incontinence prevalence in the community: effects of differences in definition, population characteristics, and study type. *J Am Geriatr Soc*. 1998; 46: 473-480.
3. Pfisterer MHD, Griffiths DJ, Resnick NM. The effect of age on lower urinary tract function: a study in women. *J Am Geriatr Soc*. 2006; 54: 405-412.
4. Sakakibara R, Panicker J, Fowler CJ, Tateno F, Kishi M, et al. Is overactive bladder a brain disease? The pathophysiological role of cerebral white matter in the elderly. *Int J Urol*. 2014; 21: 33-38.
5. Smith AL, Wang PC, Anger JT, Mangione CM, Trejo L, et al. Correlates of Urinary Incontinence in Community-Dwelling Older Latinos. *J Am Geriatr Soc*. 2010; 58: 1170-1176.
6. Inouye SK, Studenski S, Tinetti ME, Kuchel GA. Geriatric syndromes: clinical, research, and policy implications of a core geriatric concept. *J Am Geriatr Soc*. 2007; 55: 780-791.
7. Gabriel Vallejos, Rodrigo Guzmán Rojas, Juan Pablo Valdevenito, Daniela Castro, Valentín Manríquez, et al. Incontinencia Urinaria en el Adulto Mayor. *Rev. Chil. Obstet y Ginecol*. 2019; 84: 158-165.
8. Coyne KS, Sexton CC, Irwin DE, Kopp ZS, Kelleher CJ, et al. The impact of overactive bladder, incontinence and other lower urinary tract symptoms on quality of life, work productivity, sexuality and emotional well-being in men and women: Results from the EPIC study. *BJU Int*. 2008; 101: 1388-1395.
9. Holroyd-Leduc JM, Mehta KM, Covinsky KE. Urinary Incontinence and Its Association with Death, Nursing Home Admission, and Functional Decline. *J Am Geriatr Soc*. 2004; 52: 712-718.
10. Buttar A, Blaum C, Fries B. Clinical characteristics and six-month outcomes of nursing home residents with low activities of daily living dependency. *J Gerontol A Biol Sci Med Sci*. 2001; 56: 292-297.
11. John G, Gerstel E, Jung M, Dällenbach P, Faltin D, et al. Urinary incontinence as a marker of higher mortality in patients receiving home care services. *BJU Int*. 2014; 113: 113-119.
12. Donaldson L, Jagger C. Survival and functional capacity: three year follow up of an elderly population in hospitals and homes. *J Epidemiol Community Health*. 1983; 37:176-179.
13. Holroyd-Leduc JM, Mehta KM, Covinsky KE. Urinary incontinence and its association with death, nursing home admission, and functional decline. *J Am Geriatr Soc*. 2004; 52: 712-718.
14. Herzog A, Diokno AC, Brown MB, Fultz NH, Goldstein NE. Urinary incontinence as a risk factor for mortality. *J Am Geriatr Soc*. 1994; 42: 264-268.
15. Baztán JJ, Arias E, González N, de Prada MIR. New-onset urinary incontinence and rehabilitation outcomes in frail older patients. *Age Ageing*. 2005; 34: 172-175.
16. Abreu HCDA, Reiners AAO, Azevedo RCDS, Silva AMCD, Abreu DRDOM, et al. Incidence and predicting factors of falls of older inpatients. *Rev Saude Publica*. 2015; 49: 37.
17. John G, Gerstel E, Jung M, Dällenbach P, Faltin D, et al. Urinary incontinence as a marker of higher mortality in patients receiving home care services. *BJU Int*. 2014; 113: 113-119.
18. Kay GG, Granville LJ. Antimuscarinic agents: Implications and concerns in the management of overactive bladder in the elderly. *Clin Ther*. 2005; 27: 127-138.
19. Wein AJ, Rackley RR. Overactive bladder: a better understanding of pathophysiology, diagnosis and management. *J Urol*. 2006; 175: 5-10.
20. Manríquez V, Rodrigo Guzmán, Michel Naser, Amalia Aguilera, Simonie Narvaez, et al. Transcutaneous posterior tibial nerve stimulation versus extended release oxybutynin in overactive bladder patients. A prospective randomized trial. *Eur J Obstet Gynecol*. 2016; 196: 6-10.
21. Durden E, Walker D, Gray S, Fowler R, Juneau P, et al. The economic burden of overactive bladder (OAB) and its effects on the costs associated with other chronic, age-related comorbidities in the United States. *Neurourol Urodyn*. 2018; 37:1641-1649.
22. Sarvezad A, Babahajian A, Amini N, Shamseddin J, Yousefifard M. Posterior Tibial Nerve Stimulation in Fecal Incontinence: A Systematic Review and Meta-Analysis. *Basic Clin Neurosci*. 2019; 10: 419-431.
23. Kumar L, Liwanag J, Athanasakos E, Raeburn A, Zarate-Lopez N, et al. Effectiveness of percutaneous tibial nerve stimulation in managing refractory constipation. *Colorectal Dis*. 2017; 19: 45-49.
24. Vera Vandoninck, Michael R van Balken, Enrico Finazzi Agrò, Filomena Petta, Francesco Micali, et al. Percutaneous tibial nerve stimulation in the treatment of overactive bladder: urodynamic data. *Neurourol Urodyn*. 2003; 22: 227-232.
25. Taylor John A, George A Kuchel. Detrusor underactivity: clinical features and pathogenesis of an underdiagnosed geriatric condition. *J Am Geriatr Soc*. 2006; 54: 1920-1932.
26. Finazzi Agrò E, Campagna A, Sciobica F, Petta F, Germani S, et al. Posterior tibial nerve stimulation: is the once a week protocol the best option. *Minerva Urol Nefrol*. 2005; 57: 119-123.